



P a p e r l e s s R e c o r d e r

TRM-00J

U s e r ' s M a n u a l

Introduction

Thank you for purchasing our electronic product (TRM-00J).
Before using this product, please read this manual carefully to understand its contents.
Please keep this manual and use it whenever necessary.

Precautions upon Usage

Please read this section before use.

This operation manual should be kept by the user of this product.
For the safe use of this product, please avoid the following:

★ **Safety Precautions**

For the safe use of the product and to prevent possible accident or damage, the following warning signs are used in this operation manual for safety-related precautions depending on their level of importance and risk. Please follow each instruction in order for you to use the product safely.

★ **Warning Symbols and Their Meanings**

 Danger	Improper handling of the equipment may cause fatality or serious injury for an impending reality.	 Caution	Improper handling of the equipment may cause injury or physical damage on it.
 Warning	Improper handling of the equipment may cause fatality or serious injury.	 Reminder	Care should be taken for ensuring safety.

★ **Example of Symbols**

	General caution, warning or prohibition without particularity		Instruction on ground connection for the equipment with safety grounding terminals		Hazard of pinched fingers on a particular portion of the equipment
	Possible injury caused by touching a particular portion of the equipment under specific conditions		Unspecific behaviors of general users		Hazard of injury due to high temperature under specific conditions
	Hazard of an electric shock under specific conditions		Hazard of injury such as an electric shock due to disassembling or modification of the equipment		Hazard of burst under particular conditions



Warning

	Wrong connection of the product may cause fire, which may lead to the breakdown of the product. After the wiring work, make sure that all connections are done correctly before turning the power of the product ON.
	Never turn the power ON while the wiring work is in progress. Never touch the high-voltage section of the product, such as the power supply terminal. Doing so may cause an electrocution.
	Breakdown of or abnormality in the product may cause serious effect to the system. Install the appropriate protective circuit outside the product.
	To avoid possible breakdown or fire, do not use this product for the purpose that is beyond the scope of its specification.
	Never attempt to modify or disassemble the product. Such attempt may cause fire, electrocution, or damage to the product.
	Do not use the product at a place that is exposed to flammable and explosive gases.



Caution

	Do not connect anything to the blank terminal.
	Do not use pointed objects to operate keys.
	To avoid electrocution and breakdown/incorrect operation of the product, never turn the power ON while the wiring work is in progress. Make sure to turn the power OFF before replacing any device (e.g., for repair) that is connected to the product. Before turning the power ON again, make sure that the all wiring works are finished.
	This product must be installed in a cool and well-ventilated area.
	Do not put any foreign object, such as a piece of metal, inside the product. Doing so may cause fire, electrocution, or breakdown of the product.
	This product is intended for instrumentation. If the product is used in a place with high voltage or strong noise, take the necessary measures at the device side.
	This product is designed to control temperature and other physical volumes of general purpose industrial facilities. Do not use this product for control that may greatly affect human life.
	Turn OFF the power of the product before cleaning it. To clean the product, wipe it with a soft and dry cloth. Avoid using thinners and other similar chemicals. Such chemicals may cause deformation or discoloration of the product.
	This product may cause electromagnetic interference in the home environment. The user of this product is requested to take necessary measures to prevent such a problem.
	Make sure to tighten terminal screws well with the designated torque. Insufficient tightening may cause electrocution or fire.
	Strictly observe precautions written in this manual upon usage.
	Unauthorized posting and reproduction of the contents of this manual is prohibited.
	Contents of this operation manual may be revised without prior notice.

Important Reminder Regarding Export Trade Control Order

Please investigate the client and the purpose of usage to make sure the product will not be used as a weapon of mass destruction (e.g., for military purpose and military facility).

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Section 1 Outline

1.1. Features

- This product is a paperless recorder that displays measurement data on LCD on a real-time basis and save them into an external memory (USB memory or SD card). LCD with touch panel allows you to operate the recorder very easily.
- The product allows you to set thermocouple, resistance temperature detector, DC voltage (current), and such other data freely up to 6 channels.
- It can also re-display the data that has been saved in the external memory.

1.2. Check the Product

Please check the following items before use:

★ Appearance

Check if case, front surface, and terminal board are free from damage.

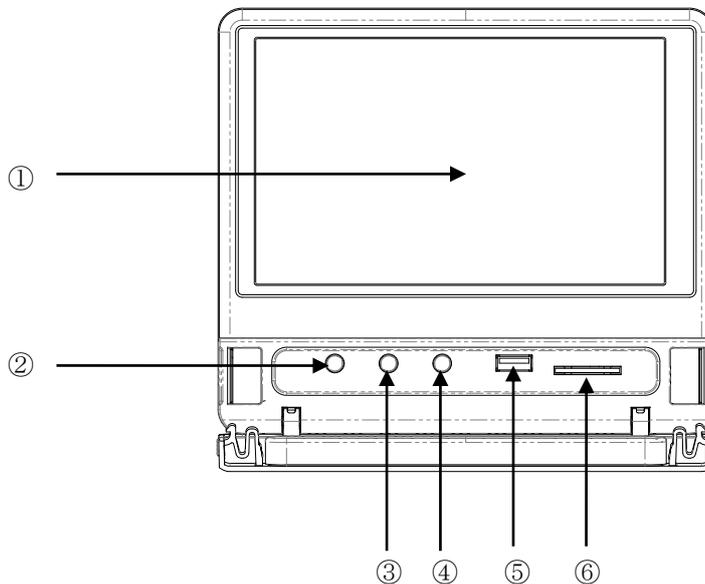
★ Check if accessories are included. (See below for accessories.)

Attaching tool (large and small—2 pieces each), Language setting change procedure, rubber packing (attached to the main unit), and internal packing of the cover (attached to the main unit).

★ These are available as optional items below.

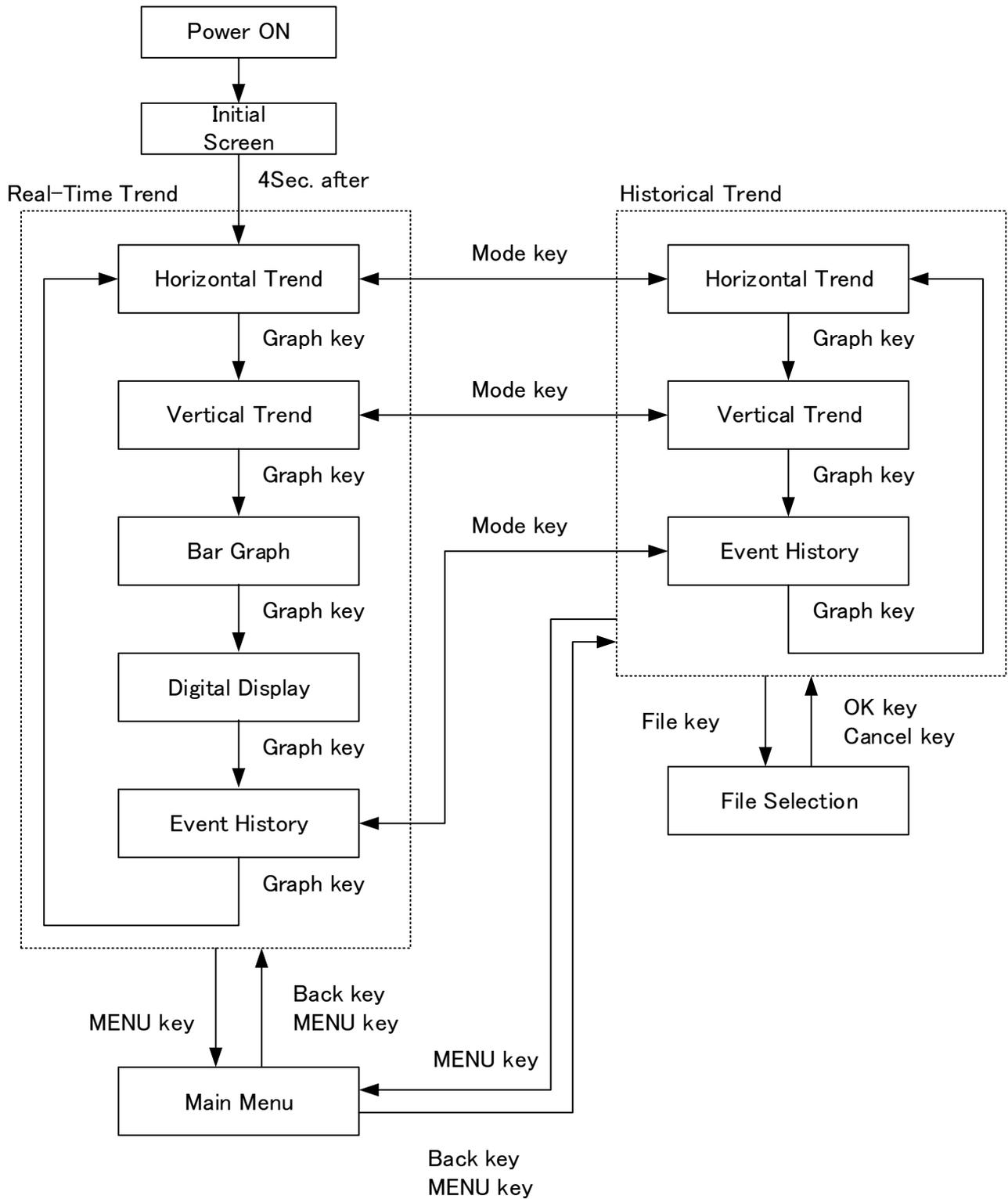
DC current input shunt resistor (model: HMSU3081A11), RS-485 communication termination resistor (model: WMSU0303A01), DI / DO cable (1m) (model: WMSU0468A01), DI / DO cable (3m) (model: WMSU0468A02)

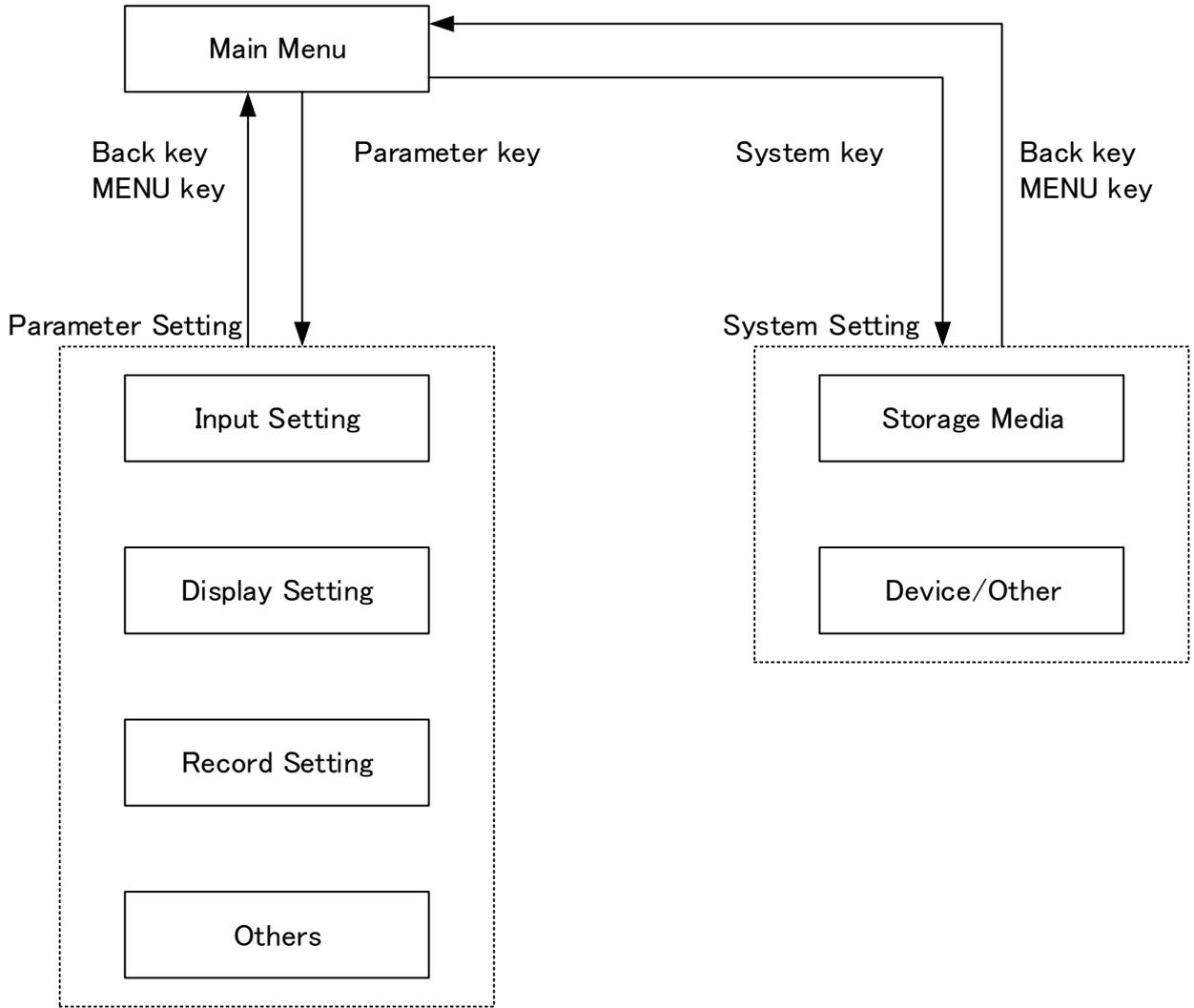
1.3. Name of Parts



No.	Name	How To Use
①	Display Sections	Liquid Crystal Display (LCD) with touch panel. Displays measuring data and parameters. Touch the surface to set the data.
②	REC Key	Starts and stops the recording.
③	MENU Key	Switches the display between trend and main menu screens.
④	FUNC Key	Sets and executes operations.
⑤	USB Memory Port	A slot to insert USB memory that will be used as an external memory.
⑥	SD Card Slot	A slot to insert SD card that will be used as an external memory.

1.4. Basic Screen Navigation





Section 2 Installation

2.1. Precautions upon Installation



To avoid electrocution and damage to the device, always turn the power OFF upon detaching/attaching the product.

★ Ambient Temperature (Use the product within the range indicated below.)

- ① Temperature Range: 0 to 50°C
- ② Humidity Range: 20 to 80%RH (without condensation)
- ③ Installation Angle: 0 to 30 degrees backward, right-and-left horizontal

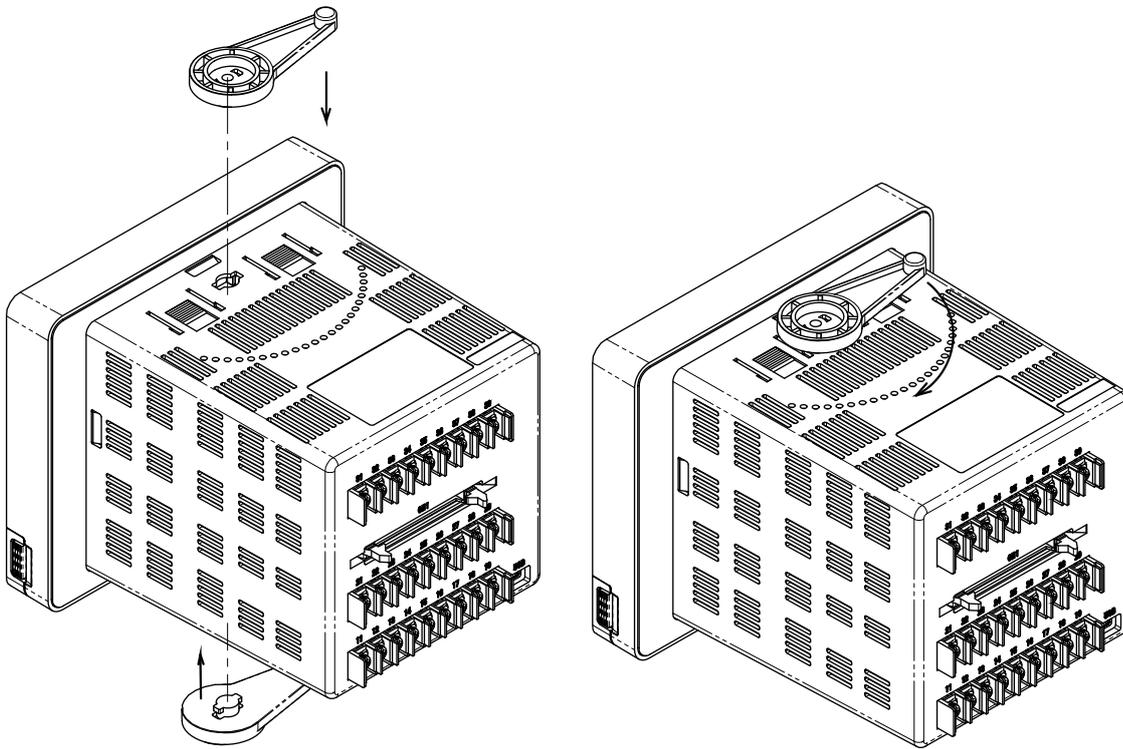
★ Avoid installing the product at the following locations:

- ① Places where the temperature changes drastically and causes condensation
- ② Places that produce corrosive and flammable gases
- ③ Places that are exposed to water, oil, steam, and chemicals
- ④ Places with direct vibration and impact
- ⑤ Places with many dust, salt, metal chips, etc.
- ⑥ Places with direct sunlight
- ⑦ Places that may negatively affect the electrical circuit, such as static electricity, noise, and magnetism
- ⑧ Places that are exposed directly to the air from the air-conditioning unit

★ Precautions upon Installation

- ① Secure enough space for ventilation to maintain the ambient temperature of less than 50°C. If the ambient temperature can reach or exceed 50°C, cool the area with a fan or cooler. However, the product must not be directly exposed to the cooled air.
- ② Avoid installing the product on top of a device that produces high heat (such as a heater or a transformer).
- ③ Install the product as far from high-voltage devices and power lines as possible.
- ④ Do not block the ventilation hole of the product. If products are to be installed side by side, always leave some space in between.

2.2. How to Attach/Detach



★ Attach to Panel

- ① Make a hole at the panel surface.
- ② Insert the product from the front surface.
- ③ Change the size of the attachment to be used depending on the thickness of the panel surface.
- ④ Lock the product by turning the attachment clockwise.

*Wiring work must be performed after the attachment of the product.

*Turn the power ON after the wiring.

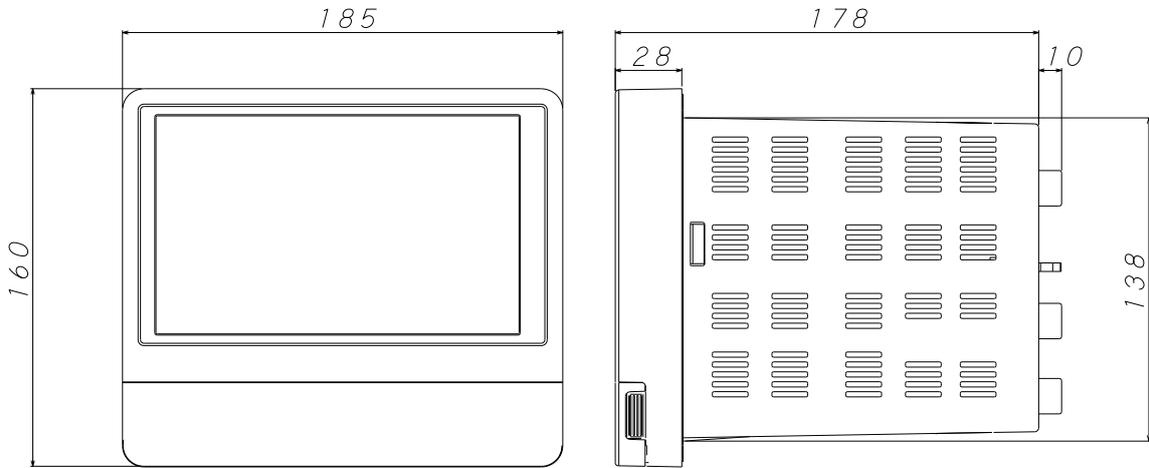
★ Detach from Panel

- ① Turn the power OFF
- ② Detach cables
- ③ Detach the attachment from the product by turning it counterclockwise.
- ④ Detach the product from the panel.

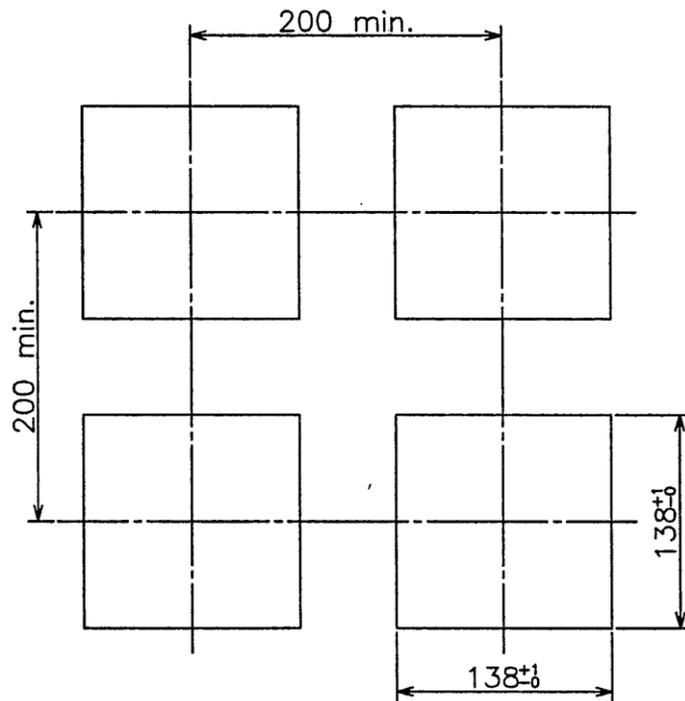
*Turn the power OFF before detaching the product.

2.3. Outline View and Dimensions of Panel Cut

Unit: mm



Unit: mm



Section 3 Wiring

3.1. Things to be Noted during the Wiring Work



To avoid electrocution and breakdown of the product, never turn the power ON while the wiring work is in progress.

- ★ For thermocouple input, use the designated wire or extension lead wire.
- ★ For resistance temperature detector input, use the lead wire with less wire resistance and zero difference in the resistance between 3 wires (3-wire type).
- ★ Upon wiring of the input signal line, it must be placed far from power source line, power line, and load line since it is easily affected by the induction noise.
- ★ Upon wiring the power source to the measuring equipment, make sure the equipment will not be affected by the noise that comes from the power supply.

In case the product is exposed to the noise, it is advisable to use the noise filter.

If the noise filter is to be used, please take note of the following:

- ◎ Install the noise filter near the temperature controller as much as possible.

Make the wiring of the output wire (secondary side) of the noise filter and product to the power terminal as short as possible.

- ◎ Separate the input wire (primary side) of the noise filter from the output wire (secondary side).

Bundling input and output wires together or wiring them close to each other in the same duct or pipe will induct the high-frequency noise, and therefore, the expected noise reduction effect cannot be achieved.

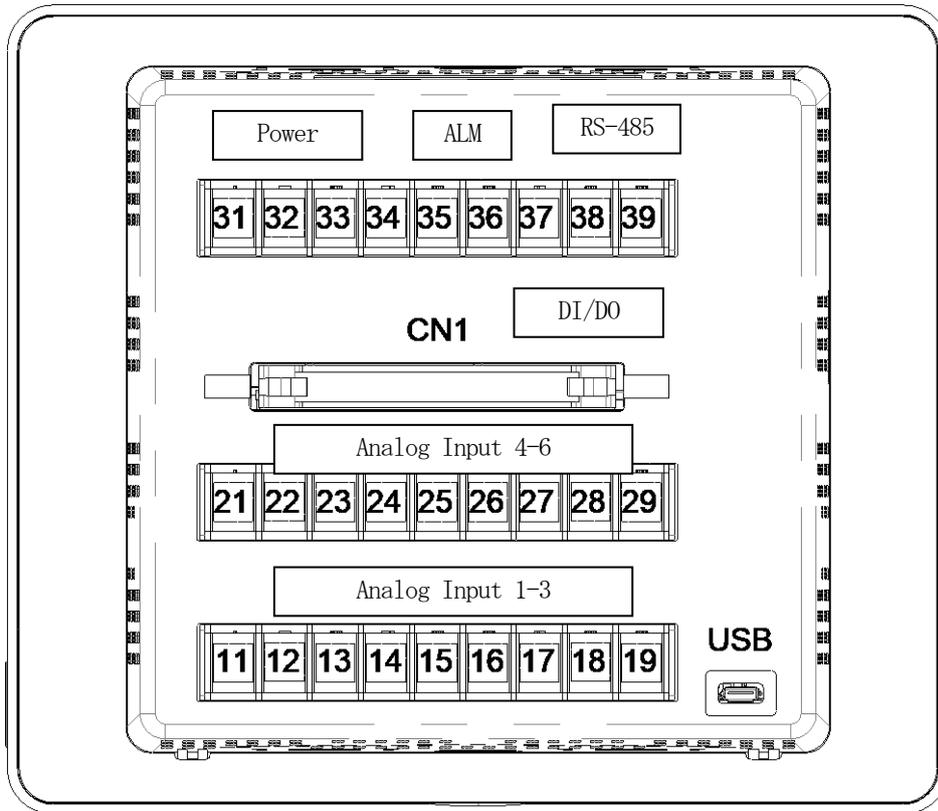
- ◎ Make the wiring of the ground wire of the noise filter as short as possible.

If the ground wire is too long, inductance will be equally inserted and, as a result, the high-frequency property gets worse.

- ◎ If the attaching board of the noise filter is to be used for the grounding, attach the noise filter after removing the paint coating in order to reduce the contact resistance with the case of the device.

- ★ For the power supply wire, use the twisted electric wire with less voltage drop.
- ★ The product starts its operation approximately 4 seconds after the power is turned ON. To use as a signal for the interlock circuit, please use the delayed relay.
- ★ Power switch and fuse are not included. If necessary, please install them near the product.
 - ◎ Recommended Fuse Rating: Rated voltage of 250V and rated current of 1A
- ★ Use a crimp contact that matches the size of the screw.
 - ◎ Size of Crimp Contact: Contact width of 8mm or less
Recommended Crimp Contact Manufacturer: Nichifu
Model: ICTV-1.25Y-4S (Y Terminal)
ICTV-1.25-4M (Rounded Terminal)
 - ◎ Recommended Tightening Torque: 0.5N·m(5kgf·cm)
 - ◎ Applicable Wiring Material: Use the wire with the size that matches the terminal.
Shielded wire is recommended.
For Pt100 (resistance temperature detector), use wiring materials of the same kind with low conducting wire resistance and zero difference in resistance between 3 wires.

3.2. Terminal Layout



3.3. Wiring to Each Terminal

3.3.1. Power Supply Terminal

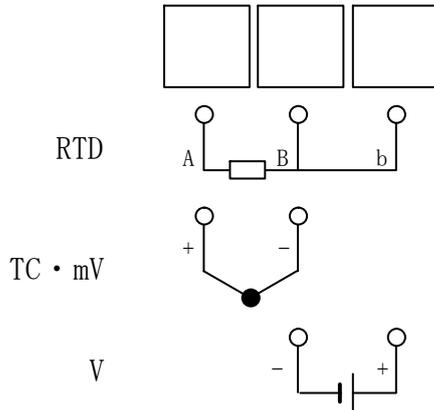
Terminal No.	31	32	33
	AC		GND

3.3.2. Analog Input Terminal

Terminal No.	21	22	23	24	25	26	27	28	29
CH	4			5			6		
Input	+/A	-/B	V+/b	+/A	-/B	V+/b	+/A	-/B	V+/b

Terminal No.	11	12	13	14	15	16	17	18	19
CH	1			2			3		
Input	+/A	-/B	V+/b	+/A	-/B	V+/b	+/A	-/B	V+/b

Common to All Channels: Method of Wiring per Input Type



※ In case of mA input, use 250Ω shunt resistor and wire at the area where V input is located.

3.3.3. ALM Terminal

Terminal No.	35	36
	DO	DO_COM

3.3.4. RS-485 Terminal

Terminal No.	38	39
	+	-

※ Attach terminator at the end station.

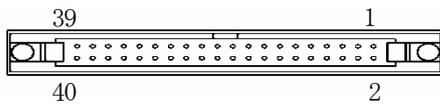
3.3.5. USB Connector

Connection Type: USB Micro B terminal

3.3.6. DI/DO Terminal

DI: Non-voltage Contact Input (9 points), common

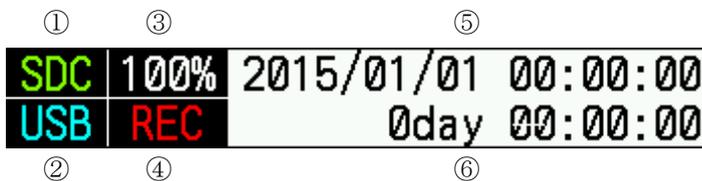
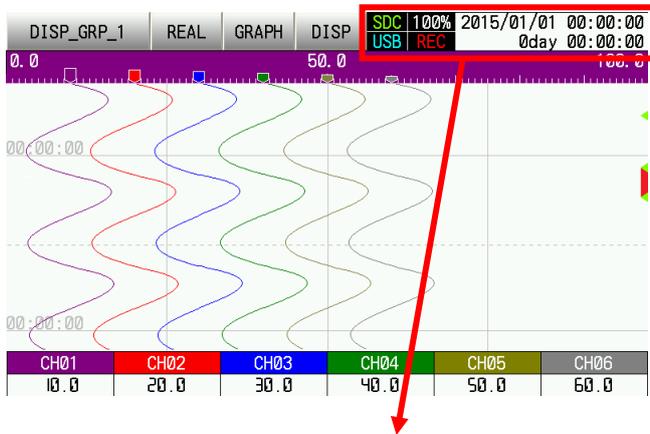
DO: Open Collector Output (12 points), common



Pin No.	Signal	Pin No.	Signal
1	DI1	21	D01
2	DI2	22	D02
3	DI3	23	D03
4	DI4	24	D04
5	DI5	25	D05
6	DI6	26	D06
7	DI7	27	D07
8	DI8	28	D08
9	DI9	29	D09
10	NC	30	D010
11	NC	31	D011
12	NC	32	D012
13	DI_COM	33	DO_COM
14	DI_COM	34	DO_COM
15	DI_COM	35	DO_COM
16	DI_COM	36	DO_COM
17	DI_COM	37	DO_COM
18	DI_COM	38	DO_COM
19	DI_COM	39	DO_COM
20	DI_COM	40	DO_COM

Section 4 Screen Description

4.1. Common Display Section



① State of SD Card

Shows the state of SD card through the text color.

Blue: Not inserted

Yellow Green: Inserted (with a remaining capacity of more than 30%)

Yellow: Inserted (with a remaining capacity of more than 10% but less than 30%)

Red: Inserted (with a remaining capacity of less than 10%)

② State of USB Memory

State of USB memory is expressed by the color of the text.

Blue: Not inserted

Light Blue: Inserted (with a remaining capacity of more than 30%)

Yellow: Inserted (with a remaining capacity of more than 10% but less than 30%)

Red: Inserted (with a remaining capacity of less than 10%)

③ Remaining Memory Capacity

Shows the remaining capacity of USB memory/SD card/internal memory. Text color indicates the type of the memory medium.

White: Internal Memory

Light Blue: USB Memory

Yellow Green: SD Card

Yellow: Remaining capacity is more than 10% but less than 30% (※)

Red: Remaining capacity is less than 10% (※)

※: If the remaining capacity of the subjected memory is low, then the color that is common to all memories will be displayed.

④ State of Recording

Shows the state of recording through the text color.

Blue: Recording is stopped

Red: Recording in progress

⑤ Clock

Displays current date and time. See [6.2.4Clock](#) to set date and time.

⑥ Date and Time of Lapse Time/Cursor

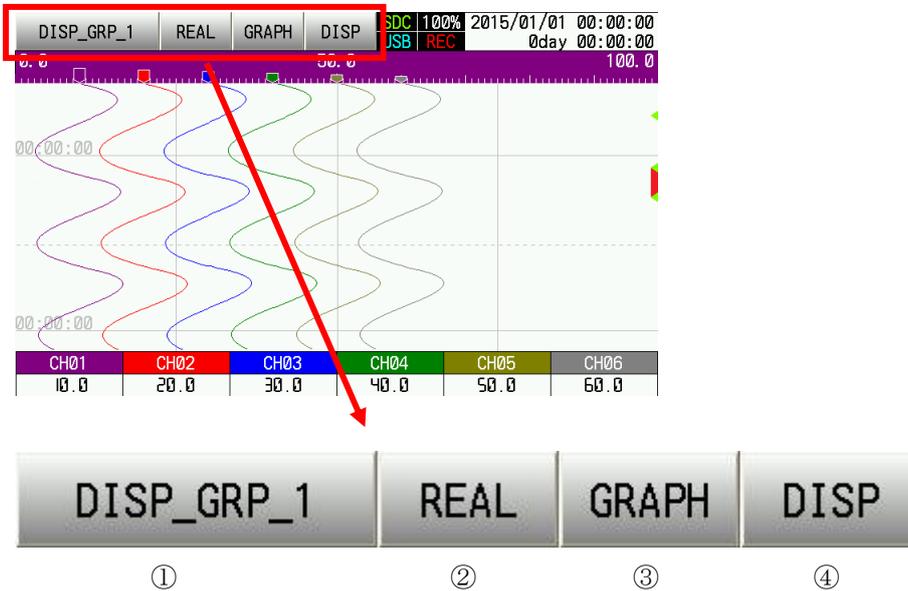
When real-time trend is being displayed, it displays the lapse time in accordance with the lapse time setting. See [5.8Lapse Time](#) for details.

When historical trend is being displayed, it displays the date and time of the cursor.

4.2. Real-Time Trend

Displays the latest data that is being recorded. See the description of each section.

4.2.1. Common Sections of Real-Time Trend



① Group Switching Key

Switches the group to be displayed.

Text to be displayed is the name of the group that is currently displayed.

See [5.3](#) Group for details.

② Mode Key

Switches the real-time trend/historical trend.

Text Display: REAL: Real Time Trend Display

HIST: Historical Trend Display

③ Graph Key

Switches the display direction of the trend and other displays.

Display sequence: "Horizontal Trend" ⇒ "Vertical Trend" ⇒ "Bar Graph" ⇒ "Digital" ⇒ "Event History" ⇒ "Horizontal Trend," and so on.

Each display method can be hidden through settings in accordance with [6.1.1.3](#) Display

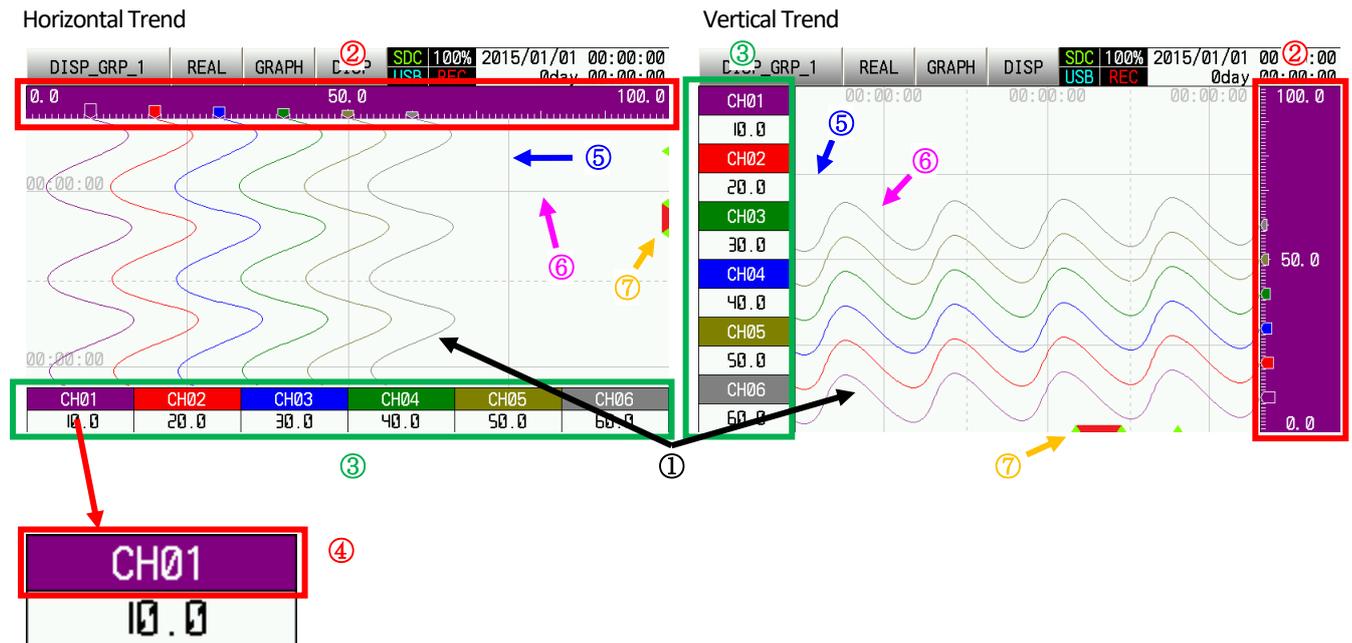
④ Display Switching Key

Turn scale display and measuring value display ON/OFF during the trend display.

Display sequence: "Scale: ON, Measuring Value: ON" ⇒ "Scale: OFF, Measuring Value: ON" ⇒ "Scale: ON, Measuring Value: OFF"

⇒ "Scale: OFF, Measuring Value: OFF" ⇒ "Scale: ON, Measuring Value: ON" and so on.

4.2.2. Trend Display



① Trend Line

Draws the line with the color that was set per channel.

② Scale

Displays the scale per channel. The color that was set per channel shall be used as a background color of the scale.

Scale range shall be determined based on the setting of [upper/lower limit of the scale range\(Rng of ScaleU/L\)](#).

It can also display up to three scales simultaneously. Assign the scale number to each channel through the [scale No.](#) setting.

Range of the scale can also be changed temporarily through the special operation (see [4.4.6](#)Channel Settings).

③ Measuring Value

Displays the measuring value of each channel in a numerical format. However, in case of a breakdown of the sensor or this product, the following texts will be displayed:

-H-: This will be displayed when the detected input value is higher than the measuring range.

-L-: This will be displayed when the detected input value is lower than the measuring range.

B. OUT: This will be displayed when the sensor is disconnected during TC input (※1), RTD input(※2), or mV input (※3).

Note: The above will not be displayed if the [burnout](#) setting is turned OFF.

Fault: This will be displayed when the input circuit of the product is not functioning.

Furthermore, if there is an error in the subjected channel, the text color turns red.

※1: K, J, T, E, R, S, B, N, U, L, WRe5-26, PR40-20, PL2

※2: Pt100, JPt100

※3: -10-10 (mV), 0-20 (mV), 0-50(mV)

④ Channel Number Key

Pressing the channel number key allows the user to switch the subjected channel to be displayed at the scale. Upon doing so, the trend line will get thicker and the unit will be displayed for approximately 3 seconds.

Channel number or tag will be displayed depending on the setting of the [label display](#).

Pop-up screen of the channel setting will be displayed when the key is pressed for 2 seconds.

See [4.4.6 Channel Settings](#) for details.

⑤ Auxiliary Line

Can set the number of auxiliary lines per channel. Set the [scale auxiliary line \(Partitions\)](#) if necessary.

If set to 0, auxiliary line will be automatically drawn in accordance with the scale.

⑥ Time Stamp Time and Line

Displays the time stamp with the fixed time interval during the recording. Fixed time interval varies depending on the setting of the [record cycle](#).

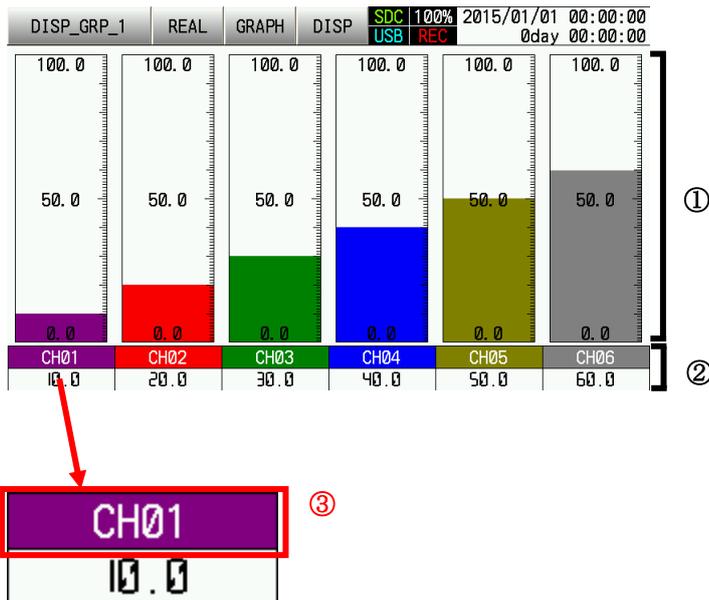
⑦ Event and Alarm Display

A yellow-green “△” symbol will be displayed at the portion where event (※1) has occurred during the recording. A red line will be displayed while the alarm (※2) is turned ON.

※1: See [5.10 Event](#)

※2: See [5.2 Alarm](#)

4.2.3. Bar Graph Display



① Bar Graph

Displays the bar graph of the measuring value per channel. Color and scale of the graph are based on the setting that is made for [display color](#) and [upper/lower limit of scale range\(Rng of ScaleU/L\)](#).

Range of the scale can also be changed temporarily through the special operation (see [4.4.6Channel Settings](#)).

② Measuring Value

Displays the measuring value of each channel in a numerical format. However, in case of a breakdown of the sensor or this product, the following texts will be displayed:

- H-: This will be displayed when the detected input value is higher than the measuring range.
 - L-: This will be displayed when the detected input value is lower than the measuring range.
 - B. OUT: This will be displayed when the sensor is disconnected during TC input (※1), RTD input(※2), or mV input (※3).
- Note: The above will not be displayed if the [burnout](#) setting is turned OFF.
- Fault: This will be displayed when the input circuit of the product is not functioning.

Furthermore, if there is an error in the subjected channel, the text color turns red.

※1: K, J, T, E, R, S, B, N, U, L, WRe5-26, PR40-20, PL2

※2:Pt100, JPt100

※3: -10-10 (mV), 0-20 (mV), 0-50(mV)

③ Channel Number Key

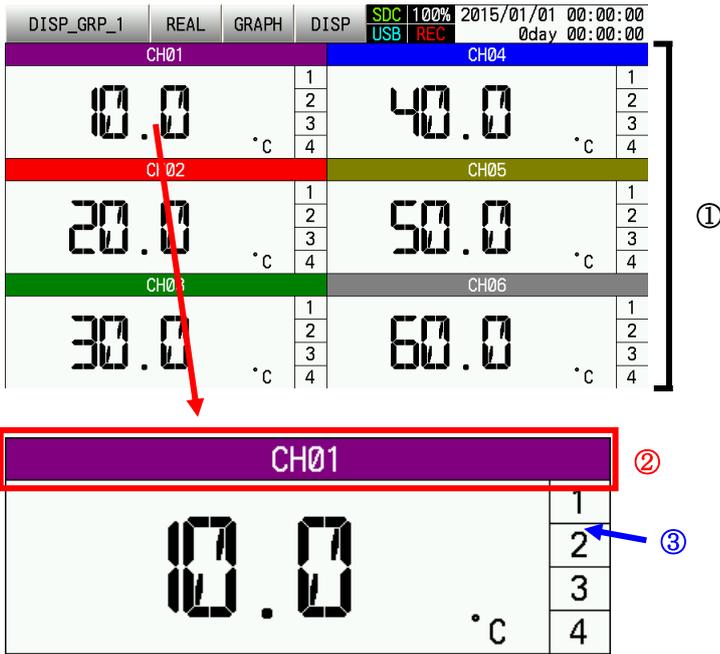
If the channel number key is pressed, the unit will be displayed for approximately 3 seconds.

A channel number or tag will be displayed depending on the setting of the [label display](#).

A pop-up screen of the channel setting will be displayed when the key is pressed for 2 seconds.

See [4.4.6Channel Settings](#) for details.

4.2.4. Digital Display



① Measuring Value

Displays the measuring value of each channel in a numerical format. However, in case of a breakdown of the sensor or this product, the following texts will be displayed:

- H-: This will be displayed when the detected input value is higher than the measuring range.
- L-: This will be displayed when the detected input value is lower than the measuring range.
- B. OUT: This will be displayed when the sensor is disconnected during TC input (※1), RTD input(※2), or mV input (※3).

Note: The above will not be displayed if the [burnout](#) setting is turned OFF.

Fault: This will be displayed when the input circuit of the product is not functioning.

※1: K, J, T, E, R, S, B, N, U, L, WRe5-26, PR40-20, PL2

※2: Pt100, JPt100

※3: -10-10 (mV), 0-20 (mV), 0-50(mV)

② Channel Number Key

If the channel number key is pressed, the unit will be displayed for approximately 3 seconds.

A channel number or tag will be displayed depending on the setting of the [label display](#).

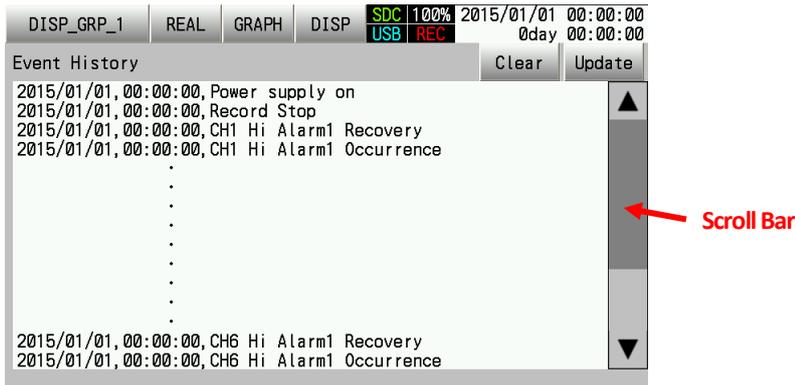
A pop-up screen of the channel setting will be displayed when the key is pressed for 2 seconds.

See [4.4.6 Channel Settings](#) for details.

③ Alarm Display

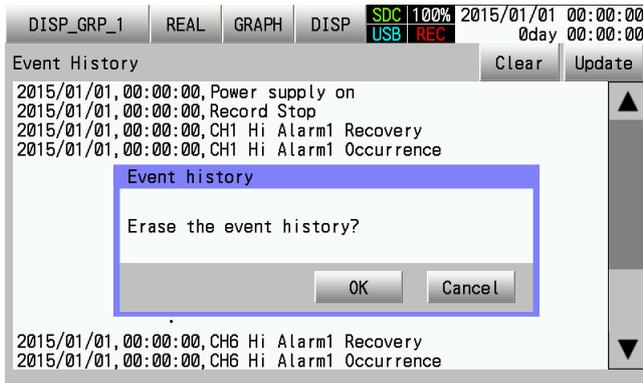
Alarm number of the subjected channel turns red.

4.2.5. Event History



Displays the history of events. Up to 50 event histories shall be kept.
 Events that were triggered during the display of this screen will be displayed by pressing the update key.
 Use scroll bar or ▲/▼ keys to scroll the screen to see events that are outside the display area.

If clear key is pressed, a pop-up screen appears to confirm the deletion.
 Event history can be deleted by pressing the OK key. To cancel the deletion, press Cancel key.

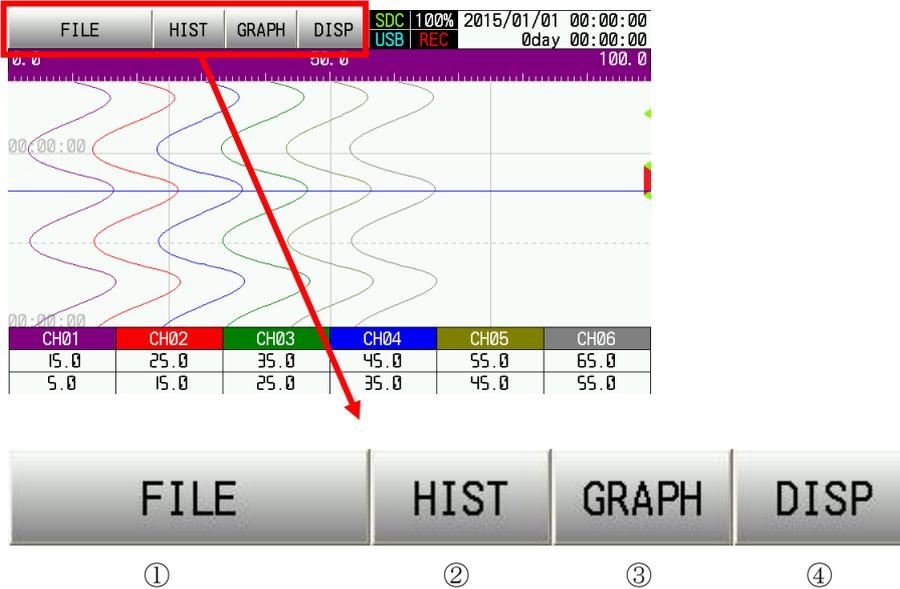


Press OK key or CANCEL key to close the deletion confirmation pop-up screen.

4.3. Historical Trend

Displays past data. See the description of each section.

4.3.1. Common Sections of Historical Trend



① File Key

If the file key is pressed, a file selection screen appears. From the file selection screen, select the file to be displayed at the historical trend. See [4.3.4 File Selection](#) for details.

② Mode Key

Switches real-time trend/historical trend.

Text Display: REAL: Real-Time Trend Display

HIST: Historical Trend Display

③ Graph Key

Switches the display direction of the trend and other displays.

Display sequence: "Horizontal Trend" ⇒ "Vertical Trend" ⇒ "Event History" ⇒ "Horizontal Trend," and so on.

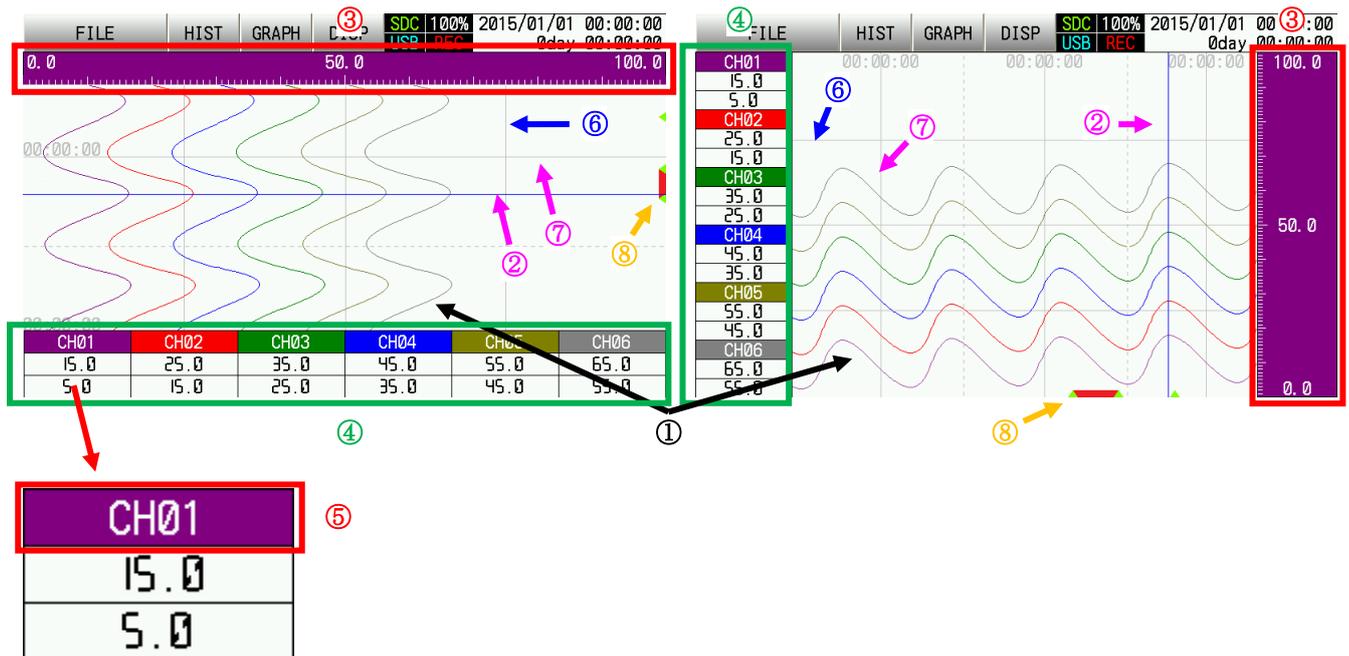
Each display method can be hidden through settings in accordance with [6.1.1.3 Display](#).

④ Display Switching Key

Turn scale display and measuring value display ON/OFF during the trend display.

Display sequence: "Scale: ON, Measuring Value: ON" ⇒ "Scale: OFF, Measuring Value: ON" ⇒ "Scale: ON, Measuring Value: OFF" ⇒ "Scale: OFF, Measuring Value: OFF" ⇒ "Scale: ON, Measuring Value: ON," and so on.

4.3.2. Trend Display



① Trend Line

Draws the line with the color that was set per channel during the recording.

② Cursor

The measuring value of the time that is indicated by the cursor will be displayed. Touching the area where the trend line is drawn will allow the cursor to move to the touched area.

③ Scale

Displays the scale per channel. Color that was set per channel during the recording shall be used as the background color of the scale.

Scale range shall be determined based on the setting of [upper/lower limit of scale range\(Rng of ScaleU/L\)](#).

It can also display up to three scales simultaneously. Assign a scale number to each channel through the [Scale No.](#) setting.

Range of the scale can also be changed temporarily through the special operation (see [4.4.6](#)Channel Settings).

④ Measuring Value

Displays, in a number format, the measuring value of each channel of the time that is indicated by the cursor.

However, the following values are displayed at the location where the sensor failure or the device failure occurred.

In case of "-H-", "B.OUT", "Fault" ... 32767

In case of "-L-" 32768

※ A decimal point is added to the displayed numerical value according to the decimal point position setting.

⑤ Channel Number Key

Pressing the channel number key allows the user to switch the subjected channel to be displayed at the scale. Upon doing so, the trend line will get thicker and the unit will be displayed for approximately 3 seconds.

Channel number or tag will be displayed depending on the setting of [label display](#).

Contents of tag shall be the one that was set during the recording.

A pop-up screen of the channel setting will be displayed when the key is pressed for 2 seconds.

See [4.4.6 Channel Settings](#) for details.

⑥ Auxiliary Line

Can set the number of auxiliary lines per channel. Set the [scale auxiliary line \(Partitions\)](#) if necessary.

⑦ Time Stamp Time and Line

Displays the time stamp with the desired time interval during recording. Desired time interval varies depending on the setting of the [record cycle](#) that is set during recording.

⑧ Event and Alarm Display

A yellow-green “△” symbol will be displayed at the portion where event (※1) has occurred during the recording. A red line will be displayed at the portion where the alarm (※2) has been turned ON.

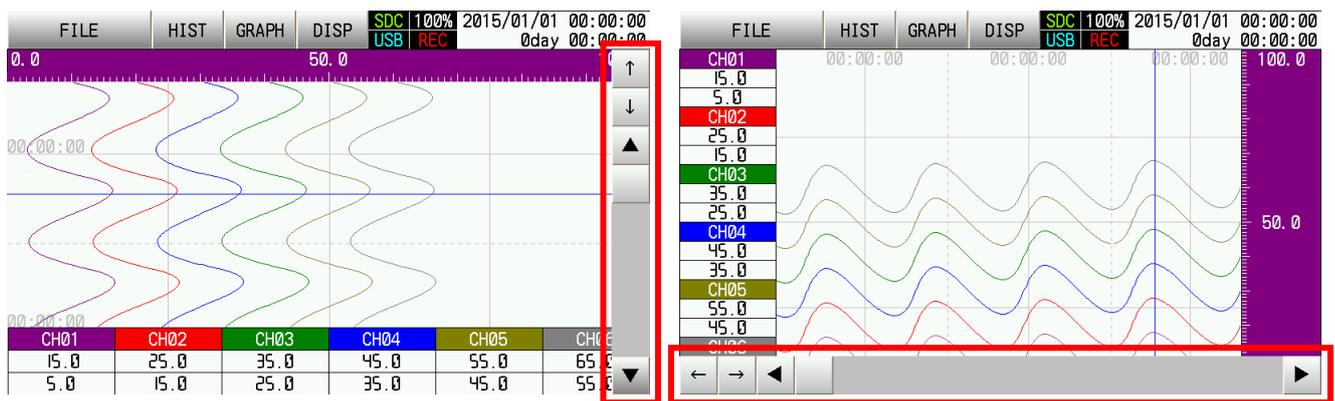
※1: See [5.10 Event](#)

※2: See [5.2 Alarm](#)

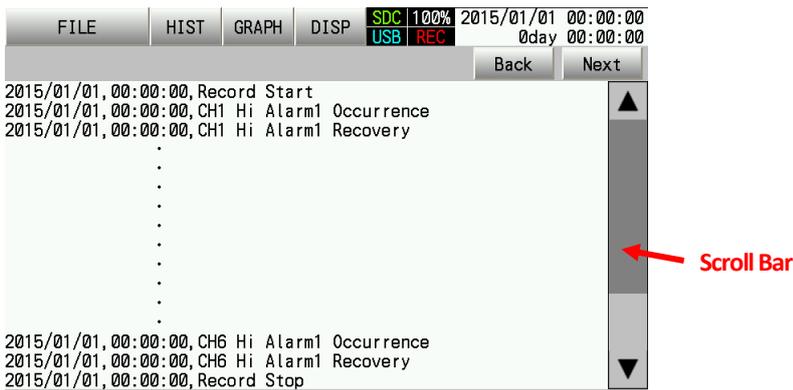
Also, if the area where the trend line is drawn is touched, ↑/↓ keys, ▲/▼ keys, and scroll bar will be displayed at the following portion of the screen (indicated by red boxes):

The cursor can be moved through ↑/↓ key.

Change the timeframe, which is displayed on top of the screen, by pressing ▲/▼ keys.



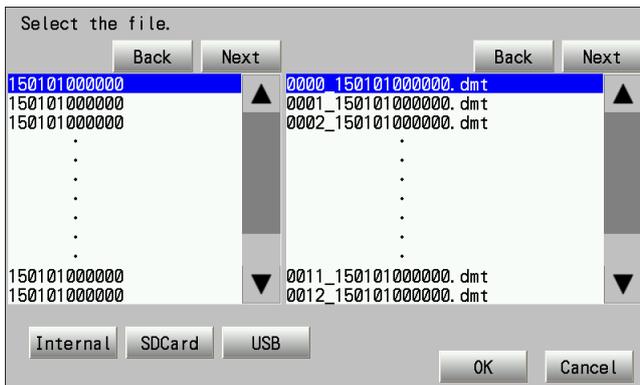
4.3.3. Event History



Displays events that were triggered within the time of the selected file.

Up to 100 events will be displayed per page. Navigation within the page shall be done by ▲/▼ keys and scroll bar. Use Previous Page and Next Page to change the page.

4.3.4. File Selection



Selects the file to be displayed with the historical trend.

Select the memory media (internal memory/SD card/USB memory) where the data is being recorded.

When memory media is selected, folders will be displayed on the left side of the screen while files that are contained in the selected folder will be displayed on the right side of the screen.

When the desired folder and file are selected and the OK key is pressed, the information of the selected file will be displayed on the original screen.

Pressing the Cancel key will display the original screen without opening the new file.

Up to 100 items per page for both folders and files will be displayed. Navigation within the page shall be done using ▲/▼ keys and scroll bar. Use Previous Page and Next Page to change the page.

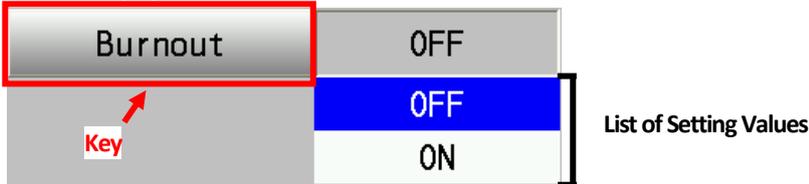
4.4. Settings

This section describes the basic operation to be performed at each setting. See [Section 6 List of Settings](#) for the list of setting values.

4.4.1. Basic Operation of Setting Screen

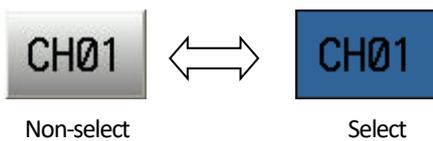
The method of setting operations differs depending on the setting. Methods of operation are as follows: [List Display](#); [Select/Non-select](#); [Text Input](#); and [Numerical Value Input](#).

4.4.1.1. List Display



The list of settings will be displayed by pressing the key. Touch the desired setting value to select. Press the key again to close the list of setting value.

4.4.1.2. Select/Non-select



Switching of non-select and select shall be done by touching the key.

4.4.1.3. Text Input



Displays the text input screen when the key is pressed. Input desired characters and press the "Enter" key.

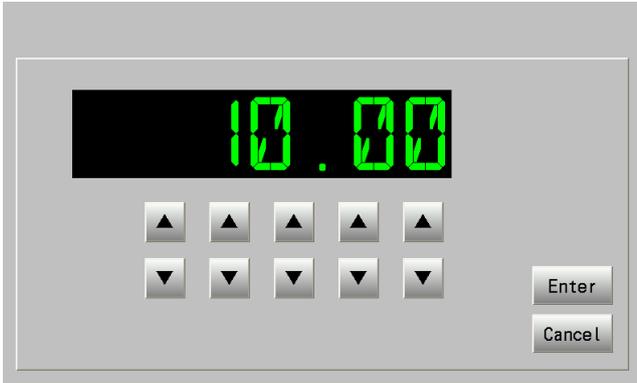


4.4.1.4. Numerical Value Input



Displays the numerical value input screen when the key is pressed.

Add or subtract values through ▲/▼ key to set the desired value and press "Enter" key.

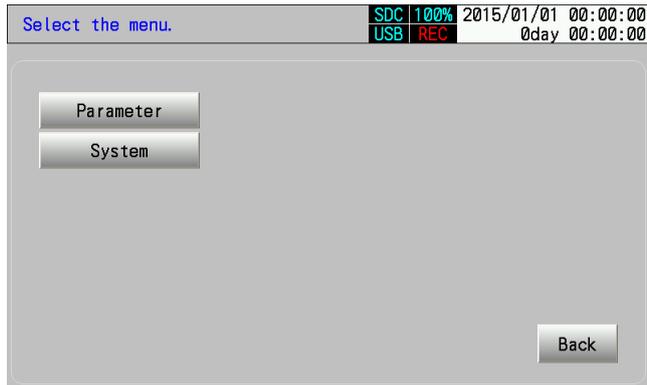


4.4.2. Unnecessary Settings

This product has a function that hides unnecessary settings in accordance with the settings condition.

Therefore, each setting screen may not display setting values in accordance with [Section 6List of Settings](#).

4.4.3. Main Menu

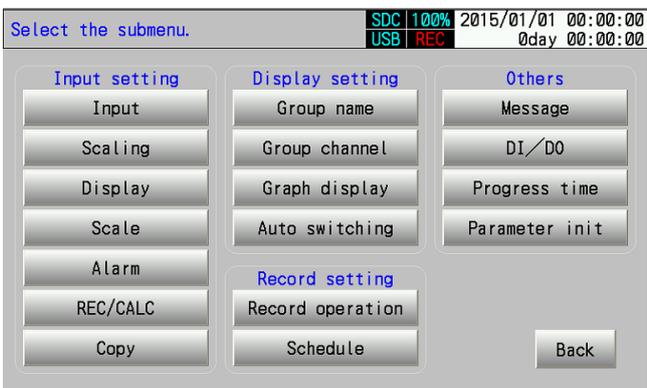


If parameter setting key is pressed, [4.4.4](#)Parameter Settings will be displayed.

If system setting key is pressed, [4.4.5](#)System Settings will be displayed.

Press Back key to go back to the original screen.

4.4.4. Parameter Settings



Pressing each submenu key will display the corresponding setting screen.

See [Section 6List of Settings](#) for settings to be displayed at each submenu.

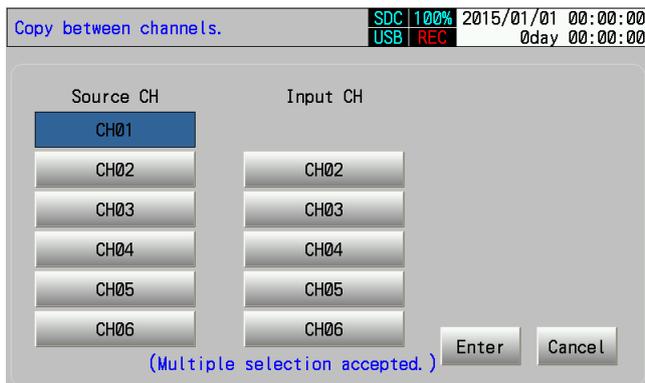
However, copying of setting value and initialization of parameters are not included in the setting screen.

See [4.4.4.1](#)Copying of Setting Value and [4.4.4.2](#)Initialization of Parameters for details.

4.4.4.1. Copying of Setting Value

Allows the user to copy the setting value of the [input](#) setting (except for the display color) between channels. Utilize this function if several sensors of the same kind will be used.

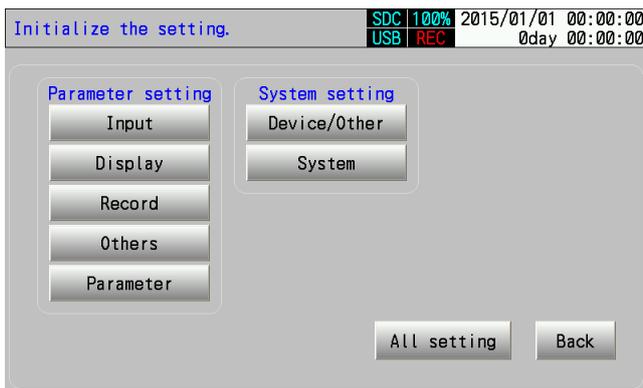
(Cannot be operated during recording)



Select the channel from the copy source. Select the channel where the setting value of the selected channel is to be copied. Press the "Enter" key. (See [4.4.1.2 Select/Non-select](#))

Press the Cancel key to cancel the copying and go back to the original screen.

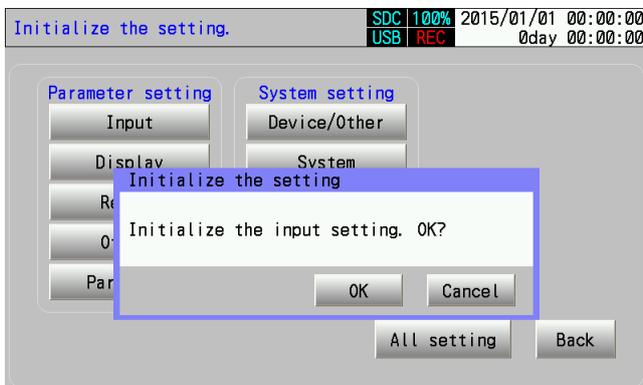
4.4.4.2. Initialization of Parameters



Allows the user to initialize the group of settings that corresponds to each key (see [Section 6 List of Settings](#)).

(Cannot be operated during recording)

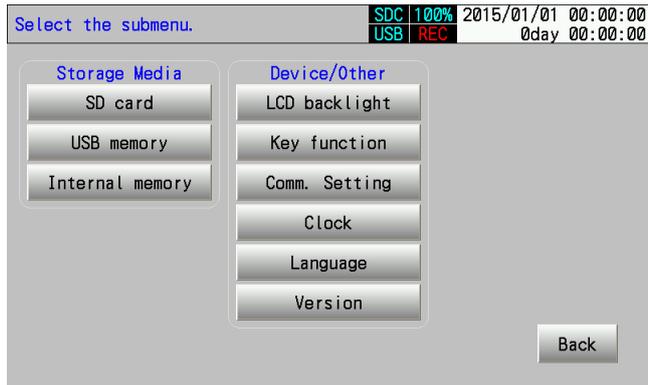
Pressing any key will display the following confirmation pop-up screen:



Press the OK key to initialize the setting group that corresponds to the selected key and close the pop-up screen.

Press the Cancel key to close the pop-up screen without performing the initialization.

4.4.5. System Settings



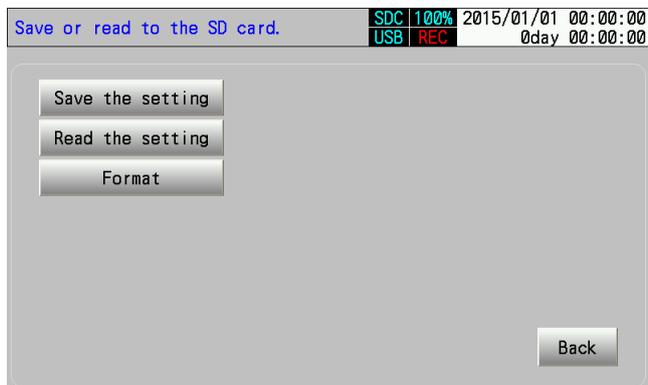
Pressing each submenu key will display the corresponding setting screen.

See [Section 6List of Settings](#) for settings to be displayed at each submenu.

Provided, however, that SD card, USB memory, internal memory, and version are not included in the setting screen.

See [4.4.5.1SD Card, USB Memory, and Internal Memory](#) and [4.4.5.2Version](#) for details.

4.4.5.1. SD Card, USB Memory, and Internal Memory

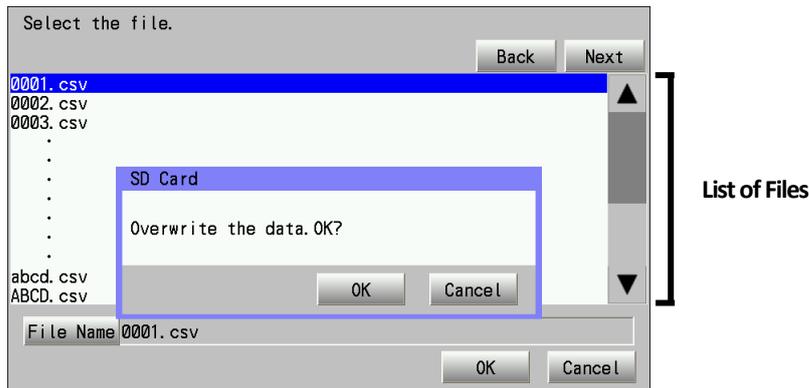


Allows the user to perform the following operations to each memory: [save or read setting values](#), and [format](#) (for the internal memory, the user is only allowed to format).

(Cannot be operated during recording)

◆ How to Read Files

If the setting value reading key is pressed, the following screen will be displayed:



Select the desired file from the file list and press the OK key to reflect setting values in the file to the product.

※Up to 2000 files can be displayed in the file list.

Make sure that the number of setting value files in the external memory does not exceed 2000.

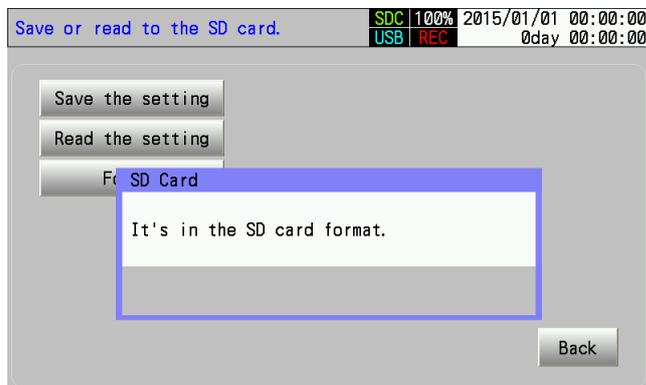
Format

A function that formats the subjected memory.

Product will erase all data in the subjected memory. Make sure that the subjected memory does not contain any data other than that for the product.

※ The event history is not deleted in the internal memory format.

If the format key is pressed, a pop-up screen appears to confirm the initialization.



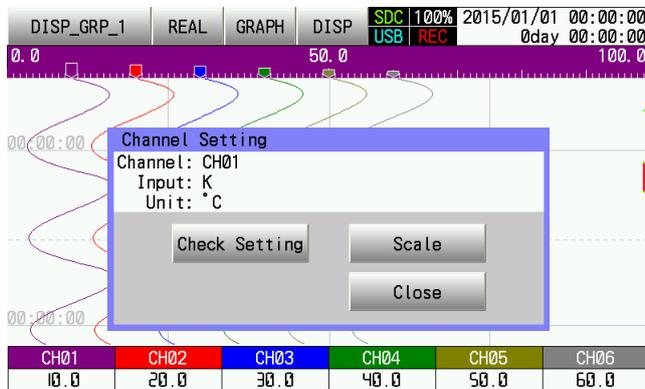
Press OK to execute the initialization (formatting). Press Cancel to cancel the initialization.

4.4.5.2. Version



Displays the software version of the product.

4.4.6. Channel Settings



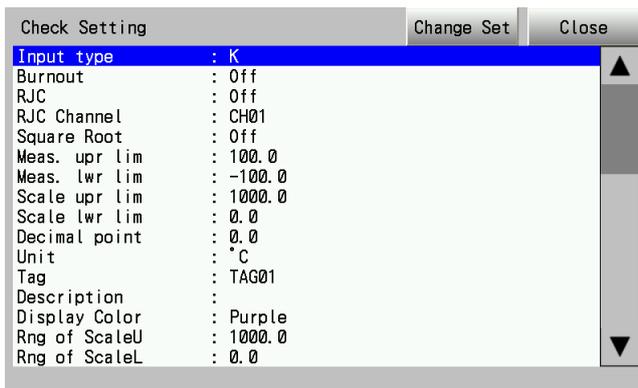
The above screen will be displayed by pressing the channel number key for 2 seconds.

If the setting verification key is pressed, a list of channel settings of the subjected channel will be displayed.

Displays the scale input screen when the scale key is pressed.

Press the Close key to close the channel setting pop-up screen.

Channel Setting List



Displays the list of setting values of the subjected channel.

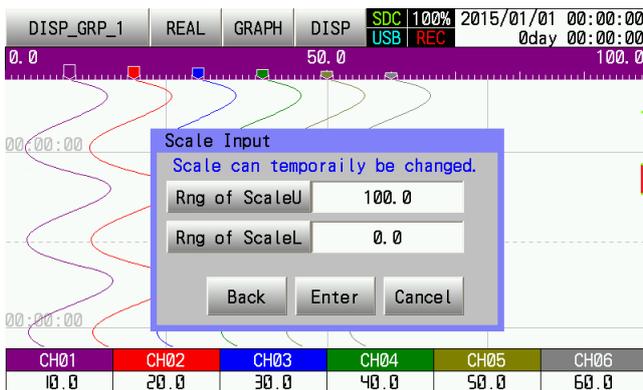
If the setting item is touched, the selected setting will be changed (selected setting: blue-colored row).

If the setting change key is pressed, the setting screen of the selected setting item will be displayed.

See [4.4](#) Settings for details.

Press the Close key to go back to the original screen.

Input Scale



Upper Limit Range Key and Lower Limit Range Key: Pressing them will display the [Numerical Value Input](#) screen, which allows the user to change the range of the scale.

Back Key: Sets the temporarily set scale range back to the saved setting value.

Enter Key: Allows the changed scale range to take effect.

Cancel Key: Discards changes.

Press the Back key, Enter key, or Cancel key to go back to the original screen.

Section 5 Function Description

5.1. Measuring Value

Performs a setting in accordance with the sensor to be used for each channel.

5.1.1. Method of Setting in Accordance with the Type of the Sensor

Method of setting per input type:

Temperature Sensor Input

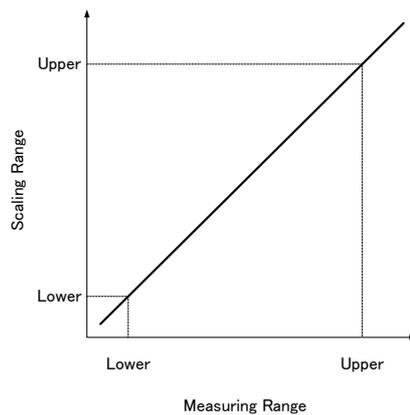
If thermocouple or platinum resistance thermometer sensor is used as the sensor, do the desire setting at [Input](#) Setting of Parameter Setting screen.

The measuring value of other channels can also be used as the reference junction temperature for more accurate measurement with the thermocouple sensor. See [5.1.2](#)RJC Function for details.

Current and Voltage Input

If the current and voltage output device is used as the sensor, do the desire setting at [Input](#) and [Scaling](#) Setting of Parameter Setting screen.

The relationship between the setting of upper/lower limit of measuring range(Meas. upr/lwr lim) at Scaling Setting and the upper/lower limit of scaling range(Scale upr/lwr lim) are asfollows:



Setting Sample: To display 0-1V input as "0.0%~100.0%"

Input Type: -1-1 (V)

Upper Limit of Measuring Range: 1.00

Lower Limit of Measuring Range: 0.00

Position of Decimal Point: 0.0

Upper Limit of Scaling Range: 100.0

Lower Limit of Scaling Range: 0.0

Unit: %

5.1.2. RJC Function

Since thermocouple is a sensor that uses Seebeck effect (electromotive force occurs in accordance with the difference in temperature between two edges of the sensor), temperature of the measuring edge side of the thermocouple can be measured by adding the temperature of the reference junction side (terminal board of the product).

RJC function allows the user to choose the temperature of the reference junction side between the measuring value of the internal circuit and the measuring value of other channels.

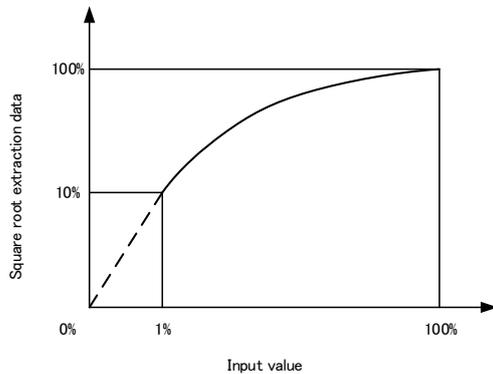
If the measuring value of other channels is used, a more accurate measurement can be achieved by using the sensor that is more accurate than the measurement accuracy of the internal circuit.

5.1.3. Square Root Operation

If the [square root](#) operation is turned ON, it sets the measurement range to 0-100% and performs the square root operation for the input value to convert it into a percentage.

It performs a scaling against the result of a square root operation and converts it into a measuring value.

When the value converted to percent (%) of the input value is a negative value, the square root extraction result shall be set to 0%.



Measurement values from 0% to 1% will be expressed by the straight line (broken line).

5.1.4. Correction of Measuring Value

Corrects the measuring value through offset and gain at [REC/CALC](#). It allows the user to correct the measuring error of sensor and product or to correct the difference between the value measured at the location where the sensor is installed and the value measured at the desired location.

The relationship between offset and gain is as follows:

$$Y = aX + b$$

X: Measuring value before the correction

Y: Measuring value after the correction

a: Setting of Gain

b: Setting of Offset

5.1.5. Remote

The operation changes depending on the [master / slave](#) switching of the communication settings.

Master operation: Data (settings, measured values, etc.) can be acquired from an external device with a slave function and recorded in this device via communication. (only RS-485 communication is supported)

The [timeout time](#) (1.0 to 30.0 seconds) and the [number of retries](#) (0 to 10 times) can be set.

If there is no response after the timeout time and the number of retries, or when an error is detected in the response message from the external device and the number of retries continues, an alarm output (setting required) or an error is displayed.

The data [acquisition cycle](#) can be set from 0 to 60 seconds. (Continuous when set to 0 seconds)

The slave device address (1 to 99) can be set. (Can be set for each channel)

<Functions under TOHO protocol only>

[The commands](#) (data) that can be acquired are as follows. (Can be set for each channel)

PV1 (measured temperature)

PV2 (input 2)

SV1 (control setting)

CSV (control SV)

MV1 (main control operation volume)

MV2 (secondary control operation volume)

<Functions under Modbus protocol only>

[The number of registers](#) can be set to 1 or 2 (1-word data or 2-word data).

(Can be set for each channel)

The order of the data part can be set as "little" or "big" in [endian](#). * 1

(Can be set for each channel)

[Register address](#) (absolute address: 30001 to 60000) can be set.

(Can be set for each channel)

- When the register address is 30001 to 40,000

The function code will be "04H".

The calculation method of the absolute address from the relative address of the function code "04H" is as follows.

Absolute address (register address) = relative address + 30001

-When the register address is 40001 to 60000

The function code will be "03H".

The calculation method of the absolute address from the relative address of the function code "03H" is as follows.

Absolute address (register address) = relative address + 40001

* 1 Endian setting is valid only when the number of registers is 2 (2-word data).

Check the specifications of the slave device and specify the 2-word data sequence.

Slave operation: Data (settings, measured values, etc.) of an external device with a master function can be written to and recorded in this device via communication. (Only Modbus protocol is supported)

The register address for writing the data of the external device is 0x3000 to 0x300A.

(Channel 1 to Channel 6). (Batch writing is possible)

Set the input type to "remote" in the [input](#) settings of the parameter settings. (Can be set for each channel)

When set to "Remote", make any settings in the [scaling](#) settings of the parameter settings.

Data is recorded at the timing of the recording cycle regardless of the communication timing.

After the power is turned on, "0" is recorded until it is written or read by communication.

If a communication error or communication failure occurs, the data before the error occurred will continue to be recorded.

Please refer to the communication manual for communication specifications.

Master operation (TOHO protocol) setting example)

When acquiring PV1 (10.0 ° C.) of an external device (device address: 99) having a slave function of the TOHO protocol by communication (acquisition cycle: 1 second), and recording it on channel 1 of this device.

(Measurement range: -10.0 ° C to 30.0 ° C)

Input type (channel 1): remote

Slave device address (channel 1): 99

Command selection (channel 1): PV1

Upper limit of measurement range (channel 1): 300

Lower limit of measurement range (channel 1): -100

Upper limit of scaling range (channel 1): 30.0

Lower limit of scaling range (channel 1): -10.0

Decimal point position (channel 1): 0.0

Unit (channel 1): ° C

Master / slave: Master

Communication protocol: TOHO

Acquisition cycle: 1 second

Master operation (Modbus protocol) setting example)

Control setting of an external device (device address: 50) that has a slave function of the Modbus protocol (RTU).

When acquiring (relative address: 0402H) by communication (acquisition cycle: 1 second) and recording it on channel 1 of this device.

(Setting range: -100.0 ° C to 100.0 ° C, the number of registers is 2, the data sequence in the data section is little endian.

Function code is "03H")

Input type (channel 1): remote

Slave device address (channel 1): 50

Number of registers (channel 1): 2

Endian (Channel 1): Little

Register address (channel 1): 41027 * 2

Upper limit of measurement range (channel 1): 1000

Lower limit of measurement range (channel 1): -1000

Upper limit of scaling range (channel 1): 100.0

Lower limit of scaling range (channel 1): -100.0

Decimal point position (channel 1): 0.0

Unit (channel 1): ° C

Master / slave: Master

Communication protocol: Modbus

Format: RTU

Acquisition cycle: 1 second

* 2 Register address (absolute address) = relative address + 40001

= 0402H + 40001 = 41027

(1026)

Slave operation setting example)

When writing and recording data (50.0 ° C) of an external device with a master function to channel 6 of this device via communication

(Measurement range is -100.0 ° C to 500.0 ° C)

Input type (channel 6): remote

Upper limit of measurement range (channel 6): 5000

Lower limit of measurement range (channel 6): -1000

Upper limit of scaling range (channel 6): 500.0

Lower limit of scaling range (channel 6): -100.0

Decimal point position (channel 6): 0.0

Unit (channel 6): ° C

Master / slave: slave

Communication protocol: Modbus

* The above is a function added from "Ver.04.05".

* Master operation (Modbus protocol) is a function added from "Ver.04.07".

5.2. Alarm

Allows the user to set up to 4 alarms per channel and outputs ON/OFF of the subjected alarm through ALM output/DO output. Setting shall be done at the [alarm](#) setting. It can also attach the [message](#) to the subjected alarm.

Alarm Type

Sets conditions to trigger the alarm.

OFF: Turn the alarm function OFF.

Upper Limit Alarm: Alarm occurs if Measuring Value \geq Alarm Setting Value is detected.

Lower Limit Alarm: Alarm occurs if Measuring Value \leq Alarm Setting Value is detected.

Abnormal Alarm: Alarm occurs if Abnormal Measuring Value (※ 1) is detected.

Communication alarm: An alarm is generated when a communication Error (* 2) is detected. (* 3)

- ※ 1: A state where input signal that exceeds the input range of the configured input type was detected (-H- or -L- is displayed), or burnout has occurred (B.OUT is displayed)
- 2: When the time-out time is exceeded during master operation and no response continues for the number of retries, or when an error is detected in the response message from the external device and the number of retries continues.
- 3: It is a function added from "Ver.04.05".

Alarm output destination

Sets the alarm output destination.

* The following are the functions added from "Ver.04.04".

If DO is set as the alarm output destination and is set to "remote" in the [DO](#) function settings, the remote operation shall be prioritized.

(If you select a DO for which "remote" is set, a  is displayed on the right side of the alarm output destination setting.)

Hysteresis

Sets to give allowance to alarm occurrence and resuming points. If the hysteresis is set, the alarm resuming point shall be the following:

Upper Limit Alarm: Measuring value < Alarm setting value - Hysteresis

Lower Limit Alarm: Measuring value > Alarm setting value + Hysteresis

Alarm Delay

This function is useful in the case where alarm is to be turned ON only if the above condition is continuously met for more than a given period.

5.3. Group

It can change the display condition per group (maximum of 8 groups).

See [6.1.2Display](#) for display conditions that can be set.

Switching of group shall be done by the group switching key (See [4.2.1Common Sections of Real-Time Trend](#)) or by automatic switching function.

Automatic Switching Function

When [auto display](#) is turned ON, the group will automatically be switched per time period that is set at the [change cycle](#) setting.

Group switching key can still be used.

Switching of group will not be performed at the historical trend display.

5.4. Record

Can set conditions of the contents to be recorded to the memory.

5.4.1. Record Cycle and File Record Cycle

Record Cycle: Sets the time interval of the recording of measurement value.

File Record Cycle(File rec. cy): It divides the file per time that was set.

Setting the range of the file record cycle varies depending on the setting value of the record cycle.

Record Cycle	Setting Range of File record Cycle
0.1 sec	10 mins
1sec, 2secs, 3secs, 5sec.	1 hr
10 secs, 15 secs, 20 secs, 30 secs, 1 min	1 hr, 1 day
2 mins, 3 mins	1 hr, 1 day, 1 week
5 mins, 10 mins, 15 mins, 20 mins, 30 mins	1 hr, 1 day, 1 week, 1 month
60 mins	1 hr, 1 day, 1 week, 1 month, 1 yr

5.4.2. Record Type

Can set the content to be recorded per channel.

OFF: Recording shall not be performed.

Inst. val: Records the measuring value of the record timing.

Average: Calculate and record the average value per record cycle.

Max/Min: Record the maximum/minimum value per record cycle.

If the record type is set to Average or Max/Min, then it computes or judges on a per sampling cycle (for this product, the sampling cycle is set to 100ms) basis.

Example: If the recording cycle is set to 1 second, then the value shall be the Average or Max/Min of 10 samplings.

5.4.3. Conditions to Start/Stop the Recording

As a default, start/stop of recording shall be done through the REC key. Through the setting, it can start/stop the recording in accordance with the following condition:

If there is more than one condition to start/stop the recording, then it starts or stops the recording when any of these conditions is met.

5.4.3.1. Schedule Function

Allows the user to set the time to start and stop the recording. It also allows the user to specify the date to activate the function on a per day of the week basis or on a daily basis. If the day of the week is specified, the function will start and end the recording only within the specified day of the week. Setting shall be done at [6.1.3.2Schedule](#).

If start time < end time, then the data from start time to end time of the subjected day will be recorded.

If start time \geq end time, then the data from start time of the subjected day to end time of the following day will be recorded.

Example Setting: Day of the week = Monday only, start time = 20:00:00, and end time = 05:00:00

Result: Data from Monday, 20:00, to Tuesday, 05:00, will be recorded.

If start time = end time, then the operation shall be the following:

Day of the Week Setting: Recorded data of the consecutive day of the weeks shall be treated as one record and will be kept in the same folder.

Example: If start time and end time = 12:00:00 while day of the week = Monday and Wednesday

Result: Data from Monday, 12:00, to Tuesday, 12:00, and from Wednesday, 12:00, to Thursday, 12:00, will be recorded.

If start time and end time = 12:00:00 while day of the week = Monday and Tuesday

Result: Data from Monday, 12:00, to Wednesday, 12:00, will be recorded.

Daily Setting: Since the stopping condition of the schedule function will be disabled, recording starts from the start date and will not stop unless the stopping condition set by the function other than the schedule is fulfilled.

In case of power failure during the start time, the recording starts if the power resumes anytime between the start time and end time.

Example) Day assigned (Monday Only), Start Time (05:00:00), End Time (12:00:00).

When the power fails at 04:00:00 and resumed at 09:00:00, the data between 09:00:00 of Monday to 12:00:00 of Monday will be recorded.

5.4.3.2. ON/OFF of DI

Allows the user to start/stop the recording through DI by setting the [function](#) setting of the desired DI number to Record ON/OFF.

Record starts with the ON signal of DI that was set and stops with the OFF signal.

Do not set Record ON/OFF to the function setting of more than one DI number.

5.4.3.3. Communication

Allows the user to start/stop the recording through the sending of specified command via communication function. See [5.11Communication](#) for detail.

5.4.4. Record Data

Creates the record file into inserted SD card or USB memory (hereinafter referred to as “external memory”) in accordance with the setting.

If no external memory is inserted, then the data will be saved in the internal memory. If the external memory is inserted while the data is being saved in the internal memory, the product will then copy the data from internal memory to the external memory and then delete the data in the internal memory.

If a pop-up such as "There is not enough free space in (external memory name)" appears during copying, there is not enough free space in the external memory. Replace with an external memory with sufficient free space.

If the external memory is not inserted, the product will then display the remaining capacity of the internal memory at the remaining memory capacity display section (see 4.1 Common Display Section).

Copy the data from the internal memory to the external memory before the memory of the internal memory runs out.

The Maximum Number of data that can be copied at one time from the internal memory to the external memory would be 4096 data. When a copy reaches to its Maximum Number of data, the copying of remaining data will start when the external memory is removed once and connected once again.

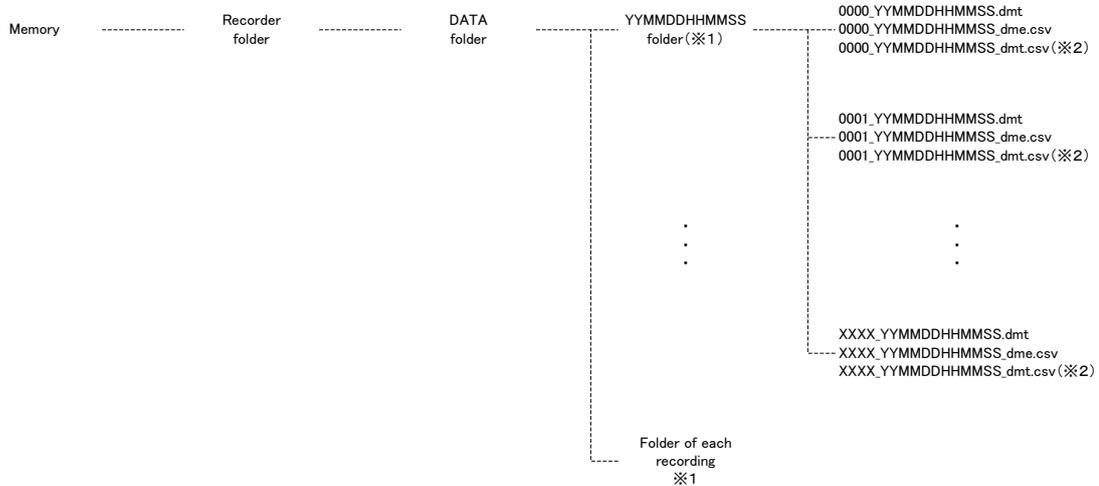
When the recorded data (no. of folders) in the internal memory are many, the initial reading may take some time.

Please copy the recorded data of the internal memory to the external memory.

The timing for copying data to the external memory is as follows.

- Insert external memory with data stored in internal memory. (excluding data being recorded)
- File recording cycle elapses during recording.
- Power OFF → ON during recording.
- Stop recording

Structure of Record Data to be Saved in the Memory



※1: Folder will be created per record under DATA folder. File name is determined by date and time the recording was started (or date and time the recording was resumed from the power interruption).

※2: File will be created per file recording cycle. File name “YYYYMMDDHHMMSS” will be the same as that of the folder name.

dmt File: Data for this product. Do not edit or delete this file alone.

csv Files: File with “_dme” at the last portion means that the file contains event information (hereinafter referred to as “Event Information File”) while file with “_dmt” at the last portion means that the file contains measuring value information of each channel (hereinafter referred to as “Data File”). If there is no event information, then the event information file will not be created.

To view the data in the external memory with PC, view it within a form of csv file.

To delete the data, delete the entire record folder.

5.5. Message

Allows the user to record the message with the desired trigger (timing) as the event information.

Setting shall be done at [6.1.4.1](#)Message.

Can set up to 20 messages. A trigger shall be set for each message.

If the FUNC key is to be set as the trigger, set the [FUNC key](#) setting to the message.

See [5.10](#)Event to verify messages that were set.

5.6. DI

Can set the function per DI. Other usage: It can also be used as the [message](#) trigger.

DI Function

OFF: Turn DI function OFF (DI ON / OFF status can be confirmed by communication)

Record ON/OFF: Starts/stops the recording through DI. See [5.4.3.2](#)ON/OFF of DI for details.

LCD ON/OFF: Switches the state of LCD backlight between active and sleep. See [5.12](#)LCD Backlight for details.

5.7. DO

Functions can be set for each DO.

DO Function

Alarm: Operates as an alarm output.

Remote: Operates by communication (USB communication, RS-485) from an external device with a Modbus master function.

The communication protocol is compatible only with Modbus.

The register address written from the external device is 0x2012. (Can be specified in bit units)

Please refer to the communication manual for communication specifications.

Even if DO is assigned to the alarm output destination in the [alarm](#) settings, the remote operation shall be prioritized.

Example): When turning ON DO01 of this device by communication from an external setting device.

DO function setting DO01: remote

Write data from an external device with DO01 (bit0) of register address 0x2012 set to 1.

* The above is a function added from "Ver.04.04".

5.8. Lapse Time

Displays at lapse time display section (See [4.1](#) Common Display Section) the lapsed time of which the condition that was specified at the [lapse time\(Progress time\)](#) setting is met. Note: Above will not be displayed if the lapse time display setting is turned OFF.

State to add the lapse time

Record: Record state

ALARM ON: Turn the alarm ON for the subject

DI: Turn DI ON for the subject

Reset the Lapse Time

- At the timing where addition is to be performed after the cancellation of the setting condition
- By pressing the time reset key at the [lapse time\(Progress time\)](#) setting

Lapse time shall not be recorded in the record data.

5.9. FUNC Key

The function of the FUNC key can be set at the [FUNC key](#) setting.

OFF: No FUNC key function.

Display sequence per pressing of the FUNC key: "Trend Screen"⇒"Parameter Setting"⇒"System Setting"⇒"Trend Screen" and so on.

Message: Desired message function will be performed through the pressing of the FUNC key. See [5.5](#) Message for details.

5.10. Event

Events can be viewed at the event history (See [4.2.5](#) Event History and [4.3.3](#) Event History) and event information file of the [record data](#). Whenever the event is triggered, the corresponding symbol will be displayed at the event and alarm display section of the [trend screen](#).

Conditions of occurrence of each event are the following:

Power supply on: Power ON

Power fail recovery: Power failure recovery occurred during recording

Record Start: Start the recording

Record Stopt: Stop the recording

Alarm Occurrence: Turn the alarm ON for the subject

Alarm Recovery: Turn the alarm OFF for the subject

Message: Detect the timing of the subject

5.11. Communication

Serial communication is performed by RS-485 and USB.

The operation changes depending on the master / slave switching of the communication settings.

Master function: Data (settings, measured values, etc.) can be acquired from an external device that has a slave function and recorded on this device. (Only RS-485 communication is supported)

Slave function: Data (settings, measured values, etc.) of an external device with a master function can be written to and recorded in this device. (Only Modbus protocol is supported)

You can also set and monitor. (Supports all protocols)

Please refer to the communication manual for communication specifications.

* The above is a function added from "Ver.04.05".

5.12. LCD Backlight

Reduces the brightness during sleep mode in order to prolong the life of LCD backlight. Setting shall be done at [6.2.1](#)LCD backlight.

Conditions to Switch from Active to Sleep

If all the above conditions are met for a time period that was specified at the sleep time setting(※), then sleep mode will be activated.

(※···If the sleep time is set to 0 minutes, there will be no sleep)

- No Key Operation
- All [DI function](#)' settings are other than "LCD ON/OFF," or [DI function](#) with "LCD ON/OFF" is being turned OFF.
- Alarm resume setting is turned OFF or alarm resume setting is turned ON, but alarm is turned OFF.

Conditions to Switch from Sleep to Active

Switches to active if any of the conditions below is detected.

- Press the key
- Any of the [DI function](#) is set to "LCD ON/OFF" while the subjected DI is being turned ON
- Alarm is turned ON while alarm resume setting is turned ON

Section 6 List of Settings

Lists down name, setting range, and initial value of each setting. Those settings with the description "per ..." at the remark column means that the setting shall be done on a per subject basis.

In such case, setting shall be done while switching the subject by the key that is located at the screen as shown in the figure below.



The above example is the case where the setting is made per channel.

6.1. Parameter Settings

6.1.1. Input Settings

6.1.1.1. Input

Name	Setting Range	Initial Value	Remark
Input Type *2	K	K	Per Channel (Max CH06)
	J		
	T		
	E		
	R		
	S		
	B		
	N		
	U		
	L		
	WRe5-26		
	PR40-20		
	PL2		
	Pt100		
	JPt100		
	-10-10(mV)		
	0-20(mV)		
	0-50(mV)		
-1-1(V)			
-10-10(V)			
0-10(V)			
4-20(mA)			
Remote *1			
Burnout *2	OFF	OFF	
	ON		
RCJ *2	Internal	Internal	
	Specified Channel		
	OFF		
RCJ Channel *2	CH01	CH01	
	CH02		
	CH03		
	CH04		
	CH05		
	CH06		

*1 This is a function added from "Ver. 04.04".

*2 Cannot be set during recording.

Name	Setting Range	Initial Value	Remark
Slave Equipment Address *1,*3	1-99	1	Per Channel (Max CH06)
Command Selection *1,*3	PV1 (Measured Temperature)	PV1	
	PV2 (Input 2)		
	SV1 (Control Setting)		
	CSV (Control SV)		
	MV1 (Main Control Operation Amount)		
	MV2 (Secondary Control Operation Amount)		
No. of Registers *2,*3	1	2	
	2		
Endian *2,*3	Little	Little	
	Big		
Register Address *2,*3	30001-60000 (Absolute Address)	40001	

*1 This is a function added from "Ver. 04.05".

*2 This is a function added from "Ver. 04.07".

*3 Cannot be set during recording.

6.1.1.2. Scaling

Name	Setting Range	Initial Value	Remark	
Square root *2	OFF	OFF		
	ON			
Meas. upr lim (Upper limit of measuring range) *2	Input voltage/current Meas. lwr lim - 327.67(mV, V, mA) Remote *1 Lower limit of measuring range(digit)~32767	Input voltage/current :10.00 Remote:1000 *1	Per Channel (Max CH06)	
Meas. lwr lim (Lower limit of measuring range) *2	Input voltage/current -327.68(mV, V, mA) - Meas. upr lim Remote *1 -32768~Upper limit of measuring range(digit)	Input voltage/current :-10.00 Remote:-1000 *1		
Scale upr lim (Upper limit of scaling range) *2	Input voltage/current, Remote Scale lwr lim - 32767(digit)	1000.0		
Scale lwr lim (Lower limit of scaling range) *2	Input voltage/current, Remote -32768(digit) - Scale upr lim	0.0		
Decimal Point *2	0	1/digit		0.0
	0.0	0.1/digit		
	0.00	0.01/digit		
	0.000	0.001/digit		
	0.0000	0.0001/digit		
Unit *2	°C	%		
	°F			
	K			
	mV			
	V			
	mA			
	A			
	mW			
	W			
	%			
	%RH			
	ppc			
	ppm			
	ppb			
	%O ₂			
	µS/cm			
	mbar			
	bar			
	Pa			
	kPa			
	MPa			
	kgf/cm ²			
	kg/h			
	L/s			
	L/min			
	L/h			
m ³ /min				
m ³ /h				
Nm ³ /min				
Nm ³ /h				

*1 This is a function added from "Ver. 04.04".

*2 Cannot be set during recording.

Name	Setting Range	Initial Value	Remark
Unit *1	mm/s	%	Per Channel (Max CH06)
	m/s		
	m/min		
	m/h		
	m/s ²		
	rpm		
	mm		
	cm		
	m		
	mm ³		
	cm ³		
	m ³		
	g		
	kg		
	t		
	L		
pH			
(No Unit)			

*1 Cannot be set during recording.

6.1.1.3. Display

Name	Setting Range	Initial Value	Remark
Tag *1	Any character	CH01:TAG01 CH02:TAG02 CH03:TAG03 CH04:TAG04 CH05:TAG05 CH06:TAG06	Per Channel (Max CH06)
Description *1	Any character		
Display Color *1	Red	CH01:Purple CH02:Red CH03:Green CH04:Blue CH05:Olive CH06:Gray	
	Green		
	Blue		
	Purple		
	Yellow		
	Aqua		
	Dark Red		
	Lime		
	Dark Blue		
	Bright Purple		
	Bule Green		
	Olive		
	Gray		
	Khaki		
Brown			
Orange			

*1 Cannot be set during recording.

6.1.1.4. Scale

Name	Setting Range	Initial Value	Remark
Rng of ScaleU (Upper limit of scale range) *1	Input voltage/current Rng of ScaleL - 32767(digit)	1000.0	Per Channel (Max CH06)
Rng of ScaleL (Lower limit of scale range) *1	Input voltage/current -32768 - Rng of ScaleU (digit)	0.0	
Scale No. *1	No.1	No.1	
	No.2		
	No.3		
Partitions *1	0-20	4	

*1 Cannot be set during recording.

6.1.1.5. Alarm

Name	Setting Range	Initial Value	Remark
Alarm Type	OFF	OFF	Per Channel (Max CH06), Per Alarm (Max Alarm04)
	Alm Up Lim		
	Alm Lw Lim		
	Abnl Alarm		
	Comm. Alarm *1		
Alm Tgt Conn	OFF	OFF	
	ALM		
	DO01-DO12		
Alarm Value	Input Thermocouple/Resistance Temperature Detector -3276.8-3276.7 (°C) Input voltage/current -32768-32767(digit)	0.0	
Hysteresis	Input Thermocouple/Resistance Temperature Detector 0.0-3276.7(°C) Input voltage/current 0-32767 (digits)	0.5	
Alm Dly (sec)	0.0-360.0	0.0	

*1 This is a function added from "Ver. 04.05".

6.1.1.6. REC/CALC

Name	Setting Range	Initial Value	Remark
Inp Fltr (sec) *1	0.0-99.9	0.0	Per Channel (Max CH06)
Record Type *1	OFF	Max./Min.	
	Inst. val		
	Average		
	Max/Min		
Offset *1	Input Thermocouple/Resistance Temperature Detector -3276.8-3276.7(°C) Input voltage/current -32768-32767 (digit)	0.0	
Gain *1	0.500-2.000 (times)	1.000	

*1 Cannot be set during recording.

6.1.2. Display Setting

6.1.2.1. Group name

Name	Setting Range	Initial Value	Remark
Group Display *1	OFF	Group1 : ON Group2-8 : OFF	
	ON		
Group Name *1	Any character	Group1:DISP_GRP_1 Group2:DISP_GRP_2 Group3:DISP_GRP_3 Group4:DISP_GRP_4 Group5:DISP_GRP_5 Group6:DISP_GRP_6 Group7:DISP_GRP_7 Group8:DISP_GRP_8	Per Group (Max Group8)
Label Display *1	Channel No.	Channel No.	
	Tag		

*1 Cannot be set during recording.

6.1.2.2. Group channel

Name		Setting Range	Initial Value	Remark
Group01 *1	CH01	Non-select	Select	
		Select		
	CH02	Non-select	Select	
		Select		
	CH03	Non-select	Select	
		Select		
	CH04	Non-select	Select	
		Select		
	CH05	Non-select	Select	
		Select		
	CH06	Non-select	Select	
		Select		
Group02 *1	CH01	Non-select	Select	
		Select		
	CH02	Non-select	Select	
		Select		
	CH03	Non-select	Select	
		Select		
	CH04	Non-select	Select	
		Select		
	CH05	Non-select	Select	
		Select		
	CH06	Non-select	Select	
		Select		
Group03 *1	CH01	Non-select	Select	
		Select		
	CH02	Non-select	Select	
		Select		
	CH03	Non-select	Select	
		Select		
	CH04	Non-select	Select	
		Select		
	CH05	Non-select	Select	
		Select		
	CH06	Non-select	Select	
		Select		
Group04 *1	CH01	Non-select	Select	
		Select		
	CH02	Non-select	Select	
		Select		
	CH03	Non-select	Select	
		Select		
	CH04	Non-select	Select	
		Select		
	CH05	Non-select	Select	
		Select		
	CH06	Non-select	Select	
		Select		

*1 Cannot be set during recording.

Name		Setting Range	Initial Value	Remark
Group05 *1	CH01	Non-select	Select	
		Select		
	CH02	Non-select	Select	
		Select		
	CH03	Non-select	Select	
		Select		
	CH04	Non-select	Select	
		Select		
	CH05	Non-select	Select	
		Select		
	CH06	Non-select	Select	
		Select		
Group06 *1	CH01	Non-select	Select	
		Select		
	CH02	Non-select	Select	
		Select		
	CH03	Non-select	Select	
		Select		
	CH04	Non-select	Select	
		Select		
	CH05	Non-select	Select	
		Select		
	CH06	Non-select	Select	
		Select		
Group07 *1	CH01	Non-select	Select	
		Select		
	CH02	Non-select	Select	
		Select		
	CH03	Non-select	Select	
		Select		
	CH04	Non-select	Select	
		Select		
	CH05	Non-select	Select	
		Select		
	CH06	Non-select	Select	
		Select		
Group08 *1	CH01	Non-select	Select	
		Select		
	CH02	Non-select	Select	
		Select		
	CH03	Non-select	Select	
		Select		
	CH04	Non-select	Select	
		Select		
	CH05	Non-select	Select	
		Select		
	CH06	Non-select	Select	
		Select		

*1 Cannot be set during recording.

6.1.2.3. Graph Display

Name	Setting Range	Initial Value	Remark
Horz trend	OFF	ON	Per Group (Max Group8)
	ON		
Vert trend	OFF	ON	
	ON		
Bar graph	OFF	ON	
	ON		
Digital disp.	OFF	ON	
	ON		

6.1.2.4. Auto switching

Name	Setting Range	Initial Value	Remark
Auto display	OFF	OFF	
	ON		
Change cycle	5 sec	5 sec	
	10 sec		
	15 sec		
	30 sec		
	60 sec		

6.1.3. Record Settings

6.1.3.1. Record Operation

Name	Setting Range	Initial Value	Remark
Record Cycle *1	0.1 sec	1 sec	
	1 sec		
	2 sec		
	3 sec		
	5 sec		
	10 sec		
	15 sec		
	20 sec		
	30 sec		
	1 min		
	2 min		
	3 min		
	5 min		
	10 min		
	15 min		
	20 min		
	30 min		
60 min			
File rec. cy *1	10Minute	1 Hour	Selectable setting varies depending on the setting of the recording cycle. See Record Cycle and File Record Cycle
	1 Hour		
	1 Day		
	1 Week		
	1 Month		
	1 Year		
File overwrite *1	Disable	Disable	
	Enable		

*1 Cannot be set during recording.

6.1.3.2. Schedule

Name		Setting Range	Initial Value	Remark
Schedule *1		OFF	OFF	
		Week Day		
		Every Day		
Start Time *1		00:00:00-23:59:59	00 : 00 : 00	
End Time *1		00:00:00-23:59:59	00 : 00 : 00	
Day of the week specified *1	Sun	Non-select	Non-select	
		Select		
	Mon	Non-select		
		Select		
	Tue	Non-select		
		Select		
	Wed	Non-select		
		Select		
	Thu	Non-select		
		Select		
	Fri	Non-select		
		Select		
	Sat	Non-select		
		Select		

*1 Cannot be set during recording.

6.1.4. Others

6.1.4.1. Message

Name	Setting Range	Initial Value	Remark
Message *1	Any character		Per Message (Max message20)
Timing *1	OFF	OFF	
	Func Key		
	Alarm On		
	Alarm Off		
	DI ON		
	DI OFF		
Channel No. *1	CH01	CH01	
	CH02		
	CH03		
	CH04		
	CH05		
	CH06		
Alarm No. *1	Alarm 01	Alarm 01	
	Alarm 02		
	Alarm 03		
	Alarm 04		
DI No. *1	DI01	DI01	
	DI02		
	DI03		
	DI04		
	DI05		
	DI06		
	DI07		
	DI08		
	DI09		

*1 Cannot be set during recording.

6.1.4.2. DI/DO

Name	Setting Range	Initial Value	Remark
DI Function *2	OFF	OFF	Per DI
	Rec. ON/OFF		
	LCD ON/OFF		
DO Function *1,*2	Alarm	Alarm	Per DO
	Remote		

*1 This is a function added from "Ver. 04.04".

*2 Cannot be set during recording.

6.1.4.3. Progress time

Name	Setting Range	Initial Value	Remark
Progress time *1	OFF	OFF	
	ON		
Condition *1	Record	Record	
	Alm ocrd		
	DI		
Channel No. *1	CH01	CH01	
	CH02		
	CH03		
	CH04		
	CH05		
	CH06		
	All		
Alarm No. *1	Alarm 01	Alarm 01	
	Alarm 02		
	Alarm 03		
	Alarm 04		
	All		
DI No. *1	DI01	DI01	
	DI02		
	DI03		
	DI04		
	DI05		
	DI06		
	DI07		
	DI08		
	DI09		

*1 Cannot be set during recording.

6.2. System Settings

6.2.1. LCD backlight

Name	Setting Range	Initial Value	Remark
Slp t (min)	0-60	5	
Actv. brt.	2-5	5	
Slp brt.	0-4	0	
Alm rcvy	OFF	ON	
	ON		

6.2.2. Key function

Name	Setting Range	Initial Value	Remark
FUNC Key	OFF	OFF	
	Switching of Screen		
	Message		
Key Lock	OFF	OFF	
	ON		
Menu Lock	Free	Free	
	Parameter		
	System		
	All		
Hard Key Lock	Free	Free	
	REC		
	FUNC		
	REC+FUNC		

6.2.3. Comm. Settings

Name	Setting Range	Initial Value	Remark
Master/Slave *1,*3	Master	Slave	
	Slave		
Protocol *3	TOHO	TOHO	
	Modbus		
Format *3	Type 1/RTU	Type 1/RTU	
	Type 2/ASCII		
Comm. Address *3	1-99	1	
Comm. Speed *3	2400bps	9600bps	
	4800bps		
	9600bps		
	19200bps		
	38400bps		
Data Length *3	7bit	8bit	
	8bit		
Stop bit *3	1bit	2bit	
	2bit		
Parity check *3	OFF	OFF	
	EVEN		
	ODD		
BCC check *3	OFF	ON	
	ON		
Resp delay *3	0-250(mS)	0	
Time Out *1,*3	1.0 - 30.0 (Sec.)	1.0	
No. of Retries *1,*3	0 - 10 (Times)	3	
Acq. Cycle *1,*3	0 - 60 (Sec.) *2	1	

*1 This is a function added from "Ver. 04.05".

*2 When set to 0 seconds, it will be continuous.

*3 Cannot be set during recording.

6.2.4. Clock

Name	Setting Range	Initial Value	Remark
Year *1	(Year) 2000-2099		
Month *1	1-12		
Day *1	1-31		
Hour *1	0-23		
Minute *1	0-59		
Second *1	0-59		

*1 Cannot be set during recording.

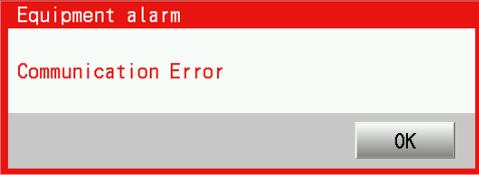
6.2.5. Language

Name	Setting Range	Initial Value	Remark
Language	English	Japanese	
	Japanese		

Section 7 Abnormal Display

7.1. Abnormal Display list

Display	Name	Occurrence conditions / Release method
	EEPROM Memory Error	Occurrence conditions: When data in EEPROM is not read correctly. Release method: If the problem occurs even when the power is turned on again, request repairs.
	FRAM Memory Error	Occurrence conditions: When data reading in FRAM is not performed normally Release method: If the problem occurs even when the power is turned on again, request repairs.
	Real Time Clock Error	Occurrence conditions: When the calendar information is not read correctly Release method: If the problem occurs even when the power is turned on again, request repairs.
	Internal Memory Error	Occurrence conditions: When reading / writing to the internal memory is not performed normally Release method: If the problem occurs even when the power is turned on again, request repairs.
	SD Card Error	Occurrence conditions: When reading / writing to the SD card is not performed normally Release method: Replace the SD card. If the error occurs even after replacement, request repairs.
	USB Memory Error	Occurrence conditions: When reading / writing to the USB memory is not performed normally Release method: Replace the USB memory. If the error occurs even after replacement, request repairs.
	Clock Battery Low Alarm	Occurrence conditions: When the voltage of the built-in watch battery is low Release method: The battery needs to be replaced. Please ask for repair.

Display	Name	Occurrence conditions / Release method
 <p>The screenshot shows a red header bar with the text 'Equipment alarm'. Below it, the text 'Communication Error' is displayed in red. At the bottom right, there is a grey button labeled 'OK'.</p>	Communication Error*1	<p>Occurrence condition: When the time-out time is exceeded during the master operation and there is no response for the number of retries, or when an error is detected in the response message from the external device and the number of retries continues.</p> <p>How to cancel: Check the communication connection. If it still occurs even after checking the connection, please request for a repair job.</p> <p>Check if there are any mistakes in the response message from the external device.</p>
 <p>The screenshot shows a red header bar with the text 'Equipment alarm'. Below it, the text 'Internal Memory Out Of Space' is displayed in red. At the bottom right, there is a grey button labeled 'OK'.</p>	Internal Memory Out Of Space	<p>Occurrence conditions: When the file overwrite prohibition is set and the data written to the internal memory exceeds the free space</p> <p>Release method: Insert SD card or USB memory and move the data. Please change the setting to allow file overwrite.</p>
 <p>The screenshot shows a red header bar with the text 'Equipment abnormality'. Below it, the text 'Input Circuit Error' is displayed in red. At the bottom right, there is a grey button labeled 'OK'.</p>	Input Circuit Error	<p>Occurrence conditions: When an abnormal input circuit is detected</p> <p>Release method: If the problem occurs even when the power is turned on again, request repairs.</p>

*1 This is a function added from "Ver. 04.05".

Section 8 Product Specifications

8.1. Ratings and performance

8.1.1. Input Point	6 points
8.1.2. Input Circuit	Input Mutual Insulation
8.1.3. Measuring Cycle	100 msec.
8.1.4. Input Type	DC voltage, DC current (shunt resistor is required), thermocouple, and resistance temperature detector
8.1.5. Burn Out Function	Originally equipped with thermocouple and mV voltage input
8.1.6. CMRR	120dB or higher
8.1.7. NMRR	40dB or higher
8.1.8. Allowable Signal Source Resistance	If the burn out is ON, the effect is approximately $0.18\mu\text{V}/\Omega$ Lead wire resistance of resistance temperature detector is less than 5Ω

8.1.9. Measurement range

Table 1 Measurement range and indicated resolution

Type	Measurement range	Maximum resolution	Accuracy rating (for F.S.)	Note
mV	-10.00 to +10.00	10 μ V	$\pm(0.1\%+1\text{digit})$	*1 0 to 200°C: $\pm(0.15\%+1\text{digit})$ *2 0 to 400°C:4% 400 to 800°C: $\pm(0.15\%+1\text{digit})$ *3 $\pm(0.2\%+1\text{digit})$ *4 0 to 300°C: $\pm(1.5\%+1\text{digit})$ 300 to 800°C: $\pm(0.8\%+1\text{digit})$
mV	0.00 to +20.00	10 μ V		
mV	0.00 to +50.00	10 μ V		
V	-1.000 to +1.000	1mV		
V	-10.00 to +10.00	10mV		
V	-0.00 to +10.00	10mV		
mA	4.00 to 20.00	0.01mA		
K	-200.0 to +1372.0	0.1°C	$\pm(0.1\%+1\text{digit})$ However, -200.0 to 0.0°C $\pm(0.15\%+1\text{digit})$	
J	-200.0 to +1200.0	0.1°C		
T	-200.0 to +400.0	0.1°C		
E	-200.0 to +1000.0	0.1°C		
R *1	-50.0 to +1768.0	0.1°C		
S *1	-50.0 to +1768.0	0.1°C		
B *2	0.0 to +1800.0	0.1°C		
N	-200.0 to +1300.0	0.1°C		
U	-200.0 to +400.0	0.1°C		
L	-200.0 to +900.0	0.1°C		
WRe5-26 *3	-0.0 to +2300.0	0.1°C		
PR40-20 *4	-0.0 to +1880.0	0.1°C	$\pm(0.2\%+1\text{digit})$	
PL II	-0.0 to +1390.0	0.1°C	$\pm(0.1\%+1\text{digit})$ However, -200.0 to 0.0°C $\pm(0.15\%+1\text{digit})$	
Pt100	-200.0 to +850.0	0.1°C	$\pm(0.1\%+1\text{digit})$	
JPt100	-200.0 to +510.0	0.1°C		

※ Connect shunt resistor upon current input.

Thermocouple Standard : K, J, T, E, R, S, B and N are JIS C 1602-2015; U and L are DIN; and WRe5-26 and PR40-20 are ATSM
Resistance Temperature Detector : Pt100 and JPt100 are JIS C 1604-2013

[Caution] Applicable under the basic condition. Accuracy of the reference junction compensation will not be included in the digital display accuracy.

Accuracy of the reference junction compensation shall be the following:

- Accuracy of the reference junction compensation : R, S, B, PR40-20, WRe5-26 : $\pm 1^\circ\text{C}$
K, J, T, E, N, U, L, PL II : $\pm 0.5^\circ\text{C}$
- Basic Condition: Ambient Temperature : $23^\circ\text{C}\pm 2^\circ\text{C}$
Ambient Humidity : $55\pm 10\%\text{RH}$
Power Supply Voltage : 85 to 250V AC
Power Supply Frequency : 50/60Hz $\pm 1\%$
Warm Up Time : More than 30 minutes from the time the power is turned ON

8.1.10. Display Sections**8.1.10.1. Display Sections**

7-inch wide TFT color LCD (800x480dots)

With touch panel and backlight. Brightness can be adjusted.

LCD may have some picture elements that light at all times or do not light at all. Also, due to the characteristic of LCD, its screen brightness may be uneven. Please be noted that these are not a defect.

8.1.10.2. Display Color

16 colors

8.1.10.3. Life of a Backlight

30,000 hours

(Life may be extended if LCD turn off function is used.)

8.1.11. Operation Buttons**8.1.11.1. No. of Buttons**

3 (can be operated by opening the cover at the lower portion of the front side of the recorder)

8.1.11.2. Function

REC: Starts/stops the recording

MENU: Displays setting screens

FUNC: Executes the pre-assigned function

8.1.12. Recording Function**8.1.12.1. External Memory**

SD Memory Card (Compatible with SD/SDHC standards Class 6 and higher)

USB Memory (Compatible with USB 2.0 standards)

8.1.12.2. Internal Memory

4GB

8.1.12.3. Memory Capacity

SD Memory Card: SD Standard: Max. 2GB

SDHC Standard: Max. 32GB

USB Memory: Max. 32GB

8.1.12.4. Supported File Systems

FAT16/FAT32

8.1.12.5. Saving Capacity

Recording capability under the following conditions:

Input Point: 6 points

Recording Type: Record maximum/minimum value

No occurrence of event, such as alarm and message.

SD Memory Card /USB Memory Capacity	4GB				
File Saving Cycle	1 hr.			1 day	
Data Recording Cycle	1 second	2 seconds	5 seconds	10 seconds	1 minute
Recording Capacity (Estimated)	0.5 years	1.0 years	2.5 years	5.0 years	30.0 years

※ Recording beyond the product life shall not be guaranteed.

8.1.12.6. Data Format CSV Format**8.1.13. Alarm Functions****8.1.13.1. No. of Settings**

Can set up to 4 points per channel

8.1.13.2. Alarm Output

Common Alarm Output 1 point (Open collector output)

Contact Rating: 30V DC 20mA/point

8.1.14. Power**8.1.14.1. Rated Power Supply Voltage**

100~240V AC

8.1.14.2. Voltage Range

85~250V AC

8.1.14.3. Power Supply Frequency

50/60Hz (Common)

8.1.14.4. Power Consumption

Approx. 32VA (AC250V)

8.1.15. Structure**8.1.15.1. Method of Attachment**

Attached to a panel (vertical panel)

8.1.15.2. Posture of Attachment

Backward 0~30 degrees, left and right horizontal

8.1.15.3. Panel Thickness

2~7mm

- 8.1.15.4. Material** PC-ABS for both case and bezel
- 8.1.15.5. Color** Gray
- 8.1.15.6. Dimensions** 185 (W) ×160 (H) ×188 (D) mm
- 8.1.15.7. Weight** 1.4kg
- 8.1.15.8. External Terminal Board** M4 Screw Terminal
- 8.1.16. Normal Operation Conditions**
- 8.1.16.1. Power Supply Voltage** 85~250V AC
- 8.1.16.2. Ambient Temperature** 0~50°C
- 8.1.16.3. Ambient Humidity** 20~80%RH
- 8.1.16.4. Warm Up Time** More than 30 minutes from the time the power is turned ON
- 8.1.17. Others**
- 8.1.17.1. Clock** With calendar function (calendar year)
Accuracy ±3.8ppm or less (Monthly error: Approx. 10 seconds)
Provided, however, that the error that may occur upon turning the power ON/OFF shall not be considered.
- 8.1.17.2. Memory Backup** Parameters will be saved in the internal flash memory
Clock will be backed up by the built-in lithium battery (Battery life (when not in use): Approx. 5 years)
- 8.1.17.3. Insulation Resistance** 20MΩ (between each terminal and ground with DC500V)
- 8.1.17.4. Voltage Endurance** Between input terminals ... 500V AC for 1 minute
Between power supply terminal and ground ... 2000V AC for 1 minute
Between input terminal and ground ... 500V AC for 1 minute
- 8.1.18. Compatible Standards**
- 8.1.18.1. Dust proofing/water proofing Standard** Based on JIS C0920 IP54 (front panel)
- 8.1.19. Transportation and Storage Conditions**
- 8.1.19.1. Temperature** -10~60°C (without freezing and condensation)
- 8.1.19.2. Humidity** 5~90%RH
- 8.1.19.3. Vibration** 10~60Hz 2.45m/s² or less
- 8.1.19.4. Impact** 249m/s² or less (while inside the package)
- 8.1.20. Communication**
- 8.1.20.1. Communication Standard** RS-485
- 8.1.20.2. Communication Function** Electrical Specifications: Based on EIA RS-485
Protocol: Modbus RTU, Modbus ASCII, TOHO
Communication Method: Two-wire half-duplex: Start-stop synchronization
Data Type: Data Length: 7 and 8bits
Stopbit: 1 and 2bits
Parity: Odd, even, none
Communication Speed: 2400, 4800, 9600, 19200, and 38400bps
Maximum Number of Units that can be Connected: 32 units including master (multi-drop)
Communication Distance: Up to 500m (Total extension)
Connection Type: M4 Terminal board
- 8.1.20.3. Communication Standard** USB 2.0
- 8.1.20.4. Communication Function** Electrical Specifications: Based on USB-CDC
Protocol: Modbus RTU, Modbus ASCII, TOHO
Communication Method: Two-wire half-duplex: Start-stop synchronization

Data Type: Data Length: 7 and 8bits
Stopbit: 1 and 2bits
Parity: Odd, even, none
Communication Speed: 2400, 4800, 9600, 19200, and 38400bps
Maximum Number of Units that can be Connected: One is to one
Communication Distance: Up to 3m
Connection Type: USB Micro B terminal

8.1.21. DI/DO

8.1.21.1. DI

Non-voltage Contact Input (9 points), common
Photocoupler driven 5V DC Approx. 9mA/point
Connection Type: Connector (40 pins, DI/DO mixed)

8.1.21.2. DO

Open Collector Output (12 points) Common
Contact Rating: 30V DC 20mA/point
Connection Type: Connector (40 pins, DI/DO mixed)