Instruction Manual

PAPERLESS RECORDER

TYPE: PHW

Fuji Electric Co., Ltd.

INP-TN1PHWc-E

PREFACE

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

- 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.

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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, 2A)
  The details of the built-in fuse are as follows.
  Type: TR-5 19372, 3.15A (Manufactured by Wickmann-Werke GmbH)
  Rating: 250V, 3.15A, 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. Otherwise malfunction or failure may result.
- 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 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: 4.9 m/s^2 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.
- This product contains a CR Coin Lithium Battery which contains Perchlorate Material-special handling may apply. See www.dtsc.ca.gov/hazardouswaste/perch lorate

CONTENTS

⚠ 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 PHW.

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 36 channels for the input types such as thermocouple, resistance bulb, and DC voltage (or current).

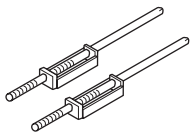
(3) It allows the measured data saved to the compact flash card to be displayed on the display unit. Use of the support software attached to the recorder allows the saved data to be displayed on a personal computer.

1.2 Product check

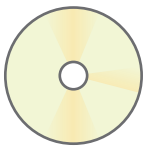
Upon receiving the recorder unit, check the appearance for damage, and if the correct quantity of the accessories are supplied.

Check on accessories

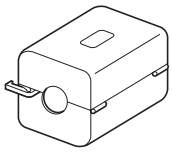
This recorder comes with the accessories shown in Fig. 1-1. Check that they are all present.



(1) Panel-mounting bracket



(2) PC support software (CD-ROM)



(3) Power supply noise filter

Fig. 1-1 Accessories

Product name			Quantity
(1)	Panel-mounting bracket		2
(2)	CD-ROM	PC support software instruction manual (both in Japanese and English)	1
(3)	Power supply noise filter		1
(4)	Quick reference		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).

PHW 4 5 6 7 8 9 10 11 12 13 : * 0 0 * 1 - * 1 * * Y

Digit	Specifications	Note
4	<Number of input points> 9 18 27 36	 1 2 3 4
7	<DI input> Without With (16 points)	 0 1
8	<Improvement No. (Fixed)>	1
9	<Display language > Japanese English	 N E
11	<Alarm output> Without Relay 10 points Relay 20 points Transistor (open collector) 16 points Relay 10 points + Transistor (open collector) 16 points Relay 20 points + Transistor (open collector) 16 points	 0 1 2 3 4 5
12	<Ethernet> Without With	 Y E

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

(1) For the memory card, use SanDisk's compact flash memory (URL: http://www.sandisk.com). Other memory cards may case trouble to the recorder.

CAUTION

1) Be sure to format the memory card with the PC you use.
Format it as FAT16 or FAT. If it is formatted as NTFS, for example, it cannot be used because the PHW 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 once a month. 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 PHW does not recognize it even if it could be formatted on Windows.

(2) Compact flash in the capacity range from 64MB to 1GB 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 7.19 “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 “**7.19 Setting method of record data format**” for details.

Note: 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.)

(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 7.27 “Memory card abstract (compact flash)” for the procedure.

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

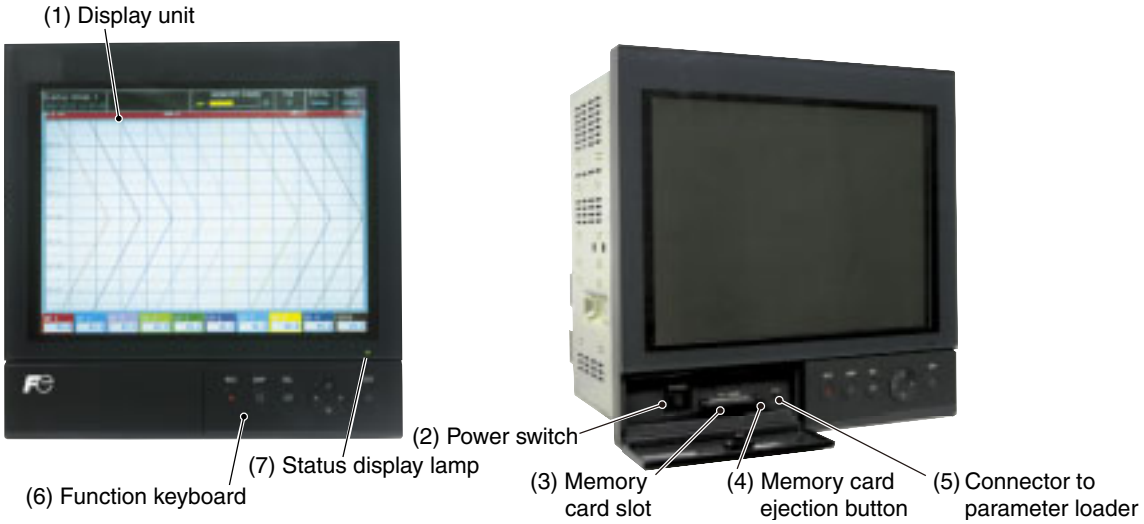
1.5 Ethernet communication function

By connecting the paperless recorder to Ethernet, the following function can be used (when E 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 on occurrence of an alarm or main unit failure.
- MODBUS TCP/IP function: Settings of the recorder can be read or written via the Ethernet.

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 the REC lamp on the display unit is highlighted) or during totalizing. Otherwise, the data cannot be recorded correctly, besides 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 shown in “7.27 Memory card abstract (compact flash)”, 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.

(7) Status display lamp

Displays power ON/OFF, LCD (screen) ON/OFF, and the recording status.

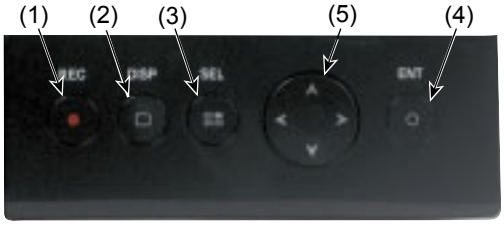
Lamp ON : Power : ON, LCD : ON (recording/recording stop)

Lamp blinking (ON/OFF for 2 sec) : Power : ON, LCD : OFF (recording)

Lamp blinking (ON/OFF for 1 sec) : Power : ON, LCD : OFF (recording stop)

Lamp OFF : Power : OFF

Key operation



	Key name	Function
(1)	REC (Record)	Used to start or stop recording. Pressing once starts recording, and pressing once again stops recording.
(2)	DISP (Display)	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). (1) Real time trend display Displays the measurement data of an arbitrary channel (2) Key guidance display Displays the guide for key operation. (3) Bar graph/analog meter display Displays the measured data of the channel in a bar graph (or analog meter) (4) Digital display Displays the measured data of the channel in numerical values. (5) Totalizing data display Displays the totalizing data of an arbitrary channel in numerical values. (6) Event summary display Displays the alarm summary or message summary. (7) Ethernet log display Displays the FTP communication and E-mail sending log. Used to switch the parameter setting screen to the data display screen.
(3)	SEL (Select)	Used to switch from the data display screen to the parameter setting screen. Pressing the key on the parameter setting screen switches to the screen one step up. Note, however, that pressing the key on the menu screen does not change screens.
(4)	ENT (Entry)	(1) Used for selection on the setting screen or registration of the set data. (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…..) *1: The screen in the past of the data currently recorded
(5)	(Cursor)	(1) Used to select setting items. (2) Used to increase or decrease numerical values. (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. (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. ▶ key: Group 1 → 2 → 3 → 4 →5 → 6→ 7 →8 → 1 ... ◀ key: Group ... ← 1 ← 8 ← 7 ←6 ← 5 ← 4 ←3 ← 2 ← 1 *1: The screen in the past of the data currently recorded

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 the photo.

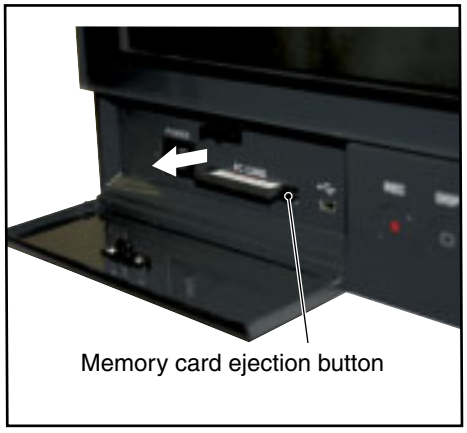
CAUTION

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

Be careful not to forcibly press the card if it is inserted obliquely. Otherwise the pin on the PHW 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 7.27 "Memory card abstract (compact flash)" for the removal of the memory card while recording is in progress.

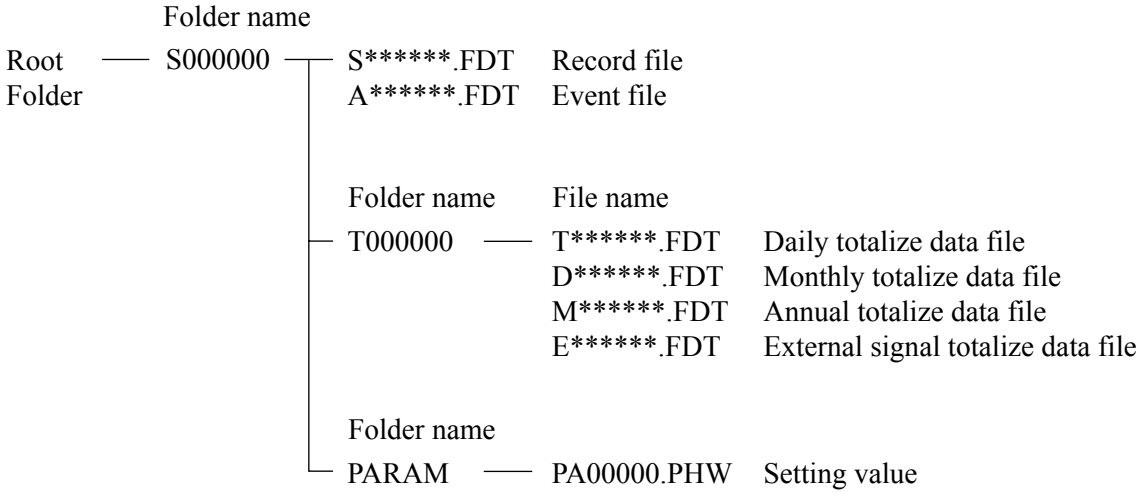
(2) After inserting the memory card into the slot, don't remove the card before the recorder acknowledge it.

(3) Be careful with static electricity when removing the memory card.

2.3 Recording data to memory card

(1) Folder configuration of Memory card:

For memory card, the following folder will be created.



(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 "7.19 Setting method of 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 4-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 4-digit numerical value.)

Refer to "Appendix 1 (2) Event data file" for recording format.

Totalizing data : Records the totalizing data at 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

Configuration file : The configuration of the recorder can be stored in a memory card.

Name of the configuration file to be created: *******. PHW (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).

(Recordable dates vary with the number of channel to be recorded. Approximately half the dates are recorded for 18-channel, one third of dates are recorded for 27-channel, and one forth of dates are recorded for 36-channel.)

(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 “7.19 Setting method of record data format” for the selection of ASCII or binary format for data recording.

(4) Recording cycle:

Refer to the following tables for the timing of writing the trend data to the compact flash.

The event data is written in the compact flash by 1 minute.

Display reflesh 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 reflesh 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.

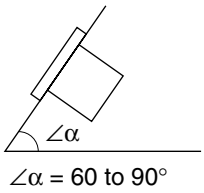
(5) A place that is free from water drip or dew condensation in the range of 20 to 80%RH.

(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.

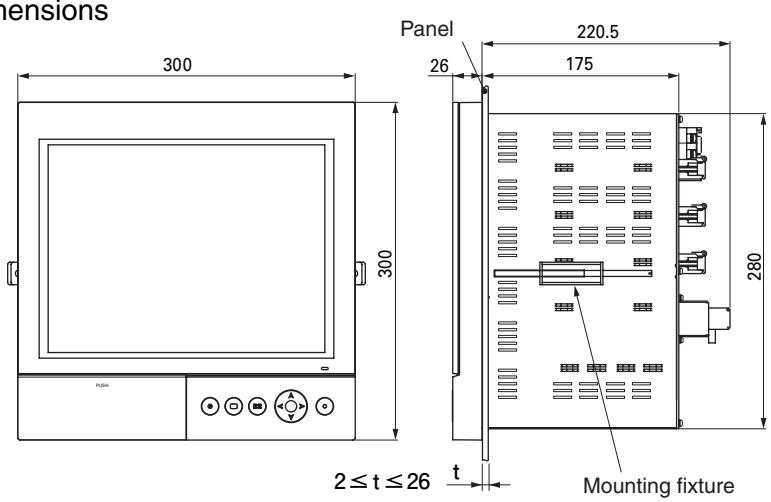
(9) Mount the unit horizontally, with no tilt to the left or right (The forward tilt should be 0° but the unit may be inclined 0 to 30° rearwards.



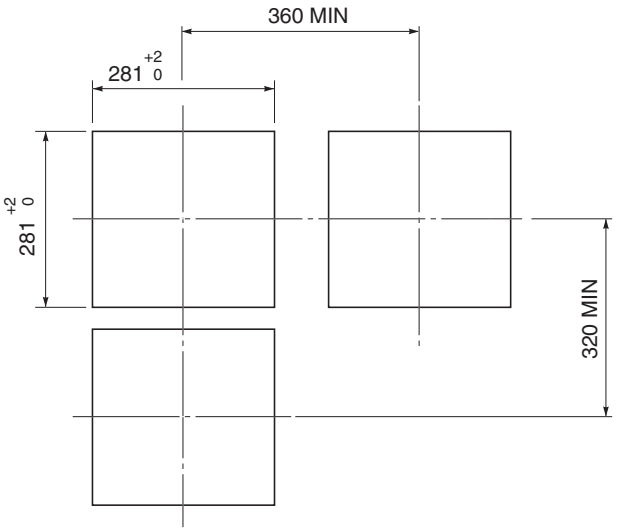
3.2 External dimensions and panel cutout dimensions

(unit: mm)

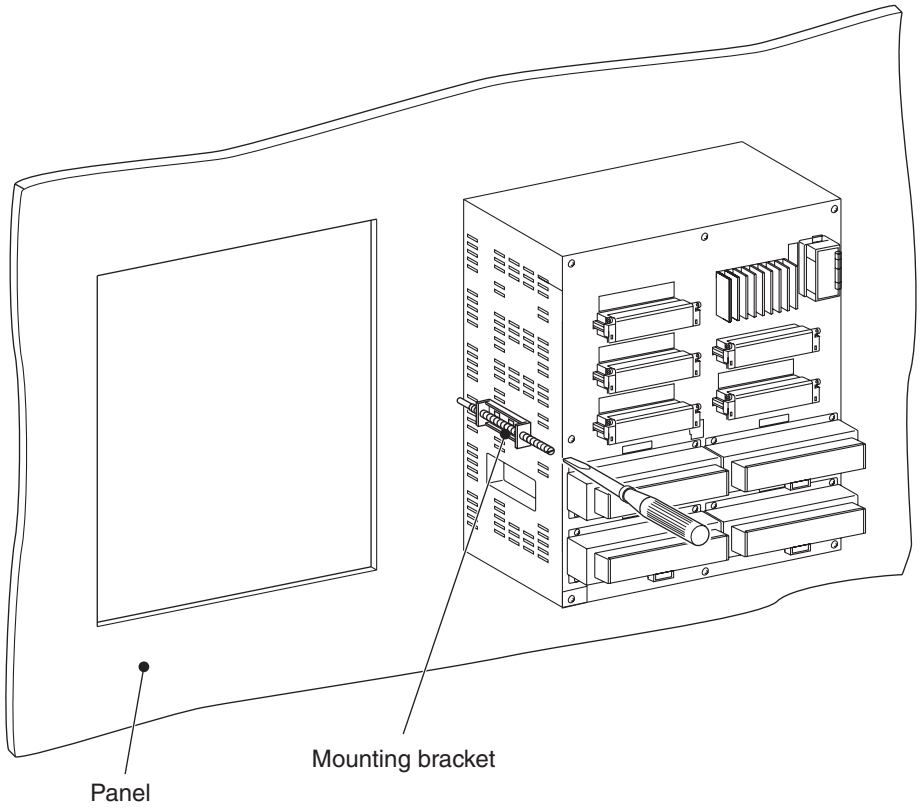
External dimensions



Panel cutout dimensions



3.3 Method of mounting onto panel



- Using the supplied mounting bracket, tighten the upper and lower screws unit the panel to be fixed.
- The panel to be used should be 2 mm or more in thickness.
- This equipment is the panel-mount type. The panel-mount type is the equipment that is designed based on that the equipment is set on control panels etc. for accident prevention, such as, electric shock caused by contact to products. In other words, there are possibilities to occur accidents including electric shock unless setting it on a control panel etc. (For example, inserting a wire etc. to the cooling slit on the product's main body.)
  This equipment should be set on the metallic case if only to control the electromagnetic interference (EMI) from products. The structure of metallic cases should be the one that the electromagnetic interference does not leak outside.
- LAN cable should be stored in the metallic duct and wiring in it.

CAUTION **Excessive torque may result in damage to front panel frame or case deformation.**

Torque: 0.2 N·m

4. WIRING

4.1 Before wiring

(Note) When cables are connected to terminals of the recorder unit, do not 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) Connection of wiring to the external terminals, exclusive use of ring crimp lugs with proper insulating sleeve.

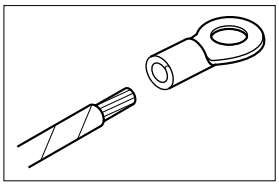
For power terminals and earth terminals, be sure to use crimp style terminals for M4 screw.

For other terminals, be sure to use crimp style terminals for M3 screw.

3) This unit has no power fuse. Mount a power fuse outside the unit as required.

Recommended fuse rating: 250V AC, 2A

4) Do not 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 output relay terminal -1

⇒ Connect Alarm relay output (DO1 to 10).

(3) Alarm output relay terminal -2

⇒ Connect Alarm relay output (DO11 to 20).

(4) Alarm output transistor terminal

⇒ Connect Alarm transistor output (DO21 to 36).

(5) DI input terminal

⇒ Connect DI signal input (DI1 to 16).

(6) Power terminal

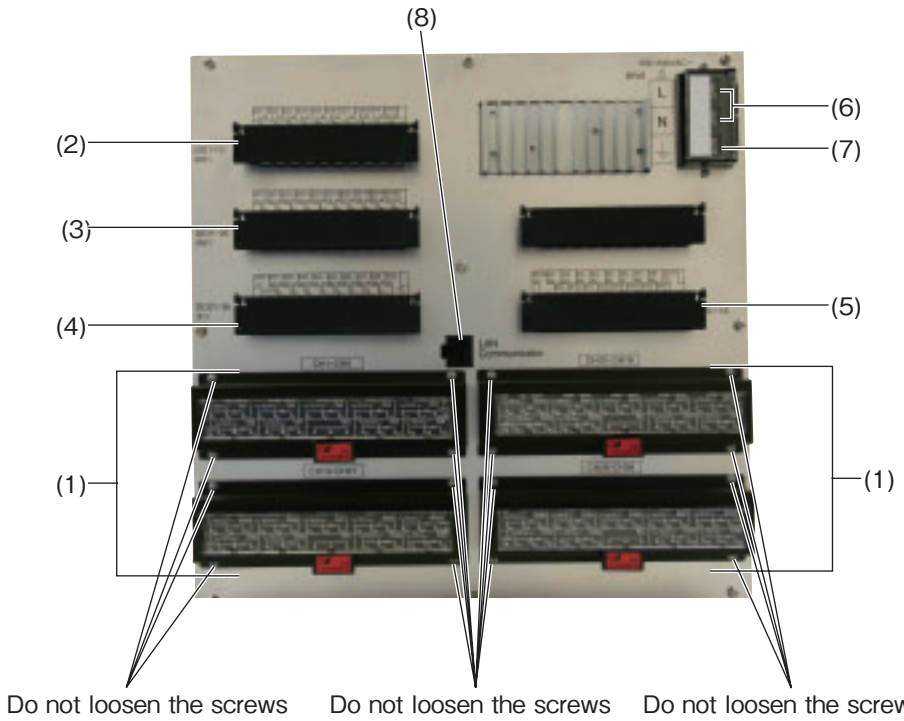
⇒ Connect power cables to L N terminal.
Power source to be connected should be free from noise.

(7) Ground terminal

⇒ Connect to ⏚ terminal (Class-D, 100Ω or less).

(8) Ethernet terminal

⇒ Plug in the LAN cable for Ethernet communication.



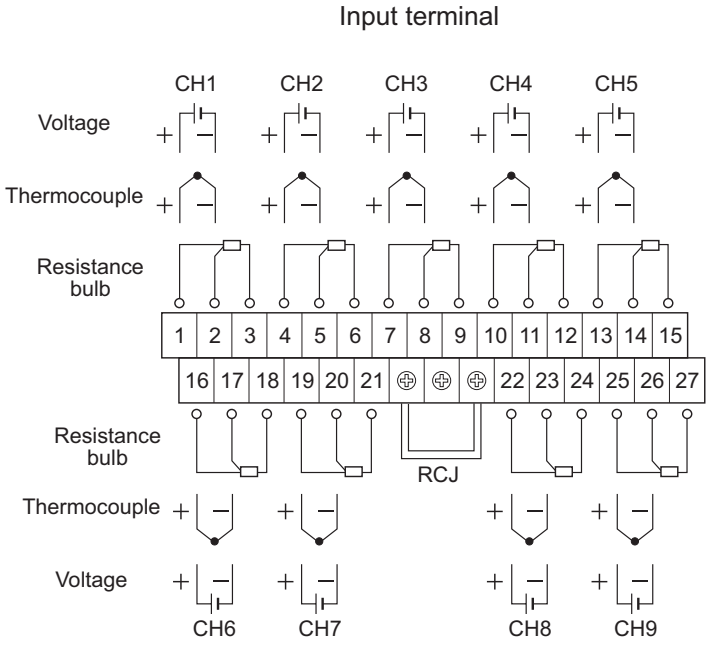
Note: Do not loosen the screws. Otherwise accurate measurement may not be carried out with thermo-couple input.

(1) Wiring of input terminal

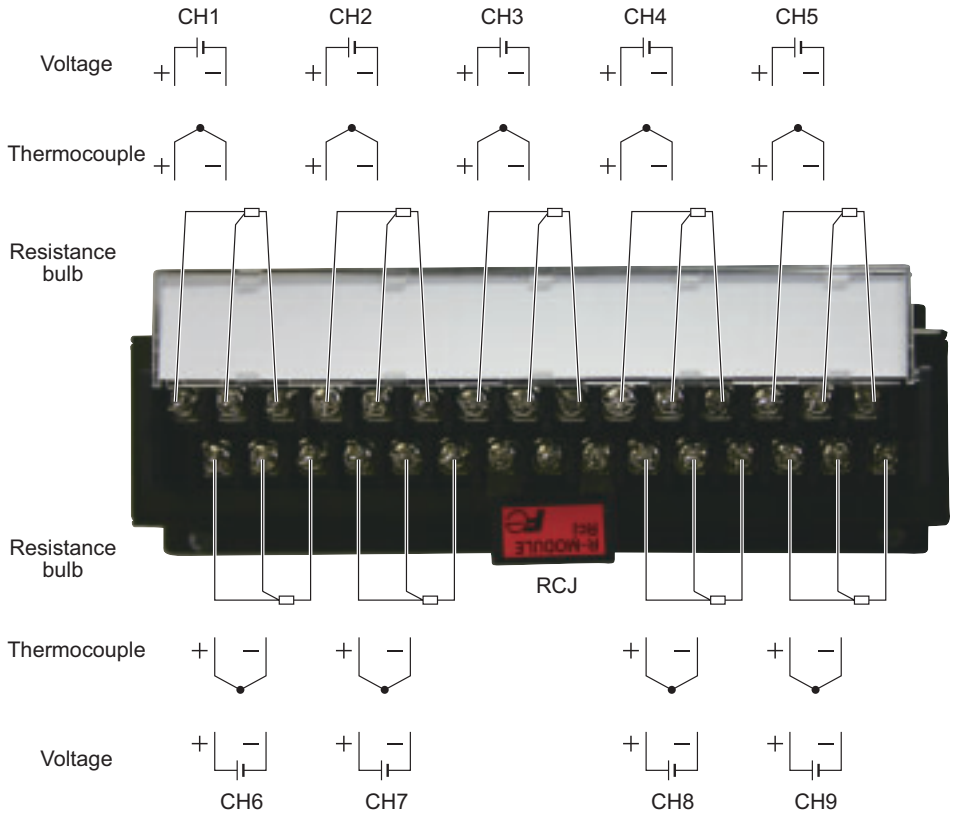
1) Input terminal No. is determined for each channel.
2) When changing the type of input signal (see Item 7.4) after purchasing the unit, connect input terminals according to the relation between terminal No. and channel No.

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

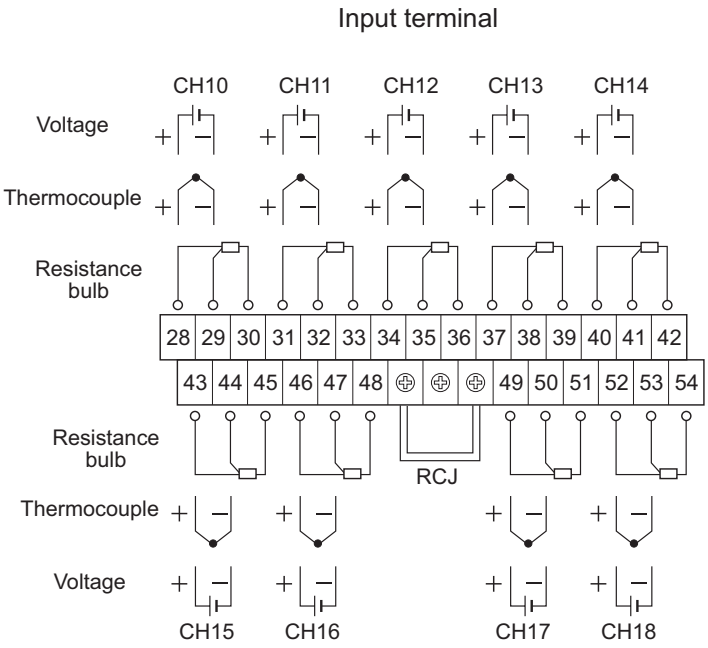
Channel 1 to 9



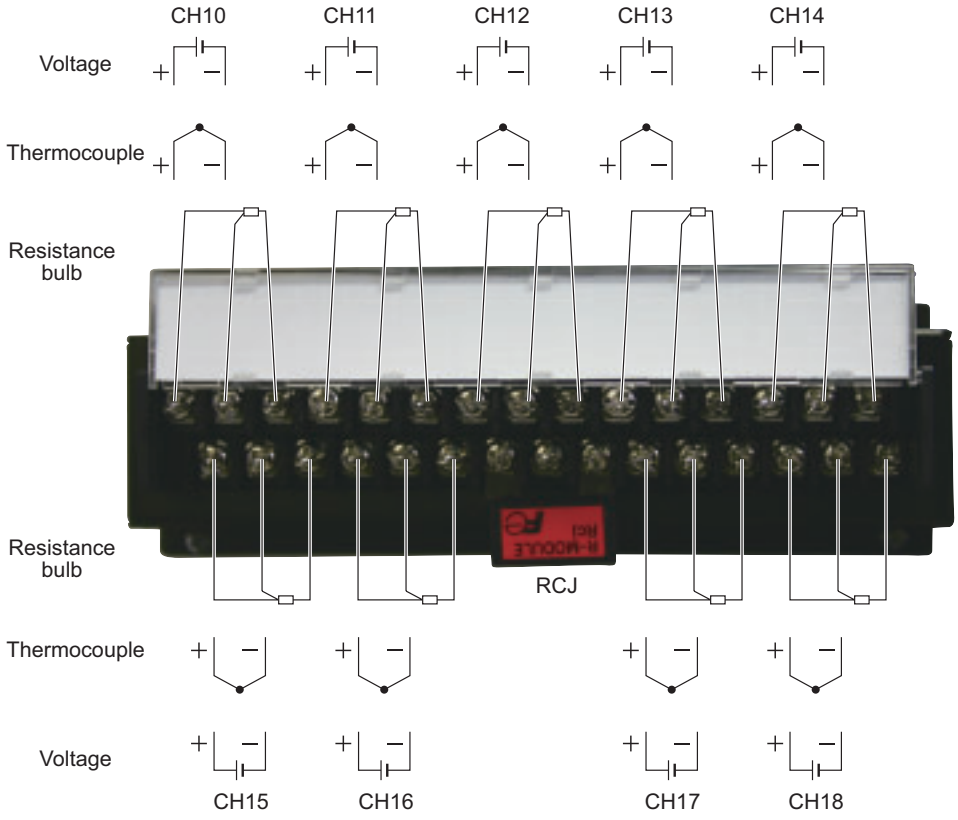
Note) For current input, connect optional shunt resitors to the voltage input terminals.



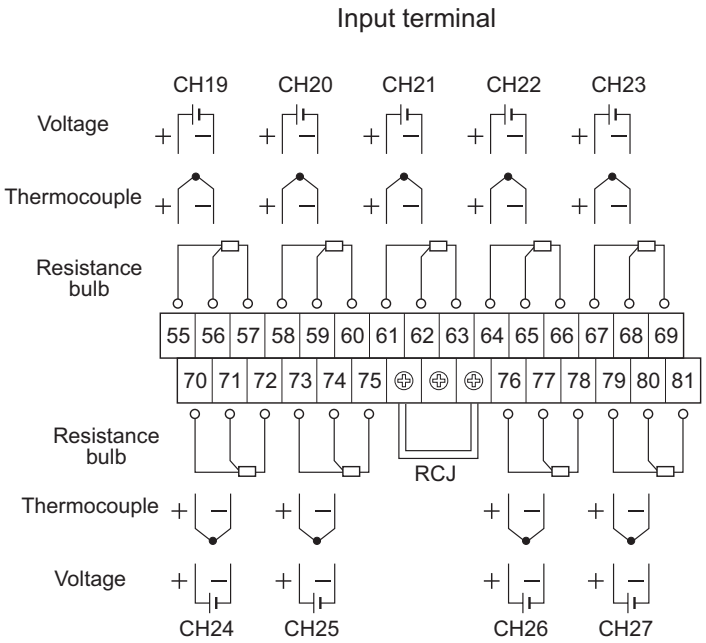
Channel 10 to 18



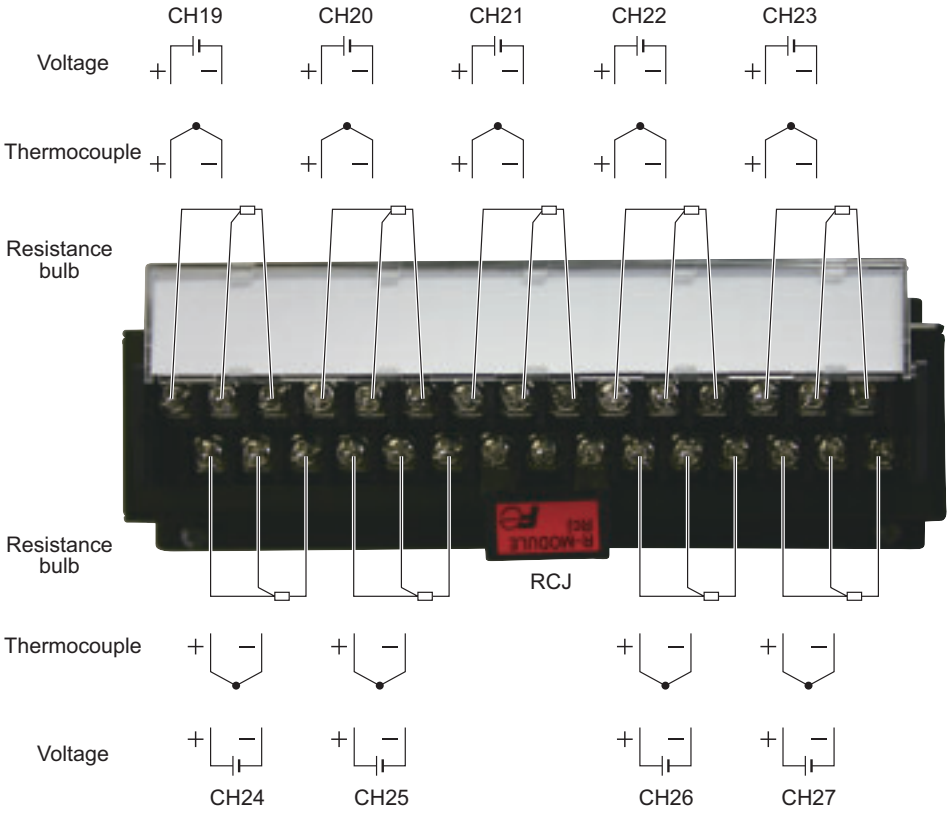
Note) For current input, connect optional shunt resitors to the voltage input terminals.



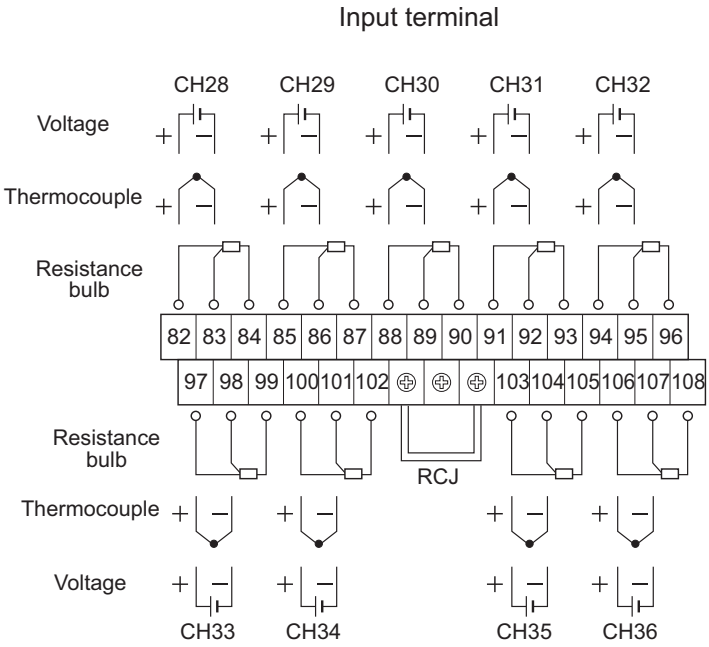
Channel 19 to 27



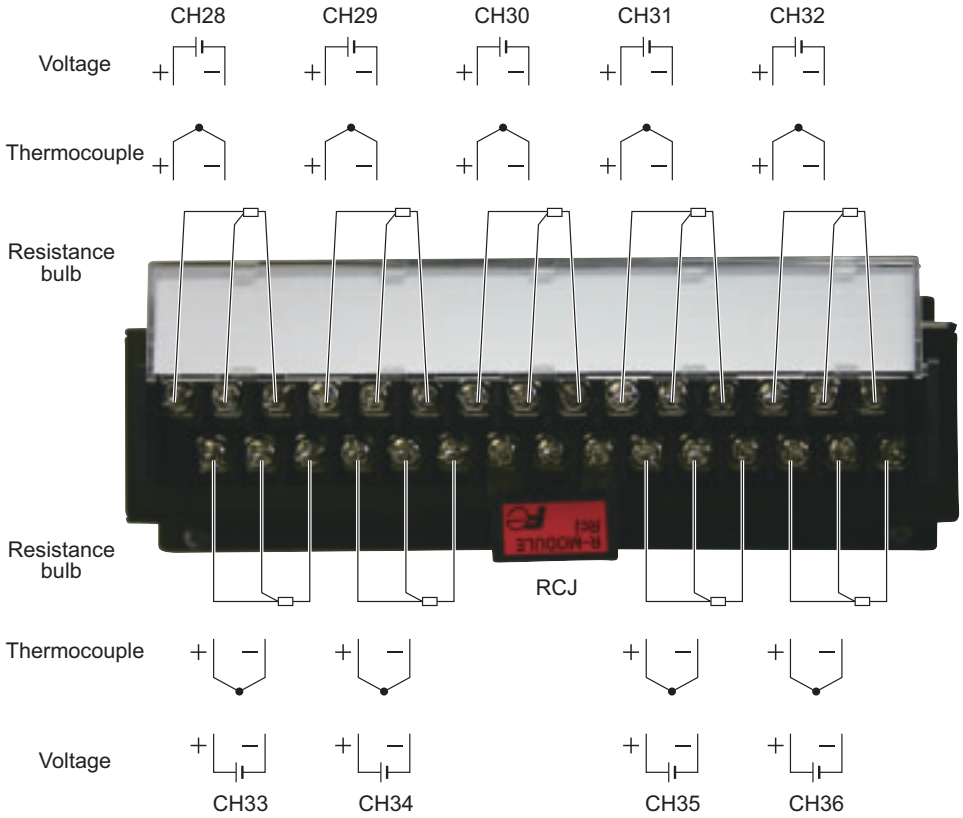
Note) For current input, connect optional shunt resitors to the voltage input terminals.



Channel 28 to 36

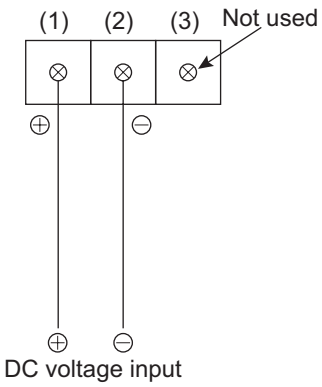


Note) For current input, connect optional shunt resitors to the voltage input terminals.

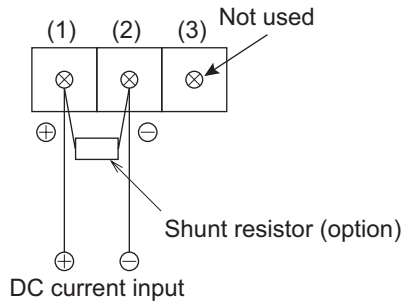


Wiring of input terminals (For an example, ch1 terminal number is noted in the parentheses)

(1) DC voltage input



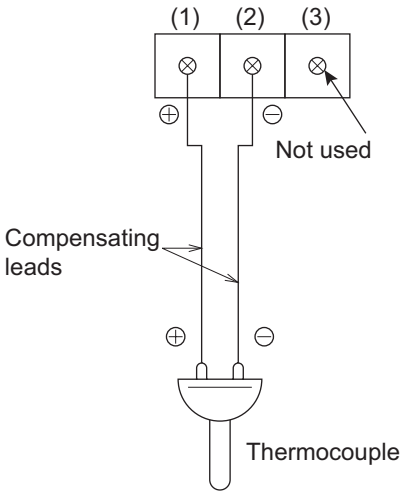
(2) DC current input



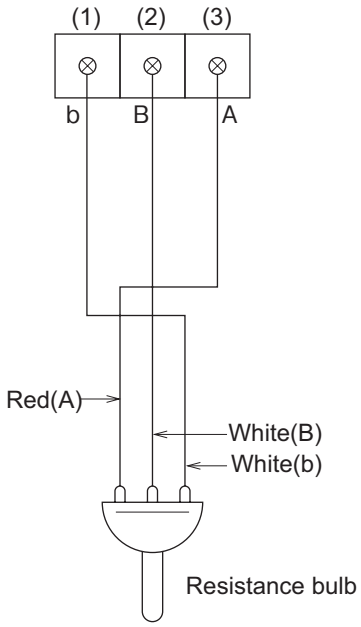
Example 1) For 4 to 20mA and 10 to 50mA input,
10Ω ± 0.1% shunt resistance is used.
(In this case, set the input range to 500mV (see Item 7.4).)

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

(3) Themocouple input



(4) Resistance input



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

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 7.4.

2) Do not remove RCJ module.

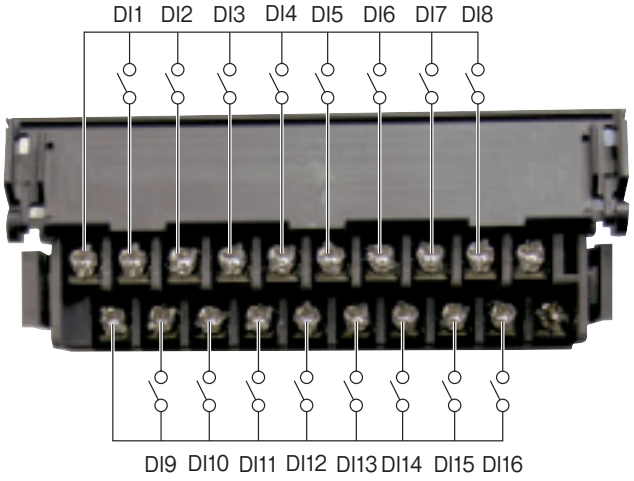
(2) Wiring of alarm output (DO)/DI (external control unit) (Option)

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.

DI input terminal

DI 0V 61	DI1 62	DI2 63	DI3 64	DI4 65	DI5 66	DI6 67	DI7 68	DI8 69	DI 0V 70	
	71	DI9 72	DI10 73	DI11 74	DI12 75	DI13 76	DI14 77	DI15 78	DI16 79	80



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 or larger

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		REC
	ON	OFF	
Recording suspended	Starts recording	No change	Starts recording
Recording in progress	No change	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.	Continues 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 (relay)

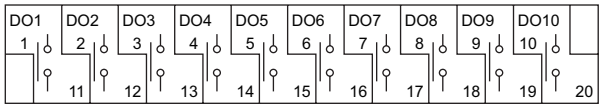
1) Alarm setting is provided at 4 points for each input channel. Up to 20 points for alarm output relay can be set as an option.

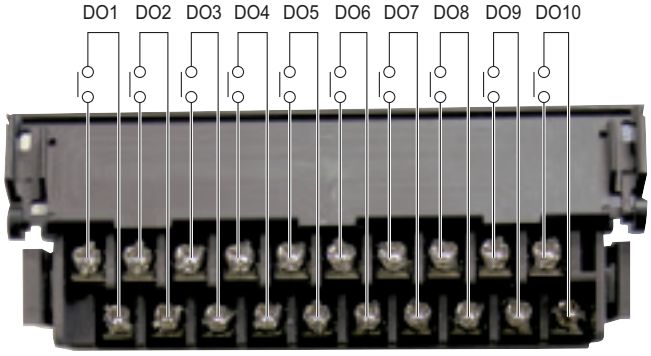
2) When an alarm occurs, the relevant terminals are shorted (ON).

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

Alarm output (relay) −1

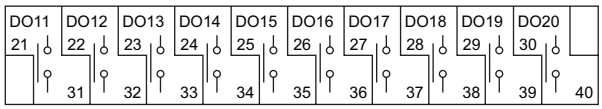
M3 screw

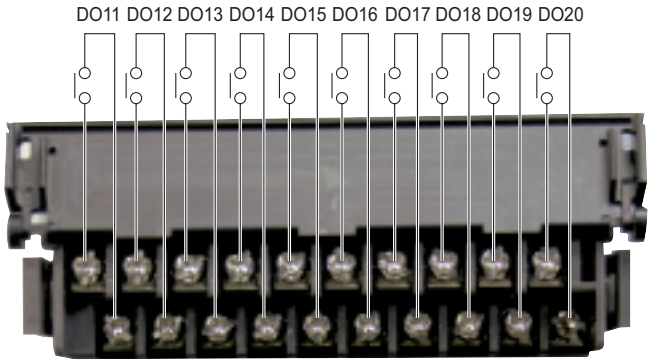




Alarm output (relay) −2

M3 screw





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).

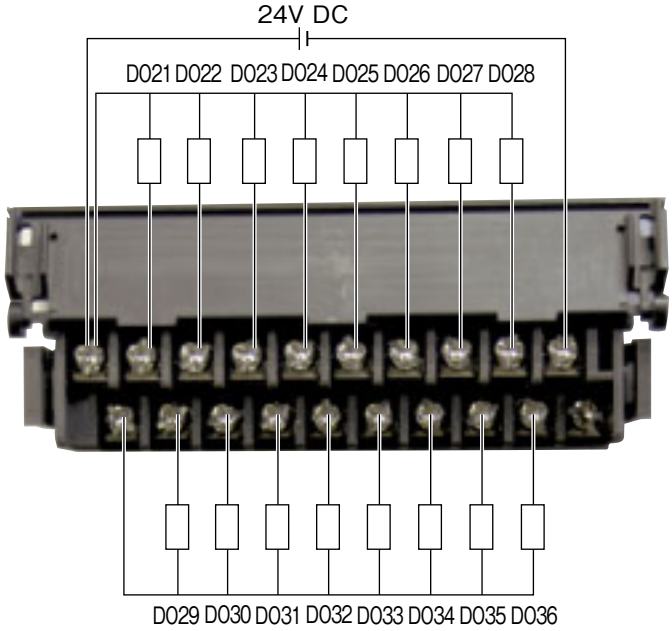
About alarm output (transistor)

1) Alarm setting is provided at 4 points for each input channel. Up to 16 points for alarm output (transistor) can be set as an option.
2) On occurrence of an alarm, the internal transistor is turned ON.
   Output : Open collector
   Rating : 30V DC/0.1A (resistance load)

Alarm output (taransister teminal)

M3 screw

VPD 41	DO21 42	DO22 43	DO23 44	DO24 45	DO25 46	DO26 47	DO27 48	DO28 49	PCD 50	
	24V DC+ 51	DO29 52	DO30 53	DO31 54	DO32 55	DO33 56	DO34 57	DO35 58	DO36 59	0V 60



Note: This is not relay out.
Do not apply voltage or feed current larger than the rating. Otherwise the internal circuit may be damaged, and the instrument stops operating.

(3) Ethernet (option)

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

Ethernet communiction 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 protcol	TCP/IP

(4) 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 9.1 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 Connecting the recorder to a loader

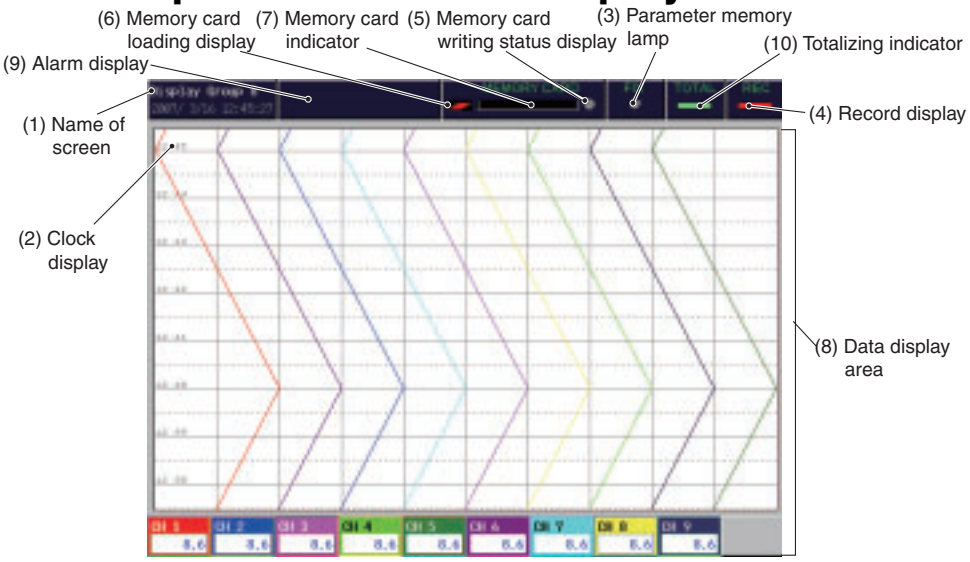
(1) When connecting the recorder to a loader, use optional PC loader communication cable (PHZP1801) as shown below.

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

CAUTION Be sure to display the data display screen (refer to Item 6.4) instead of the parameter setting screen before using the loader. Otherwise, the set value may not be written.

5. DISPLAY FUNCTION

5.1 Basic composition of Data Display screen



(1) Name of screen

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. Perform the "Recording set values" in the equipment.

(4) Record display

The REC lamp 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

Turns ON when measured data is being written in a memory card.

(6) Memory card loading display

It indicates the loading state of the memory card.

Gray display : Shows the state where the memory card is not loaded in the slot.

Green display: Shows the state where the memory card can be pulled out.

Red display : Shows the state where the memory card must not be pulled out.

(7) Memory card indicator

It indicates how much of the memory card has bee used in graphs. At 90%, it turns red. When the overwrite function of the recording file is set to OFF, the recorder stops recording at 100%. 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 5.2 to 5.4.) Measured data are displayed for channel 1 to 9 at factory shipment. Select the channel to be displayed referring to "7.12.1 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.

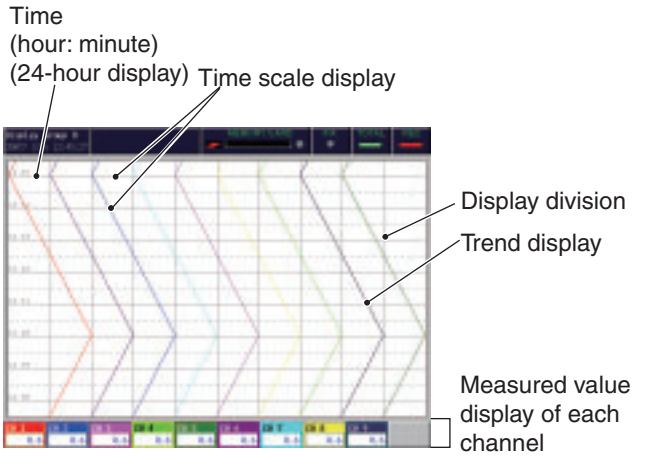
(10) Totalizing indicator

While totalizing is in progress, the TOTAL lamp is lit. Refer to 5.5 for details of totalizing screen.

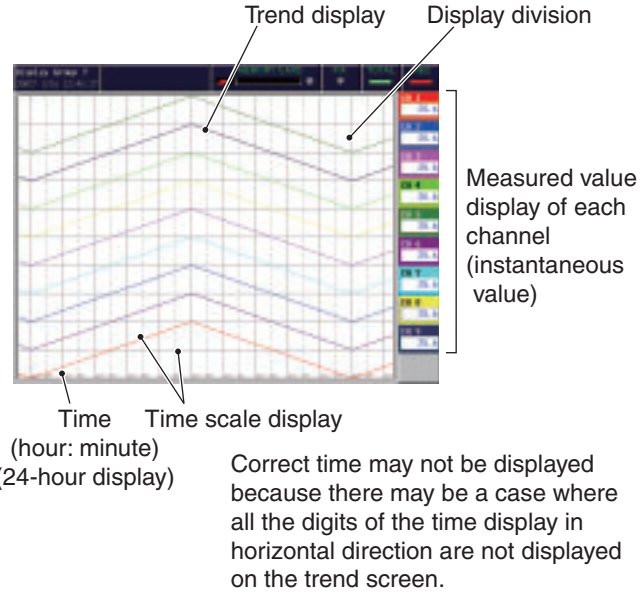
5.2 Real time trend display of measured data

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.

Vertical Trend



Horizontal Trend



*) 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 DISP key.

4) The recorder performs the recording by pressing REC, 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.

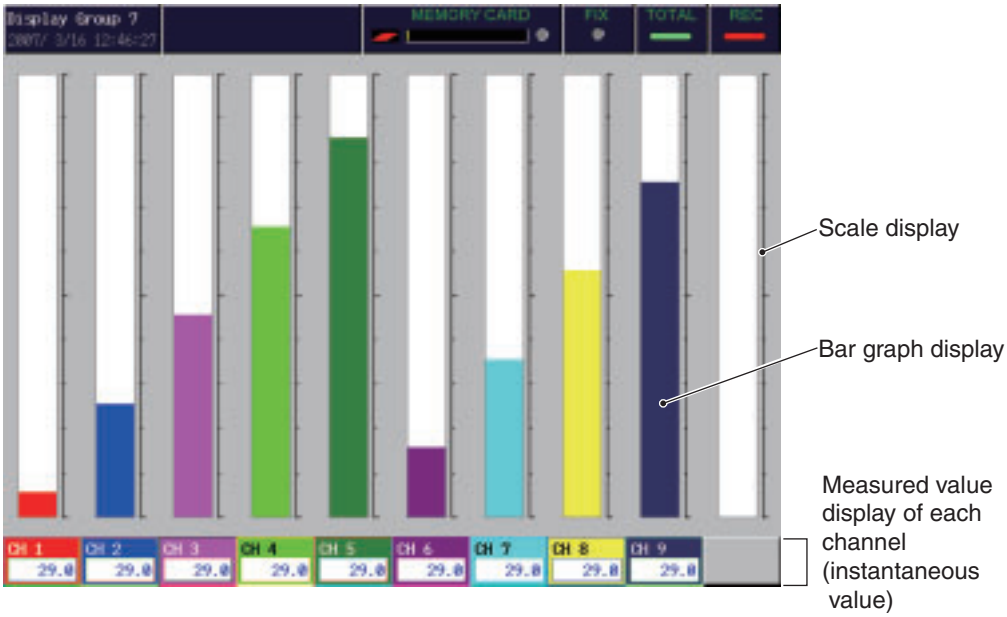
5) If the power is turned OFF while recording, data written in the memory card will be destroyed. Be sure to press the REC key to stop the recording, and then turn OFF the power.

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 burn-out). Note that, 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.

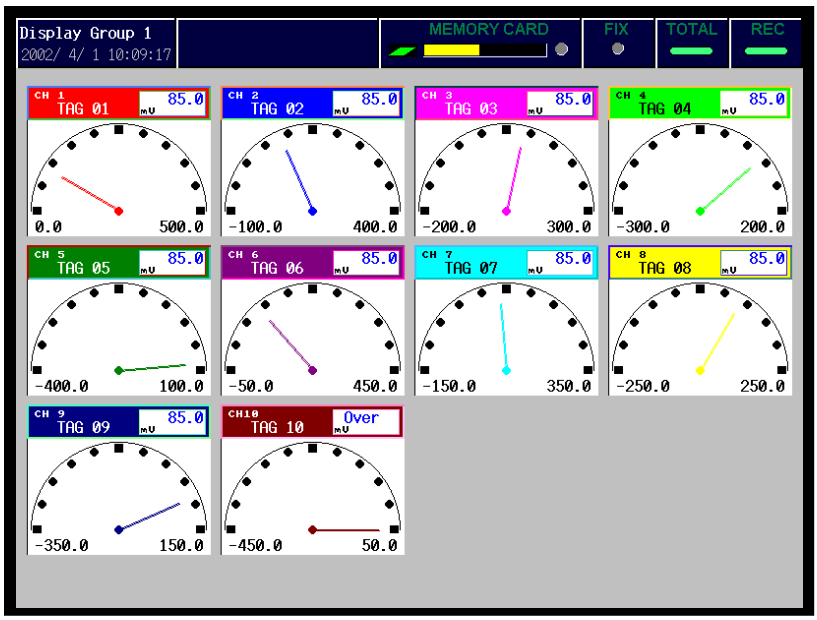
5.3 Display of measured data in bar graphs or analog meters

The measured data can be displayed either in bar graphs or analog meters. The display type can be selected by referring to Item 7.12.2 “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.



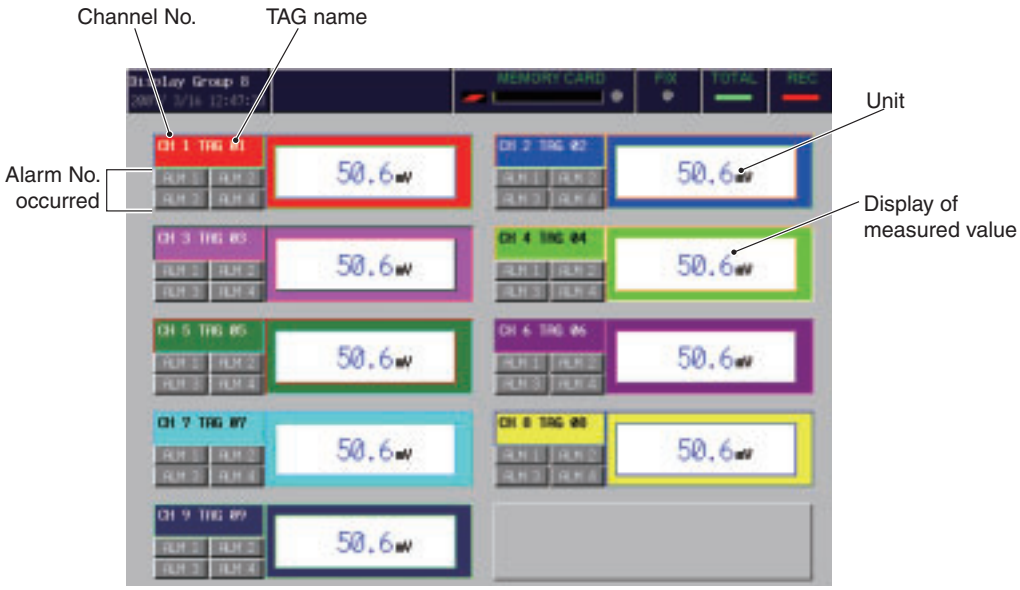
(1) Setting of display ranging from 0 to 100% is displayed in graphs.

(2) Display refreshment cycles are fixed to 1 sec.

(3) The recorder displays measured data even when it stops recording.

5.4 Digital display of measured data

Measured data is displayed in numerical values.

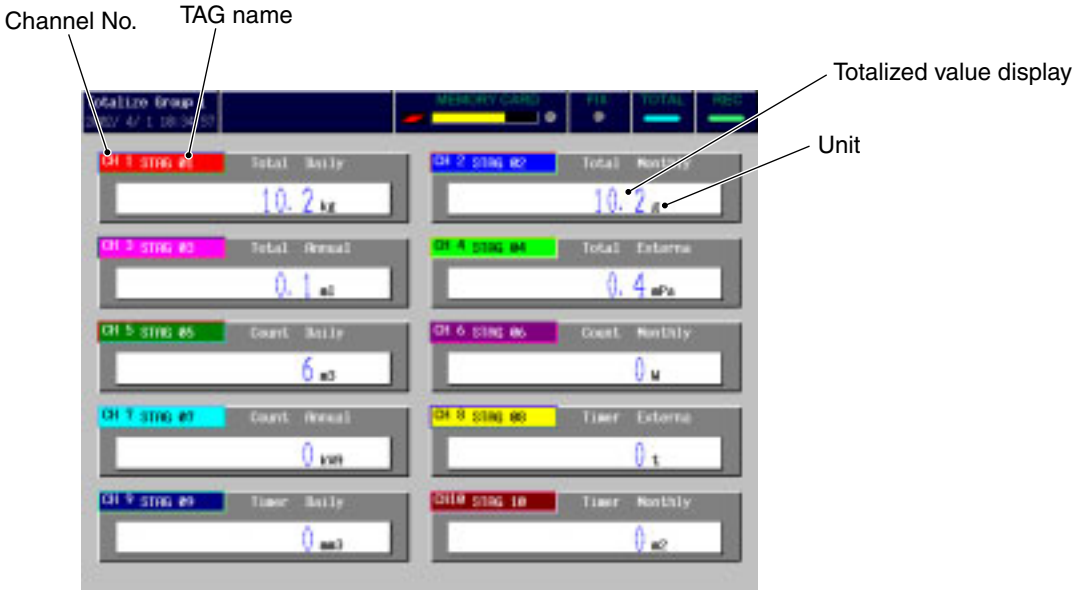


(1) Measured values of each channel are displayed in digital value.

(2) Display refreshment cycles are fixed to 1 sec.

(3) When an alarm occurs, Alarm No. at the channel is displayed in red.

5.5 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.

	Totalize reset	
Elapsed time	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.

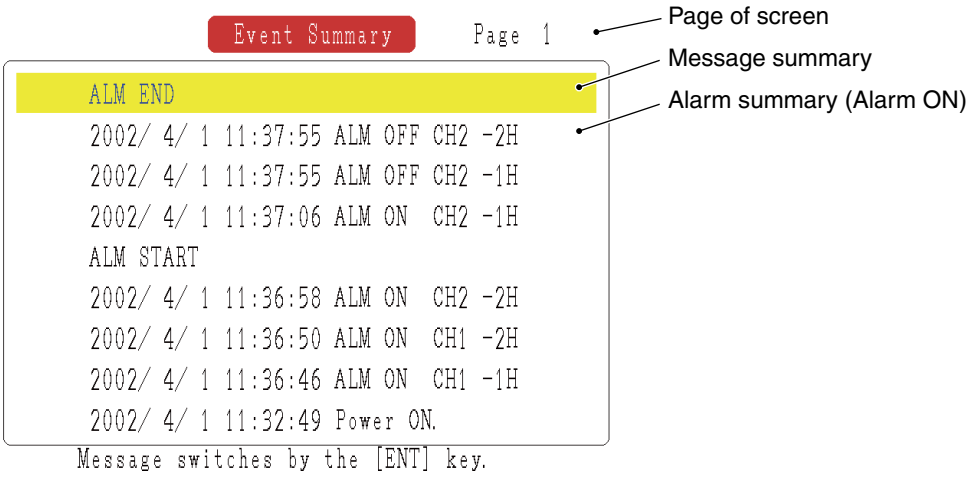
(7) Totalize start/stop time and the previous totalized value are displayed on the totalizing 4-channel display screen.

(8) Totalizing is performed until the maximum value 999,999,999 is reached. Totalizing is not performed when exceeding that value.

5.6 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.

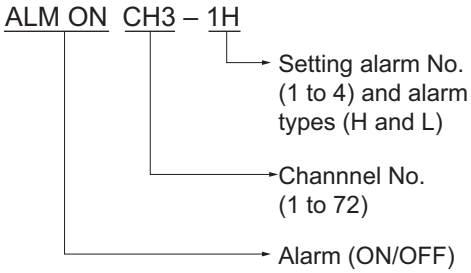
(3) When events occur, they are displayed on the screen despite in the recording state. If the recorder is not in the recording state, events are not recorded in the memory card.

(4) Once displayed, the event is kept displayed until the power is turned off (turning off the power clears the event buffer).

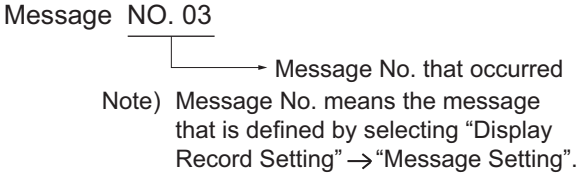
(5) Press the ENT key to switch between message contents display and message start time display. The message contents are initially displayed.

(6) How to view the event summary and message summary is as follows:

Example of alarm summary

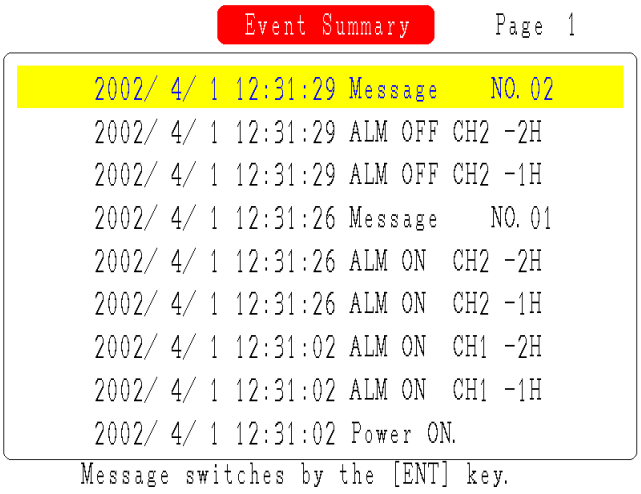


Example of message summary



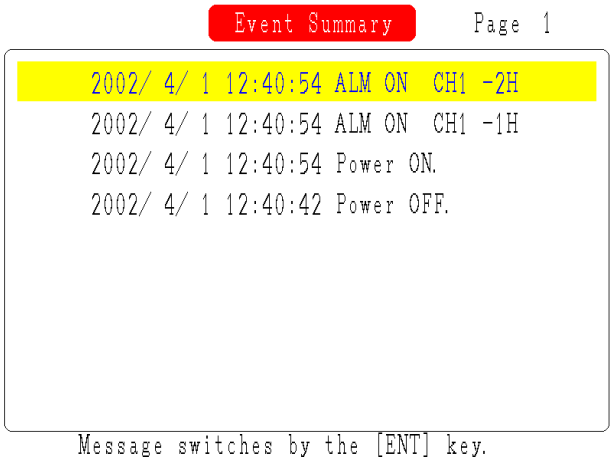
Note) Message No. means the message that is defined by selecting “Display Record Setting” → “Message Setting”.

Example of message display



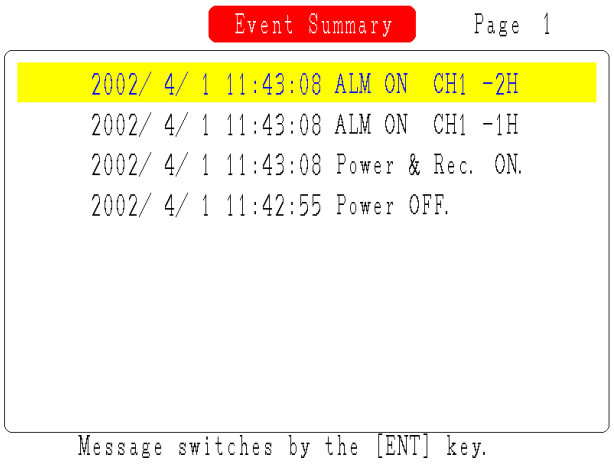
(7) Turn OFF/ON the power, and event summary is displayed.
Message is changed according to recording status.

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



(Not recorded in the event file.)

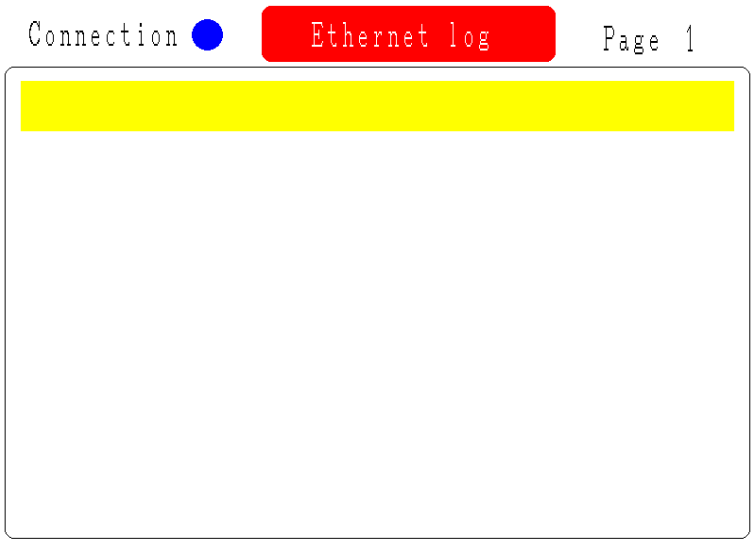
2) When power is turned OFF/ON while recording is in progress



(Recorded in the event file.)

5.7 Ethernet log display

The communication items of Ethernet function (FTP, E-mail, and MODBUS TCP/IP) 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 recording status.

(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.)

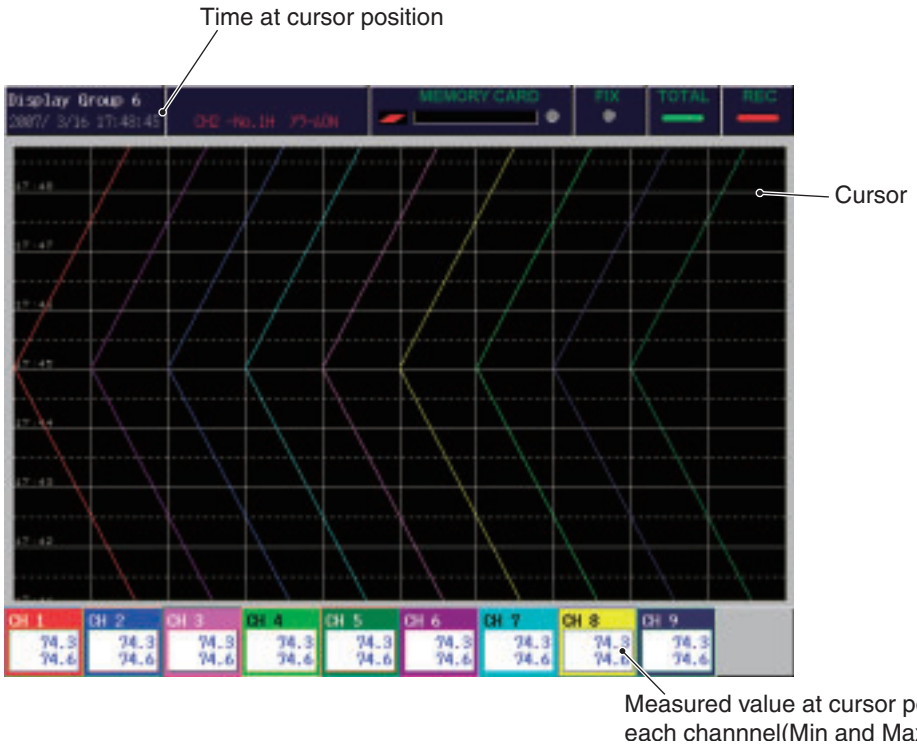
(5) Details of the display are as follows.

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”

5.8 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.

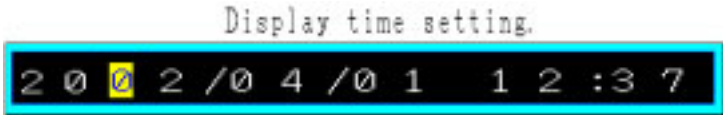
(2) Recording start/stop cannot be performed on the screen. To do this, switch the "Historical Trend" screen to "Real Time Trend" screen. However, this "Historical Trend" screen cannot be shifted to the "Parameter Set" screen. To shift the "Real Time Trend" screen, be sure to press the SEL key.

(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.

5.9 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.

5.10 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.

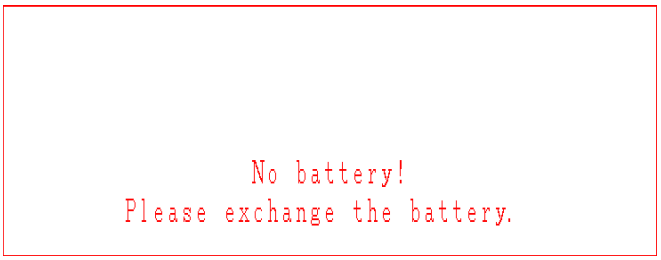
(3) Clock function

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. After the display appears, Fix and repair will be required within 1 month. When you power on again with dead battery, abnormality of time, the record and the total will be caused.



(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 5.6 "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.)

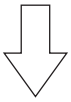
6. OPERATION AND ACTIONS

6.1 Before running the recorder

Check the following points before starting operation.

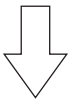
Loading the memory card

(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

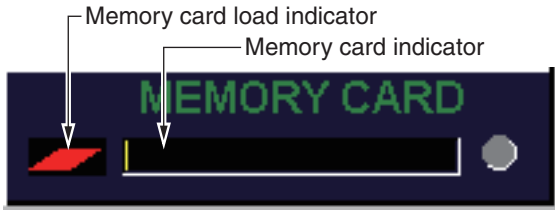
(1) Channel settings····· See Item 7.4.

6.2 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.

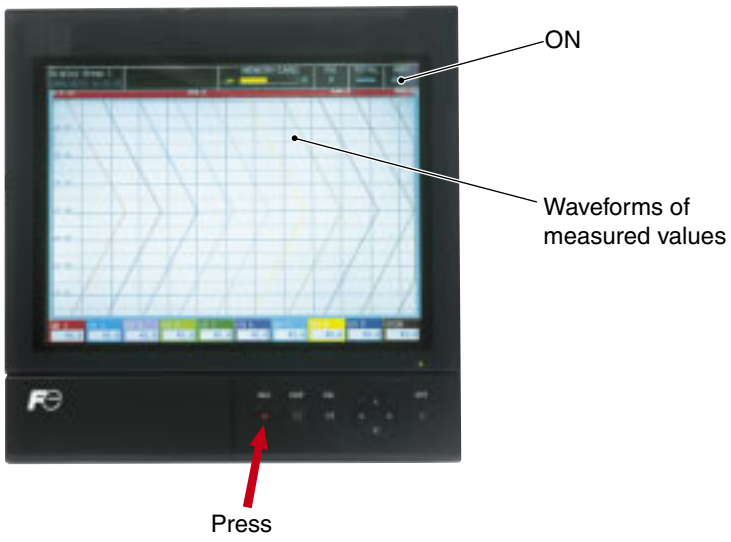
* TAG. No. or the unit display is also available according to screen configuration setting.

6.3 Stopping and starting the recording operation

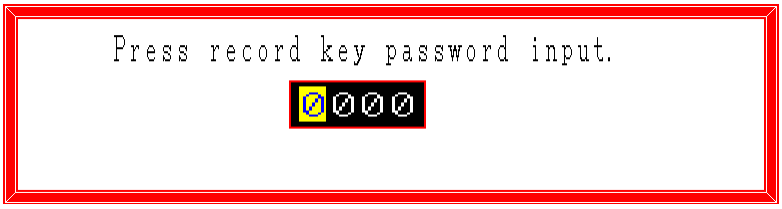
(1) Recording start

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 of recording.”

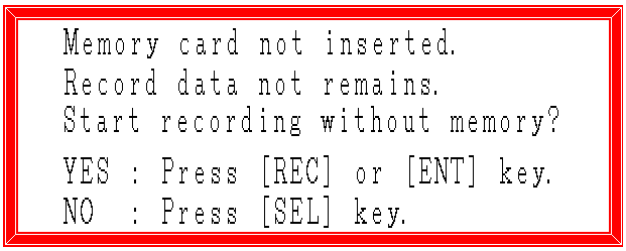


2) When the password for stopping and starting the record operation is set, the password setting screen is displayed as follows. Therefore, make a setting of the password. When the password is correct, the recording is started.



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, if recording does not start.

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

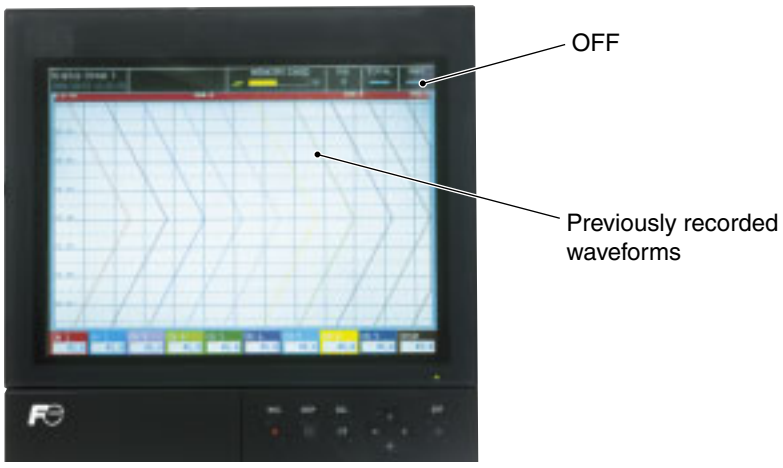


(2) Recording stop

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

```
Do you want to stop recording?
YES : Press [REC] or [ENT] key.
NO  : Press [SEL] key.
```

2) After the stop of the recording, the REC lamp comes off. The trend display on the data display unit stops. Carry out the recording of all data that have not yet written in the memory card.



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.

```
Press record key password input.
 0000
```

6.4 Switching data display screens

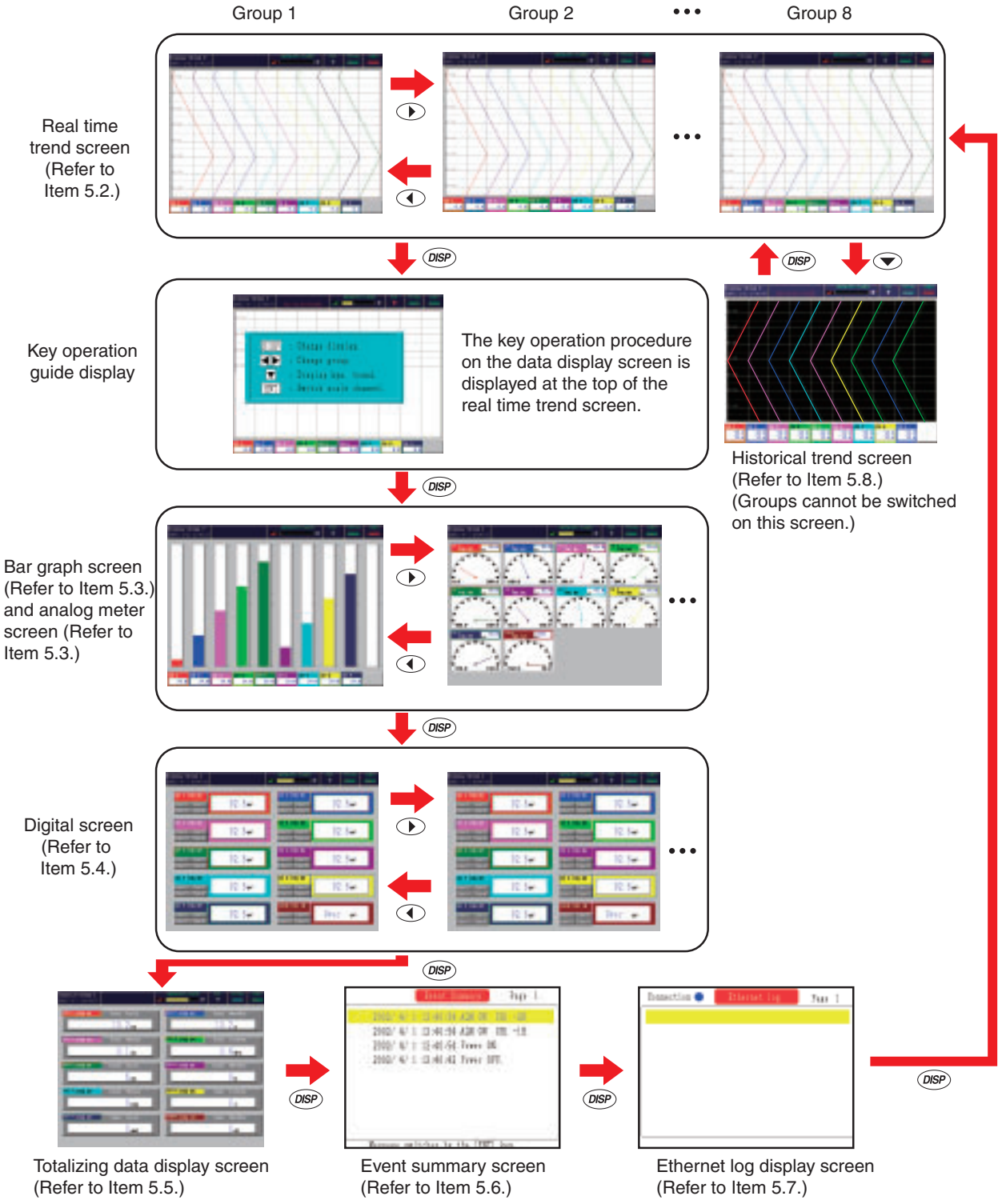
Data display screens include real time trend screen, bar graph (analog meter) screen, digital screen and totalizing screen. Every time the DISP key is pressed, the screen switches to another one. To display the historical trend screen, press the ▼ key in the real time trend screen.

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 7.12.2 for selection of bar graph/analog meter display.

The structure of the data display screen is as follows.

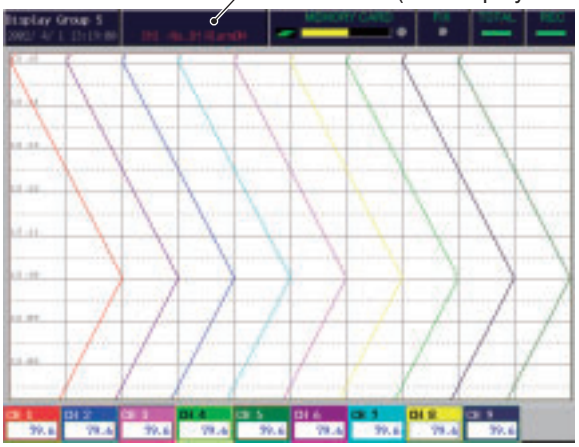


6.5 Display of alarm

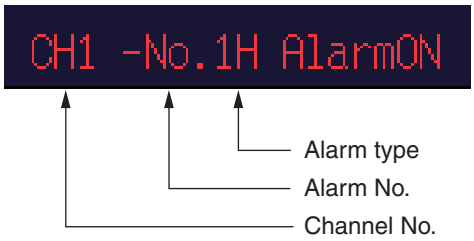
(1) Alarms that occurred on the Trend Display, Bar Graph and Digital Display screens:

When an alarm occurs, its content is displayed.

(The display is kept on until the alarm is reset.)



Example of alarm display



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

* 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 are displayed on the historical screen and the record data display screen of the memory card. This is not the past alarm record.

7. SETTING AND CHECKING PARAMETERS

7.1 Setting and checking

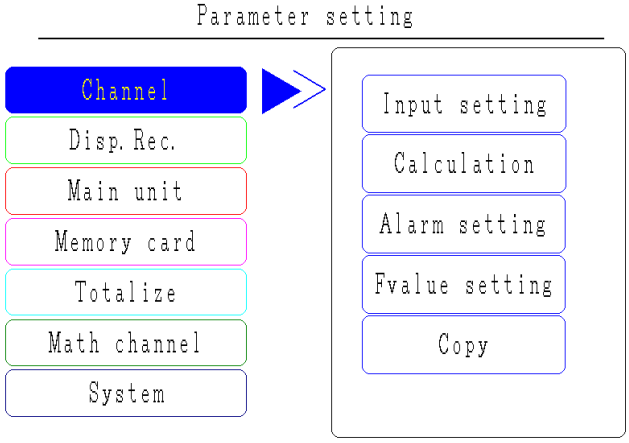
Follow the description of Item 7.2 “Outline of parameter setting procedure” to enter into each screen, and then follow the description of Item 7.3 “Basic operation of setting screens” to make parameter setting.

(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) Recording range consists of multi-ranges. Set the range as desired. The input types are the same for every 2 channels.

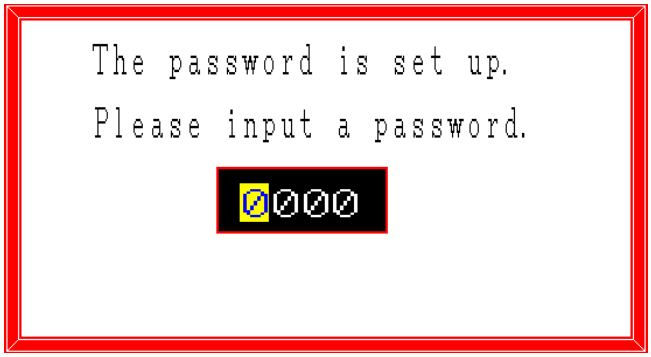
(3) Alarms, TAG No. and messages are not set. Set them as required. An input filter is set at 3 seconds.

(4) Press the SEL key in the data display screen to display the parameter setting screen. Refer to Item 7.2 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 Set	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 channel input	○	Set the same input types for every 2 channels.
		Unit : °C	°C, °F, and engineering unit for voltage input	○	
	Calculation	Input filter : 3 sec	0 to 900 sec (1 sec step)	○	
		Subtraction channel : 0	0 to 72 (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 Set	Alarm type : OFF	OFF, H, L	○	
		Alarm No : 1	1 to 4	○	
		DO relay No. : None	None, 1 to 36	○	
		Alarm set value : 0.0°C	Engineering unit	○	
Display record settings	Display recording mode set	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 : TAG01 to TAG36	Up to 8 characters	○	
		Tag (Bottom) : Blank	Up to 8 characters	○	
		Display color : By each channel	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 in event file.
		Timing : None	No, DI ON, DI OFF, Alarm ON, Alarm OFF		
	Display Setting	Display Name: Display group 1 to 8	Up to 32 characters		
		Screen structure : No.1-9=ch1-9	From ch1 to 72 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		

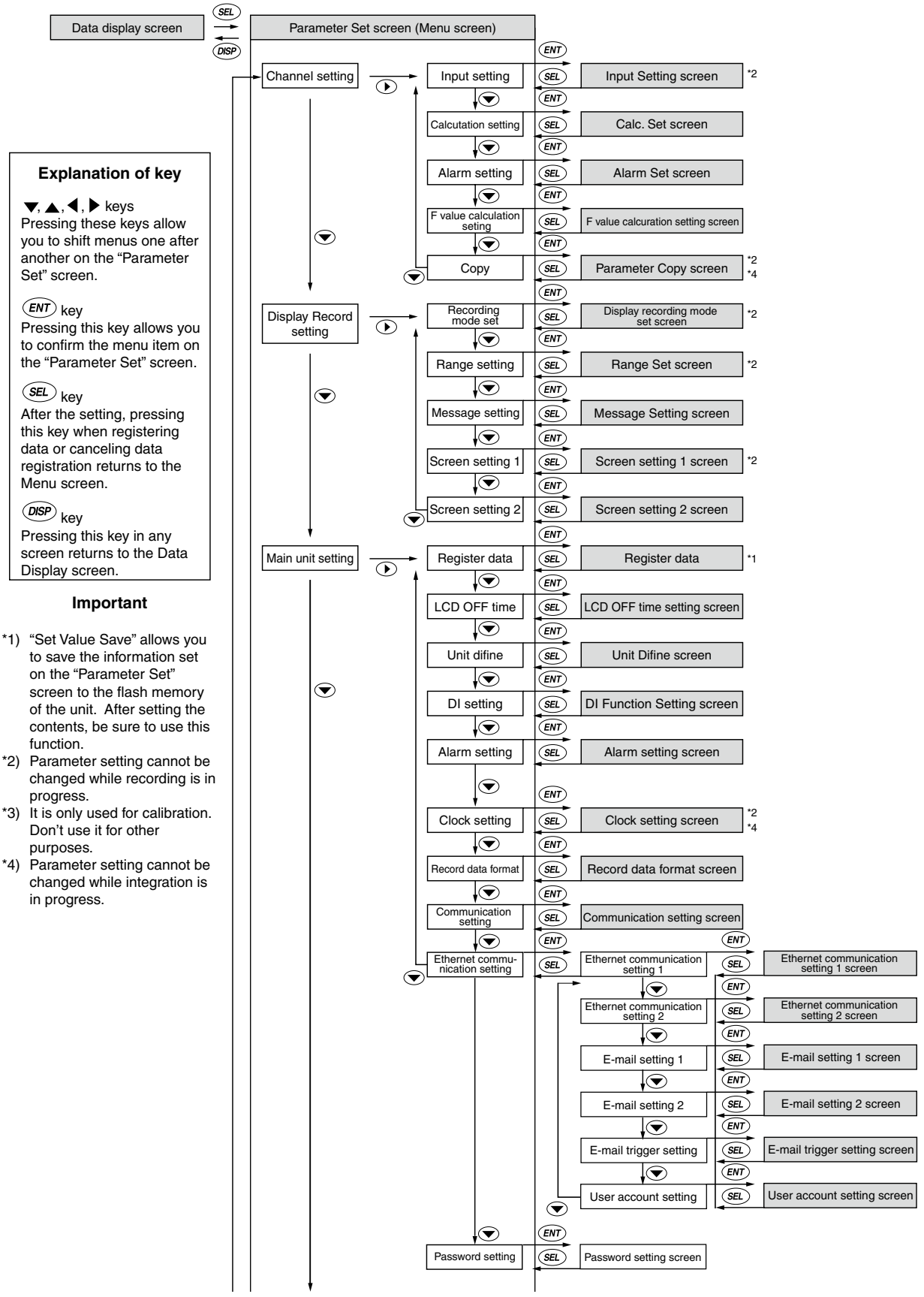
* When parameter copy (section 7.8) is selected, the items marked with ○ are copied. Initial value is restored with the items marked with △.

	Parameter names		Factory setting contents (initial value)	Setting range	Remarks
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, Integration start/stop	
	Alarm Setting		Alarm Hysteresis : 0.20%	0.00 to 100.00%	
			Alarm Latch : OFF	OFF, ON	
			Memory FULL alarm : None	None, 1 to 36	
			Battery alarm : None	None, 1 to 36	
	Record data format		Recorded data format : ASCII	ASCII, Binary	
	Communication setting		MODBUS station No. : 1	0 to 255 (0 : No communication)	
			MODBUS communication speed : 19200bps	19200bps, 9600bps	
			MODBUS parigy : Odd	None, Odd, Even	
			Front communication function : ON	OFF, ON	Be sure to set it to ON.
	Ethernet setting	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 : 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 : Blank	Up to 64 characters	
		E-mail trigger setting	Title : Blank	Up to 32 characters	
			Triigger 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	
			Mail send test : —	—	
		User account setting	User name : Blank	Up to 16 characters	
			Password : Blank	Up to 8 characters	
			User Level : Administrator	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)	

	Parameter names	Factory setting contents (initial value)	Setting range	* Copy setting	Remarks
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 16, Channel 1 to 72, Alarm No. 1 to 4		
	Channel setting 1	Totalize calculation : Totalizer	Input value totalizer, Counter, Time measurement		
		External input : DI1	DI1 to 16, Channel 1 to 72, Alarm No. 1 to 4		
		Totalize base time : /h	/s., /min, /h., /day		
		Totalize reset operation : ON	OFF, 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 : 0.0C	Engineering unit		
		Totalize cut value : 1	1 to 32767		
Calculation channel settings	Calculation	Arithmetic expression : No setting			
	Input Setting	Unit: °C	Engineering unit	○	
		Measurement range: 0.0 to 500.0	-3276.7 to 3276.7	○	
		Engineering unit: 0.0 to 500.0	-3276.7 to 3276.7	○	
		Square rooter: OFF	-3276.7 to 3276.7	○	
	Calculation Setting	Input filter: 3 sec	0 to 900 sec (1 second steps)	○	
		Subtraction channel: 0	0 to 72 (0: no subtraction)	○	
		PV shift: 0	Engineering unit	△	
		PV gain: 100%	0.00 to 327.67	△	
		F value calculation function: OFF	OFF, ON	○	
	Alarm Set	Alarm No : 1	1 to 4	○	
		Alarm type: OFF	OFF, H, L	○	
		DO relay No.: OFF	None, 1 to 36	○	
		Alarm Set value: 0.0°C	Engineering unit	○	
	Range Setting	Tag : TAG37 to TAG72	Up to 8 characters	○	
		Tag (Bottom): Blank	Up to 8 characters	○	
		Display color:	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	○	
	Calculation timer setting	H-P, L-P timer period setting: 1	1 to 32767 min.		
		Average value timer period setting: 1	1 to 32767 min.		
		Total value timer period setting: 1	1 to 32767 min.		
	Constant Setting	Constant: 0	-32767 to 32767		

* When parameter copy (section 7.8) is selected, the items marked with ○ are copied. Initial value is restored with the items marked with △.

7.2 Outline of parameter setting procedure



Explanation of key

▼, ▲, ◀, ▶ keys
Pressing these keys allow you to shift menus one after another on the “Parameter Set” screen.

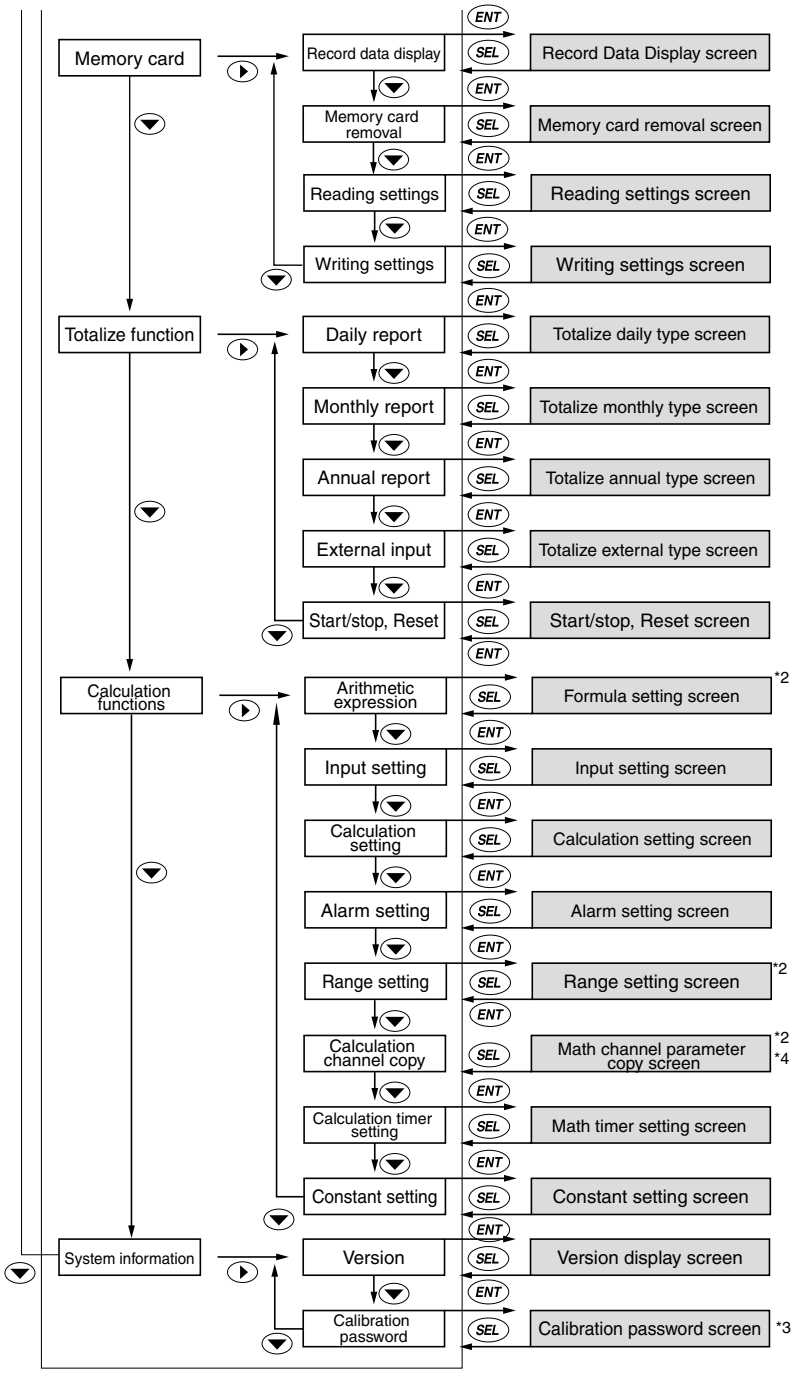
ENT key
Pressing this key allows you to confirm the menu item on the “Parameter Set” screen.

SEL key
After the setting, pressing this key when registering data or canceling data registration returns to the Menu screen.

DISP key
Pressing this key in any screen returns to the Data Display screen.

Important

*1) “Set Value Save” allows you to save the information set on the “Parameter Set” screen to the flash memory of the unit. After setting the contents, be sure to use this function.
*2) Parameter setting cannot be changed while recording is in progress.
*3) It is only used for calibration. Don’t use it for other purposes.
*4) Parameter setting cannot be changed while integration is in progress.



*2) Parameter setting cannot be changed while recording is in progress.
*3) It is only used for calibration. Don't use it for other purposes.
*4) Parameter setting cannot be changed while integration is in progress.

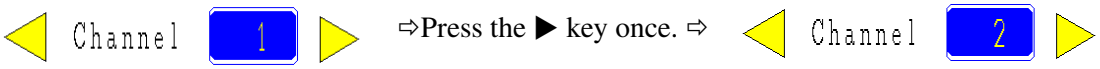
7.3 Basic operation of setting screens

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 (◀, ▶).

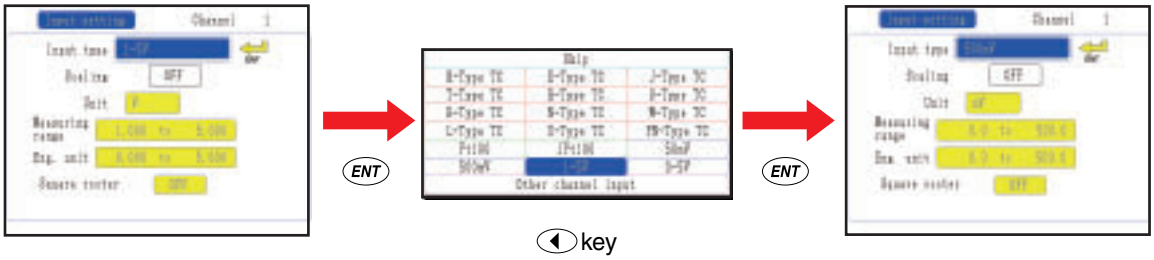
Example: When changing the channel from 1 to 2;



(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";

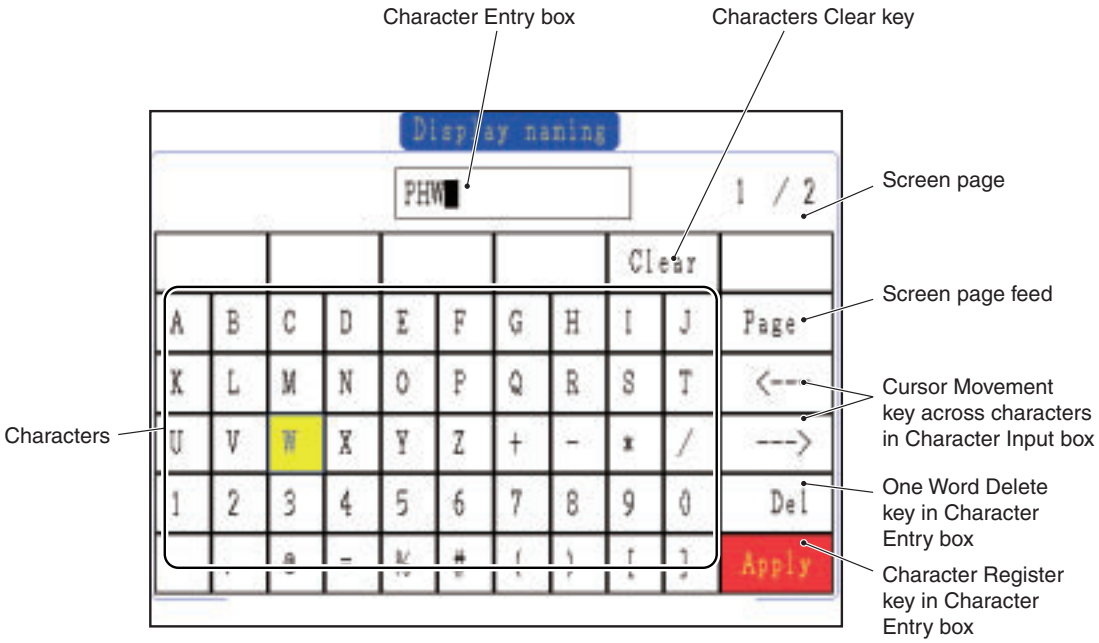
(4) When setting the contents by entering characters;

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 PHW 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.

7.4 Setting method of input types, skip, scaling, units and square rooter, and Unit code table

[Explanation]

Set the input types for each channel (resistance bulb, thermocouple, and DC voltage input), unit (°C, V), and scaling for DC voltage input, measuring range, engineering unit, and square rooter.

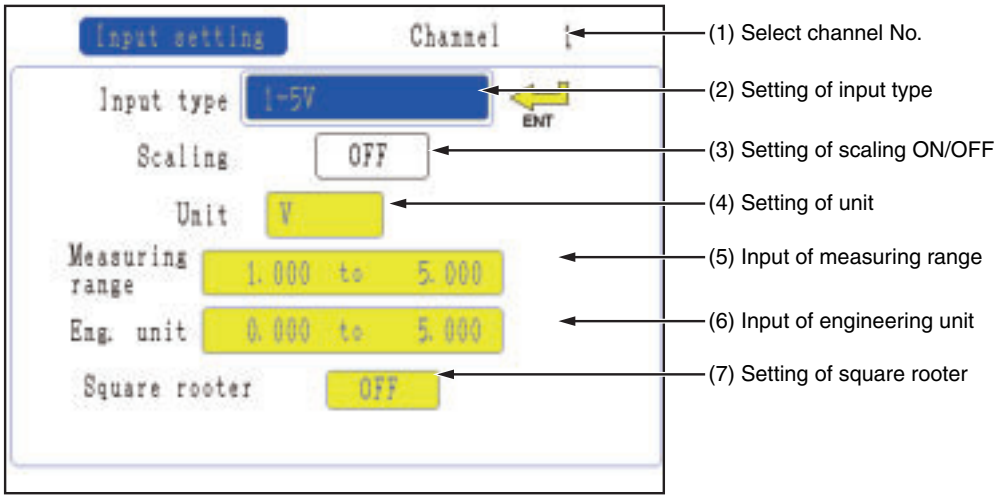
Note 1) When the Input type is set to Skip, indication, recording and alarm for the channel are not carried out.

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".

Skip		
K-Type TC	E-Type TC	J-Type TC
T-Type TC	R-Type TC	S-Type TC
B-Type TC	N-Type TC	W-Type TC
L-Type TC	U-Type TC	PN-Type TC
Pt100	JPt100	50mV
500mV	1-5V	0-5V
Other channel input		

Note: About input type setting

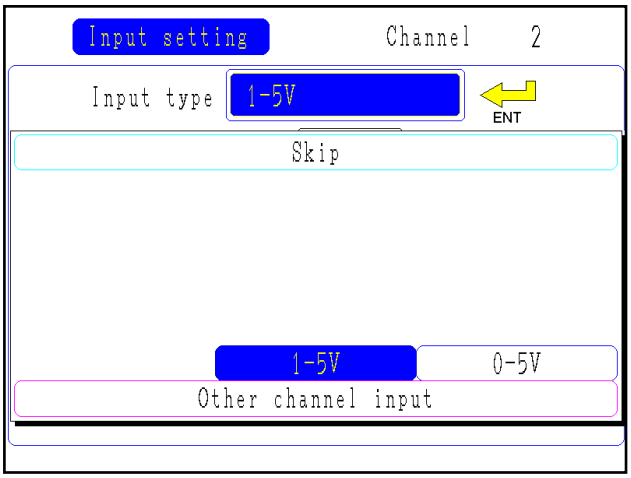
The same input type is basically allocated to 2 channels.

Channels 2, 4, 6, 8, 11,13, 15, 17, 20, 22, 24, 26, 29, 31, 33, 35 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	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, 18, 27, and 36 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 only1 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

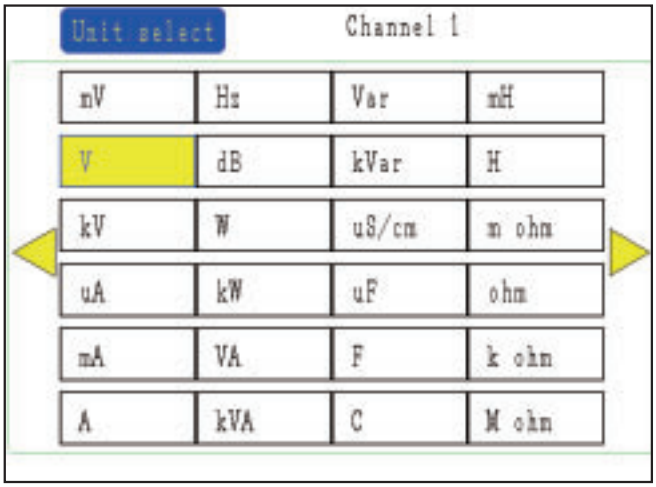
With DC voltage input, set Scaling "ON" "OFF" with the cursor key.

Note: When scaling is set to "ON", the recording range is zero-cleared. For details, refer to Item 7.10, "Set of Recording Range".

(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. Care must be taken 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	mm^2
F	kg/d	kg/h	kg/min	kg/s	bar	Pa	cm	l	cm^2
%RH	g/d	g/h	g/min	g/s	N/mm^2	kPa	m	kl	m^2
vol%	m^3/d	m^3/h	m^3/min	m^3/s	N/m^2	MPa		mm^3	g
	l/d	l/h	l/min	l/s				cm^3	kg
								m^3	t

Density		Analysis			Power · Energy	Velocity · Acceleration		Time	Electro-magnetism
g/cm^3	g/l	ppm	ppmNOx	$\%CO_2$	mN	mm/s	rps	s	mV
kg/cm^3	kg/l	$ppmNH_3$	ppb	%He	N	mm/min	rpm	ms	V
g/m^3	g/ml	$ppmSO_2$	pH	%Ar	N · m	mm/h	rph	s	kV
kg/m^3		$ppmH_2S$	mol	$\%O_2$	J	m/s	m/s^2	min	A
		ppmCO	%	%NaCl	kJ	m/min	rad/s	h	mA
		$ppmO_2$	$\%H_2$	%CO		m/h	km/h		A

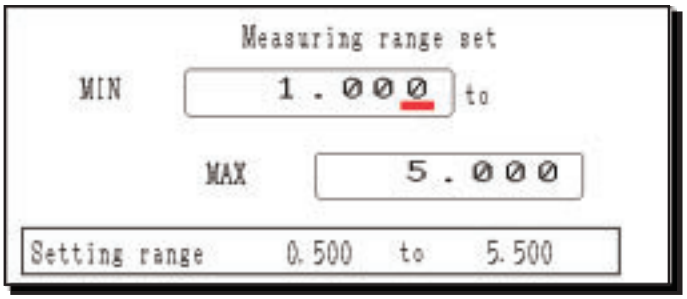
Electromagnetism			Heat · Light	Radiation	Other	Customer-made (Note 2)	
Hz	Var	mH	lx	Sv/h	Pa · s	(Unit 1)	(Unit 7)
dB	kVar	H	cd	mSv/h	mPa · s	(Unit 2)	(Unit 8)
W	S/cm	m ohm	lm	nGy/h		(Unit 3)	(Unit 9)
kW	F	ohm	cd/m^2	Gy/h		(Unit 4)	(Unit 10)
VA	F	k ohm		m		(Unit 5)	(Unit 11)
kVA	C	M ohm				(Unit 6)	(Unit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

Note 1: Blank consists of some spaces

Note 2: Units can be made by the customer (See 7.15).

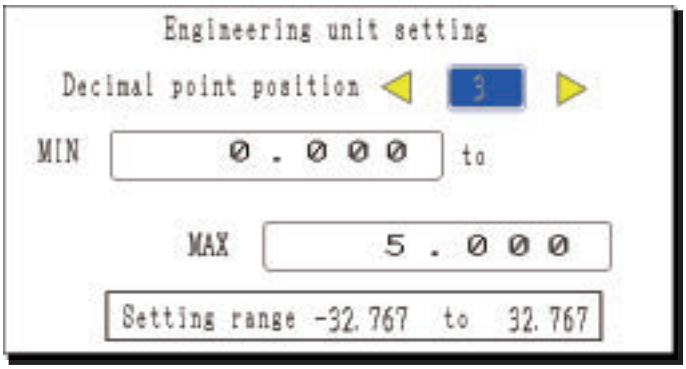
(5) Entering the measuring range

The measuring range can be set only when the scaling is set to ON. Move the cursor to "Measuring Range" and press the (ENT) key to display the "Measuring range set" screen as shown below. 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. Move the cursor to "Engineering Unit" and press the (ENT) key to display the "Engineering Unit setting" screen as shown below. 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) × $\sqrt{0}$ = 0 (t/h)
When input is 3V (50%)	(1000-0) × $\sqrt{0.5}$ = 707 (t/h)
When input is 5V (100%)	(1000-0) × $\sqrt{1}$ = 1000 (t/h)

7.5 Setting method of input filter (time constant), PV shift, and subtraction

[Explanation]

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

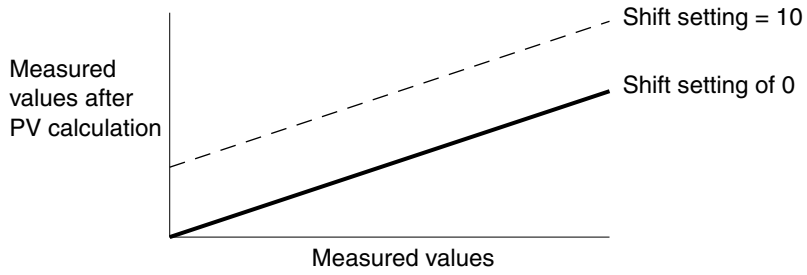
Select the channel to which subtraction and F value calculation is to be performed.

[PV shift function]

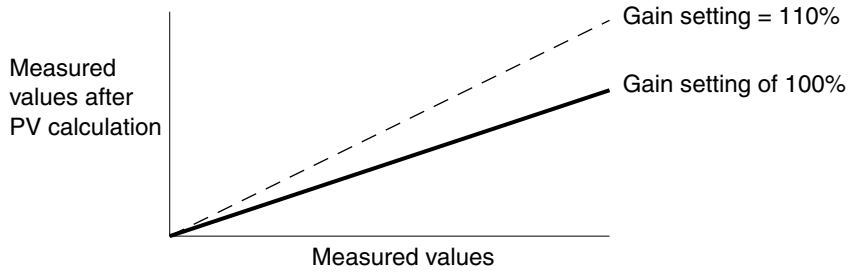
- Measured values can be calculated, recorded, and displayed with the PV shift constant.
- PV shift calculation can be achieved with the gain and shift values.

  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 record 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

  ch1=ch1-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

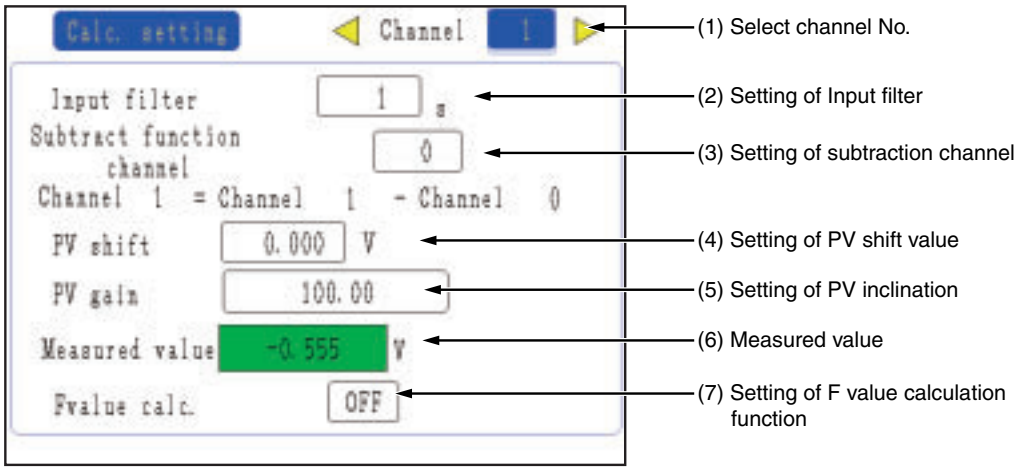
$$\text{F value} = \sum \frac{10^{\left(\frac{(T - T0)}{Z}\right)}}{60}$$

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.

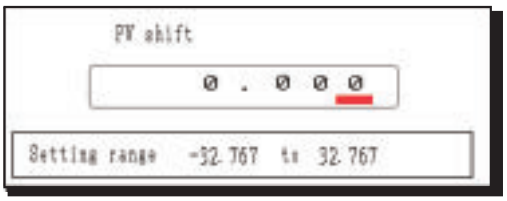
Input filter range: 0 to 900 sec (step of 1 sec)

(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.

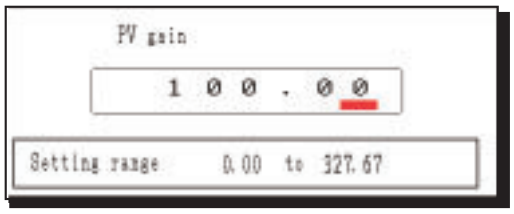
(4) To set PV shift value

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.

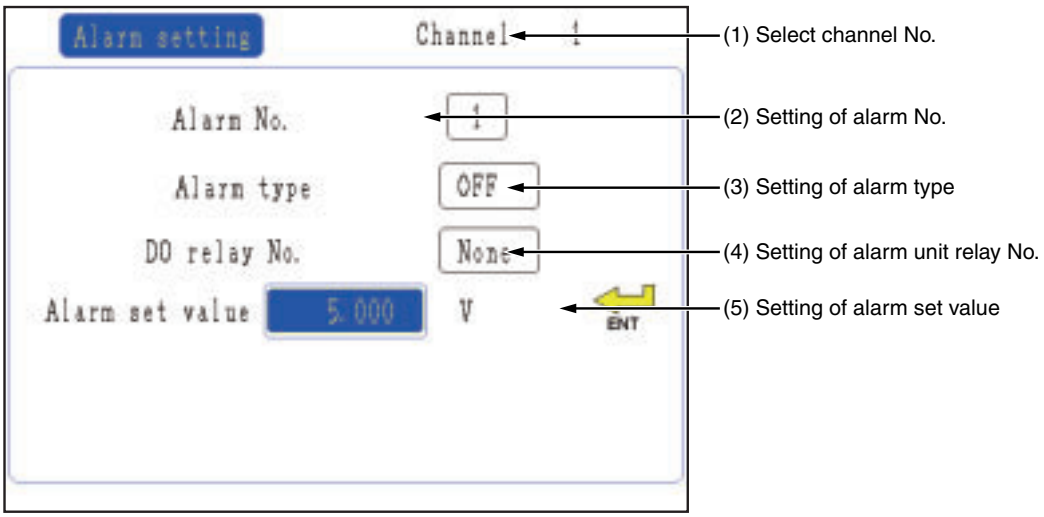
7.6 Setting method of alarm

[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 36, No output for “None”)
- 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.



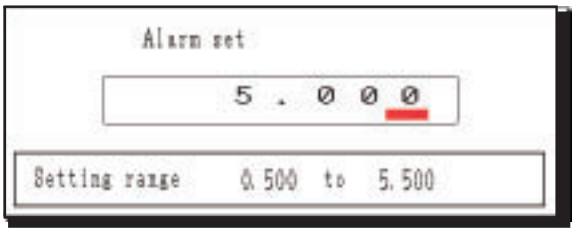
(1) To select channel No.
Select the “Channel No.” by using the cursor key.

(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: If a relay is not provided, the alarm is displayed in the event summary, but relay output is not produced.

7.7 Setting method of F value calculation (Setting common to all channels)

[Explanation]

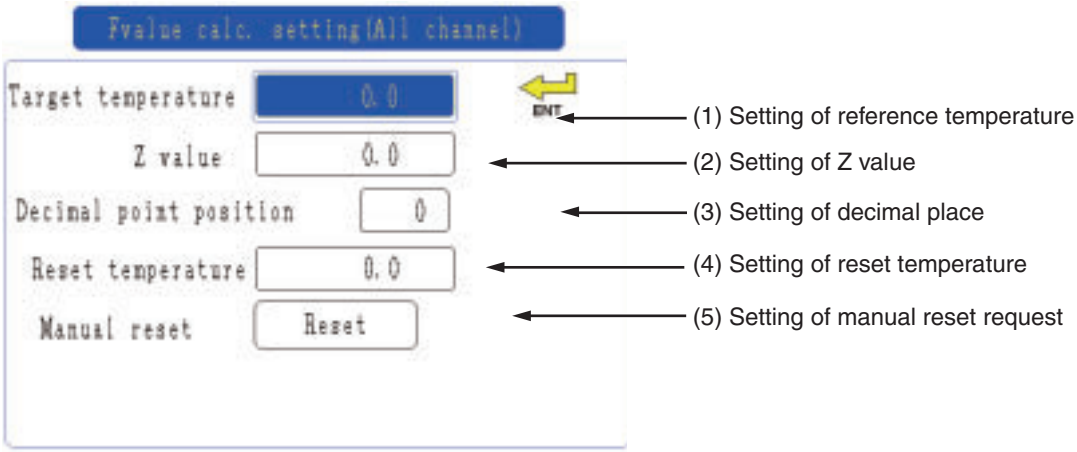
- Select the calculation constants to be used for F value calculation (Extinction value calculation of bacteria by sterilization by heating) that are common to all channels.

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

- F value calculation can be manually reset.

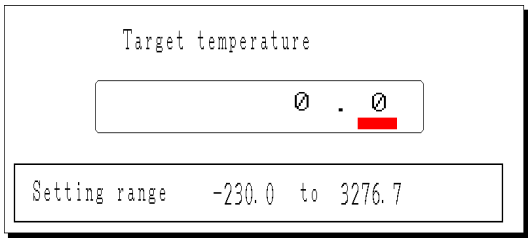
[Operation]

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



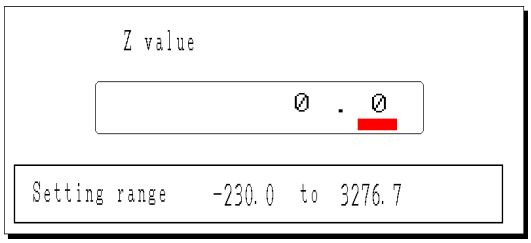
(1) To set target temperature

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.

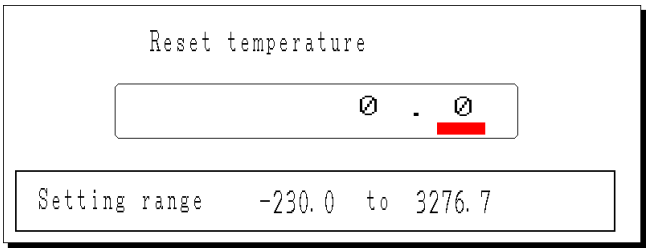


(3) To set decimal point position

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.

7.8 Parameter copy

[Explanation]

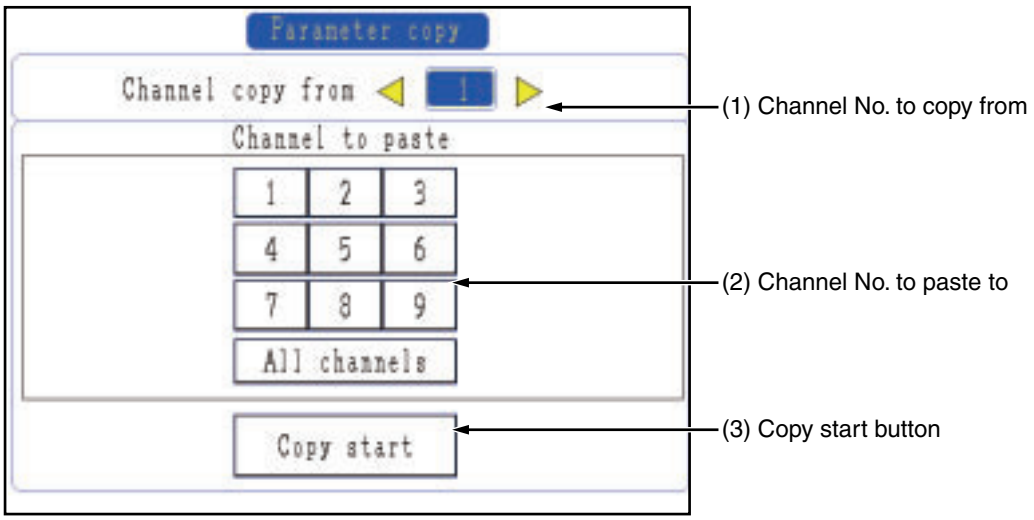
This screen allows you to copy parameters at one channel to other channels.

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

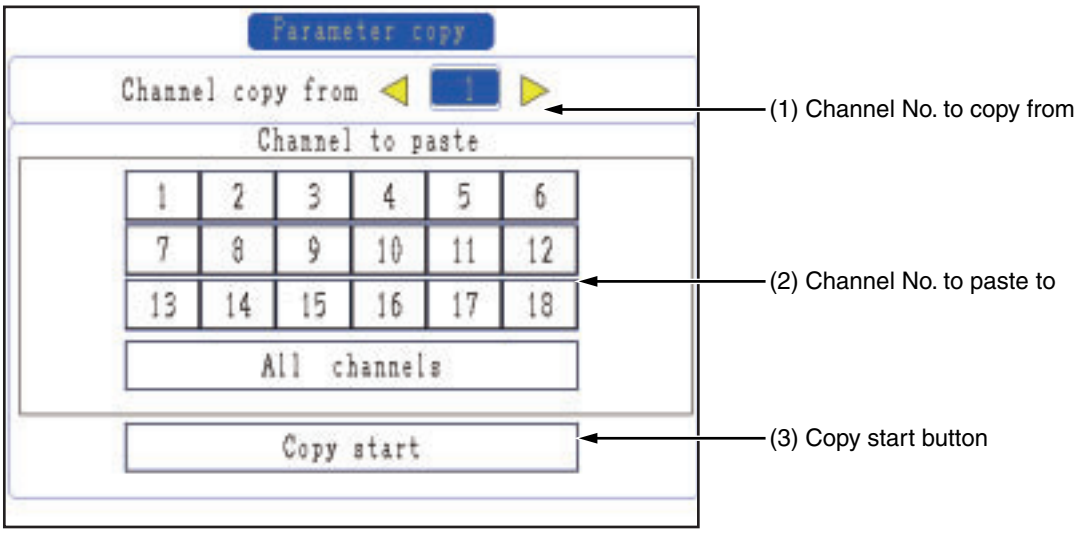
[Operation]

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

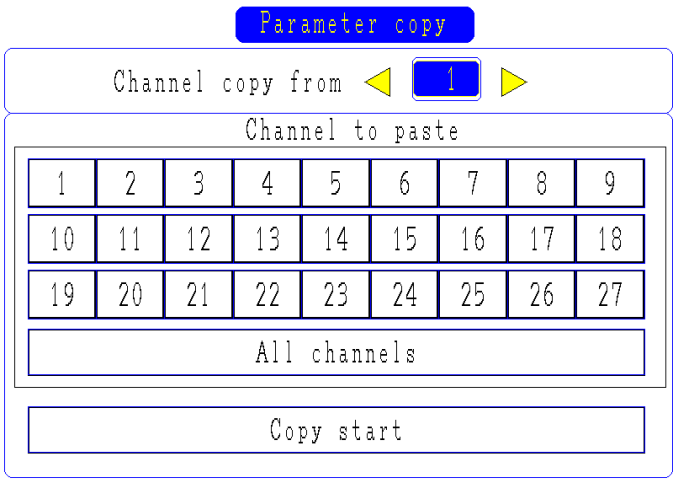
Copy screen for the number of input points of 9



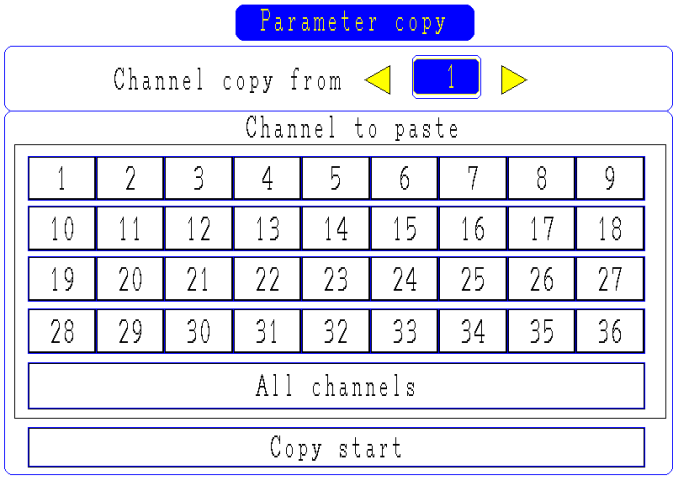
Copy screen for the number of input points of 18



Copy screen for the number of input points of 27



Copy screen for the number of input points of 36



(1) Channel No. to copy from

Select “Channel copy from” using the cursor key.

(2) Channel No. to paste to

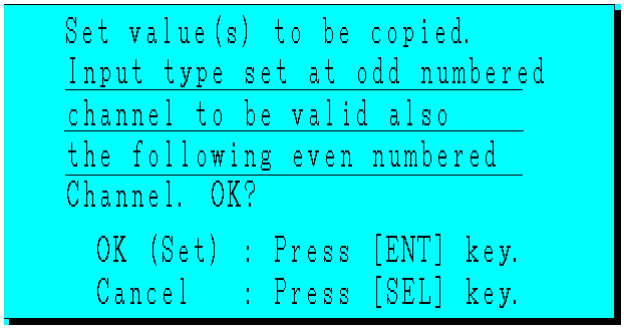
Select “Channel to paste” using the cursor key and the (ENT) key. (Select “All channels” to paste to all channels.)

(3) Copy start button

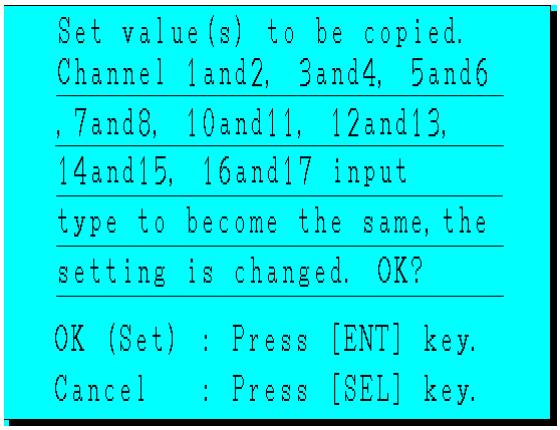
Press the (ENT) key, and the “Guidance” screen appears as shown in the next page.

Press the (ENT) key to copy, and select the (SEL) key to cancel.

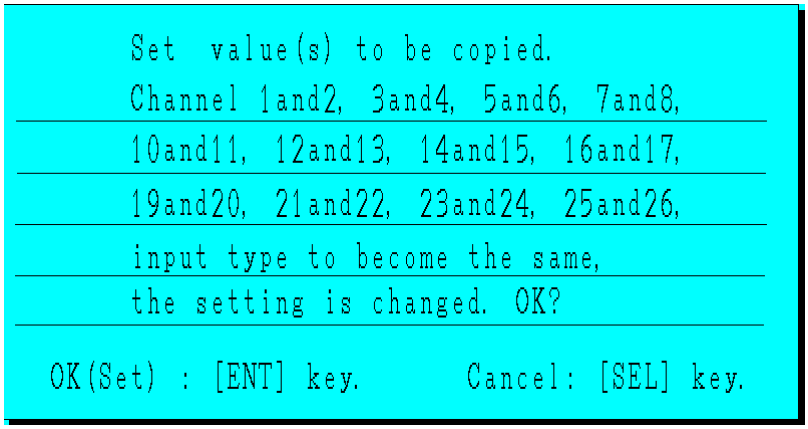
Guidance screen for the number of input points of 9



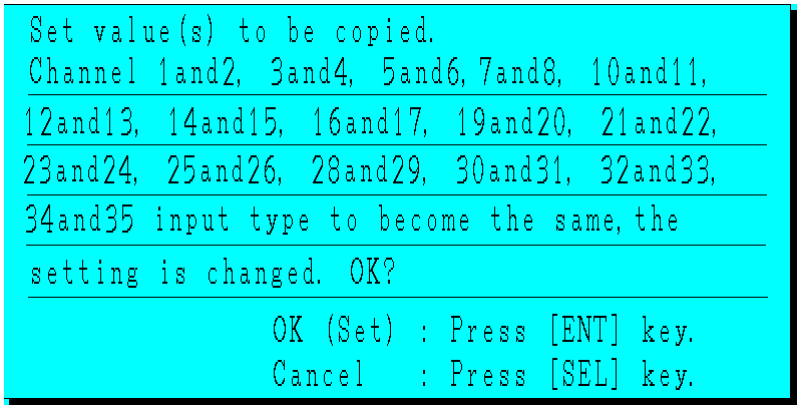
Guidance screen for the number of input points of 18



Guidance screen for the number of input points of 27



Guidance screen for the number of input points of 36



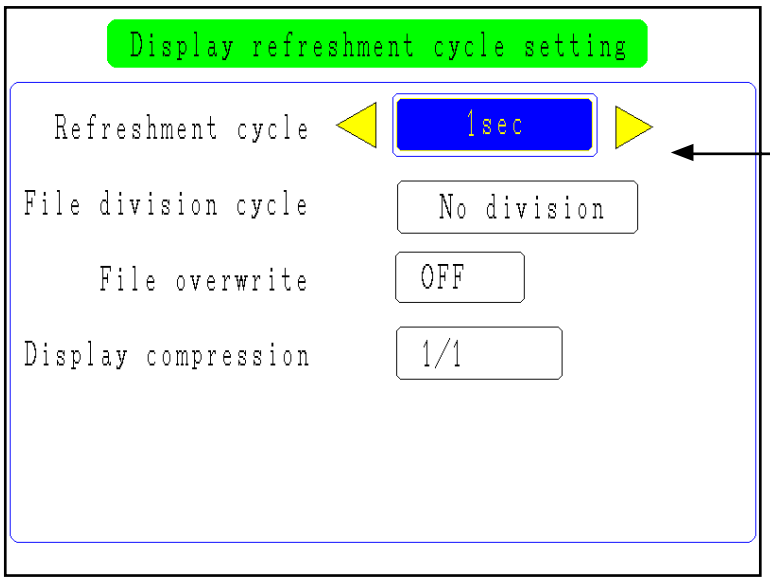
7.9 Setting method of display refreshment cycles, File division cycle, File overwrite, and Trend display compression

[Explanation]

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

[Operation]

Select "Display Record" →"Display Recording Mode" from the "Parameter Set" screen, and the "Display Recording Mode Setting" screen appears.



(1) To set "Display refreshment cycle"

Select the cycle time (1, 2, 3, 5, 10, 20, 30 sec, 1, 2, 3, 5, 10, 20, 30 min, 1, 2, 3, 4, 6, 12 hour) 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. Refer to "Appendix 6" for the timing of 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 (No division, 1 hour, 1 day, 1 week, or 1 month) and then press the (ENT) key to display the File division cycle setting screen.

If "No division" is selected, the archived 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 archived file is divided at 0:00 on the first day of every month.

Note) • If the File division cycle setting is shorter than the Display refreshment cycle setting, the archived file without data is created.

• 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.

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

(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 1) Historical display screen cannot be compressed.

Note 2) The compression rate cannot be changed during recording.

7.10 Setting method of TAG. No., display range, and record mode

[Explanation]

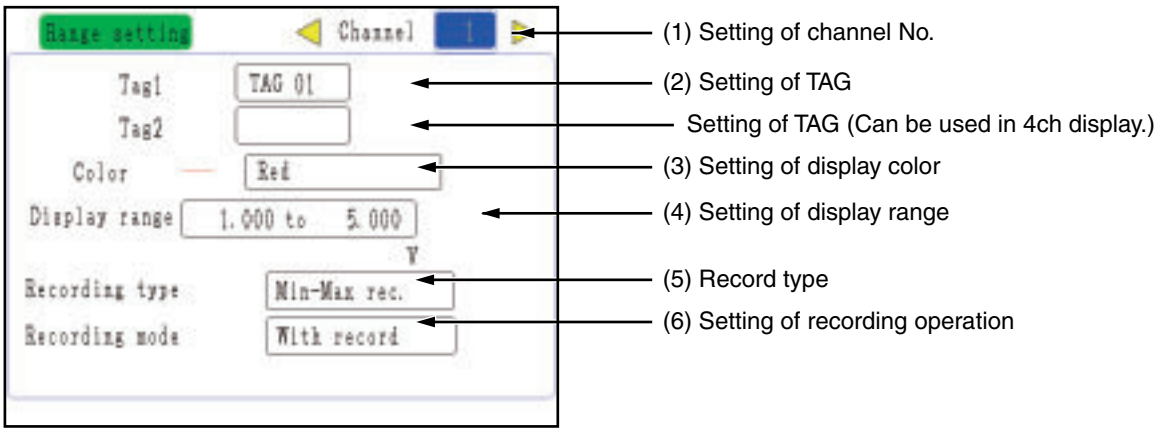
This “Range Setting” screen allows you to set “TAG”, “Display Range”, and “Recording Mode” for each channel.

- TAG : Set TAG (TAG name) using alphanumeric characters consisting of up to 8 digits.
  Up to 8 characters can be entered. Note, that on some screens such as trend screen, up to 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 recording 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.

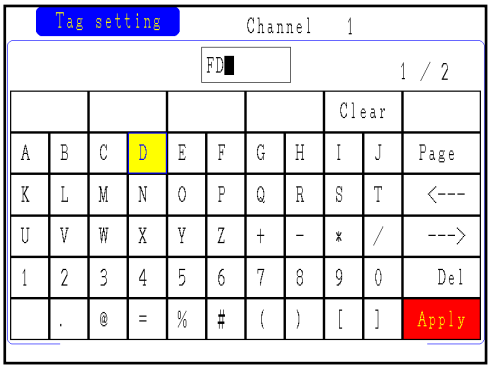
CAUTION When “Display Only” is set to all channels that have been set as group setting, trend does not display even if the recording is started.

[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.

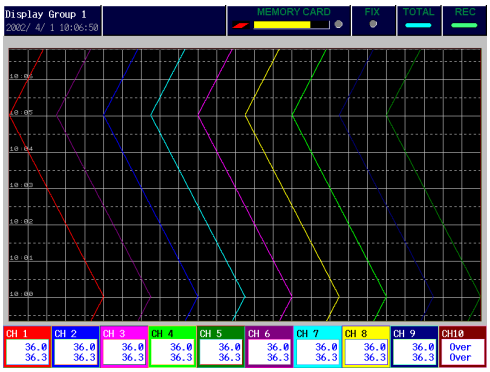


(2) TAG. 1 setting

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.

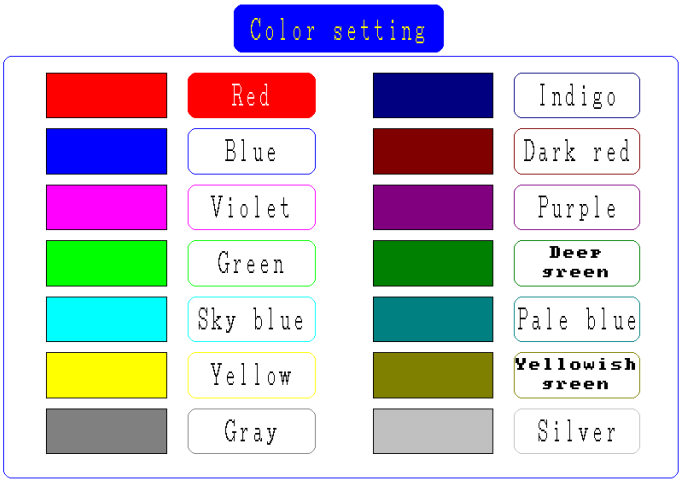
After entry of the TAG name, press the “Apply”, and then press the ENT key.

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”.

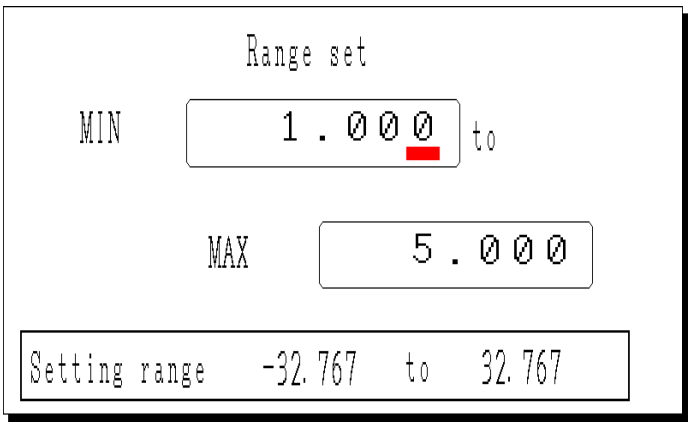


Table 1 Display Range Set Range

Type		Input range	Record 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

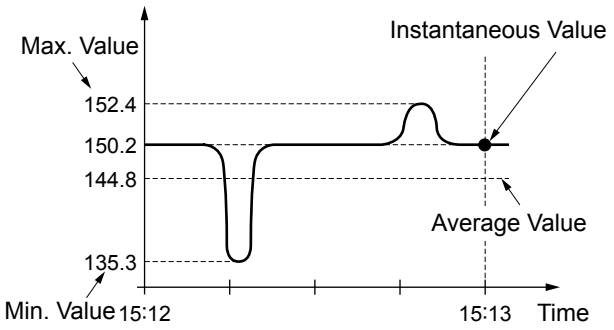
Type of recording can be selected from the following three.

- **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

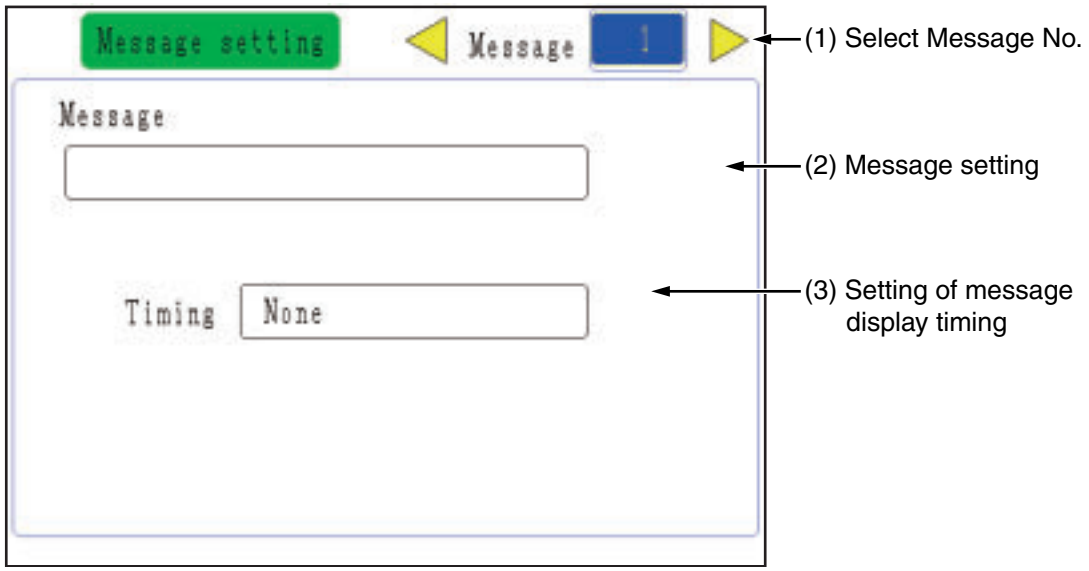
7.11 Setting method of messages

[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.

[Operation]

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



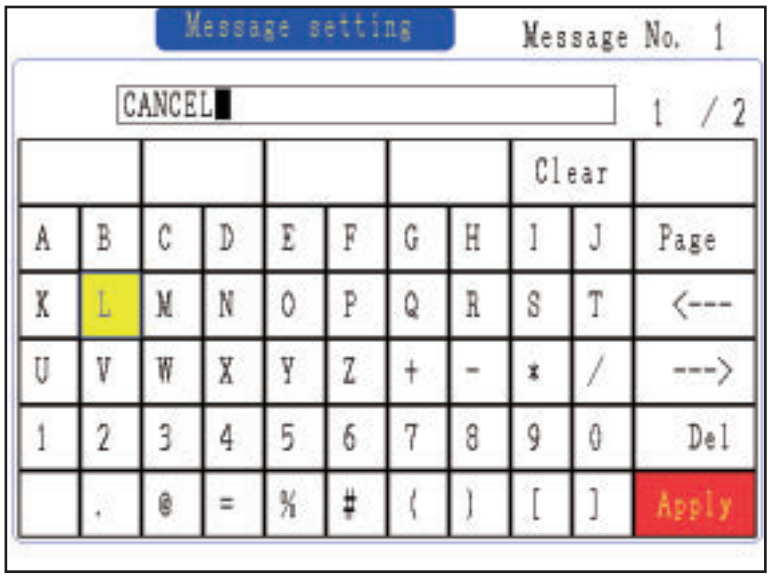
(1) To select Message No.

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.

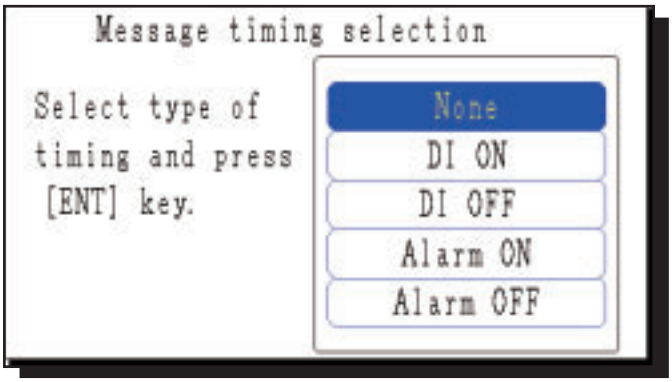
After entry of the message, press “Apply” to register the message, and then the ENT key.



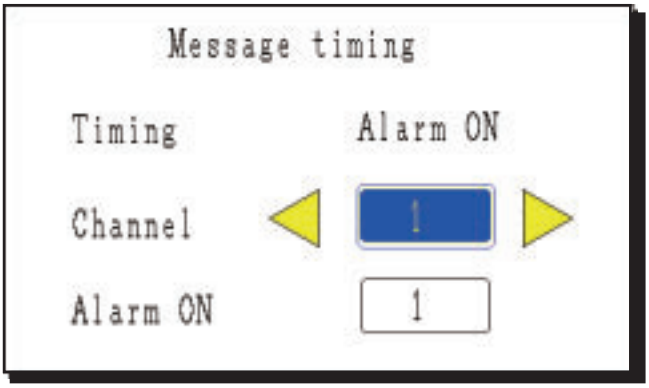
(3) To set the message display timing

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 7.6.



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.



7.12 Setting method of data display screen

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

7.12.1 Screen setting 1

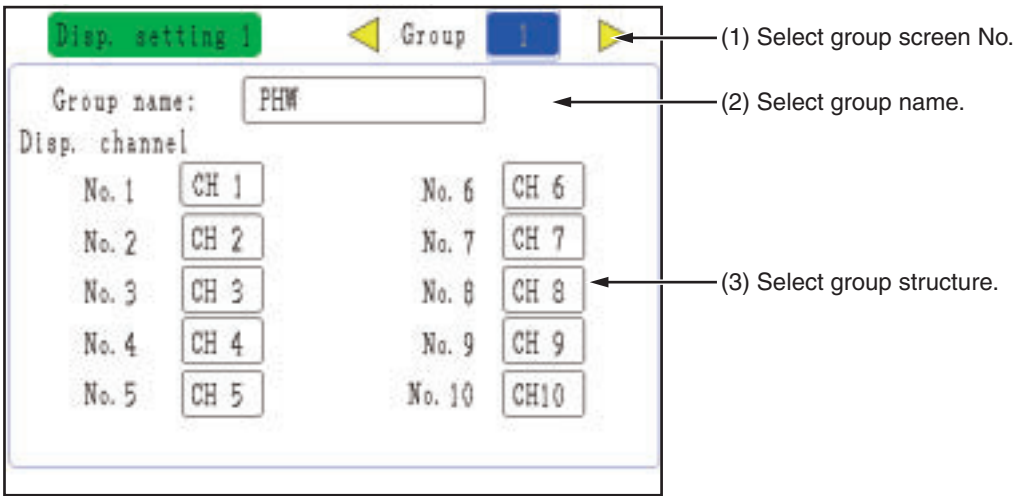
[Explanation]

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.



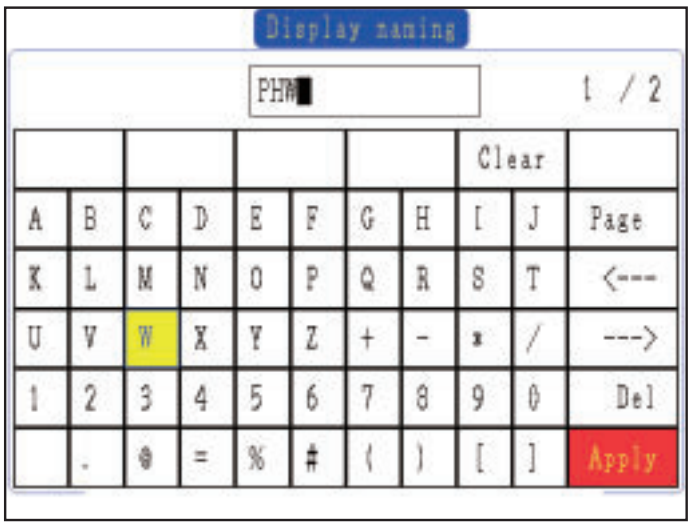
(1) To select group screen No.

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.

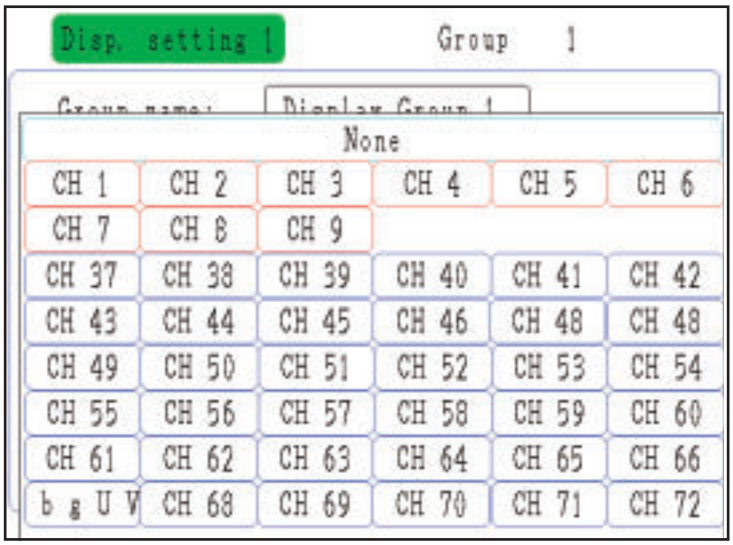
When the name is entered, press the ENT key in “Apply” position to register the screen name.



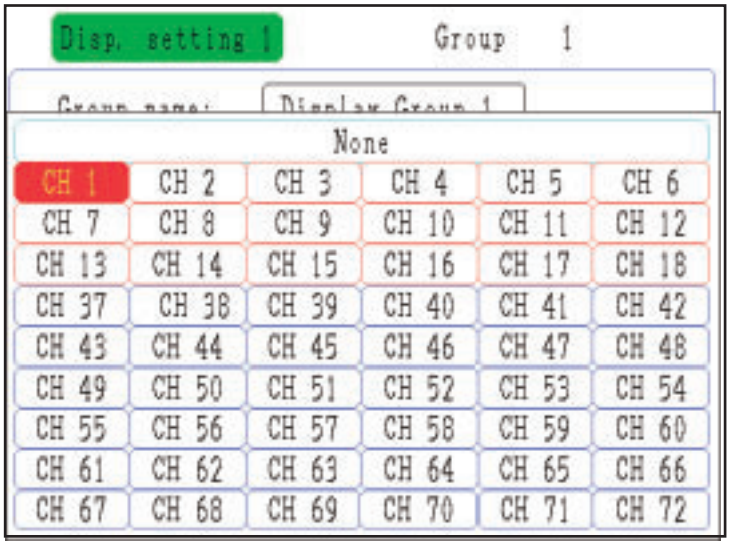
(3) To set group structure

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.

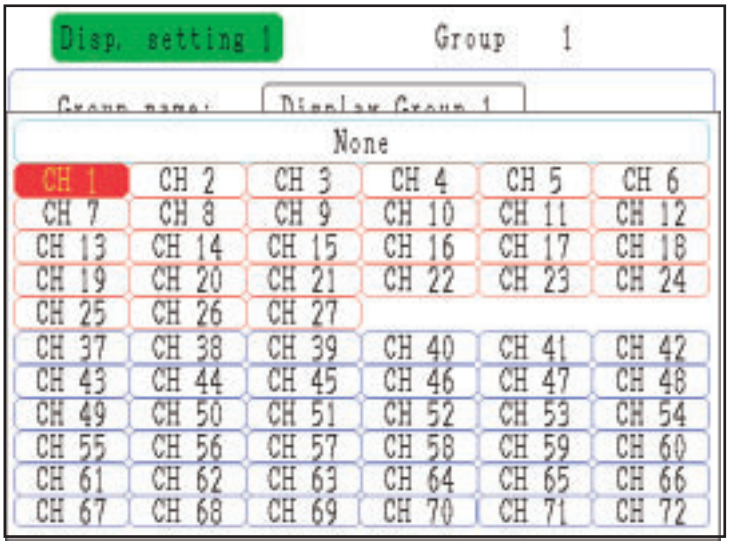
A channel setting screen for the number of inputs of 9



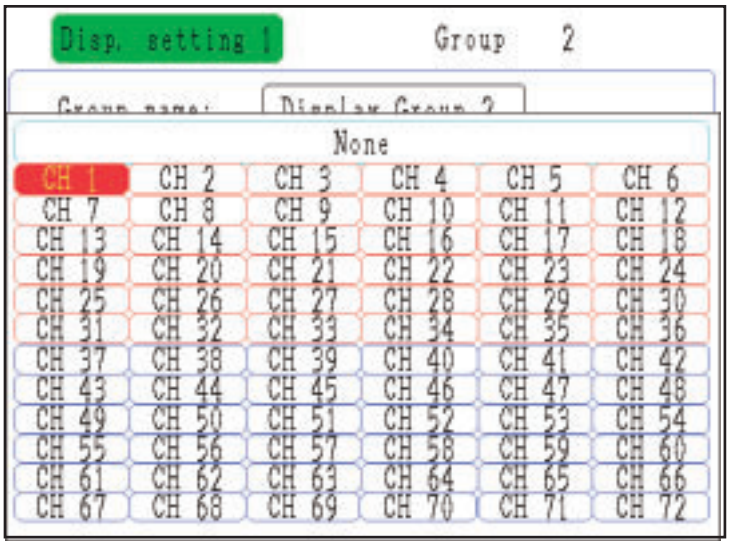
A channel setting screen for the number of inputs of 18



A channel setting screen for the number of inputs of 27



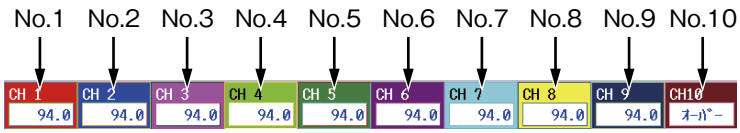
A channel setting screen for the number of inputs of 36



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.



7.12.2 Screen setting 2

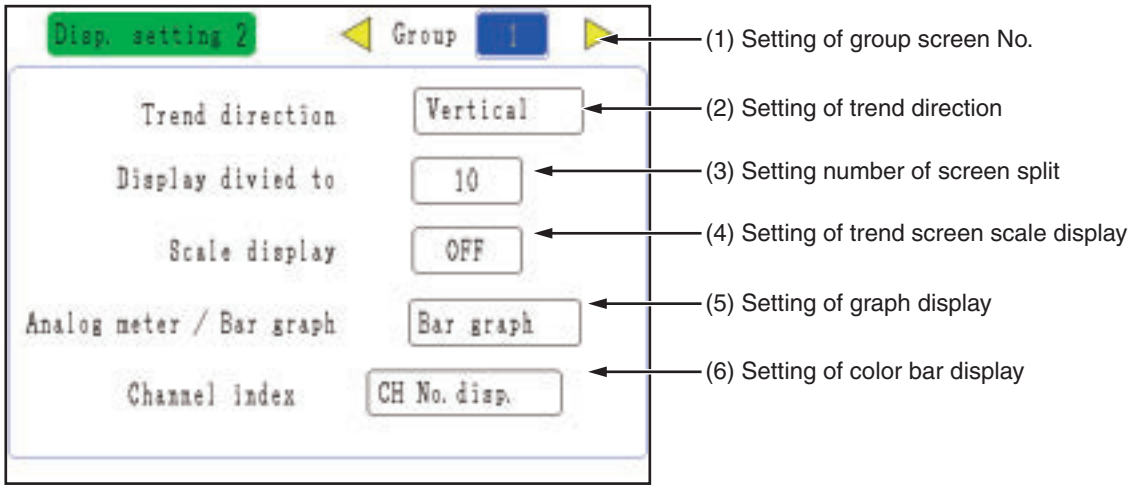
[Explanation]

Screen setting 2

- Set the direction (vertical or horizontal) of the trend screen (real time/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.

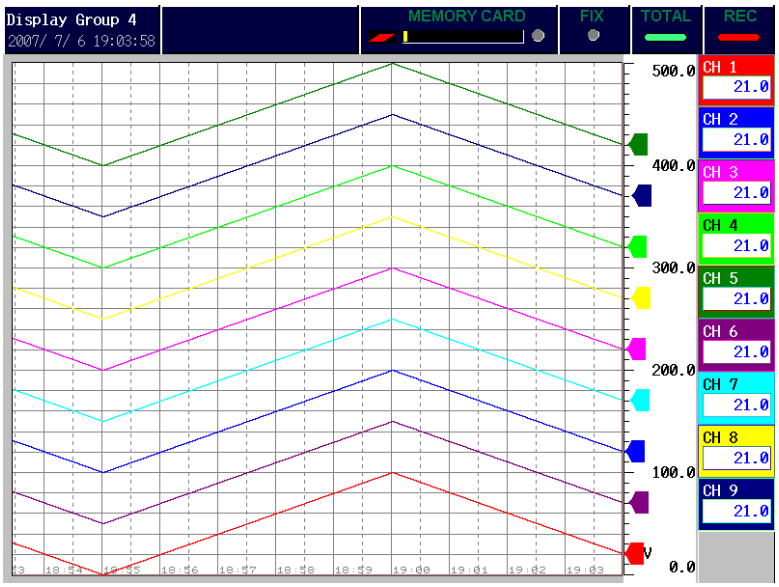
(3) To set the number of screen split

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.

(6) To select color bar display

Select contents to be displayed on the color bar of the 10-channel trend display screen. Select one from “Channel No. display”, “TAG No. display” and “Unit display” using the cursor key.
In case of 4 or 6 channel trend display screen, all contents (“Channel No. display”, “TAG No. display” and “Unit display”) are displayed.

7.13 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 (SEL) 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.

7.14 Setting method of LCD OFF time

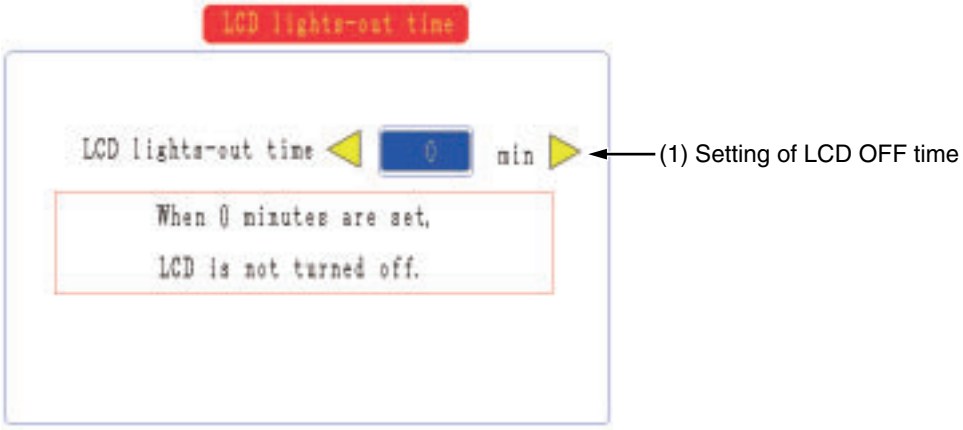
[Explanation]

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.

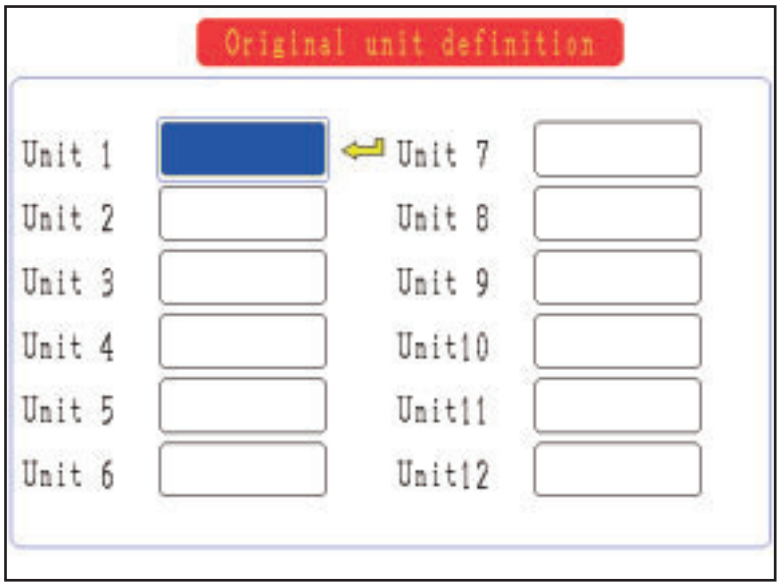
7.15 Unit define

[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 7.4.

[Operation]

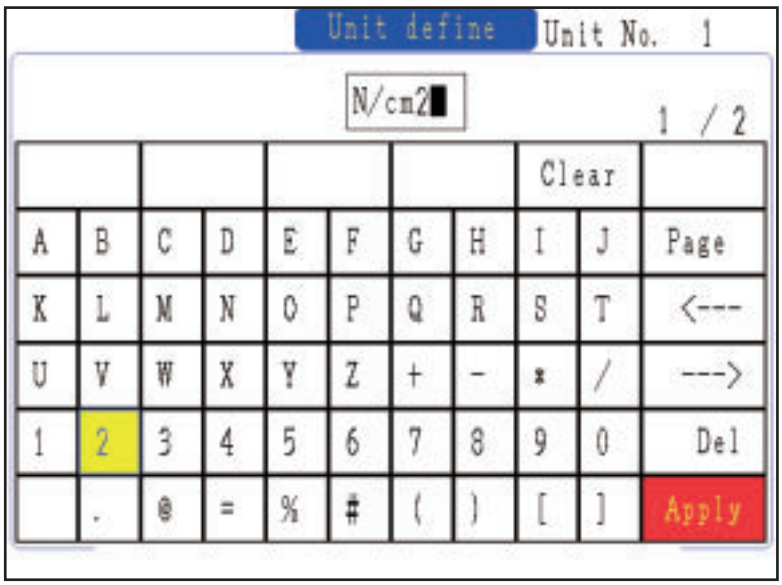
Select “Main Unit” → “Unit Define” from the “Parameter Setting” screen. So, the “Original Unit Definition” screen appears.



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.



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

7.16 Setting method of DI (external control unit) function

[Explanation]

Up to 16 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.

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

(6) Message set

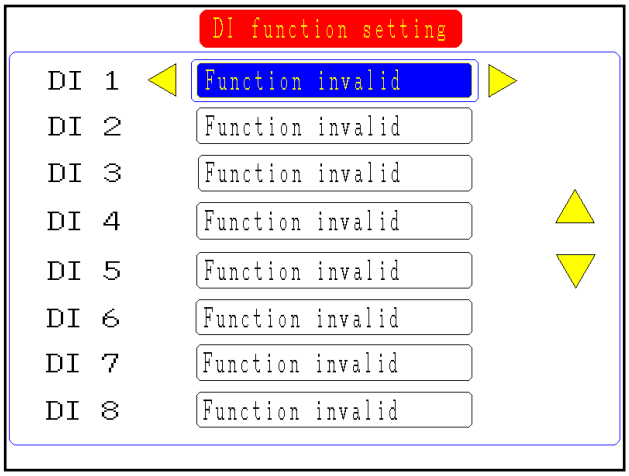
Message can be set using DI.

- 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.)

CAUTION Set the ON/OFF pulse width of DI input to 400 msec or longer.

[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.

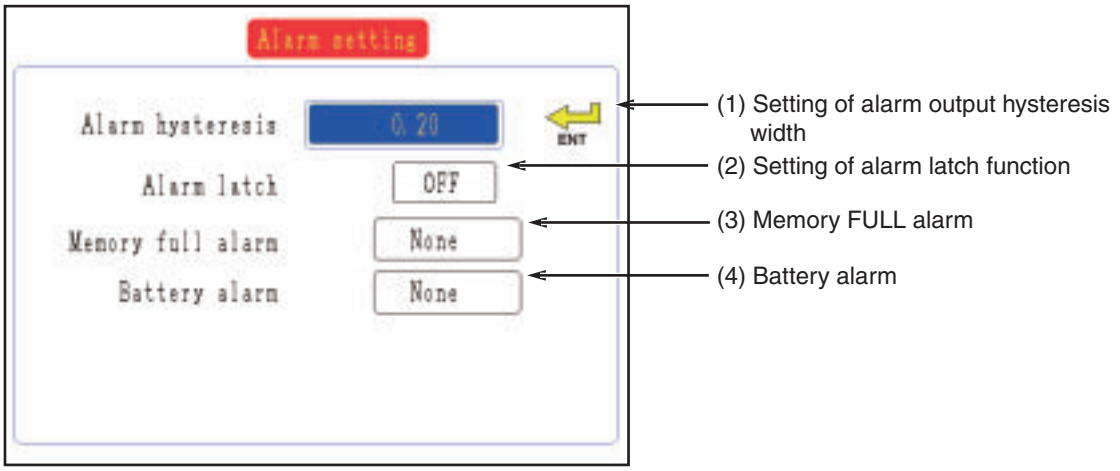
7.17 Alarm setting (whole, memory FULL, battery)

[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.

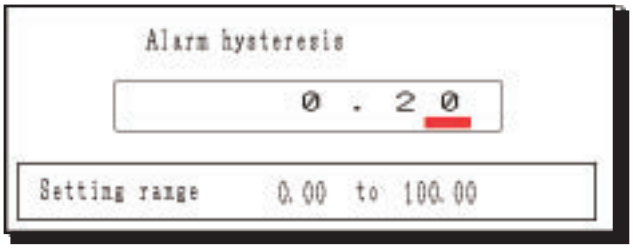
[Operation]

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 DO20 are relay contact output, DO21 to DO36 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 DO20 are relay contact output, DO21 to DO36 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.

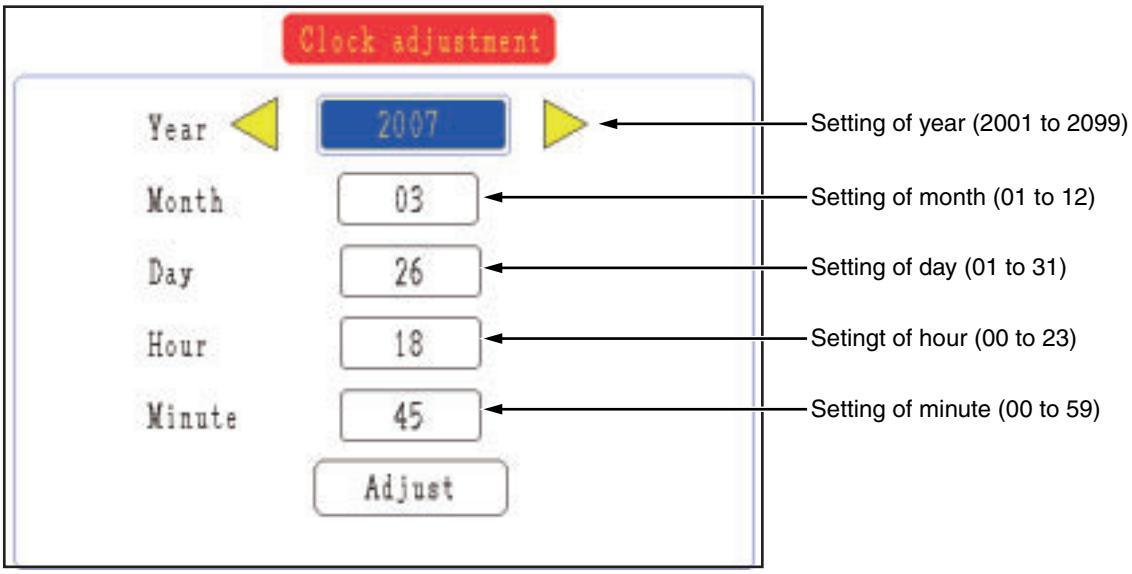
7.18 Adjustment method of clock

[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]

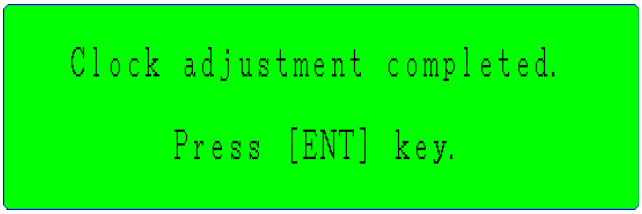
Select "Main Unit" → "Clock Adj." from the "Parameter Setting" screen. So, the "Clock Adjustment" screen appears.



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.



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.**

7.19 Setting method of record data format

[Explanation]

Select record data format from ASCII or binary format.

Each format has the following characteristics.

ASCII format

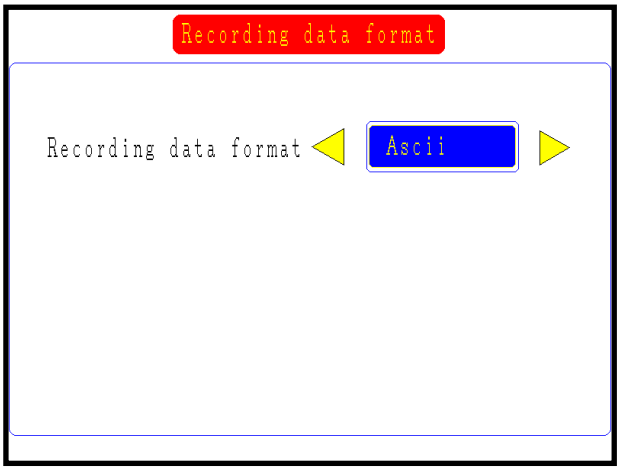
- Record data can be directly opened on Excel or with text editor.
- The number of data that can be recorded is about 1/4 that of binary format.

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.

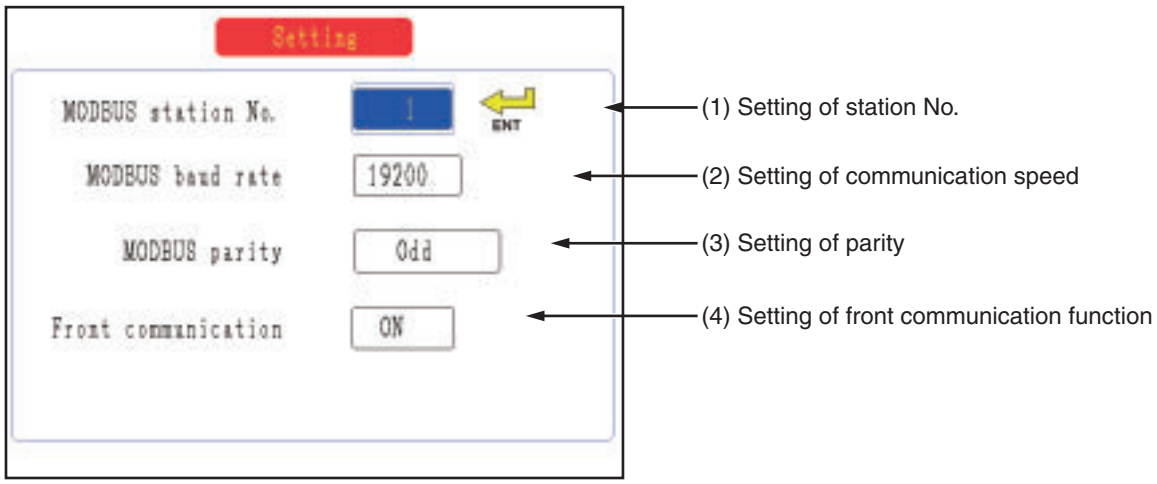
7.20 Setting method of communication function

[Explanation]

Communication is allowed, conforming to MODBUS RTU protocol.
Make the setting on the following 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 from the "Parameter Setting" screen, and then press the (ENT) key. The Communication setting screen appears.



(1) To set station No.

Move the cursor to Station No. and press the (ENT) key. 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 changed 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.
(RS-485 communication function is not provided at the moment, and this setting doesn't have a proper meaning.)

(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.
(RS-485 communication function is not provided at the moment, and this setting doesn't have a proper meaning.)

(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 to save the setting, and then turn off the power and turn it on again.)

7.21 Setting the Ethernet function

[Explanation]

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

The followings 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.

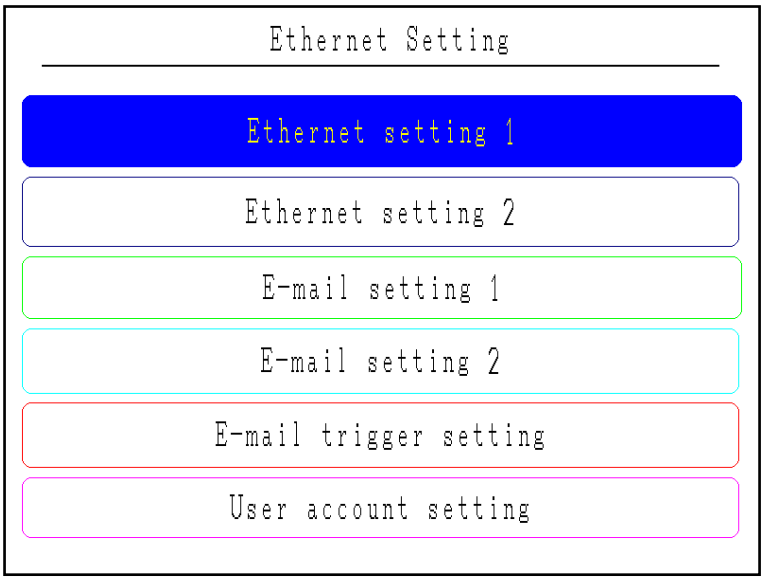
(2) The display operation of the paperless recorder may be slowed down when a large file is fetched.

(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.

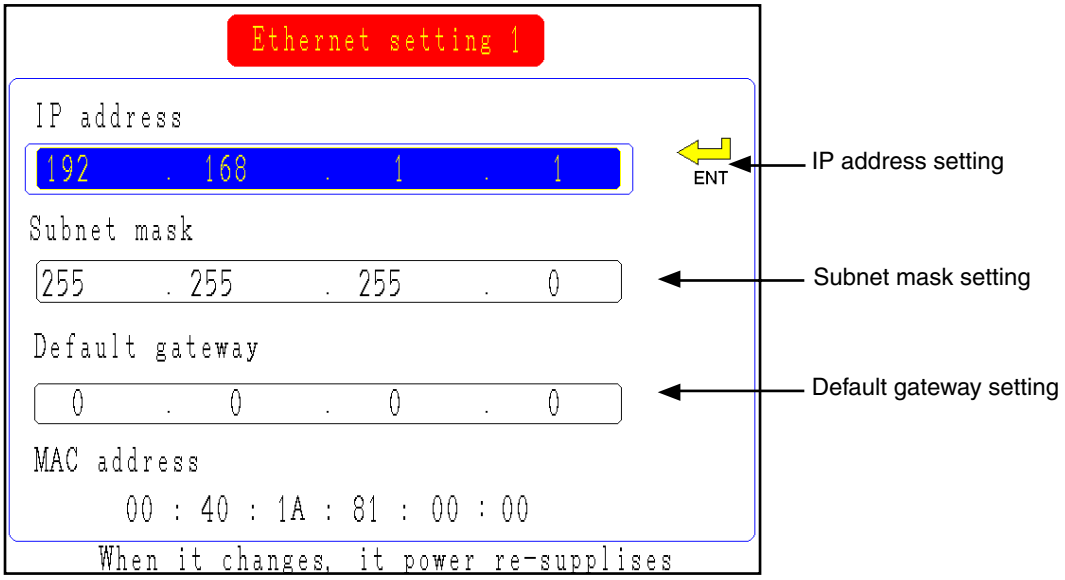
(4) Do not delete or change the file name with which recording or integration is being performed.

[Operation]

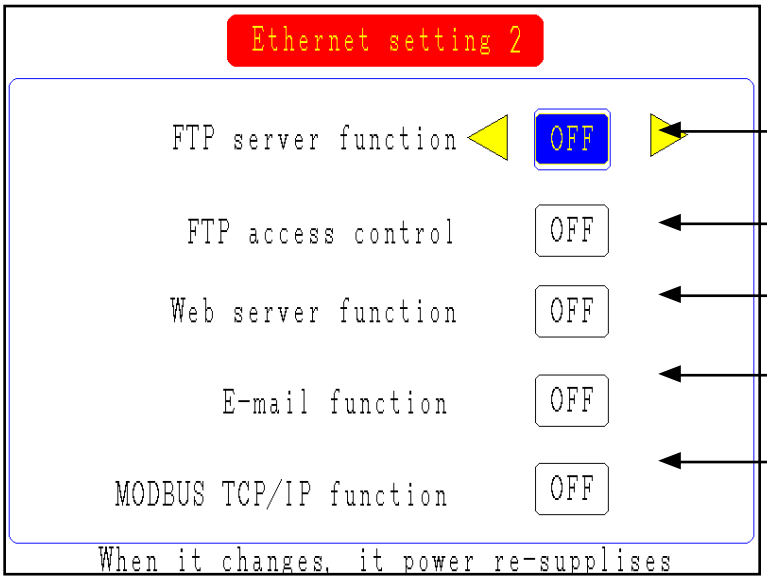
(1) Select “Main unit setting” → “Ethernet Setting” from the “Parameter Setting” screen, and the “Ethernet Setting” screen appears.



(2) Select “Ethernet Setting 1,” and the following screen appears.



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



FTP server function ON/OFF setting

FTP access control ON/OFF setting

Web server function ON/OFF setting

E-mail function ON/OFF setting

Modbus TCP/IP function ON/OFF setting

7.22 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.

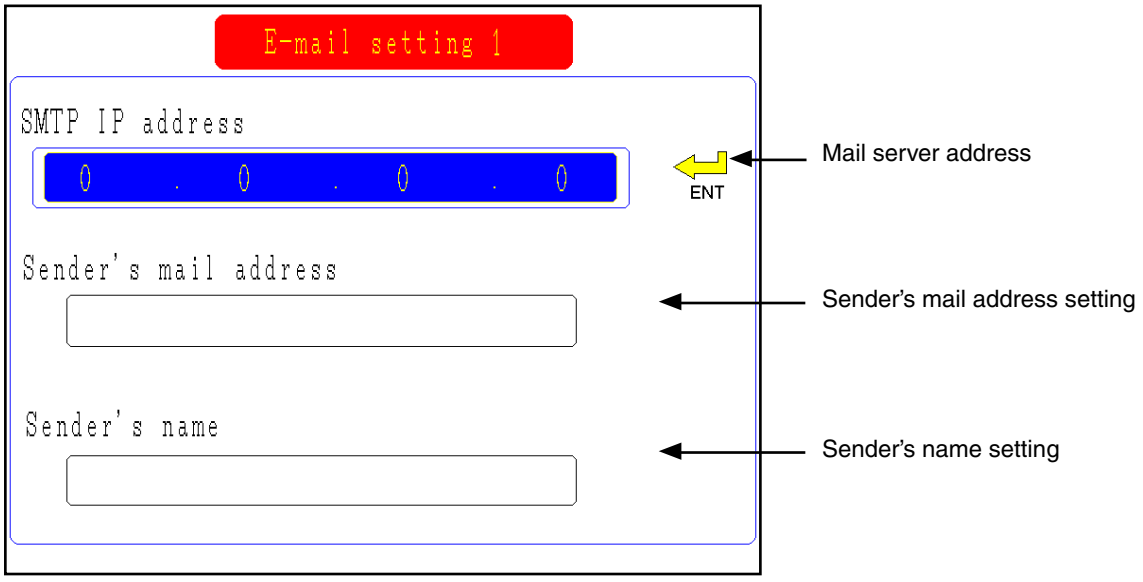
Refer to the “Instruction Manual for Paperless Recorder Communication Function” for details of the setting.

Note)

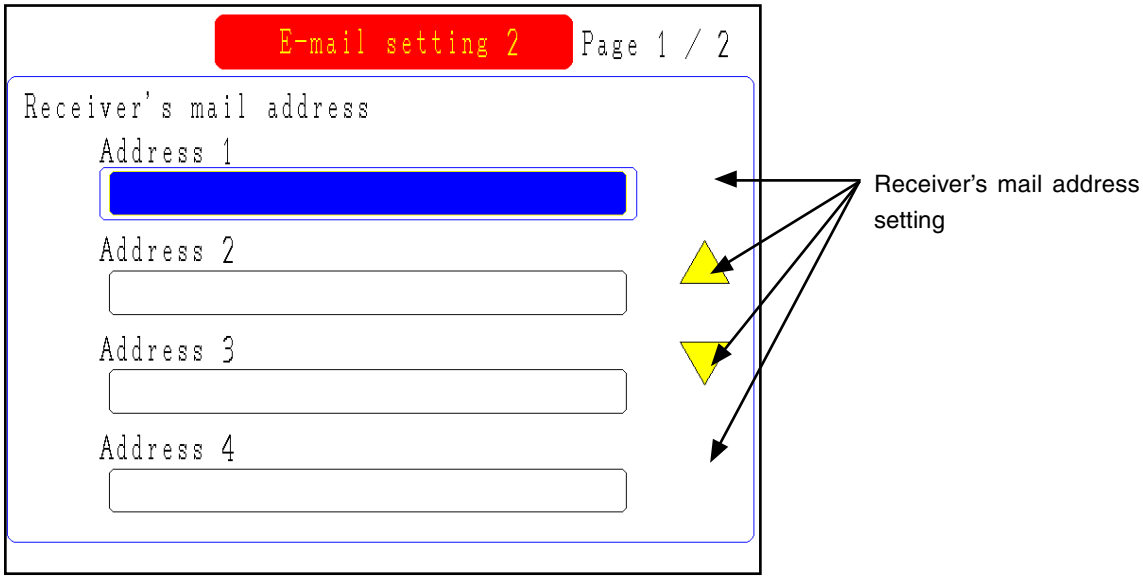
- To use the E-mail function, set the E-mail function to ON on the “Ethernet Setting 2” screen.

[Operation]

(1) Select “Main unit setting” → “Ethernet Setting” → “E-mail setting 1” from the “Parameter Setting” screen, and the following screen appears.



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



7.23 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.

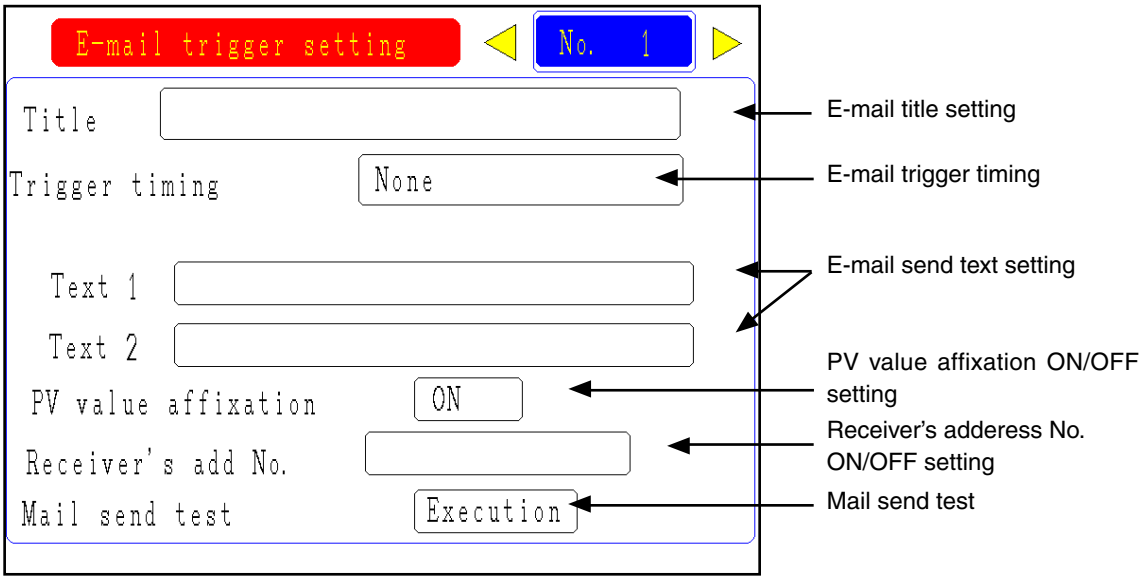
Refer to the “Instruction Manual for Paperless Recorder Communication Function” for details of the setting.

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 Setting” → “E-mail trigger setting” from the “Parameter Setting” screen, and the following screen appears.



7.24 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

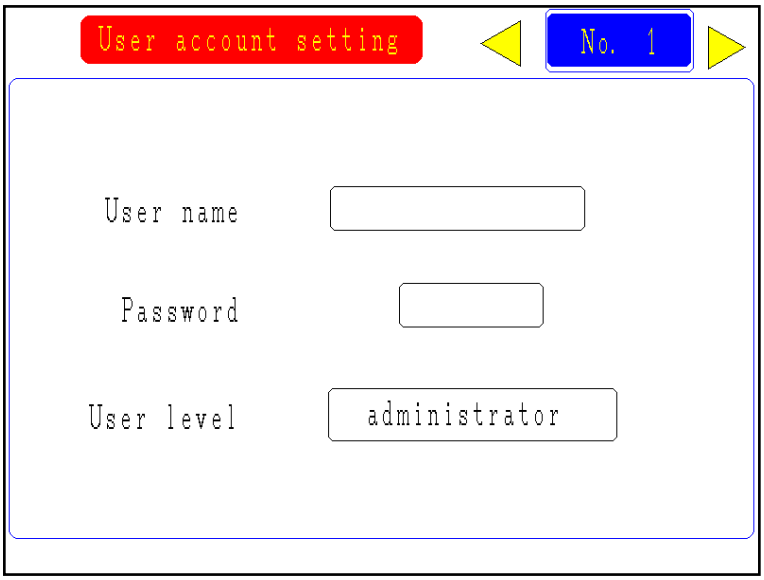
Refer to the “Instruction Manual for Paperless Recorder Communication Function” for details of the setting.

Note)

- Do not use a space character for password.

[Operation]

Select “Main unit setting” → “Ethernet Setting” → “E-mail trigger setting” from the “Parameter Setting” screen, and the following screen appears.



7.25 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 recording is started or stopped.
- When entering the “Parameter Setting” screen.
- When entering the memory card-related setting screen.

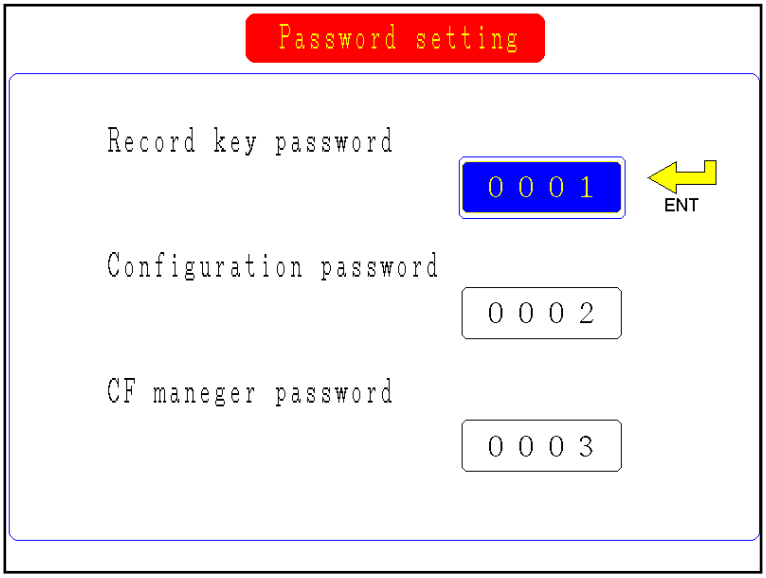
After parameter is set and doesn’t need to be changed, password setting is recommended. It is due to prevent settings from being changed mistakenly by password.

Note) If you forget the password, parameter cannot be changed. So, it is imperative that you print the following table after password is set.

	Password
Recording start/stop	
Parameter Setting screen	
Memory card-related setting screen	

[Operation]

Select “Main unit setting” → “Password Setting” on the next page from the “Parameter Setting” screen, and then press the ENT key to display the “Parameter Setting” screen.



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.

7.26 Record data display of memory card

[Explanation]

The record 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: The File name of 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 (REC) key or by DI input, a new file is created.

  A trend file and an event file are created as a set of 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 Axxxxx.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

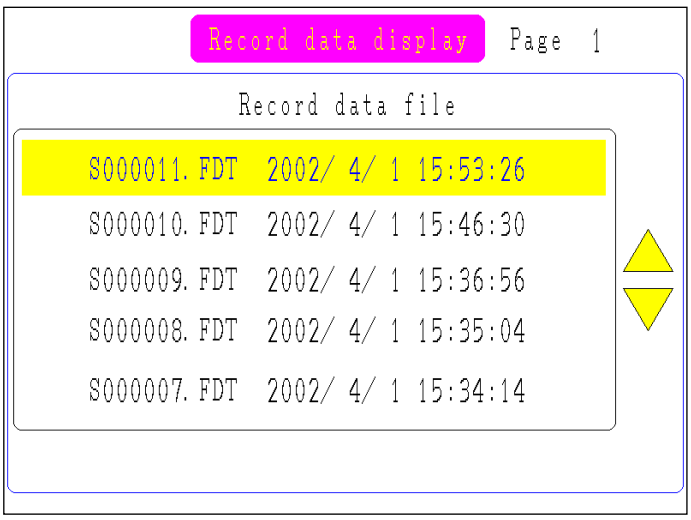
     After change

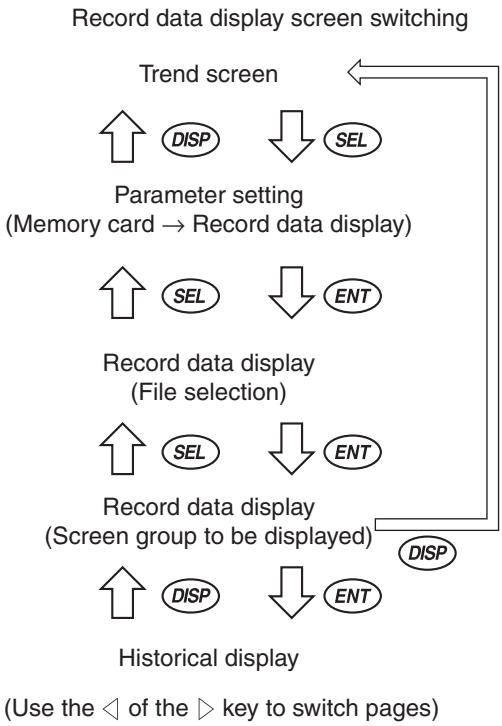
     S88. FDT/A01.FDT 2002-11-19 10:00
     S02. FDT/A88.FDT 2002-11-19 15:38

  7) Be sure to enter the file name with one-byte characters.

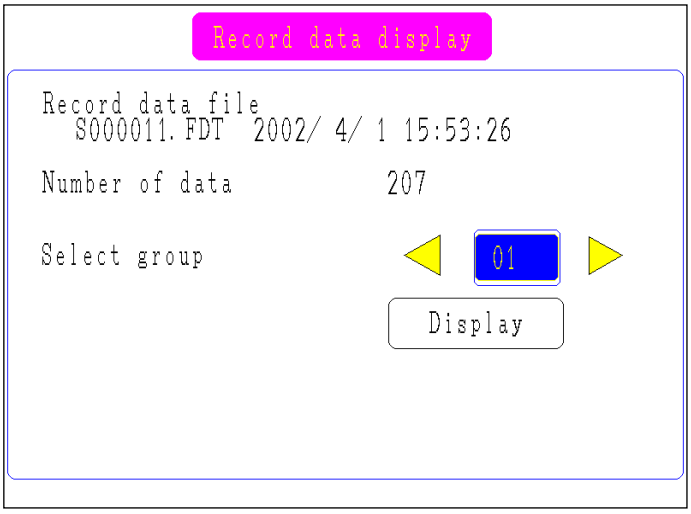
[Operation]

Select "Memory card" → "Rec. data disp." from the "Parameter Setting" screen to display the record data display screen.

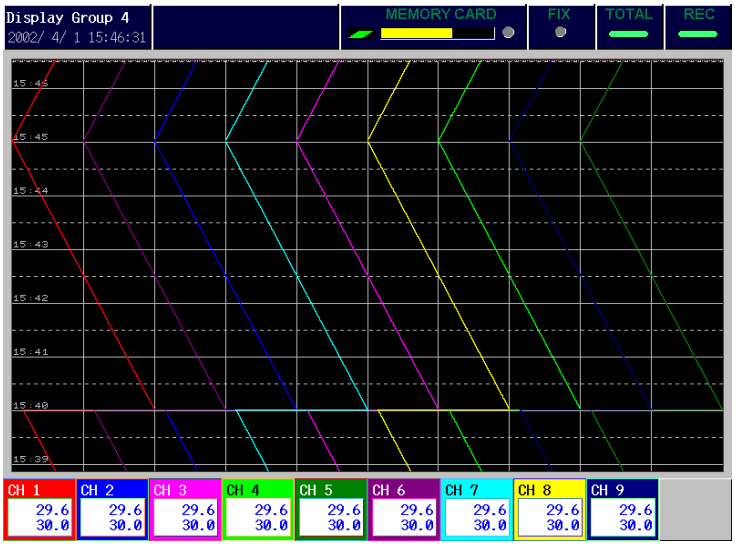




(1) Select the file to be opened using the cursor key, and then press the (ENT) key to display the following record data display screen.



(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 5.8 "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.

7.27 Memory card abstract (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 PHW becomes full while the memory card is being removed, the record data is cut off.
- The internal buffer (memory) of PHW can store the data up to the following unit.

(1) Record data and event data: Approximately 5M 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. (When recording 36-channel in MAX-MIN recording, approximately 36,000 data can be stored. When the display refresh cycle is 1 second, data equivalent to 10 hours can be stored. Note that, the number of saved data change according to the number of event data.)

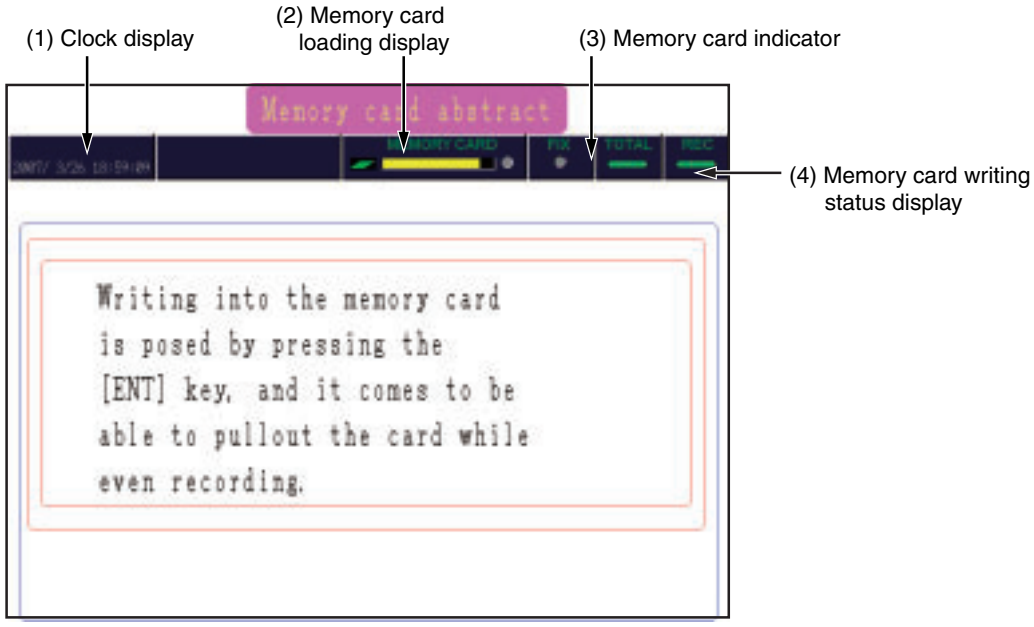
(2) Totalize data: Approximately 64K bytes

4 bytes are required for 1 totalize data. (When totalizing 36-channel, approximately 400 data can be stored. When totalizing once every 1 hour in daily report, data equivalent to 400 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" → "Memory card abstruct" from 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.

Lit in gray: 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.

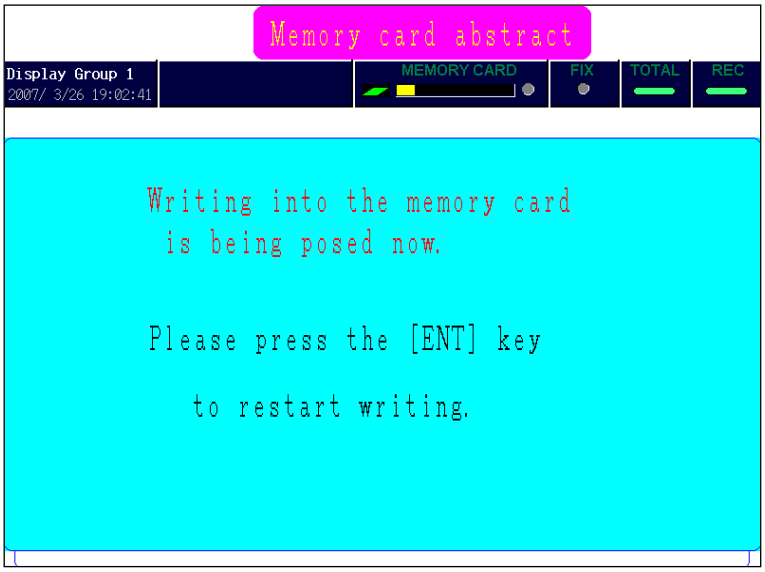
(3) Memory card indicator

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.



7.28 Reading settings

[Explanation]

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

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

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

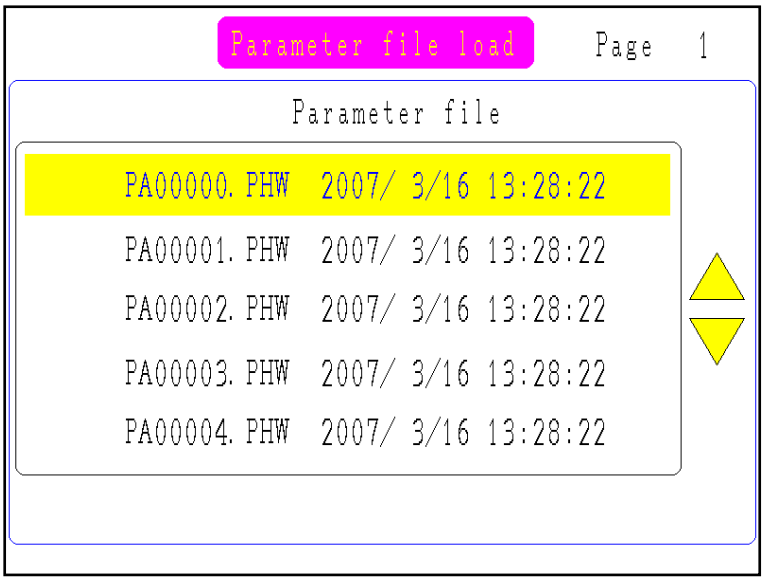
Note)

- **Settings cannot be read while recording or integration is being performed.**

[Operation]

(1) Select “Memory card” → “Parameter file load” from the “Parameter Setting” screen to display the Parameter file load 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.



7.29 Writing settings

[Explanation]

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

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

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

Note)

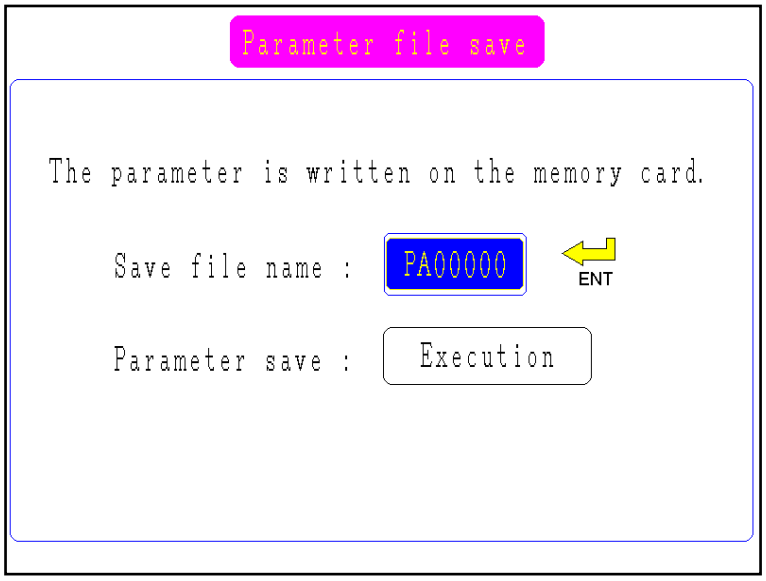
- **A file cannot be created with the same name as the setting file stored in the memory card. (The setting file cannot be overwritten.)**

[Operation]

(1) Select “Memory card” → “Parameter file save” from the “Parameter Setting” screen to display the Parameter file save screen.

(2) Move the cursor to “Save file name” and select the setting file name to be created.

(3) Move the cursor to “Parameter save” and then press the (ENT) key, and a setting file is created within the memory card.



7.30 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 then 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.

7.31 Setting method of 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.

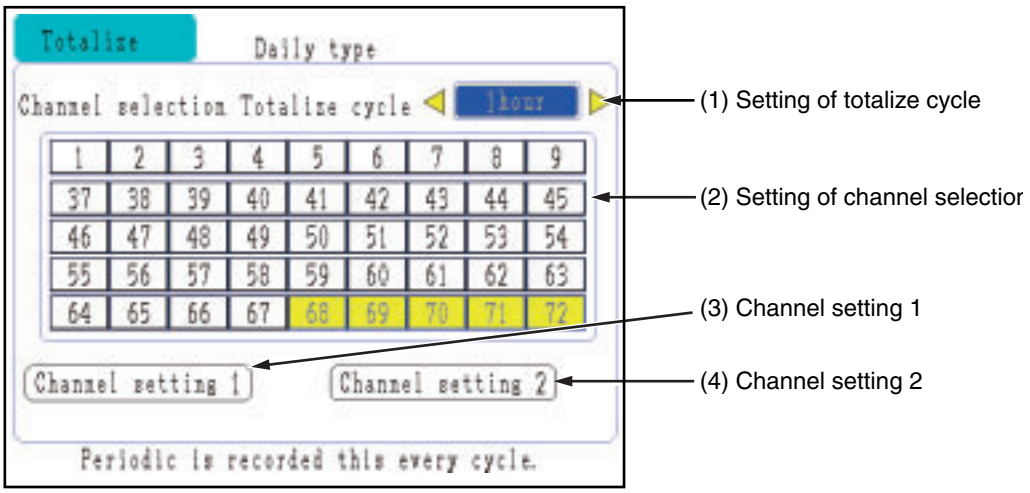
[**Example**] Recording start: 8:32:21
First recording: 09:00:00
Second recording: 10:00:00
Recording is thus continued at every hour on the hour.

The file name of the record is T******.FDT.
The file cannot be viewed on the PHW. View it on the PC using a viewer, etc.

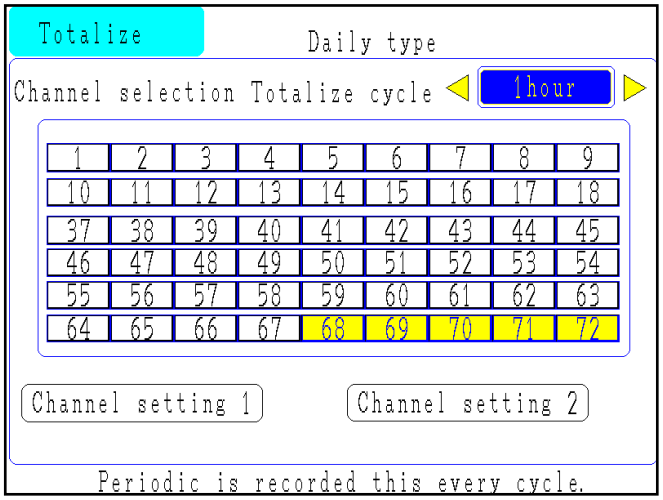
[**Operation**]

- Select "Totalize setting" →"Daily type" from the "Parameter Setting" screen, and the daily type screen appears.

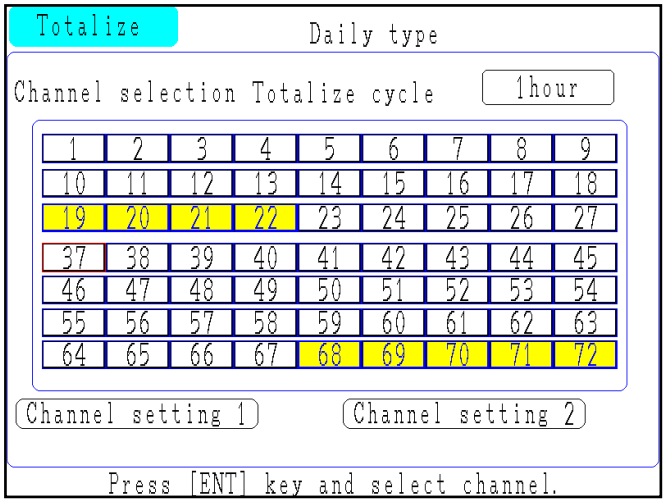
Daily type screen for the number of input points of 9



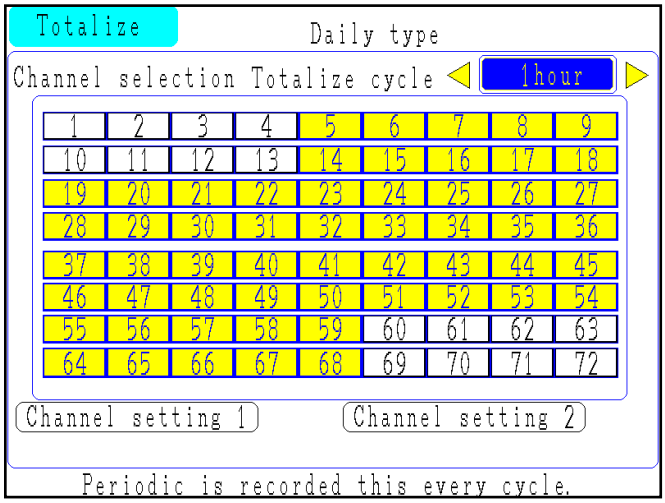
Daily type screen for the number of input points of 18



Daily type screen for the number of input points of 27



Daily type screen for the number of input points of 36



(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 7.32.

(4) Channel setting 2

See section 7.33.

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.

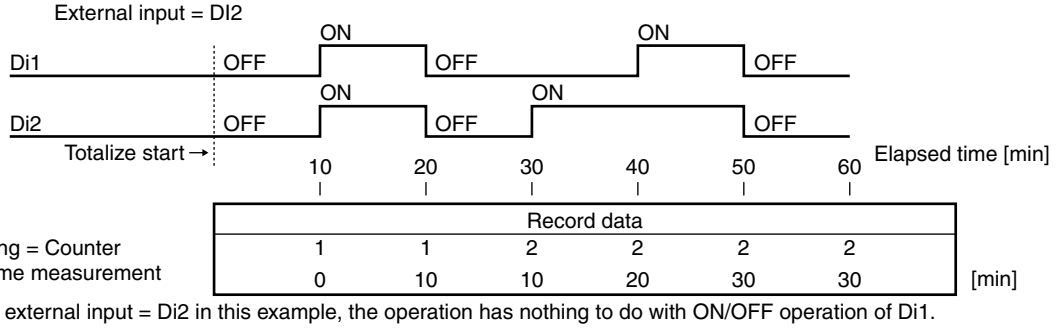
b) Select "Counter," and the number of times of DI set to ON or alarm occurrence (on) during totalizing period is recorded. Decimal point does not appear in counter display.

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 400 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 asfollows.

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.

7.32 Setting method of channel setting 1 (Daily)

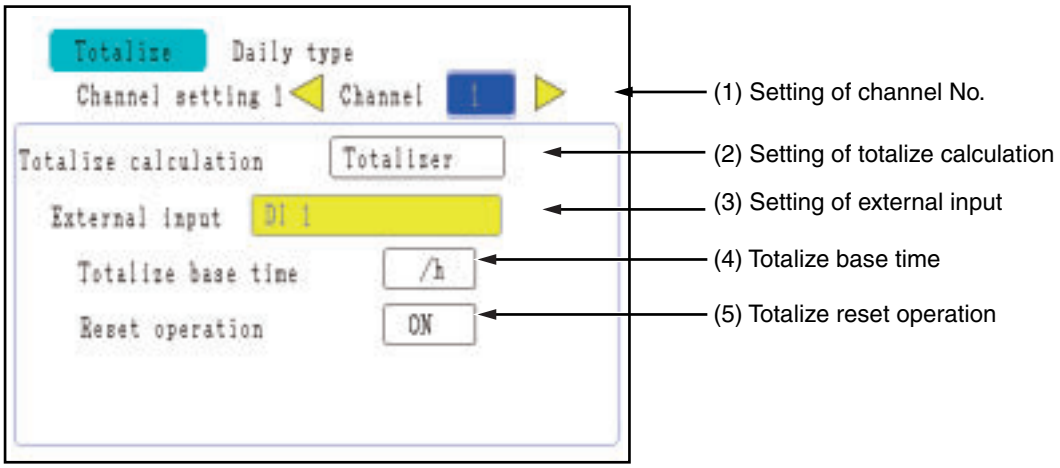
[Explanation]

Make the setting on daily totalizing for each 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.

(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 × 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.

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

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

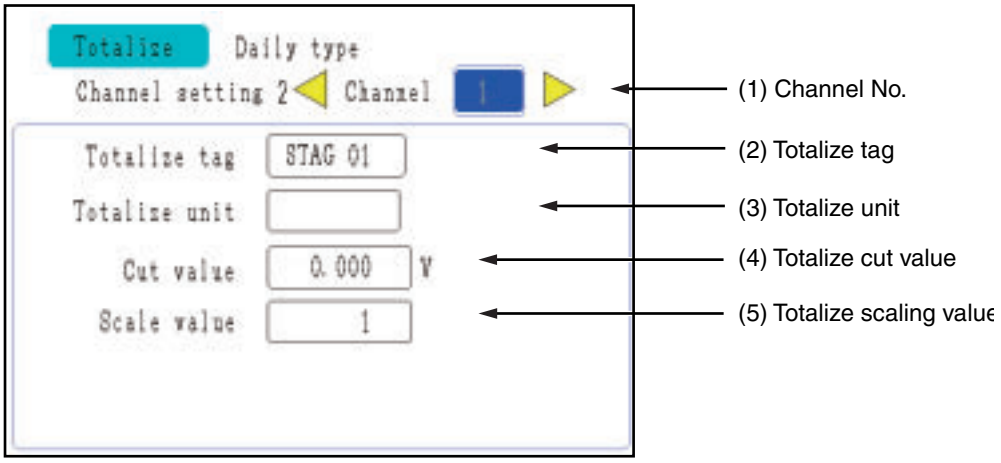
7.33 Setting method of channel setting 2 (Daily)

[Explanation]

Make the following setting related to daily totalizing by channel on this screen.
– TAG, unit, lower limit cut value, cut value (scaling)

[Operation]

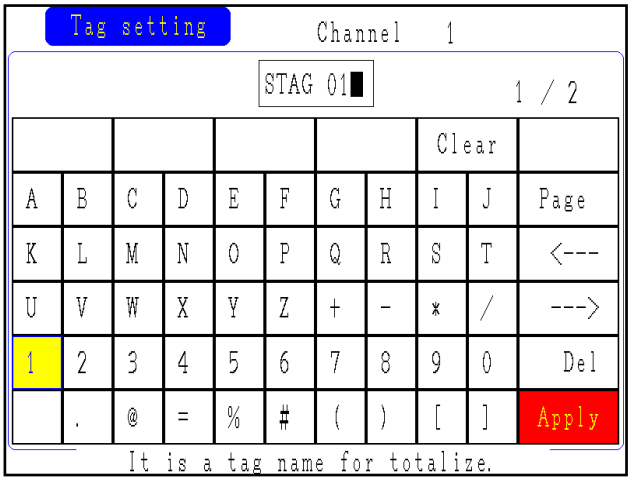
- Move the cursor to “Channel setting 2” on the daily type screen and press the ENT key, and the channel setting 2 screen appears.



(1) To set channel No.
Select target channel No. using the cursor key.

(2) Totalize tag

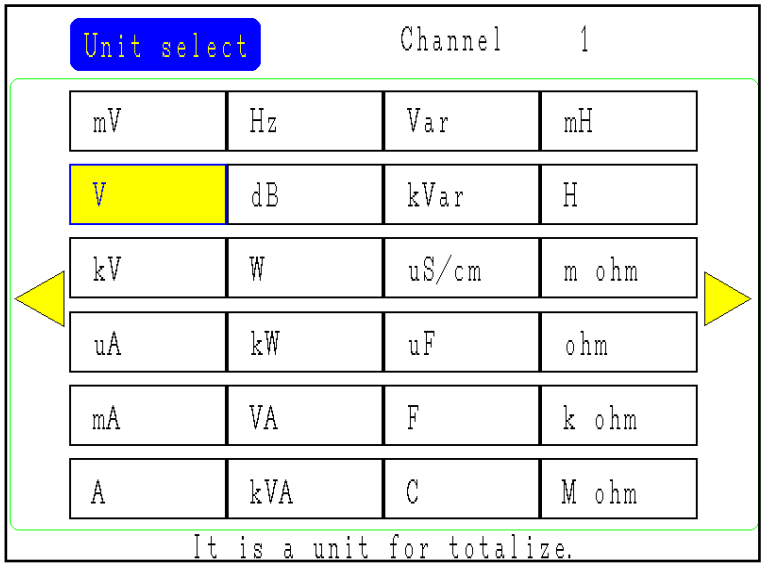
- Move the cursor to Totalize tag and press the ENT key, and the TAG setting screen (shown below) appears. Enter totalize TAG using the cursor key and the ENT key.
  Then press the ENT key at “Apply” position, and the totalize tag is registered.
- Totalize TAG is recorded in the totalize file and displayed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

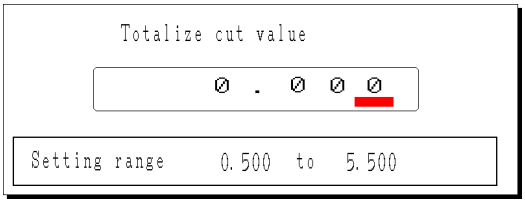
Move the cursor to the Totalize unit field and press the ENT key to display the following unit select screen. Select the desired unit using the cursor key and then press the ENT key.



(4) To set totalize cut value for each channel

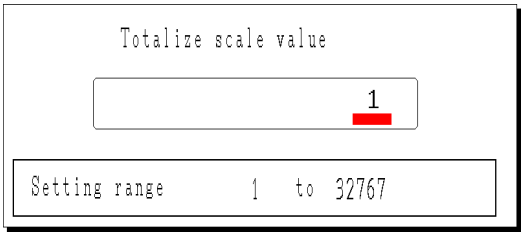
Move the cursor to the field of totalize cut value and press the ENT key to display the following totalize cut value setting screen. Enter totalizing cut value using the cursor and the ENT key.

- 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 appears as shown below. 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 m^3/h, totalize cut value = 1000 because 1[1/h] = 1/1000 [m^3/h].

7.34 Setting method of monthly totalizing

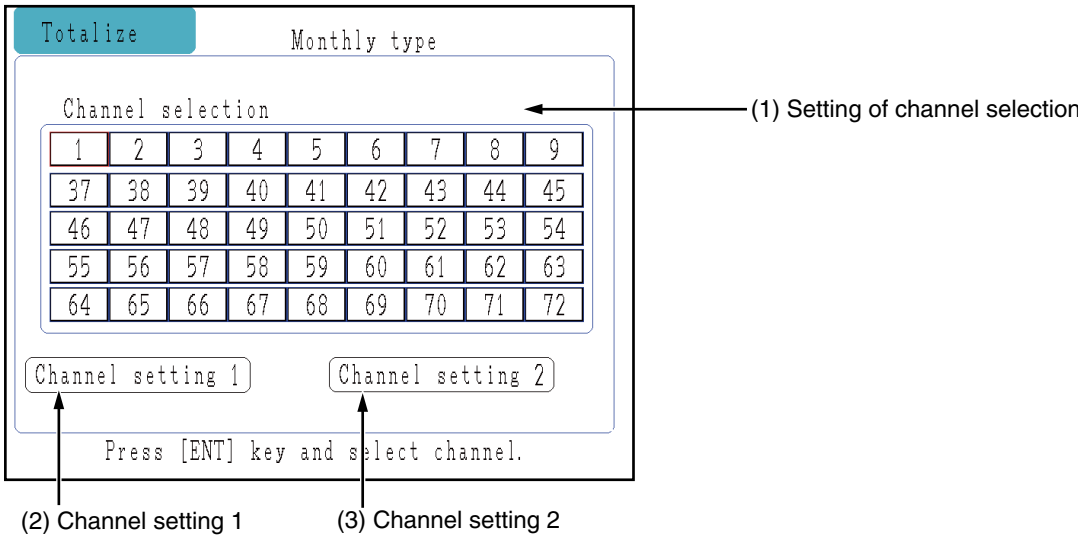
[Explanation]

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 PHW. View the file on a PC using a viewer, etc.

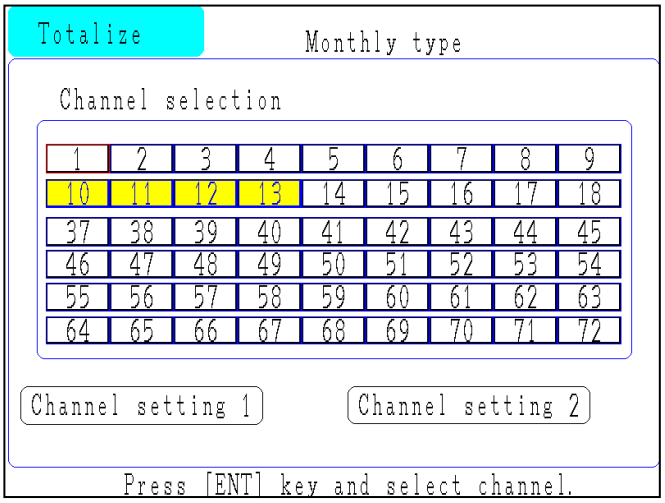
[Operation]

- Select "Totalize setting" → "Monthly" from the "Parameter Setting" screen, and the monthly type screen appears.

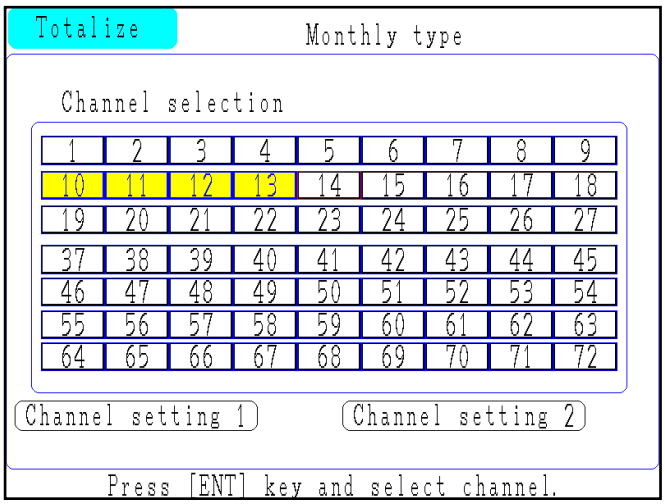
A monthly type screen for the number of inputs of 9



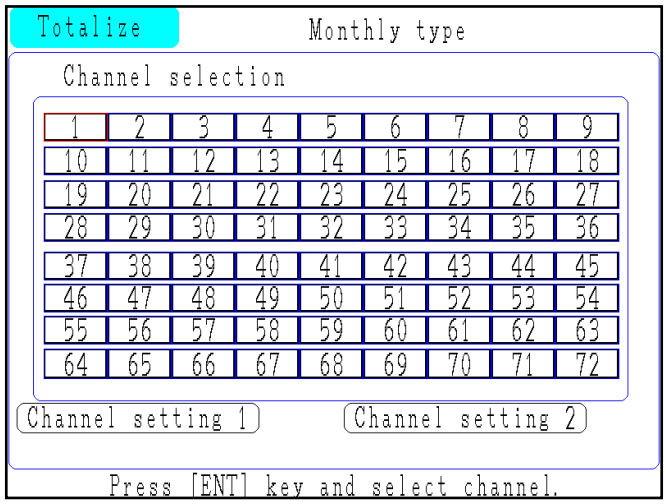
A monthly type screen for the number of inputs of 18



A monthly type screen for the number of inputs of 27



A monthly type screen for the number of inputs of 36



(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 7.32 (meaning of each item is the same as daily report).

(3) Channel setting 2

See section 7.33 (meaning of each item is the same as daily report).

7.35 Setting method of 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:

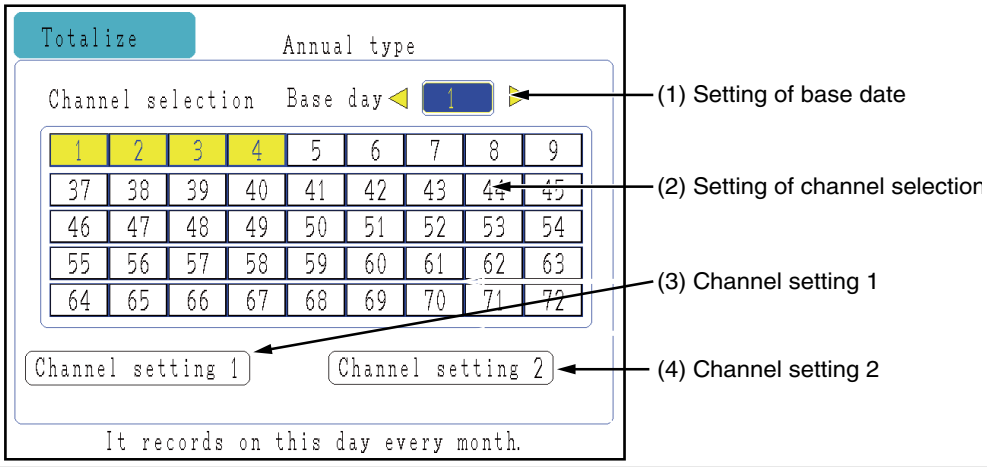
Recording in February: the instant when time changes from 23:59:59 of the 27th to 0:00:00 of the 28th of February
Recording in April: the instant when time changes from 23:59:59 of the 28th to 0:00:00 of the 29th of April

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

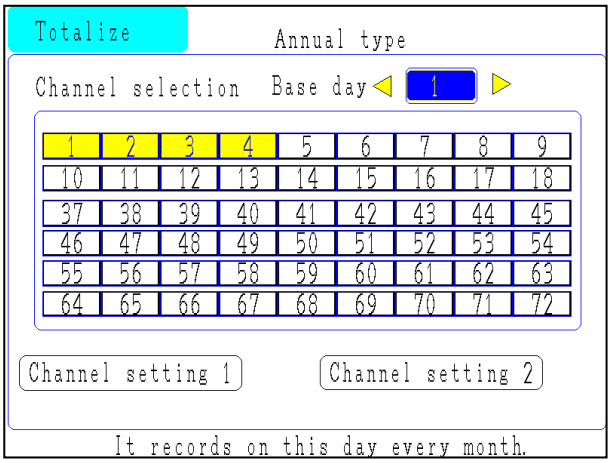
[**Operation**]

- Select “Totalize setting” → “Annual type” from the “Parameter Setting” screen, and the Annual type screen appears.

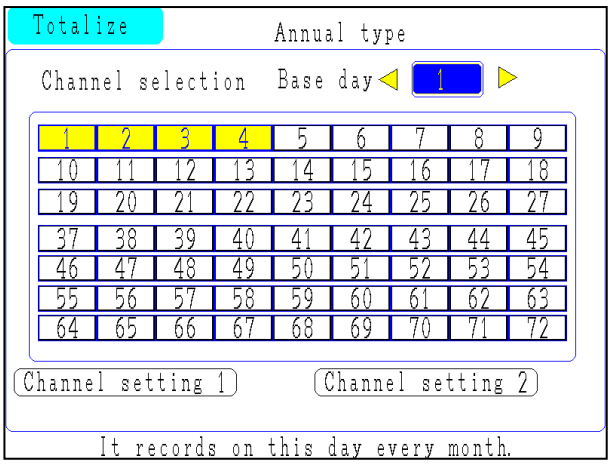
A yearly type screen for the number of inputs of 9



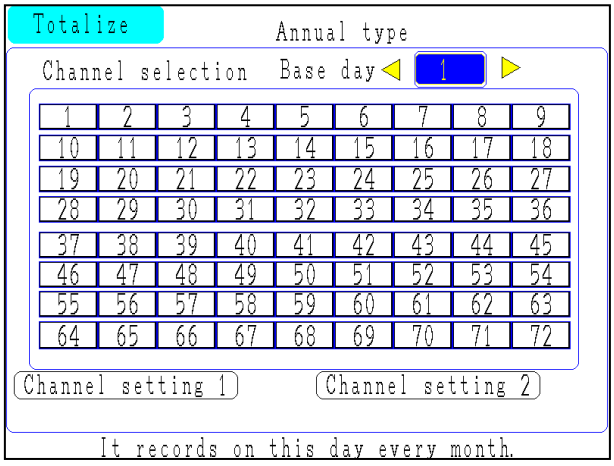
A yearly type screen for the number of inputs of 18



A yearly type screen for the number of inputs of 27



A yearly type screen for the number of inputs of 36



(1) To set base date

Move the cursor to Base date, and select the base date when totalized 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, or external input, a confirmation message appears.

(3) Channel setting 1

See section 7.32 (meaning of each item is the same as daily report).

(4) Channel setting 2

See section 7.33 (meaning of each item is the same as daily report).

7.36 Setting method of external input totalizing

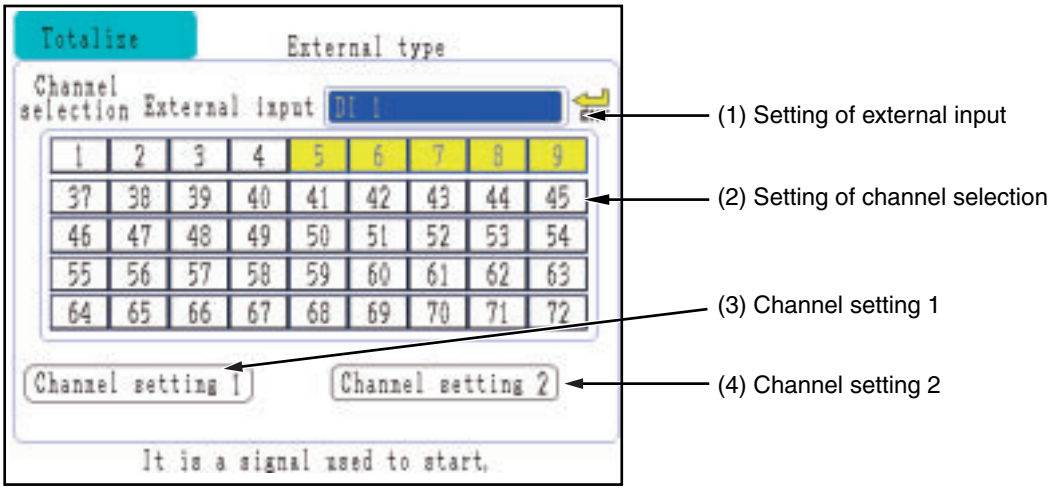
[Explanation]

- 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 PHW. View the file on a PC using a viewer, etc.

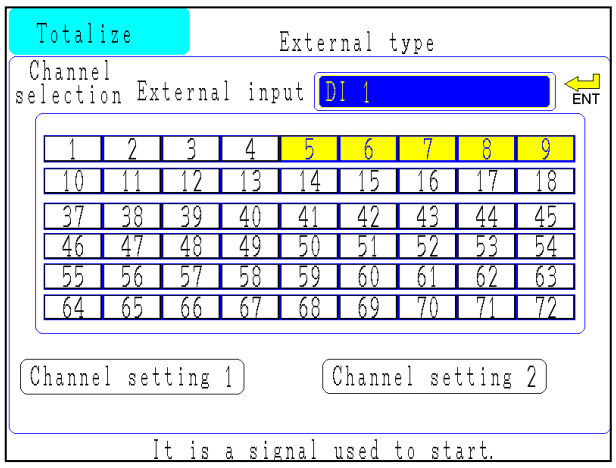
[Operation]

- Select "Totalize setting" → "External type" from the "Parameter Setting" screen, and the External type screen appears.

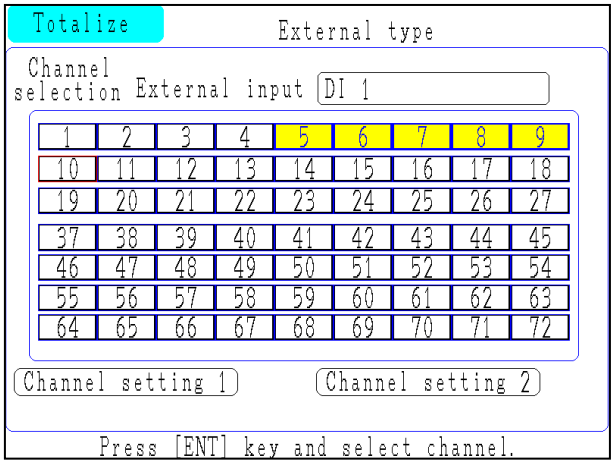
An external type screen for the number of inputs of 9



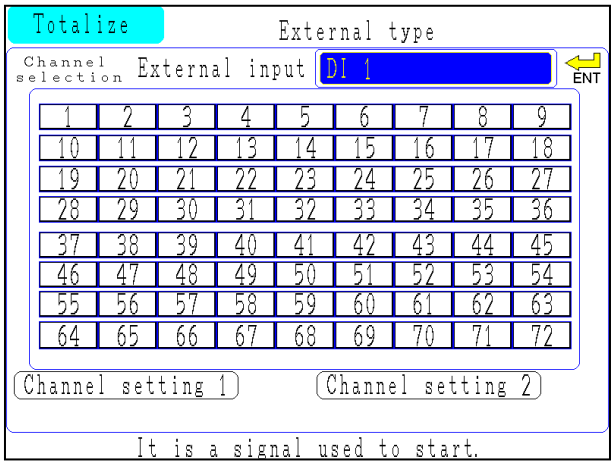
An external type screen for the number of inputs of 18



An external type screen for the number of inputs of 27

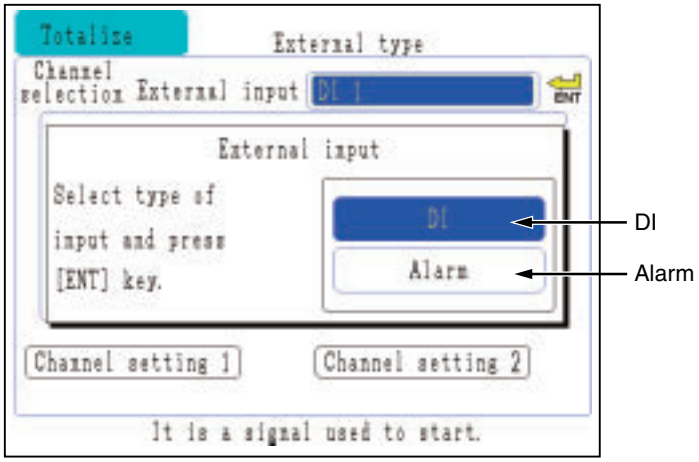


An external type screen for the number of inputs of 36



(1) To set external input

Move the cursor to External input and press the (ENT) key, and the External input type 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 7.32 (meaning of each item is the same as daily report).

(4) Channel setting 2

See section 7.33 (meaning of each item is the same as daily report).

7.37 Totalize start/stop or reset setting

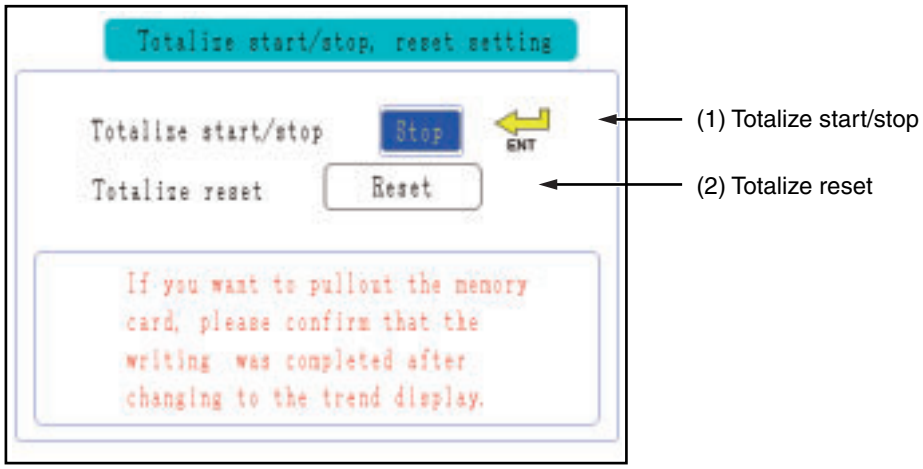
[Explanation]

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).

Totalized value can be seen in the totalizing screen. Refer to "6.4 Switching data display screens" to display the screen.

[**Operation**]

- Select "Totalize setting" → "Totalize start/stop, reset setting" from the "Parameter Setting" screen, and the totalize start/stop, reset 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.

(2) Totalize reset

Move the cursor to the item and press the (ENT) key, and the totalized value is reset to 0 if totalizing is currently performed. Confirmation message does not appear.

7.38 Setting method of calculation channel

[Explanation]

36 channels from channel 37 to 72 can be used as the calculation channel.

Formula (3 calculations x 4 expressions) can be set per each channel.

To input calculation channel, the result of expression 4 is entered. Note that, when the result of expression 4, that is not including the decimal point, is outside the range of ±32767, input a value limited to ±32767.

Note 1) Calculation is always executed from left to right. The priority is not given for four arithmetic operations.
Example: the following formula (A) is calculated as (B).
Expression (A) B01 = C01 + C02 x C03
Expression (B) B01 = (C01 + C02) x 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 formula, see the following table.

Available items	Display	Contents
Four formulae (addition)	A+B	Add A and B.
Four formulae (subtraction)	A-B	Subtract B from A.
Four formulae (multiplication)	A*B	Multiply A by B. Note) 0/0 = 0
Four formulae (division)	A/B	Divide A by B.
Absolute value	ABS(A)	Calculate absolute value.
Power method	POW(A,B)	Raise A to the “B”th power (A^B).
Square root	SQR(A)	Calculate square root of A.
LOG	LOG(A)	Calculate common logarithm of A.
LN	LN(A)	Calculate natural logarithm of A.
EXP	EXP(A)	Calculate exponential in “e” of A.
Humidity	RH(A,B)	Calculate relative humidity when A is dry-bulb temperature and B is wet-bulb temperature.
Max. (between channels)	MAX(A,B)	Compare A and B to calculate whichever larger.
Min. (between channels)	MIN(A,B)	Compare A and B to calculate whichever smaller.
Maximum value (time)	H-P(A)	Calculate max. value of A and initialize it with timer input.
Minimum value (time)	L-P(A)	Calculate min. value of A and initialize it with timer input.
Average value	AVG(A)	Calculate average value of A and update it with timer input.
Totalize value	SUM(A,B)	Calculate totalize value of A/B and reset it with timer input.
Clear of formula	End/Delete	Formula is deleted without confirmation. Care should be taken when deleting.
Input data	Input data	For formula, “Channel input”, “Channel totalize value”, “DI input”, “Communication input”, “Constant” and “Previous formula result” are available.

• For formula, see the following table.

Input data	Display	Setting range
Channel input	C01 to C72	Measurement value of channel 1 to 72.
Channel totalize value	T01 to T72	Totalize value of channel 1 to 72 (totalize value with no decimal point that is limited to ±32767 can be used).
DI input	D01 to D16	DI 1 to 16 (OFF:0, ON:1)
Communication input	M01 to M36	1 to 36 (No decimal point)
Constant	K01 to K60	1 to 60
Formula result	B01 to B03	1 to 3

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

ABS(A) : Calculate absolute value of A

[**Example**]

Describe examples of ABS (A) output below (decimal point is set to 1).

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

POW (A,B) : Raise A to the “B”th power (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 0th power is 1.00.

[**Example**]

Describe examples of ABS (A) output 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	When input data is abnormal
0.0	0.0	1.0	0 raised to the 0th power is 1.00

SQR (A) : Calculate square root of A.
When input data is negative number, 0 is outputted.

[**Example**]

Describe examples of SQR (A) output 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 No, 0 is outputted.

LOG (A) : Calculate common logarithm of A.
When input data is negative number, 0 is outputted.

[**Example**]

Describe examples of LOG (A) output 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 No, 0 is outputted.

LN (A) : Calculate natural logarithm of A.
When input data is negative number, 0 is outputted.

[**Example**]

Describe examples of LN (A) output below (decimal point is set to 1).

Input A	Output LOG (A)	Memo
100.0	4.6	
-10.0	0.0	When input data is negative No, 0 is outputted.

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

[**Example**]

Describe examples of EXP (A) output below (decimal point is set to 1).

Input A	Output EXP (A)	Memo
1.2	3.3	

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

Temperature span that can calculate humidity is within -40 to 150°C.

In case of wet-bulb temperature ≥ dry-bulb temperature, 100%RH is outputted.

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

		Wet-bulb temperature (Input B)		
		-40°C or less	Within range	150°C or more
Dry-bulb temperature (Input A)	-40°C or less	0%RH	0%RH	0%RH
	Within range	0%RH	Calculation value	100%RH
	150°C or more	0%RH	100%RH	100%RH

[**Example**]

Describe examples of RH (A,B) output 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	When A=B, output is 100%RH
50.0	-41.0	0.0	Input B < -40°C
151.0	10.0	100.0	Input A > 150°C

MAX (A,B) : Compare A and B to calculate whichever larger.

[**Example**]

Describe examples of MAX (A,B) output below (decimal point is set to 1).

Input A	Input B	OutputMAX (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) : Compare A and B to calculate whichever smaller.

[**Example**]

Describe examples of MIN (A,B) output 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) : According to H-P, L-P timer period, maximum value of input A is calculated. Output is initialized at a cycle.

[**Example**]

Describe examples of H-P (A) output below (decimal point is set to 1, and the value of H-P, L-P timer period is 2 min).

Input A	Output H-P (A) (Output value at a cycle)	Memo
Sin.wave, Cycle ; 1 minute Amplitude ; 50.0, bias ; 0.0	50.0	MAX value of Sin.wave

L-P (A) : According to H-P, L-P timer period, minimum value of input A is calculated. Output is initialized at a cycle.

[**Example**]

Describe examples of L-P (A) output below (decimal point is set to 1, and the value of H-P, L-P timer period is 2 min).

Input A	Output L-P (A) (Output value at a cycle)	Memo
Sin.wave, Cycle ; 1 minute Amplitude ; 50.0, bias ; 0.0	-50.0	MIN value of Sin.wave

AVG (A) : According to AVG timer period, average value of input A is calculated. Output is updated at a cycle (the indication does not change).

[**Example**]

Describe examples of AVG (A,B) output below (decimal point is set to 1, and the value of AVG timer period is 2 min).

Input A	Output AVG (A) (Output value at a cycle)	Memo
Sin.wave, Cycle ; 1 minute Amplitude ; 50.0, bias ; 0.0	0.0	AVG value of Sin.wave

SUM (A,B) : According to SUM timer period, totalize value of input A is calculated. Totalize value is reset at a cycle. Also, negative numbers can be totalized.

[**Example**]

Describe examples of SUM (A,B) output below (decimal point is set to 1, and the value of SUM timer period is 2 min).

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	

7.39 Setting method of formula

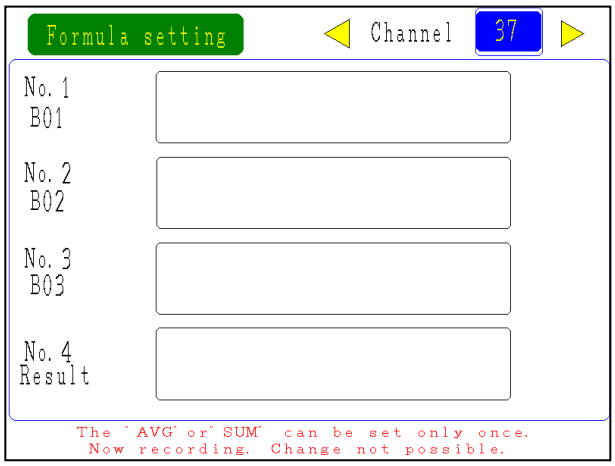
[Explanation]

Make formula setting per each channel.

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

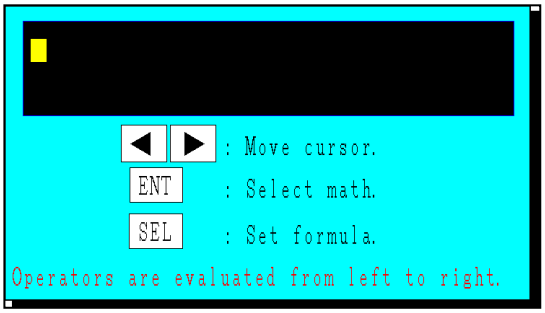
[Operation]

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

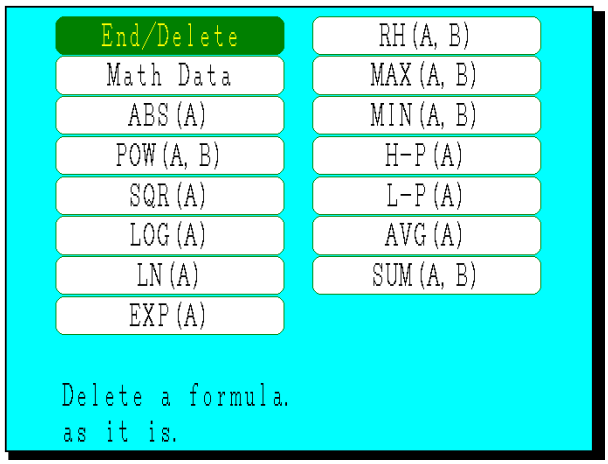


(1) To set channel No.
Select target channel No. using the cursor key.

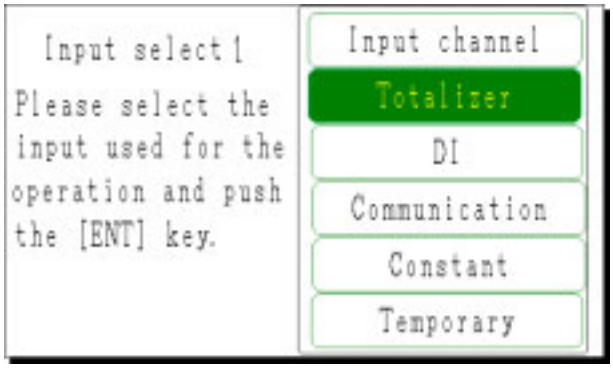
(2) To set formula
Move the cursor to the input field and press the ENT key, and the formula setting screen (shown below) appears.



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 “7.24” to “7.28”)
- DI input : Enter the DI No. to be used (See “7.16”).
- Communication input : Enter the communication input No. to be used.
- Constant : Enter the constant No. (No. of which constant is set) to be used (See “7.40”).
- Formula result : When the result of formula 1 to 3 is used, enter the formula No.

[**Example**]

Formula = Constant 5 x (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, B01 = Formula result)

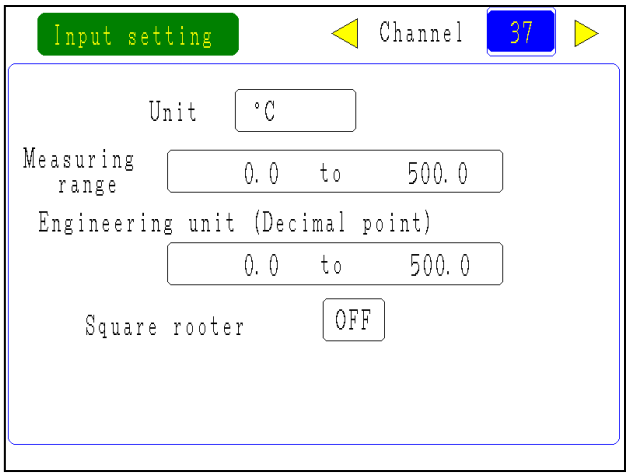
7.40 Input setting

[Explanation]

After calculation is set, make the settings of units, measurement value, engineering value, and square rooter per each channel.

[Operation]

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



For operation procedure, refer to “7.4 Setting method of input types, skip, scaling, units and square rooter”.

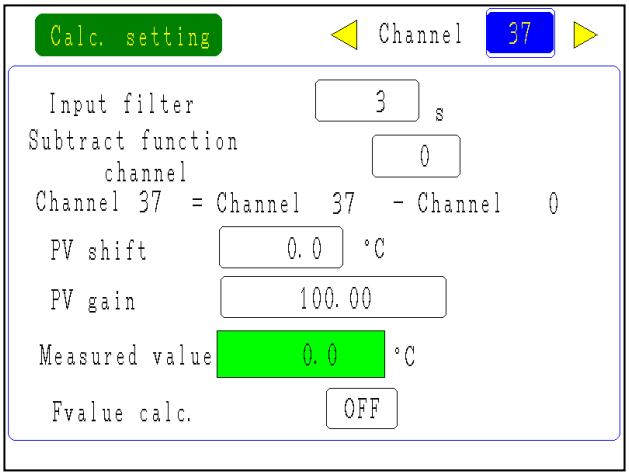
7.41 Calculation setting

[Explanation]

After calculation is set, make settings of input filter (time constant), subtraction, PV shift, PV gain, and F value calculation per each channel.

[Operation]

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



For operation procedure, refer to “7.5 Setting method of input filter (time constant), PV shift and subtraction”.

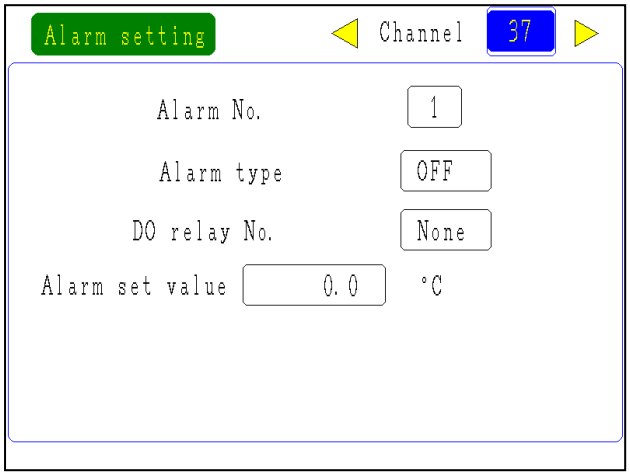
7.42 Alarm setting

[Explanation]

After calculation is set, make alarm setting per each channel.

[Operation]

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



For operation procedure, refer to “7.6 Setting method of alarm”.

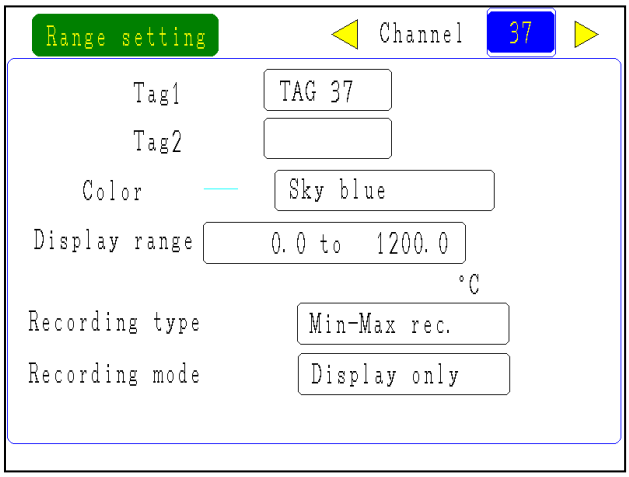
7.43 Range setting

[Explanation]

After calculation is set, make settings of TAG, display color, display range, recording type, and recording mode per each channel.

[Operation]

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



For operation procedure, refer to “7.10 Setting method of TAG.NO., display range, and record mode”.

7.44 Math channel parameter copy

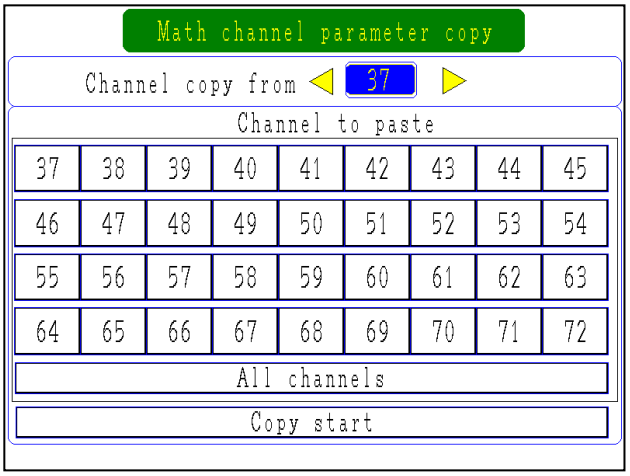
[Explanation]

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.



For operation procedures, refer to “7.8 Parameter copy”.

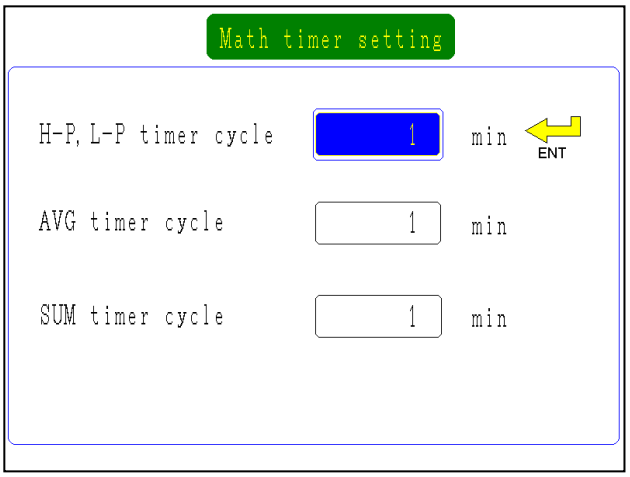
7.45 Math timer setting

[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.



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 (ENT) key.

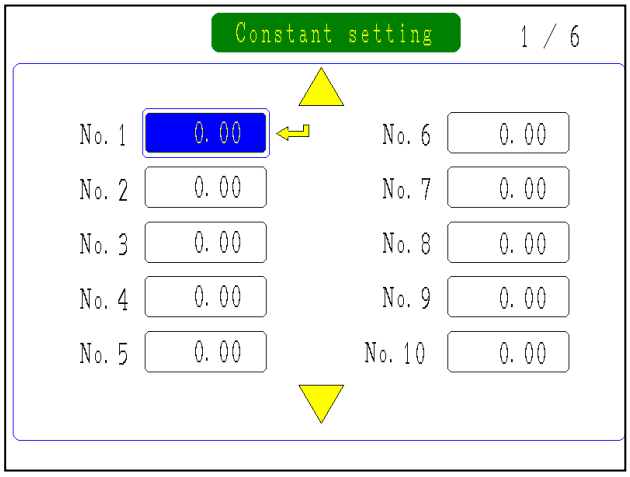
7.46 Constant setting

[Explanation]

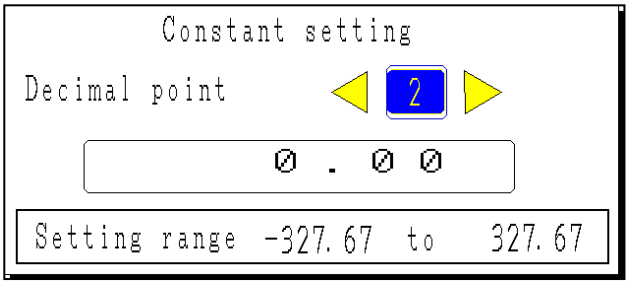
When constant is set at “7.39 Setting method of formula”, execute the following procedure.

[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 the constant setting screen appears as shown below. Enter the decimal point position and constant using the cursor key and ENT key.



8. MAINTENANCE AND INSPECTION

8.1 Recommended replacement cycle of parts

(When used at 25˚C)

Names of parts	Cycle	Remarks
LCD (liquid crystal display)	5 years	LCD backlight cannot be replaced as a single unit. Return to factory for repair.
Fuse (external use)	2 years	When external fuses are used, replace them every 2 years for preventive maintenance. Fuse rating: 250V AC, 2A
Memory card	6 months	• 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.

8.2 Calibration

To assure measuring accuracy, perform calibration every year.

For calibration procedure, refer to Chapter 9. Contact our Sales Representative for details.

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

8.4 Cleanup method

When cleaning the main unit, basically wipe with a dry cloth.

Do not use alcohol/ solvents such as benzine, thinner, etc.; these may cause damage, deformation, discoloration. For wiping off in wet condition, squeeze out excess moisture completely, and then wipe off.

9. CALIBRATION

The following operation can be carried out.
(1) Calibration of the measured value
(2) Initialization of the set value

9.1 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.

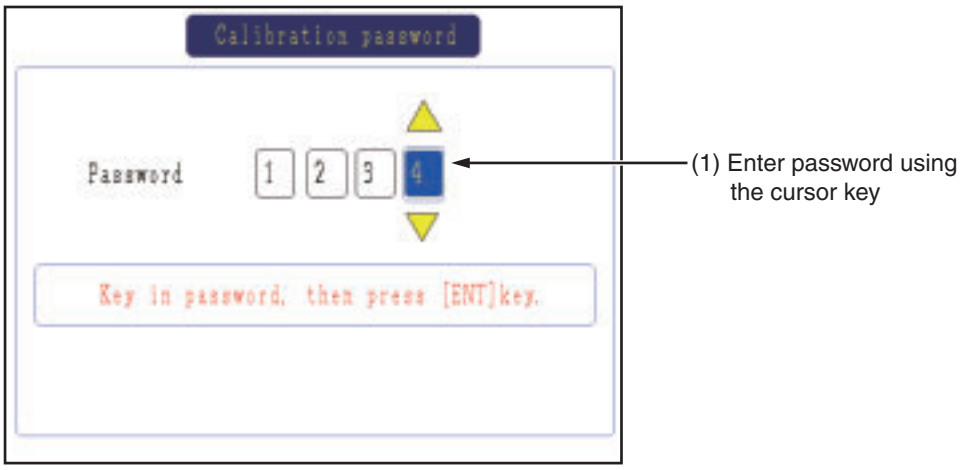
Note 1) If improper calibration input signals are added, the instrument operates improperly. Be sure to follow the procedure shown above to perform calibration. Otherwise the instrument may operate improperly. The devices listed in the table in section 9.1, [Required device], are required for calibration.

Note 2) If reading error is not large, adjust the value to the reading of the [PV shift function] described in section 7.5.

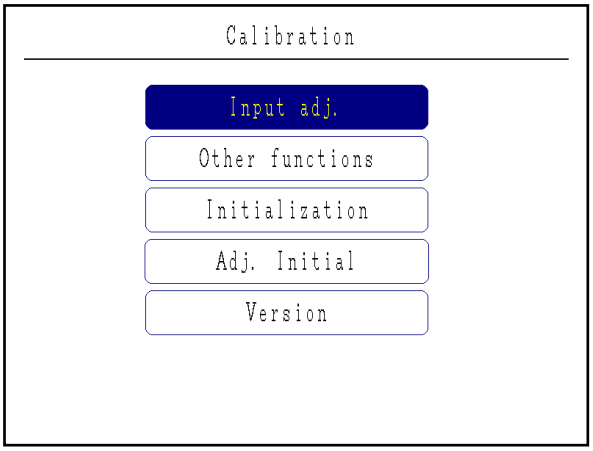
[Operation]

(1) Select "System" → "Calibration password" from 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.

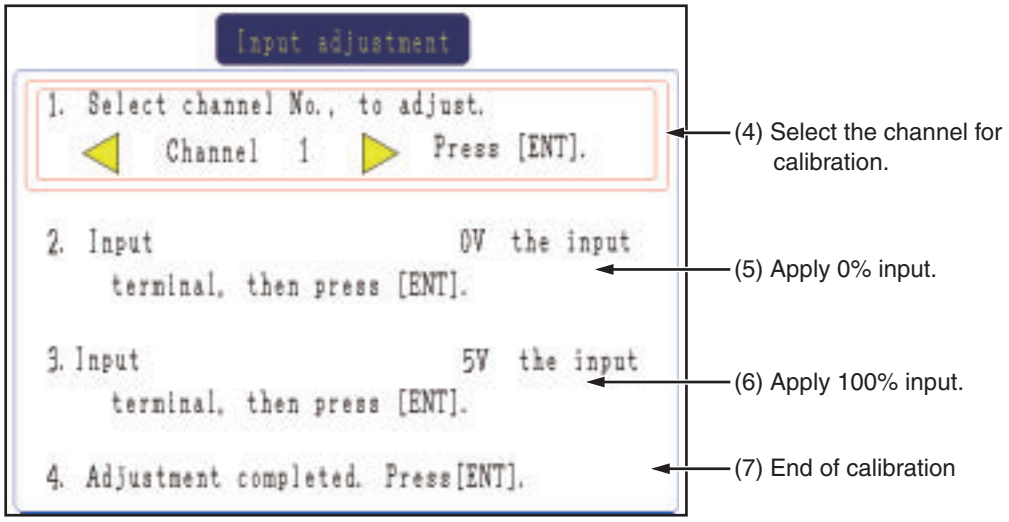


(2) Press the (ENT) key to display the menu screen on the application operation screen.



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. Press the ENT key.

(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: 10μV (in mV range) Output impedance: 2Ω or lower
Dial resistor	0.01 to 400.00Ω Resolution: 0.01Ω
Digital multimeter	5 + 1/2 digit display Resolution: 1μV (in mV range)

9.2 Initializing the measured value

[Explanation]

Parameters can be returned to the value set at the time of delivery from the factory.

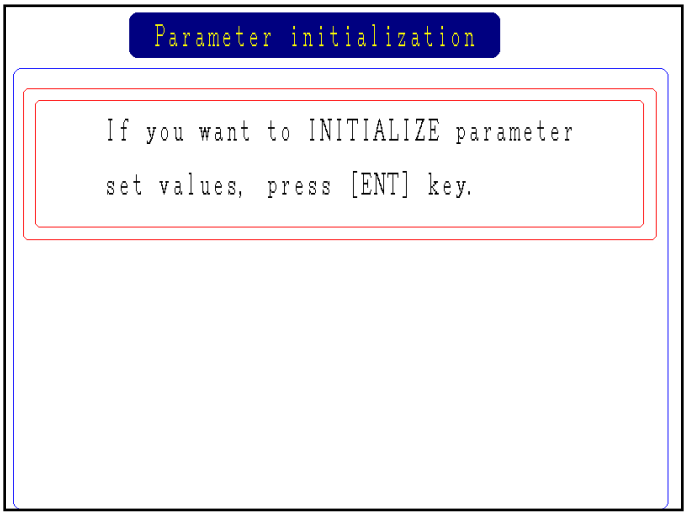
- After initializing the set value, be sure to store the initialized parameters in a nonvolatile memory. Otherwise they return to the values before the initialization when the power is turned off.

Note) If parameters are initialized, the adjusted values are not initialized.

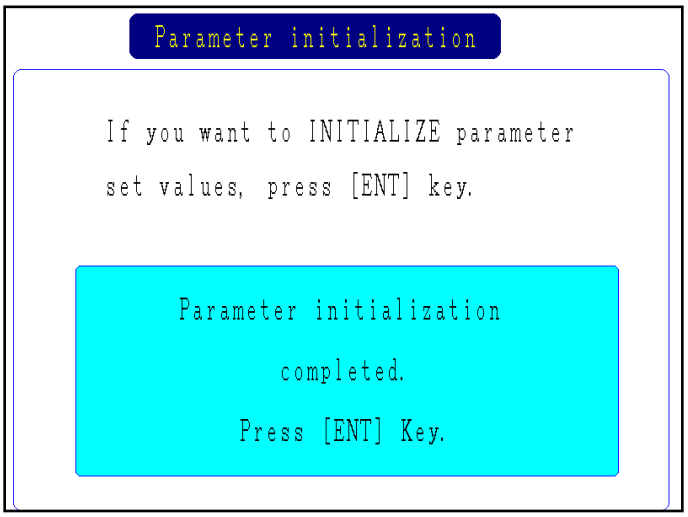
[Operation]

(1) Follow the procedure (1) and (2) in [Operation] of Item 9.1 "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.



10. 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 7.5.	
The data indicator indicates "Over", "Under" or "Error".	1) If the input is not connected correctly or a signal that is different from the input type is connected, the indication becomes faulty.	• Connect correctly. • Set the input type according to the input signal.
	2) A value beyond the settable range is inputted. (Item 11. SPECIFICATION, Input system)	Measurement impossible.
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.	
"Memory card is full, Recording stopped. Please replace Memory card with a new one." 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) Was the (DISP) key pressed after the compact flash is replaced with the one with sufficient capacity?	2) Press the (DISP) key.

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 7.12.
	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 7.4.
	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 7.9.
	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 7.10.
Display disappeared during operation.	Press any key.	1) Change the LCD OFF time according to the description in section 7.14.
	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.

11. SPECIFICATIONS

1. Input system

- Number of input points : 9, 18, 27 or 36 points (Can be selected at the time of purchase)
- Input circuit : Input mutual isolation (See “Others” on P11-7 for the withstand voltage)
  Resistance bulb measured current: about 1 mA
- Measuring cycles : 9 or 18 points….100ms cycles
  27 or 36 points….200ms cycles
- Recording cycle : 1 second 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		Reference 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
	1-5V	1.000 to 5.000V
	0-5V	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 method of input types (Item 7.4)" 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: approx. 0.2 μA
- 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.
- Computation function : The following calculation is available with the computation function.
  (1) Computation function:
  Addition, subtraction, multiplication, division, absolute value, exponential, square-root extraction, LOG, LN, EXP, humidity, maximum, minimum, average, and integration.
  (2) Computation input enable:
  Analog input (Ch1 to 72), integration input (Ch1 to 72), DI (DI1 to 16), communication input (No.1 to 36), and constant number (No.1 to 60).

2. Indication system

- Indicator : 12" TFT color LCD (800 x 600 dots) with backlight, no contrast adjustment.
  On the LCD, certain picture elements remain lit or extinguished. On account of the nature inherent to LCD, the brightness may be non-uniform. But, such are not troubles.
- Color of indication : 14 colors
- Applicable language : English, Japanese
- 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, 6 or 4 channels per screen group.
  (Input: 72 points at the maximum).
  Display refreshment cycles: select from 1 second to 12 hours
  Scale display or no-display can be selected.
- Bar graph display : Number of channels: 10, 6 or 4 channels per screen group.
  (Input: 72 points at the maximum).
  Display refreshment cycles: 1 second
- Analog meter display : Number of channels: 10, 6 or 4 channels per screen group. Display in bar graphs or in analog meters can be selected.
  Display refresh cycle: 1 second
- Digital display : Number of channels: 10, 6 or 4 channels per screen group.
  (Input: 72 points at the maximum).
  Display refreshment cycles: 1 second
- Totalizing data display : Number of channels: 10, 6 or 4 channels per screen group.
  (Input: 72 points at the maximum).
  Display refresh 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/set : Already-set Data Display and Set Change Display screen

• TAG indication : Number of characters to be displayed:
Up to 8 characters
Up to 8 characters (Note 1) at 10 or 6 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, hiraganas and katakanas.
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	Channnels per screen	Item			
		Tag 1	Tag 2	Unit	ch Np.
Trend Bar graph	4 or less	All			
	5, 6	○	−	○	○
	7 or more	×	−	×	×
Analog meter	6 or less	All			
	7 or more	○	−	○	○
Instantaneous value		All			

○ : Displayed
× : 1 item 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 : 8 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 FAT16 or FAT. Otherwise, reading and saving are impossible.

• Recording capacity : 1GB maximum (compact flash). Limiting the recording file to 64 MB is recommended (for 112 hours if display refresh cycle is 1 second. See Table 1 (p. 11-11).) If impossible, up to 256 MB is tolerated. A file recorded beyond could not be opened.

* Only the Sandisk's compact flash is warranted. And please change the compact flash every six month to prevent the data losing.

- 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, yearly 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 case of 9-channel recording in ASCII data format, and 256 MB compact flash used). Refer to Table 1.
- 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 : Manufactured by SanDisk
  URL: http://www.sandisk.com
  Type: SDCFB-256-J60 (256MB) Available at any PC shops
- 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. 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 recording 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; 20 (option: Up to 2 cards with relay output can be mounted.)
- Transistor output (open collector output):
  16 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 : 100 to 240V AC

Range of operating voltage : 90 to 264V AC

Supply frequency : 50/60Hz ±2% (both employable)

Power consumption

Power voltage	Consumption
100V AC	About 65VA
240V AC	About 80VA

7. Structure

- Mounting method : Panel-mounted (vertical panel)
- Thickness of panel : 2 to 26 mm
- Materials : Stainless steel for case, PC-ABS for bezel
- Color : Silver for case, Munsell N2.0 (black) for bezel
- External dimensions : 300 (W) × 300 (H) × 220.5 (D) mm
- Mass : About 4.7 kg (9-point input, without option)
  About 6.2 kg (full option)
- External terminal board : Input terminal: M3 screw terminal
  Power terminal: M4 screw terminal

8. Operating condition

Power supply voltage : 90 to 264V AC

Power supply frequency : 50/60Hz ±2% (sharing)

Ambient temperature : Without Ethernet function: 0 to 50°C*1
With Ethernet function: 0 to 40°C*2

- Ambient humidity : 20 to 80%RH
- Vibration : 10 to 60Hz 0.2m/s^2 or less
- Shock : None

• Magnetic field : 400 A/m or less

• Signal source resistance : Thermocouple input …. 1kΩ or less
Resistance bulb input …. 10Ω/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: In case of the 12th digit of ordering code is ”Y”.

*2: In case of the 12th digit of ordering code is ”E”.

9. Reference standard

• Accuracy/resolution : Measuring conditions (23±2˚C, 65±10% RH, power voltage, frequency fluctuation within ±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	±(0.15%+1 digit) ±(0.3%+1 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	±(0.15%+1 digit)	0.1°C
DC voltage	50mV	±(0.15%+1 digit)	10μV
	500mV		100μV
	5V		1mV

Note 1) Digital indication accuracy is a percentage (%) with respect to input range of 1 page.

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: ±0.5˚C
R, S, B, W: ±1.0˚C (when measured at 0˚C or more)

• Max. input voltage : Thermocouple, resistance bulb,
DC voltage: ±10V DC (continuous)

• Input impedance : Thermocouple,
DC voltage: About 1MΩ

10. Others

- Clock : With calendar function (Christian era)
  Accuracy: ±50 ppm or less (monthly error: about 2 minutes)
  However, time error at 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 MΩ (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 conditions:
  For the fluctuation in the range from 90 to 264V AC
  (frequeucy: 50/60Hz)
  Reading change: ±(0.2%+1 digit) or lower.
  For the fluctuation in the range from 47 to 63Hz
  (power voltage: 100V AC)
  Reading change: ±(0.2%+1 digit) or lower.
- Effect of input signal resistance:
  Thermocouple input: 50μV±1 digit per 100Ω
  DC voltage: Fluctuation for resistance value equivalent to 0.1% of the input resistance: ±(0.2%+1 digit) or lower.
  Reistance bulb (for wiring resistance of 10Ω for 1 line (the same for 3 lines))
  Reading change: ±(0.2%+1 digit) or lower.
- Effect of ambient temperature:
  Reading change: ±(0.3%+1 digit)/10˚C or lower.
- Effect of Mounting position : For the backward 30˚ slant
  Reading change: ±(0.2%+1 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: ±(0.2%+1 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, 2.45 m/s^2 or lower
- Shock : 294m/s^2 or lower (packed state)

14. Additional function (Option)

■Alarm relay output (11th digit of code symbols: ”1”, ”2”, ”4” or ”5”)
Up to 2 cards with 10-point relay output can be mounted. (Maximum 20 points)

- Terminal structure : M3 screw terminal
- Alarm relay output : 1a contact output (10 points/card),
  Individual channel or common output (OR output) allowed.
  Rating: Contact capacity 240V AC/3A,
  30V DC/3A (Resistive load).

■Alarm open collector output (11 digit of code symbols is ”3”, ”4” or ”5”)
Card having 16 alarm points (open collector output) can be mounted.

- Terminal structure : M3 screw terminal
- Alarm output : Open-collector transistor output (16 points)
  Rating: 30V DC/0.1A (resistance load)

■DI input (digit of code symbol is ”1”)
Card having 16 DI input can be mounted.

- Terminal structure : M3 screw terminal
- DI input : No-voltage contact input (16 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
- Input pulse width : ON pulse width: 400msec or more
  OFF pulse width: 400msec 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.
- Integrated value display : Digitally displays the integrated 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.

Note1: 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)) (Windows Vista is not supported.)
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 PHZP1801) 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) (Windows Vista is not supported.)
• 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
Record range voluntary setting	Recording 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 with a bargraph at the top.
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	Shift 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..

Compact Flash 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

Compact Flash 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 goes on increasing, the period becomes as follows.

  18 input points; The period is approximately one half of those listed in the table.
  27 input points; The period is approximately one-third of those listed in the table.
  36 input points; The period is approximately one-fourth 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.

When compact flash is not used, up to 5M bytes of the recording data and the event data can be stored in the main unit. (In case of 36-channel in Max./Min. recording, approximately 36,000 data can be stored. For 10 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.)

APPENDICES

Appendix 1 Recording format (ASCII)

(1) Trend data file

```
S001446.FDT
PHW41B11-E10EY
SNo.LYT0000T        Ver.V04W
36,00,00,00,08
CH01,TAG 02          ,01,31,mV    ,   0.0,  500.0,0,0,   0.0,    0.0,000,100,1,0,00,    0.0,0,00,    0.0,0,00,    0.0,0,00,   0.0
CH02,TAG 02          ,02,40,      ,     0,   5000,0,0,     0,      0,000,100,0,1,00,    300,0,00,      0,0,00,      0,0,00,     0
CH03,TAG 02          ,03,31,mV    ,   0.0,  500.0,0,0,   0.0,    0.0,000,100,1,0,00,    0.0,0,00,    0.0,0,00,    0.0,0,00,   0.0
CH04,TAG 02          ,04,31,mV    ,   0.0,  500.0,0,0,   0.0,    0.0,000,100,1,0,00,    0.0,0,00,    0.0,0,00,    0.0,0,00,   0.0
CH05,TAG 02          ,11,31,mV    ,   0.0,  500.0,0,0,   0.0,    0.0,000,100,1,0,00,    0.0,0,00,    0.0,0,00,    0.0,0,00,   0.0
CH06,TAG 02          ,10,31,mV    ,   0.0,  500.0,0,0,   0.0,    0.0,000,100,1,0,00,    0.0,0,00,    0.0,0,00,    0.0,0,00,   0.0
CH07,TAG 02          ,05,31,mV    ,   0.0,  500.0,0,0,   0.0,    0.0,000,100,1,0,00,    0.0,0,00,    0.0,0,00,    0.0,0,00,   0.0
CH08,TAG 02          ,06,31,mV    ,   0.0,  500.0,0,0,   0.0,    0.0,000,100,1,0,00,    0.0,0,00,    0.0,0,00,    0.0,0,00,   0.0
CH09,TAG 02          ,08,31,mV    ,   0.0,  500.0,0,0,   0.0,    0.0,000,100,1,0,00,    0.0,0,00,    0.0,0,00,    0.0,0,00,   0.0
≈                                                                                                                              ≈
CH35,TAG 35          ,11,01,BC    ,   0.0, 1200.0,0,0,   0.0,    0.0,000,100,1,0,00,    0.0,0,00,    0.0,0,00,    0.0,0,00,   0.0
CH36,TAG 36          ,10,01,BC    ,   0.0, 1200.0,0,0,   0.0,    0.0,000,100,1,0,00,    0.0,0,00,    0.0,0,00,    0.0,0,00,   0.0
G1,Display Group 1 ,01,02,03,04,05,06,07,08,09,10
G2,Display Group 2 ,10,11,12,00,00,00,00,00,00,00
G3,Display Group 3 ,07,08,09,10,11,12,00,00,00,00
G4,Display Group 4 ,01,02,03,04,05,06,07,08,09,00
G5,Display Group 5 ,01,02,03,04,05,06,07,08,09,00
G6,Display Group 6 ,01,02,03,04,05,06,07,08,09,00
G7,Display Group 7 ,01,02,03,04,05,06,07,08,09,00
G8,Display Group 8 ,01,02,03,04,05,06,07,08,09,00
                   ,CH01MIN,CH01MAX,CH02MIN,CH02MAX,CH03MIN,CH03MAX,CH04MIN,CH04MAX,CH05MIN,CH05MAX,CH06MIN,CH06MAX,CH07MIN,CH07MAX,CH08MIN,CH08MAX,CH09MIN,CH09MAX,  ≈  CH35MIN,CH35MAX,CH36MIN,CH36MAX
2007/ 4/10 17:33:17,  100.0,  100.0,    221,    221,  -67.7,  -67.7,  -64.6,  -64.6,  -56.4,  -56.4,  -64.5,  -64.5,  -57.1,  -57.1,  -63.5,  -63.5,  -67.8,  -67.8,     0.0,    0.0,    0.0,    0.0
2007/ 4/10 17:33:18,  100.0,  100.0,    221,    237,  -67.8,  -66.3,  -64.8,  -63.0,  -56.8,  -56.0,  -64.9,  -64.1,  -57.8,  -57.1,  -64.5,  -63.5,  -69.5,  -67.8,     0.0,    0.0,    0.0,    0.0
2007/ 4/10 17:33:19,  100.0,  100.0,    237,    253,  -67.7,  -66.7,  -64.6,  -63.5,  -56.3,  -55.3,  -64.5,  -63.3,  -57.9,  -56.3,  -64.5,  -62.6,  -69.6,  -67.8,     0.0,    0.0,    0.0,    0.0
2007/ 4/10 17:33:20,  100.0,  100.0,    253,    270,  -67.8,  -66.3,  -64.8,  -62.8,  -56.7,  -55.8,  -64.8,  -64.0,  -57.7,  -57.1,  -64.4,  -63.5,  -69.3,  -67.8,     0.0,    0.0,    0.0,    0.0
2007/ 4/10 17:33:21,  100.0,  100.0,    270,    286,  -67.7,  -66.6,  -64.5,  -63.3,  -56.3,  -55.2,  -64.4,  -63.3,  -57.8,  -56.3,  -64.4,  -62.6,  -69.6,  -67.7,  ≈  0.0,    0.0,    0.0,    0.0
2007/ 4/10 17:33:22,  100.0,  100.0,    286,    303,  -67.7,  -66.1,  -64.6,  -62.6,  -56.6,  -55.8,  -64.8,  -63.9,  -57.6,  -57.0,  -64.4,  -63.5,  -69.2,  -67.7,     0.0,    0.0,    0.0,    0.0
```

Parameter set values, channel No., TAG name, recorded color, input types, units, display range (0%), display range (100%), etc. of each channel

AX. value and MIN. value of each channel

Note) Data such as burn-out, error, and time of occurrence are recorded as –32768 (with decimal point). Over-/under range Indication is recorded as 32767/–32767 (with decimal point).

(2) Event data file

```
A000014.FDT                        : File name
PHW41B11-E10EY                     : Type
SNo.LYT0000T      Ver.V04W         : Board
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
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
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
```

Message data

"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)

Appendix 2 Difference between Micro Jet Recorder (PHA) and PHW

Item	PHA	PHW
Display	Fluorescent display tube 20 characters x 2 stages	TFT color LCD 800 x 400 dots, 255 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 (300mm/h) or over : unstable	"Display Refresh Cycle" are settable within 1 sec to 12 hours. (See 5.2.)
Effective chart width	180mm With ±0.5mm over	About 239mm (Trend direction: vertical) About 163mm (Trend direction: horizontal) No over scale
Scale line	Scale lines are printed at intervals of about 100mm.	Scale line can be 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 18mm.
List pring	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 set to ON/OFF
Daily report	Provided	Not provided
Message	16 characters x 10 types Recording start/stop, DI on/off, Alarm ON/OFF	16 characters x 10 types Recorded in Event Data file only
Recording cycles	Links to chart speed 300/chart speed (mm/h)	Linked to Display Refresh Cycles (See 1.4.)
Input		
No. of input points	1, 2, 3, 6, 12 points	9, 18, 27, 36 points
Input types	TC x 12, Pt x 2, 50mV, 500mV, 5V, 50V	TC x 12, Pt x 2, 50mV, 500mV, 5V (No 50V range)
Change of input signal	Pin selection + setting on front display	Front display, note that the same input 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, 1to 5V, 0 to 5V)
Input sampling cycles	320ms : 6 points, 640ms : 12 points	100ms：9,18 points 200ms：27, 36 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 cannot be set during recording. (See Appendix 3.)
Performance and characteristic		
Input resistance	10MΩ (50mV, TC) 1MΩ (5V),100KΩ (500mV)	1MΩ (All input types)
Accuracy of clock	±50ppm (monthly error 2 min)	±50ppm (monthly error 2 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)	M3 screw terminal（input terminal), M4 screw terminal (power supply terminal）
Case material	Steel	Steel with openings
Mass	About 6kg	About 6kg
Dimensions	288 × 288 × 199mm	300 × 300 × 220.5mm
DIO unit	DI :3 points Alarm relay:6 points ×2 (Max.12 points）	DI :16 points Alarm relay:10 points ×2（Max.20 points） Alarm (open collector):16 points
Communication unit	RS-485	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 All parameters Data in recording （daily report and total report)	Clock: Battery backup Parameters: Parameters can be stored in internal nonvolatile memory and compact flash Data in recording: Up to 5M bytes data is backed up before it is written in compact flash memory Totalized data : Battery backup
Parts that need periodical maintenance	Recorder head (every 6 months) Recording paper (every month) Motor (every 5 years) Display tube (every 30,000 hours)	LCD display unit : replace every 50,000 hours（replace together with front panel) Memory card : every 6 months
Effect of common mode noise	CMRR 120dB	CMRR 120dB (G terminal—between 3-2) In case of Pt, cable A should not be affected by common mode noise when wiring.
Effect of wiring resistance	Thermocouple : 0.25μV/Ω	Thermocouple : 0.5μV/Ω Minimize the wiring resistance.

Appendix 3 Parameters that cannot be set during recording

Channel parameters	Input types Units Scaling (measuring range, engineering unit) Square rooter TAG Display color Display range Recording types Recording mode F value calculation function F value calculation decimal point
Recording parameters	Display refreshment cycles File division cycle File overwrite function Trend display compression function Display naming Display structure
Unit parameters	Clock Record data format
Functions that cannot be used during recording	Channel parameter copying function Parameter initialization Reading the setting value from compact flash Math channel parameter copying function
Calculation channel parameter	Computing equation Units Scaling (measuring range, engineering unit) Square rooter TAG Display color Display range Recording types Recording mode F value calculation function

Appendix 4 Parameters that cannot be set while totalizing is underway

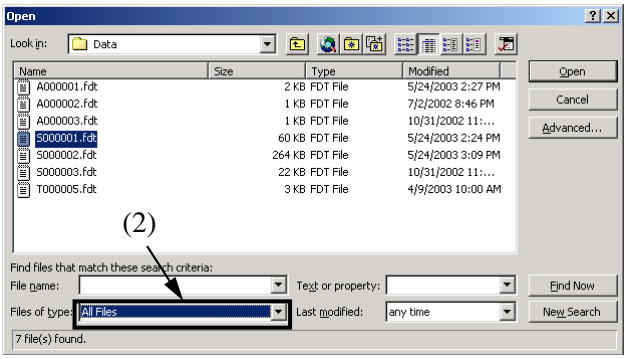
Channel parameters	Totalizing type Totalizing calculation mode External input Totalizing unit time Totalizing reset mode Totalizing TAG Totalizing unit Totalizing lower limit cut value Totalizing divisor
Totalizing parameters	Integrated time for daily report Base date for annual report External input signal
Unit parameter	Clock Recorder data format
Functions that cannot be used during integration	Initializing setting value Loading setting value from compact flash
Calculation channel parameter	Totalizing type Totalizing calculation mode External input Totalizing unit time Totalizing reset mode Totalizing TAG Totalizing unit Totalizing lower limit cut value Totalizing divisor

Appendix 5 Opening the PHW record data in ASCII format on Excel

Note 1) Binary format record data cannot be opened with the method shown below. (See section 7.19 Setting method of record data format for details.)

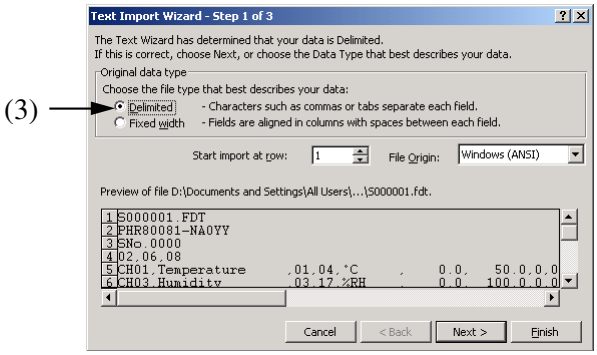
Note 2) The record data of 5MB or larger in case of 9-point input, and 10MB or larger in case of 18-point input cannot be opened on Excel. In these cases, read the data using the data viewer (contained in the attached CD-ROM) and perform CSV conversion to divide the file, which allows the data to be read.

(1) Start up Excel, select “File(F)” and the “Open (O)” on the menu to display the following screen.

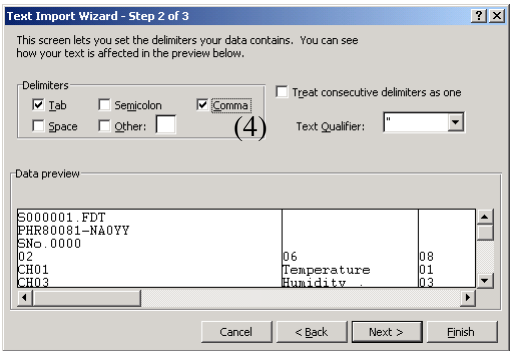


(2) Select “All” for the file type, and select PHW record data (S****.FDT).

(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 PHW.

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, 10:00 …..etc.

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 Bar graph screen Analog meter screen Instantaneous value display screen Totalized value display screen Event display screen Ethernet log display screen Historical display screen	Channel setting	○	Input setting screen	(7.4)	Input types, skip, scaling, units and square rooter
		○	Calculation setting screen	(7.5)	Input filter, PV shift, PV gain, substraction, F value calculation function
		○	Alarm setting screen	(7.6)	Alarm, DO relay No., Alarm set value
		○	F value calculation setting screen	(7.7)	Reference temperature, Z value, decimal point position, reset temperature, mannual reset
		○	Copy parameter	(7.8)	(Selected channel or all channels can be copied.)
	Display record setting	○	Display refreshment cycles screen	(7.9)	Display refreshment cycles, file division cyle, file overwrite, and trend display compression
		○	Range setting screen	(7.10)	TAG No., TAG No.2, display color, display range, recording type, recording operation
		○	Message setting screen	(7.11)	Message, message display timing
		○	Screen setting 1	(7.12)	Screen name, screen structure channel
		○	Screen setting 2	(7.12)	Trend direction, number of screen division, scale display, bar graph/meter selection, color bar display selection
	Main unit setting	○	Register data screen	(7.13)	Register data
		○	LCD OFF time screen	(7.14)	LCD OFF time
		○	Unit defining screen	(7.15)	Unit
		○	DI setting screen	(7.16)	DI function
		○	Alarm setting screen	(7.17)	Alarm hysteresis, alarm latch, memory full alarm, battery alarm
		○	Clock adjustment screen	(7.18)	
		○	Record data format screen	(7.19)	Record data format
		○	RS-485 communication setting screen	(7.20)	Station No., baud rate, parity, front communication
			Ethernet communication setting screen		
			○ Ethernet setting 1 screen	(7.21)	IP address, subnet mask, default gateway FTP server function, FTP access control, Web server function, E-mail function, MODBUS
			○ Ethernet setting 2 screen	(7.21)	TCP/IP
			○ E-mail setting 1 screen	(7.22)	SMTP address, sender's address, sender's name
			○ E-mail setting 2 screen	(7.22)	Receiver's address
			○ E-mail trigger setting screen	(7.23)	Title, trigger timing, text 1, text 2, measured value affixation, receiver's address No., E-mail send test
			○ User account setting screen	(7.24)	User name, password, user level
		○	Password setting screen	(7.25)	○Parameter setting password, △Memory card operation password, Recording start/stop password
	Memory card	△	Record data display screen	(7.26)	Record file display
		△	Memory card removing screen	(7.27)	Memory card writing prohibition
		△	Reading settings screen	(7.28)	Reading setting value
		△	Writing settings screen	(7.29)	Writing setting value

Measurement value display screen	Parameter setting screen			Setting item
	Totalize function	Daily type	(7.31) Channel setting screen 1 (7.32)	Totalize cycle, base day, external input, totalize calculation operation, totalize type, digital type, totalize base time, totalize reset type, totalize
		Monthly type screen	(7.34) Channel setting screen 2 (7.33)	TAG, totalize unit, totalize cut value, totalize scaling value
		Annual type screen	(7.34)	
		External type screen	(7.36)	
		Control screen	(7.37)	Totalize start/stop, totalize reset
	Calculation function	Formula setting screen	(7.39)	Formula
		Input setting screen	(7.40)	Unit, measurement value, engineering value, square rooter
		Calculation setting screen	(7.41)	Input filter, substraction, PV shift, PV gain, F value calculation
		Alarm setting screen	(7.42)	Alarm operation, DO relay No., alarm measurement value
		Range setting screen	(7.43)	TAG No., TAG No2, display color, display range, recording type, recording operation
		Math channel parameter copy screen	(7.44)	(Selected math channel or all channels can be copied.)
		Math timer setting screen	(7.45)	Math timer
		Constant setting screen	(7.46)	Constant
	System information	Version screen	(9.1)	
		Calibration password screen (1234)	(9.1)	Input adjustment, special setting (*1), set value initialization, adjusted value initialization (*1), version

*○ :The setting lock is available by parameter setting password.

△ :The setting lock is available by compact flash operation password.

*1 : Do not perform operation.

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