VM8800A
Paperless Recorder

Instruction Manual

Ohkura

WXPVM88mnA0001E
November 2013 (5th edition)

Using This Device Safely

Thank you for your purchase of this recorder.

- Please read this Instruction Manual carefully to obtain a good understanding before preparing for the installation and operation of the recorder.
  Incorrect handling of the device could cause an accident or failure.
- The specifications for this recorder are subject to change for the purposes of product improvement without prior notice.
- Modifying the recorder without obtaining consent from Ohkura is strictly prohibited.
- We are not responsible for any accident caused by a modification made to the device without obtaining consent from Ohkura.
- The user of the recorder should keep this Instruction Manual.
- After reading this instruction manual, be sure to keep it at a place where it is always accessible to anybody who needs it.
- Be sure that this Instruction Manual is delivered to the person who uses it.

Manufacturer : Ohkura Electric Co., Ltd.

Model : See product nameplate

Serial number : See product nameplate

Made in Japan

Note 1: Windows XP/Vista/7 and Excel are registered trademarks of Microsoft Corporation in the US.

Note 2: Modbus is a registered trademark of Schneider Electric.

Note 3: Ethernet is a registered trademark of Fuji Xerox Co., Ltd.

The instruction manuals for this product are as follows:

No.	Title	Document code	Description
1	VM8800A Paperless Recorder Instruction Manual (this manual)	WXPVM88mnA0001E	Describes settings that concern general use of the recorder, all steps from wiring to operation, alarms, etc., as well as maintenance operation.
2	VM8000A Paperless Recorder Communication Function Instruction Manual	WXPVM80mnA0002E	Describes the communication functions using Modbus.
3	VM8000A Paperless Recorder Data Viewer Instruction Manual	WXPVM8000A0101E	Describes the Data Viewer, which comes with the recorder.
4	VM8000A Paperless Recorder Parameter Loader Instruction Manual	WXPVM8000A0102E	Describes the Parameter Loader, which comes with the recorder.

Observing signs

Warning	Please read carefully. Failure to follow warnings may result in injury or death.
Caution	Please read carefully. Failure to follow cautions may cause damage to the device.
[Caution]	Please follow this caution for proper use of device.
[Reference]	Please read this for device operation reference.

[Caution]

- This document may not be copied, in part or in whole, without obtaining consent from Ohkura.
- This document is subject to change without notice.

The following symbols are used on the device to ensure safe operation:

Symbols	
	Indicates a handling caution. Please refer to this Instruction Manual in order to protect yourself and the device.
	Indicates a protective ground terminal. Be sure to ground the terminal before operating the device.
	Indicates an electric shock warning. Indicates danger of electric shock unless you observe the warning.

To ensure safe use of the device, be sure to observe the following warnings as well as those noted in the text of this Instruction Manual.

⚠ Warnings

General
- Before handling a wire, fuse, or internal component, be sure to disconnect this device from the power supply in order to prevent electric shock.

Ground
- To prevent electric shock, be sure to ground the protective ground terminal before powering this device.
- Do not cut or disconnect the protective ground wire.

Power
- Make sure that the supply voltage of this device matches the voltage of the power supply.

Rated supply voltage:	100-240 VAC
Working voltage range:	85-264 VAC
Power frequency:	50/60 Hz
Power consumption:	100 VA max

Environment
- Do not use this device in an environment exposed to flammable, explosive, or corrosive gas, water, or steam.

Installation location:	Indoors
Altitude:	2000 m or less
Ambient temperature:	0 to 50°C
Ambient humidity:	20 to 80% RH (no condensation)
Overvoltage category:	II
Permissible degree of contamination: 2	
Shock resistance:	2 m/s^2 or less
Vibration resistance:	10-60Hz, 1m/s^3 or less
(Without anti-seismic support)	

I/O wiring
- Please turn the power off before installing I/O wires.

⚠ Cautions

I/O wiring	● Do not use free terminals for relay or other purposes.
Card insertion	● When inserting a CF card, verify the card orientation. An attempt to force a CF card into the recorder in the wrong direction could damage pins on the CF card or on the recorder. Note that damage due to reverse insertion is not included in the warranty coverage.
Internal	● Do not replace a PC board or other control. When perform, we cannot guarantee operation of the device. Be sure to contact your dealer or our sales representative.

[Cautions]

Manual	● Deliver the Instruction Manual to the user of the product. ● Be sure to read this manual before using the device. ● If you find something unclear or incorrect, or if there is missing information or other errors in the manual, kindly notify our sales representatives. ● After reading this manual, keep it stored safely near the device. ● If you lose or damage the manual, notify your dealer or our sales representative. ● You may not copy or duplicate this manual, in part or in whole, without obtaining consent from Ohkura
Installation	● When installing the device, wear safety shoes, helmets, and other protective gear and proceed with caution. ● Do not step or ride on the installed recorder because that could be dangerous.
Maintenance	●Only Ohkura service people or those with permission from Ohkura may replace or disassemble any unit, PC board, or other component of the device.
Disposal	● Dispose of used batteries as prescribed by local regulations. ● Do not burn plastic parts included in maintenance or replaceable components. Doing that is dangerous because it could produce a toxic gas.
Cleaning	● Wipe the surface of the device with a dry cloth to clean it. ● Do not use an organic solvent. ● Power down the device before cleaning.
Revision	● This Instruction Manual is subject to change without prior notice.
Disclaimer	● When operating, maintaining, and repairing the device, always observe the cautions outlined in this manual. We are not responsible for and do not guarantee against any damage to a device that is used without observing the cautions.

Table of Contents

1. Preface

1.1 About the Paperless Recorder

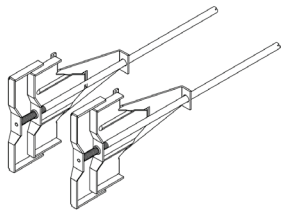
● This product is a paperless recorder that can display measurement data on a real-time basis on an LCD screen and hold data in a compact flash memory card (hereinafter referred to as a CF card). You can easily operate on it using an LCD module with a touch panel.

● You can freely configure up to 48 channels for thermocouple, resistance temperature detector (RTD), DC voltage (current) and other input types.

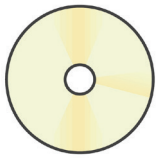
● Data saved on the CF card can be viewed on the display. You can also view this data on your PC by using the support software that comes with the recorder.

1.2 Checking Accessories

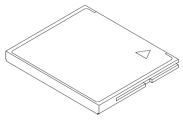
When the product arrives, visually check the product and its accessories for missing items and any damage. If you find anything missing or damaged, contact your dealer or our sales representative. Please make sure that the following accessories are included with the product.



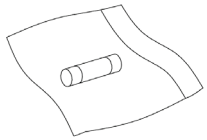
(1) Panel mounting brackets



(2) CD-ROM (Instruction Manual and support software)



(3) Compact flash (CF) card



(4) Fuse (250 V, 3 A)

Figure 1.1 Accessories

No.	Name	Model	Remarks
(1)	Panel mounting brackets	H4A13299	Panel mounting brackets
(2)	CD-ROM	WMSU0684A01	Instruction Manual and support software
(3)	CF card	WMSU0682A01	1 GB
(4)	Fuse	WPSJ011D000002A	Rating: 250 V, 3 A

1.3 About the Protection Sheet

This product affixes a protection sheet to an acrylic panel and topsheet area.

If set up is completed, please use a after tearing off the sheets.

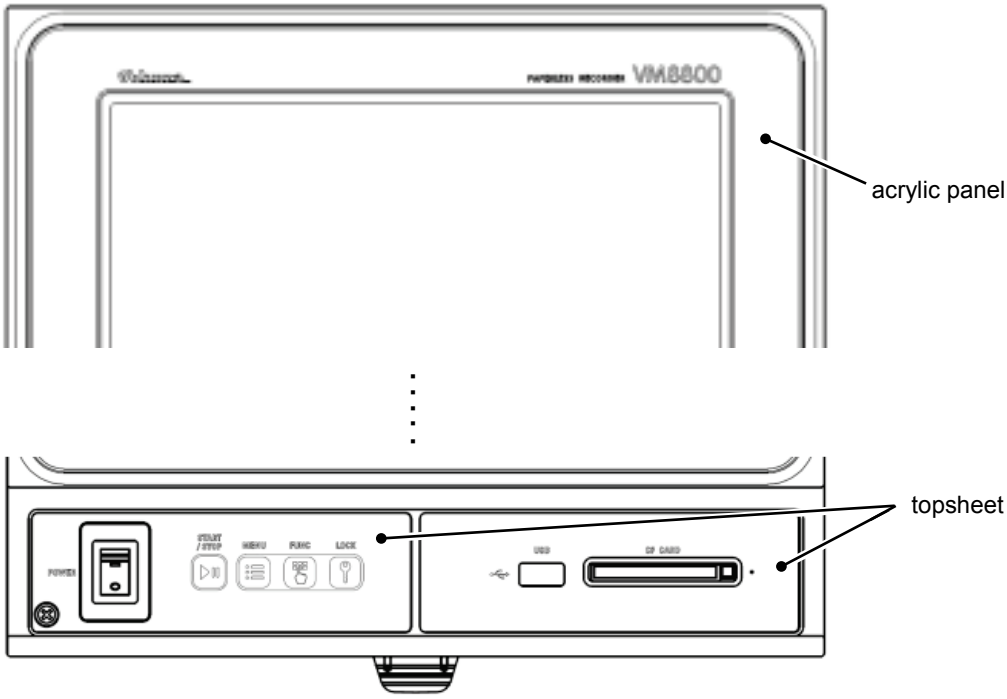


Figure 1.2 Acrylic panel and topsheet position

1.4 Temporary Storage

Keep this product in the following environment. This is also true when the product is installed in equipment.

⚠ Caution

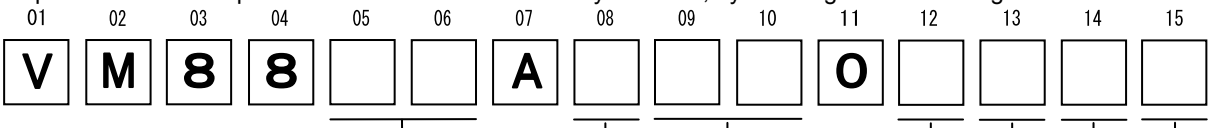
Storage of the product in an improper environment could compromise the appearance, function, lifetime, and other characteristics of the product.

Storage environment

- Do not expose to excessive dust
- Do not expose to any flammable gas, explosive gas, or corrosive gas (such as SO_2 or H_2S)
- Do not expose to vibration or shock
- Do not expose to water or steam or to high humidity (above 95% RH)
- Do not expose to direct sunlight or to high temperature (above 50°C)
- Not exposed to extreme cold (below -20°C)

1.5 Checking the Model and Specification

A nameplate marked with the model and other information is attached to the side of the inner module. Make sure that the specification for the product that has arrived matches your order, by referring to the following table:



[Input points]

Col.	Specification	Code
5-6	06 points	06
	12 points	12
	18 points	18
	24 points	24
	30 points	30
	36 points	36
	48 points	48

[Communication, USB]

Col.	Specification	Code
8	Ethernet	1
	Ethernet+USB	2
	Ethernet+RS485	3
	Ethernet+USB+RS485	4
	Auxiliary	9

[DI, DO, relays]

Col.	Specification	Code
9-10	None	00
	DO(16)	01
	DI(24)	02
	DI(5)	03
	8 relays	04
	DO(16)+DI(24)	05
	DO(16)+DI(5)	06
	DO(16)+8 relays	07
	DI(24)+DI(5)	08
	DI(24)+8 relays	09
	DI(5)+8 relays	10
	DO(16)+DI(24)+DI(5)	11
	DO(16)+DI(24)+8 relays	12
	DO(16)+DI(5)+8 relays	13
	DI(24)+DI(5)+8 relays	14
	DO(16)+DI(24)+DI(5) +8 relays	15
	30 relays	16

[Painting]

Col.	Specification	Code
12	<Door paint color>	
	N1.5 (standard)	1
	Auxiliary	9

[Structure]

Col.	Specification	Code
13	<Structure>	
	6-ch terminal block, short-depth, without anti-seismic(standard)	A
	6-ch terminal block, short-depth, with anti-seismic	B
	6-ch terminal block, long-depth, without anti-seismic	C
	6-ch terminal block, long-depth, with anti-seismic	D
	12-ch terminal block, short-depth, without anti-seismic	E
	12-ch terminal block, short-depth, with anti-seismic	F
	12-ch terminal block, long-depth, without anti-seismic	G
	12-ch terminal block, long-depth, with anti-seismic	H

[Software option]

Col.	Specification	Code
14	<Option>	
	No	0
	Yes	1

[Auxiliary]

Col.	Specification	Code
15	<Auxiliary specification>	
	No	0
	Auxiliary hardware	X
	Auxiliary software	Y
	Aux. HW and spec. SW	Z

1.6 About the Nameplate

A standard nameplate is attached. If you mount your custom acrylic resin or other nameplate, observe the following dimensions:

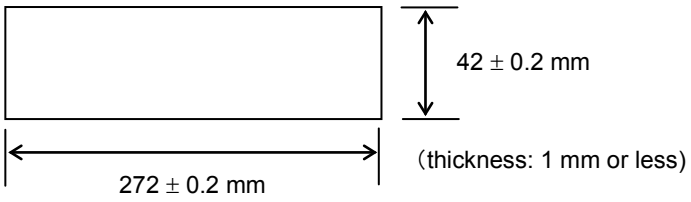


Figure 1.3 Recommended nameplate dimensions

Caution

If your custom nameplate does not conform to the recommended dimensions, it could damage the cover or mount.

1.7 Handling the CF Card and USB Memory

Use the CF card that comes with the recorder or our optional CF card.

Caution

- The CF card and USB memory (optional) that come with the product are formatted. You do not have to format them. If you need to format them, do that on the recorder. If you use the formatting function included in your PC, the formatted medium could fail to work correctly.
- When inserting the medium, confirm that the direction is correct and that the insertion is complete. A CF card that is forcibly inserted in the wrong direction is not recognized by the recorder and could cause the CF card and/or the recorder to become faulty. Note also that any product damage caused by inserting the card in the wrong direction is not included in the warranty coverage.
- While the CF card is in the process of recording, do not turn off the power or remove the CF card. Data could be corrupted or erased.
- If data on the CF card becomes corrupted, important record data will be lost. You should back up data saved on the CF card at least once a month.

● Approximate record capacity

An approximate record capacity that can be assumed when a 1-GB CF card is used is as follows. Note that the record capacity varies with the situation of alarm and message occurrences.

[Condition]
- Inputs: 6
- Record type: Maximum/minimum records (instant values are collected if the data record cycle is 100 ms)
- No alarm, message, or other event occurs.

CF card capacity	1 GB			
File save cycle	10 min	1 h		
Data record cycle	100 ms	1 s	5 s	10 s
Record capacity (approximate)	45 days	280 days	3.5 years	7.0 years

* If the product lifetime has expired, recording is not guaranteed.

● Data write timing

Record data is saved in internal memory and, by default, will be written to the CF card at the file save cycle. You can also configure the recorder so that record data is not output to the CF card. If you do so, please output record data manually. If no CF card is inserted, an output confirmation screen will appear when you insert a CF card.

2. Name and Function of Each Component

2.1 Name and Function of Each Component

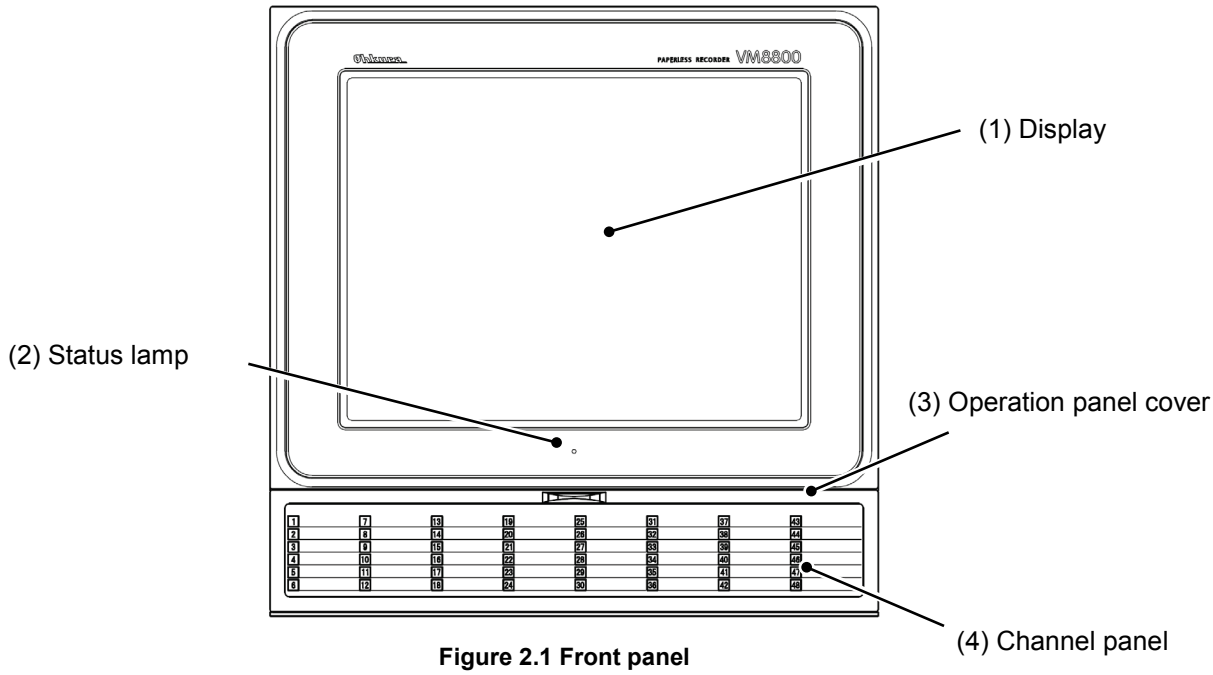


Figure 2.1 Front panel

(1) Display

This is an LCD with a touch panel. It displays measurement data and various parameters.

Using the touch panel, you can configure display and other settings.

(2) Status lamp

This lamp indicates whether the recorder is powered on or off, whether the LCD is on or off, and whether or not the recorder is in the process of recording.

Lamp status	Recorder status
Solid blue.	Power on, recording in progress.
Solid green.	Power on, recording not in progress.
Blinks red.	Power on, FAIL alarm ON.
Off	Power off.

(3) Operation panel cover

This cover protects the buttons, CF card insertion port, and USB memory insertion port.

For information on each button and insertion ports, see (5) to (11) below.

(4) Channel panel

You can write and display the name of each channel here.

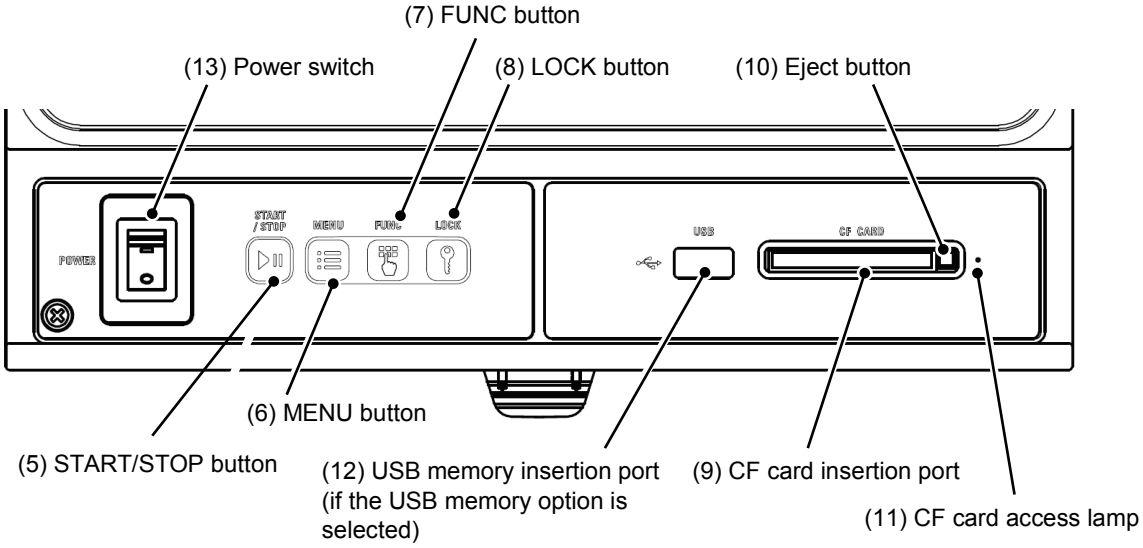


Figure 2.2 Operation panel (opened)

(5) START/STOP button

Starts or stops recording.

(6) MENU button

Displays the menu screen.

(7) FUNC button

Displays the FUNC menu. (For further information, see Section 6.11).

(8) LOCK button

When security is on, this button is used to apply or release a lock. (This button is disabled when security is off.)

(9) CF card insertion port

Insert a CF card into this port.

⚠ Caution

- Please check the orientation of the CF card carefully. Insertion of a CF card in the wrong orientation could damage the CF card or recorder.
- Improper removal of the CF card could prevent the CF card from recording data normally or could damage previously-saved data. Be sure to remove the CF card properly. (For further information, see Section 5.4.)

(10) Eject button

Use this button to remove the CF card.

(11) CF card access lamp

This lamp blinks while the CF card or USB memory is being accessed.

(12) USB memory insertion port (if the USB memory option is selected)

Insert USB memory through this port.

⚠ Caution

- Be careful of the USB memory orientation. Insertion of a USB memory in the wrong orientation could damage the USB memory or recorder.
- Improper removal of USB memory could prevent the USB memory from recording data normally or could damage previously-saved data. Be sure to remove the USB memory properly. (For further information, see Section 5.5.)

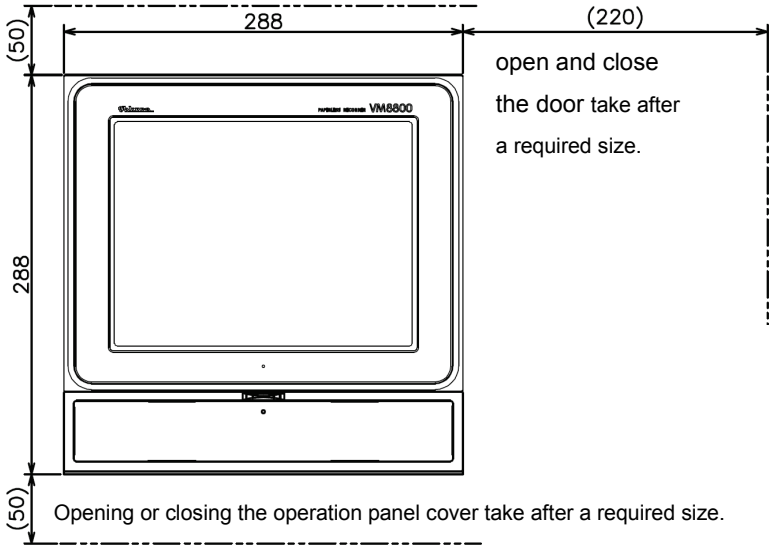
(13) Power switch

Controls the power to the recorder. Before performing wiring or similar work, be sure to turn off this switch.

3. Installation

3.1 Outside Dimensions and Panel Cut Dimensions

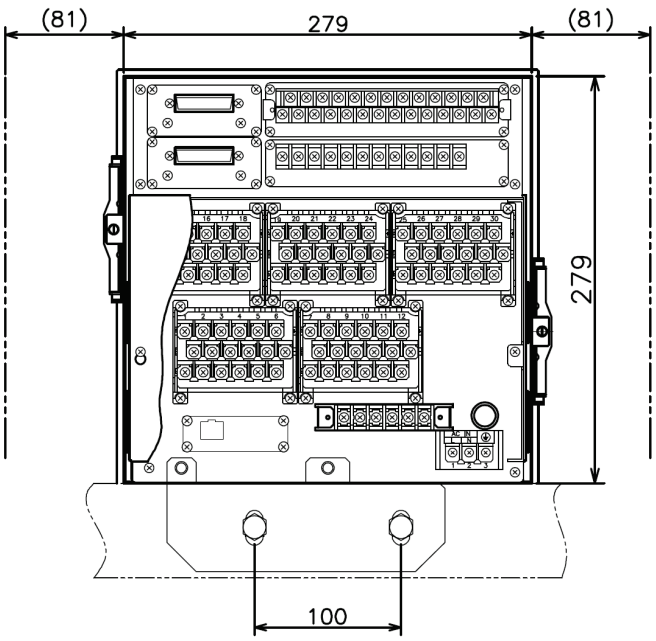
<Front> [Unit: mm]



* The top space (50mm) is required to open and close the door.
The bottom space (50mm) is required when opening or closing the operation panel cover.
The side space (220mm) is required when opening and closing the door.

<Model : 13th digit of code symbol: : “A” or “B” (VM88xxAxxx0xAxx , VM88xxAxxx0xBxx)>

<Rear> [Unit: mm]



<Side> [Unit: mm]

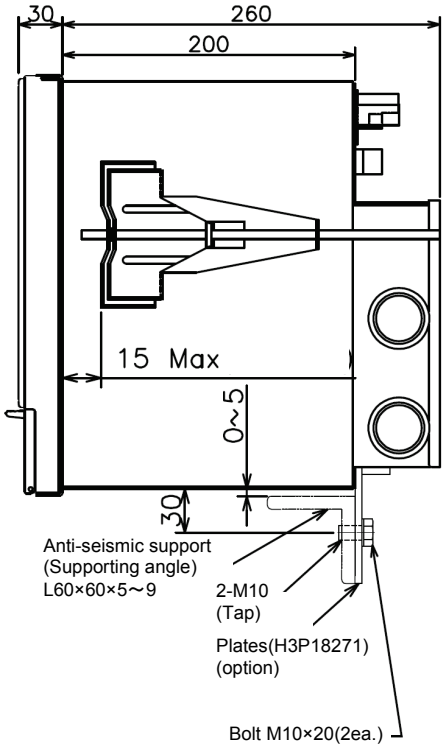


Figure 3.1 Outside dimensions(A,B)

⚠ Caution

If recorders are to be installed on a wall or in contact with instruments, you should make sure that spaces with at least the dimensions indicated in parentheses are reserved for the maintenance and safety of each recorder.

<Model : 13th digit of code symbol: “C” or “D” (VM88xxAxxx0xCxx , VM88xxAxxx0xDxx)>

<Rear> [Unit: mm] <Side> [Unit: mm]

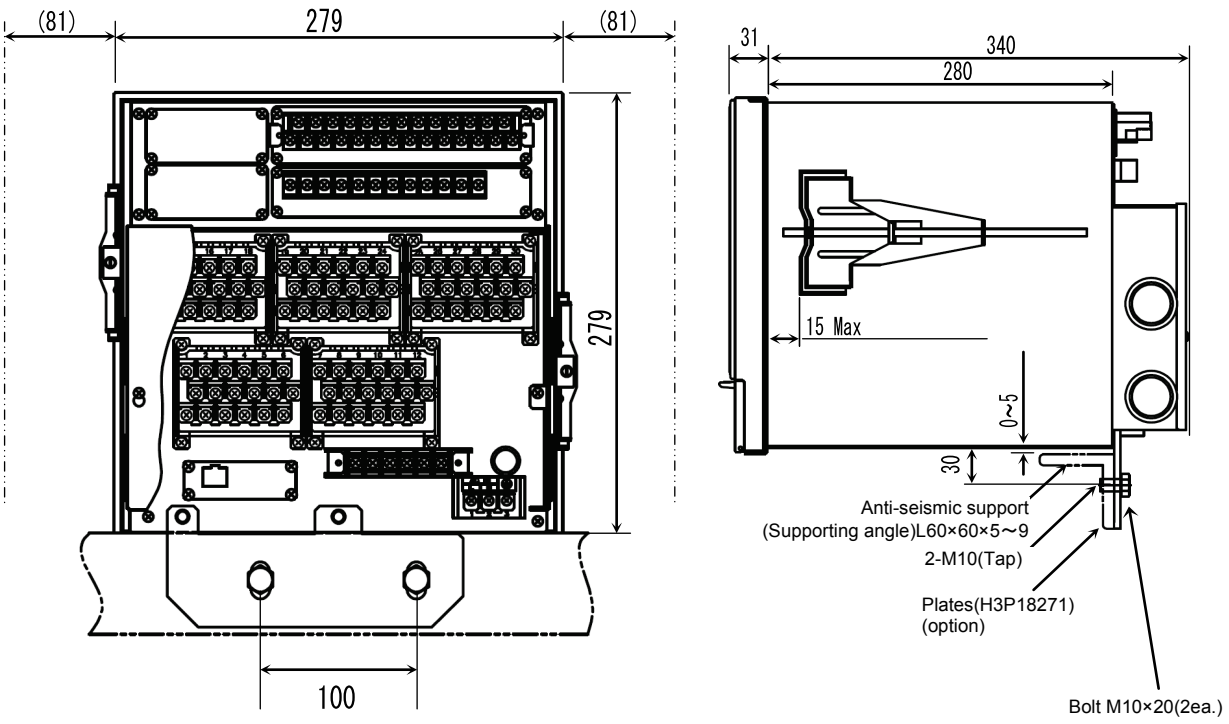


Figure 3.2 Outside dimensions (C,D)

<Model : 13th digit of code symbol: “E” or “F” (VM88xxAxxx0xExx , VM88xxAxxx0xFxx)>

<Rear> [Unit: mm] <Side> [Unit: mm]

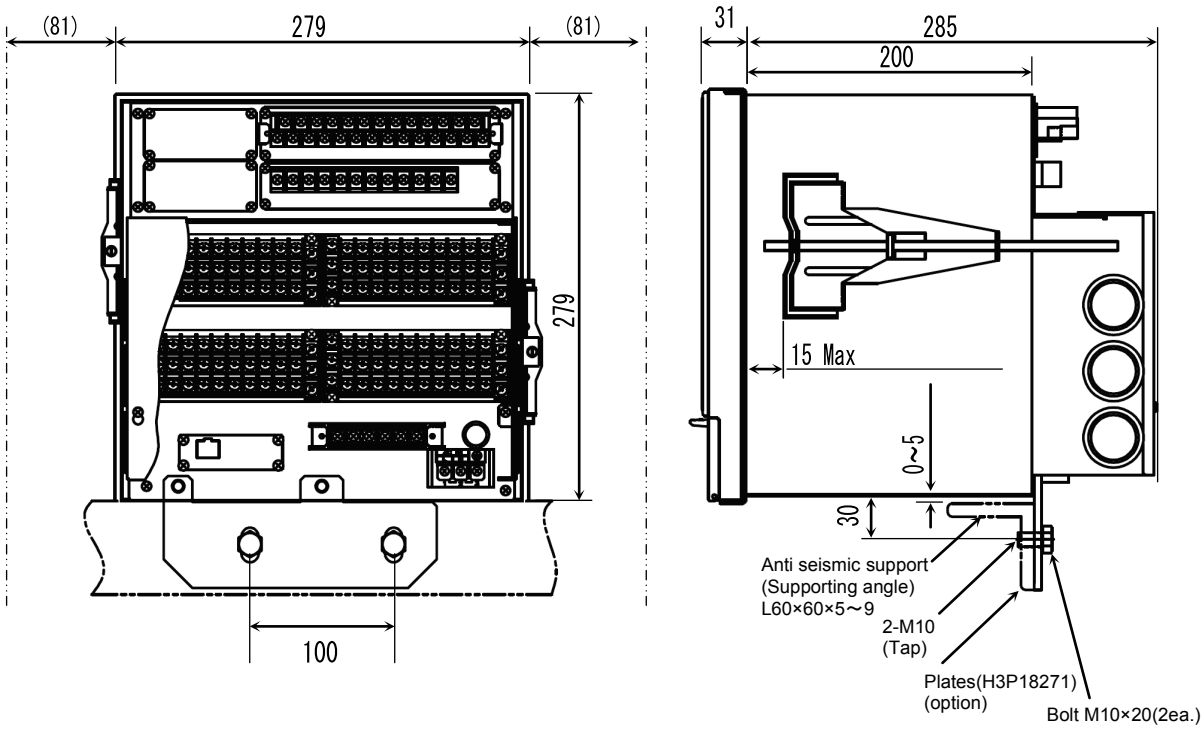
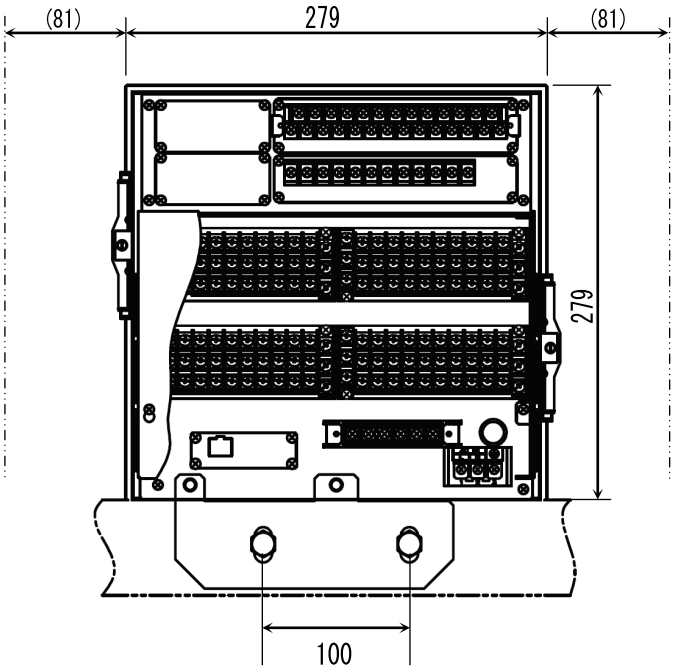


Figure 3.3 Outside dimensions (E,F)

<Model : 13th digit of code symbol: “G” or “H” (VM88xxAxxx0xGxx , VM88xxAxxx0xHxx)>

<Rear> [Unit: mm]



<Side> [Unit: mm]

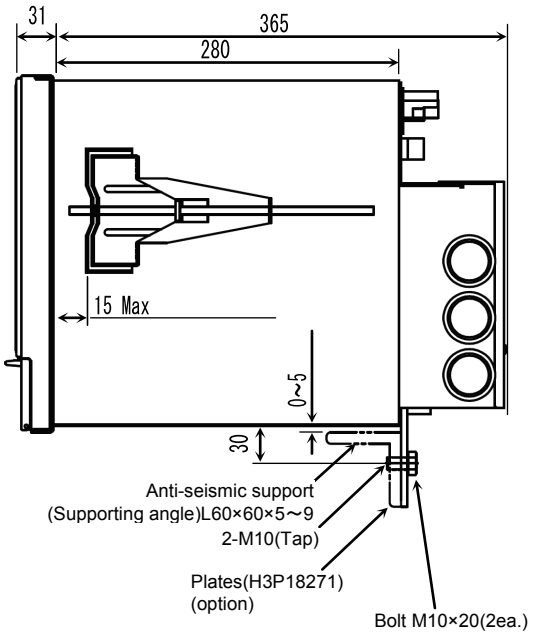


Figure 3.4 Outside dimensions (G,H)

<Panel cut> [Unit: mm]

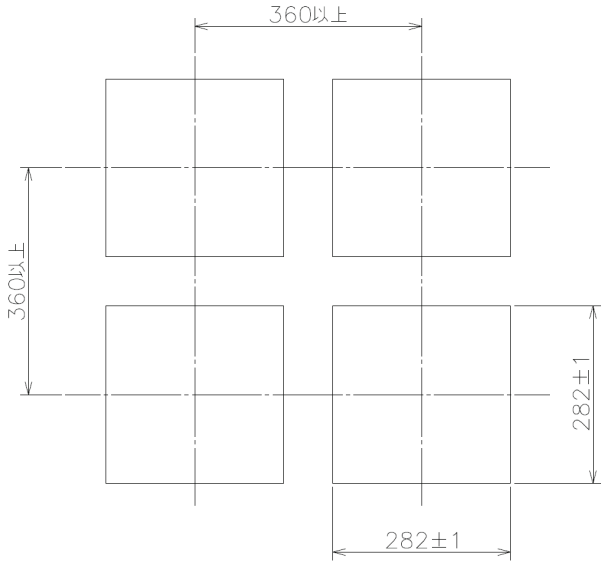


Figure 3.5 Panel cut dimensions

3.2 Installation on a Panel

3.2.1 Place of installation

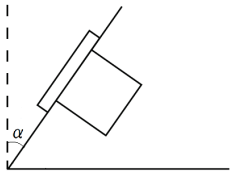
⚠ Warning

Do not expose the recorder to flammable, explosive, or corrosive gas (such as SO_2 or H_2S).

⚠ Caution

Install the recorder at a place that fulfills the following conditions:

- Humidity is stable.
  The humidity should be in the range from 20 to 80% RH (60% RH is the best).
- The temperature is close to 25°C (fixed temperature).
- Mechanical vibrations are low.
- Dust is low.
- Electromagnetic field influence is low.
- Direct radiant heat exposure is low.
- Ventilation to dissipate heat from the device is good.
- Space for wiring, maintenance, and inspection can be easily secured.
- There is no exposure to the influence of electromagnetic waves from radio equipment or mobile phones.
- The installed recorder can be kept horizontal without slanting to the left or right.
  (The inclination angle must be 0° on the front and within 0-30° on the rear.)



Mounting panel

- The mounting panel should be a steel sheet that is 3 mm to 15 mm thick.
- The maximum mounting panel thickness is 20 mm.

Inclination

- The recorder, when installed, must be kept horizontal without slanting to the left or right.
- The inclination angle of the installed recorder must be 0° on the front and within 30° on the rear.

3.2.2 Installation Method

(1) Insert the recorder into the front of the panel.
(2) Insert the hooks on the mounting brackets into the square holes on the left and right sides of the case.
(3) Tighten the bolts of the mounting brackets to secure the recorder to the panel.
Tightening with excess force could cause case distortion and/or mounting bracket deformation, leading to device failure.
Proper tightening torque: About 2 N·m (20 kgf·cm)

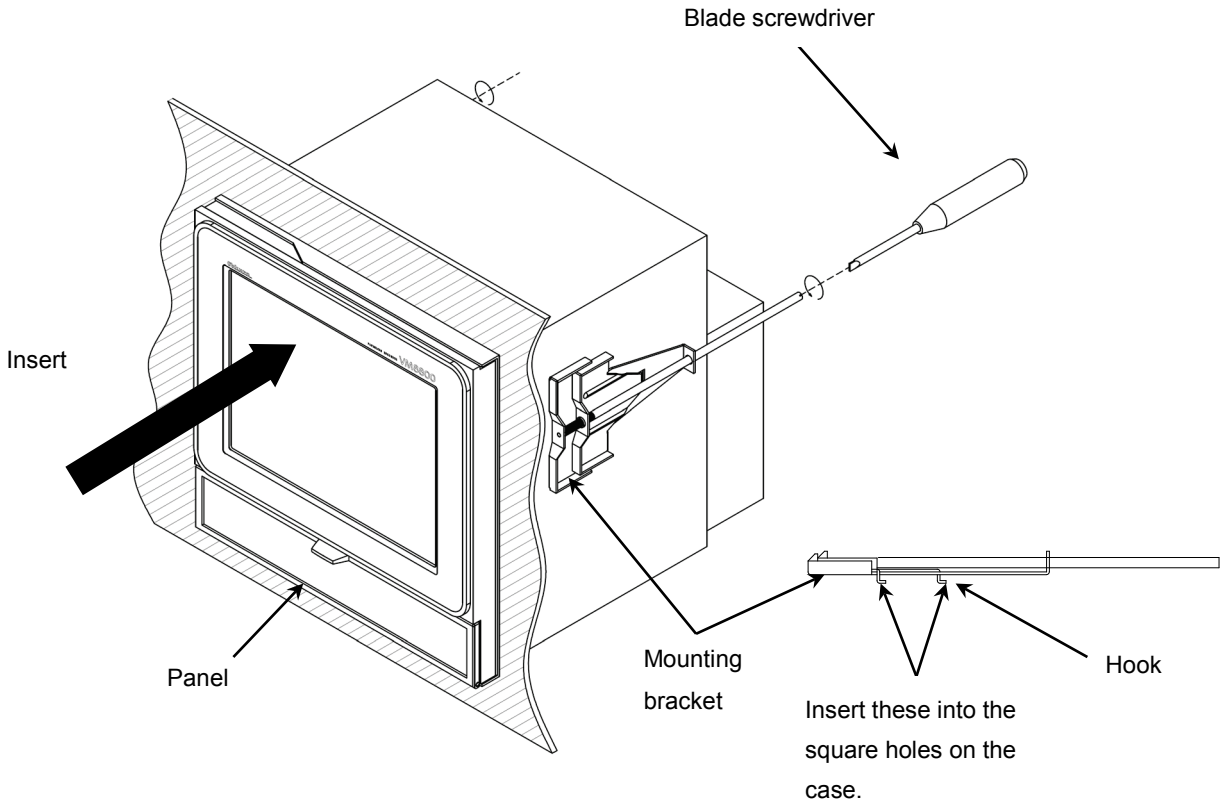


Figure 3.6 Method for installation on a panel

3.3 Securing the Case Rear (Optional Anti-Seismic Specification)

If your recorder is based on the anti-seismic specification (optional), mount the recorder on the panel as described in Section 3.2.2 "Installation Method," and then secure the case rear as described below.

[Reference]

Obtain an anti-seismic support (reinforcement angle).
The reinforcement angle must be an equilateral steel L-bar (60 x 60) with a thickness of about 5 to 9 mm.

(1) If the recorder is an anti-seismic model, the following components should be included:

- Plate	(1)	Model: H3P18271
- Bolt M10 × 20	(2)	With plain and spring washers
- Screw M6 × 14	(2)	With plain washer

(2) Mount the components specified in (1) above on the reinforcement angle as shown in Figure 3.7.

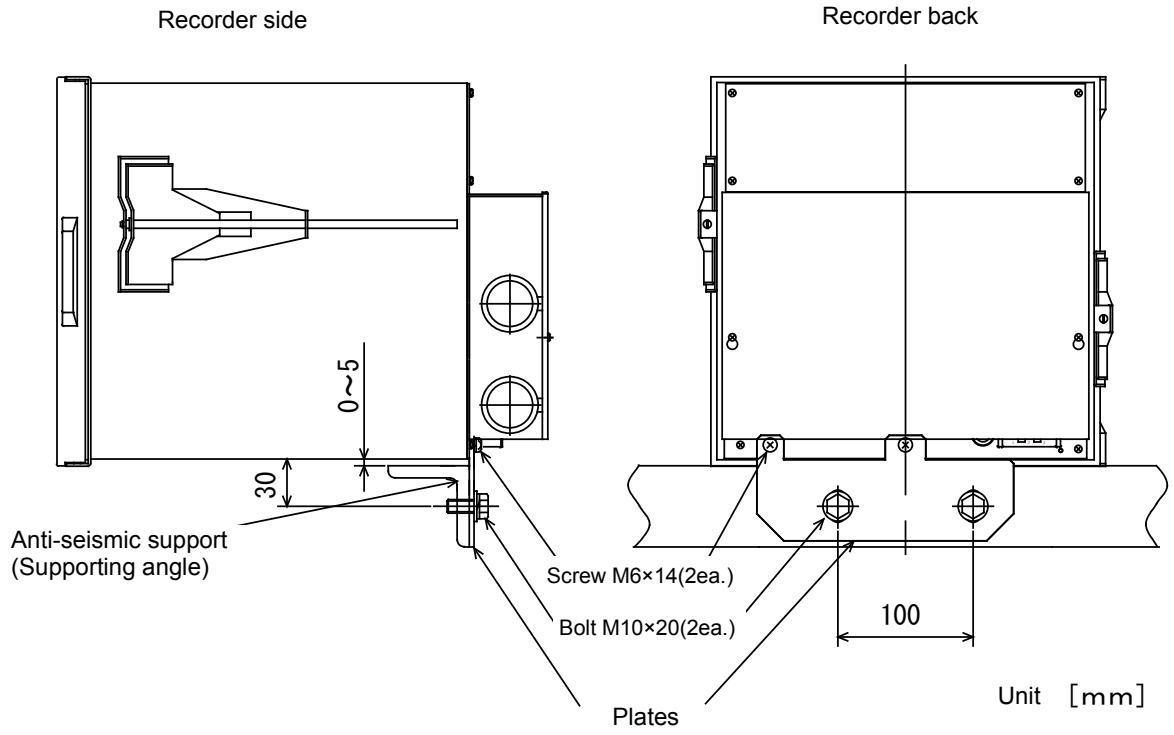


Figure 3.7 Securing the case rear (anti-seismic specification)

4. Wiring

4.1 Terminal Layout and Power Wiring

4.1.1 Terminal Block Layout (6-channel Terminal Block)

* The 13th column of the model is A, B, C, or D.

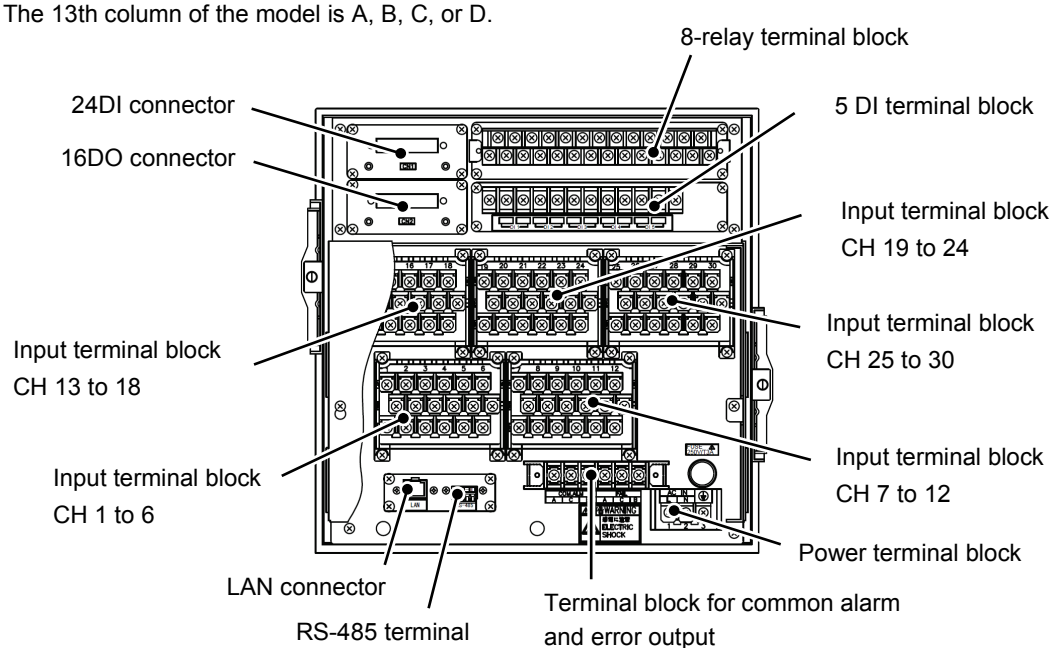


Figure 4.1 Terminal layout on 6-channel terminal block (recorder rear)

4.1.2 Terminal Block Layout (12-channel Terminal Block)

* The 13th column of the model is E, F, G, or H.

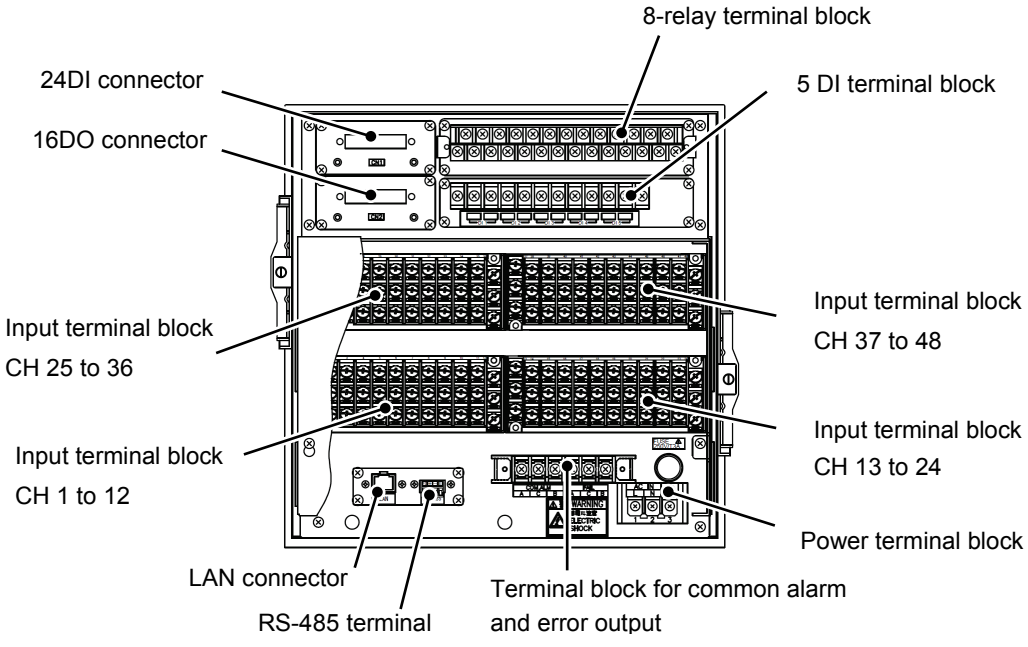


Figure 4.2 Terminal layout on 12-channel terminal block (recorder rear)

4.1.3 Power Wiring

Warning

- Be sure to ground the protective ground terminal before powering the recorder to prevent electric shocks.
- Do not cut or disconnect the protective ground wire.
- Make sure that the supply voltage matches the power voltage specification of the recorder.
- Attach the clear protective cover before energizing the recorder.

Caution

- Use 600-V polyvinyl chloride insulated wires (JIS C3307) or equivalent or more-grade wires as power wires.
- Mount insulated sleeve spade lugs (for M4) at the wire terminals.
- Apply third-class grounding (a ground resistance of up to 100 Ω and a minimum ground wire thickness of 1.6 mm) to any protective ground terminal. (Protective ground)
- If the protective ground wire is shared with other equipment, the recorder may be affected by noise from the ground wire.
- For safety, install circuit breakers, switches, or other protective devices on the power wiring and mark them to indicate that they will turn off the recorder.
- Make sure that the voltage fluctuations of the main power are within ±10% of the rated voltage.
- When the recorder is switched on, a transient current may flow into the main power conductor.

(1) Turn off the power switch on the recorder.

(2) Remove the clear protective cover from the power terminal block.

(3) Connect the power wires as shown in Figure 4.3.
Connect the non-grounded power wire to terminal 1.

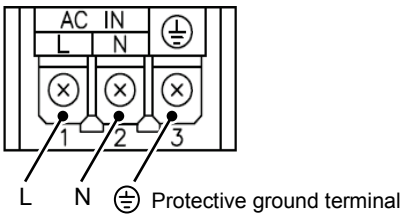
(4) Re-mount the clear protective cover.

(5) Make sure that protective ground is applied correctly.

L: Line phase (non-ground)

N: Neutral phase

⏚:Ground line



Power: 85 to 264 VAC

Figure 4.3 Power wiring

4.2 Input Wiring

Warning

Be sure to turn off the power before installing input wires.

Caution

● Notes on input wires

- Be careful that noise does not interfere with the input wires. For input wires, you should use shielded wires or twisted-pair wires, which are resistant to noise.
- For an input from a thermocouple, connect the strands of the thermocouple directly to the recorder or use compensation lead wires. You should use shielded input wires.
- For resistance temperature detector input, make sure that the resistance variations among the three wires are within the following. You should use shielded input wires.
  For a Pt100 or JPt100: The variations are within 50 mΩ.
- If the recorder is exposed to induced noise -- especially if the input wire is placed near a high-frequency power supply, you should use shielded twisted-pair wires.
- Mount insulated sleeve spade lugs (for M4) at the wire terminals.

● Notes on wiring

- The wiring between the recorder and a measurement point must be away from any power supply circuit (25-V or more power supply circuit or DO circuit).
- Short unused input terminals. (For an mV, V, or thermocouple input, directly connect the positive and negative terminals; for an RTD input, directly connect the A, B, and b terminals.)
- To ground shielded wires, etc., connect them to the protective ground terminal on the recorder.
  Be sure to turn off the power before installing input wires.

4.2.1 Wiring Procedure (6-channel Terminal Block)

(1) Turn off the power to the recorder.

(2) Remove the rear cover of the input terminal block.

(3) Install input wires as shown in Figures 4.4 to 4.6.

(4) Re-mount the rear cover.

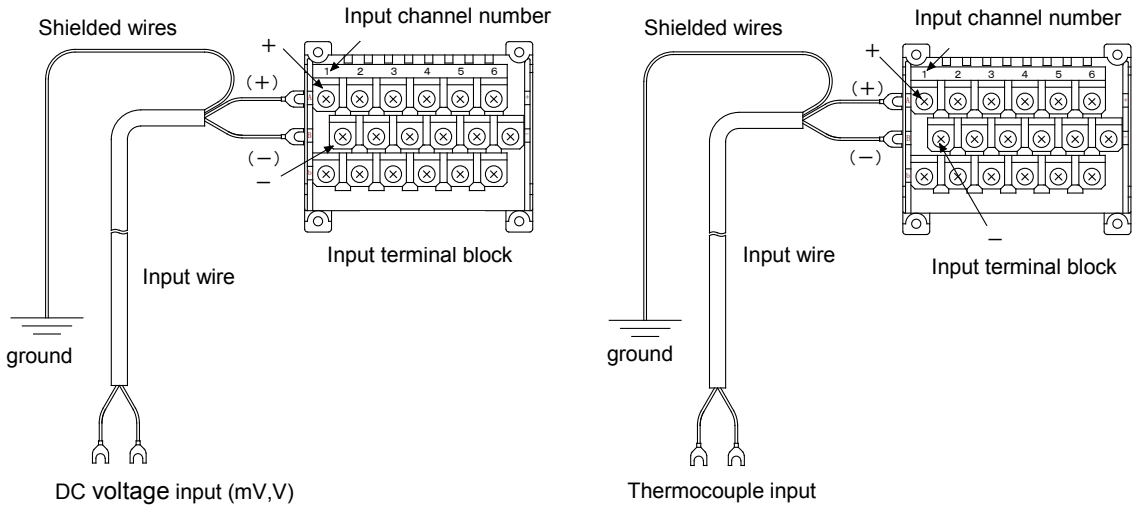


Figure 4.4 Input wiring (for mV, V, and thermocouple inputs) on 6-channel terminal block

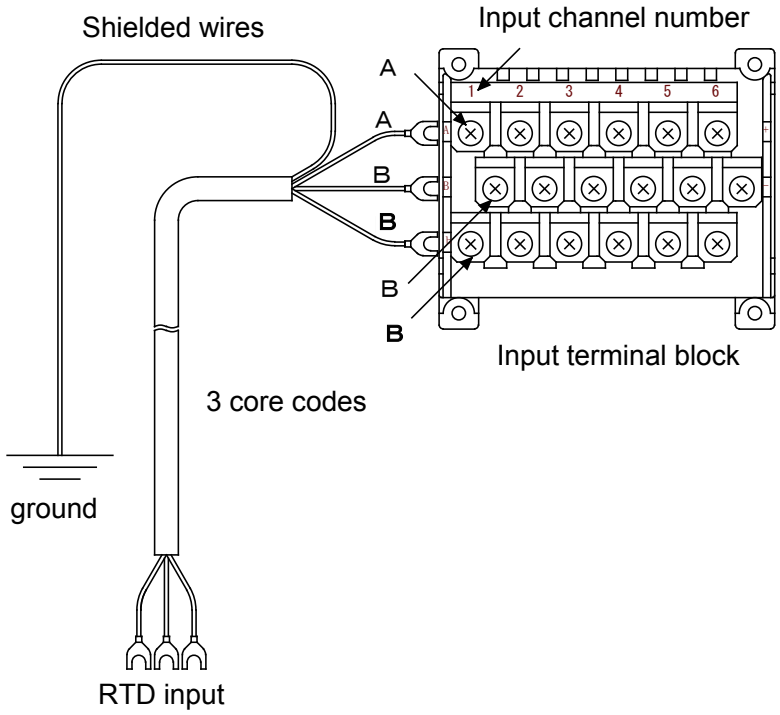


Figure 4.5 Input wiring (for RTD input) on 6-channel terminal block

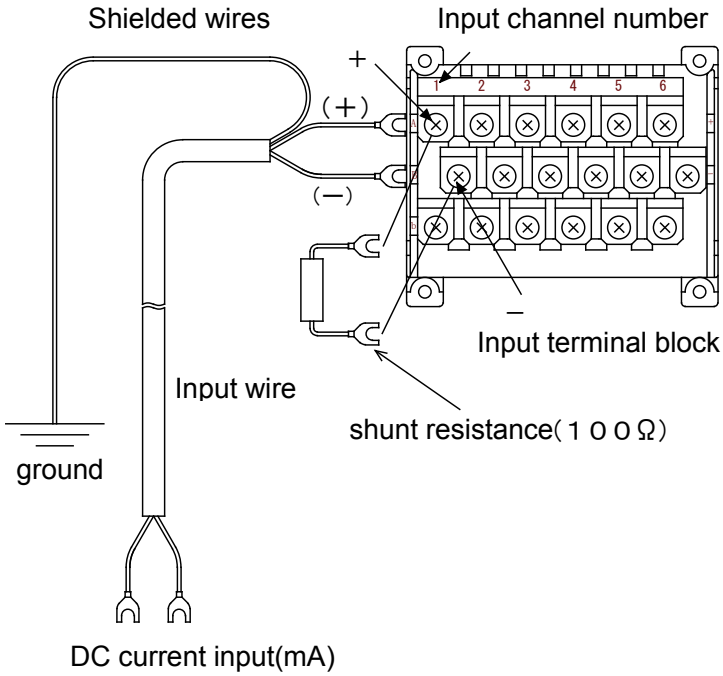


Figure 4.6 Input wiring (for current input) on 6-channel terminal block

[Caution]

- Mount a shunt resistor on the input terminal block of the recorder.
  (However, this is unnecessary if an appropriate resistance is included according to the specification.)
- The resistance of the shunt resistor, which influences the input accuracy, should be as follows:
  Resistance: 100 Ω, Power rating: 1/8 W, Tolerance: within ±0.1%,
  Temperature coefficient: within ±50 ppm

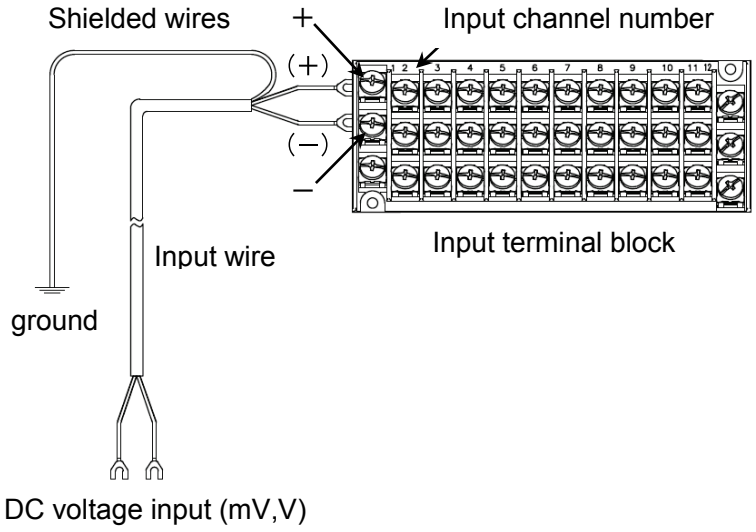
4.2.2 Wiring Procedure (12-channel Terminal Block)

(1) Turn off the power to the recorder.

(2) Remove the rear cover of the input terminal block.

(3) Install input wires as shown in Figures 4.7 to 4.9.

(4) Re-mount the rear cover.



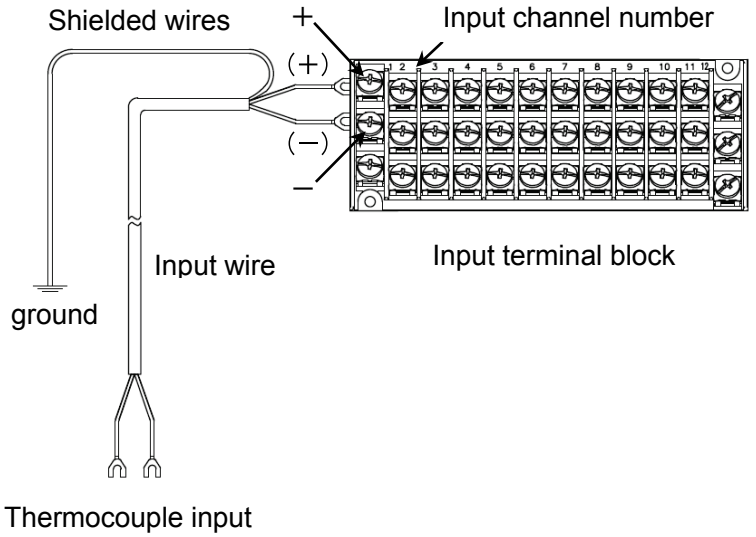


Figure 4.7 Input wiring (for mV, V, and thermocouple inputs) on 12-channel terminal block

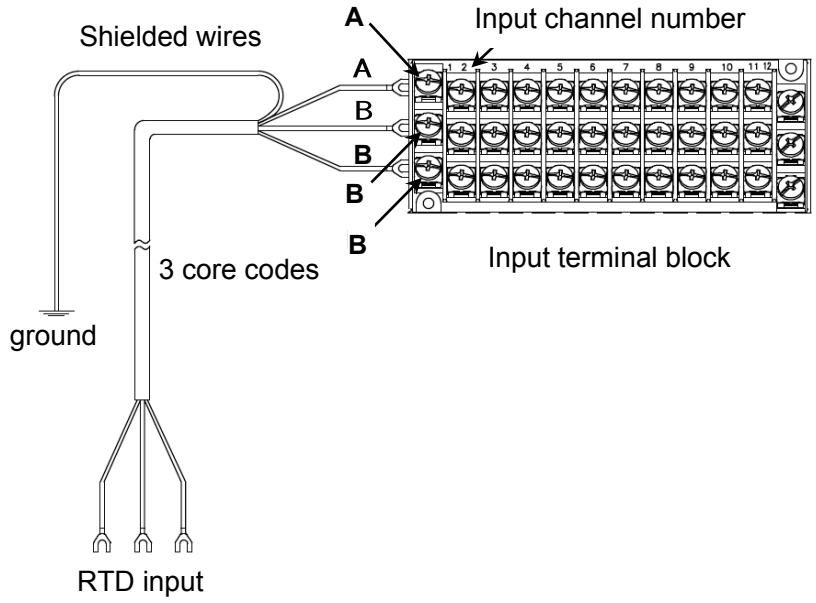


Figure 4.8 Input wiring (for RTD input) on 12-channel terminal block

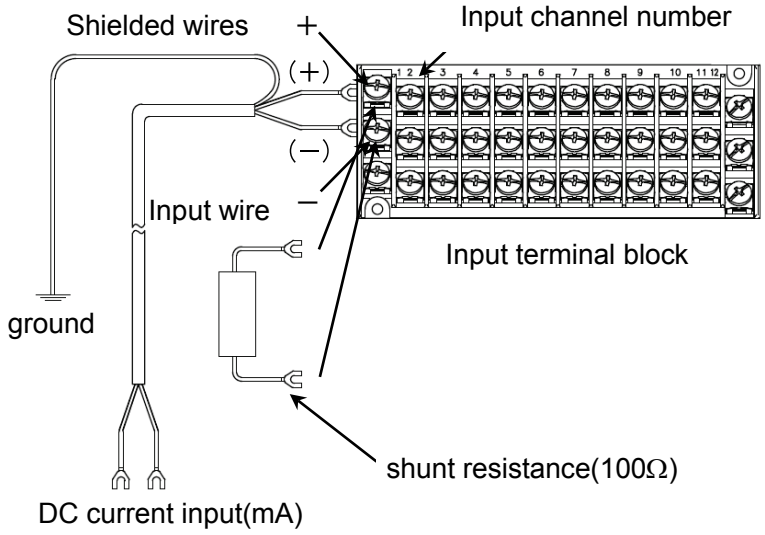


Figure 4.9 Input wiring (for current input) on 12-channel terminal block

[Caution]

- Mount a shunt resistor on the input terminal block of the recorder.
  (However, this is unnecessary if an appropriate resistance is included according to the specification.)
- The resistance of the shunt resistor, which influences the input accuracy, should be as follows:
  Resistance: 100 Ω, Power rating: 1/8 W, Tolerance: within ±0.1%,
  Temperature coefficient: within ±50 ppm

4.3 Wiring for Common Alarm (COM.ALM) and Error Output

Warning

- Be sure to turn off the power to the recorder before installing wires.
- If a power supply is connected to a relay output, turn off the power supply as well.

Caution

Notes on output wiring

- The common alarm output and error output contact capacities are as follows:
  250 VAC, 3 A max. (resistance load)
  30 VDC, 3 A max. (resistance load)
  125 VDC, 0.5 A max. (resistance load),
- On the output terminal, mount a surge protection circuit (such as a varistor) as required.
- On a wire terminal, mount insulated sleeve spade lugs (for M4).
- Make sure that the output wires are kept away from the input wires.

4.3.1 Wiring Procedure

(1) Turn off the power to the recorder.

(2) Install the COM alarm output and FAIL output wires as shown in Figure 4.10.

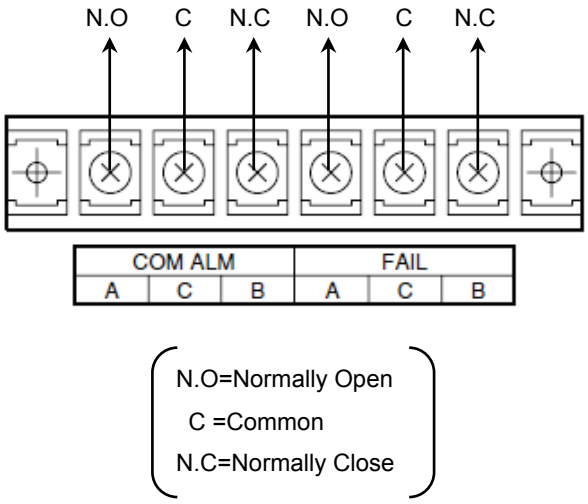


Figure 4.10 Wiring for COM alarm output and FAIL output

[Caution]

If you intend to use only the common alarm output, assign an arbitrary DO (alarm output) No.

4.4 LAN Cable Installation

4.4.1 Communication Specification

Specification	100BASE-TX
Transmission speed	100 Mbps
Transmission mode	Baseband
Maximum segment length	100 m (between node and hub)
Connection cable	UTP (shielded non-twisted pair) Category 5
Protocol	TCP/IP

⚠ Caution

- Make sure that the LAN cable is as far away as possible from the power line and high-voltage line, in order to avoid inductive noise.

4.4.2 Connection to PC

In case of connecting to the PC, use a crossover cable.

In case of connecting to the PC via HUB, use a straight cable.

4.5 DI/Relay Wiring (Optional)

Warning

- Be sure to turn off the power to the recorder before installing wires.
- If a power supply is connected to a relay output, turn off the power supply as well.

Caution

Notes on DI wiring

- Since a DI input includes a drive power supply, do not apply an external voltage to the DI input terminal.
- The DI input must have a contact capacity with a forward/reverse withstand voltage of at least 50 VDC, 16 mA and an ON resistance of up to 20 Ω (including wiring resistance).
- Do not use any unassigned terminal as a relay terminal.

Notes on relay wiring

- The relay output contact capacity is as follows:
  250 VAC, 3 A max. (resistance load)
  30 VDC, 3 A max. (resistance load)
  125 VDC, 0.5 A max. (resistance load)
- On the output terminal, mount a surge protection circuit (such as a varistor) as required.
- On a wire terminal, mount insulated sleeve spade lugs (for M4).

4.5.1 DI and Relay Wiring Examples

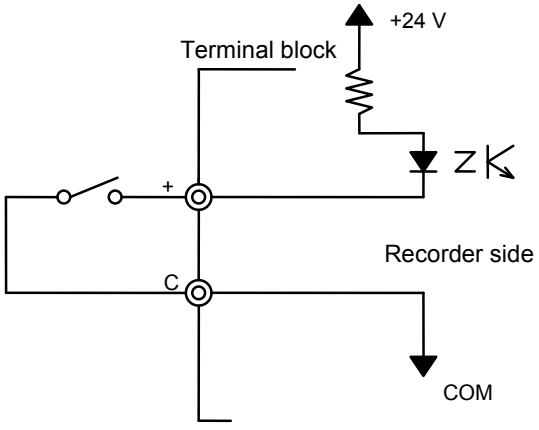


Figure 4.11 DI wiring example

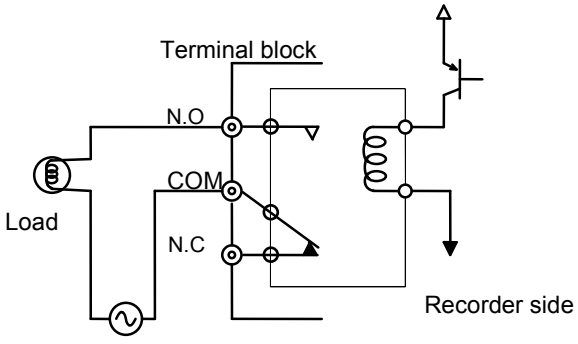


Figure 4.12 Relay wiring example

4.5.2 Wiring Procedure

Install DI/relay wires as shown in Figures 4.13 and 4.14.

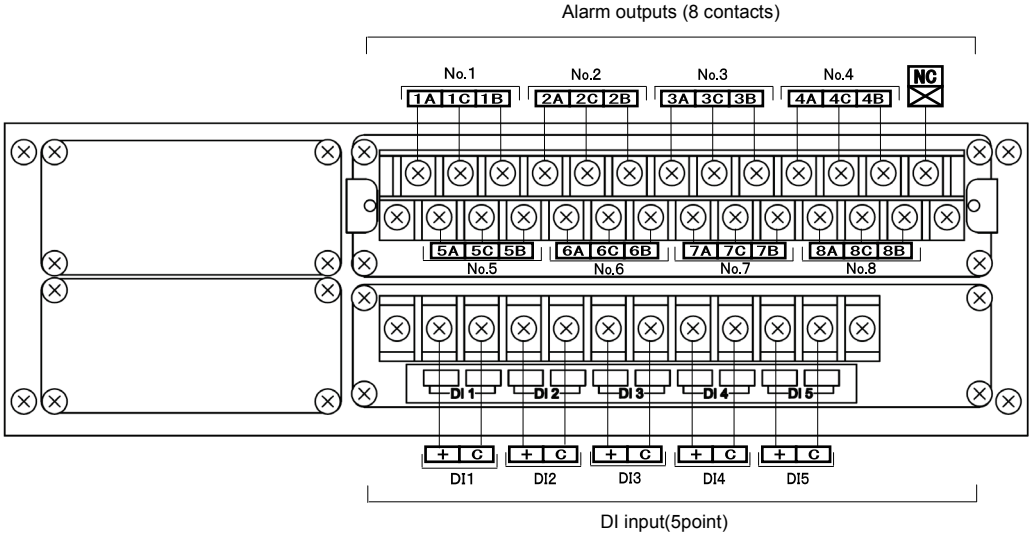


Figure 4.13 Wiring for 5 DI inputs and alarm outputs (8 contacts)

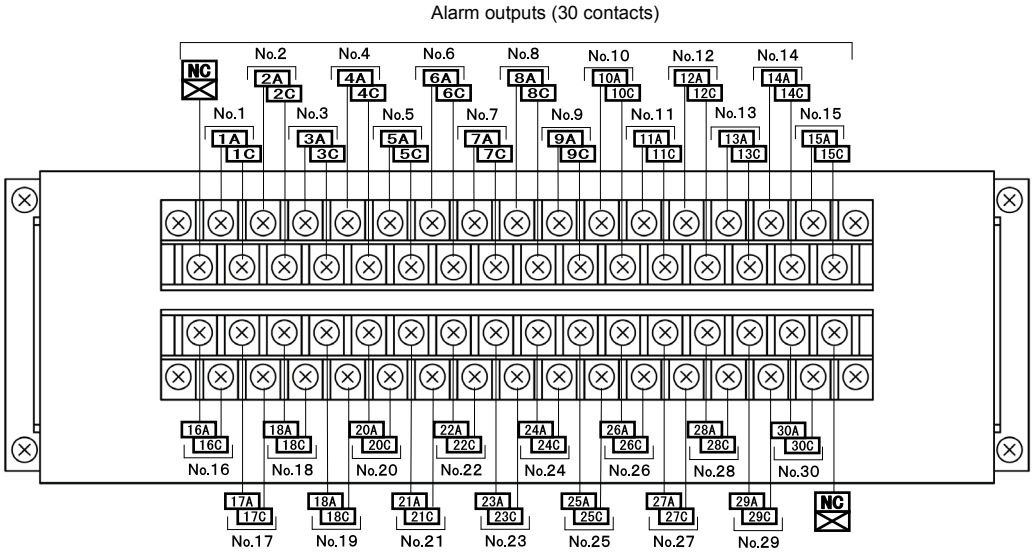


Figure 4.14 Wiring for 30 alarm outputs

4.6 16 DO Points (Optional)

4.6.1 Specification

- Output signal

  Open-collector: 30 VDC max., 20 mA max.

- Number of outputs

  16

- Output insulation

  Photo-coupler insulation (for the common line; insulation is not provided between output signals)

- Insulation resistance

  Between output signal terminal and ground terminal: 20 MΩ or more with a 500-VDC megger

- Withstand voltage

  Between output signal terminal and ground terminal: 500 VAC for 1 min

4.6.2 Circuit Construction

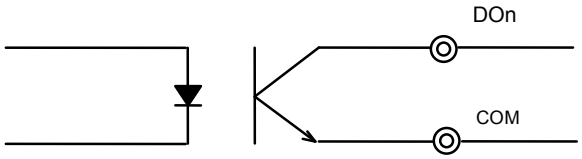


Figure 4.15 DO circuit construction (DOn, where n = 01 to 16, is a signal name)

4.6.3 Connector Pin Layout

Figure 4.16 shows the output signal connector layout and Table 4.1 indicates how connector terminal numbers relate to signal names and alarm output setting numbers.

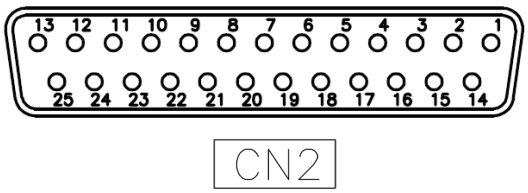


Figure 4.16 16DO Connector terminal numbers

Table 4.1 Connector terminal numbers and alarm output setting numbers

Terminal number	Signal name	Alarm output setting number	Terminal number	Signal name	Alarm output setting number
1	DO01	09	16	DO16	24
2	DO02	10	17	COM	
3	DO03	11	18	COM	
4	DO04	12	19	COM	
5	DO05	13	20	COM	
6	DO06	14	21	COM	
7	DO07	15	22	COM	
8	DO08	16	23	COM	
9	DO09	17	24	COM	
10	DO10	18	25	COM	
11	DO11	19			
12	DO12	20			
13	DO13	21			
14	DO14	22			
15	DO15	23			

4.6.4 Recommended Connector

When wiring, use the following connector or its equivalent.

Manufacturer: Hirose Electric Co., Ltd.

Model: HDBB-25P(05)

4.7 24 DI Points (Optional)

4.7.1 Specification

- Input signal

  Non-voltage contact

- Number of inputs

  24

- Input insulation

  Photo-coupler insulation (for the common line; insulation is not provided between input signals)

- Insulation resistance

  Between input signal terminal and ground terminal: 20 MΩ or more with a 500-VDC megger

- Withstand voltage

  Between input signal terminal and ground terminal: 500 VAC for 1 min

4.7.2 Circuit Construction

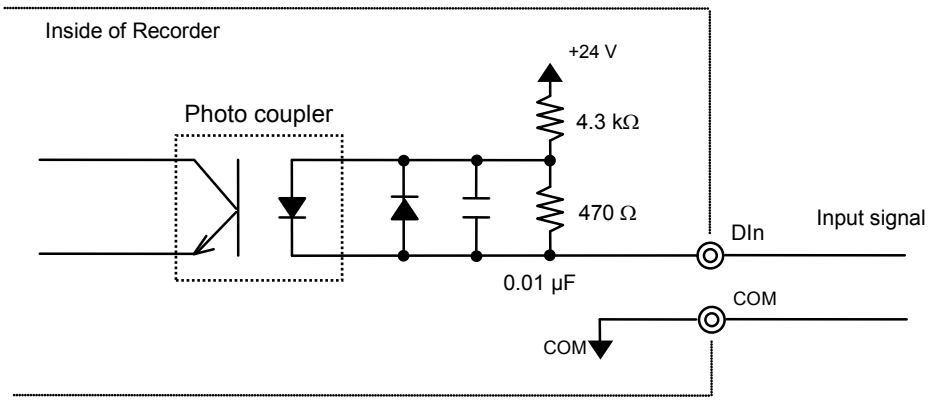


Figure 4.17 DI circuit construction (DIn, where n = 01 to 24, is a signal name)

4.7.3 Connector Pin Layout

Figure 4.18 shows the input signal connector layout and Table 4.2 indicates how connector terminal numbers relate to signal names and DI input setting numbers.

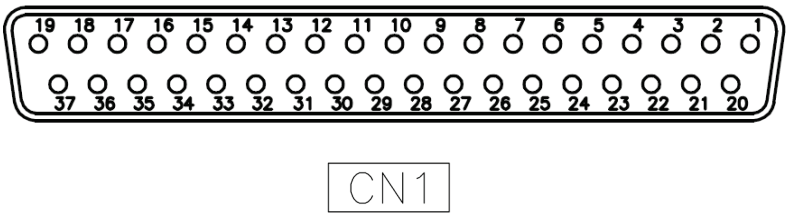


Figure 4.18 24DI Connector terminal numbers

Table 4.2 Connector terminal numbers and DI input setting numbers

Terminal number	Signal name	DI input setting number	Terminal number	Signal name	DI input setting number
1	COM		21	COM	
2	COM		22	DI23	28
3	DI24	29	23	DI21	26
4	DI22	27	24	DI19	24
5	DI20	25	25	DI17	22
6	DI18	23	26	DI15	20
7	DI16	21	27	DI13	18
8	DI14	19	28	COM	
9	COM		29	COM	
10	COM		30	DI12	17
11	COM		31	DI10	15
12	DI11	16	32	DI08	13
13	DI09	14	33	DI06	11
14	DI07	12	34	DI04	9
15	DI05	10	35	DI02	7
16	DI03	8	36	COM	
17	DI01	6	37	COM	
18	COM				
19	COM				
20	COM				

4.7.4 Recommended Connector

When wiring, use the following connector or its equivalent.

Manufacturer: Hirose Electric Co., Ltd.

Model: HDCB-37P(05)

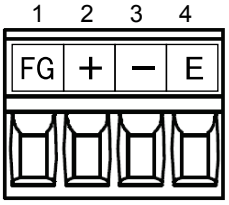
4.8 RS-485 (Optional)

4.8.1 Specification

Protocol	Modbus RTU
Communication speed	9600/19200/38400 bps
Parity	Even, Odd ,or None
Data Length	8 bits
Stop bit	1 bit
Slave address	1 to 247 (0:Invalid)

4.8.2 Wiring Procedure

RS-485 terminal is screw-type terminal block. Figure 4.19 shows the terminal layout.



Terminal number	Signal name	Description
1	FG	Frame Ground
2	+	Transmission Line +
3	-	Transmission Line -
4	E	Termination Setting

Figure 4.19 RS-485 Terminal layout

Suitable wire (twisted wire)

Size	AWG#28 to 16
Cross-sectional area	0.08mm^2 to 1.25mm^2

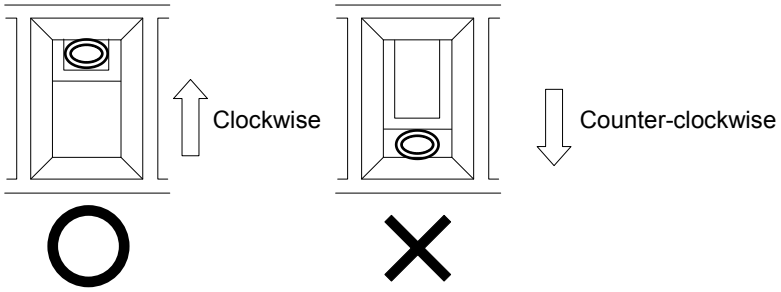
(1) Remove 7mm of the wire's insulation.

(2) Insert wire into terminal hole until it stops. Tighten screw clockwise to fix wire in place.
(Screw tightening torque: 0.22Nm to 0.25Nm)

(3)In case of using for the terminal unit, short-circuit the terminal E and (-).
The termination resistor(120Ω) is built in.

[Caution]

- Don't twist the wires to connect them.
- Don't solder the wires to connect them. The solder may be broken by vibration.
- In the terminal block socket construction, if the wire is fastened upon counter-clockwise rotation of the screw, the connection is incorrect. Remove the wire, check the terminal hole, and then re-connect the wire.



[Reference]

- Using shielded twisted pair cables are recommended.
- When using shielded cable with crossover wiring for the RS-485 transmission line, grounded one end.
- In case of using pole terminals, it is recommended following the terminals.

Manufacturer:	Phoenix Contact
Model:	AI 0,25-6 (AWG#24/ 0.25mm^2)
	AI 0,5-6 (AWG#20 / 0.50mm^2)
	AI 0,75-6(AWG#18 / 0.75mm^2)
	AI 1-6(AWG#18 / 1.00mm^2)

5. Operation

5.1 Inserting a CF Card

The recorder uses a CF card to hold record data and settings files.

If the recorder is configured to automatically save record data, a CF card must be inserted in the recorder at all times.

If the recorder is configured to manually save settings, a CF card must be inserted each time the need to save data arises.

(For information on automatic and manual saving of settings, see Section 8.17.)

● CF card insertion

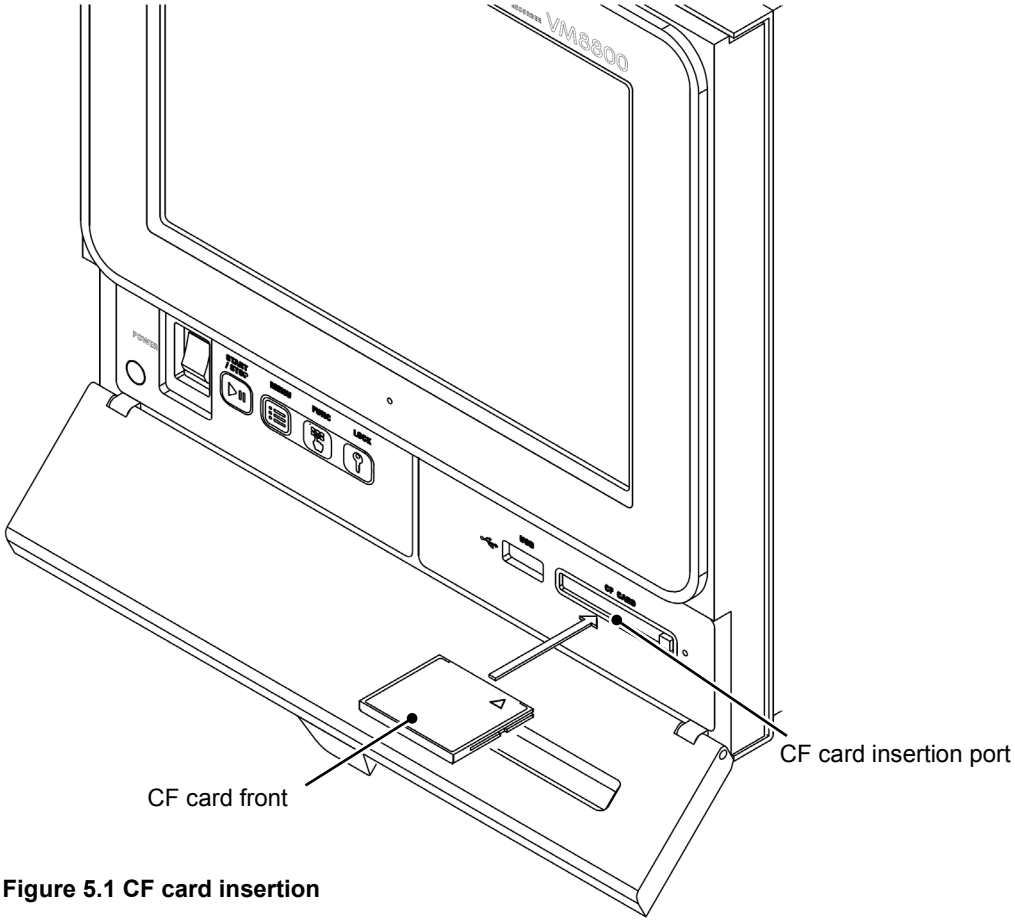


Figure 5.1 CF card insertion

Insert a CF card through the CF card insertion port on the recorder as shown in Figure 5.1. When inserting a CF card, be sure that the card faces up and that it is inserted in the correct direction.

You can insert a CF card regardless of whether the recorder is powered on or off and whether recording has started or stopped.

[Reference]

The front and back surfaces of a CF card are distinguished shown in Figure 5.2; the front surface is marked with a triangle (∆). Insert the CF card in the direction denoted by the triangle vertex

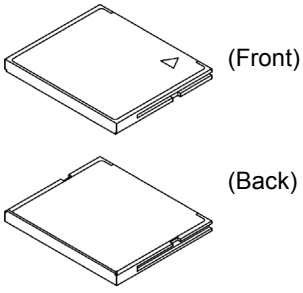


Figure 5.2 Front and back surfaces of a CF card

⚠ Caution

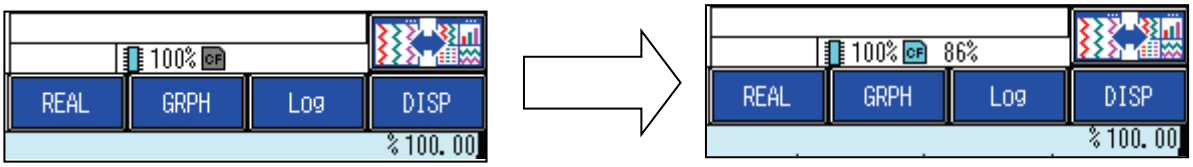
Forced insertion of a CF card in the wrong orientation or direction could cause damage.

When inserting a CF card, make sure that it faces up and is being inserted in the correct direction.

● Confirmation of CF card recognition

When a CF card is inserted into a recorder that is powered on, the recorder automatically recognizes the card. While the card is being identified, the CF card access lamp blinks.

If the CF card is correctly recognized, the CF card icon on the screen top changes to aqua and the remaining storage capacity is displayed.



[Caution]

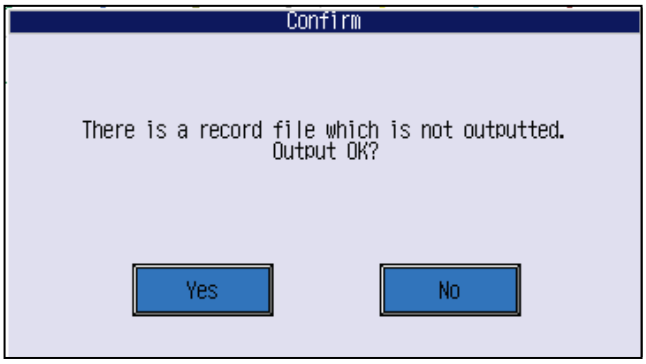
CF card recognition may require several seconds depending on the status of the card.

● Data Marked for Output

If data that has not been output to the CF card remains in the recorder, an output confirmation window will open after CF card recognition.

If you want to output the data, select Yes to output the data.

(For information on data marked for output, see Section 5.6.)



If you do not want to output the output-pending data, select No to close the window.

[Caution]

Inserting a CF card by itself does not initiate data output. Data output will start when you confirm the output confirmation window.

● CF card recognition failure

If the inserted CF card is faulty or its format is not supported by the recorder, it is not recognized and the following window opens.

In this case, press the OK key, remove the card, and check if the card is faulty and its format is supported by the recorder.

(No special operation is required for card removal.)

[Caution]

The formats supported by the recorder are FAT16 (FAT) and FAT32. The recorder does not recognize other formats, such as NTFS and exFAT.

5.2 Inserting USB Memory (Optional)

The recorder uses USB memory to supplement the CF card by saving some data. You can manually save record data, settings files, etc. in USB memory.

The USB memory is optional. If your order does not include this option, you cannot perform the operation described in this section.

● USB memory insertion

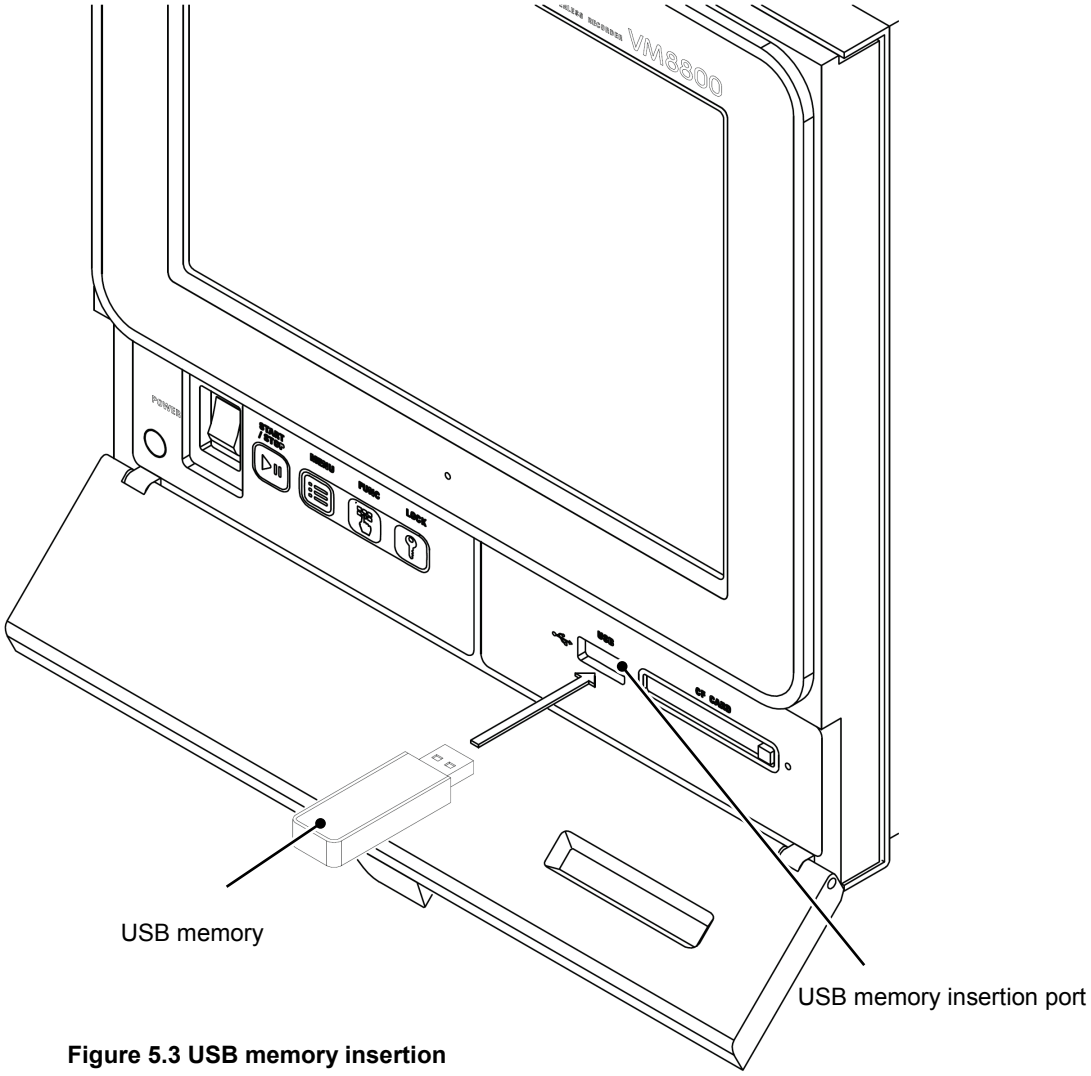


Figure 5.3 USB memory insertion

Insert USB memory through the USB memory insertion port on the recorder as shown in Figure 5.3. When inserting USB memory, make sure that the USB memory matches the connector on the recorder.

You can insert USB memory regardless of whether the recorder is powered on or off and whether recording has started or stopped.

⚠ Caution

Forced insertion of USB memory that does not match the connector on the recorder could cause damage.
When inserting a USB memory, make sure that it faces up and is being inserted in the correct direction.

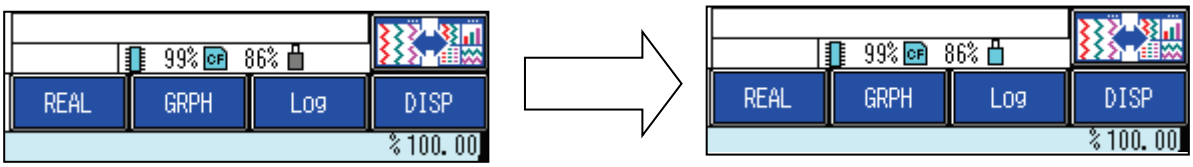
[Reference]

If your order does not include the USB memory option, your recorder does not have a USB memory insertion port.

● Confirmation of USB memory recognition

When a USB memory is inserted into a recorder that is powered on, the recorder automatically recognizes the USB memory.

If the USB memory is correctly recognized, the USB memory icon on the screen top changes to aqua.



[Caution]

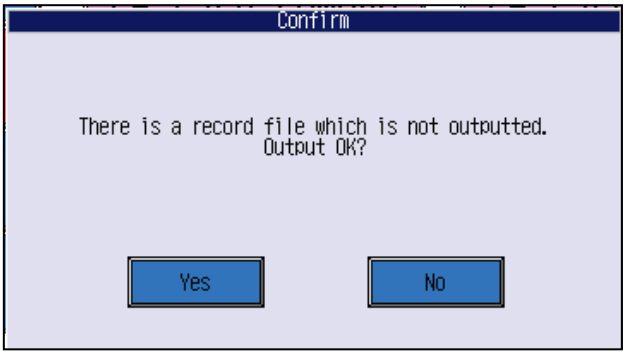
USB memory recognition may require several seconds depending on the status of the USB memory.

● Data Marked for Output

If data that has not been output to the USB memory remains in the recorder, an output confirmation window will open after USB memory recognition.

If you want to output the data, select Yes to output the data.

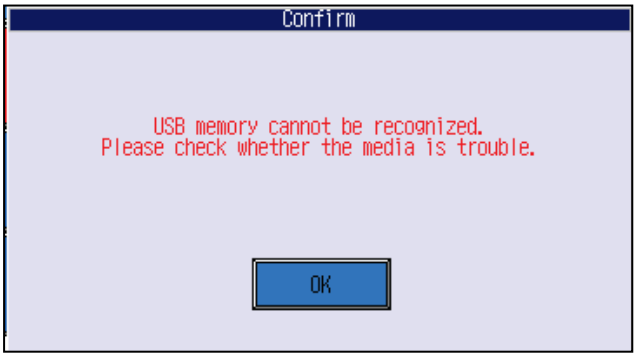
(For information on output of output-pending data, see Section 5.6.)



If you do not want to output the output-pending data, select No to close the window.

● USB memory recognition failure

If the inserted USB memory is faulty or its format is not supported by the recorder, it is not recognized and the following window opens.



In this case, press the OK key, remove the USB memory, and check if the USB memory is faulty and if its format is supported by the recorder.
(No special operation is required for memory removal.)

[Caution]

The formats supported by the recorder are FAT16 (FAT) and FAT32. The recorder does not recognize other formats, such as NTFS and exFAT.

5.3 Starting and Stopping Recording

● Recording status

The recorder may be in one of two recording statuses: global recording and group recording.

[Global recording]

This status indicates how the entire recorder is recording. Global recording needs to be started before recording can be performed.

While global recording is stopped, any group recording is inactive and all settings can be changed. If need to perform maintenance or adjust settings,, stop overall recording.

If global recording has been started, recording is performed according to the settings for each record group.

[Group recording]

This status indicates whether each record group is in the process of recording.

The recorder can perform recording for up to four groups. You can change the conditions for starting and stopping recording for each record group by configuring the appropriate settings.

(For information on conditions for starting and stopping recording, see Section 8.16.)

The following table indicates how the global recording status influences the group recording statuses and whether settings can be changed:

Global recording status	Group recording statuses	Settings change
Stopped	All groups are stopped.	All settings and operations are possible.
Started	As per the status of the record trigger set for each record group	Only certain settings and operations are possible.

(For information on settings and operations that cannot be changed while recording is started, refer to the explanation for the pertinent setting.)

● Recording status confirmation

[Global recording]

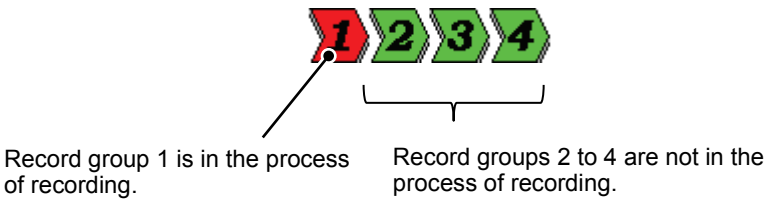
You can confirm the global recording status by checking the recording status display at the screen top and the status LED.

	Global recording started	Global recording stopped
Recording status icon		
Status LED	Blue	Green

[Group recording]

You can confirm the group recording status by checking the record group icons at the screen top.

The icon of a record group that has started recording is red and the icon of a record group that has stopped recording is green.



(For information on screen-top display, see Section 6.1.1.)

● Starting global recording

When global recording is stopped, press the START/STOP button on the front of the recorder.

● Stopping global recording

When global recording is started, press the START/STOP button on the front of the recorder.

The following window opens before global recording stops.

To stop global recording, press Stop in the window or press the START/STOP button again. To continue recording, press Continue in the window or press the MENU button.

When global recording stops, all group recording stops. In this state, recording will not start even when the condition for a record trigger is satisfied.

● Starting and stopping group recording

Group recording starts and stops according to the record trigger setting for each record group.
(For information on record trigger settings, see Section 8.16.)

● Recording status at power-on

The recording status is retained even after the recorder is switched off. When the recorder is switched on, the recorder is returned to the recording status at the time of turning off the recorder.

[Caution]

If a common alarm, DI record, or schedule is specified for the group record trigger setting, the recording status at power-on determines whether to start or stop recording.

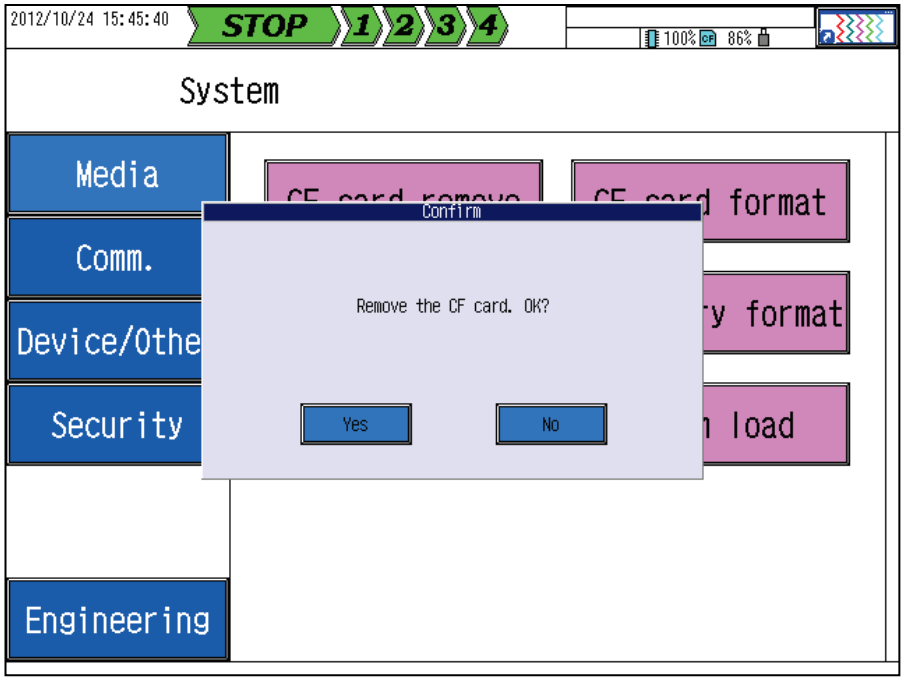
5.4 Removing the CF Card

Perform the following operation if you need to replace the CF card or temporarily remove it while the recorder is running.

You can remove the CF card even when the recorder is recording using the following procedure.

● Removal procedure

(1) System > Media > CF card remove



(2) Select Yes in the confirmation window.

(3) Press OK on the following screen.

(4) Open the operation panel cover, press the CF card eject button, and remove the card.

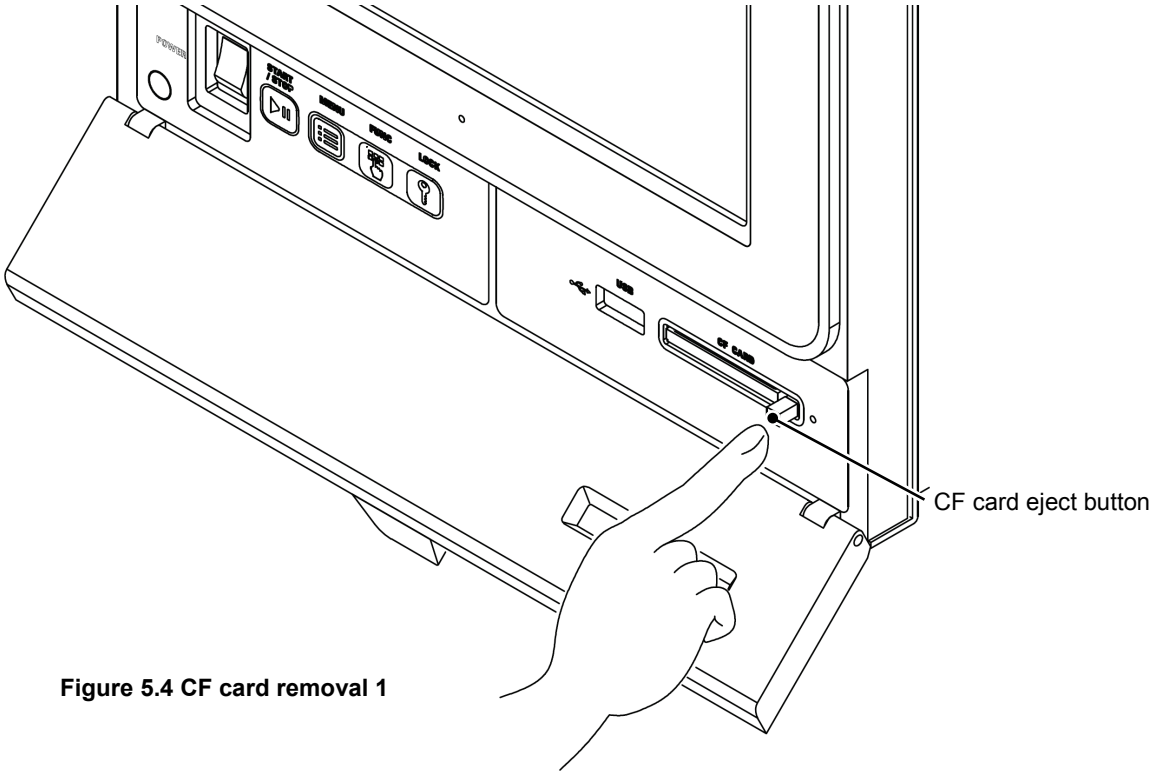


Figure 5.4 CF card removal 1

(5) Remove the CF card.

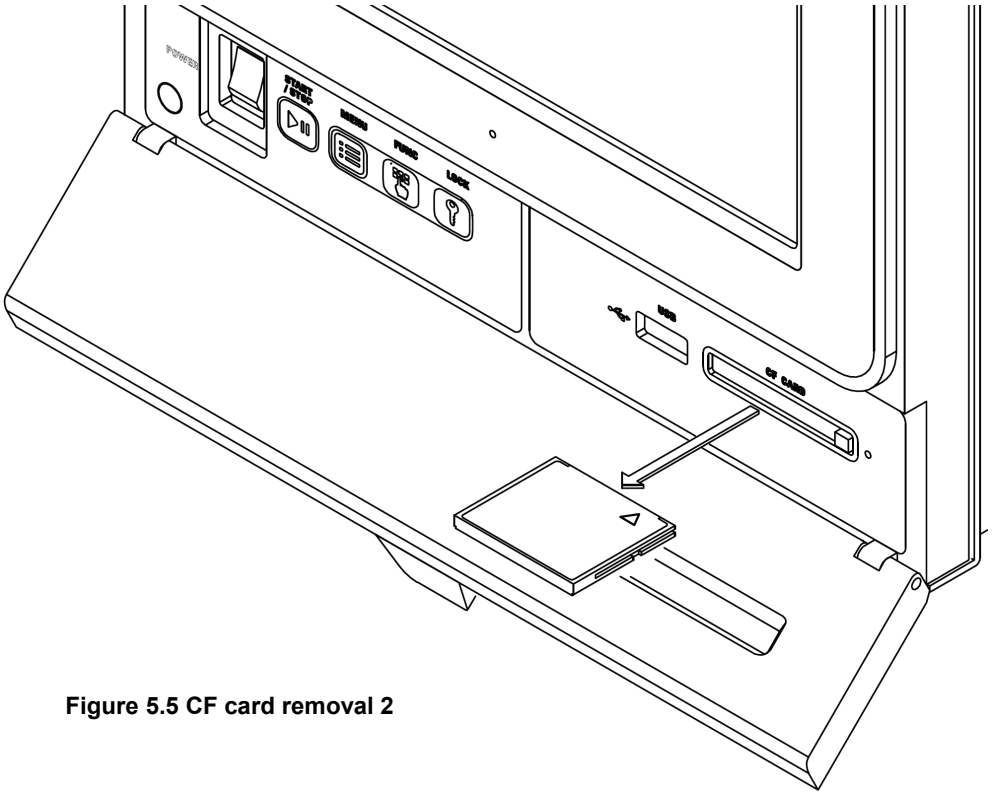


Figure 5.5 CF card removal 2

⚠ Caution

- Be sure to perform the above procedure to remove the CF card while the recorder is running.
- Removing the CF card without performing the above procedure may cause data corruption on the CF card.

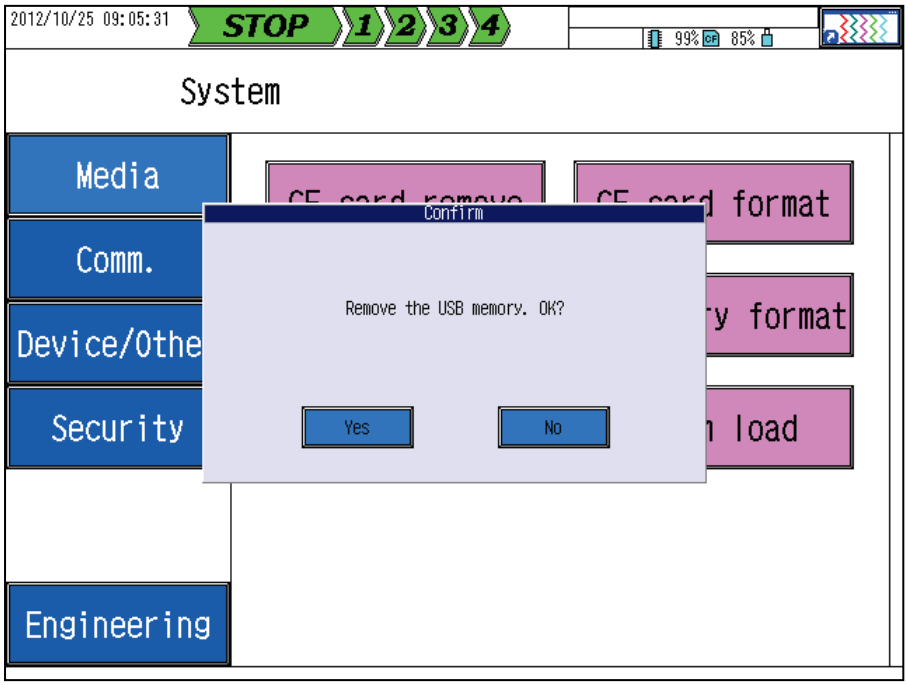
5.5 Removing the USB Memory (Optional)

Perform the following operation to remove the USB memory while the recorder is running.

The USB memory is optional. Note that, if your order does not include the USB memory option, you cannot perform the operation in this section.

● Removal procedure

(1) System > Media > USB memory removal



(2) Select Yes in the confirmation window.

(3) Press OK on the following screen.

(4) Remove the USB memory.

Caution

- Be sure to perform the above procedure to remove the USB memory while the recorder is running.
- Removing the USB memory without performing the above procedure may result in data corruption on the USB memory.

5.6 CF Card Output and USB Memory Output (Optional)

[Explanation]

You can output record data and parameter logs from internal memory at any time.

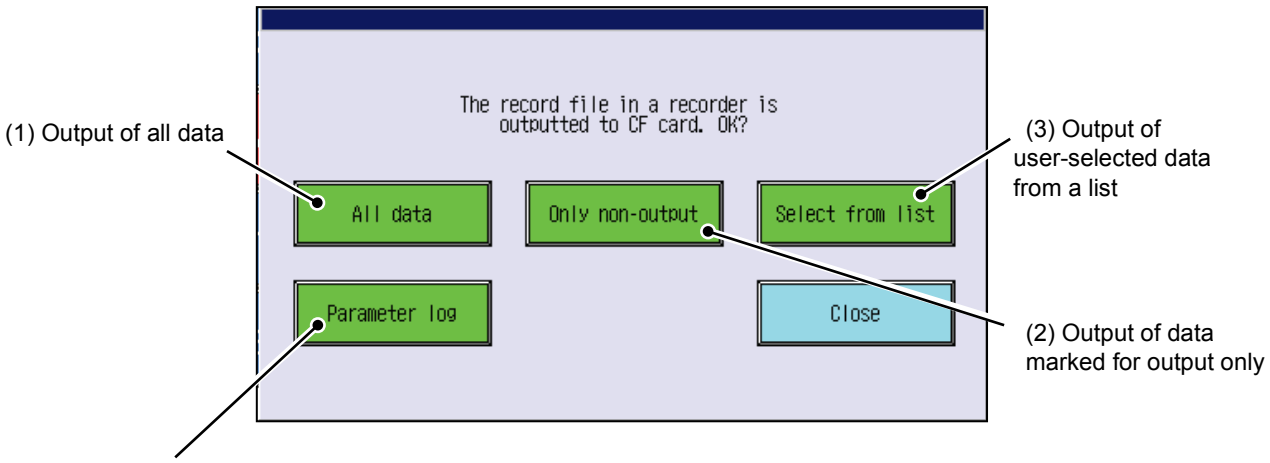
[Procedure:]

Press the MENU button, and then select CF card output or USB memory output to open the output window. (Alternatively, select Yes in the confirmation window that opens after the recording medium is inserted.)

In the output window, select the desired output method.

Note: The USB memory is optional. If your order does not include this option, USB memory output is not displayed.

CF card output and USB memory output initiate the same operation except that the output recording medium type is different. The following explanation assumes the CF card output window and uses the term "recording medium" in place of the CF card or USB memory.



5.6.1 Output of All Data

All record data in the internal memory is output to the recording medium.

[Save folder]

(Recording medium root)¥*Recorder*¥*Data_YYMMDD_hhmmss*¥(folder named according to the record data folder naming convention *)

(*YYMMDD_hhmmss*: Indicates the time of the output.)

YY: Year (00-99), *MM*: Month (01-12), *DD*: Day (01-31)

hh: Hour (00-23), *mm*: Minute (00-59), *ss*: Second (00-59)

[Save file name]

Data is output to a file named according to the record data file naming convention. (*)

* For information on the naming convention, see Section 7.3.

[Caution]

- Output of all data may require in excess one hour, depending on the number of output data records and the status of the recording medium.
- The maximum output data size may reach 400 MB. Confirm that the available storage capacity of the recording medium is sufficient.

5.6.2 Output of Data Marked for Output Only

Only data marked for output in the internal memory is output.
(For further information on output-pending data, see Section 7.3.4.)

[Save folder]

(Recording medium root) ¥(record data save folder *)

[Save file name]

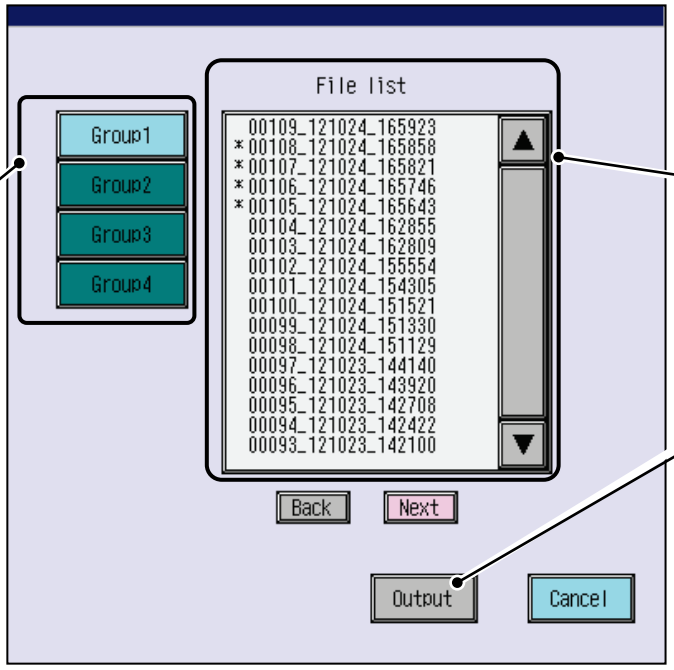
Data is output to a file named according to the record data file naming convention. (*)

* For further information on folders and the naming convention, see Section 5.6.6.

5.6.3 Output of User-selected data from a List

From record data saved in the internal memory, you can select any data to be output.

Pressing Select from list opens the following window:



1) Select a record group to display a list of files available for output belonging to that record group.

2) From the list, select files you want to output by marking each of them with an *.

3) Output the files.

* The naming convention of save folder and files is identical to that of the output of all data function.

[Caution]

- Only files from one record group can be selected for output at one time.
- If you change the selected record group after marking files at step 2), all selections are cleared.

5.6.4 Output of Parameter Logs

When settings are changed on the recorder, the relevant settings files are automatically saved to the internal memory (up to 200 files).

All settings files saved to the internal memory are output.

[Save folder]

(Recording medium root)¥*Recorder*¥*Prm_YYMMDD_hhmmss*¥(folder named according to the record data folder naming convention *)

(*YYMMDD_hhmmss*: Indicates the time of the output.)

YY: Year (00-99), *MM*: Month (01-12), *DD*: Day (01-31)

hh: Hour (00-23), *mm*: Minute (00-59), *ss*: Second (00-59)

[Save file name]

XXXX_ YYMMDDhhmmss.dp8

XXXX: Serial number (0000- 9999)

YYMMDD_HHmmss: Indicates the time the settings were saved.

YY: Year (00^99), *MM*: Month (01-12), *DD*: Day (01-31)

hh: Hour (00-23), *mm*: Minute (00-59), *ss*: Second (00-59)

* For information on the naming convention, see Section 5.6.6.

5.6.5 Progress Display and Cancellation

During the output process, a window showing a progress bar is displayed.

To interrupt the output process, press Cancel.

[Operation subsequent to output process interruption]

Pressing Cancel will interrupt the output process after the current file has been completely written.

When the output process is resumed, a new file of the new time is created and receives data from the beginning. If [Output of data marked for output only] is selected, data output will begin with the first record that has not yet been output.

● If the recording medium has insufficient free space or reaches the maximum number of files:

If the recording medium has insufficient free space or exceeds the maximum number of record data files during the output process, an error occurs, causing the output process to be interrupted.

Under the following conditions, however, previous data on the CF card will be overwritten without an error:

- Output of data marked for output only is in progress.
- The recording medium is a CF card.
- The external file overwrite setting is ON.

In the above case, the oldest record data is deleted on the CF card and a new file is written on the CF card.

(For information on the maximum number of record data files and the external file overwrite setting, see Section 8.17.)

5.6.6 Folder Structure on CF Card or USB Memory

When data is saved from the recorder to a CF card or USB memory, a folder named Recorder is automatically created on the CF card or USB memory.
The contents of the Recorder folder are as follows:

[Folder structure]
[Recorder] -+-[Data]
+-[Prm]

1) Data

This folder holds trend files measured by the recorder. When recording starts, a new file named according to the following naming convention is created. During recording, one dpk file is created at each record cycle.
(For information on record cycles, see Section 8.16.)

* Folder naming convention
Folder name: ***FFFFF_X***

FFFFF: Record folder set for the pertinent record group (up to 16 characters)
If no record folder name is set, this segment does not appear.

X: Record group No.
(For information on record folder names and record group Nos., see Section 8.16.)

The contents and naming convention of record files saved in each folder are as follows:
- Record trend file
This is a measurement data file created at each record cycle.
File name: ***ACCCCC_DDDDDDDD_YYMMDD_hhmmss*.dpk**

* Unique naming convention (serial number + identification name + date + time)
A: File identification mark (0-9, A-Z)
If the output file name is duplicated, this mark is incremented by 1.

CCCCC: Serial number (00000-99999)

DDDDDDDD: Identification name set for each record group
If no identification name is set, this does not appear.
(For identification names, see Section 8.16.)

YY:	Year (00-99)
MM:	Month (01-12)
DD:	Day (01-31)
hh:	Hour (00-23)
mm:	Minute (00-59)
ss:	Second (00-59)

2) Prm

This folder holds settings files (.dp8) saved in the recorder.
On the recorder, data can be read from and written to settings files saved in this folder.
(For information on reading/writing parameters, see Sections 9.6 and 9.7.)

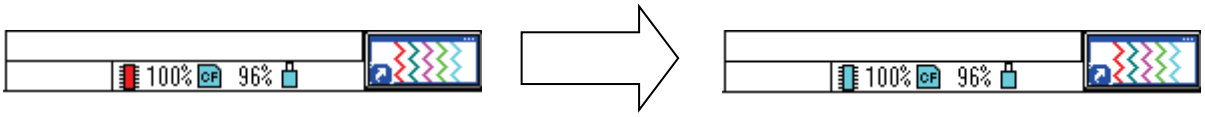
5.7 Power Off

Before turning off the power to the recorder, make sure that overall recording is stopped and that file saving is completed.

● Power-off procedure

(1) Stop overall recording.

(2) Wait until the internal memory icon changes from red to blue.



(3) Wait until the CF card write window closes.

(If a CF card is inserted and the external file save setting is Auto:)

(For information on the external file save setting, see Section 8.17.1.)

(4) Turn the power off.

⚠ Caution

- Perform the above procedure to turn off the power to the recorder.
- Turning off the power to the recorder without performing the above procedure could corrupt files in the internal memory and on the recording medium.

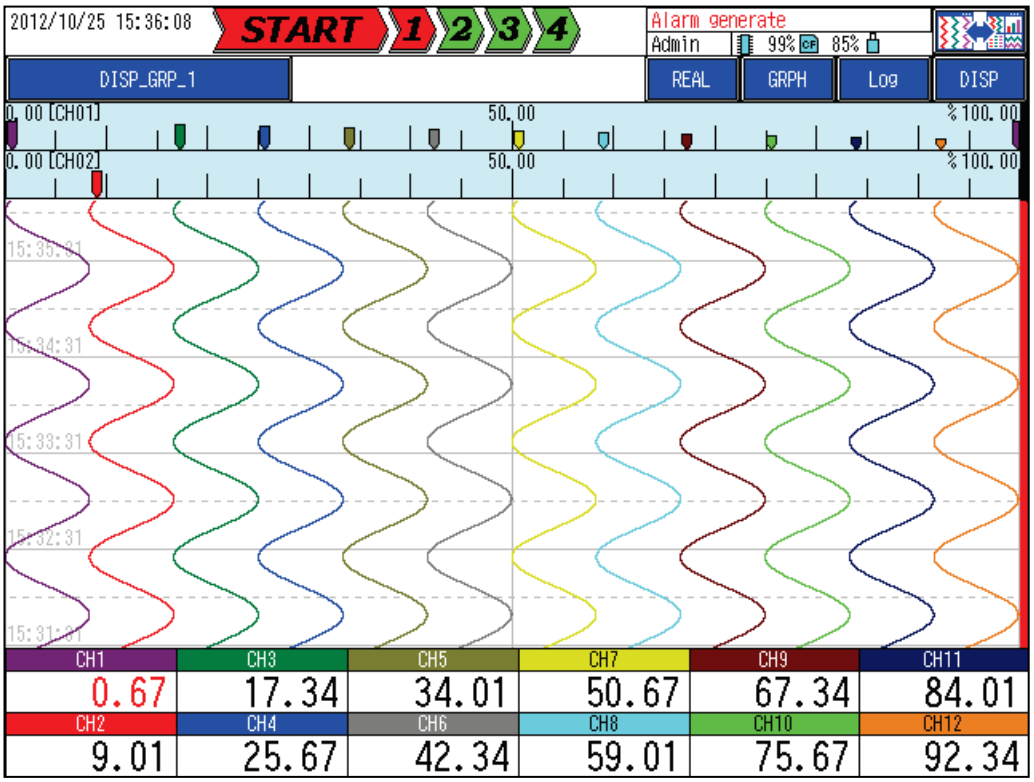
6. Display Functions

6.1 Basic Layout of Data Display Screen

The data display screen consists of two sections: screen top and screen bottom.

(1) Screen top

(2) Screen bottom



(1) Screen top

This section is used to display the status of the recorder and perform menu operation.

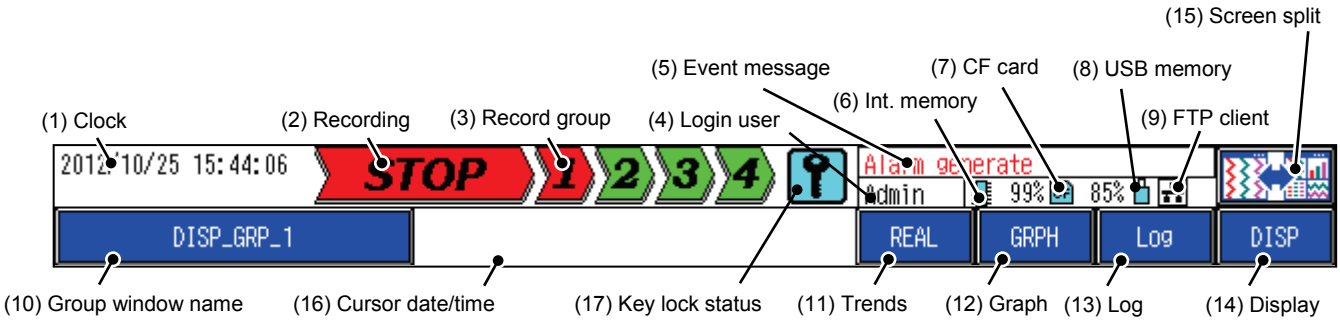
(2) Screen bottom

This section displays the following trend and log information:

Horizontal trends:	See Section 6.3.
Vertical trends:	See Section 6.4.
Bar graph:	See Section 6.5.
Digital:	See Section 6.6.
Overview:	See Section 6.7.
Historical trends:	See Section 6.8.
Log:	See Section 6.9.
Screen splitting:	See Section 6.12.

6.1.1 Screen Top

The upper level provides a common information area and the lower level provides a display group information area.



(1) Clock

Upper level: Current date and time

Lower level: Displays the elapsed time if the elapsed time display is enabled.

(For information on elapsed time, see Section 8.24.)

(2) Recording

Shows the overall recording status.

Green: Stopped

Red: Started

(3) Record group

Shows the recording status of each record group.

Green: Stopped

Red: Started

(For information on record groups, see Section 8.16.)

(4) Login user

Shows the security user name of the current login user.

(For information on security users, see Section 9.20.)

(5) Event message

Shows the event that has occurred most recently. If multiple events have occurred, the display switches at set intervals.

(For information on event messages, see Section 6.9.)

(6) Internal memory

Shows the status of the internal memory.

Aqua: The internal memory is not being accessed.

Red: The internal memory is being accessed.

[Remaining capacity]

100%: The internal memory holds no file to be saved in the CF card.

99 to 1%: Files remain that are yet to be saved to the CF card.

As the displayed number decreases, the size of files remaining to be saved increases.

0%: No files in the internal memory have yet been saved to the CF card.

If the internal memory fills up completely, files in the internal memory will be deleted in chronological order.

(7) CF card

Shows the CF card status and remaining capacity.

Gray: No CF card is inserted.

Aqua: A CF card is inserted.

Red: The CF card is being accessed.

(Even if a CF card is inserted, this display will change to gray when the card becomes removable. For information on CF card removal, see Sections 5.4 and 9.2.)

[Remaining capacity]

Shows the remaining capacity of the CF card.

However, when the number of files stored in the record folder exceeds 10000, this display becomes 0% even if there is free space on the CF card.

(8) USB memory (optional)

Shows the USB memory status.

Gray: No USB memory is inserted.

Aqua: USB memory is inserted.

Red: The USB memory is being accessed.

[Reference]

If your order does not include the USB memory option, this display is not provided.

(9) FTP client

Shows the communication status of the FTP client function.

(For further information, see Section 9.11.)

(10) Group selection

Pressing this changes the display group. (Only groups that are configured for Display ON are selectable.)

The selected group name is also shown.

(For information on display groups, see Section 8.13.)

(11) Real-time/historical

You can select Real-time trends or Historical trends.

The currently selected trend display name is shown.

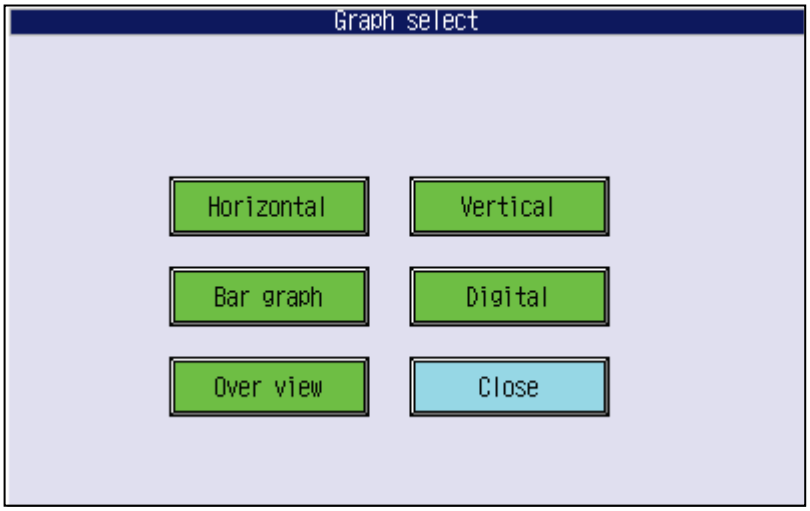
REAL: Real-time trends

HIST: Historical trends

(For information on historical trends, see Section 6.8.)

(12) Graph selection

You can select a graph from the following window:



* For details of each graph, see Sections 6.3 to 6.7.

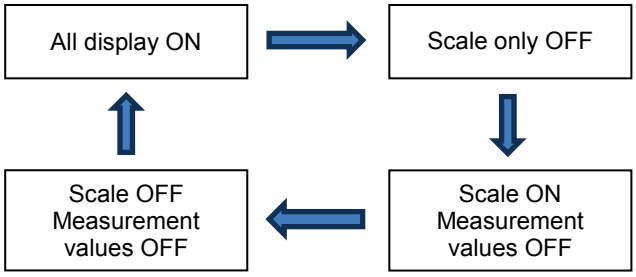
(13) Log display selection

Shows [Log].

(For further information, see Section 6.9.)

(14) Display selection

Toggles trend display methods as follows:



(For information on scale and measurement values displays, see Section 6.2.)

(15) Screen split

Switches the screen split mode.

(For information on screen split, see Section 6.12.)

(16) Cursor date/time

In historical trends, displays the date and time of the cursor position.

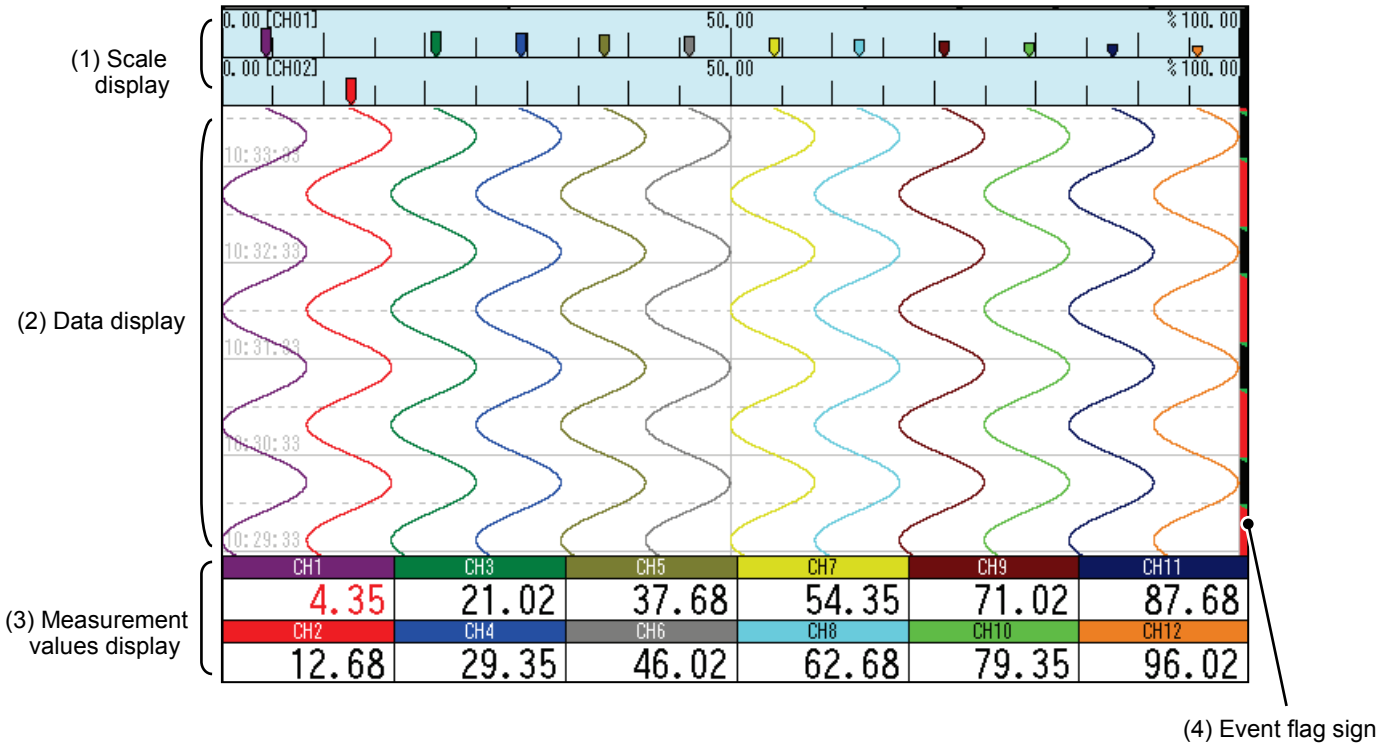
(For information on historical trends, see Section 6.8.)

(17) Key lock

Shows the security status.

(For further information, see Section 9.19.)

6.2 Basic Layout of Trend Display Screen



(1) Scale display

Shows scales (scale plates and pointers) in up to three levels depending on the setting.

(For information on scale No., see Section 8.7.2.)

(2) Data display

Shows measurement values in a chart.

The graph refreshes in synchronization with the record cycle.

The measurement values and pointers refresh at 1-second intervals regardless of the record cycle.

(3) Measurement values display

- Channel field

Shows Channel Number, TAG, or Details.

(For information on how to switch the display, see Section 8.7.1.

* Pressing the channel field displays the chart corresponding to the channel using thick lines for 3 seconds and displays the unit on the channel field. In addition, the display color and scale width on the scale display (1) are changed accordingly.

If the scale is changed temporarily, the channel field blinks.

A 2-second or longer press on the channel field opens the channel operation window.

(For information on the channel operation window, see Section 6.2.1.)

- Measurement values area

Shows current measurement values. If an abnormality occurs, one of the following appears:

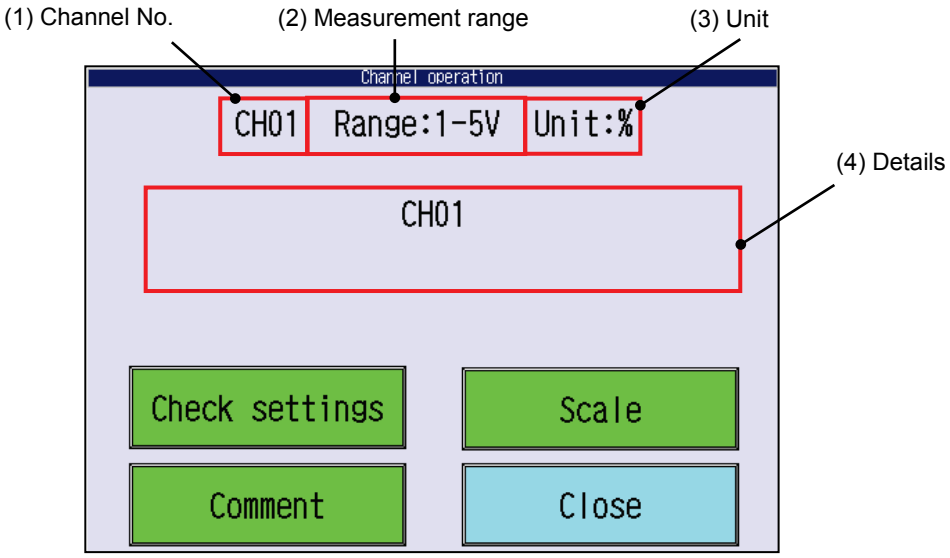
Burnout H	: B.OUT H	Burnout L	: B.OUT L
H over	: -H-	L over	: -L-
Input circuit error	: ERROR	Formula error:	INVALID
Alarm	: Red illumination	Alarm latch	: Blinking display

(4) Event flag sign

Marked in red if an alarm has occurred during the time zone and in green if a message or other event has occurred during the time zone.

6.2.1 Channel Operation Window

In this window, you can check channel settings and add comments.



(1) Channel No.

Shows the No. of the channel being displayed.

(2) Measurement range

Shows the measurement range that is currently set.

(3) Unit

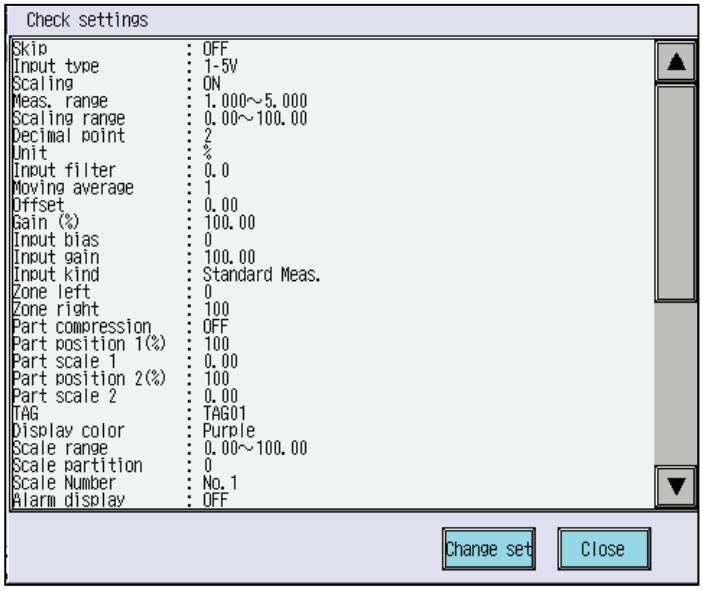
Shows the unit that is currently set.

(4) Details

Shows the details value that is currently set.

i) Checking settings

You can check settings of the selected channel. In addition, by selecting a setting item and pressing the Change set key, you can jump to the window for setting change.



[Reference]

If you load a past measurement file onto historical trends, you can check settings on the past measurement file. In this case, you can only check some, but not all, settings.

ii) Comments

You can add comments on the trends.

[Caution]

You can only add comments on historical trends. The comments are not directly displayed in the trends window. For further information, see Section 6.10.

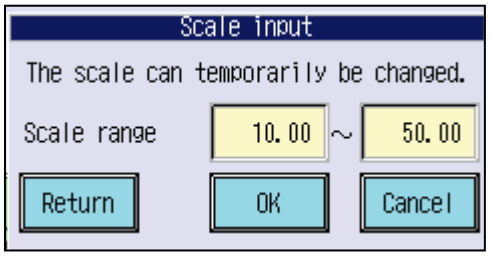
iii) Scale

You can temporarily change the scale width of the selected channel according to the settings.

If the scale width of a channel has been changed, the corresponding channel No. blinks in the measurement values display area.

You can restore the standard size by pressing Return.

* Any scale width change is reset by turning the power off.



iv) Close

Closes the channel operation window.

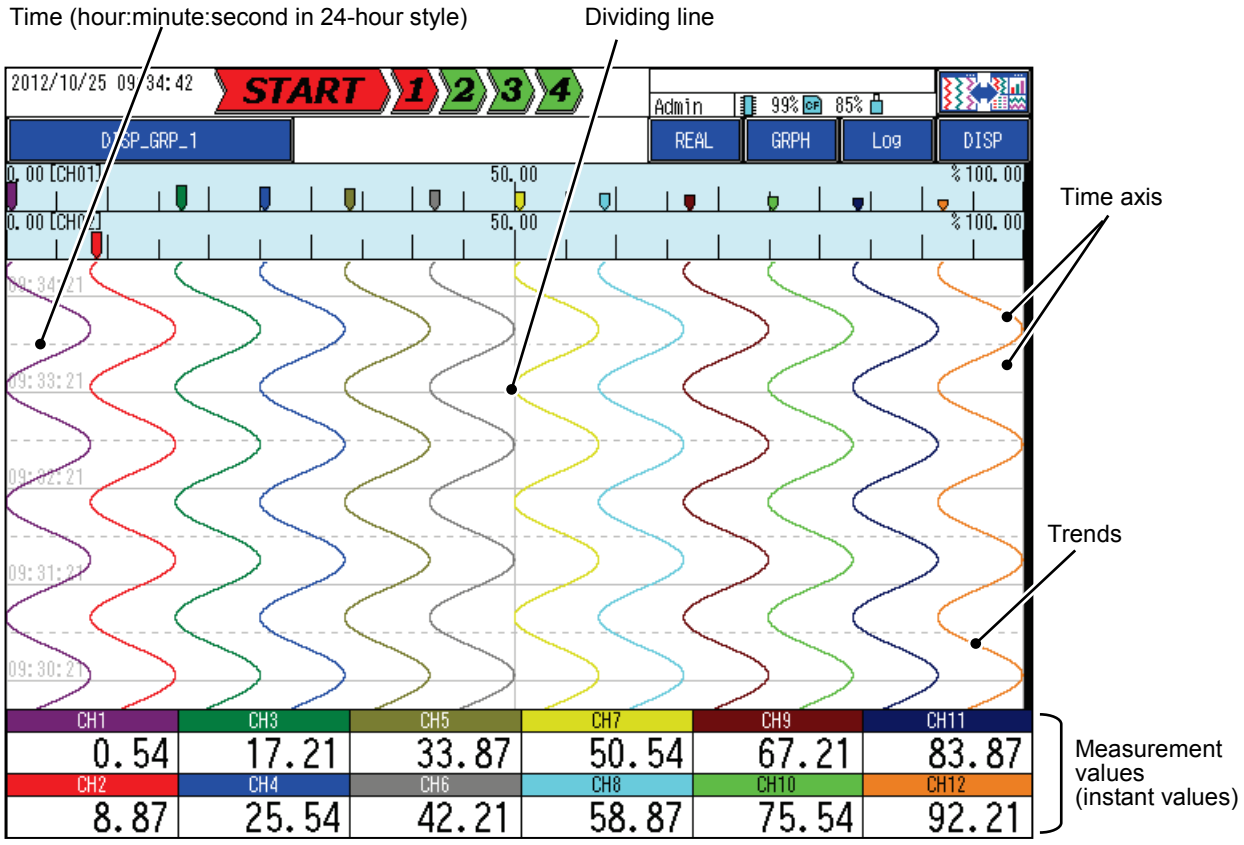
6.3 Measurement Data Presented in Horizontal Trends

[Explanation]

Measurement data is presented in horizontal trends.

[Operation]

GRPH > Horizontal



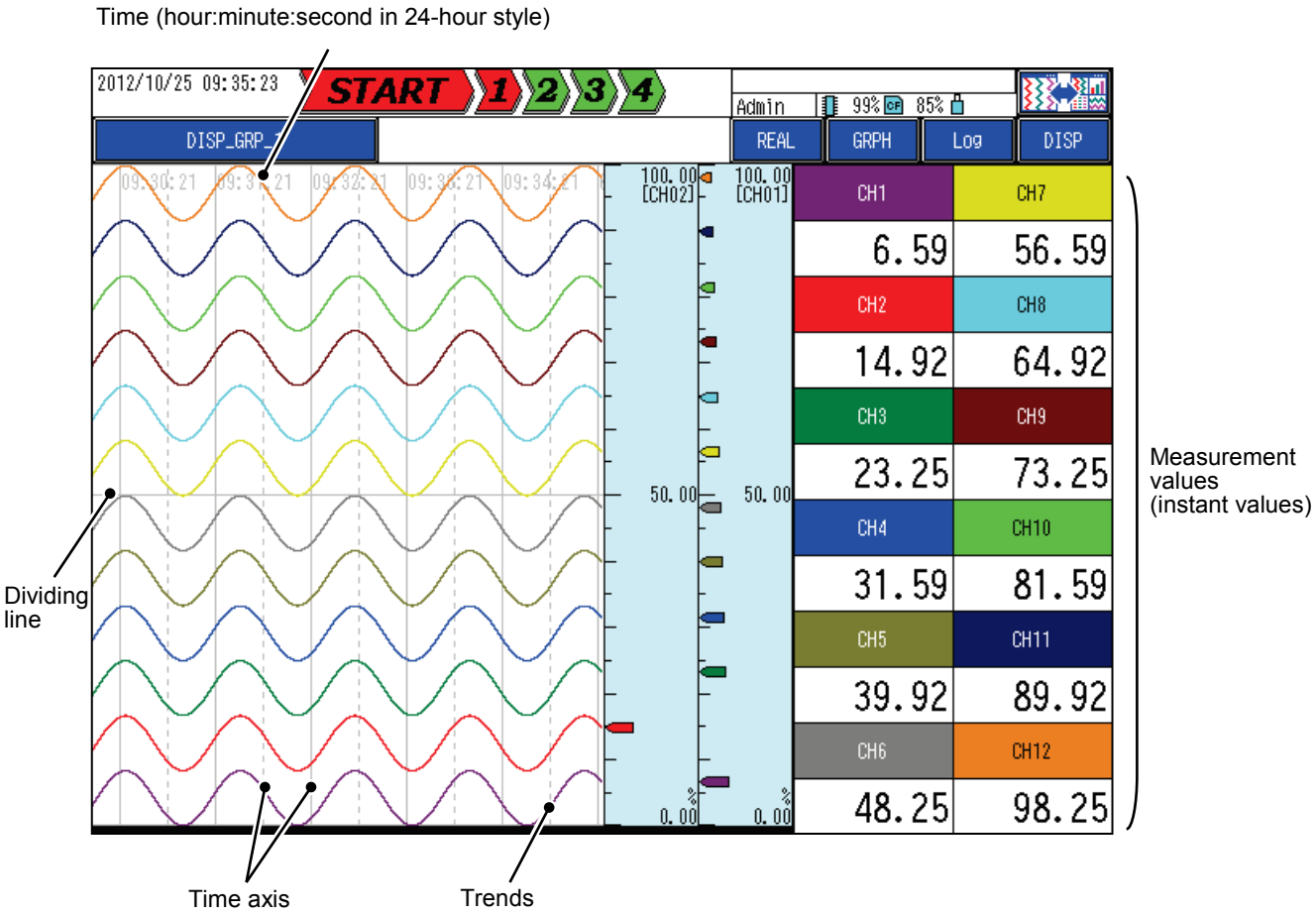
6.4 Measurement Data Presented in Vertical Trends

[Explanation]

Measurement data is presented in vertical trends.

[Operation]

GRPH > Vertical



6.5 Measurement Data Presented in a Bar Graph

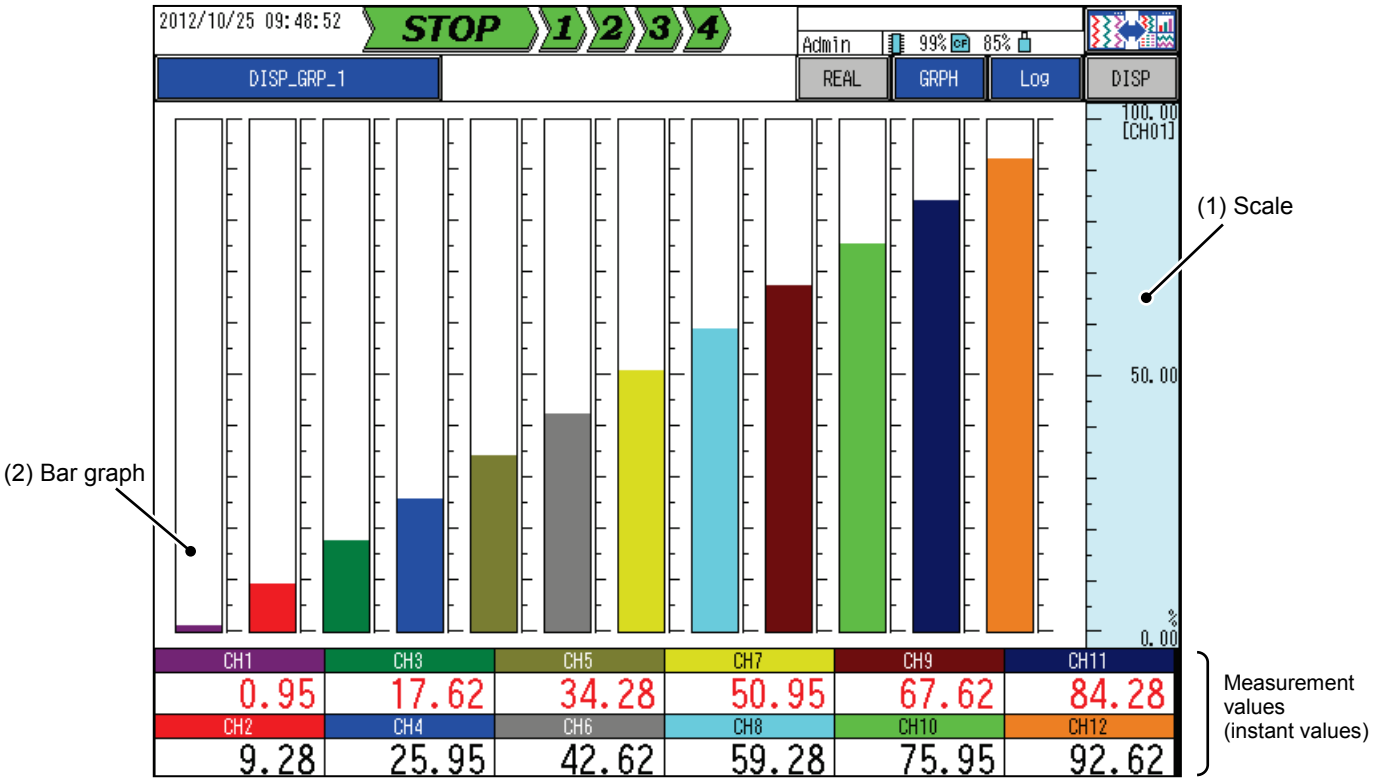
[Explanation]

Measurement data is presented in a bar graph.

REAL and DISP are disabled.

[Operation]

GRPH > Bar graph



(1) Scale

A press on [Measurement values] changes the scale width accordingly.

(2) Bar graph

The number of bars in the bar graph depends on the number of channels registered.

(For the number of channels, see Section 8.14.)

6.6 Measurement Data Presented as Digital Values

[Explanation]

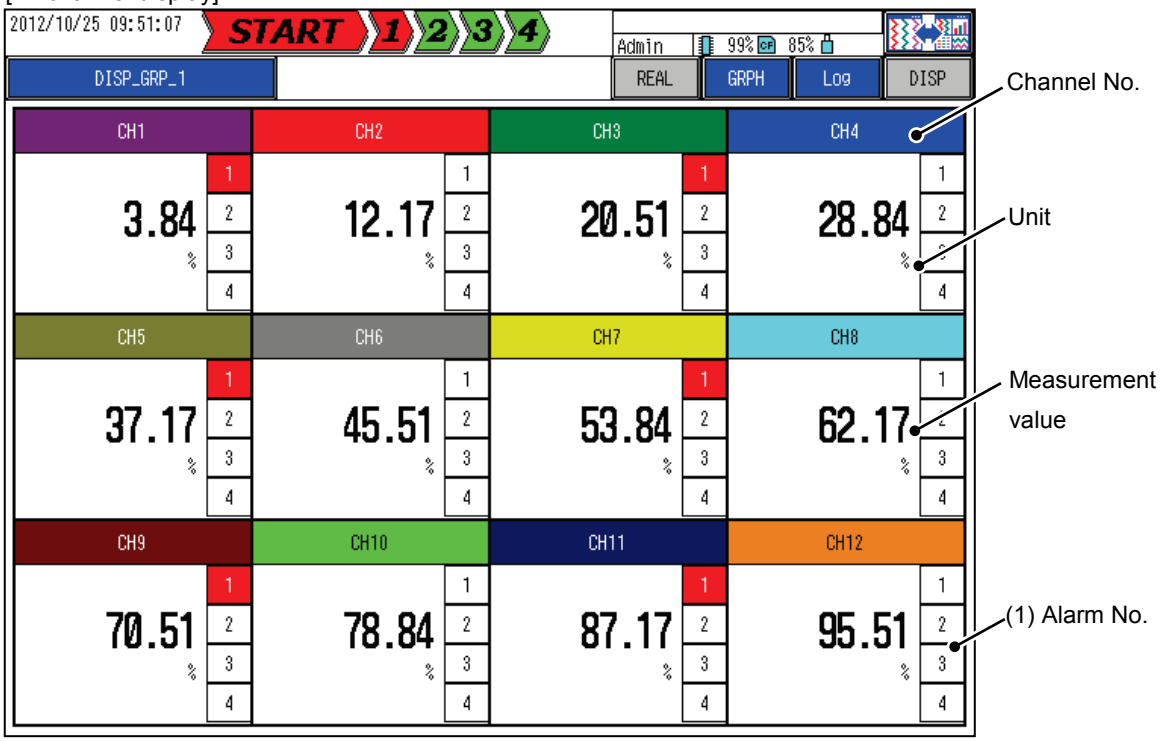
Measurement data is presented as numeric values using a large font.

REAL and DISP are disabled.

[Operation]

GRPH > Digital

[12-channel display]



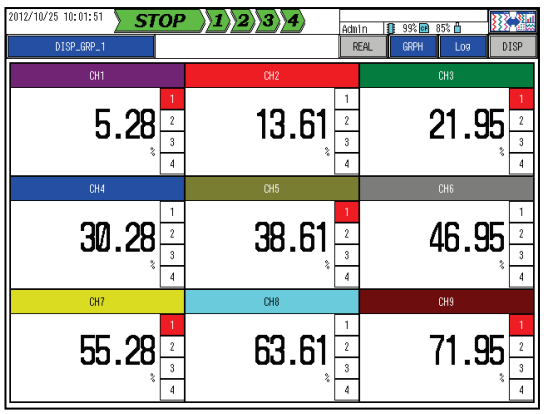
(1) Alarm No.

If an alarm occurs on a channel, the corresponding alarm No. is displayed in red.

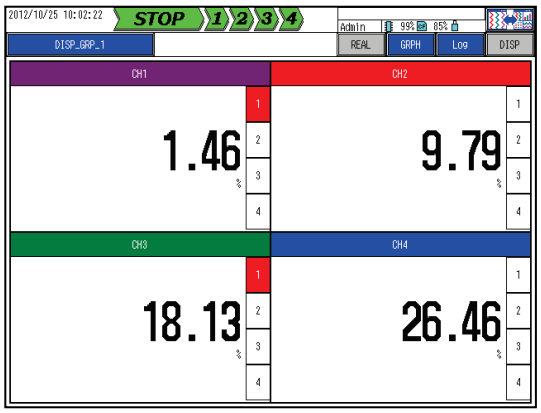
* The digital display area layout varies with the number of channels registered.

(For information on the number of channels, see Section 8.14.)

[9-channel display]



[4-channel display]



6.7 Overview Display

[Explanation]

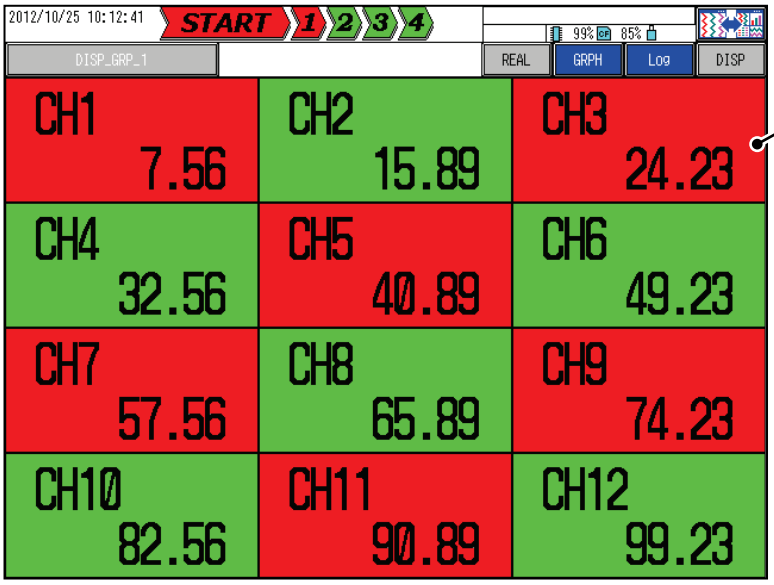
Information on all channels registered with the pertinent display group is displayed together.

Gray keys are disabled.

[Operation]

GRPH > Over view

[12-channel display]



(1) Measurement value

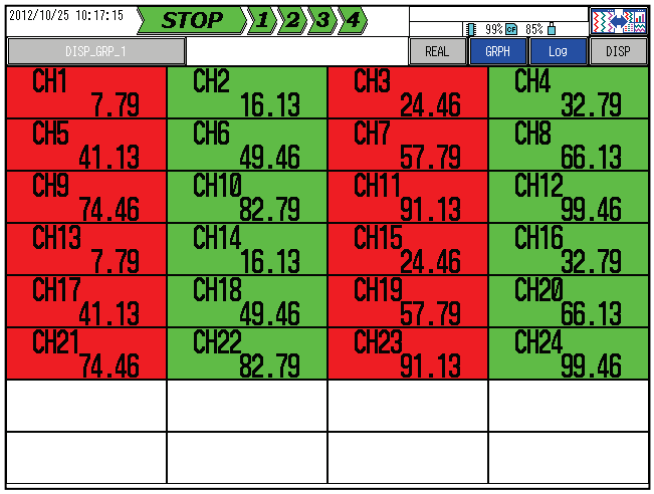
Shows the numeric value of each channel. If an alarm has occurred on a channel, the background is red.

* The number of measurement values displayed varies with the number of channels registered.

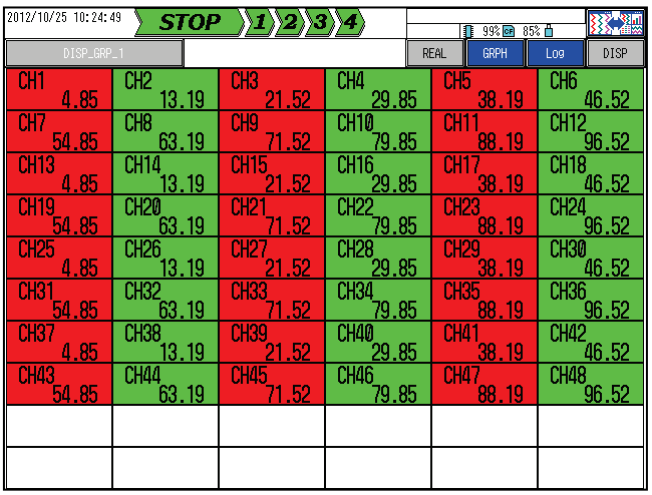
The number of channels here means the total number of channels registered with the eight display groups.

(For information on the number of channels, see Section 8.14.)

[24-channel display]



[48-channel display]



6.8 Historical Trend Display

[Explanation]

You can look up data that is being recorded at present and view past data history.

Historical trends can be displayed in one of two modes:

- Memory History mode

  Pressing REAL in the real-time trend window places the recorder in memory history mode.

  (The file selection icon is represented by  .)

  Current and recently recorded data is displayed.

  (One 12-channel window can display up to about 60,000 records.)

  If a date/time search attempt is made beyond the searchable range in memory history mode, the recorder automatically begins to search the data saved in the internal memory and shifts to file history mode.

- File history mode

  The recorder enters file history mode when you press the file selection icon in memory history mode and specify past data.

  (The file selection icon is represented by  .)

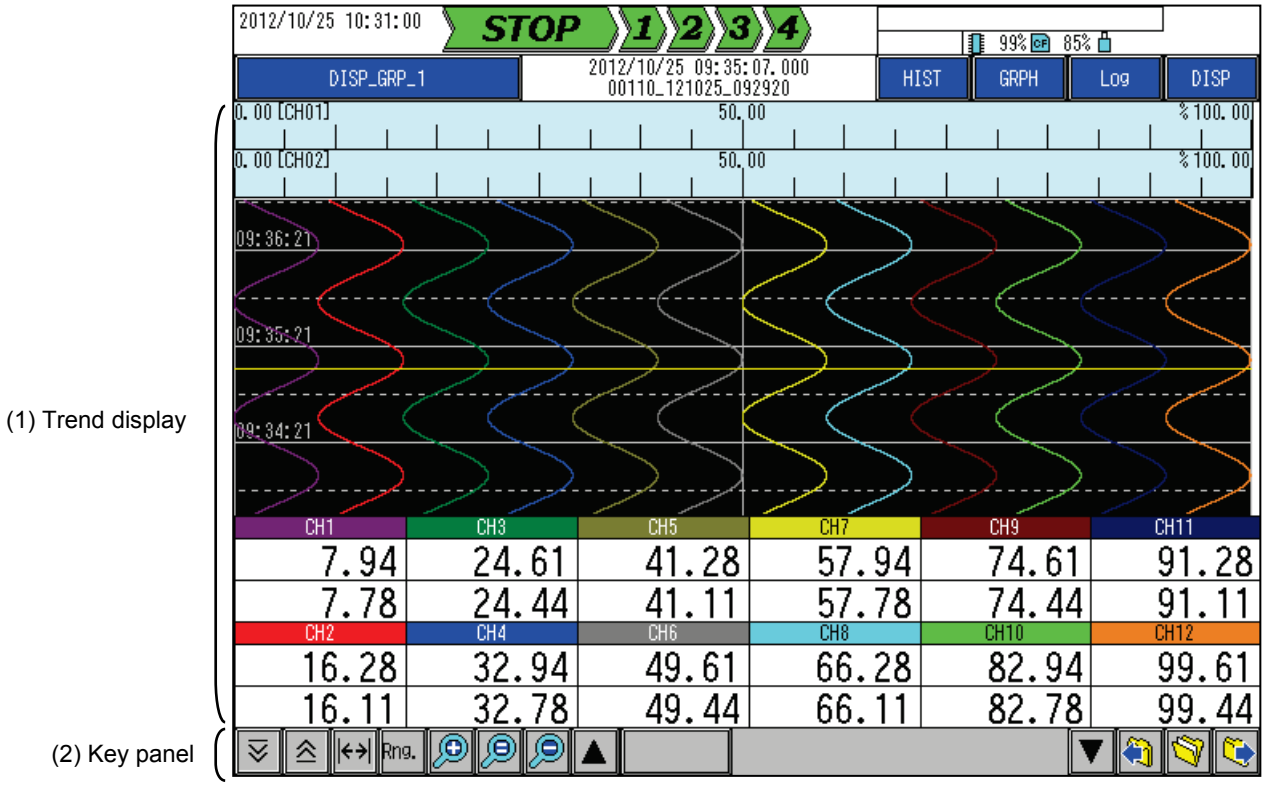
  In this mode, information in one file is displayed. To change the file, use the [Previous] and [Next] keys or use the file selection window.

* For information on the file selection icon, see Section 6.8.2.

[Reference]

If the number of channels or the record type registered with the record group is changed, the trends displayed in memory history mode are initialized.

● Historical trends



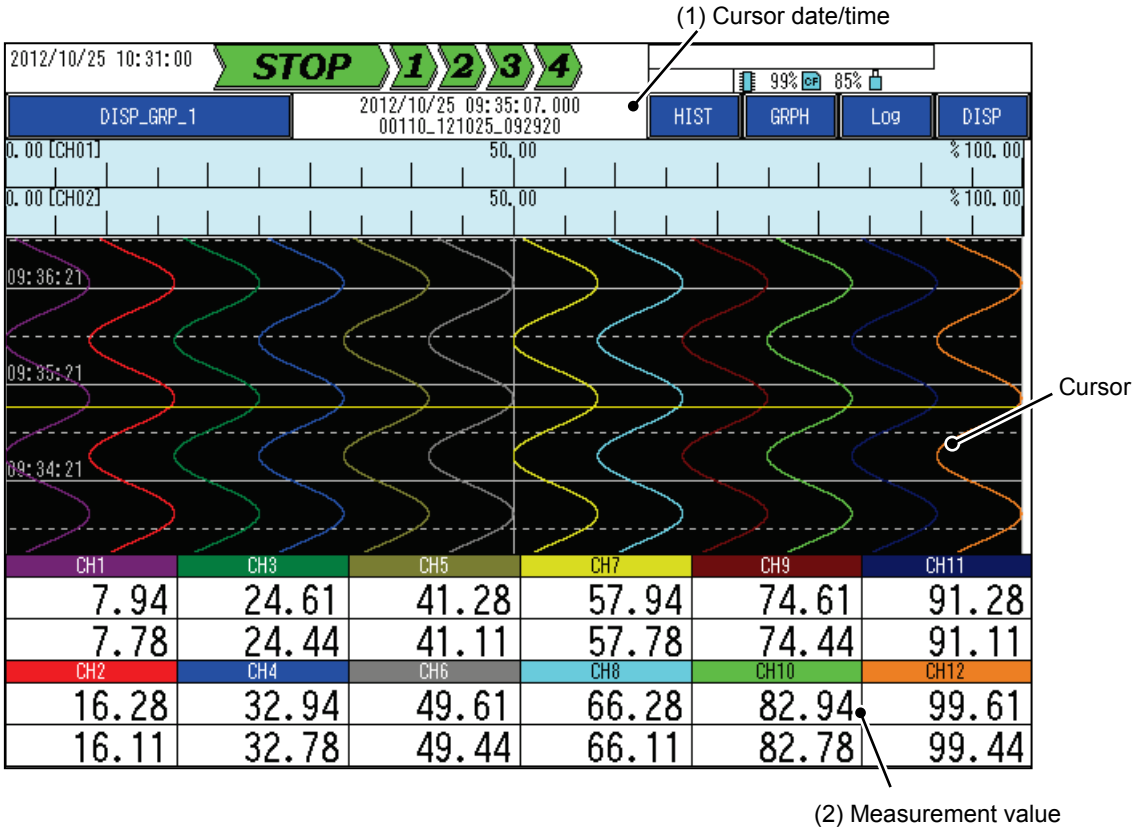
(1) Trend display

Shows trend information. For further information, see Section 6.8.1.

(2) Key panel

You can perform various operations. For further information, see Section 6.8.2.

6.8.1 Trend Display



(1) Cursor date/time

Shows the date and time at the cursor position.

Pressing this area opens the date/time input window. When you specify a date and time in this window, the cursor moves to the specified point in time.

(2) Measurement value

Shows the measurement value at the cursor position.

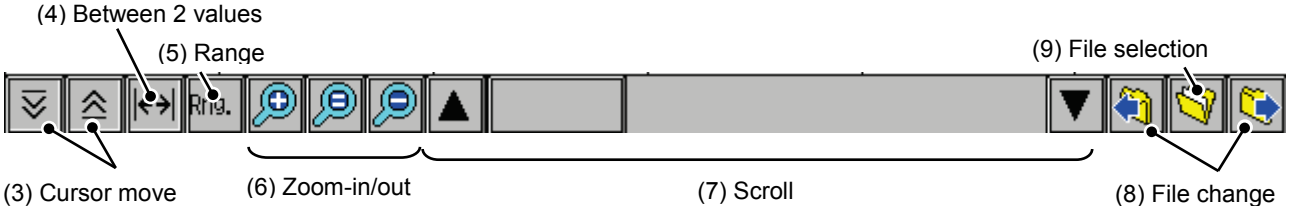
If the record type setting is maximum/minimum, the display field is divided into two levels.

Upper level: Maximum

Lower level: Minimum

(For information on record types, see Section 8.16.)

6.8.2 Key Panel



(3) Cursor move

Moves the cursor position.

(4) Between 2 values

Increases the scale width of the selected channel. Specify the positions of two values according to the instructions displayed on the screen top. If the scale width of a channel is increased, the corresponding channel No. blinks on the measurement values display area.

Pressing a second time on this key restores the standard size.

(5) Range

Select a time range displayed on one screen (page).

All: All record data is displayed on one page.

1 hour/page: Record data of 1 hour is displayed on one page.

1 day/page: Record data of 1 day is displayed on one page.

7 days/page: Record data of 7 days is displayed on one page.

(6) Zoom in/out

The time axis on the screen is expanded/shrunk at one of six levels.

Zoom in : Each press expands the time axis. The display range shrinks accordingly.

Original : A press restores the default (greatest) size.

Zoom out : Each press shrinks the time axis. The display range expands accordingly.

(7) Scroll

You can scroll the graph display area.

A long press of a scroll button scrolls the screen at a higher speed.

(8) File change

Record data is divided into multiple files, each corresponding to one save cycle.

(For information on file save cycles, see Sections 8.16.1 and 7.2.3.)

[ ]: Moves to the previous record data file.

[ ]: Moves to the next record data file.

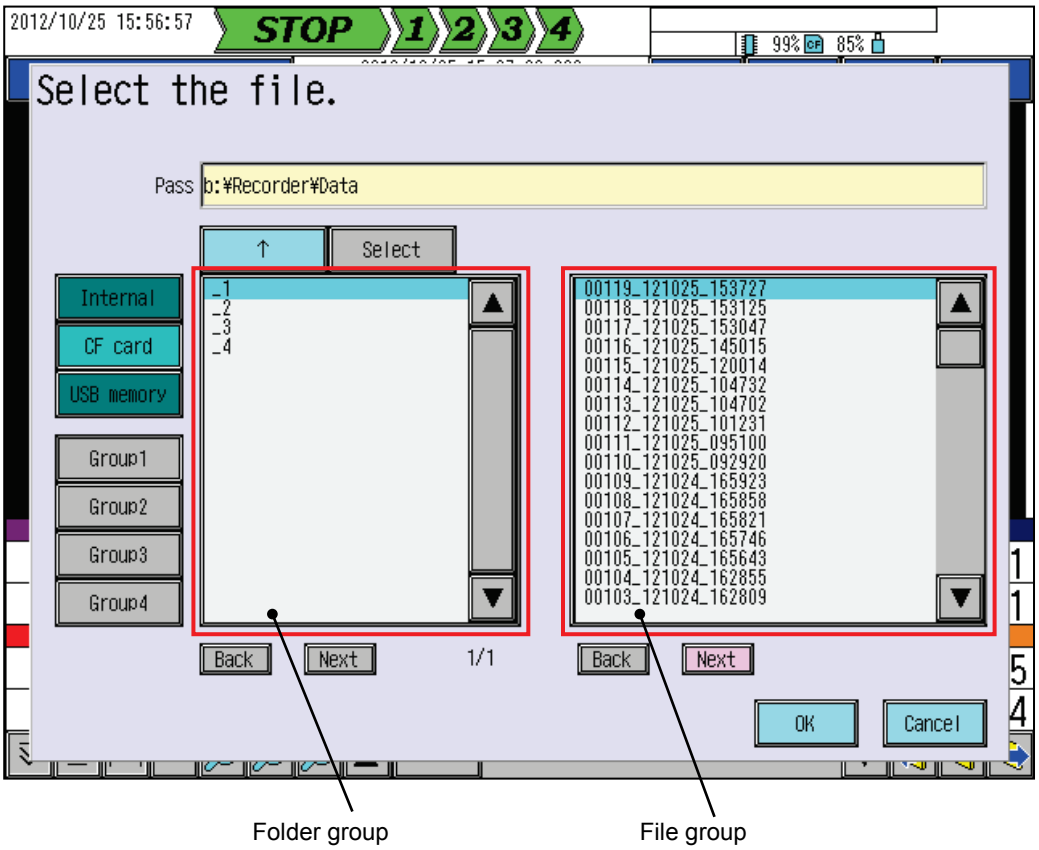
* Pressing the key has no effect if the previous or next file does not exist.

* These keys are only enabled in file history mode.

(For information on the mode, see Section 6.8.)

(9) File selection

It is possible to read data that was recorded in the past (see the following figure).



When you select a folder from [Folder group], the record data files contained in the folder are listed in [File group]. When you select a file from [File group] and press OK, the data in the selected file is displayed in the historical trend area.

Historical trends are displayed according to the current settings of the following:

- Trend direction
- Number of scale partitions
- Trend scale display
- Channel display color

6.9 Log Display

[Explanation]

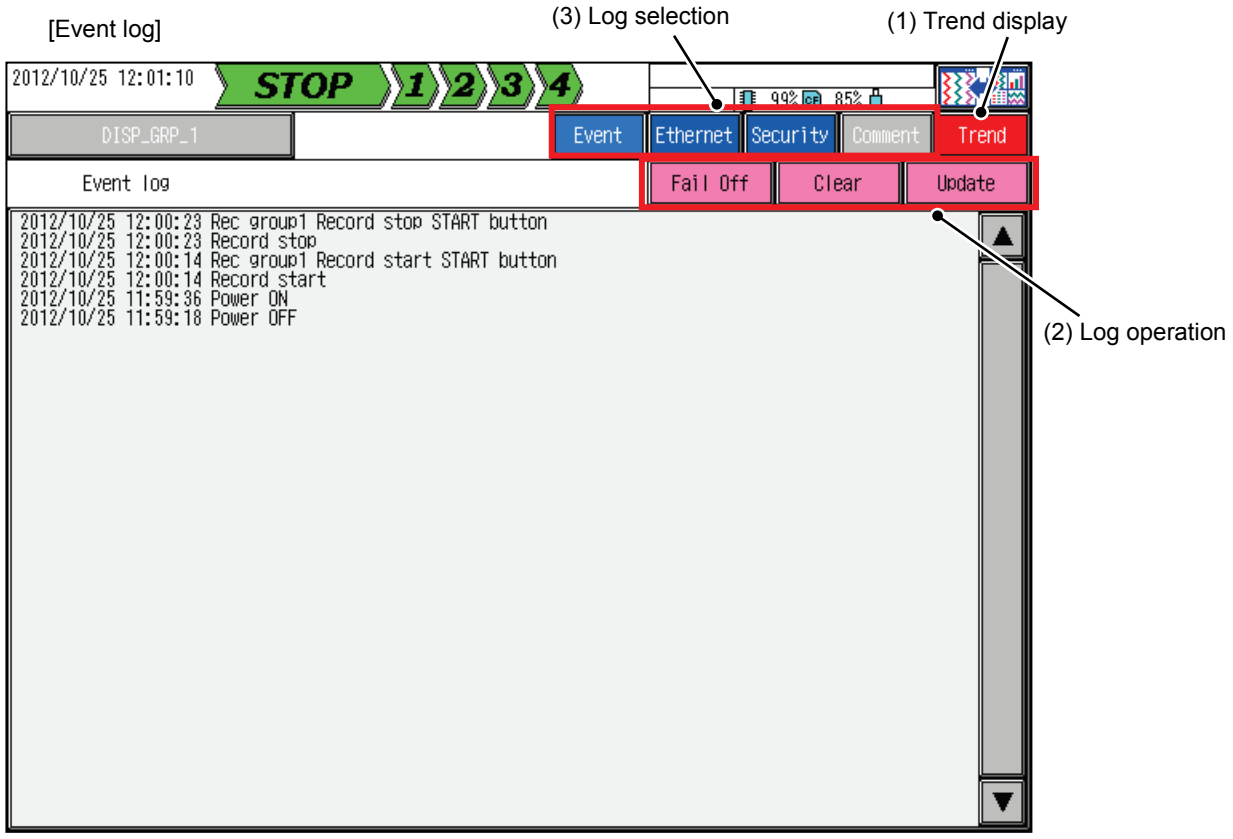
Events, messages, and other data that is saved during recording are stored as logs.

LAN communication log and parameter change log are also stored as logs.

(For information on each event type, see "● Event Log display examples" below.)

[Operation]

In the real-time trend window, press [Log].



(1) Trend display

Pressing this returns you to the trend display window.

(2) Log operation

Fail Off: Resets the FAIL alarm.

Clear: Clears the log information.

Update: Updates the log information.

(3) Log selection

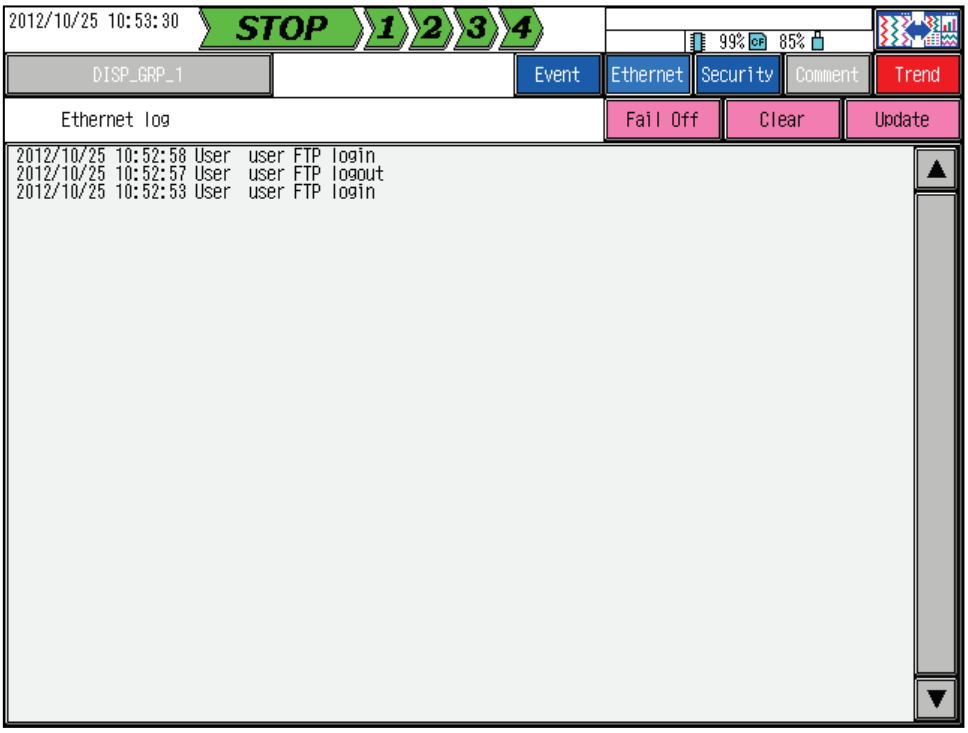
Pressing a button opens the corresponding window.

- Event key

  Opens the event log window (above figure).

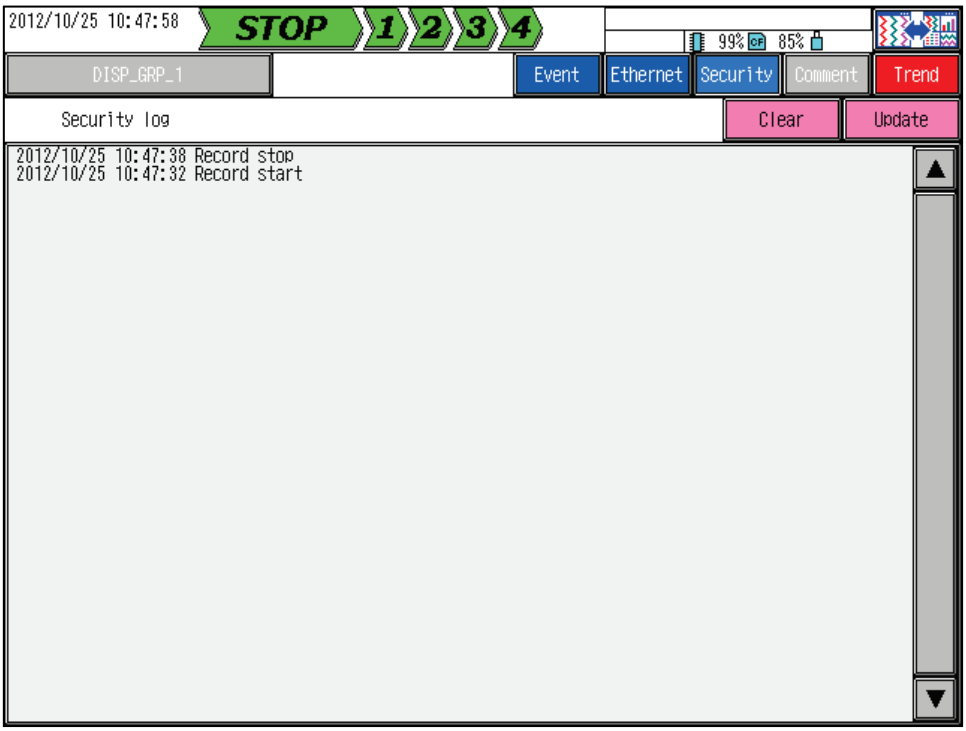
- Ethernet key

Displays Ethernet log.



- Security key

Displays security logs. The Fail Off key is disabled.



- Comment key

Displays a comment list. This key is only enabled when historical trends are displayed.

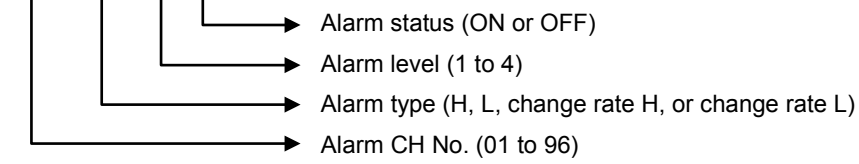
(For information on comment list display, see Section 6.10.)

● Event log display examples

The date and time is followed by the following log information, which varies depending on the event that has occurred:

- Alarm ON and OFF

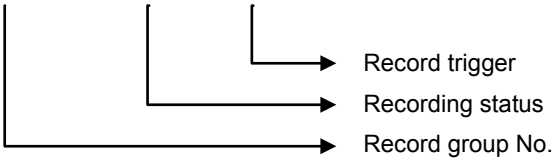
CH01 H alarm 1 ON



(For details of each alarm, see Section 8.8.)

- Record group start and stop

Record group 4 Started Common alarm



(For information on record groups, see Section 8.16.)

- Message

The value registered in the setting window is displayed.

(For messages, see Section 8.19.)

6.10 Comment Setting and List Display

[Explanation]

You can specify a time from record data and add your comment to the record data at that time. You can jump to the comment at the specified time from the comment list window.

(You can only add comments on historical trends. The comments are not directly displayed in the trend window.)

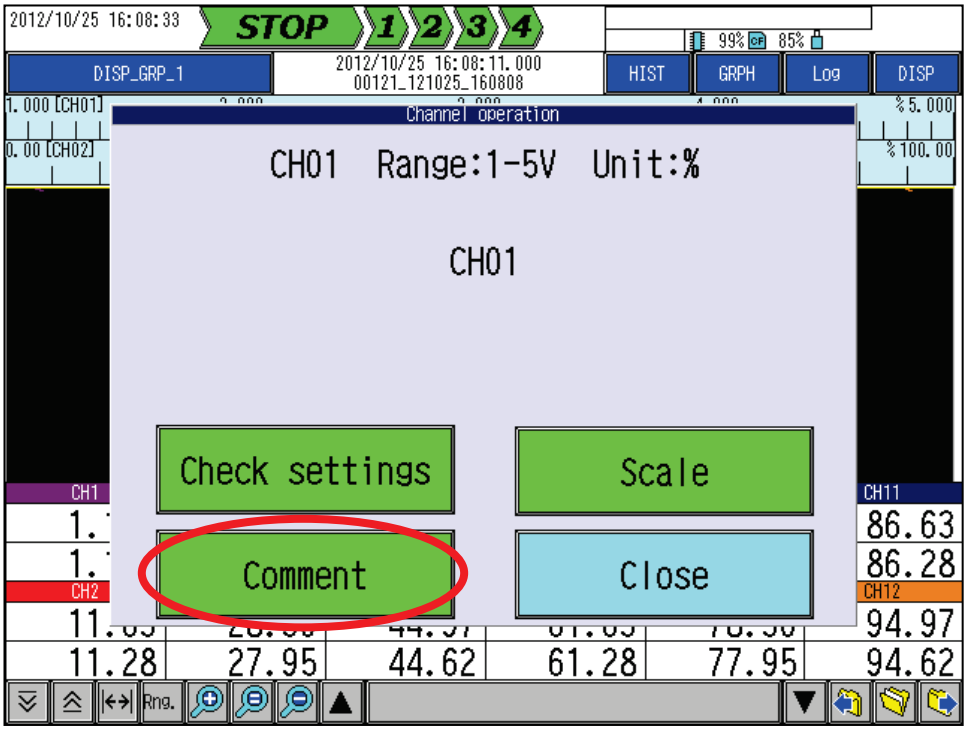
[Caution]

Trends that are already output to recording media are separate from trends that are displayed in memory history mode. Even if you set comments for trends of one type, they are not set for trends of the other type even though the trends of both types are at the same time position.

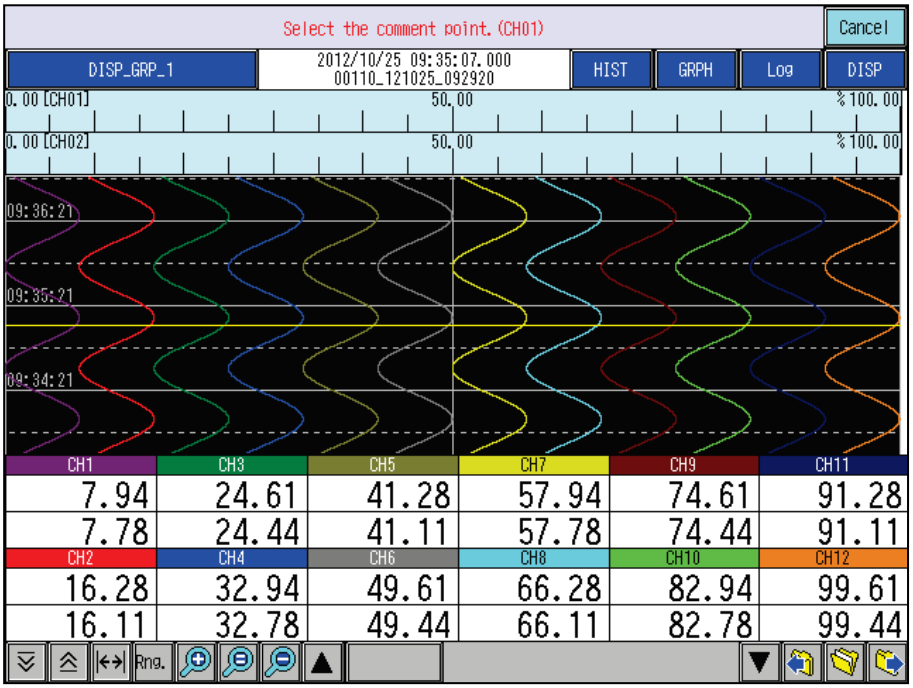
* Set comments can also be viewed in the Event Summary area of the Data Viewer.
(For information on event summaries, see Section 3.5 of the Instruction Manual for Data Viewer.)

● Comment setting

Press the channel field for 2 seconds or longer to open the channel operation window and select Comment.



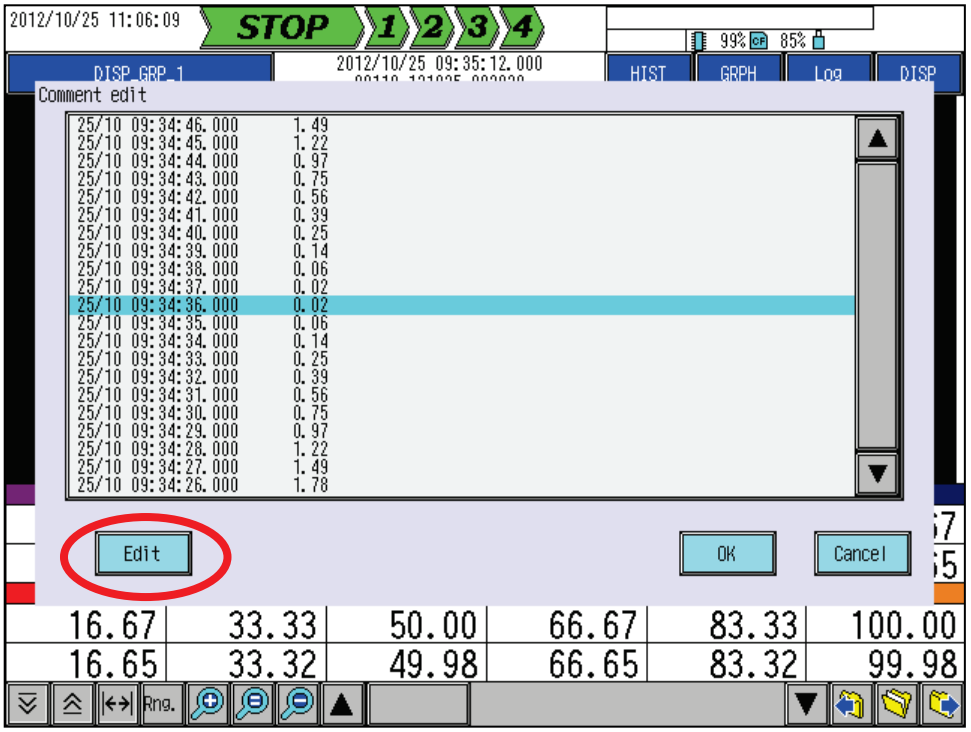
Touch the position corresponding to where you want to add your comment.



When you select a comment point, the commend edit window (shown below) opens. Press Edit and you can enter comments in the character input window that is displayed.

* Enter a comment at the aqua line denoted by the cursor position. By touching the screen, you can change the cursor position. For information on the character input window, see Section 8.4.

Confirm the comment by using OK.

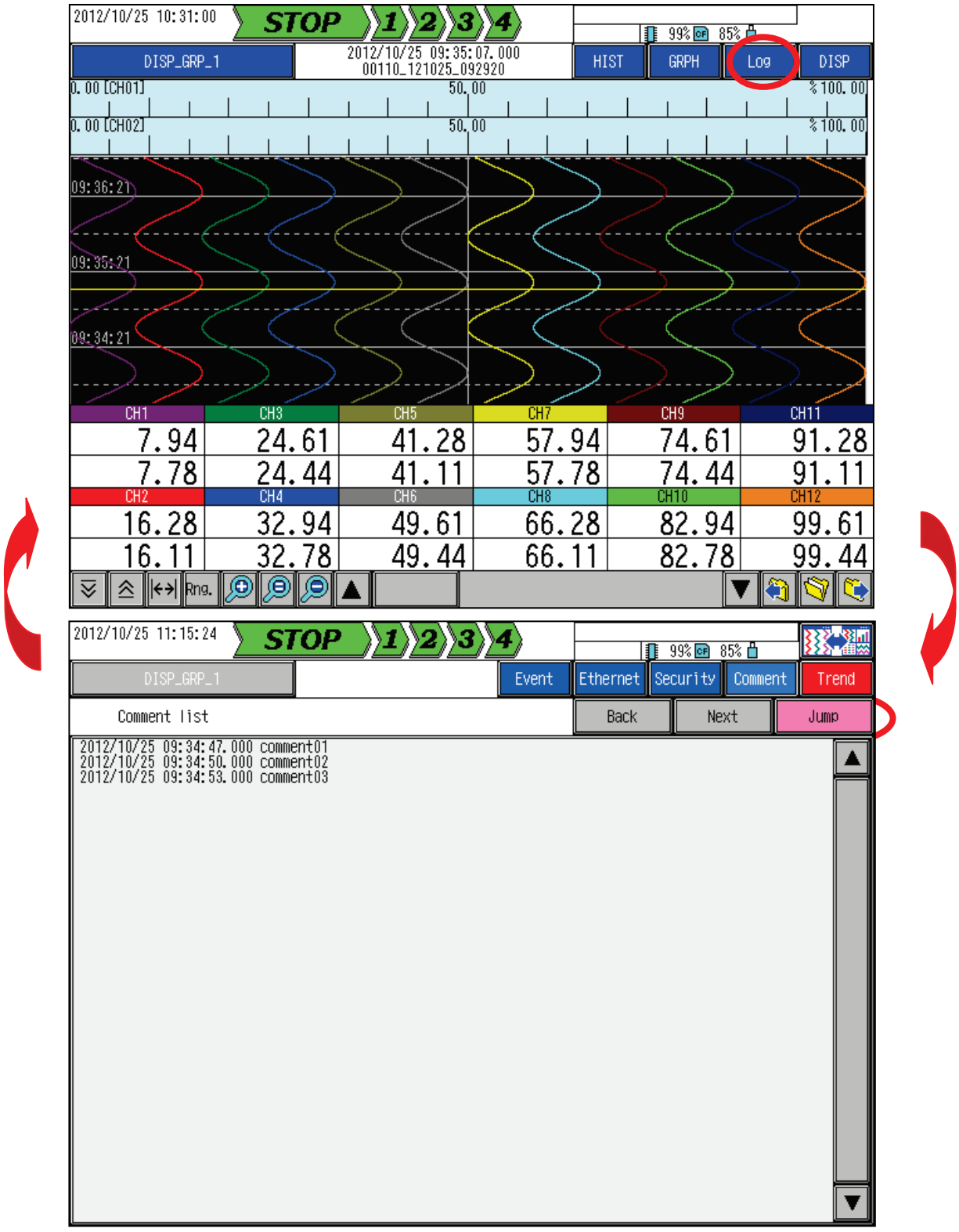


● Comment list and jump to a comment point

You can open a comment list by selecting Log > Comment in historical trends.

When you select a comment from the comment list and press Jump, the cursor moves to the selected comment point.

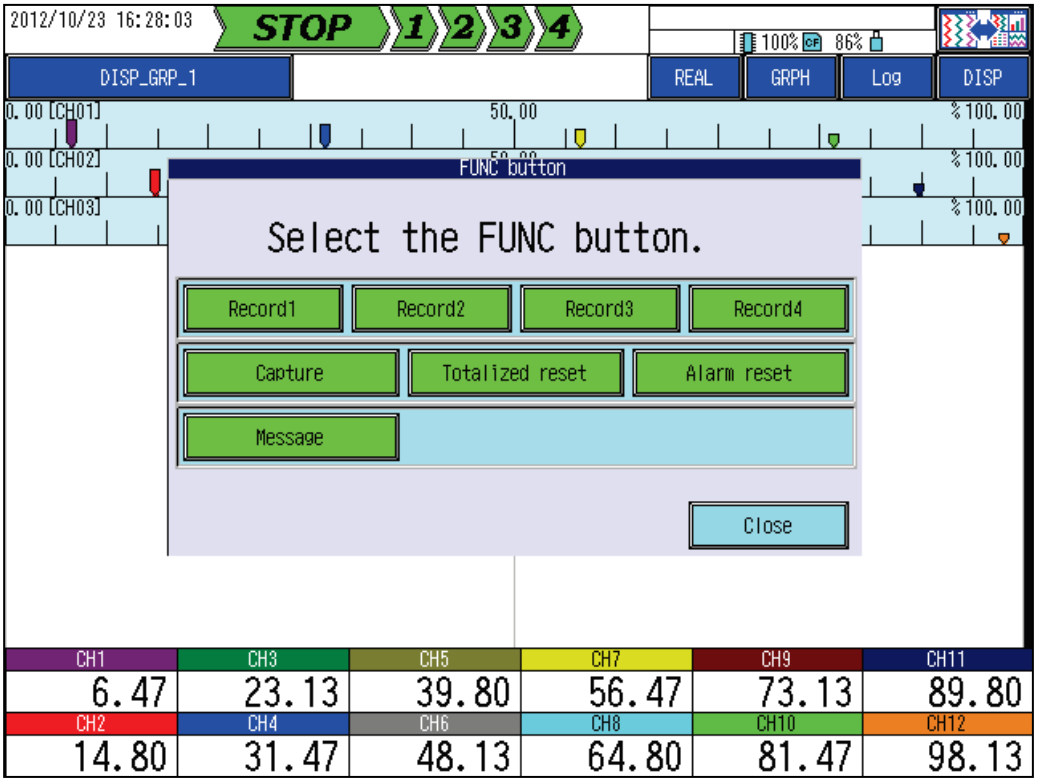
(The selected item becomes aqua.)



6.11 Function Menu

[Explanation]

By pressing FUNC, you can use the following functions:



Record 1 to record 4 : Starts/stops the record group for which one of FUNC records 1 to 4 is set as the record trigger. (*1) (*2)

Capture : Saves the displayed data to the CF card as PNG-format data.
Save directory: “/Recorder/Cap/”
* If no CF card is inserted, the data cannot be captured.

Integration reset : Resets the integrated value. (*3)
(For information on integrated values, see Section 8.10.1.)

Alarm reset : Resets alarm latches and new alarms. (*3)
(For further information, see Section 8.8 or 8.23.)

Message : Registers a message with the event log. (*3)
(For further information, see Section 8.19.)

*1 This function is only available when overall recording is started.
(For information on overall recording, see Section 5.3.)

*2 If the condition for recording is not satisfied, a press does not start recording.

*3 If the condition is not satisfied, a press does not initiate the function.

6.12 Screen Split

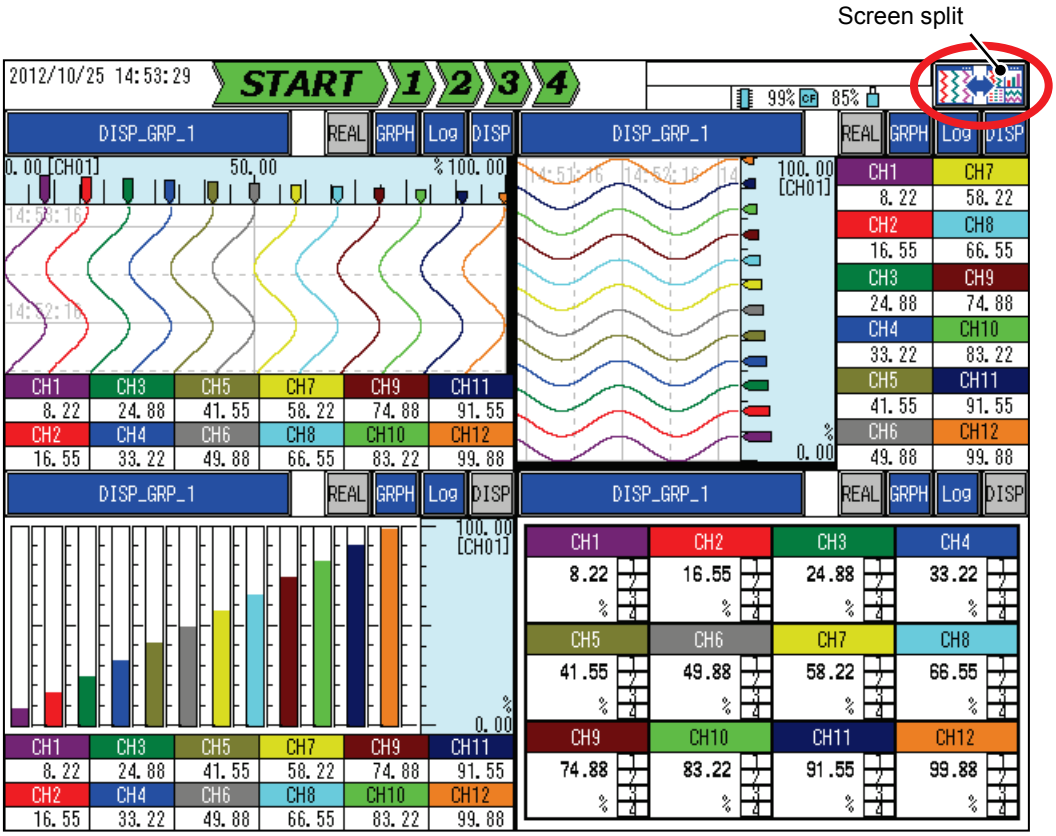
[Explanation]

The screen is split into four parts, which can display different graph types and different display groups.

[Operation]

Press Screen split at the right top of the screen.

Pressing this key a second time restores the full display.



* When the screen is split into four parts, historical trends cannot be displayed.

7. Saving Record Data

7.1 Record Data Storage and Flow

7.1.1 Types of Data Saved

This recorder saves the following types of data:

Data type	Description
Measurement data	Data that is saved at record cycles. Instant values, maximum/minimum values, or average values can be selected as measurement data according to settings. For details of record types, see Section 8.16.1.
Event data	Data that is saved when an event occurs. Events are monitored at 100-ms intervals and their data is saved regardless of the record cycle. Event data indicates record start/stop, alarm ON/OFF, or message output.
Comment data	Arbitrary comments can be set on record data at a specified time.

The above data is saved in external files, which are included in output to recording media.

7.1.2 Data Flow

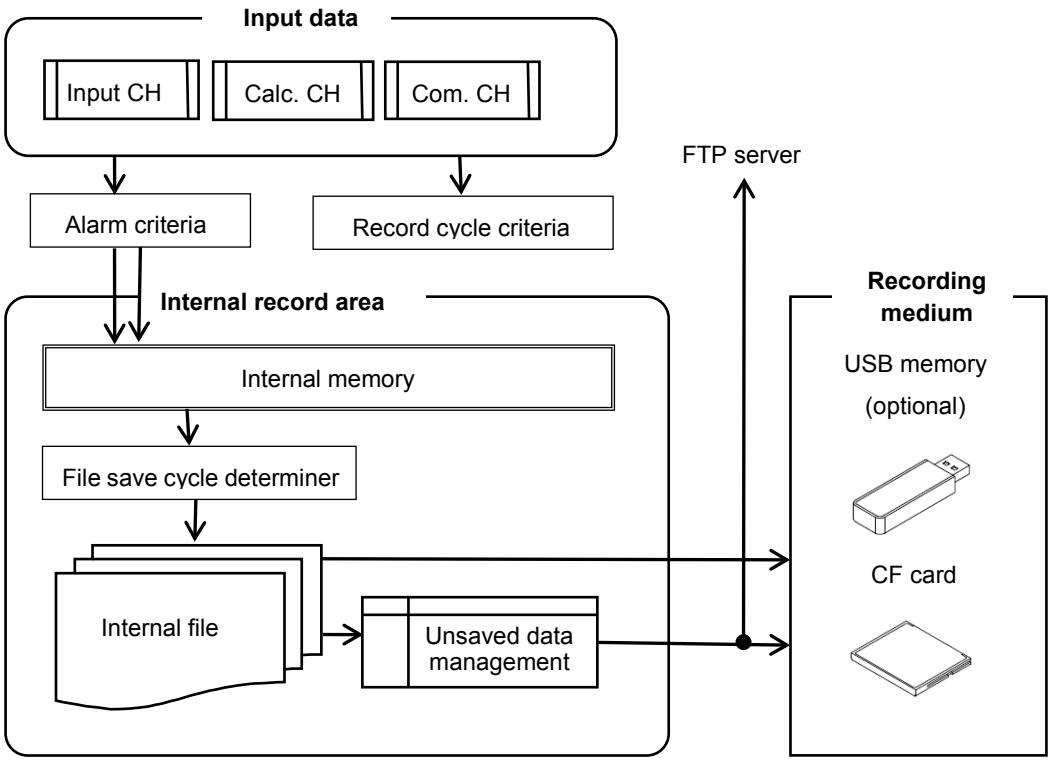


Figure 7.1 Record data flow

Event data and measurement data are first saved in the internal memory, and then stored in internal files at file save cycles.

7.2 Internal Memory

7.2.1 Data Record Timing

During recording, measurement data is recorded in the internal memory at intervals specified by the record cycle.

Data measurement is performed at 100-ms intervals regardless of the record cycle.

The measurement data save format varies with the record type setting.

* Event data is recorded regardless of the record cycle each time an event occurs.

[Reference]

Record cycles are interpreted as absolute times rather than relative times.

Example: If the record cycle is specified as 20 seconds, record data is saved at 12:00:20, 12:00:40, 12:01:00, ...

(For information on record cycles and record types, see Section 8.16.1.)

● Measurement cycles and record cycles

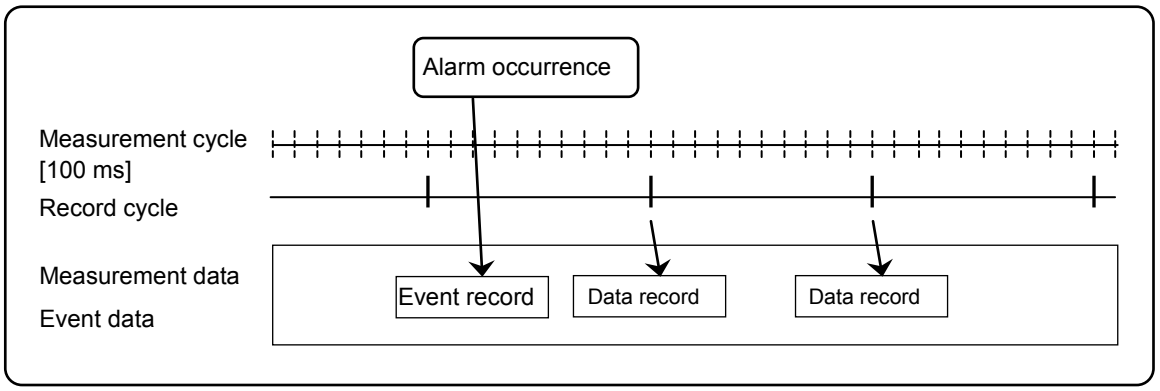


Figure 7.2 Measurement cycle and record cycle

The above figure is an example showing when measurement data and event data are saved. Measurement data is recorded at record-cycle intervals and event data is recorded regardless of the record cycle each time an event occurs.

[Caution]

- If a large number of alarms occur and are reset in a short period of time, the writing of event data concerning these alarms may fail.

7.2.2 Pre Record

When a record group is ready to start recording, this function makes it possible to record pre-group-recording data as well. It is also possible to continue recording for a certain period of time even after the group recording is stopped, depending on the record trigger setting.

As a result, even if common alarms are specified as the record trigger, pre-alarm data and post-alarm data can also be recorded.

(For information on group recording, see Section 7.6.)

● Conditions required for the execution of the pre-record function

- [Record trigger] is set to "Common alarm," "FUNC record," "DI record," or "Schedule."
- The pre-record setting is ON.

* For information on the file save timing in pre-record ON mode, see Section 7.2.3.

7.2.3 File Save Timing

Data stored in the internal memory is saved as an internal file under the following circumstances:

- At file-save-cycle intervals
- When recording stops.
- When recording in pre-record ON mode starts.
- When power is recovered while the recording state continues.

Caution

Before turning the power off, stop overall recording. Turning the power off during recording could damage files in the internal memory and the recording medium.

● File save timing

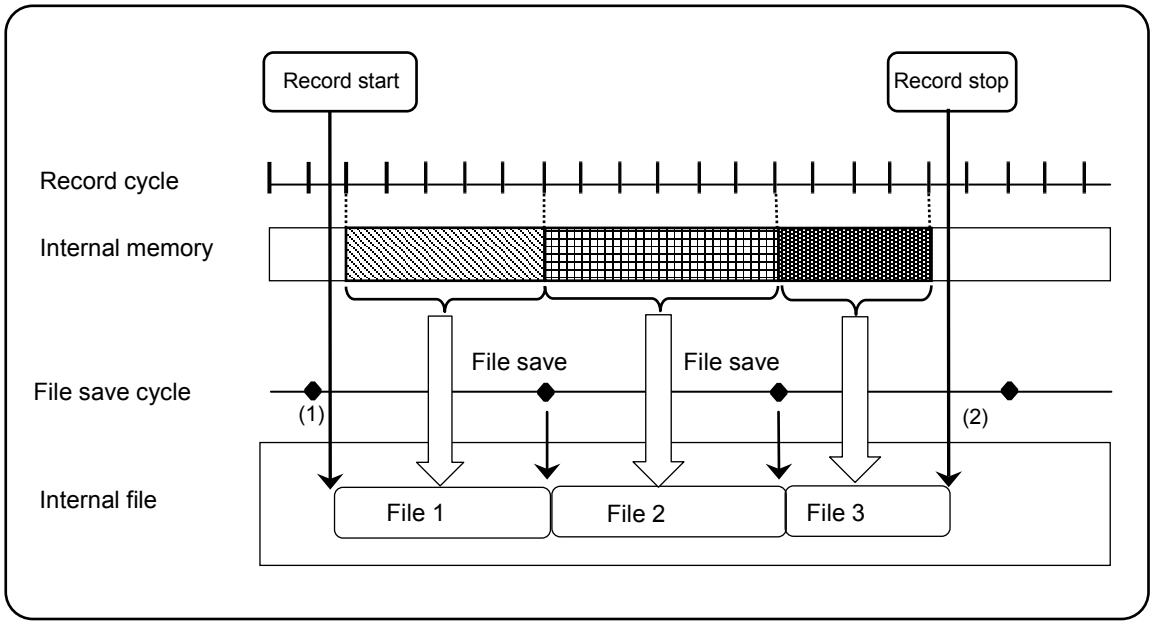


Figure 7.3 File save timing while recording is stopped

When recording starts at (1), record start event data is saved in the internal memory. During recording, measurement data is saved in the internal memory at the record-cycle intervals. Data stored in the internal memory is output to files on the recording medium at specified file-save-cycle intervals.

When recording stops at (2), data in the internal memory is saved to files regardless of the file save cycle. At this time, record-stop event data is also saved.

[Reference]

File save cycles are interpreted as absolute times rather than relative times.

Example: If the file save cycle is set to 1 hour, files are saved at 13:00:00, 14:00:00, 15:00:00, ...

(For information on file save cycles, see Section 8.16.1.)

[● Pre-record range]

The recording behavior in pre-record ON mode varies with the record trigger.

The pre-record range is 50% of the file save cycle.

- Record trigger: FUNC button or schedule

Recording stops immediately when the record stop time comes.

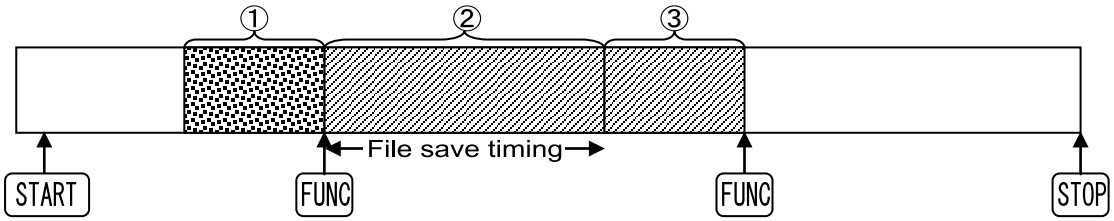


Figure 7.4 Save timing 1 in pre-record ON mode

(1)・・・Pre-record file. The data prior to record start triggered by the FUNC button is saved.

(2)・・・The data in this range represents ordinary record data subsequent to the record start due to the fulfillment of the trigger condition .

(3)・・・Recording stops when the time for record stop triggered by the FUNC button comes.

- Record trigger: Common alarm or DI

If the trigger condition turns off, and then turns on again during pre-record, recording will continue as before.

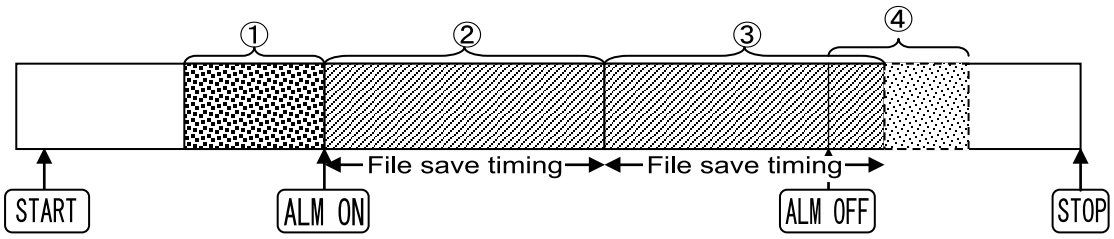


Figure 7.5 Save timing 2 in pre-record ON mode

(1)・・・Pre-record file. The data prior to record start triggered by alarm occurrence is saved.

(2)・・・The data in this range represents a record file that is effective after the record trigger condition is satisfied.

(3)・・・After the alarm is reset, recording is performed over 50% of the file save cycle. If the save cycle is exceeded during recording, a new file will start when the new save cycle begins.

(4)・・・Recording stops after the recording of the pre-record file is completed.

If group recording starts while the pre-record setting is ON, the pre-record data (a certain range of data prior to the start of group recording) is saved as a file during the process (1).

[Caution]

If the power is turned off in pre-record ON mode, the pre-record data prior to the power-off is discarded.

7.2.4 Internal File Overwrite

Internal files stored in the internal memory will be deleted in chronological order if one of the following conditions is satisfied when a new file is saved:

(1) The number of files exceeds 5000.
If multiple record groups are in use, the number of files here indicates the total number of files belonging to each record group.

(2) The internal memory becomes full.

● Internal file deletion if multiple record groups are in use

If only one record group is in use, files are deleted in chronological order simply according to conditions (1) and (2).

If multiple record groups are in use, the record priority determines the order in which files for record groups will be deleted.

(For information on record priorities, see Section 7.6.3 or 8.17.1.)
(For further information on record groups, see Section 7.6.2.)

7.3 Recording Media

7.3.1 Types of Recording Media

The following table lists the recording media that can be used in the recorder, as well as types of data that can be saved to these recording media:

Recording medium	Data that can be saved
CF card	- Record data files (auto/manual) - Settings files - Parameter log files - Capture files
USB memory	- Record data files (manual save only) - Settings files - Parameter log files
FTP server	- Record data files (auto save only)

7.3.2 External File Save Setting

* This setting only applies to the CF card.

Record data that is created during recording is automatically output to the CF card.

(For further information, see Section 8.17.1.)

7.3.3 External File Overwrite Setting

* This setting only applies to the CF card.

If record data can no longer be written due to an insufficient remaining CF card capacity, record data in the CF card is deleted in chronological order so that writing to the CF card can be continued.

(For further information, see Sections 7.4.3 and 7.4.4.)

7.3.4 Unsaved Data Management

Individual files containing record data stored in the recorder are managed so that it is possible to see whether each file has been saved to the recording medium.

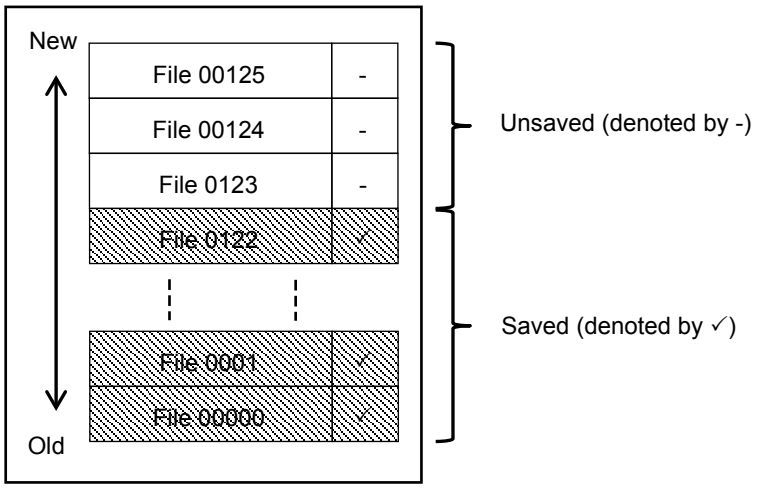


Figure 7.6 Unsaved data management

Whether a file is saved or not is managed for each type of recording medium. Therefore, even if there is no data that is unsaved to the CF card, there may be data that is unsaved to the USB memory or FTP server.

[Caution]

Output-pending data, once it is output, is treated as "already output." When you attempt to output this data to another recording medium, you cannot select "Output of data marked for output only." Instead, you need to select "Output of all data" or "Select from list."

7.4 Saving to the CF Card

7.4.1 Auto Save Operation

For information on the external file save setting, see Section 8.17.1.

7.4.2 Manual Save Operation

For information on how to manually save a file containing unsaved data, see Section 5.6.

7.4.3 Operation in External File Overwrite OFF Mode

If the external file overwrite setting is OFF, saving to the CF card will stop when the remaining capacity of the CF card becomes 0%.

* The remaining capacity status of the CF card is always reflected on an auxiliary relay. If this auxiliary relay is assigned to an external relay, the fact that the remaining capacity of the CF card has become 0% can be reported externally.

(For further information, see Section 8.22.2.)

[Caution]

If you continue to use a CF card whose remaining capacity is 0%, the internal memory capacity will decrease. Replace the CF card.

7.4.4 Operation in External File Overwrite ON Mode

This section explains the operation performed if the external overwrite setting is ON.

When the remaining capacity of the CF card becomes 0%, the record data file that has the oldest timestamp of all files on the CF card is deleted so that a new file can be saved.

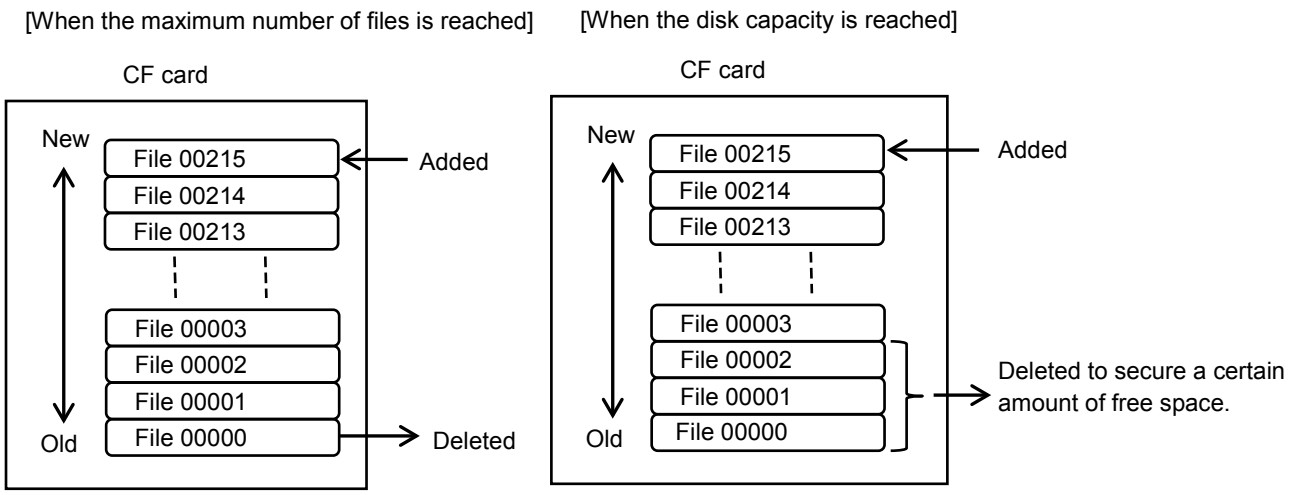


Figure 7.7 Overwrite processing on CF card

If one record folder contains 10000 files, it has reached the maximum number of files.

When a record folder reaches the maximum number of files, the single oldest file in the folder will be deleted. When a folder reaches its storage capacity, multiple files are deleted until a certain amount of free space is secured.

The deletion target is limited to external record files (with extension .dpk).

Other files will not be deleted even if they are stored in the folder.

[Caution]

- The maximum number of files in a record folder includes files that have no bearing on the recorder. When using a record folder, be careful that files or other data that is not generated by the recorder will not be stored in the folder.
- Files will be deleted in chronological order, meaning that files with older timestamps will be deleted first. Serial numbers of record files, dates included in file names, or similar information are not used for determining chronological order.

[Reference]

You can avoid the problem with the upper limit number of files by changing the record folder name.

(For the setting of record folder names, see Section 8.16.)

(For further information on record folders, see Section 5.6.6.)

7.5 Saving to Other Media

7.5.1 Saving to USB Memory (Optional)

You can manually save record data in USB memory.

(For information on how to save data manually, see Section 5.6.)

7.5.2 Saving to FTP Server

By using the FTP client function, you can save record data to the FTP server. Files containing only data marked for output are automatically transferred to the FTP server at the file save cycles.

If data is transferred from multiple recorders to the FTP server at the same time, intentional delays between recorders are included in the transfer process in order to avoid traffic duplication.

It is also possible to accumulate a number of files as determined by the specified save cycle and transfer this group of accumulated files at one time.

(For information on how to configure FTP client settings, see Section 9.11.1.)

Example: If the file save cycle is 1 hour and the save cycle is 10:

Since one record file is created at 1-hour intervals, files are transferred at 10-hour intervals.

(File transfer for each record group is controlled independently.)

(If the save cycle is 1, files are transferred in synchronization with file saving.)

(For information on file save cycles, see Section 8.16.1.)

[Reference]

Delays in transfer to the FTP server

- A delay is provided before the first transfer after start-up and before the transfer next to the completion of the transfer of an unsaved file.
- The delay time, ranging from 1 to 5 minutes in 1-minute increments, is determined randomly for each recorder before each transfer.
- If there are two FTP servers, delay time for each FTP server is controlled separately.
- If a transfer error occurs, a delay is provided before the next transfer. The delay time in this case is randomly determined.

7.6 Record Group and Display Group

7.6.1 Display Group

Up to 12 channels of data input to the recorder can be registered with each of 8 display groups. Input data with the same channel number can be registered with multiple display groups. This makes it possible to view input data with different graph settings (graph type, etc.) at the same time.

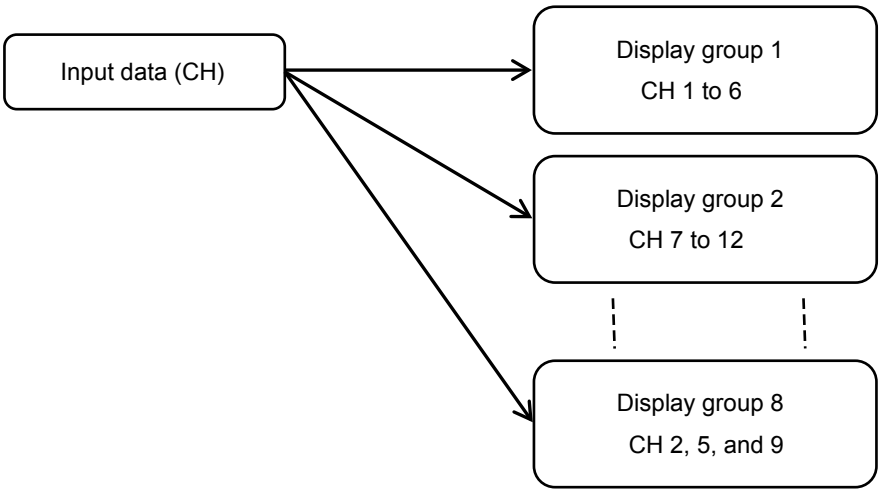


Figure 7.8 Display groups

In the above figure, input data channels 1 to 12 are assigned to display groups 1, 2, and 8.

Channels that are assigned to a display group can be assigned to another display group.
(Display group 8 includes channels that are already assigned to display groups 1 and 2.)
(For information on display group settings, see Sections 8.13 and 8.14.)

You can group record data by associating display groups with record groups, which will be explained in the next section.

7.6.2 Record Groups

The recorder can use up to 4 record groups.

On channels belonging to the same record group, recording can be performed at the same time with a particular record cycle, record type, file save cycle, and other parameters specified for the record group. Record data for each record group is saved separately from that of other record groups. This means that you can use the single recorder as if you had four recorders running at the same time.

Record groups, when used, are associated with display groups as shown below.

Multiple display groups can also be assigned to one record group.

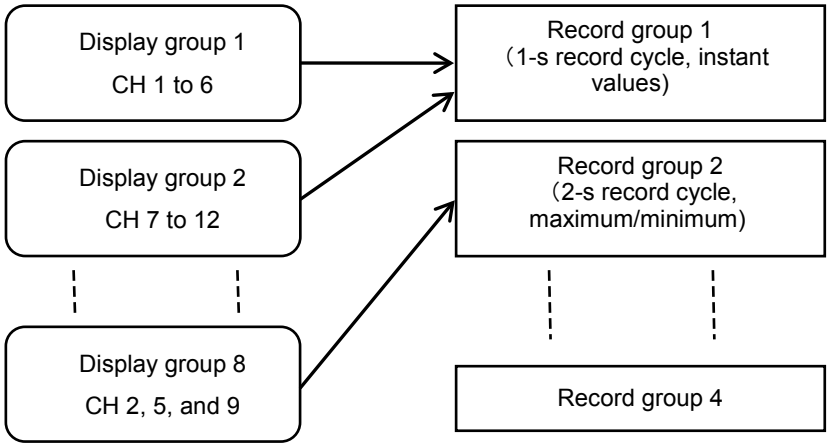


Figure 7.9 Record groups

In the above figure, display groups 1 and 2 are assigned to record group 1 and display group 8 is assigned to record group 2. In this case, the format of saved record data is as follows:

[Record group 1]

- Saved channels: CH 1 to 12 (channels registered with display groups 1 and 2)
- Record cycle: 1 second
- Record type: Instant values

[Record group 2]

- Saved channels: CH 2, 5, and 9
- Record cycle: 2 seconds
- Record type: Maximum/minimum

In the above example, maximum/minimum values are recorded at 2-second intervals, on CH 2, 5, and 9 belonging to record group 2, in addition to instant values recorded at 1-second intervals.

7.6.3 Record Priorities

Internal files are overwritten with new data according to the conditions described in Section 7.2.4. If multiple record groups are in use, you can use the record priority function to assign record priorities to record groups in order to adjust the occupancy rate of internal file data belonging to each record group, as shown below.

Before internal files are overwritten, the occupancy rate of each record group in the total internal memory size is calculated. Overwrite processing is performed on a priority basis on record groups whose occupancy rate exceeds a specified level.

Example:

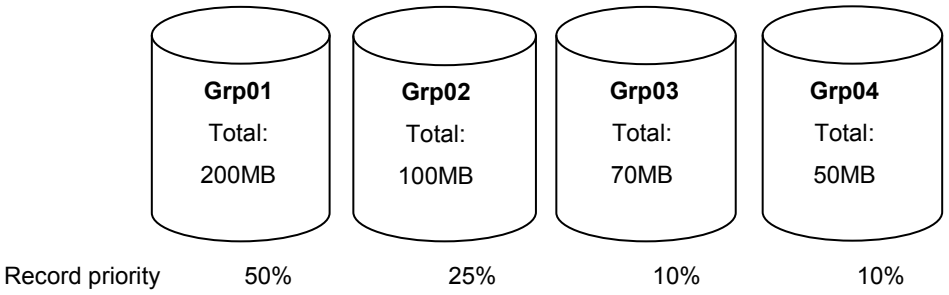


Figure 7.10 Record priority setting example

If the total capacity of the internal memory is 450 MB, the current occupancy rate of each record group is calculated as follows:

Grp01: 200/450 = 44.4%
Grp02: 100/450 = 22.2%
Grp03: 70/450 = 15.5%
Grp04: 50/450 = 11.1%

The above calculation result indicates that record groups 3 and 4 exceed the record priority setting value. Therefore, old files belonging to groups 3 and 4 are deleted to increase free space in the internal memory so that new files can be saved.

* For information on how to set record priorities, see Section 8.17.1.

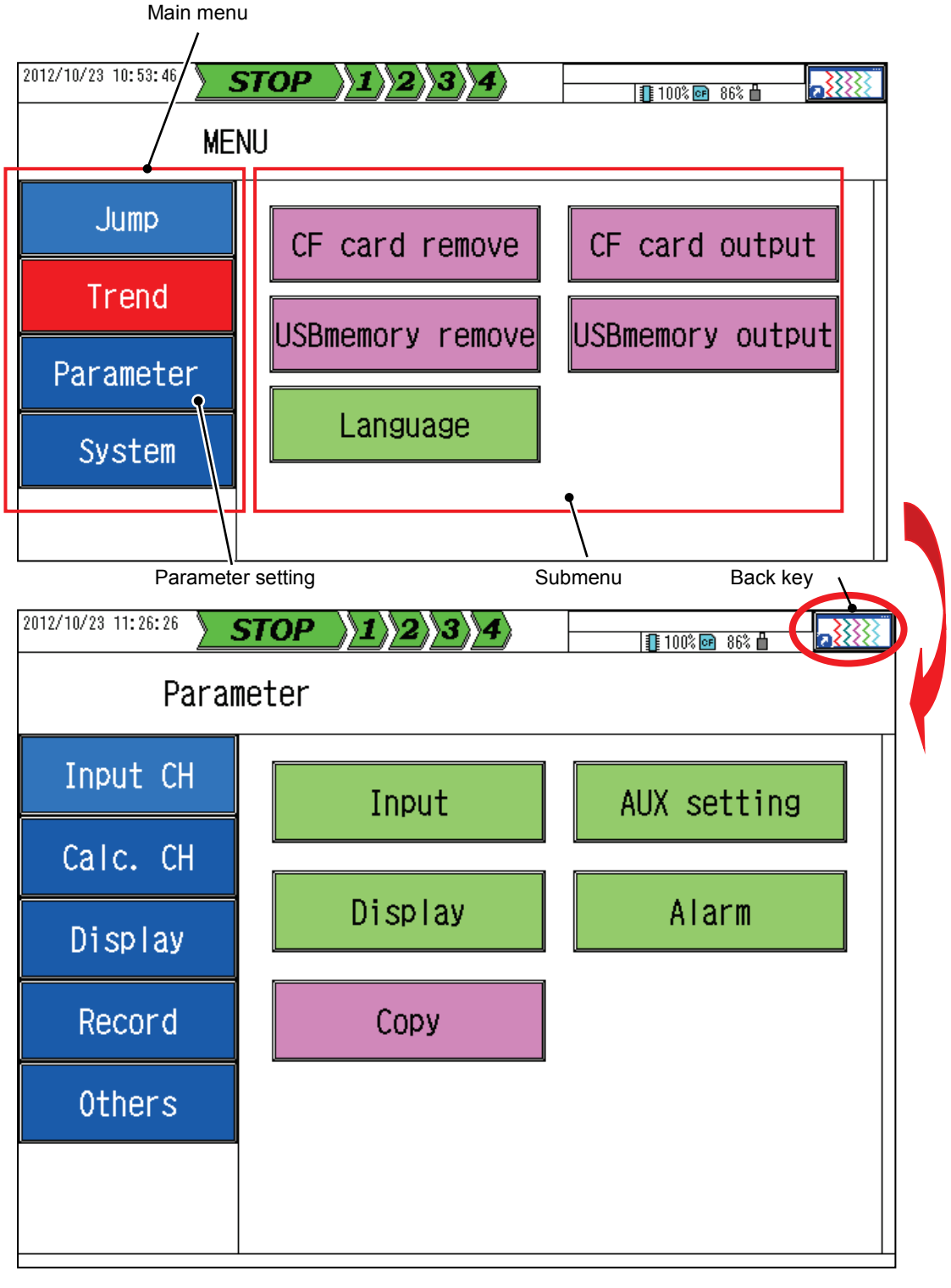
8. Setting and Checking Parameters

8.1 Setting and Checking

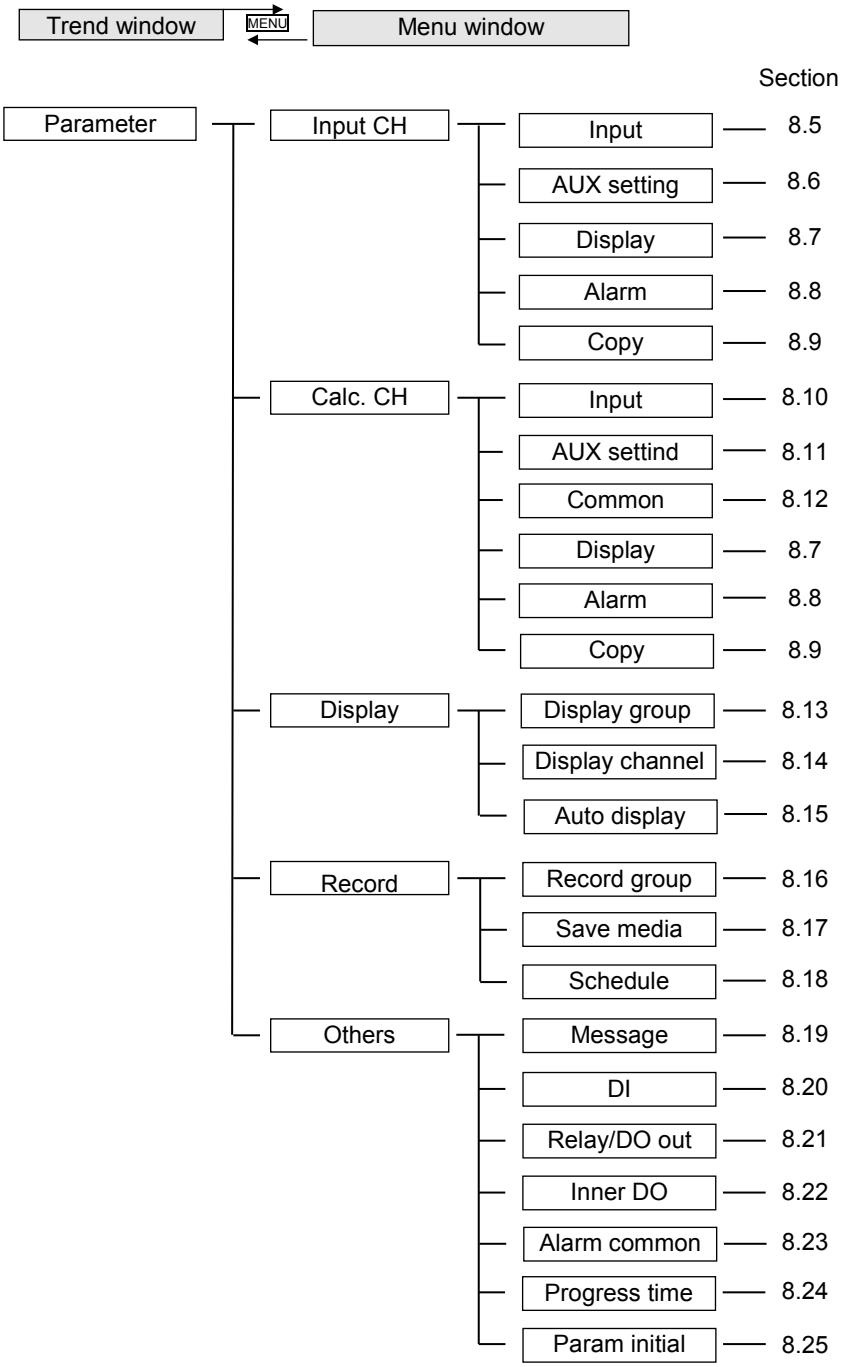
● Main menu

Pressing the MENU button opens the menu window. When you select Parameter from the main menu, the parameter setting window appears.

By pressing the Back key, you can return to the previous screen.



8.2 Overview of the Parameter Setting Procedure



8.3 Initial Values of Parameters

・Input CH

Input	Skip	: OFF
	Input type	: 1-5V
	Scaling	: ON
	Meas. range(L)	: 1.000
	Meas. range(H)	: 5.000
	Scaling range(L)	: 0.00
	Scaling range(H)	: 100.00
	Decimal point	: 2
	Unit	: %
	Input filter(sec)	: 0.0
	Moving avarage	: 1
	Offset	: 0.00
	Gain(%)	: 100.00
AUX setting	Input bias	: 0
	Input gain	: 100.00
	Input kind	: Standard Meas.
	Zone left	: 0
	Zone right	: 100
	Part compression	: OFF
	Part position 1(%)	: 100
	Part scale 1	: 0.00
	Part position 2(%)	: 100
	Part scale 2	: 0.00
Display	TAG	: TAGnn (nn=CH No.)
	Exposition	: CHnn (nn=CH No.)
	Display color	: Purple(CH01)
		: Red(CH02)
		: Green(CH03)
	Scale range(L)	: 0.00
	Scale range (H)	: 100.00
	Scale partition	: 0
	Scale Number	: No.1
	Alarm display	: OFF
Alarm	Act.	: OFF
	OUT1	: OFF
	OUT2	: OFF
	Value	: L1 100.00
		: L2 100.00
		: L3 0.00
		: L4 0.00
	Hysteresis	: 0.50
	Alarm delay(sec)	: 0
	Change rate time(sec)	: 0.0
	NEW alarm output	: OFF

・Calc. CH

Input	Skip	: OFF
	Formula	: Blank
	Decimal point	: 2
	Unit	: %
	Input filter(sec)	: 0.0
	Moving avarage	: 1
	Offset	: 0.00
	Gain(%)	: 100.00
AUX setting	Extend output	: Standard
	Zone left	: 0
	Zone right	: 100
	Part compression	: OFF
	Part position 1 (%)	: 100
	Part scale 1	: 0.00
	Part position 2 (%)	: 100
	Part scale 2	: 0.00
Common	Type	: Standard
	Value	: 0
	Decimal point	: 0
	Logical table	: Blank
	Reference temp.	: 0.0
	Z value	: 0.0
	Start temp.(℃)	: 0.0
	Absolute time(hour)	: 1 sec
	Absolute time(week)	: Sun
	Absolute time(day)	: 1
	Relative time(sec)	: 1
	Relative time(min)	: 1
Display	TAG	: TAGnn (nn=CH No.)
	Exposition	: CHnn (nn=CH No.)
	Display color	: Purple(CH49)
		: Red(CH50)
		: Green(CH51)
	Scale range(L)	: 0.00
	Scale range (H)	: 100.00
	Scale partition	: 0
	Scale Number	: No.1
	Alarm display	: OFF
Alarm	Act.	: OFF
	OUT1	: OFF
	OUT2	: OFF
	Value	: L1 320.00
		: L2 320.00
		: L3 -320.00
		: L4 -320.00
	Hysteresis	: 0.00
	Alarm delay(sec)	: 0
	Change rate time(sec)	: 0.0
	NEW alarm output	: OFF

・Display

Display group	Display	: ON (Group1)
		: OFF(Group2～8)
	Display name	: DISP_GRP_n (n=Grp No.)
	TAG disp set	: Channel No.
	CH disp No.	: Auto
	Part disp type	: Single
	Record group	: Group1
	Line position	: 0
	Line width	: None
	Line color	: Red
Display channel	Display channel	: CH01～12
Graph display	Horizonal	: ON
	Vertical	: ON
	Bar graph	: ON
	Digital display	: ON
Auto display	Auto display	: OFF
	Change cycle	: 5 sec

・Record

Record group	Group record	: ON (Group1)
		: OFF (Group2～4)
	Record cycle	: 1sec
	File save cycle	: 1hour
	Pre record	: OFF
	Record trigger	: START button
	Record type	: Max／Min
	Rec folder name	: blank
	Identification	: blank
Save media	Ex. file save	: Auto
	Overwrite	: OFF
	Record priority	: 0%
Schedule	Schedule	: OFF
	Start time	: 00:00:00
	End time	: 00:00:00
	Week	: All lift

・Others

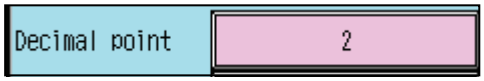
Message	Message	: Blank
	Message timing	: OFF
DI	Function	: OFF
Relay/DO out	Output logic	: OR
Inner DO	Output logic	: OR
	NC/NO	: NO(A contact)
	Output relay	: OFF
	AUX output relay	: OFF
Alarm common	New alarm output time	: 1.0(sec)
	Alarm latch	: OFF
Progress time	Prog. time disp	: Disable
	Auto reset	: Disable
	Condition	: Record

8.4 Basic Operations of the Setting Window

[Explanation]

You can always change settings or perform screen transitions by touching the screen. The following are different methods of setting item values:

● Setting values that change each time the setting is touched



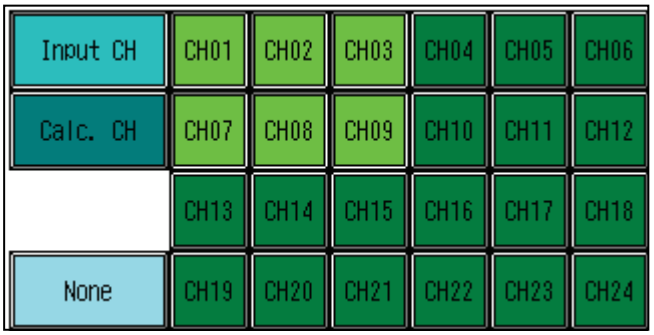
In this case, consecutive presses of the 2 key causes changes: 3 > 4 > 0 > 1 > 2 ....

● Setting values selected from a menu

In this case, pressing CH01 opens a selection window (shown below).

By touching ◀ or ▶, you can directly increase or decrease the channel number value.

If multiple selection is allowed, the selected items are displayed in bright color.



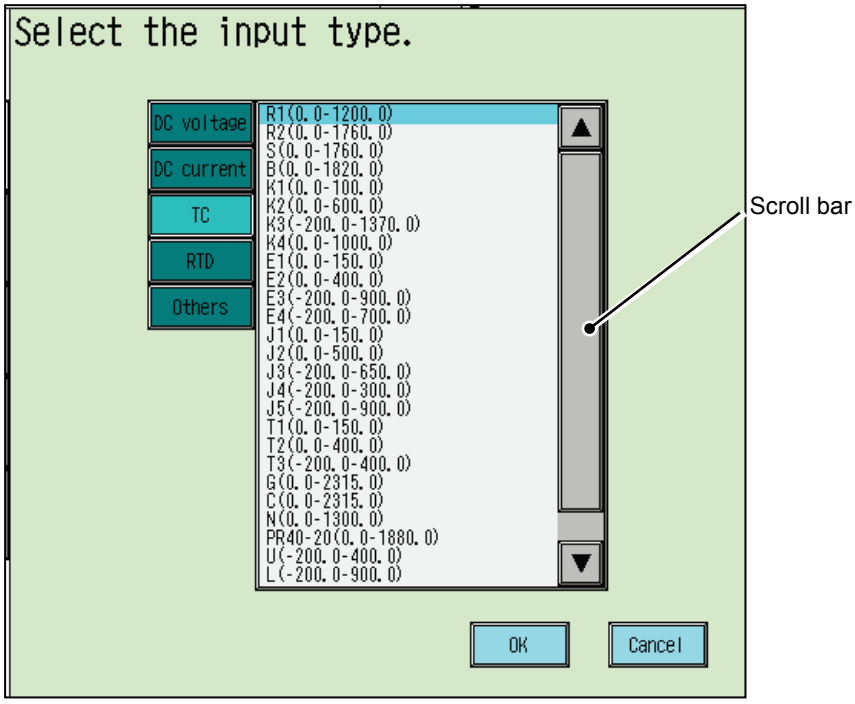
● Setting values that are selected from a list

Select an option from the list. (The selected option is displayed in aqua.)

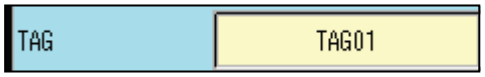
If there are too many options to fit in the display area, the scroll bar is displayed as shown in the figure below.

You can change the display by touching ▲ or ▼ or sliding the scroll bar.

After selecting an option, press OK to determine your selection.



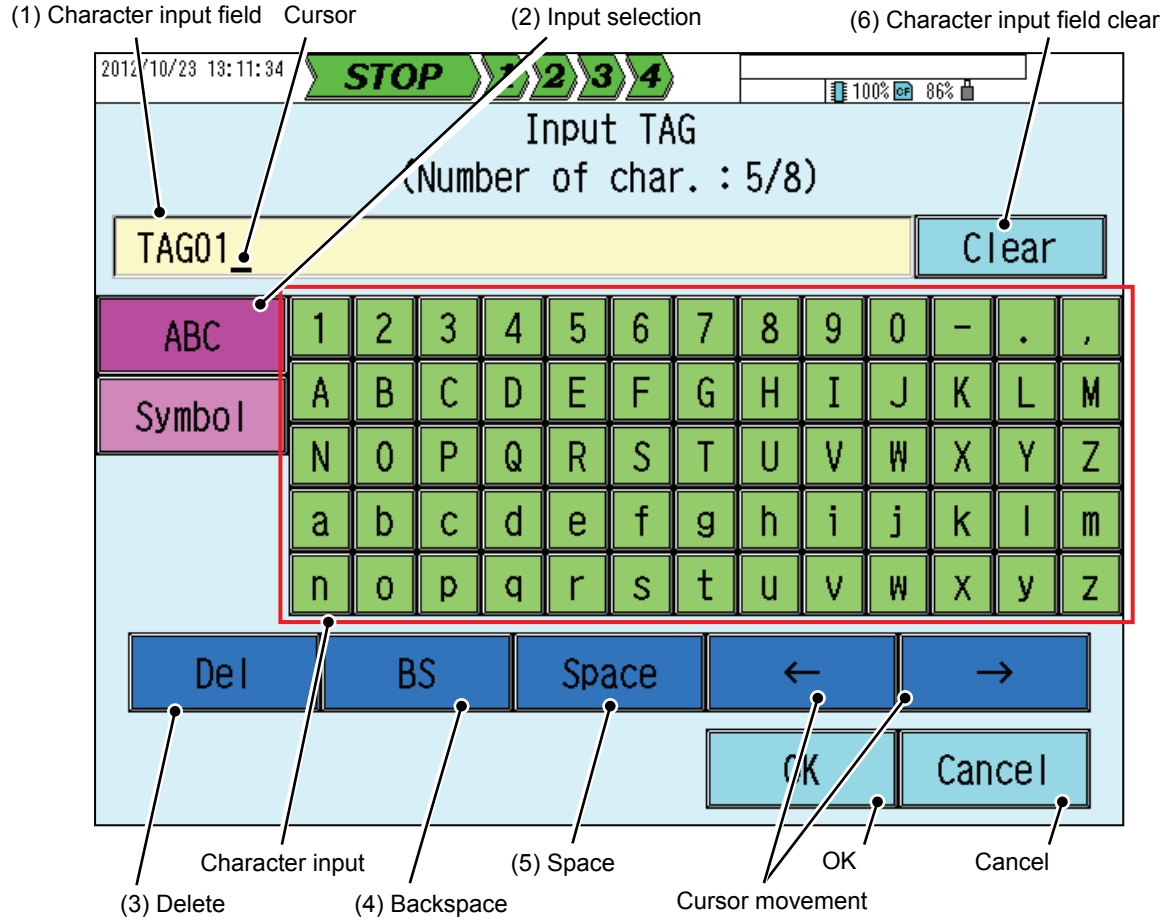
● Setting values that are directly entered as a character string or a numeric value



In this case, pressing TAG01 opens the character input window.

Enter characters as described in "Description of the character input window" on the next page.

[Reference] Description of the character input window



(1) Character input field
The entered characters are displayed.
You can move the cursor by pressing this field.
(A voiced or semi-voice sound mark also occupies a one-character space (Japanese language only).)

(2) Input selection
Used to change the character input mode.

(3) Delete
Deletes the character at the current cursor position.

(4) Backspace
Deletes the character one position before the current cursor position and moves the cursor left.

(5) Space
Used to enter a blank character.

(6) Character input field clear
Deletes all entered characters.

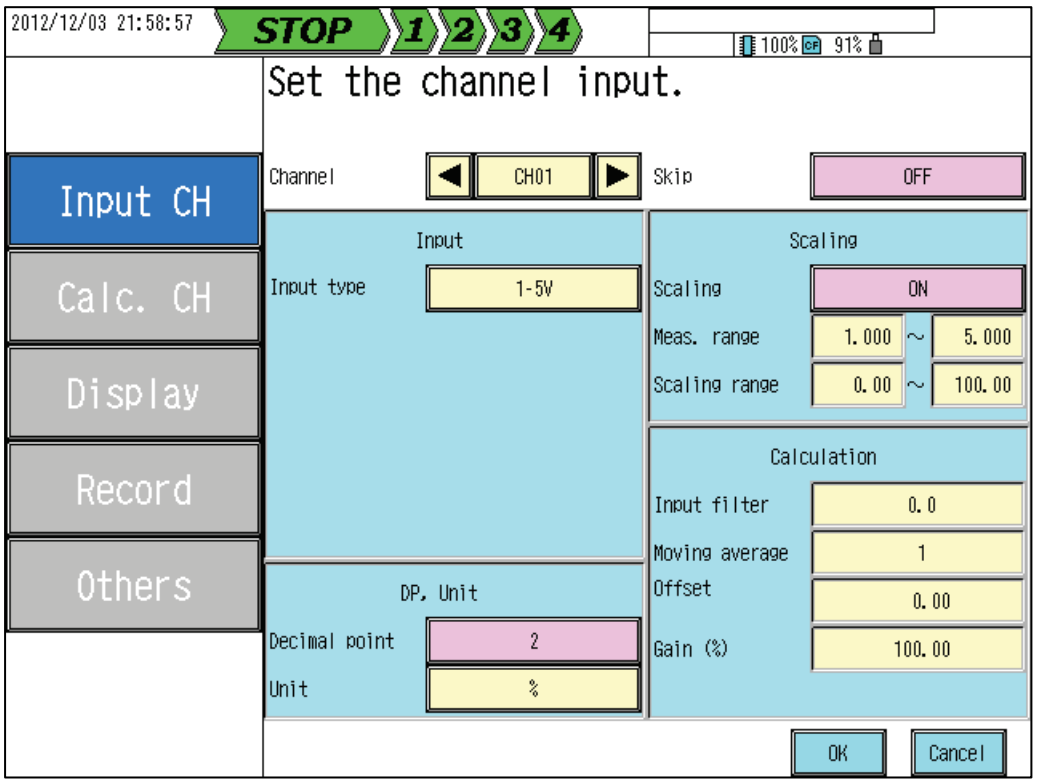
8.5 Configuring Input Specifications

[Operation]

Parameter > Input CH > Input

The content displayed varies depending on the input type and scaling settings.

Note: You can change settings for some items, even during recording.



[Settings]

No.	Item	Setting
(1)	Channel skip	OFF, ON
(2)	Input type	* See the "Range codes" described later.
(3)	Reference CH	CH01～CH48 (∗1)
(4)	Burnout	OFF, High, Low
(5)	RJC	OFF, Internal, Assign CH(DE wire), Assign CH(DH wire)
(6)	RJC Channel	CH01～CH48 (∗1)
(7)	Decimal point	0～4
(8)	Unit	V, mV, mA, ℃, K, %, %RH (Arbitrary units can be created by user setting.)
(9)	Scaling	OFF, ON, Swuare root ON
(10)	Meas. range	* Depends on the input type.
(11)	Scaling range	-32000～32000digit (∗2)
(12)	Iput filter	0.0～99.9 (sec)
(13)	Moving average	1～64
(14)	Offset	-32000～32000digit (∗2) (∗3)
(15)	Gain	-320.00～320.00 (%) (∗3)

∗1 You cannot select a channel number beyond the specification you designated when purchasing the recorder.

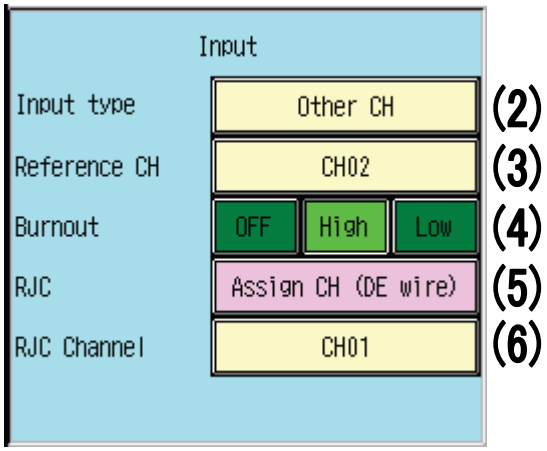
∗2 The decimal point position varies depending on the setting.

∗3 You can change the setting even during recording.

● Range codes

Input type	Range code	Type	Measurement range			Unit
DC voltage	000	mV	-10.00	~	10.00	-
	001	mV	-50.00	~	50.00	-
	002	mV	-200.0	~	200.0	-
	003	V	-1.000	~	1.000	-
	004	V	-5.000	~	5.000	-
	005	V	-20.00	~	20.00	-
	006	V	0.000	~	5.000	-
	007	V	1.000	~	5.000	-
DC current	008	mA	4.00	~	20.00	-
TC	010	R1	0.0	~	1200.0	℃
	011	R2	0.0	~	1760.0	℃
	012	S	0.0	~	1760.0	℃
	013	B	0.0	~	1820.0	℃
	014	K1	0.0	~	100.0	℃
	015	K2	0.0	~	600.0	℃
	016	K3	-200.0	~	1370.0	℃
	017	K4	0.0	~	1000.0	℃
	018	E1	0.0	~	150.0	℃
	019	E2	0.0	~	400.0	℃
	020	E3	-200.0	~	900.0	℃
	021	E4	-200.0	~	700.0	℃
	022	J1	0.0	~	150.0	℃
	023	J2	0.0	~	500.0	℃
	024	J3	-200.0	~	650.0	℃
	025	J4	-200.0	~	300.0	℃
	026	J5	-200.0	~	900.0	℃
	027	T1	0.0	~	150.0	℃
	028	T2	0.0	~	400.0	℃
	029	T3	-200.0	~	400.0	℃
	030	G	0.0	~	2315.0	℃
	031	C	0.0	~	2315.0	℃
	032	N	0.0	~	1300.0	℃
	033	PR40-20	0.0	~	1880.0	℃
	034	U	-200.0	~	400.0	℃
	035	L	-200.0	~	900.0	℃
	036	Au-Fe	0.0	~	300.0	K
	037	PL Ⅱ	0.0	~	1360.0	℃
RTD	038	JPt100-1	-50.0	~	200.0	℃
	039	JPt100-2	-200.0	~	600.0	℃
	040	Pt100-1	-50.0	~	200.0	℃
	041	Pt100-2	-200.0	~	600.0	℃
Others	050	Other CH	—	~	—	—

8.5.1 Input Types



(1) Channel skip

A channel that is set to Skip ON is ineligible for recording, display, and alarm output.

(A channel's skip setting does not affect the setting or calculation for the channel.)

∗ An error occurs if Channel Skip ON is set for all channels, including both input and calculation channels.

(2) Input type

The range specified for the input type controls the measurement circuit that performs measurement.

For information on settings, see "● Range codes" on the previous page.

(3) Reference channel

This item can be configured only when the input type (2) is "Other channel."

A channel cannot be specified as its own reference channel.

A channel whose input type is "Other channel" cannot be specified as the reference channel.

[Caution]

Changing the input type (2), the reference channel (3), or the input type of the reference channel resets the following settings of the pertinent channel:

- Decimal point position (depends on the input type) - Scaling (OFF)
- Scaling range (The value is held and only the decimal point position is changed.)
- Measurement range (depends on the input type)
- Offset (0) - Gain (100.00)
- Auxiliary input - input bias (0) - Auxiliary input - input gain (100.00)
- Input kind (standard measurement) - Standard temperature (0)
- Multiple adjustment - Measurement value (measurement range H)
- Multiple adjustment - Output value (The value is held and only the decimal point position is changed.)
- Zoon left (0) - Zoon right (100)
- Partial compression/expansion (0) - Partial position (100)
- Partial scale (0) - Scale range (L: range lower limit, H: range upper limit)
- Alarm action (OFF)
- Alarm value (L1/2: range lower limit, L3/4: range upper limit)
- Alarm outputs 1 to 2 (OFF) - Alarm hysteresis (0.5% of the range upper/lower limit)

(4) Burnout

This item can be configured only when the input type (2) is "Thermocouple" or "mV" (except for the 200 mV range).

The input circuit is controlled so that the input fully swings to High or Low when the terminal is open.

When this item is OFF, the operation is indefinite.

(5) RJC

This item can be configured only when the input type (2) is "Thermocouple."

Specify the terminal temperature compensation method to be used to obtain the thermocouple input temperature.

OFF: The measurement value is directly linearized.

Internal: The temperature is detected by a temperature sensor within the instrument terminal block in order to compensate for each thermocouple.

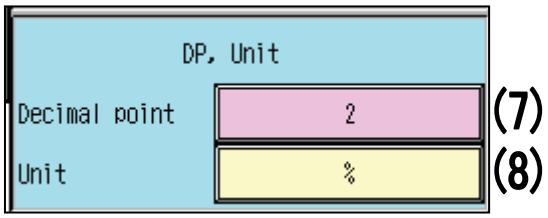
Specified channel (DE connection): A method that performs temperature compensation in an external compensation box. The temperature within the external compensation box is taken as a thermocouple input for the specified channel in order to achieve temperature compensation. For the temperature compensation on the specified channel, the internal temperature compensation is used.

Specified channel (DH connection): A method that performs temperature compensation in an external compensation box. The temperature within the external compensation box is taken as a voltage signal input or RTD input for the specified channel in order to achieve temperature compensation.

(6) RJC channel

Select the channel to be used for temperature compensation when the RJC (5) setting is "Specified channel."

8.5.2 Decimal Point Position and Unit



(7) Decimal point (decimal point position)

Used to change the decimal point position that is specified for each input type (2).

If the measurement result exceeds ±32000 as a digital value, "-H-" or "-L-" will be displayed.

[Reference]

If the decimal point position is set to "1" when the setting value is "10000," the value is displayed as "1000.0."

(8) Unit

Used to change the unit that is specified for each input type (2).

Pressing the measurement display area in the trend window displays the unit for three seconds.

[Caution]

Changing the decimal point position (7), the scaling setting (9), or the scaling range (11) resets the following settings of the pertinent channel:

- Scaling range (The value is held and only the decimal point position is changed.)
- Offset (The value is held and only the decimal point position is changed.)
- Standard temperature (The value is held and only the decimal point position is changed.)
- Multiple adjustment - Measurement value (Measurement range H)
- Multiple adjustment - Output value (The value is held and only the decimal point position is changed.)
- Partial compression/expansion (Disable)
- Partial position (100)
- Partial scale (0)
- Scale range (L) (range lower limit if scaling is OFF, or scaling H or L, whichever is smaller, if scaling is ON) (*1)
- Scale range (H) (range lower limit if scaling is OFF, or scaling H or L, whichever is larger, if scaling is ON) (*1)
- Alarm action (OFF)
- Alarm outputs 1 to 2 (OFF)
- Alarm value L1/L2 (range lower limit if scaling is OFF, or scaling H or L, whichever is larger, if scaling is ON) (*1)
- Alarm value L3/L4 (range lower limit if scaling is OFF, or scaling H or L, whichever is smaller, if scaling is ON) (*1)
- Alarm hysteresis (*1)
  (If scaling is ON: The hysteresis is 0.5% of the range upper/lower limit converted into a scaling value
  a = abs((scaling range H - scaling range L)/(measurement range H - measurement range L))
  ans = (range upper limit - lower limit) x a x 0.005
  If scaling is OFF: 0.5% of the range upper/lower limit)

∗1 This item only changes the number of decimal places if the decimal point position is changed when scaling is OFF.

Example: Assume the input type is ±10.00 mV" and the decimal point position is "2." When the decimal point position is changed to "1":

Scale range (L): Changes from "-10.00" to "-10.0."

Scale range (H): Changes from "10.00" to "10.0."

If the setting value after change exceeds ±32000 as a digital value, it is automatically rounded to ±32000 as a digital value.

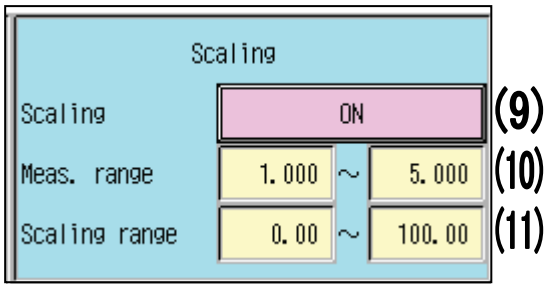
Example: Assume the input type is ±10.00 mV and the decimal point position is "2." When the decimal point position is changed to "4":

Scale range (L): Changes from "-10.00" to "-10.0000," and then to "-3.2000."

Scale range (H): Changes from "10.00" to "10.0000," and then to "3.2000."

(If scaling is "ON," only the decimal point position in the setting is changed.)

8.5.3 Scaling



(9) Scaling

This item can be configured only when the input type (2) is "mV," "VOLT," or "mA."

The measurement value can be converted into any type of value.

OFF: The measurement result is output as is.

ON: The measurement range (L-H) is converted to the scaling range (L-H).

Square root extraction ON: The measurement range (L-H) is converted to the scaling range (L-H). This conversion involves square root extraction.

(The input value range of 0-1% (equivalent to 10% of output) is converted to a scaling range linearly rather than through square root extraction.)

∗ The displayed digital value in the vicinity of the zero point may sway due to the relationship between the scaling magnification and the number of displayed digits.

(10) Meas. range

Specify the effective measurement range for the input type. The setting range and decimal point position depend on the input type (2) setting.

* If measurement range L ≧ measurement range H, a setting error occurs.

(11) Scaling range

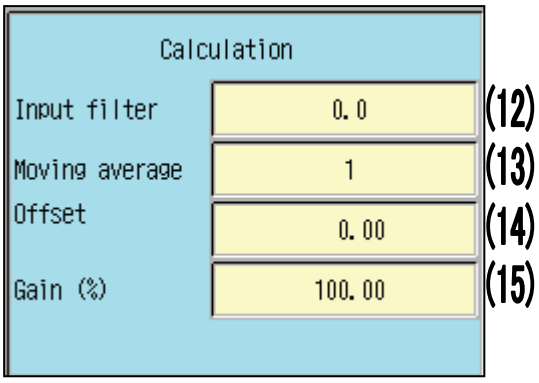
Specify a range for "scaling" (9). The decimal point position depends on the decimal point (7) setting.

∗ If measurement range L = measurement range H, a setting error occurs.

[Caution]

Changing the "scaling" (9) or "scaling range" (11) setting resets some settings of the pertinent channel.
For information on the items that will be reset, see [Caution] in Section 8.5.2.

8.5.4 Calculation



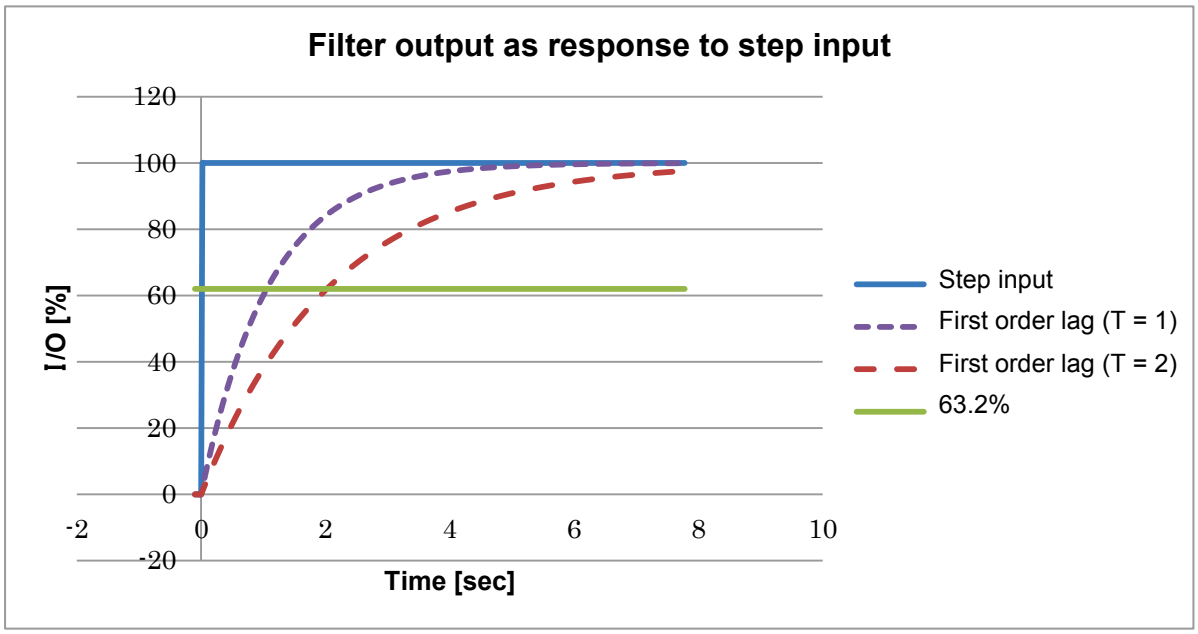
(12) Input filter

Used to apply a first order lag filter to the input.

The example here specifies a response time (time constant T) required to reach 63.2% of step input.

As the input filter setting increases, the measurement value change becomes slower.

[Reference] Relationship between time constant T and input filter



(13) Moving average

Specify the number of samples used for the moving average.

If this item is set to 1, moving average processing will not be performed.

(14) Offset

(15) Gain

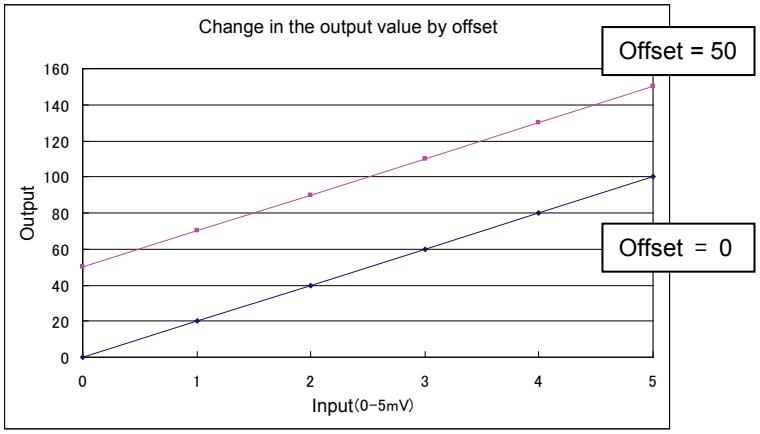
The output value is obtained based on a linear equation, using the offset (14) and gain (15) settings.

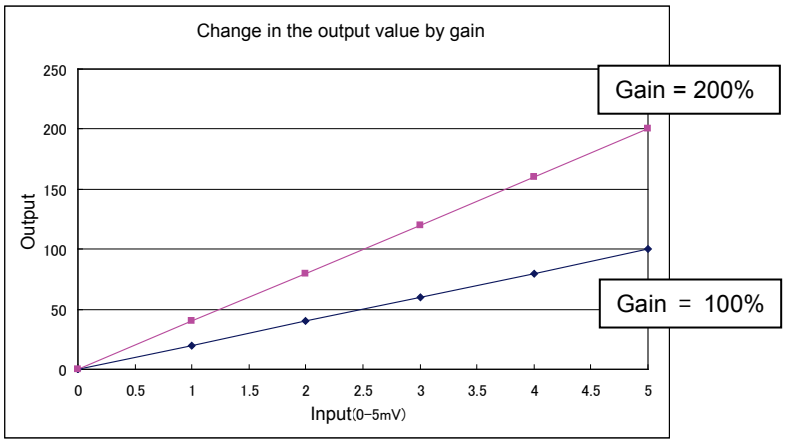
∗ Input abnormalities (burnout, INVALID, L/H over, etc.) are judged based on the measurement value after offset and gain calculation.

∗ You can change the setting of these items even during recording.

[Reference] Offset and gain specifications

Example: If the input range is 0-5 mV and the scaling range is 0-100%





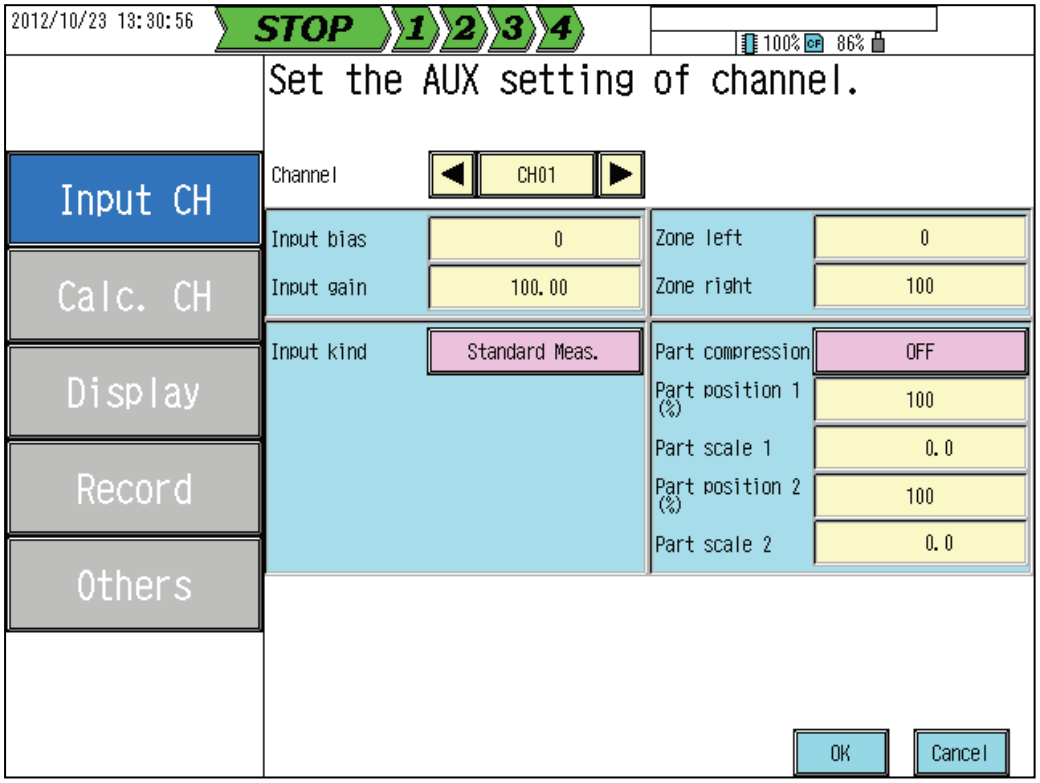
8.6 Setting Auxiliary Input for Input Channel

[Operation]

Parameter > Input CH > AUX setting

The content displayed varies depending on the input type setting.

Note: You cannot change settings during recording.



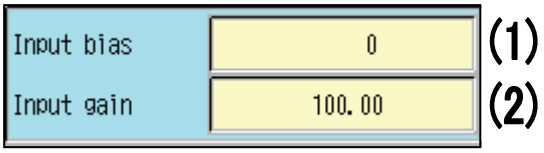
[Settings]

No.	Item	Setting
(1)	Input bias	-99999～99999(μV)
(2)	Input gain	-320.00～320.00(%)
(3)	Input kind	Standard Meas., Differ temp. input, Multiple adjustment
(4)	Standard temp.	-32000～32000digit (*1)
(5)	Measured value	It is dependent on an input kind. (*1)
(6)	Output valve	-32000～32000digit (*1)
(7)	Zone left	0～99
(8)	Zone right	1～100
(9)	Part position	OFF, ON
(10)	Part position 1	1～100(%)
(11)	Part scale 1	-32000～32000digit (*1)
(12)	Part position 2	1～100(%)
(13)	Part scale 2	-32000～32000digit (*1)

*1 For information on the input type and decimal point position, see Section 8.5.

The decimal point position varies depending on the setting.

8.6.1 Input Bias and Input Gain



(1) Input bias (μV)

(2) Input gain (%)

These items can be configured only when the input type is "Thermocouple" or "RTD."

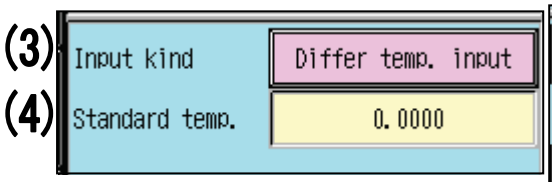
The gain and offset are calculated for the thermo-electromotive force before linearization is performed.

(For information on input types, see Section 8.5.1.)

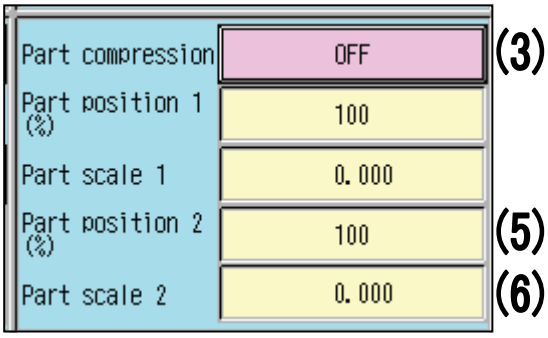
(For information on the gain and offset, see Section 8.5.4.)

8.6.2 Difference Temperature Input and Multipoint Adjustment

If [Differ. temp. input] is selected



If [Multiple adjustment] is selected



(3) Input kind

The following functions are available:

Standard measurement: The measured temperature is read and used as is.

Differ. temp. input (difference temperature input): The difference between the measured temperature and the standard temperature (4) is obtained and the calculation result is output.

Multiple adjustment: The scaling range is adjusted using additional finer partition points.

Auxiliary: Not used generally.

(4) Standard temp.

This item can be configured only when the input kind (3) is "Differ. temp. input." It is effective only when the input type is "Thermocouple."

The difference between the measured temperature and the value specified here is obtained and the obtained difference temperature is output.

(5) Multiple adjustment - Measurement value

(6) Multiple adjustment - Output value

These items can be configured only when the input kind (3) is "Multiple adjustment."
They are effective only when the scaling setting is "ON."

The scaling range from L to H is linearized so that, at each partition point specified at [Multiple adjustment - Measurement value] (5), the value specified at [Multiple adjustment - Output value] (6) is obtained.

∗ An error occurs if the specified values do not fulfill the following conditions:

[Measurement range L] < [measurement points 1 to 4] ≤ [measurement range H]

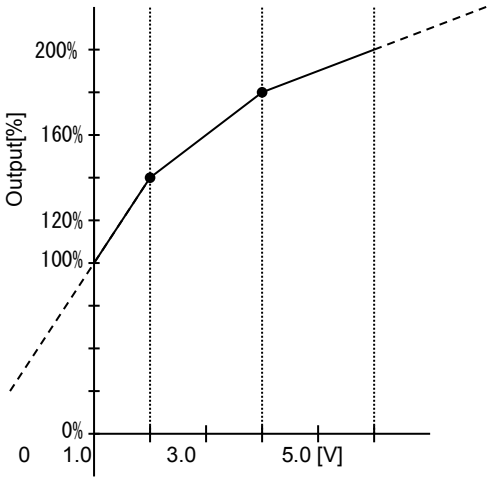
[Measurement point 1] < [Measurement point 2] < [Measurement point 3] < [Measurement point 4]

However, if [Measurement point 1 to 4] = [Measurement range H], it indicates that no measurement point is used and no error occurs.

Example: Measurement range = 0.000 to 5.000 V, scaling range = 100.00 to 200.00%

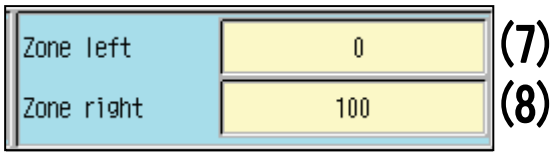
Partition point	Measurement range L	1	2	3	4	Measurement range H
Measurement value [V]	0.000	***1.000***	***3.000***	5.000	5.000	5.000
Output value [%]	100.00	***140.00***	***180.00***	000.00	200.00	200.00

* In this case, points 3 and 4 are invalid and the resulting input graph is as follows:



* Input values that are lower than the measurement range L and higher than the measurement range H are linearized as extensions from the nearest straight lines (in the graph above denoted by the dotted lines).

8.6.3 Zones



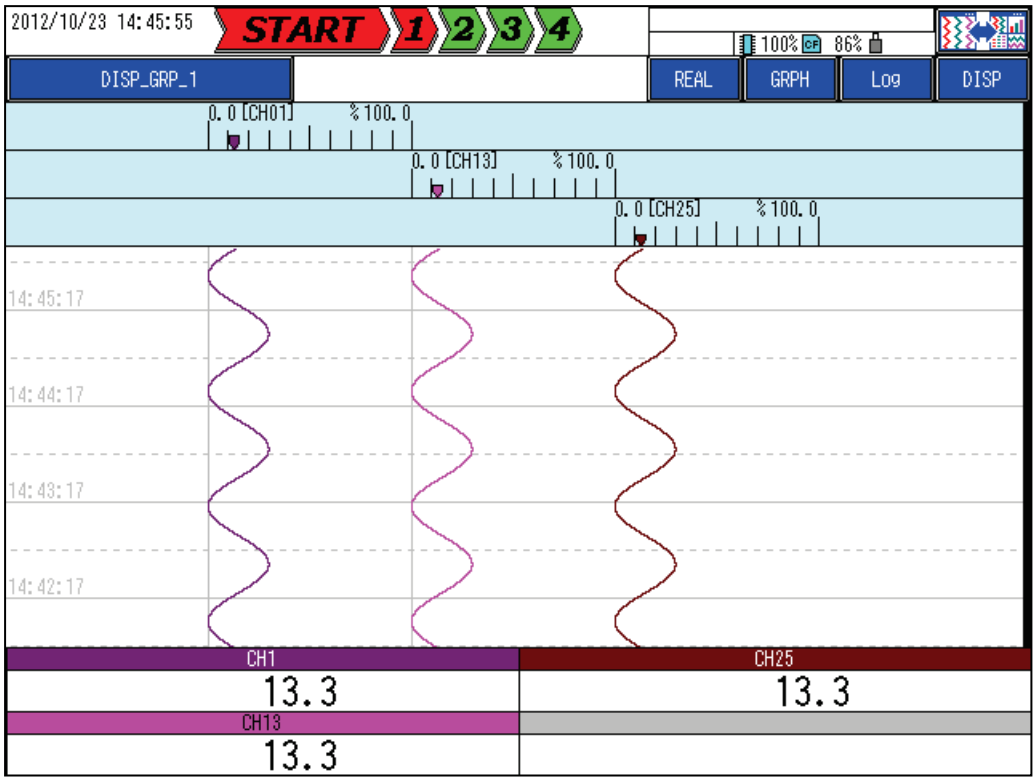
(7) Zone left

(8) Zone right

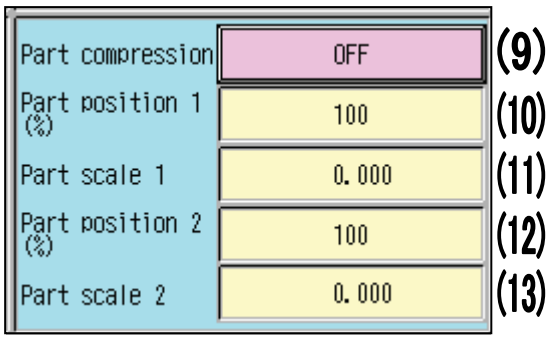
The measurement value for each channel is recorded within the specified range (see the figure below).
(This function applies only to the screen display. It has no effect on the measurement values.)

∗ A setting error occurs if the following relationship is set between the specified values.
[Zone left] ≥ [Zone right]

[Setting examples]
CH01: Zone left = 20, Zone right = 40
CH13: Zone left = 40, Zone right = 60
CH25: Zone left = 60, Zone right = 80



8.6.4 Partial Compression/Expansion



(9) Part compression (partial compression/expansion)
The scale magnification of a defined selectioncan be changed rather than being kept for a linear display.
(This function applies only to the screen display. It has no effect on the measurement values.)

(10) Part position 1 (partial position 1)

(11) Part scale 1 (partial scale 1)

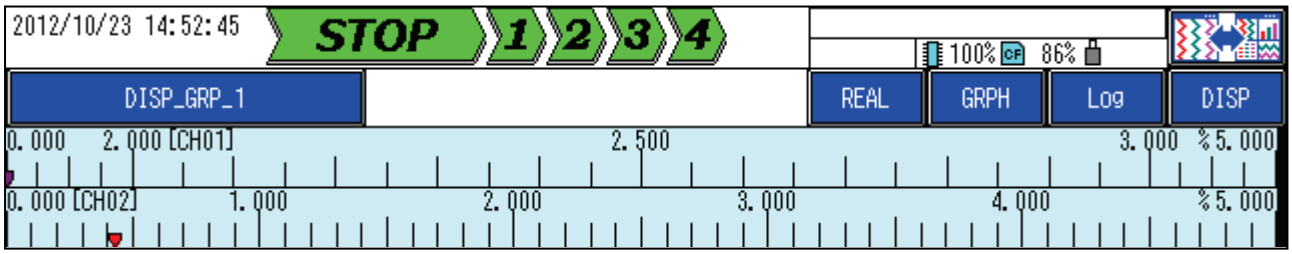
(12) Part position 2 (partial position 2)

(13) Part scale 2 (partial scale 2)

The values specified for these items are effective only when the "Part compression" is set to "Enable."
Each partial scale value is set at the corresponding partial position in the scale range.

∗ An error occurs if the specified values do not fulfill the following condition:
[Scale range L] < [Partial scale 1] < [Partial scale 2] < [Scale range H]
However, this input restriction does not apply to a partial scale for which Partial position is set to "100" because this value indicates that no partial scale is used.

[Setting examples]
CH01: Input type = 0-5V, Part position 1 = 10(%), Part scale 1 = 2.000, Part position 2 = 90(%),
Part scale 2 = 3.000
CH02: Input type = 0-5V, Part compression = Disable (initial value)

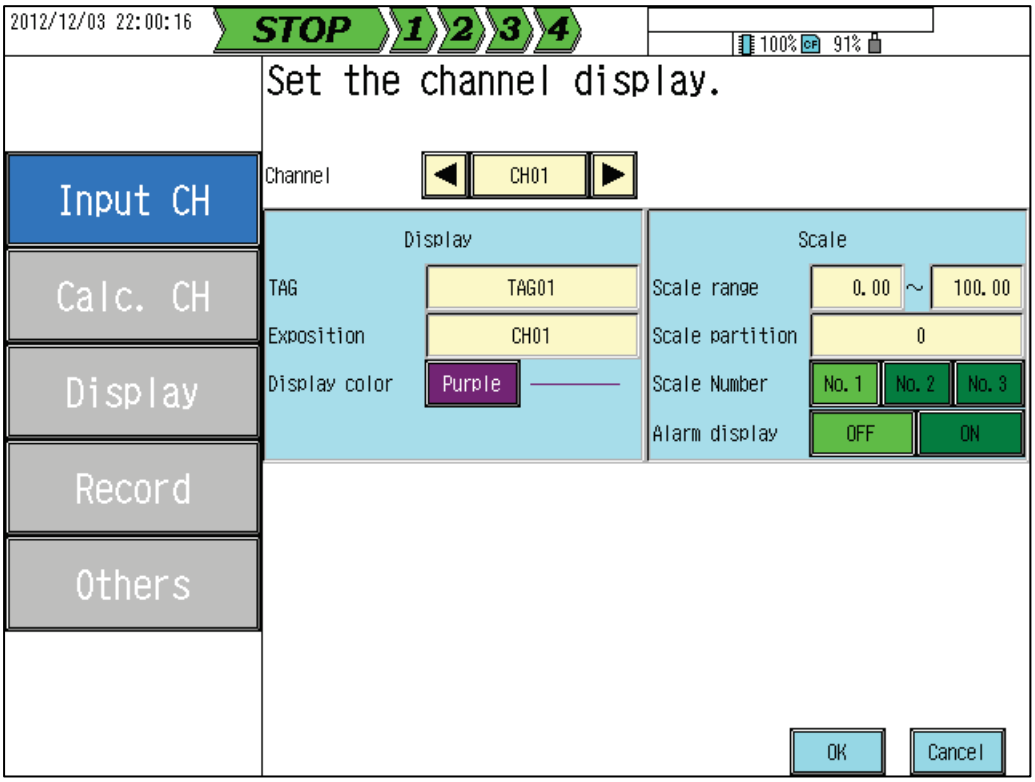


8.7 Specifying How to Display Channels

[Operation]

Parameter > Input CH > Display

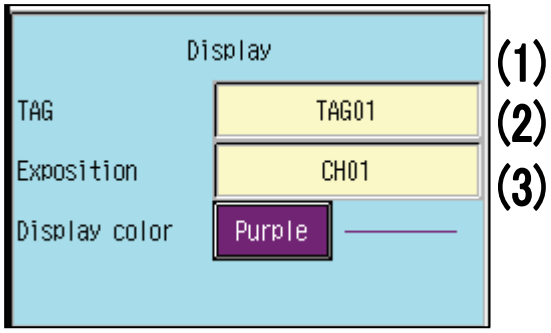
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	TAG	Character input in ASCII
(2)	Exposition	
(3)	Display color	Red、Green、Bule、Purple、Yellow、Aqua、Maroon、Lime、Navy、Fuchsia、Teal、Olive、Gray、Khaki、Brown、Orange
(4)	Scale range	-32000～32000digit
(5)	Scale partition	0～50
(6)	Scale Number	No.1～No.3
(7)	Alarm display	OFF, ON

8.7.1 Channel Display

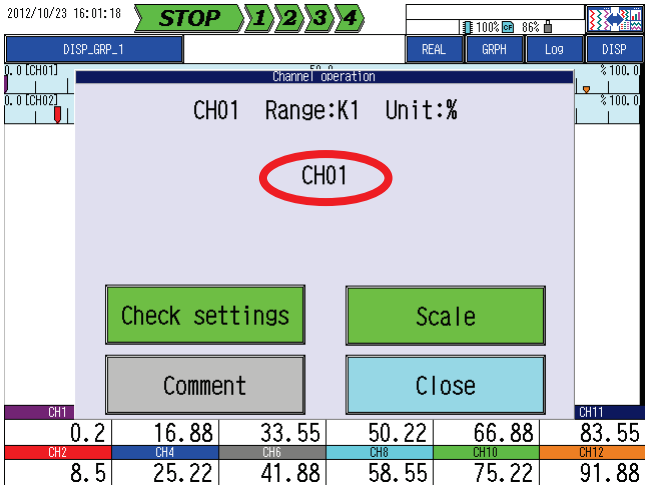


(1) TAG

(2) Exposition

Before the TAG or Exposition set here can be displayed in the trend window, [TAG disp set] (tag display setting) must be set to "TAG" or "Exposition." (For further information, see Section 8.13.1.)

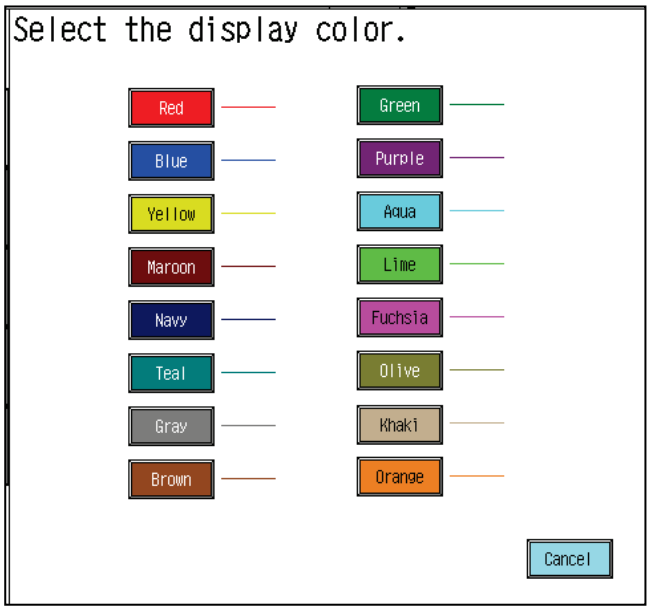
The entered exposition will also be displayed in the channel operation window (right figure). (For information on the channel operation window, see Section 6.2.1.)



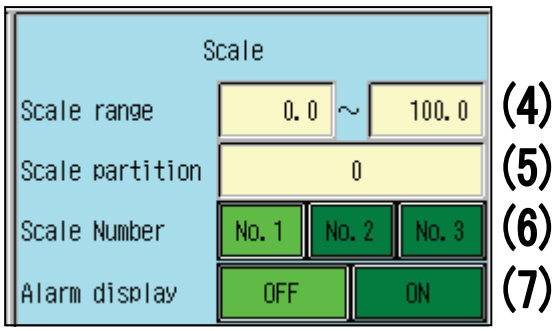
(3) Display color

You can change the trend graph color.

Pressing the button to the right of [Display color] (2) opens the display color selection window (see right).



8.7.2 Channel Scale



(4) Scale range

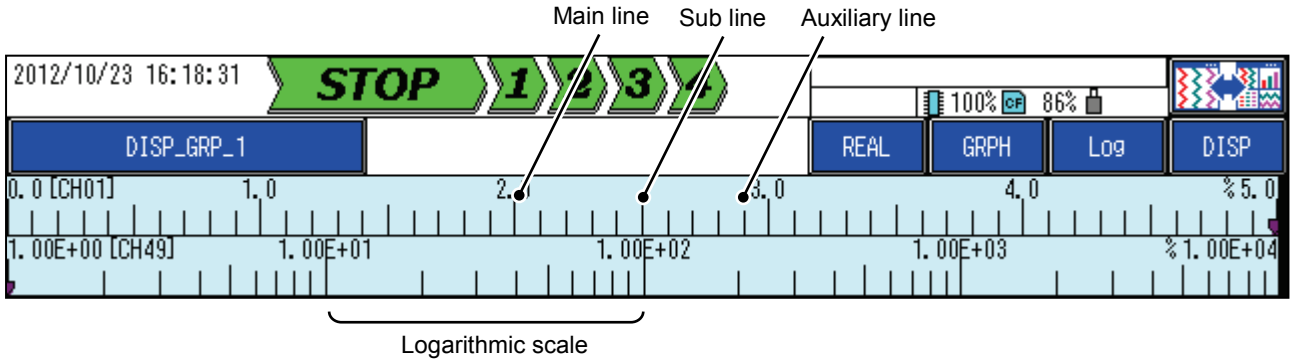
The following three types of scale dividing lines can be used.

Main line : Corresponds to the broadest divisions and tied with the [Scale partition] (5) setting.

Sub line : Used to represent finer divisions than the main line divisions. One to four sub lines are displayed between two main lines.

If further finer divisions are required, use auxiliary lines.

Auxiliary line : Used to represent finer divisions than those that can be represented by main and sub lines.



If "Exponential" is specified for the auxiliary input of a calculation channel, a logarithmic scale is displayed for the channel (CH49 in the figure above).

(For information on exponential output, see Section 8.11.1.)

(5) Scale partition

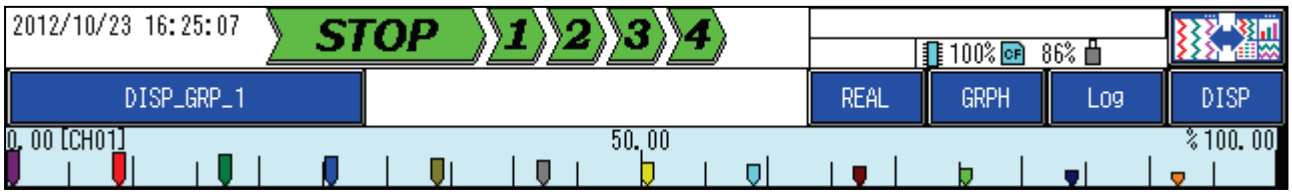
Specify the number of main lines in the specified scale range (4). If you specify "0" as the scale partition value, the number of partitions is calculated automatically.

(6) Scale number

You can display up to three scales, each on one level. Configure the scale number (6) setting to specify which level each channel should be displayed on.

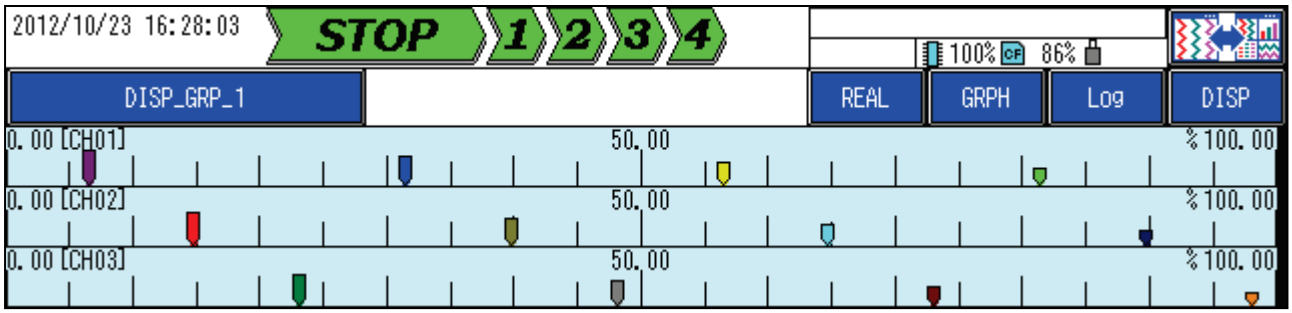
[One-level display]

Scale No. 1: CH01, CH02, CH03, CH04, CH05, CH06, CH07, CH08, CH09, CH10, CH11, and CH12
Scale No. 2: None
Scale No. 3: None



[3-level display]

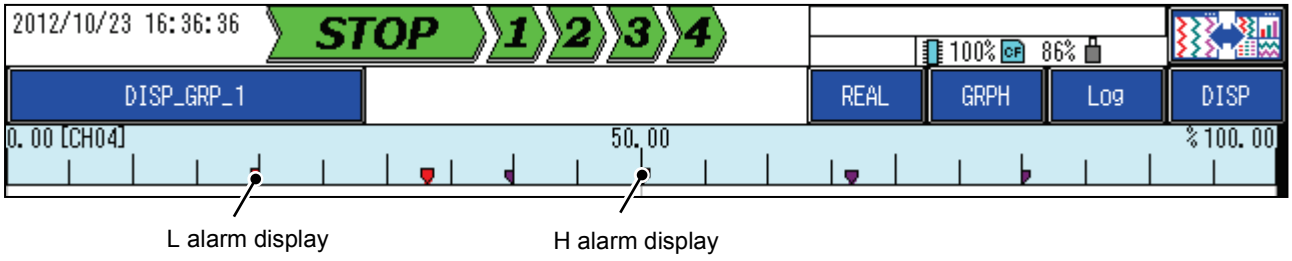
Scale No. 1: CH01, CH04, CH07, and CH10
Scale No. 2: CH02, CH05, CH08, and CH11
Scale No. 3: CH03, CH06, CH09, and CH12



(7) Alarm display

Displays the specified H and L alarm values on the scale. The values are displayed on the scale in the same color as they are for the channel.

(Change rate alarms are not displayed. For further information on each alarm, see Section 8.8.1.)

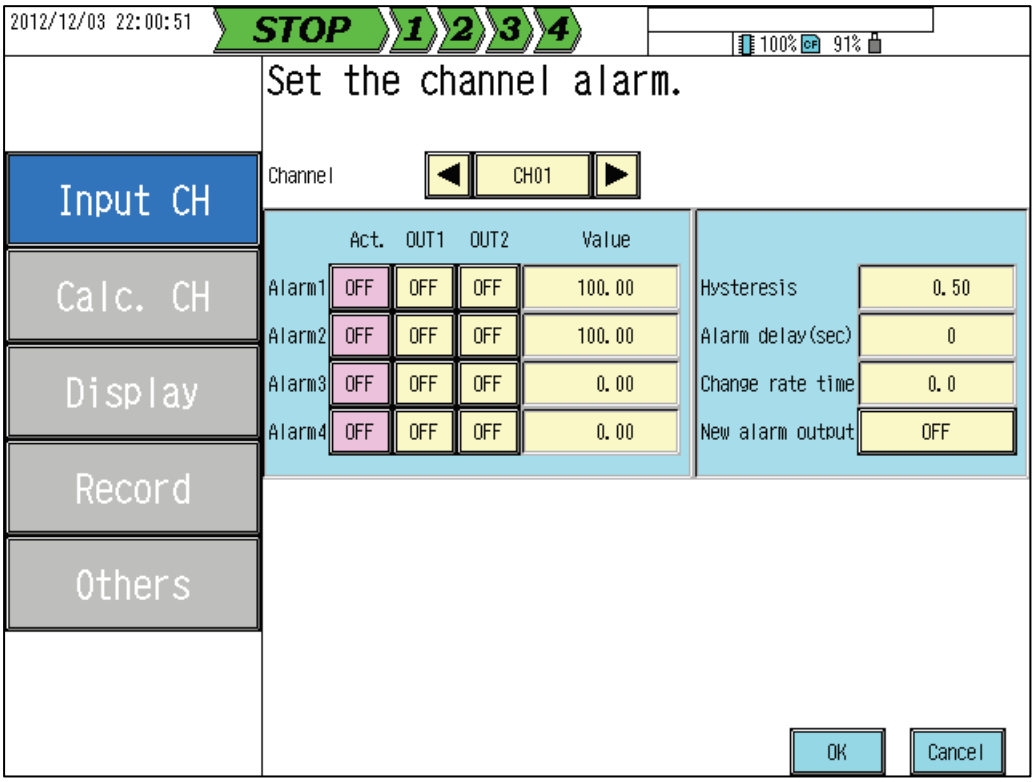


8.8 Configuring Channel Alarms

[Operation]

Parameter > Input CH > Alarm

Note: You can change certain settings even during recording.



[Settings]

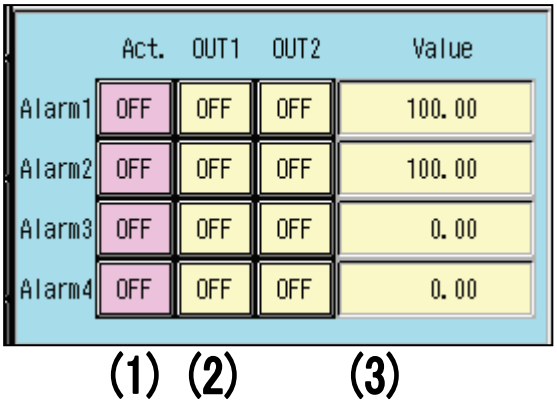
No.	Item	Setting
(1)	Act.	OFF, High, Low, rHigh, rLow (*3)
(2)	OUT	OFF, 1～30, 101～148 (*1) (*3)
(3)	Value	-32000～32000digit (*2) (*3)
(4)	Hysteresis	0～32000digit (*2)
(5)	Alarm delay(sec)	0～3600
(6)	Change rate time (sec)	0.0～60.0
(7)	New alarm output	OFF, 1～8, 101～108 (*1)

*1 You cannot select a relay No. that is beyond the specification you designated when purchasing the recorder.

*2 The decimal point position varies depending on the setting. For further information, see Section 8.5.2.

*3 You can change the setting even during recording.

8.8.1 Alarm Types



(1) Alarm type

You can set up to four alarm levels for each channel.

OFF : The alarm will not be used.

High : The alarm is issued when the measurement value exceeds the specified alarm value (3).

Low : The alarm is issued when the measurement value drops below the specified alarm value (3).

rHigh : The alarm is issued when the increase of the measurement value during the specified change rate time (6) exceeds the specified alarm value (3).

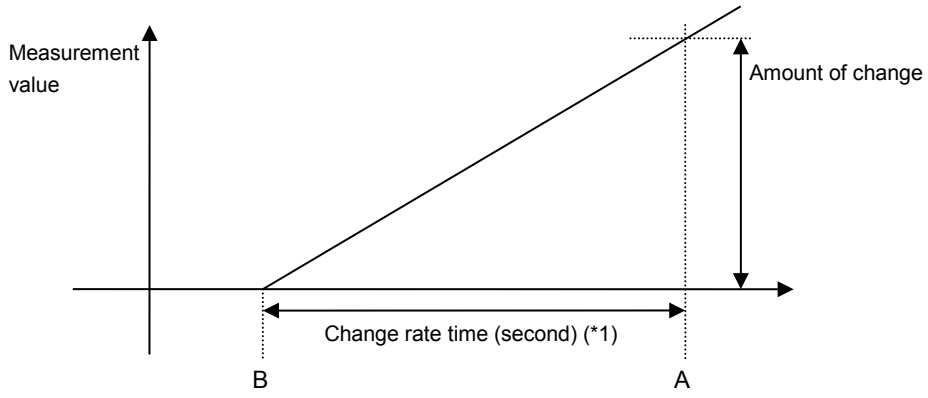
rLow : The alarm is issued when the decrease of the measurement value during the specified change rate time (6) exceeds the specified alarm value (3).

[Reference]

- Alarm type "rHigh"

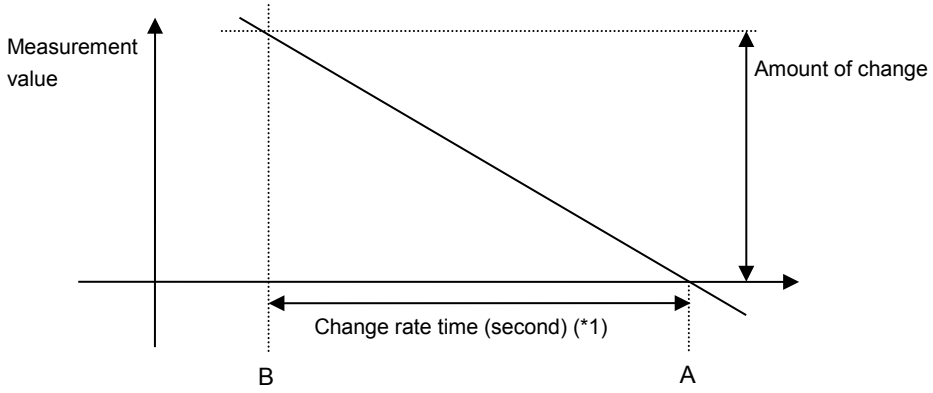
The alarm is issued when the amount of positive change (absolute value) exceeds the specified alarm value.

At this time, the amount of negative change is not judged.



- Alarm type "rLow"

The alarm is issued when the amount of negative change (absolute value) exceeds the specified alarm value. At this time, the amount of positive change is not judged.



*1 Let A be the measurement value at the current time position and B be the measurement value at the time of rate change position.

|A - B|= amount of change

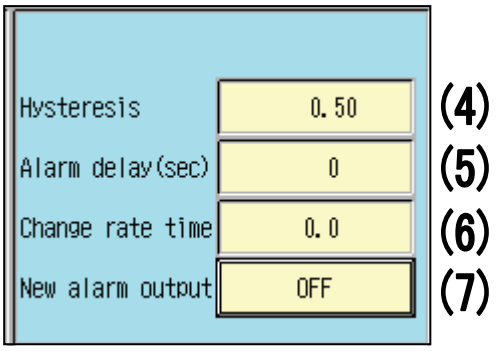
(2) Alarm output

The alarm state is output to the relay, DO, and/or inner DO.
Up to two output destinations can be specified for each level.
(For information on inner DOs, see Section 8.22.1.)

(3) Alarm value

Used for judgment as to whether to issue the alarm.

8.8.2 Alarm Hysteresis and Delay



(4) Hysteresis

The hysteresis is the difference between the value at which the alarm is issued and the value at which the alarm is reset.

No hysteresis judgment will be performed for rHigh and rLow alarms.

[Reference]

- If the hysteresis is 0.5, the measurement range is from 0 to 10.0, the alarm type is "High," and the alarm value is "8.0"

  Since the measurement value exceeds 8.0, the alarm will continue to be issued until the measurement value drops below 7.5.

(5) Alarm delay

The alarm delay is the period from the time the measurement value exceeds the specified alarm value (3) to the time the alarm is actually issued.

(6) Change rate time

The change rate time is the period (in seconds) during which rHigh and rLow alarm judgment is made. A value of "0.0" disables judgment as to whether to issue a change rate alarm.

(7) New alarm output

The alarm will be output to the output destination specified here, only during the specified new alarm output time.

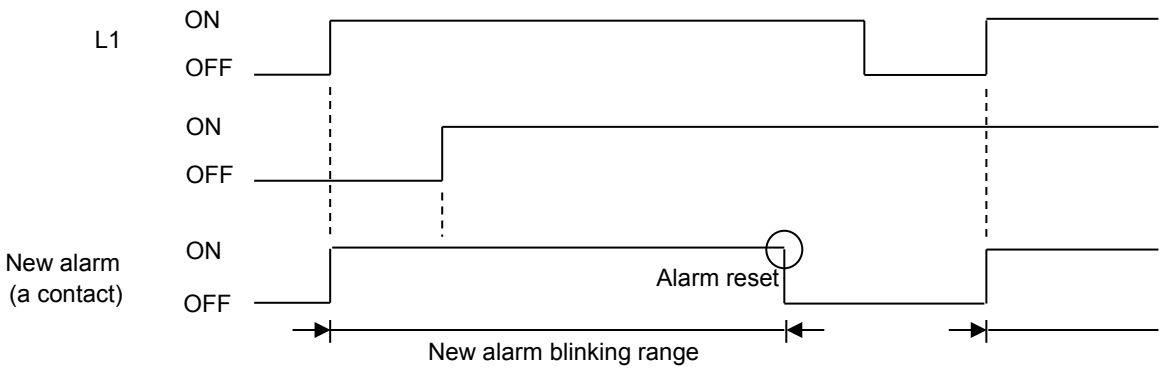
(For information on the new alarm output time, see Section 8.23.1.)

[Caution]

The relay that is specified as a new alarm output destination is always related to another relay so that their OR is output.

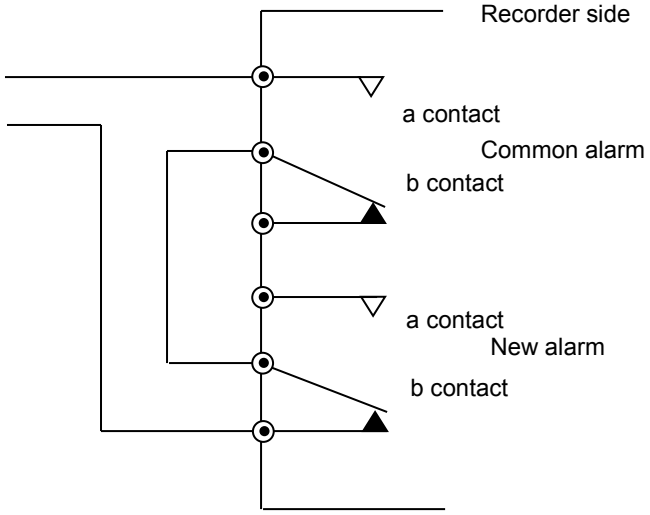
[Example of new alarm operation (1)]

If the new alarm output time is "0.0" (alarm latch)

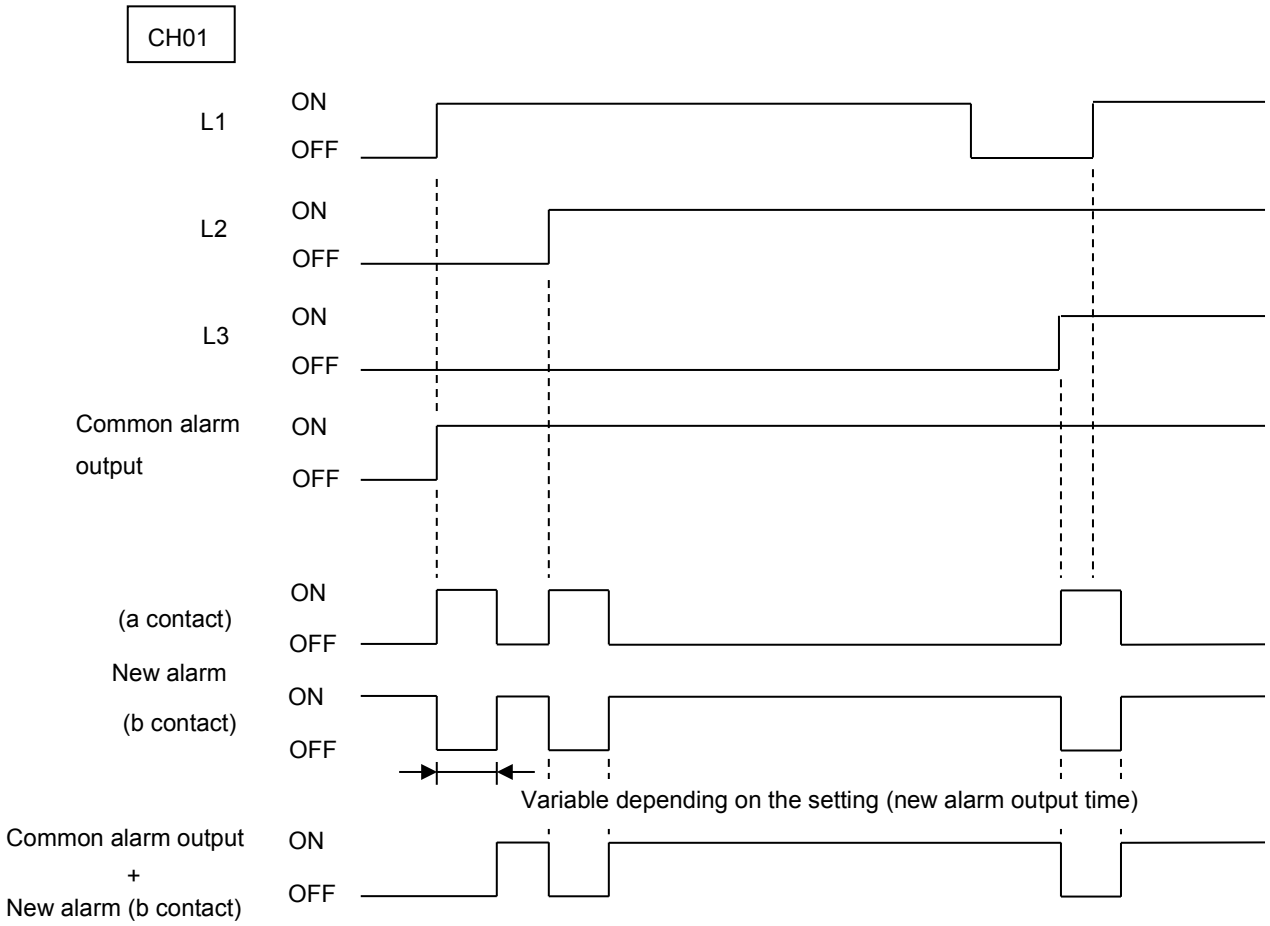


[Example of new alarm operation (2)]

The combination of common alarm output and new alarm output can be used to detect subsequent alarms.



Example of wiring for new alarm



(Example of wiring for new alarm)

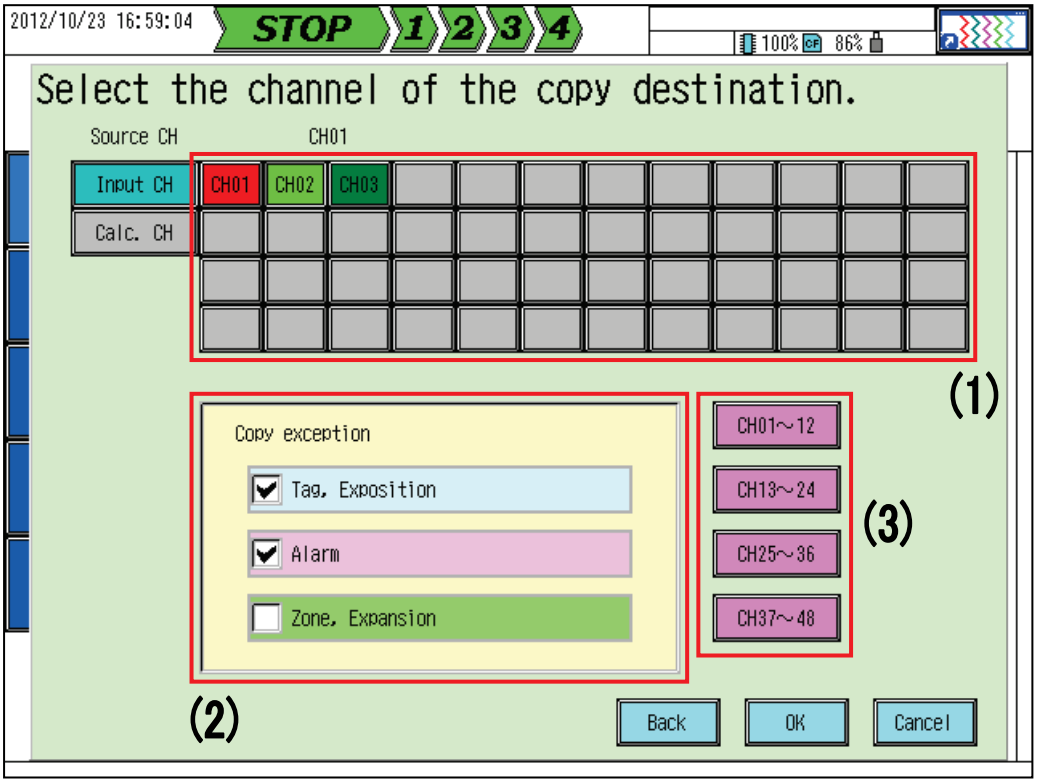
8.9 Copying Channel Settings to Another Channel

[Operation]

Parameter > Input CH > Copy

Note: You cannot copy a channel during recording.

(The range of selectable calculation channels is from CH49 to CH96.)



(1) Channel No.

First, select a copy source channel. (The color of the selected channel changes to red.)

Selecting a copy source channel enables you to select a copy destination channel. (Multiple channels can be selected. The selected channels are in bright color.)

(2) Copy exception

Excludes the checked items from the copy target.

(3) Group selection

You can use a button in this area to select multiple consecutive channels as the copy destinations in a group.

(Buttons in this area are disabled until a copy source channel and a copy destination channel are selected.)

● Items to be copied

Input		AUX setting	
	Channel skip		Input kind
	Input type		Standard temp.
	Reference CH		Multiple adjustment
	Burnout		Zone left
	RJC		Zone right
	RJC Channel		Part compression
	Decimal point		Part position
	Unit		Part scale
	Scaling		
	Meas. range(L)(H)	Display	
	Scaling range(L)(H)		TAG
	Input filter		Exposition
	Moving average		Scale range(L)(H)
	Offset		Scale partition
	Gain		Scale Number
	Input bias		Alarm display
	Input gain		
		Alarm	
			Act.
			OUT
			Value
			Hysteresis
			Alarm delay
			Change rate time
			New alarm output

● Items not to be copied (Copy exception)

TAG・Exposition		Alarm	
	TAG		Act.
	Exposition		OUT
			Value
Zone・Expansion			Hysteresis
	Zone left		Alarm delay
	Zone right		Change rate time
	Scale partition		New alarm output
	Scale Number		

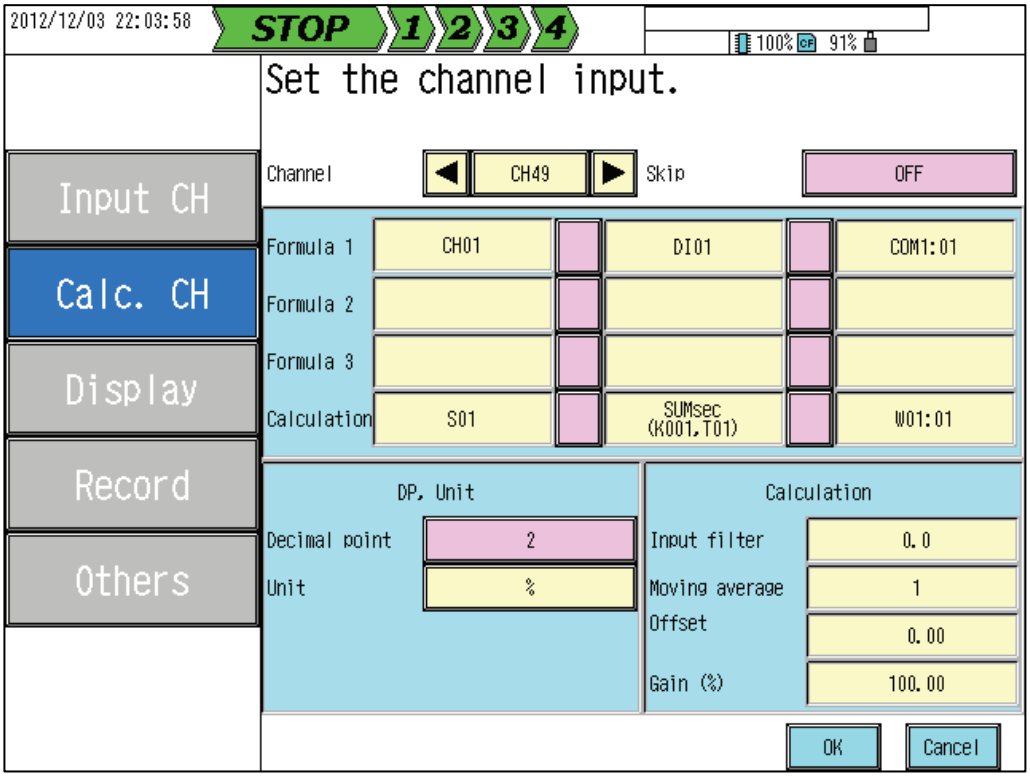
* For details on each item, see the pertinent section.

8.10 Configuring Calculation Specifications

[Operation]

Parameter > Calc. CH > Input

Note: You can change some settingseven during recording.



[Settings]

No.	Item	Setting
(1)	Channel Skip	OFF, ON
(2)	Operation expression	* See "Input types" described later.
(3)	Operator	+, -, *, /
(4)	Decimal point	0～4
(5)	Unit	V, mV, mA, ℃, K, %, %RH (Arbitrary units can be created by user setting.)
(6)	Input filter	0.0～99.9 (sec)
(7)	Moving average	1～64
(8)	Offset	(*1) (*2)
(9)	Gain	-320.00～320.00 (*2)

* For items (1) and (4) to (9), see Sections 8.5.2 and 8.5.4.

*1 The setting range varies depending on the "Extend output" setting. (For further information, see Section 8.11.1.)

*2 You can change the setting even during recording.

8.10.1 Formulas

This setting window allows you assign the following calculations to calculation channels.

1）Four basic arithmetic operations

Example: Input CH01 + CH02 - CH03 and output the result to CH50.

Example: Input CH04*CH49/K001 and output the result to CH55.

2）Function operation

Example: Raise the value input from CH01 to the n-th power and output the result to CH60. (POW function)

Example: Obtain the maximum of the measurement values on channels CH01 to CH12 and output the result to CH65. (MAXto function)

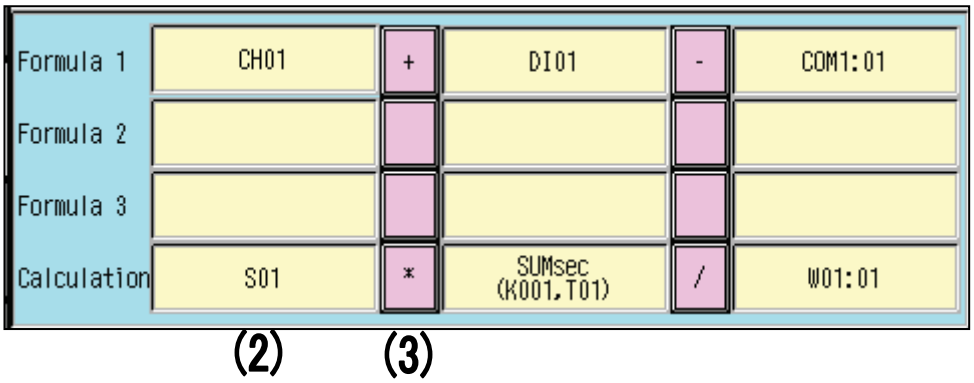
3）Integration operation

Example: Integrate the value input from CH02 at 1-second intervals and continue to output the result to CH70. The integrated value is reset at 5-minute intervals. (SUMsec function)

4）F value calculation (FCAL function)

5）Logical calculation/conditional branching

Example: Output the CH01 value to CH80 if the result of logical calculation table Q001 is correct (True) or the CH02 value to CH80 if it is incorrect (False). (Conditional branching)



(2) Formula

You can assign one input type or function to one term. (For further information, see "● Calculation argument selection window" described later.)

For each of Calculations 1 to 3 and Formula, you can specify up to three terms.

[Caution]

The channel output that represents the final calculation result is the result of "Formula."

Calculations 1 to 3 are used as parameters. The results of them are not output to the channel.

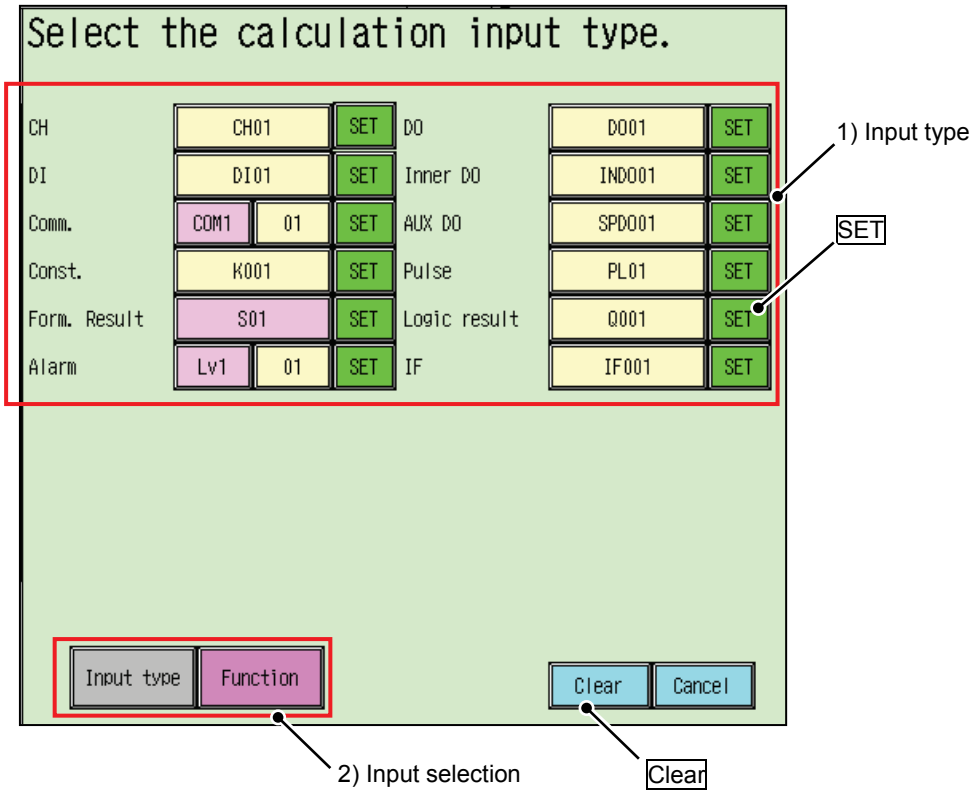
(3) Operators

You can assign up to two operators to each of formula and calculations.

Signs "+," "-," "*," and "/" represent the four basic arithmetic operators.

●Calculation argument selection window

When [Input type] is selected



1) Input type

The input types listed in the table below can be used for formula arguments.

Press SET to set the input type to a formula. Use Clear to reset the currently set input type.

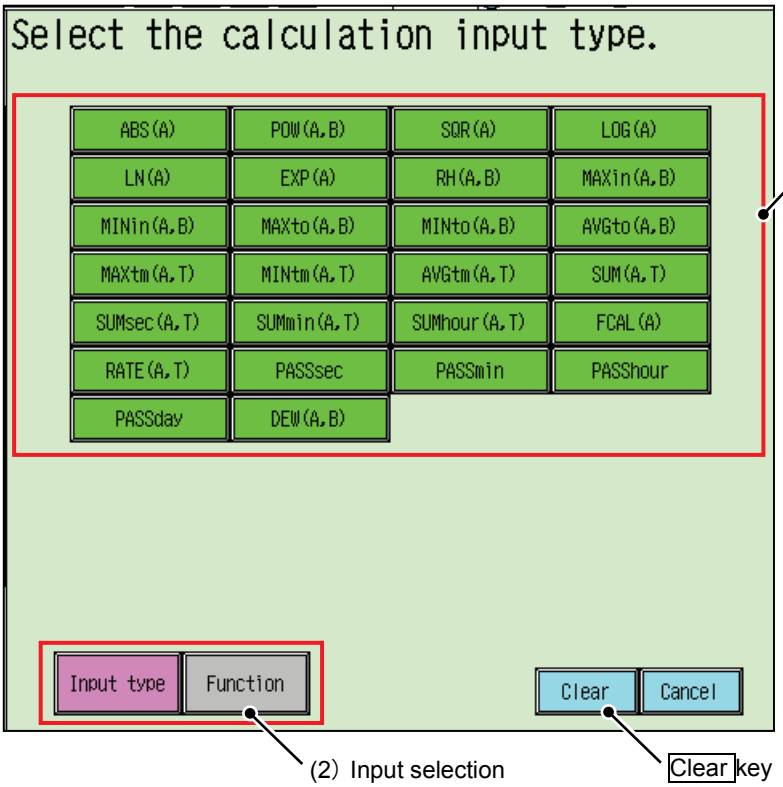
[Input types]

Input type	Setting range	Description
CH	CH01～48, CH49～96	The measurement value on an input channel or calculation channel is used.
DI	DI01～29	DI input ON or OFF is used as a numeric value 1 or 0, respectively.
Comm.	COM1:01～4:48	The data written at a certain communication address on the communication map is used. (*1)
Const.	K001～100	A numeric value in the constant table is used. (*2)
Form.Result	S01～03	The result of calculations S1 to S3 is used.
Alarm	W01:01～48:04, W49:01～96:04	The alarm state ON or OFF on each channel is used as input 1 or 0.
DO	DO01～30	The output state ON or OFF of each DO is used as input 1 or 0.
Inner DO	INDO01～48	The output state ON or OFF of each inner DO is used as input 1 or 0. (*3)
AUX DO	SPDO01～20	The output state ON or OFF of each auxiliary relay is used as input 1 or 0. (*3)
Pulse	PL01～29	A 1 is output when the DI changes from OFF to ON. (*4)
Logic result	Q001～100	The result True or False of a logical calculation table is used as input 1 or 0. (*2)
IF	IF001～100	The result True (1) or False (0) of a logical calculation table is judged. If it is True (1), argument A is output. If it is False (0), argument B is output. (*5)
Timer	T01～20	An absolute time or relative time value is used to reset the integrated value, etc. (*6)
DI reset	U1～U4	A DI input is used to reset the integrated value, etc. (*6)

∗1 For further information on the communication map, see Section 2.3 of the communication manual.
∗2 For further information, see Section 8.12.1.
∗3 For further information, see Section 8.22.
∗4 If you want to count pulses, you need to use an integration function, such as SUM(PL01,T). (The pulse width is 200 ms.) (For information on integration functions, see "● Function types" described later.)
∗5 When setting a conditional branch, you need to separately set the arguments to be used for the conditional branch, in the function setting window. (For information on the function setting window, see "When [Function] is selected" described later.)
∗6 For further information, see "● Timer types" described later.

When [Function] is selected

Press [Function] in the input selection area (2) to move to the function selection window.



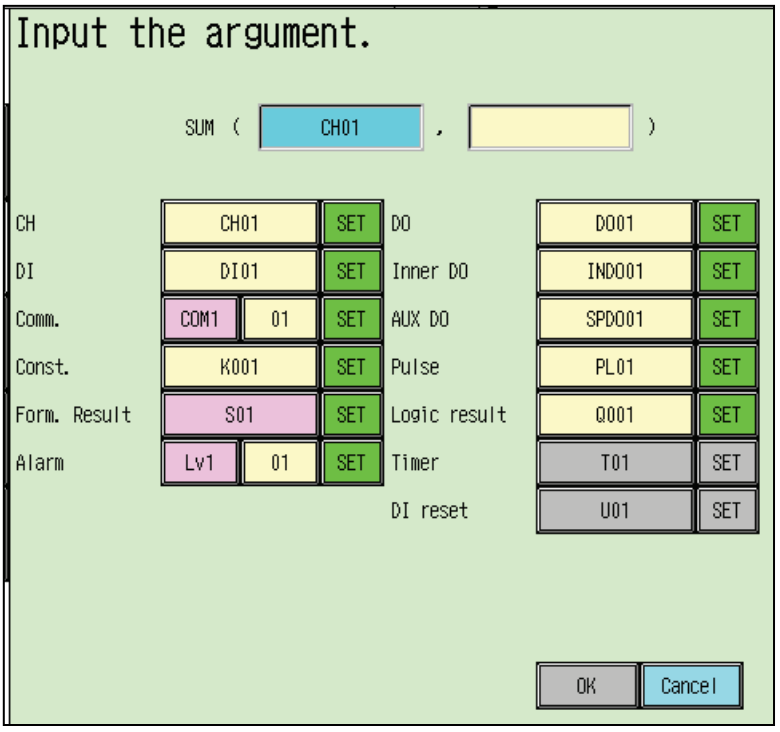
(3) Function types

You can use a function as an argument in a formula.

When you select a function from the function types area (3), the function setting window opens (shown below).

Select the input type for the function, and then press SET to set the argument.

∗ The types and number of arguments that can be set for a function depends on the function type. (For information on arguments, see "● Function types" described later.)



[● Function types]

Function name	Arguments (*1)	Descriptor	Description
ABS	(A)	Absolute value	Returns the absolute value of the input value.
POW	(A,B)	Power	Raises A to power B.
SQR	(A)	Square root	Obtains the square root of A.
LOG	(A)	Common logarithm	Obtains the common logarithm (to base 10) of A.
LN	(A)	Natural logarithm	Obtains the natural logarithm (to base e) of A.
EXP	(A)	Exponentiation	Exponentiates e.
RH	(A,B)	Relative humidity	Obtains the relative humidity from dry-bulb temperature A and wet-bulb temperature B using Sprung's formula under the following condition: Condition: The wind velocity is 2.5 m/s or more and the dry-bulb and wet-bulb temperatures are from 0 to 100°C
MAXin	(A,B)	Maximum (between 2 inputs)	Obtains the maximum or minimum of A and B.
MINin	(A,B)	Minimum (between 2 inputs)	
MAXto	(A,B)	Maximum (continuous input)	Obtains the maximum, minimum, or average from A to B.
MINto	(A,B)	Minimum (continuous input)	
AVGto	(A,B)	Average (continuous input)	
MAXtm	(A,T)	Maximum (time series)	Obtain the maximum, minimum, or average of A. Also, reset at the time appointed in T.
MINtm	(A,T)	Minimum (time series)	
AVGtm	(A,T)	Average (time series)	
SUM	(A,T)	Integrated value	Outputs the integrated value of input A that is reset at the time interval specified by T.
SUMsec	(A,T)	Integrated value (unit: second)	
SUMmin	(A,T)	Integrated value (unit: minute)	
SUMhour	(A,T)	Integrated value (unit: hour)	
FCAL	(A)	F-value calculation	Returns the heating time in minutes required to eliminate microorganisms at the concentration represented by input A.
RATE	(A,T)	Rate of change	Obtains input A changes observed at the time interval specified by T.
PASSsec	-	Progress time (unit: second)	Returns the progress time count value. (*3)
PASSmin	-	Progress time (unit: minute)	
PASShour	-	Progress time (unit: hour)	
PASSday	-	Progress time (unit: day)	
DEW	(A,B)	Dew point	Obtains the dew point from dry-bulb temperature A and wet-bulb temperature B.

∗1 Any input can be assigned to A and B. T represents a timer type (including a user reset).
(For information on timers, see "● Timer types" described later.)

∗2 The recorder performs measurement at 100-ms intervals. Therefore, if the input value is integrated as is, calculation results are incorrect because the unit of the input source is different. This means that the function must be selected based on the unit of the input values.
Shown below are the relationship between functions and time units and examples.

Time unit	Function name	Calculation	Example: Integrated value of 20 L/min input over 1 minute
None	SUM	∑(measurement value)	12000
/s	SUMsec	∑(measurement value/10)	1200
/min	SUMmin	∑(measurement value /600)	20
/h	SUMhour	∑(measurement value/36000)	0.333

∗3 For information on the progress time, see Section 8.24.1.

[Caution]

If the calculation result of each function exceeds a certain limit, "L/H Over" is displayed as the result.
The range of values that cause "L/H Over" varies depending on the "Extend output" setting as follows (*1):

Extend output	Range of effective values
Standard	-32000 to 32000 as digital values (*2)
Extension	Extended range from L to R with ±6.66% margins (*2)
Exponential	Exponent range from L to R with ±6.66% margins

*1 For information on the "Extend output" setting, see Section 8.11.1.

∗2 The decimal point position varies depending on the setting.

[● Timer types]

Item	Range	Description
T01 to T04	1 second to 24 hours	The timer is reset at the specified cycle.
T05 to T08	Sunday to Saturday	Every week, the timer is reset at hour 0 minute 0 second 0 on the specified day of the week.
T09 to T12	1 to 31 (day)	The timer is reset at hour 0 minute 0 second 0 on the specified date.
T13 to T16	1 to 9999 (second)	The timer is reset at the specified cycle (seconds).
T17 toT20	1 to 9999 (minutes)	The timer is reset at the specified cycle (minutes).
U1 to U4	Fixed	The timer is reset when a registered input arrives at the DI integration reset port.

∗ You can only specify a timer reset for an argument of a function if the argument name begins with a "T."

(For example, MAXtm and SUMhour include such an argument.)

∗ For information on each timer, see Section 8.12.3.

∗ Before you can use U1 to U4, you need to set the DI function to [DI reset U1-4].

(For further information, see Section 8.20.1.)

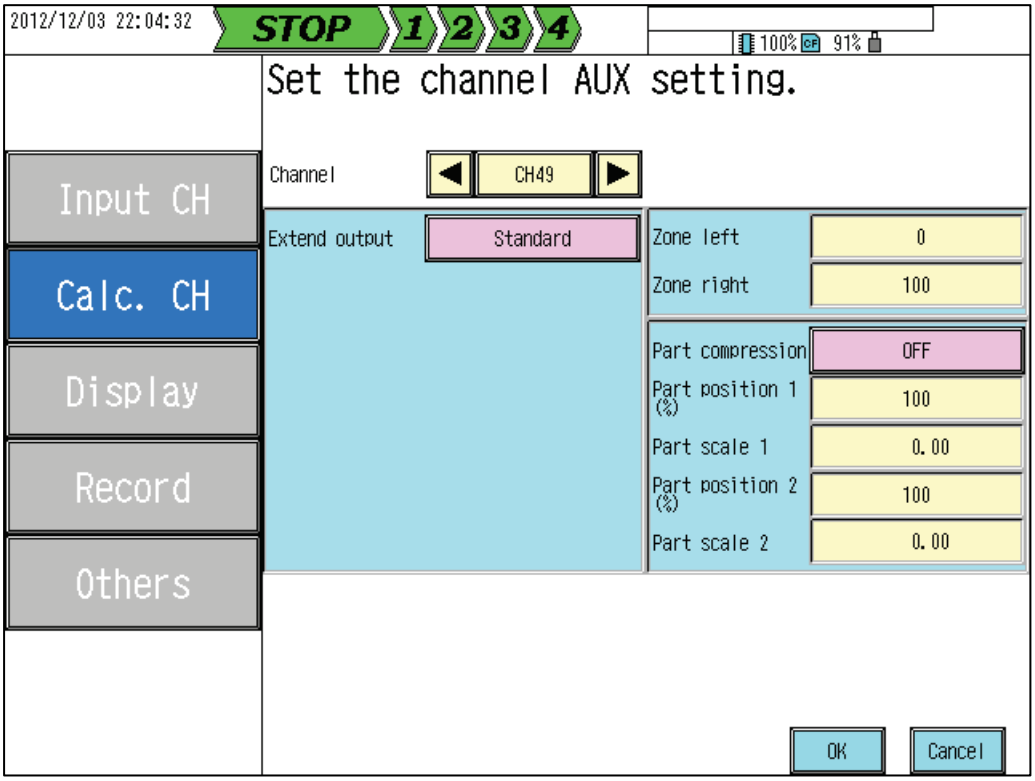
8.11 Setting Auxiliary Inputs for a Calculation Channel

[Operation]

Parameter > Calc. CH > AUX input

The content displayed varies depending on the "Extend output" setting.

Note: You cannot change settings during recording.



[Settings]

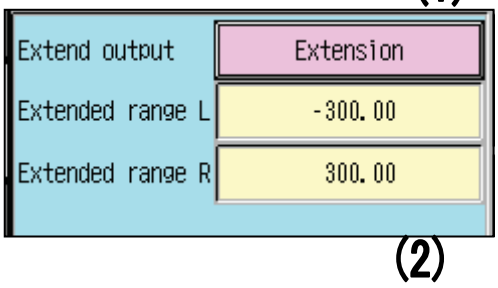
No.	Item	Setting
(1)	Extend output	Standard, Extension, Exponential
(2)	Extend range	-999999～999999 (*2)
(3)	Exponent range	1.00E-20～1.00E+20
(4)	Zone left	0～99
(5)	Zone right	1～100
(6)	Part compression	OFF, ON
(7)	Part position 1	1～100
(8)	Part scale 1	(*1)
(9)	Part position 2	1～100
(10)	Part scale 2	(*1)

* For information on items (4) to (10), see Sections 8.6.3 and 8.6.4.

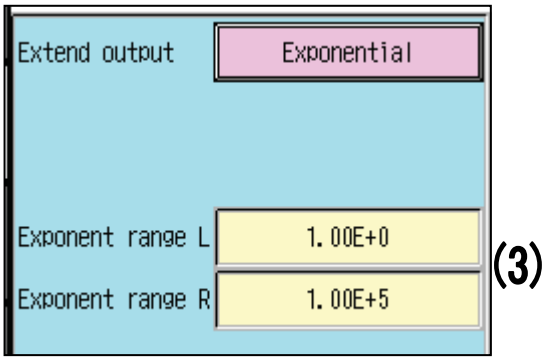
*1 The setting range varies depending on the "Extend output" setting. For further information, see Section 8.11.1.

8.11.1 Extend Output

When [Extension] is selected



When [Exponential] is selected



(1) Extend output

For a calculation channel, you can extend the number of display columns and select exponential output.
The setting ranges of the following items vary depending on the "Extend output" setting (1).

Item	Setting
Offset (Input)	Standard : -32000～32000digit (*1) Extension : -999999～999999 Exponential : -9.99E-20～9.99E+20
Part position (AUX setting)	Standard : -32000～32000digit (*1) Extension : -999999～999999 Exponentia : 0.00E-20～9.99E+20
Scale range(L)(H) (Display)	Standard : -32000～32000digit (*1) Extension : -999999～999999 Exponential : 0.01E-20～9.99E+20
Value (Alarm)	Standard : -32000～32000digit (*1) Extension : -999999～999999 Exponential : 0.01E-20～9.99E+20
Hysteresis (Alarm)	Standard : 0～32000digit (*1) Extension : 0～999999 Exponential : 0.00E-20～9.99E+20

*1 For information on the decimal point position, see Section 8.5.2.
The decimal point position varies depending on the setting.

(2) Extended range

This item can be configured only when the "Extend output" setting (1) is "Extension."
Specify the output range assumed when the measurement values, which are normally represented in the range of ±30000 as digital values, are converted into extended-output equivalents.

(3) Exponent range

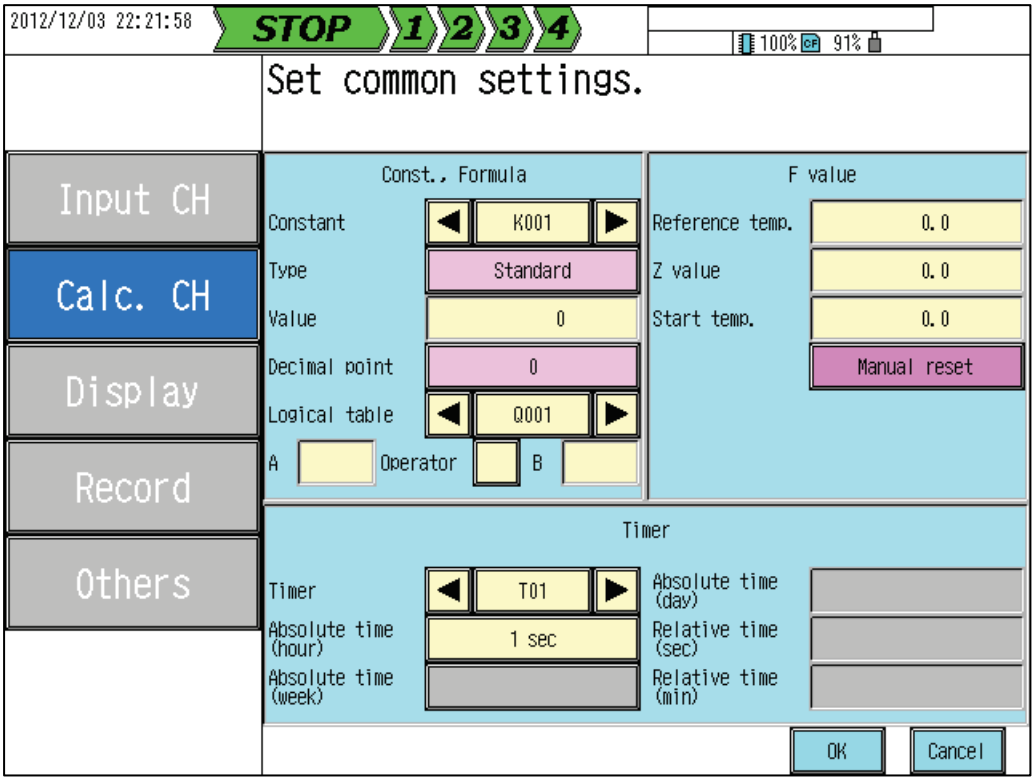
This item can be configured only when the "Extend output" setting (1) is "Exponential."
Specify the output range assumed when the measurement values, which are normally represented in the range of ±30000 as digital values, are converted into exponential equivalents.

8.12 Configuring Calculation Common Functions

[Operation]

Parameter > Calc. CH > Common

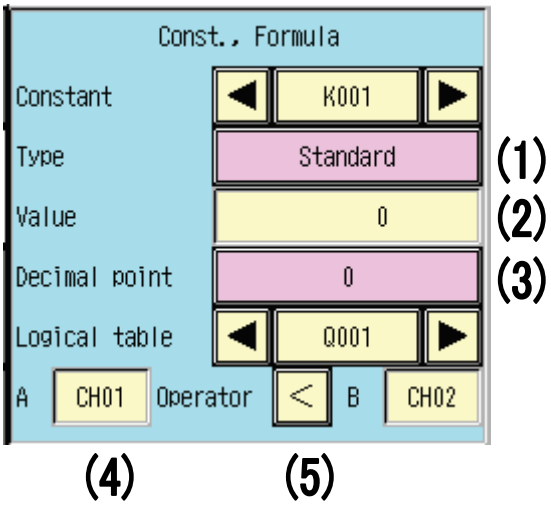
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Type	Standard, Extension, Exponential
(2)	Value	The setting range varies depending on the [Constant - Type] (1) setting. The decimal point position varies depending on the [Constant - Decimal point] (3) setting.
(3)	Decimal point	0～4
(4)	Logical argument	For selectable input types, see Section 8.10.1.
(5)	Logical operator	<, <=, >=, >, =, <>, AND, OR, NOT, XOR
(6)	Reference temp.(℃	-3200.0～3200.0
(7)	Z value	
(8)	Start temp.(℃)	
(9)	Absolute time(hour)	1, 2, 3, 5, 10, 15, 20, 30sec, 1, 2, 3, 5, 10, 15, 20, 30min, 1, 2, 3, 4, 6, 8, 12, 24hour
(10)	Absolute time (week)	Sun, Mon, Tue, Wed, Thu, Fri, Sat
(11)	Absolute time (day)	1～31
(12)	Relative time (sec)	1～9999
(13)	Relative time (min)	

8.12.1 Constant and Logical Calculation Table



(1) Constant - Type

Specify constants to be used in formulas, in the range from K001 to K100.

You can select "Standard," "Extension," or "Exponential" as the "Extend output" setting for the constant. (For information on formulas, see Section 8.10.1.)

(2) Constant - Value

Specify the value of the constant. The setting range varies depending on the [Constant - Type] (1) setting, as follows:

Standard: ±32000

Extension: ±999999

Exponential: ±9.99E+20

(3) Constant - Decimal point

The decimal point position to be used when "Standard" or "Extension" is selected.

(This item cannot be configured if the [Constant - Type] setting (1) is "Exponential.")

(4) Logical calculation argument

Specify logical formulas Q001 to Q100 to be used in formulas.

The result of a logical formula (Q001 to Q100) can be used as a numeric value or a conditional branch IF judgment condition.

(If the result of the logical formula is True, a 1 is output. If it is False, a 0 is output.)

[Caution]

Any argument of a logical formula must not be a timer, function, or conditional branch IF.

When setting a logical formula table, you cannot specify, as an argument, a Q-formula that has the same No. as the logical formula table being set.

Example: You cannot specify logical formula "Q009" as an argument of formula "Q009."

(5) Logical operator

The argument(s) specified as the logical calculation argument(s) (4) will be judged by the logical operator (5).

[Logical operators]

Item	Setting
<, <=, >=, >, =, <>	Judgment as to which of the two arguments is larger or whether they are equal
AND (*1)	A 1 is output when both of the two logical formulas are True (1).
OR (*1)	A 1 is output when one of the two logical formulas is True (1)
NOT (*1) (*2)	A 0 is output when the logical formula is True (1). A 1 is output when the logical formula is False (0).
XOR (*1)	A 0 is output when the results of the two logical formulas are the same. A 1 is output if the results are different.

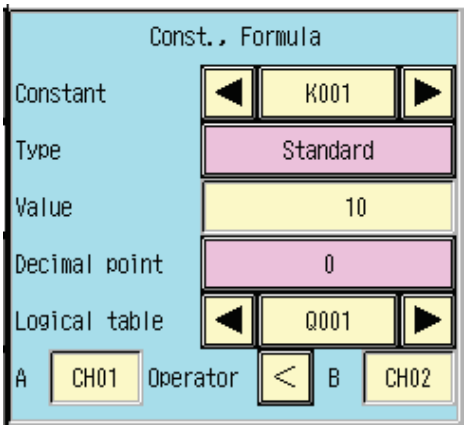
∗1 If AND, OR, NOT, or XOR is selected, one of logical formulas Q001 to 100 can only be selected as its argument.

∗2 When NOT is selected, only argument A can be set.

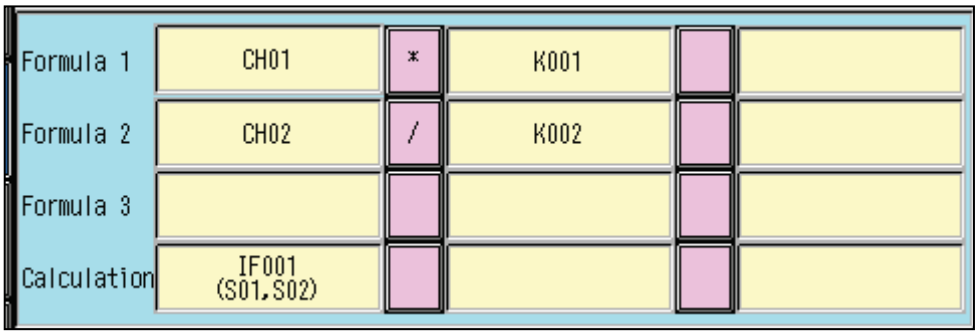
● Example of setting a logical formula

Example: Compare the values input from CH01 and CH02. If the CH01 value is greater, output the CH01 input value multiplied by 10. If the CH02 value is greater, output the CH02 value multiplied by 1/10.

- For Q001, select ">" as the operator, "CH01" as argument A, and "CH02" as argument B.

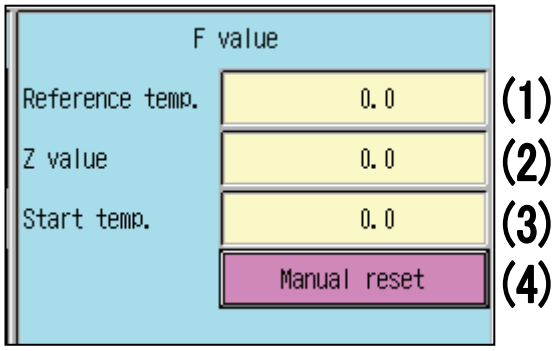


- In the formula input window, set "CH01*K001(10)" for Calculation 1, "CH02/K001(10)" for Calculation 2, and "IF001(S1,S2)" for Formula. (Set the constant K001 in the [Constant - Value] (2) field.)
  (The logical formula table number corresponds to the conditional branch IF number. The conditional branch IF001 determines the output value based on the result of the logical formula Q No. 001.)



With the above settings, if the CH01 value is greater than the CH02 value, argument A (Calculation1) specified in conditional branch IF001 is output to the specified calculation channel. If the CH01 value is equal to or less than the CH02 value, argument B (Calculation 2) specified in conditional branch IF001 is output to the specified calculation channel.

8.12.2 F Value Calculation



(1) Reference temp.
Specify the reference temperature.

(2) Z value
Specify the Z value (the temperature increase required to eliminate microorganisms).

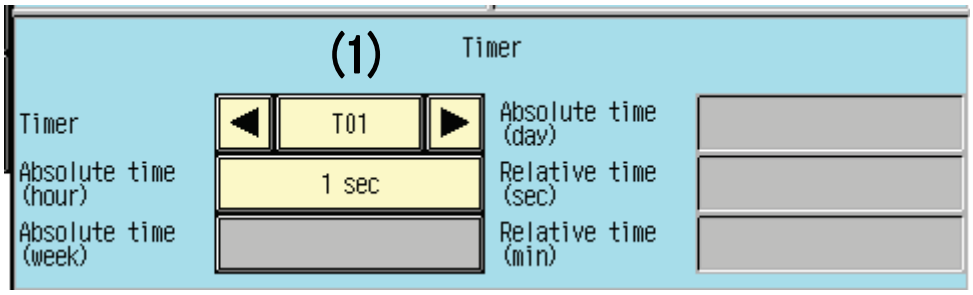
(3) Start temp.
Specify the start temperature. F value calculation will not be performed while the current temperature is lower than the start temperature.

(4) Manual reset
Manually reset the integrated data, including the F value calculation result.
You can also reset the integrated data by selecting [Reset Integration] from the function menu.
(For information on the function menu, see Section 6.11.)

[Caution]

To use F value calculation, you need to assign the FCAL function to the calculation channel.
For further information, see Section 8.10.1.

8.12.3 Timer



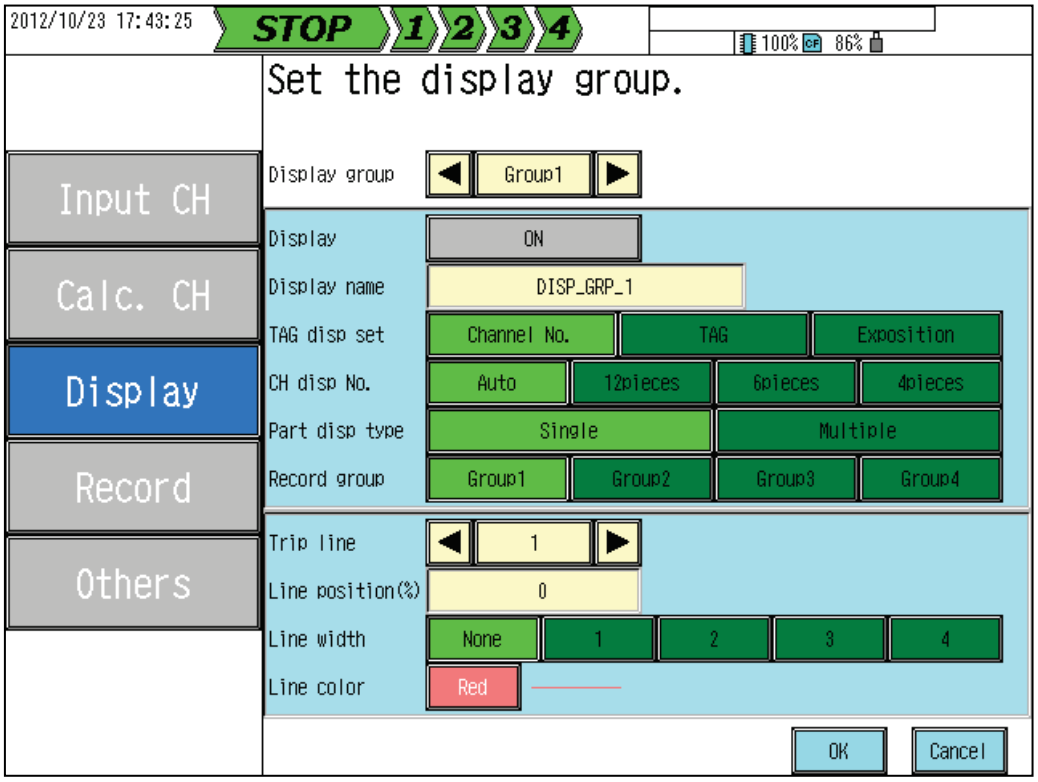
(1) Timer
The timer value that can be used for formulas.
(For information on the timer, see Section 8.10.1.)

8.13 Setting Display Groups

[Operation]

Parameter > Display > Display group

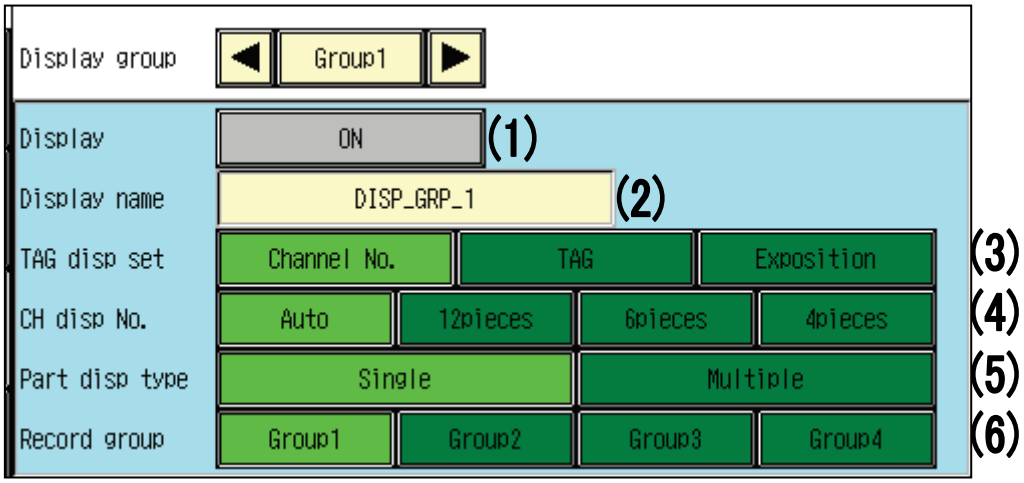
Note: You cannot change settings during recording.



[Settings]

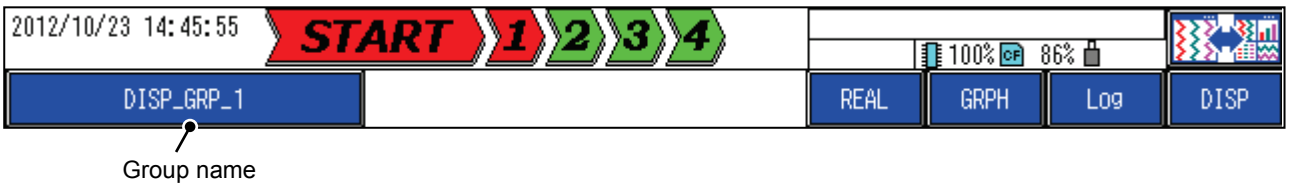
No.	Item	Setting
(1)	Display	OFF, ON
(2)	Display name	CHARACTER INPUT IN ASCII
(3)	TAG disp set	Channel No., TAG, Exposition
(4)	CH disp No.	Auto, 12pieces, 6pieces, 4pieces
(5)	Part disp type	Single, Multiple
(6)	Record group	Group1～4
(7)	Line position	0～100(%)
(8)	Line width	None, 1～4
(9)	Line color	Red、Green、Bule、Purple、Yellow、Aqua、Maroon、Lime、Navy、Fuchsia、Teal、Olive、Gray、Khaki、Brown、Orange

8.13.1 Display Group



(1) Display
Specify whether to show (ON) or hide (OFF) the group in the trend window.
(For Group1, you can only select "ON" as the display (1) setting.)

(2) Display name
The group name to be displayed in the trend window.
The figure below shows the position at which the specified group name will be displayed.



(3) TAG disp set (TAG display setting)
Specify what to display in the measurement values display area in the trend window.
You can specify the content of the "TAG" or "Exposition" from the channel display settings window.
(For further information, see Section 8.7.1.)

[When "Channel No." is selected] [When "TAG" is selected]

(4) CH disp No. (number of channels displayed)

Specify the number of channels to be displayed on one screen.

If "Auto" is selected, the number of channels to be displayed will be automatically determined according to the number of registered channels.

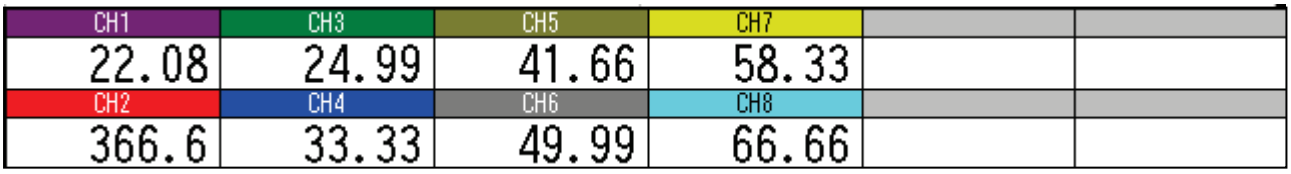
If the number of registered channels is smaller than the value specified here, the screen has a blank area with a size corresponding to unused channels.

If the number of registered channels is larger than the value specified here, the screen can be scrolled to show off-screen channels.

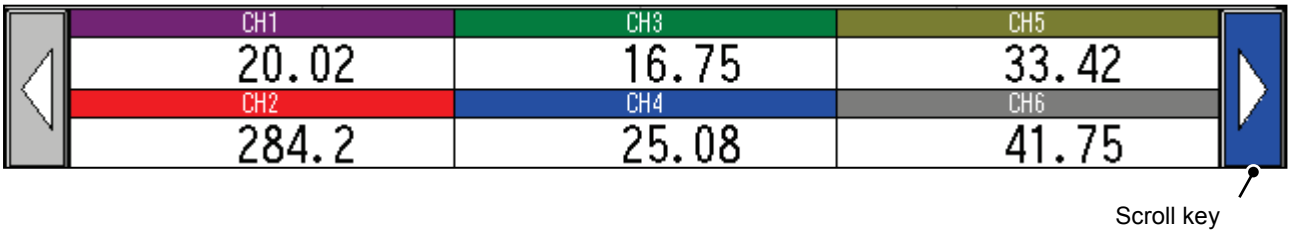
[Reference]

If eight channels have been registered:

●CH disp No.: 12



●CH disp No.: 6



(5) Part disp. type (partition display type)

Specify how to display partitions in each scale when multiple scales exist.

Single: Only the partitions for the last selected single channel will be displayed in the trend window.

Multiple: The partitions set for each scale will be displayed together in the trend window.

(If a single scale is assigned to multiple channels, the partitions for the last selected channel with the pertinent scale number will be displayed for that scale.)

∗ You can select channels on the measurement values display area in the trend window.

(For information on the measurement values display area, see Section 6.2.)

(6) Record group

Specify which record group to assign the display group to.

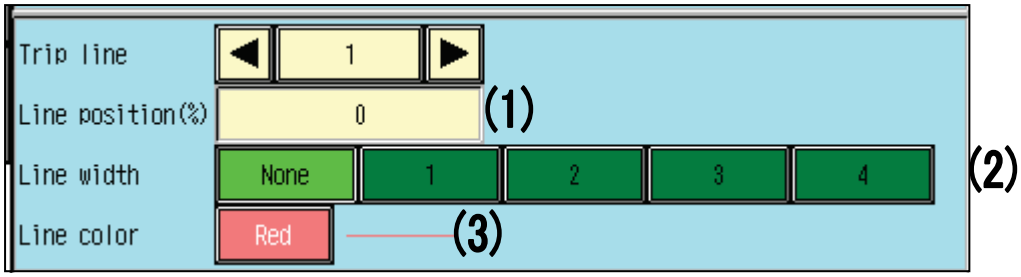
(For information on the relationship between display groups and record groups, see Section 7.6.)

[Caution]

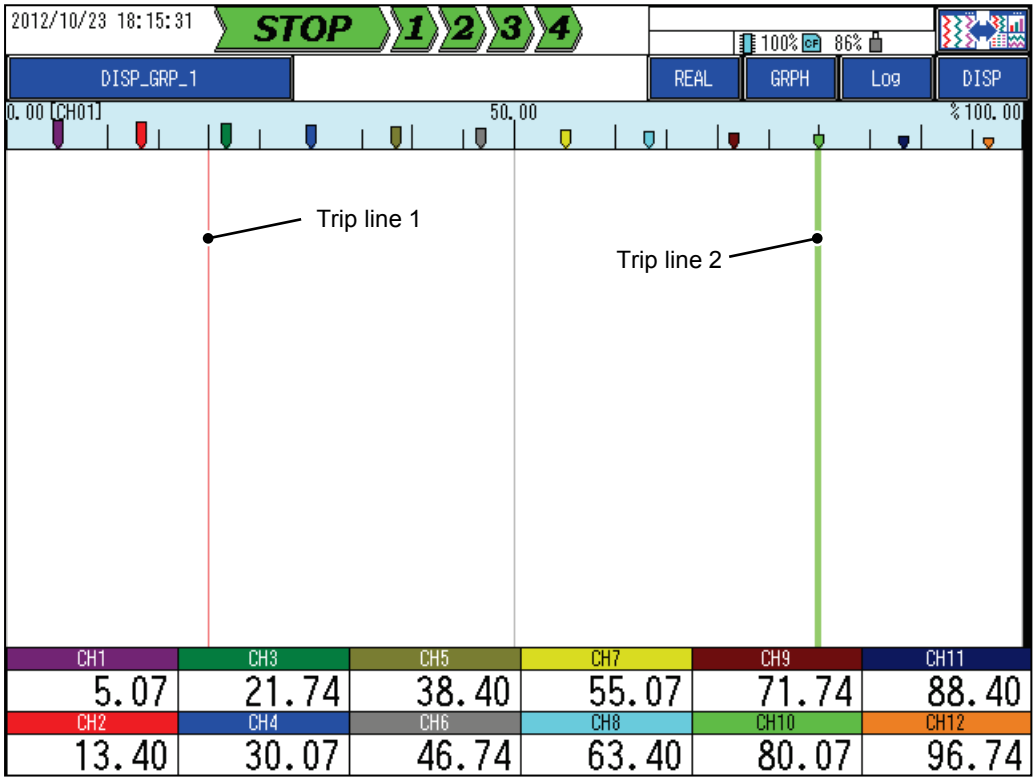
The trend graph of a display group cannot be drawn before the record group assigned to the display group starts recording.

Example: If the record group (6) for display groups Nos. 1 and 2 is set to "Group4," drawing for display groups Nos. 1 and 2 will start when record group No. 4 starts recording.

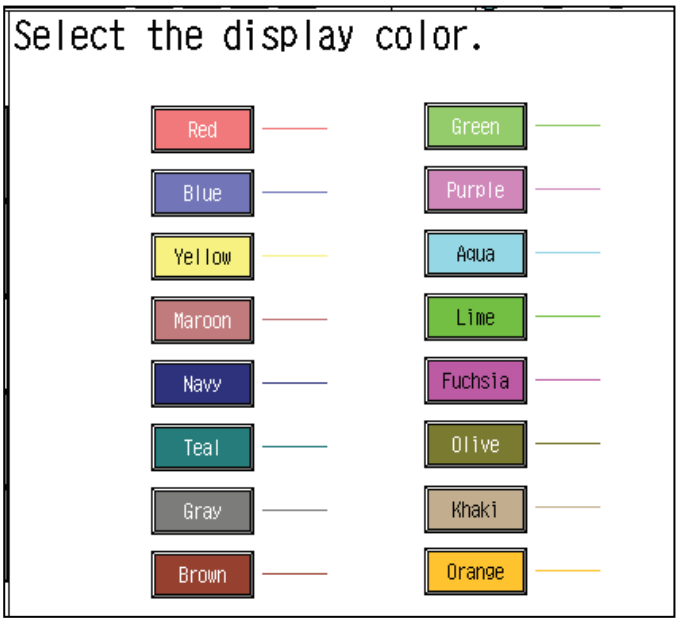
8.13.2 Trip Lines



Draw lines at any positions in the trend window. (See the figure below.)
Examples: Trip line 1 - Line position = 20%, Line width = 1, Color = Red
Trip line 2 - Line position = 80%, Line width = 4, Color = Green



(1) Line position
Trip line drawing position
(2) Line width
Trip line thickness
(3) Line color
You can select a trip line display color (see right).

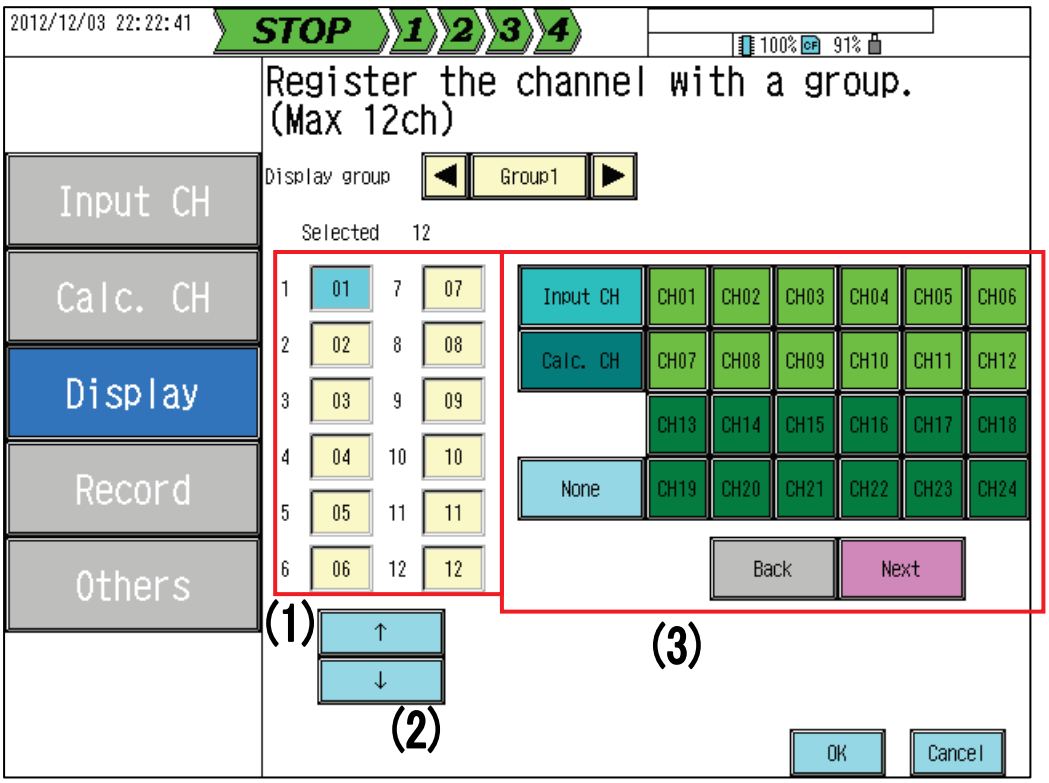


8.14 Setting Display Channels

[Operation]

Parameter > Display > Display channel

Note: You cannot change settings during recording.



(1) Display channels

You can register up to 12 channels with a single display group.

When a channel number is selected in the Channel No. field (3), the channel is registered at the current cursor position (displayed in aqua).

Pressing None clears the setting at the cursor position.

[Caution]

If there is a display group for which no display channel is selected, a setting error occurs.

(2) Cursor keys

Move up or down the channel No. at the current cursor position.

(3) Channel No.

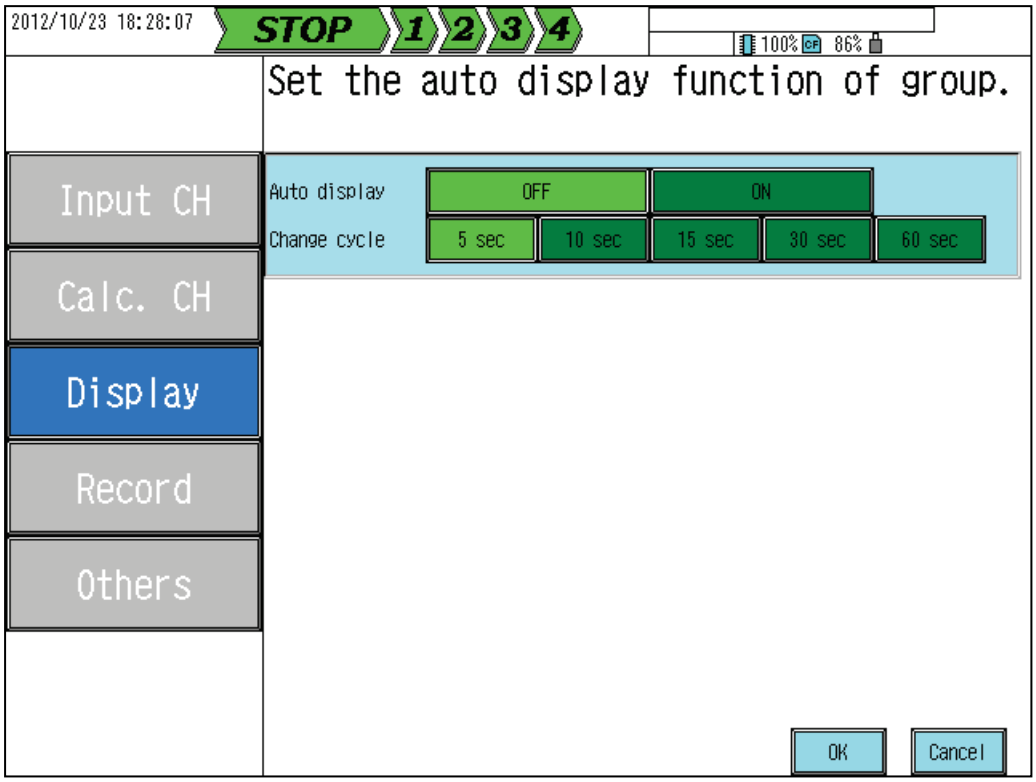
Registers the channel at the current cursor position.

You can change the screen by selecting the pertinent Input CH or Calc. CH key or the Back or Next key.

8.15 Configuring Auto Display Settings

[Operation]

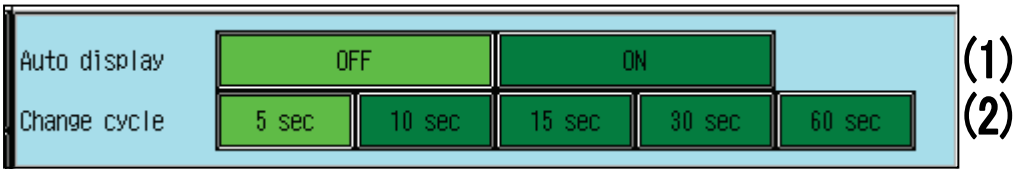
Parameter > Display > Auto display



[Settings]

No.	Item	Setting
(1)	Auto display	OFF, ON
(2)	Change cycle	5 sec, 10 sec, 15 sec, 30 sec, 60 sec

8.15.1 Auto Display



(1) Auto display
This function automatically changes the display group in the trend window.

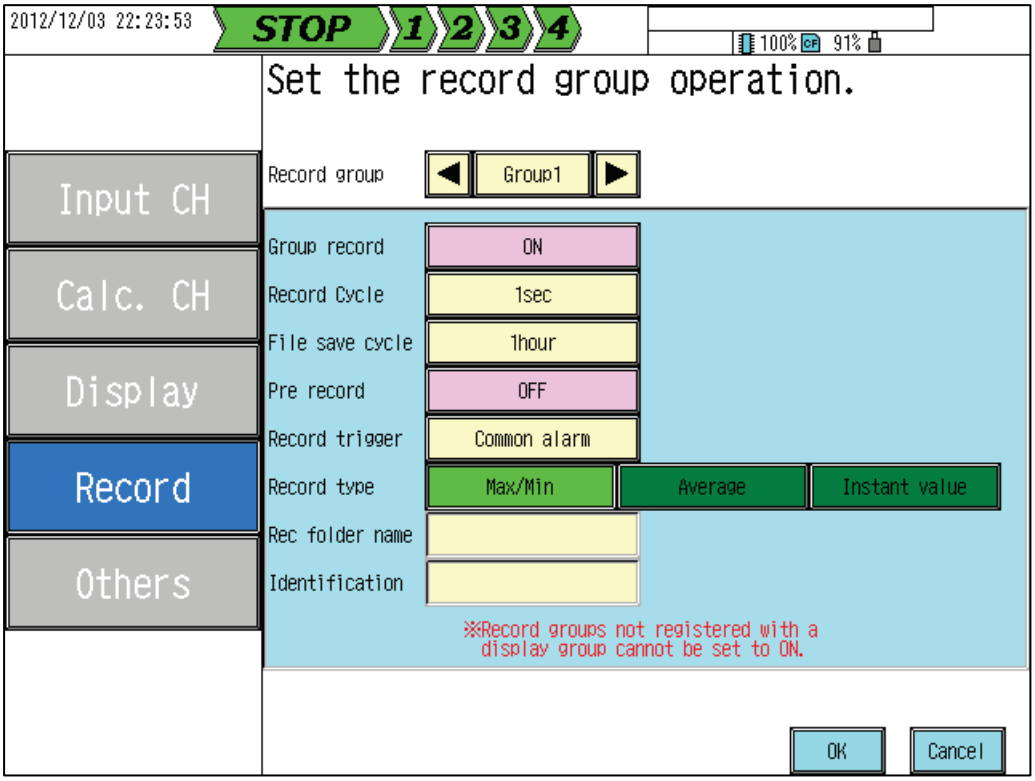
(2) Change cycle
The cycle at which the function will automatically change the display group.

8.16 Setting Record Groups

[Operation]

Parameter > Record > Record group

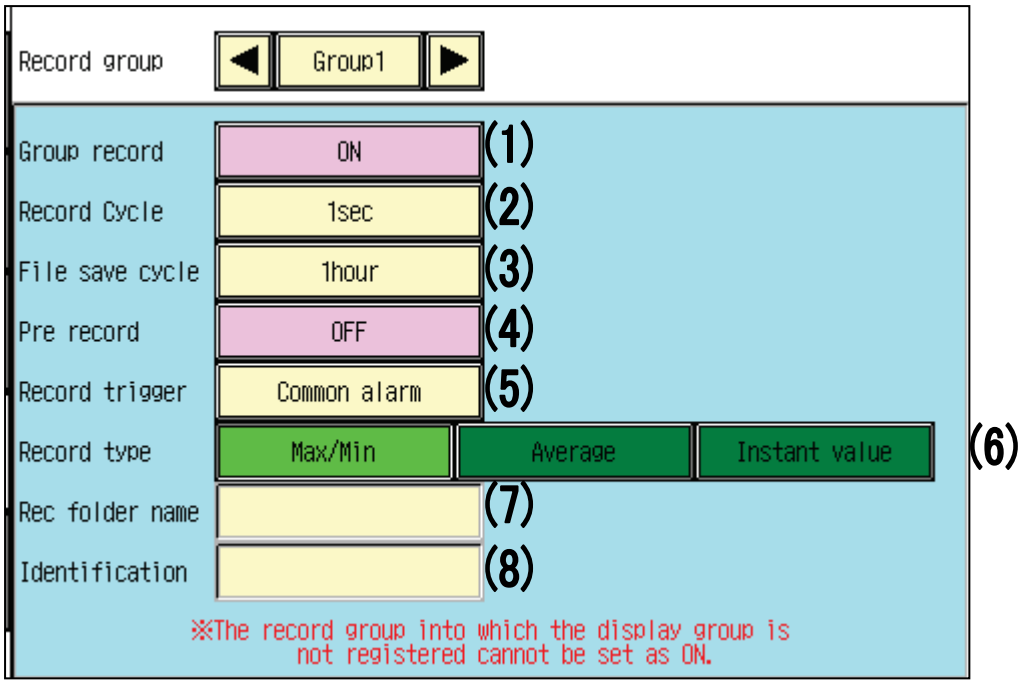
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Group record	OFF, ON
(2)	Record Cycle	100ms, 1, 2, 3, 5, 10, 15, 20, 30sec, 1, 2, 3, 5, 10, 15, 20, 30, 60min
(3)	File save cycle	10min, 1hour, 2hour, 6hour, 12hour, 1day, 1week, 1month
(4)	Pre record	OFF, ON
(5)	Record trigger	START button, Common alarm, FUNC record1～4, DI record1～4, Schedule
(6)	Record type	Max／Min, Average, Instant value
(7)	Rec folder name	CHARACTER INPUT IN ASCII
(8)	Identification	

8.16.1 Record Groups



(1) Group record

Enables or disables recording for the pertinent record group.

[Caution]

If no display group is assigned the record group being set, you cannot set this item to "ON."
(For information on display groups, see Section 8.13.1.)

(2) Record Cycle

The sampling cycle for the record group being set.

[Caution]

The sampling cycle specified for the record cycle (2) is considered as an absolute time, not a relative time.
Example: If the cycle is specified as "20 seconds" at a time of 12:00:04, record data will be sampled at 12:00:20, 12:00:40, 12:01:00 ....

(3) File save cycle

Specify the cycle at which to write data being recorded to the internal memory and CF card.
The range of selectable save cycles varies depending on the specified record cycle (2) and the specified number of registered channels.
(For further information, see "● How selectable save cycles are restricted by the number of registered channels" further in this document.)
(For information on the number of registered channels, see Section 8.14.)

[Caution]

The specified file save cycle (3) is considered as an absolute time, not a relative time.
Example: If the cycle is specified as "1 hour" at a time of 12:10:20, record data will be saved at 13:00:00, 14:00:00, 15:00:00 ....

(4) Pre-record

You can set this item unless the record trigger (5) is "START button."

Specify whether to enable or disable the pre-record function. For further information, see Section 7.2.2.

(5) Record trigger

Specify the condition for each record group to start or stop recording.

START button : Recording for the record group starts/stops together with overall recording when the front START/STOP button is pressed.

Common alarm : Recording for the record group starts when a common alarm occurs and stops when the alarm is reset.

FUNC record 1-4 : Recording starts or stops when [Record1-4] in the function menu is pressed.

∗ Note that the FUNC record numbers and record group numbers do not always match. It is also possible to start/stop recording for record group No. 4 when triggered by FUNC record 1.

(For information on the function menu, see Section 6.11.)

DI record 1-4 : Recording for the record group starts when a DI whose DI Function setting is "DI record 1-4" turns ON and stops when the DI turns OFF.

∗ Note that the DI record numbers and record group numbers do not always match. It is also possible to start/stop recording for record group No. 4 when triggered by DI record 1.

(For information on the DI functions, see Section 8.20.1.)

Schedule : Recording starts and stops according to the settings of the scheduled start and end times.

(For further information, see Section 8.18.1.)

[Caution]

The function that starts and stops recording according to the specified record trigger (5) is enabled only when overall recording is started.

(6) Record type

The maximum/minimum or average of values measured at the specified record cycle (2) can be obtained.

For further information on each record type, see "● Record type specification" described later.

∗ If the record cycle (2) is set to 100 milliseconds, only "Instant value" can be specified here.

(7) Rec folder name

Specify the name of the record folder to be created for recording.

(8) Identification

Assign an identification name to the record file to be created for recording.

∗ For information on the naming conventions for the record folder and identification name, see Section 5.6.

[●How selectable save cycles are restricted by the number of registered channels]

Record cycle	100 milliseconds						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	yes	Yes	Yes	No	No	No	No
2 hours	yes	No	No	No	No	No	No
6 hours	No	No	No	No	No	No	No
12 hours	No	No	No	No	No	No	No
1 day	No	No	No	No	No	No	No
1 week	No	No	No	No	No	No	No

Record cycle	1 second						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	No
6 hours	Yes	Yes	Yes	No	No	No	No
12 hours	Yes	Yes	Yes	No	No	No	No
1 day	Yes	No	No	No	No	No	No
1 week	No	No	No	No	No	No	No

Record cycle	2 seconds						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	No	No	No
12 hours	Yes	Yes	Yes	Yes	No	No	No
1 day	Yes	Yes	Yes	No	No	No	No
1 week	No	No	No	No	No	No	No

Record cycle	3 seconds						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	Yes	Yes	No
12 hours	Yes	Yes	Yes	Yes	Yes	No	No
1 day	Yes	Yes	Yes	No	No	No	No
1 week	No	No	No	No	No	No	No

Record cycle	5 seconds						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 hours	Yes	Yes	Yes	Yes	Yes	Yes	No
1 day	Yes	Yes	Yes	Yes	Yes	No	No
1 week	Yes	No	No	No	No	No	No

Record cycle	10 seconds						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 day	Yes	Yes	Yes	Yes	Yes	Yes	No
1 week	Yes	Yes	No	No	No	No	No
1 month	No	No	No	No	No	No	No

Record cycle	15 seconds						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 week	Yes	Yes	Yes	No	No	No	No
1 month	No	No	No	No	No	No	No

Record cycle	20 seconds						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 week	Yes	Yes	Yes	No	No	No	No
1 month	Yes	No	No	No	No	No	No

Record cycle	30 seconds						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 week	Yes	Yes	Yes	Yes	No	No	No
1 month	Yes	No	No	No	No	No	No

Record cycle	1 minute						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 week	Yes	Yes	Yes	Yes	Yes	Yes	No
1 month	Yes	Yes	Yes	No	No	No	No

Record cycle	2 minutes						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 week	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 month	Yes	Yes	Yes	Yes	No	No	No

Record cycle	3 minutes						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 week	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 month	Yes	Yes	Yes	Yes	Yes	No	No

Record cycle	5 minutes						
Save cycle	Number of registered channels						
	2	6	12	24	36	48	96
10 minutes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 hour	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 day	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 week	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1 month	Yes	Yes	Yes	Yes	Yes	Yes	No

∗ If the record cycle is longer, i.e., 10 minutes, 15 minutes, 20 minutes, 30 minutes, or 60 minutes, any file save cycle can be specified (Yes).

∗ Channels whose channel skip setting is ON are not counted as registered channels.
(For information on the channel skip setting, see Section 8.5.1.)

[● Record type specification]

The recorder allows you to select one of the following three record types:

(1) Maximum/minimum

The maximum and minimum values measured during each record cycle will be recorded. For example, if the record cycle is 1 second, 10 measurement values in total are obtained during each record cycle of 1 second because the measurement cycle internal to the recorder is 100 milliseconds. (Recording for 1 second is performed at millisecond 00.)

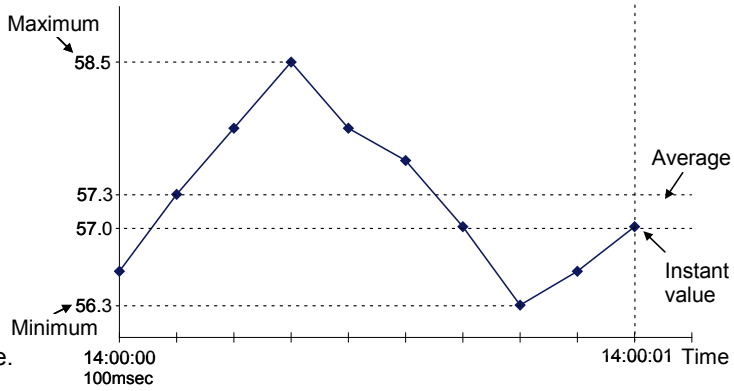
Suppose that the measurement value changed as indicated on the left table. The values recorded as the maximum and minimum values are "58.5" and "56.3," respectively (see the right table below).

Time	Time count (ms)	Measurement value
14:00:00	100	56.6
14:00:00	200	57.3
14:00:00	300	57.9
14:00:00	400	58.5
14:00:00	500	57.9
14:00:00	600	57.6
14:00:00	700	57.0
14:00:00	800	56.3
14:00:00	900	56.6
14:00:01	0	57.0

Recorded here.

Record data

Time	Time count (ms)	CH01 MAX	CH01 MIN
14:00:01	0	58.5	56.3



(2) Average

The average of the values measured during each record cycle will be recorded.

For the above example, the value recorded as the average is "57.3" (see the table below).

Record data

Time	Time count (ms)	CH03 AVG
14:00:01	0	57.3

(3) Instant value

The last value measured during each record cycle will be recorded.

For the above example, the value recorded as the instant value is "57.0" (see the table below).

Record data

Time	Time count (ms)	CH02 INS
14:00:01	0	57.0

∗ The duration of measurements that can be recorded in the CF card is longer when the average or instant value is recorded than when the maximum and minimum values are recorded.

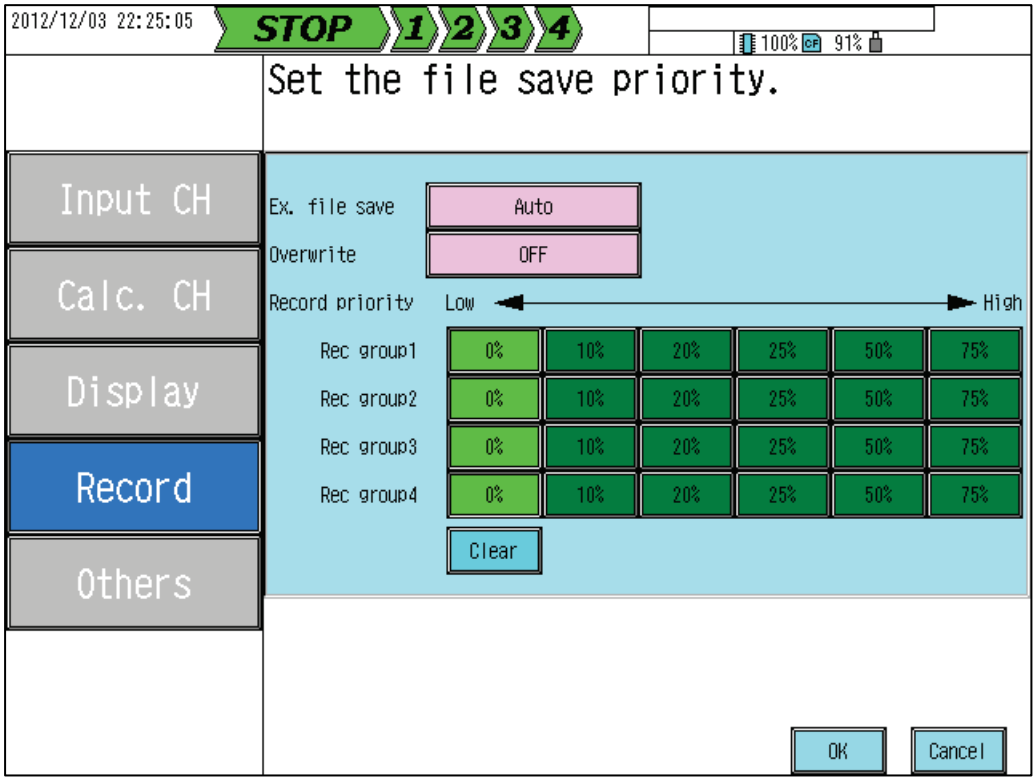
(This is because the number of values recorded for each record cycle is 1 rather than 2.)

8.17 Setting Record Priorities

[Operation]

Parameter > Record > Save media settings

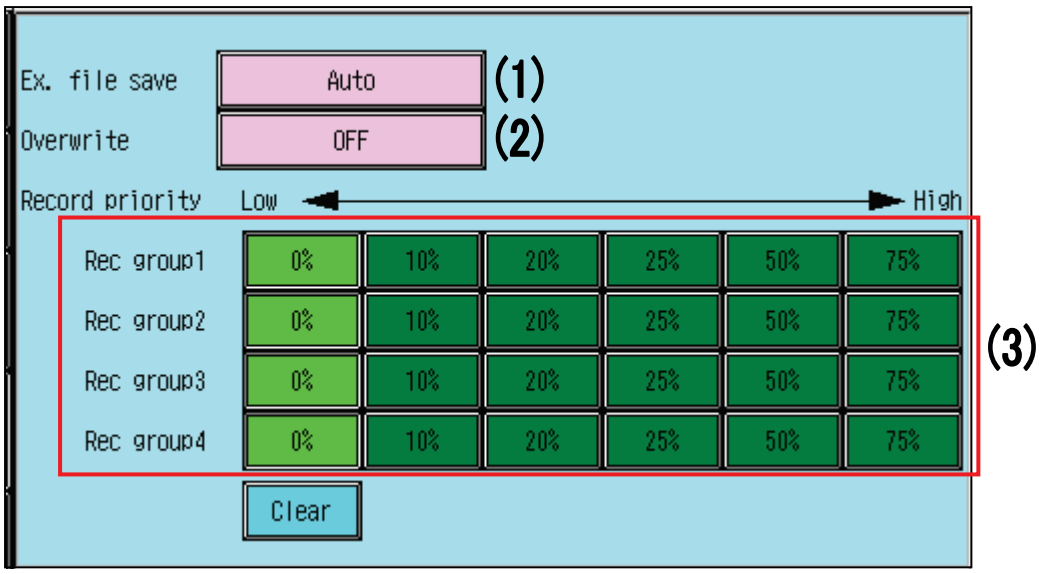
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Ex. file save	Auto, Manual
(2)	Overwrite	OFF, ON
(3)	Record priority	0%, 10%, 20%, 25%, 50%, 75%

8.17.1 Record Priority



(1) Ex. file save (external file save)

Specify how to output the record data (created during recording) to the recording medium.

Auto : The record data will be automatically output to the recording medium at the specified file save cycle.

Manual : The record data will be output only to the internal memory at the specified file save cycle.

If you set this item to "Manual," you need to execute [CF card output] and other related operations.

(2) Overwrite (external file overwrite)

When record data can no longer be written to the recording medium due to insufficient capacity, the existing record data is deleted in chronological order so that writing to the recording medium can be continued.

OFF : Writing to the recording medium will stop when the recording medium runs short of free space. (Recording will continue.)

ON : As the recording medium capacity becomes low, record data will be deleted in chronological order.

[Caution]

The function that overwrites the internal memory is always ON.

(3) Record priority

Assign each record group an internal memory overwrite priority. Before the internal memory is overwritten with new data, the priority specified here determines which data belonging to the pertinent record group should be deleted.

Record data will be deleted in ascending order of priority and chronological order.

For further information, see Section 7.6.3.

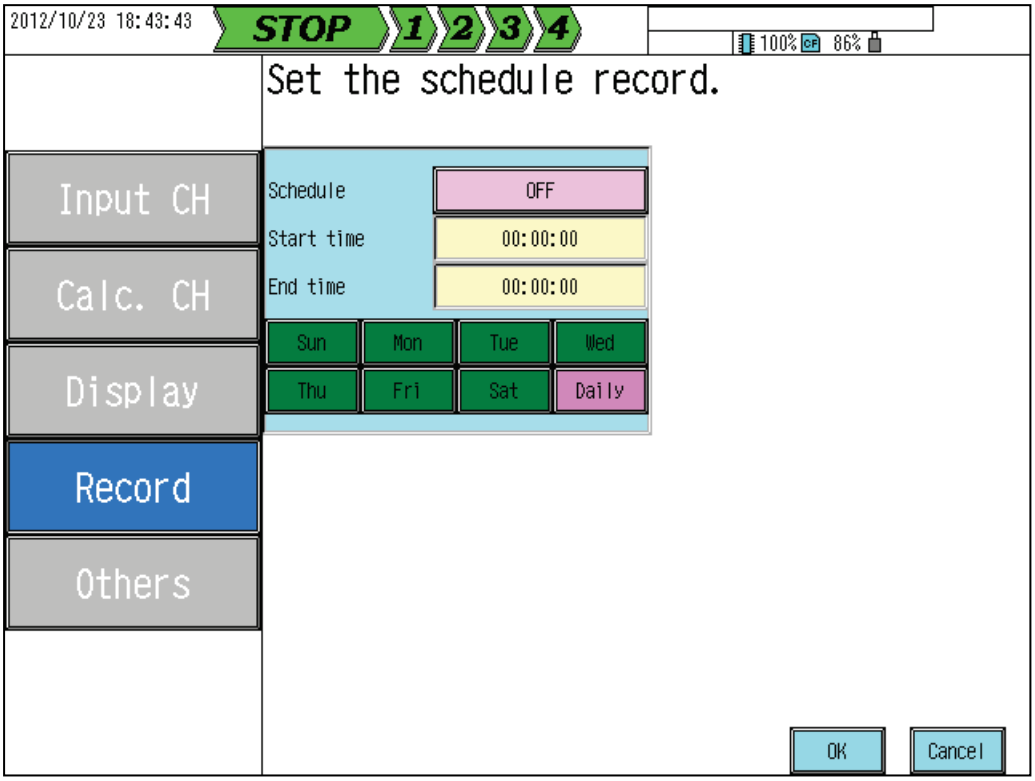
∗ The sum of the priority values of all record groups must be within 100%.

8.18 Setting the Schedule

[Operation]

Parameter > Record > Schedule

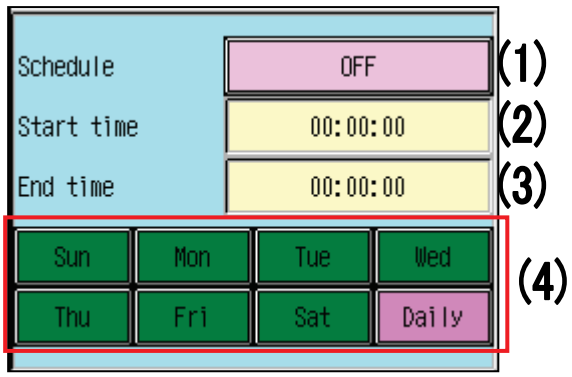
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Schedule	OFF, ON
(2)	Start time	00:00:00～23:59:59
(3)	End time	00:00:00～23:59:59
(4)	Week	Sun, Mon, Tue, Wed, Thu, Fri, Sat, Daily

8.18.1 Schedule



(1) Schedule
You can specify a time and a day of the week as the recording start/stop trigger for record groups.

(2) Start time
Recording start time.

(3) End time
Recording stop time.

(4) Day of the week
Specify the day(s) of the week on which the schedule function should be executed.
Pressing Daily turns ON or OFF all days of the week at once.
(The items that are currently selected are in bright color.)

[Caution]
This function applies to record groups for which the record trigger is set to "Schedule."
(For further information, see Section 8.16.1.)

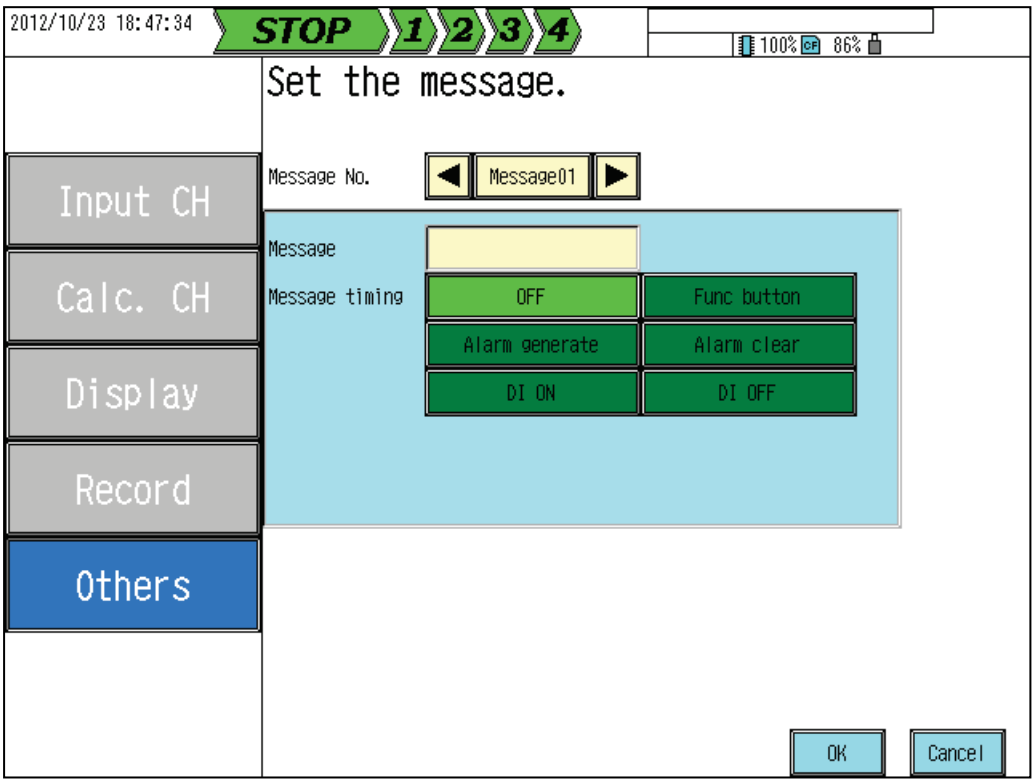
8.19 Setting Messages

[Operation]

Parameter > Others > Message

The display content varies depending on the timing value setting.

Note: You cannot change settings during recording.

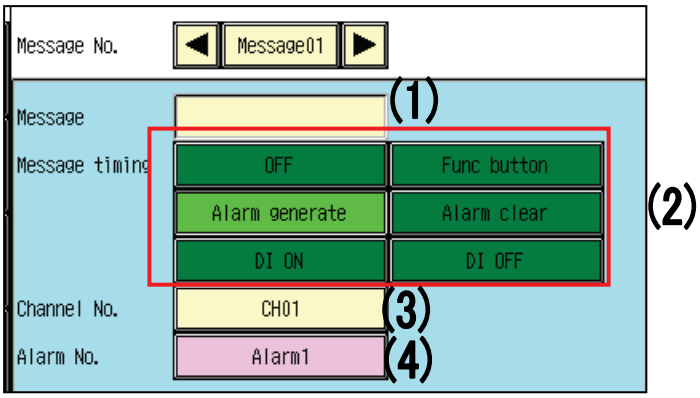


[Settings]

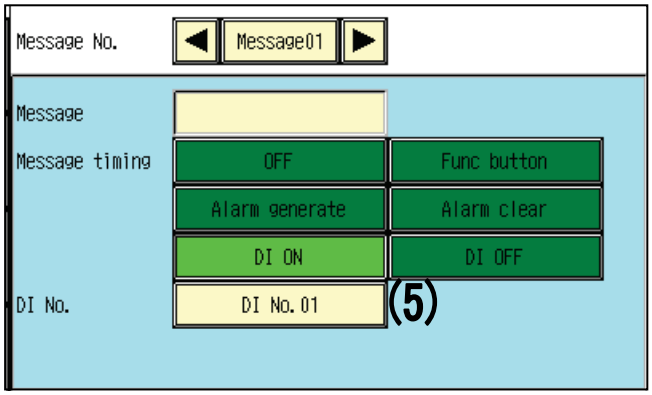
No.	Item	Setting
(1)	Massage	CHARACTER INPUT IN ASCII
(2)	Message timing	OFF, Func botton, Alarm generate, Alarm clear, DI ON, DI OFF
(3)	Channel No.	CH01～48, CH49～96
(4)	Alarm No.	Alarm 1～4
(5)	DI No.	DI01～DI29

8.19.1 Messages

[When "Alarm generate" or "Alarm clear" is selected]



[When "DI ON" or "DI OFF" is selected]



(1) Message

Specify the character string of the message content to be output.

(2) Message timing

Specify when to output the specified message text (1) to the event history.

OFF	: Disables this function.
FUNC button	: The message will be output when "Message" is selected from the function menu.(For information on the function menu, see Section 6.11.)
Alarm generate/clear	: The message will be output when the alarm identified by the specified alarm number (4) occurs in the channel identified by the specified channel No. (3) or when the alarm is reset.
DI ON/OFF	: The message will be output when the DI identified by the specified DI No. (5) turns ON or OFF.

(3) Channel No.

(4) Alarm No.

The alarm channel number and level number to be used when the timing (2) is set to "Alarm generate" or "Alarm clear."

(5) DI No.

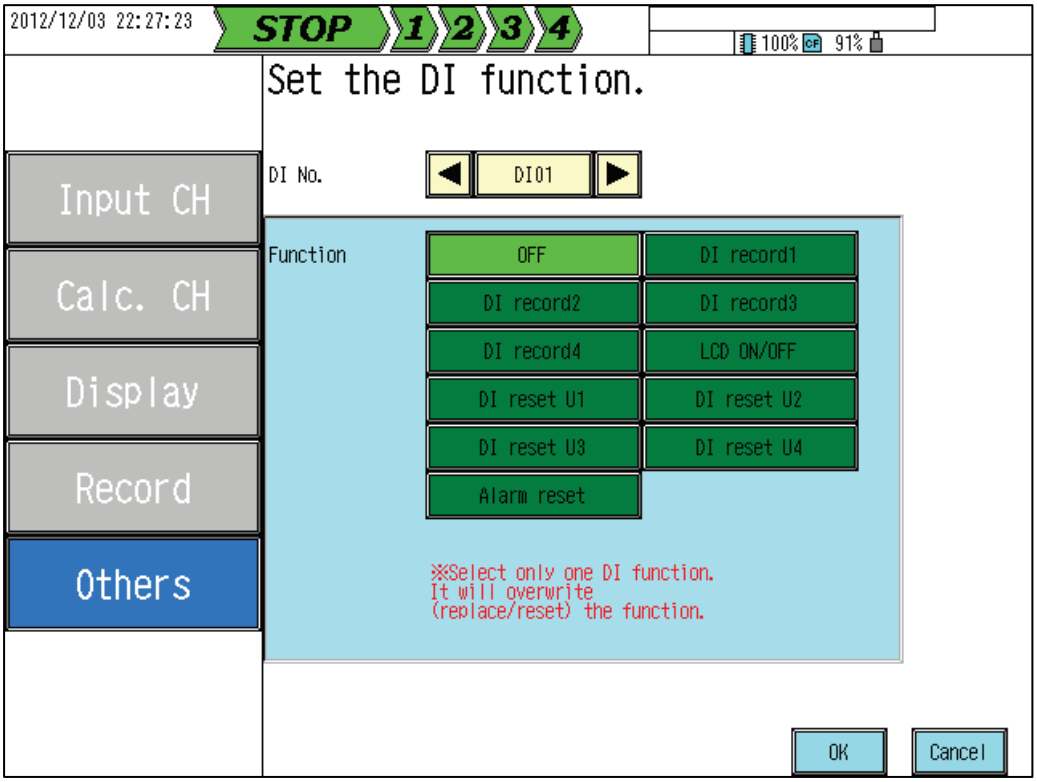
The DI No. to be used when the timing (2) is set to "DI."

8.20 Configuring the DI Function

[Operation]

Parameter > Others > DI

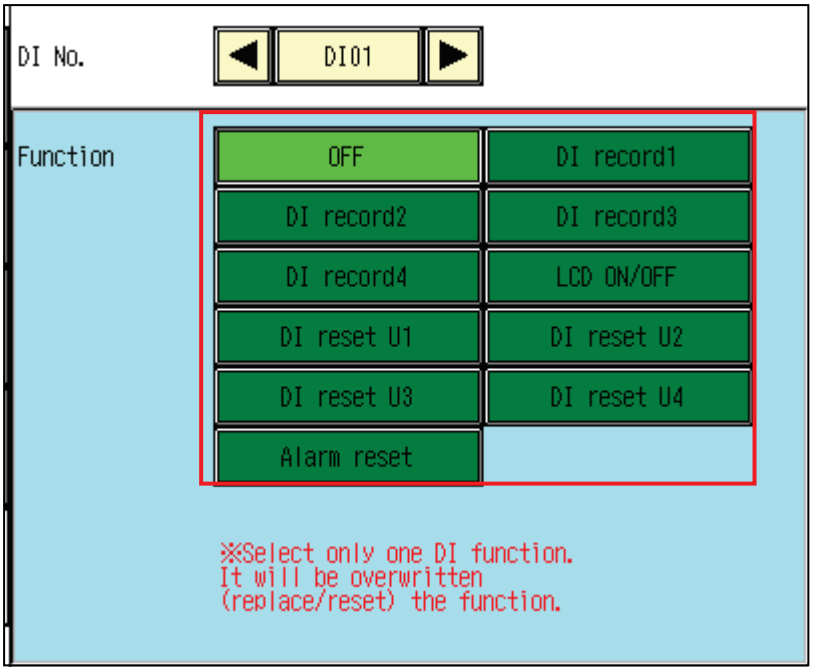
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Function	OFF, DI record 1～4, LCD ON/OFF, DI reset U1～4, Alarm reset

8.20.1 DI Function



(1) Function

Specify the function to be executed when each DI is input.

OFF : Disables this function.

DI record 1-4 : Starts/stops recording for the record groups for which the record trigger is set to "DI Record1-4."
(For information on record triggers, see Section 8.16.1.)

LCD ON/OFF : Turns on the LCD when the DI is ON, regardless of the sleep time setting.
(For information on the sleep time, see Section 9.14.1.)

DI reset U1-4 : Resets the integrated value of the integration functions for which the timer is set to "U1-4."
(For information on integration functions, see Section 8.10.1.)

Alarm reset : Resets the new alarm output and alarm display latch.
For further information, see Sections 8.8.2 and 8.23.1.

[Caution]

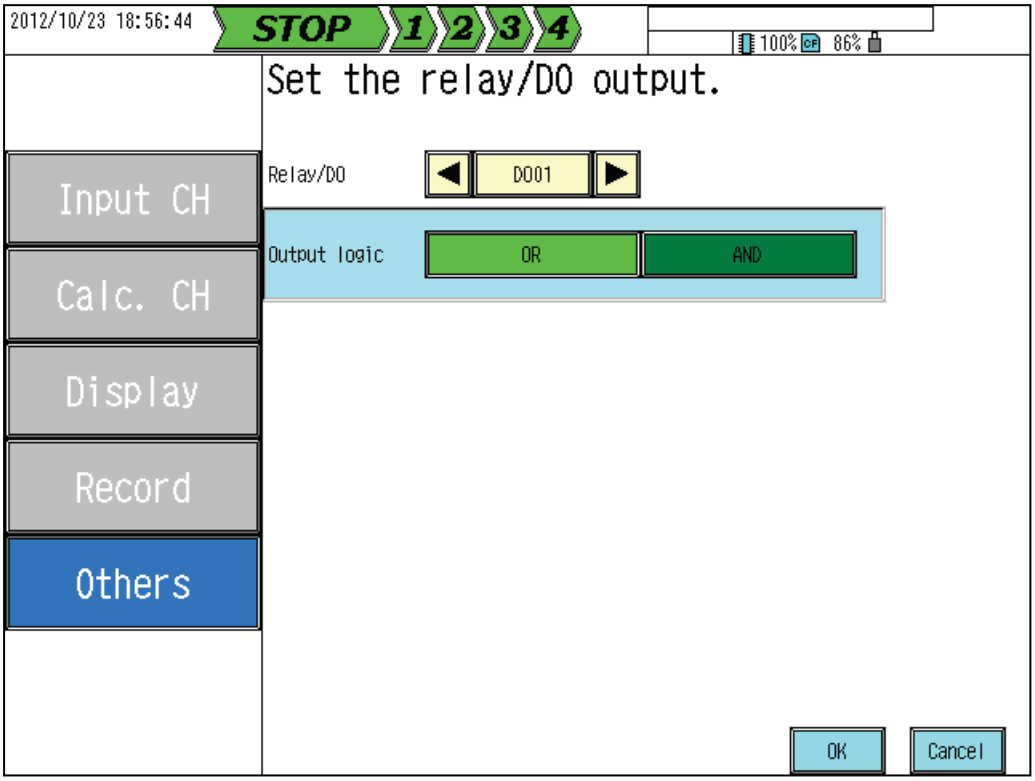
Except for "OFF," one function can be assigned to one DI. If the same function is assigned to multiple DIs, the function of each DI previously set will automatically turn "OFF."

8.21 Configuring Relay Output Settings

[Operation]

Parameter > Others > Relay/DO output

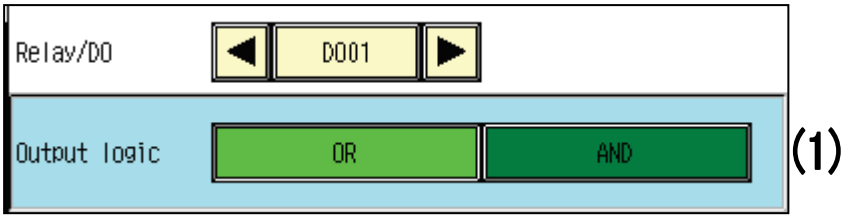
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Output logic	OR, AND

8.21.1 Relay Outputs



(1) Output logic

If multiple alarms are assigned the same output destination, this setting specifies the condition under which relay output activates.

OR : The relay output turns on when at least one of the alarms is generated.

AND : The relay output turns on when all of the alarms are generated.

[Caution]

If one of the alarms assigned to the output relay is of type OFF and "AND" is specified here as the output logic, the relay output will not turn on.

If one of the alarms assigned to the output relay is of type OFF, be careful of the output logic.

8.22 Configuring Inner DO Settings

[Explanation]

The alarm output state, ON (1) or OFF (0), will be recorded in internal software (for up to 48 channels).

As with ordinary relays, you can configure the output logic and NC/NO settings.

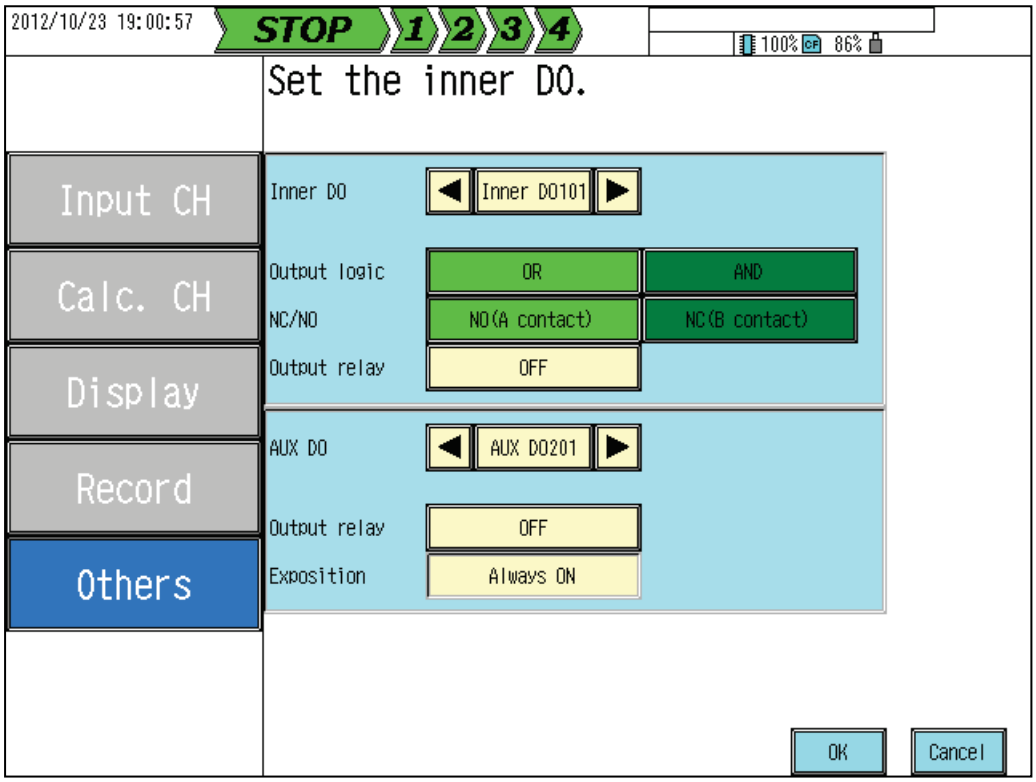
The state of an inner DO can be used as the output to another relay or DO, or as a formula argument.

(For information on formulas, see Section 8.10.1.)

[Operation]

Parameter > Others > Inner DO

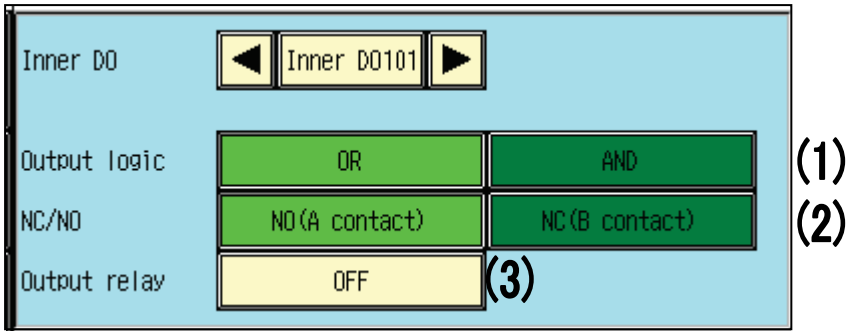
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Output logic	OR, AND
(2)	NC/NO	NO(A contact), NC(B contact)
(3)	Output relay	OFF, 1～30, 101～148
(4)	AUX Output relay	
(5)	Exposition	Displays the exposition of the pertinent auxiliary relay.

8.22.1 Inner DO Output



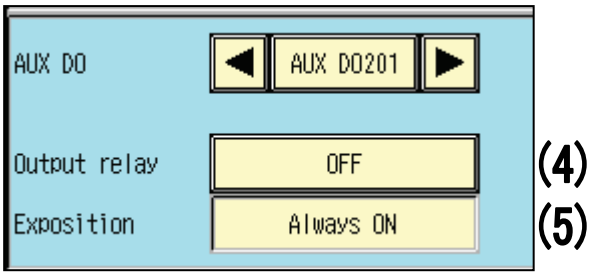
(1) Output logic
Specify the inner DO output condition, in the same manner as for "Output logic" in Section 8.21.1.

(2) NC/NO
The type of the inner DO contact.
NO (A contact): Normally open.
NC (B contact): Normally closed.

(3) Output relay (inner DO output destination)
Outputs the inner DO state to another inner DO or an external relay.

[Caution]
If you output to an inner DO, if you specify an inner DO with the same or smaller number, the resulting operation may be unpredictable.

8.22.2 Auxiliary Relay Outputs



(4) Output relay (auxiliary relay output destination)
The recorder includes some auxiliary inner DOs, separate from the ordinary inner DO and external relays that assume special output states that do not depend on any alarm condition.
Select an auxiliary relay output destination.

(5) Exposition
Displays the description of the pertinent auxiliary relay. (This item is not available for setting.)

[Exposition of each auxiliary relay]

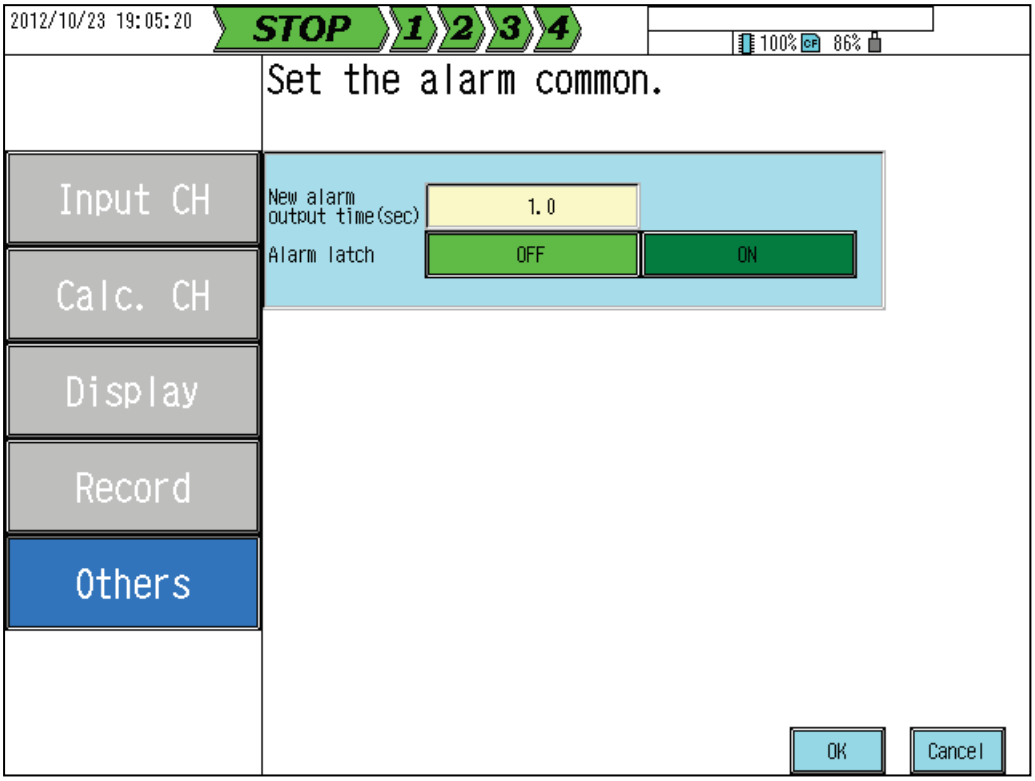
Relay No.	Exposition
201	Always ON (1)
202	Always OFF (0)
203	Common alarm output ON (1)/OFF (0)
204	FAIL output ON (1)/OFF (0)
205	Remaining CF card capacity 0%
206	Remaining USB memory capacity 0%
207 to 209	Reserved
210	Overall recording started (1)/stopped (0) state
211 to 214	Recording started (1)/stopped (0) state of record group 1 to 4
215 to 220	Reserved

8.23 Configuring Common Alarm Functions

[Operation]

Parameter > Others > Alarm common

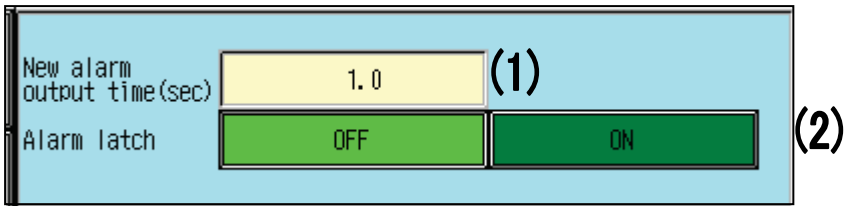
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	New alarm output time (sec)	0.0～999.9(sec)
(2)	Alarm latch	OFF, ON

8.23.1 New Alarm Output Time and Alarm Display Latch



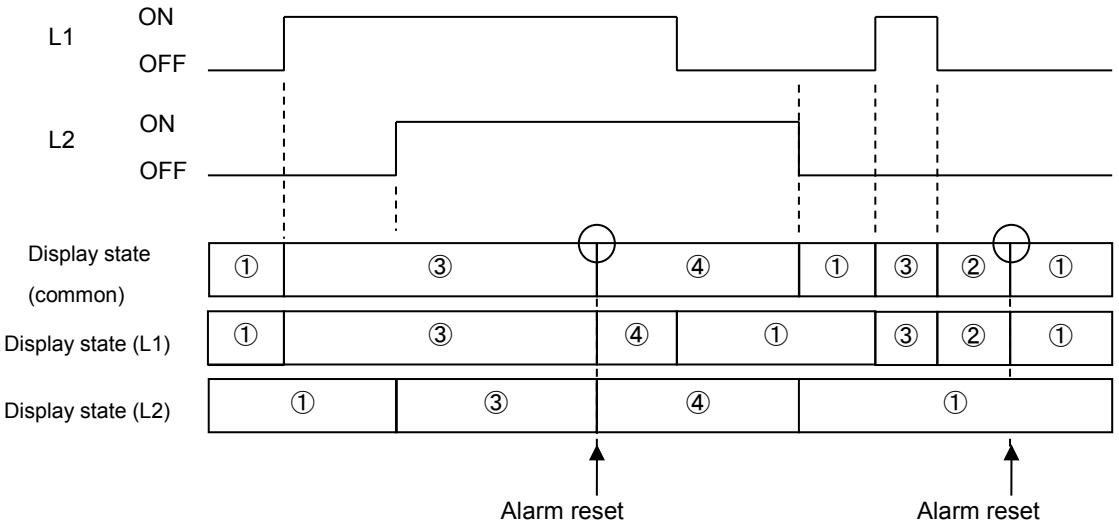
(1) New alarm output time
After a new alarm event occurs, the new alarm output will continue until the time specified here elapses. (By executing [Alarm Reset] in the function menu, you can reset new alarm output before the specified new alarm output time (1) elapses.)
∗ If this item is set to "0.0," new alarm output will continue until "Alarm reset" is executed.

(2) Alarm latch (alarm display latch)
When an alarm occurs, this function latches (blinks) the alarm state until a manual reset is performed. By executing [Alarm Reset] in the function menu, you can reset the display latch.

The alarm display state in each trend graph varies depending on the alarm state and whether an alarm reset is performed or not, as shown on the next page.

[Example of operation performed when "Alarm latch" is "ON"]

State	**State (1)** Alarm OFF No alarm has occurred after reset	**State (2)** Alarm OFF After alarm occurrence and before reset
Vertical/horizontal trends (measurement values display)	Text color: On (black)	Text color: Blinking (black)
Digital display (alarm display area)	Text color: On (black) Background color: White	Text color: Blinking (black) Background color: White
Overview	Text color: On (black) Background color: Green	Text color: Blinking (black) Background color: Green
State	**State (3)** Alarm ON After alarm occurrence and before reset	**State (4)** Alarm ON After alarm occurrence and reset
Vertical/horizontal trends (measurement values display)	Text color: Blinking (red)	Text color: On (red)
Digital display (alarm display area)	Text color: Blinking (black) Background color: Red	Text color: On (black) Background color: Red
Overview	Text color: Blinking (red) Background color: Red	Text color: On (black) Background color: Red



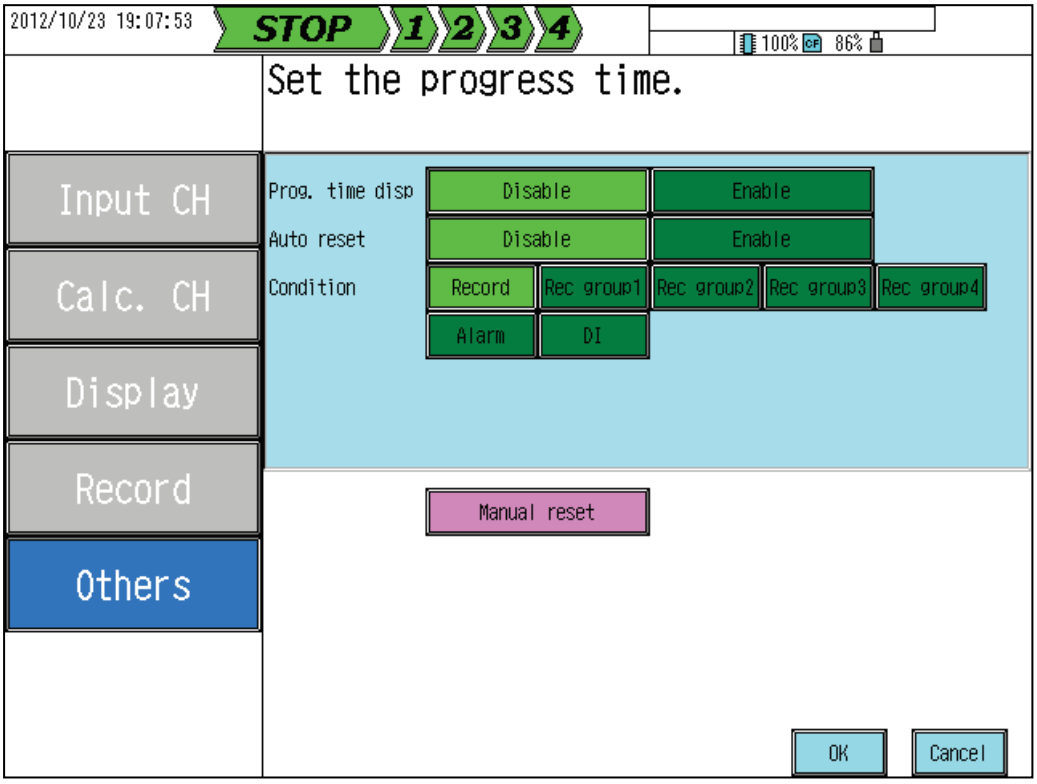
8.24 Progress Time Counting

[Operation]

Parameter > Others > Progress time

The display content varies depending on the specified conditions.

Note: You cannot change settings during recording.

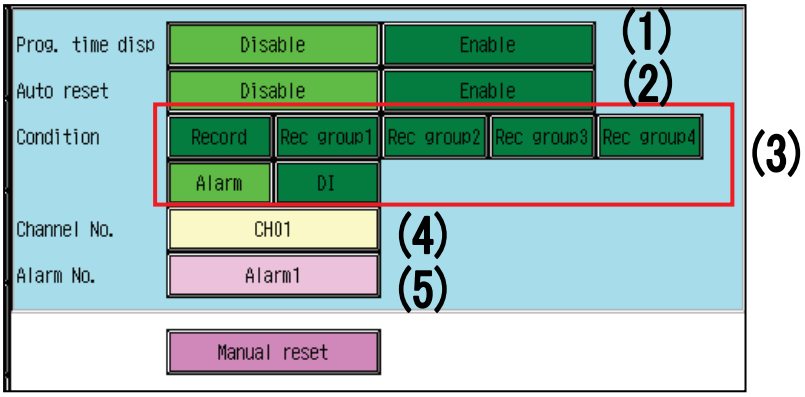


[Settings]

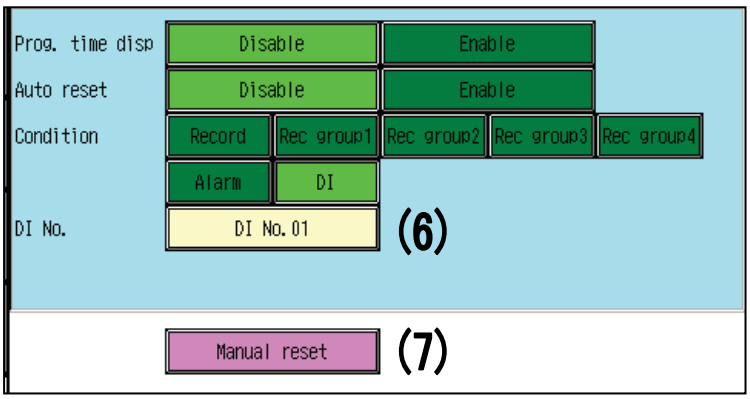
No.	Item	Setting
(1)	Prog. time disp	Disable, Enable
(2)	Auto reset	
(3)	Condition	Record, Rec Group1～4, Alarm, DI
(4)	Channel No.	All, CH01～48, CH49～96
(5)	Alarm No.	All, Alarm1～4
(6)	DI No.	DI01～DI29

8.24.1 Progress Time

[When "Alarm" is selected]



[When "DI" is selected]



(1) Prog. time disp. (progress time display)
When "Enable" is selected for this item, the progress time is displayed on the bottom line of the clock display field in the real-time trend window. (For information on the clock display, see Section 6.1.1.)
Even when "Disable" is selected for this item, the progress time is counted if the specified condition (3) is fulfilled.

(2) Auto reset
Specify whether to reset the progress time count value when starting counting.
Disable: Counting will restart without resetting the previous count value.
Enable: Counting will restart after resetting the previous count value.

(3) Condition
The condition that needs to be met to start or stop counting.
Record : Counting will start when overall recording starts and will stop when overall recording stops.
Rec group1-4 : Counting will start when recording for the specified record group (1 to 4) starts and will stop when recording for the record group stops.
Alarm : Counting will start when an alarm occurs and stop when the alarm is reset.
DI : Counting will start upon a rising edge of the DI and will stop upon a trailing edge of the DI.

(4) Channel No.

(5) Alarm No.
The alarm channel number and level No. to be used when the condition (3) is set to "Alarm."

(6) DI No.
The DI number to be used when the condition (3) is set to "DI."

(7) Manual reset

Used to manually reset the count.

∗ The option "All," which can be selected in the CH No. or Alarm No. field, indicates all channel numbers or all alarm numbers.

Example: If "CH01" is selected for [CH No.] and "All" is selected for [Alarm No.]

Progress time counting will start when an alarm that corresponds to one of Alarm Nos. 1 to 4 occurs on CH 01.

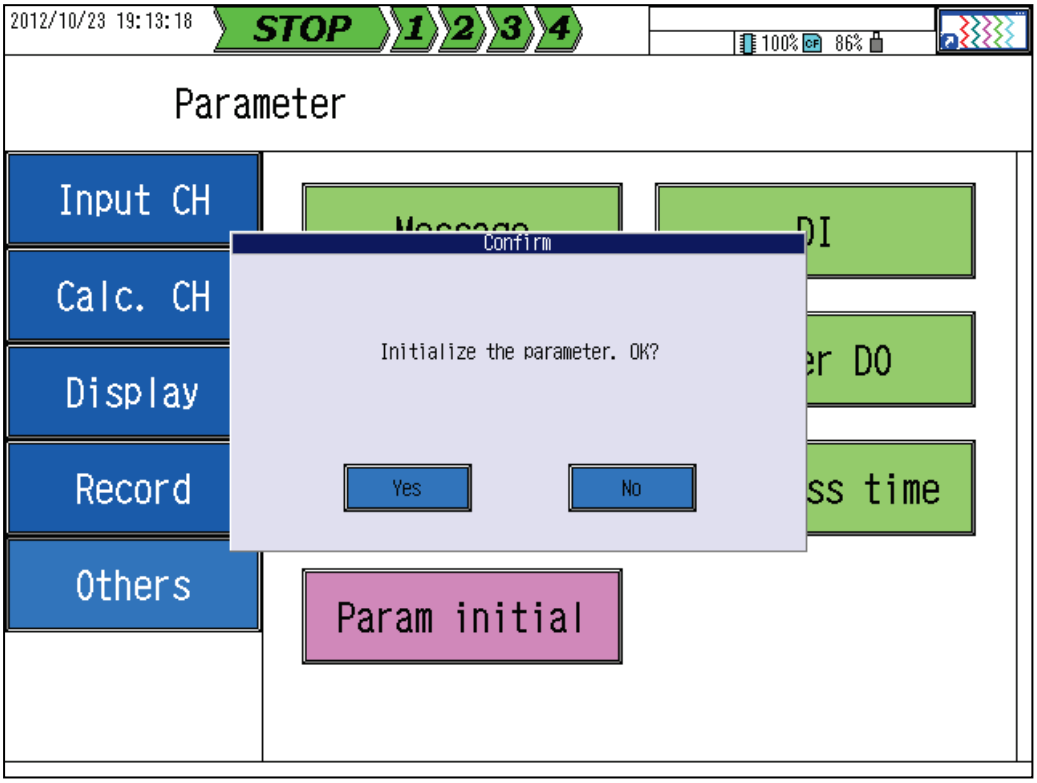
Counting will stop when all alarms corresponding to one of Alarm Nos. 1 to 4 that have occurred on CH01 are reset.

8.25 Initializing Parameters

[Operation]

Parameter > Others > Param initial

Note: You cannot initialize parameters during recording.



When you press Param initial, a confirmation window (shown above) opens.

This operation initializes parameter data.

(For information on the settings after initialization, see Section 8.3.)

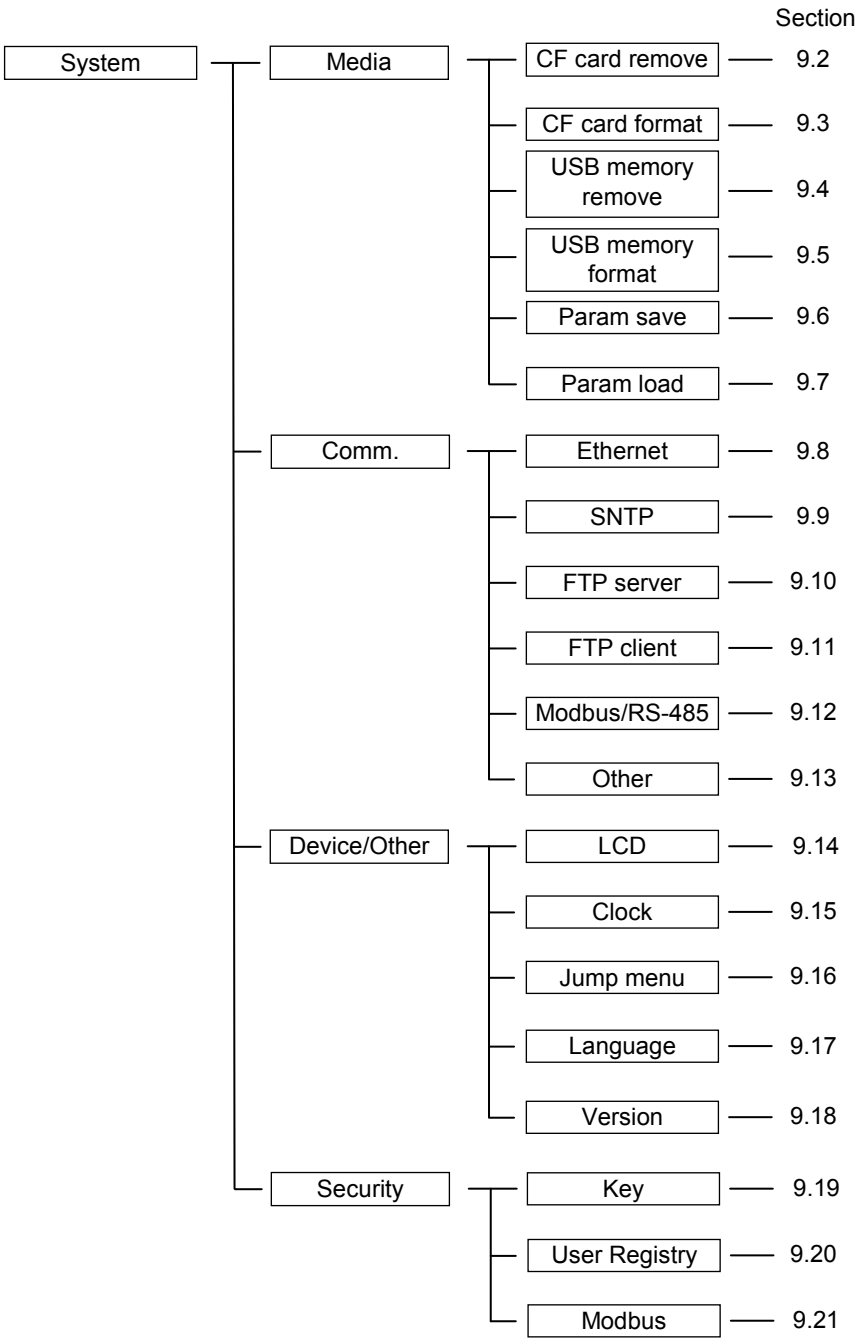
Caution

Initializing parameters resets all configured parameters to their initial values. We recommend backing up your parameter settings before performing initialization.

9. Configuring and Confirming System Settings

9.1 Overview of the Procedure for Configuring System Settings and Initial Values of System Settings

9.1.1 Overview of the Procedure for Configuring System Settings



9.1.2 Initial Values of System Settings

・Comm.			・Device/Other		
Ethernet	IP Address	: 192.168.1.1	LCD	Sleep time	: 5
	Subnet Mask	: 255.255.255.0		Act. brightness	: 5
	Default GW	: None		Sleep brightness	: 0
	DNS address	: None		Alarm recover	: OFF
	Keep alive	: ON			
	Keep alive cycle(min)	: 10	Jump menu	Jump menu	: All OFF
SNTP	SNTP Func	: OFF	Language	Language	: English
	SNTP address	: None		Date format	: YYYY/MM/DD
	Time Cal cycle	: 10			
	Get the time When power ON.	: OFF	・Security		
	Time zone(UTC)	: +09:00	Key	Key security	: OFF
				Lock method/ Logout method	: -
FTP server (20 users)	User name	: -			
	password	: -		Password	: -
	Level	: -		Key lock	: -
FTP Client （2 users）	FTP client	: OFF	User Registry (20 users)	User name	: -
	Host name	: None		Password	: -
	User name	: None		Level	: -
	Password	: None			
	Save host folder	: None	Modbus	Modbus security	: OFF
	Port number	: 21		AdminUserPass	: None
	PASV mode	: OFF		MeasUserPass	: None
	Save cycle	: 1		CtlUserPass	: None
				PrmUserPass	: None
Modbus /RS-485	Operation	: Modbus TCP			
	Station No.	: 0			
	Modbus TCP Receive timeout	: 10			
	Comm. speed	: 9600			
	Parity	: Even			
Other	FTP server root drive	: CF card			

9.2 Removing the CF Card

[Explanation]

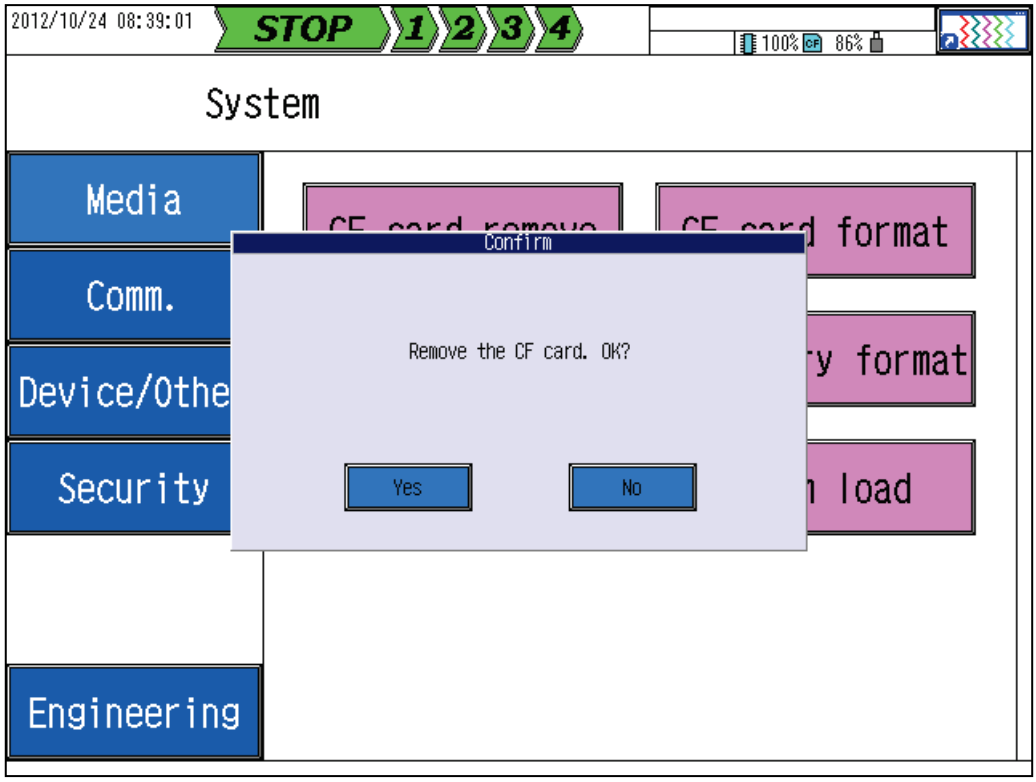
Write data to the CF card and prepare the CF card for removal.

∗ You can remove the CF card even when recording is in progress. (Recording will continue.)

∗ If this operation is selected when no CF card is inserted in the recorder, an error message is displayed. Insert a CF card to the recorder and then retry.

[Operation]

System > Media > CF card remove



Caution

When removing the CF card during recording, be sure to perform this operation to prevent data from being corrupted.

9.3 Formatting the CF Card

[Explanation]

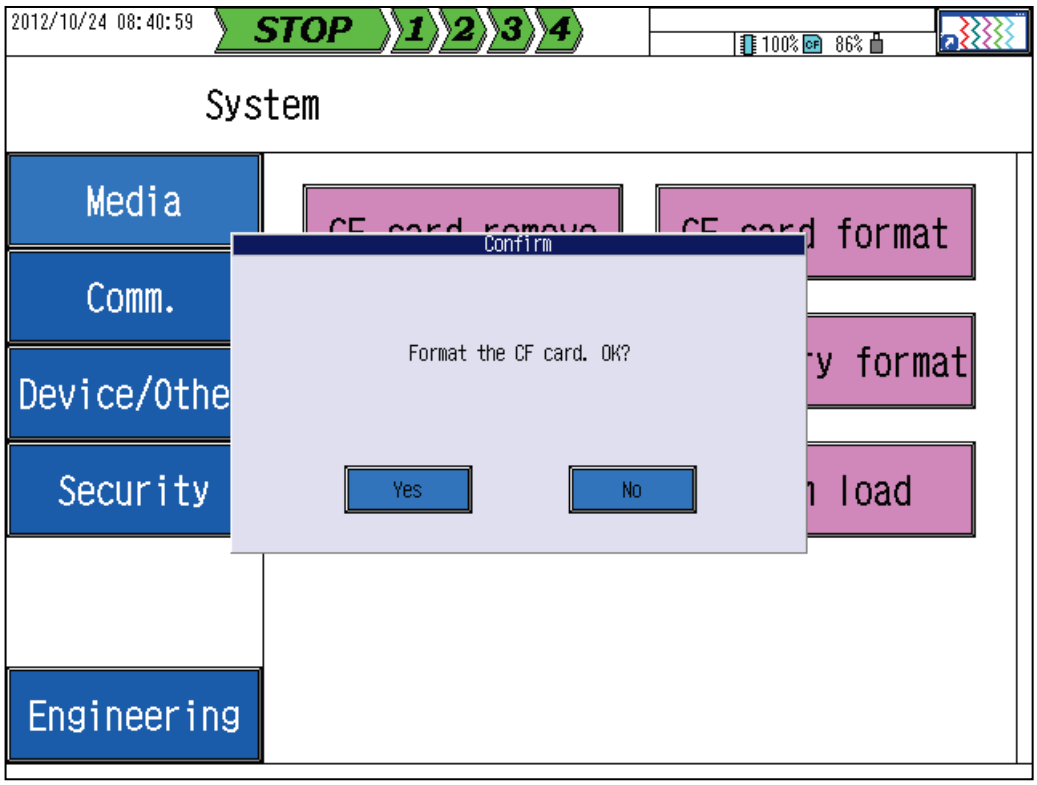
Format the CF card.

∗ If this operation is selected when no CF card is inserted in the recorder, an error message is displayed. Insert a CF card to the recorder and then retry.

[Operation]

System > Media > CF card format

Note: You cannot format the CF card during recording.



Caution

Formatting a CF card erases all data saved on the CF card. Be sure to back up necessary data in advance.

9.4 Removing the USB Memory (Optional)

[Explanation]

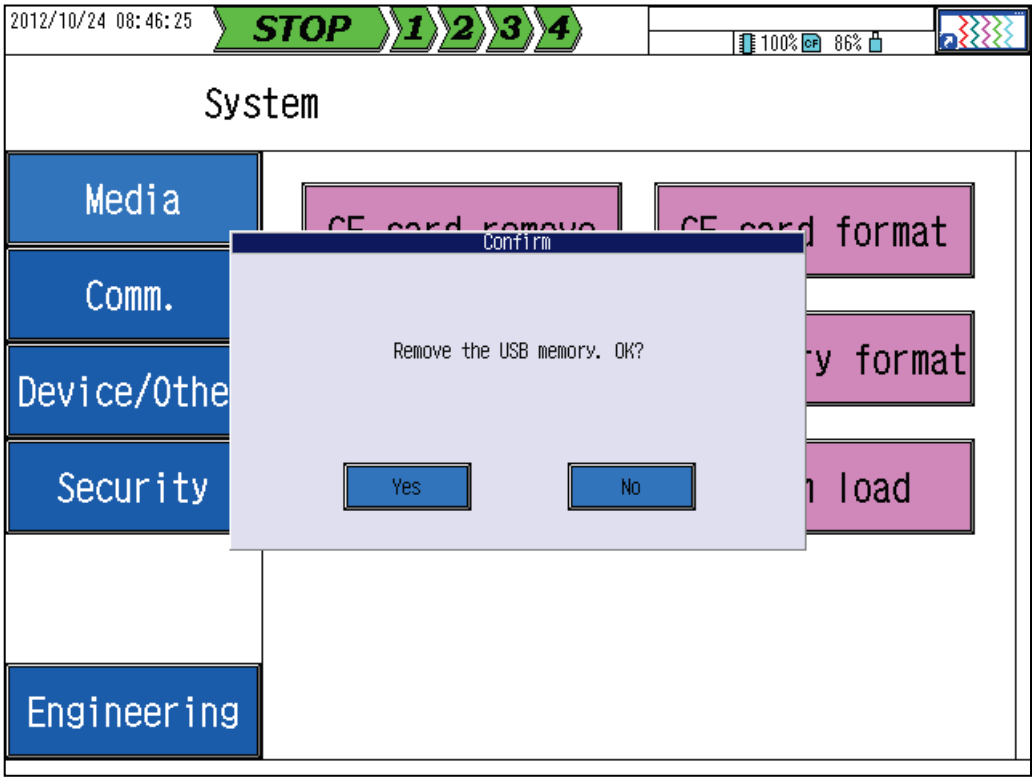
Write data to the USB memory and make the USB memory ready for removal.

∗ You can remove the USB memory even when recording is in progress. (Recording will continue.)

∗ If this operation is selected when no USB memory is inserted in the recorder, an error message is displayed.
Insert USB memory to the recorder and then retry.

[Operation]

System > Media > USB memory remove



Caution

When removing the USB memory during recording, be sure to perform this operation to prevent data from being corrupted.

9.5 Formatting the USB Memory (Optional)

[Explanation]

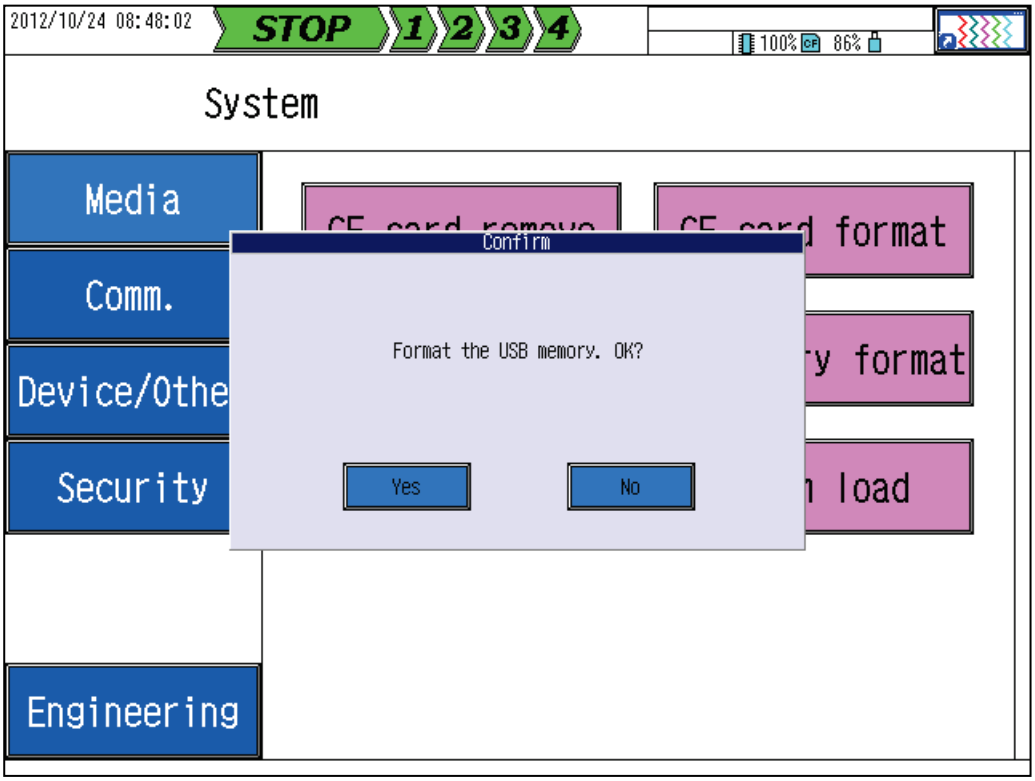
Format the USB memory.

∗ If this operation is selected when no USB memory is inserted in the recorder, an error message is displayed. Insert USB memory to the recorder and then retry.

[Operation]

System > Media > USB memory format

Note: You cannot format the USB memory during recording.



Caution

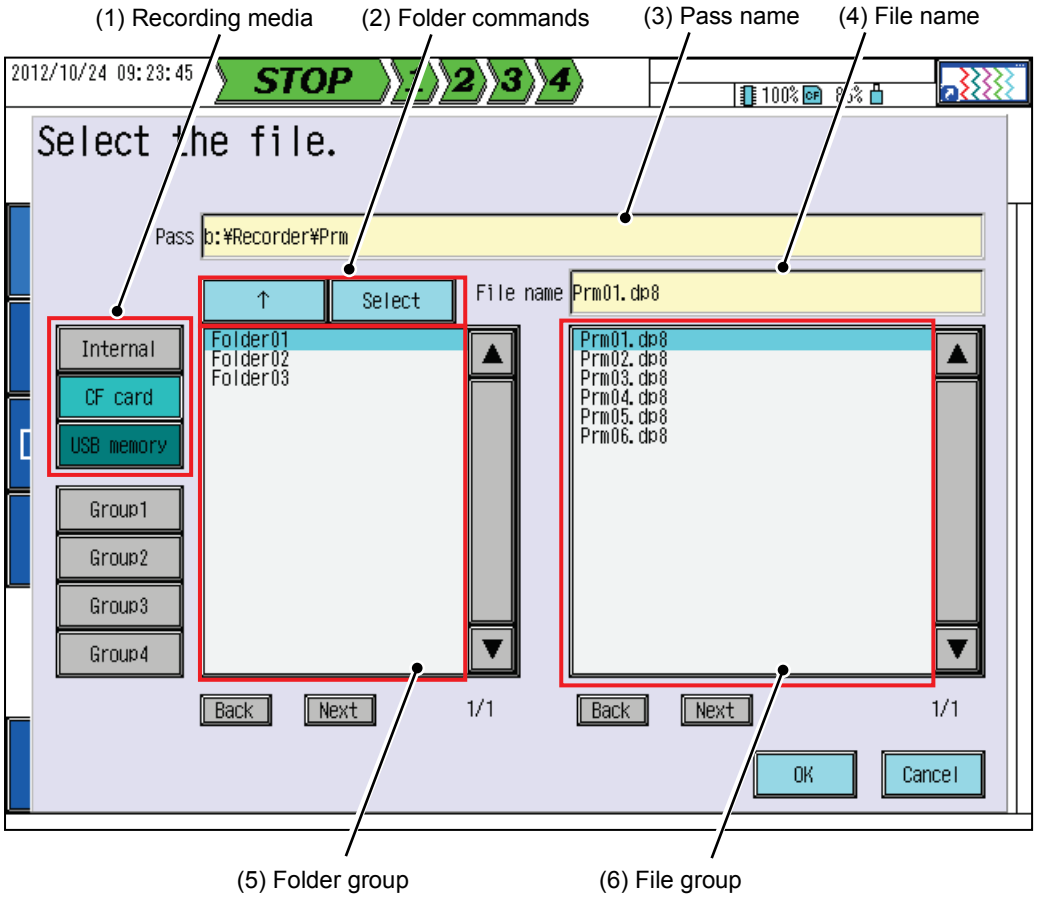
Formatting USB memory erases all data saved in the USB memory. Be sure to back up necessary data in advance.

9.6 Saving Setting Values

[Operation]

System > Media > Setting value save

∗ If this operation is selected when no recording medium is inserted in the recorder, an error message is displayed. Insert a recording medium to the recorder and then retry.



(1) Recording media

Select the recording medium to save the setting values to.

(2) Folder commands

Used to manipulate folders displayed in the folder group area (5).

Use Select to view the content of the folder that is currently selected. Use ↑ to move up one level in the folder structure.

(The folder that is currently selected is displayed in an aqua background.)

(3) Pass name

Shows the location (full pass) of the folder that is currently displayed.

(4) File name

Selecting this item opens a character input window, in which you can specify a desired file name.

The entered file name is automatically assigned an extension of .dp8 and the file is saved in the folder selected in the folder group area (5).

[Caution]

If a file with the same name exists in the file group (6), the new file will overwrite the existing file. (An overwrite confirmation window is displayed.)

(5) Folder group

Shows the folders that exist at the location identified by the pass name (3).

(6) File group

Shows the settings files that exist at the location identified by the pass name (3). Only files with an extension of .dp8 are displayed.

* Up to 100 folders or settings files can be displayed on one page. If more files exist, change the screen using Back or Next.

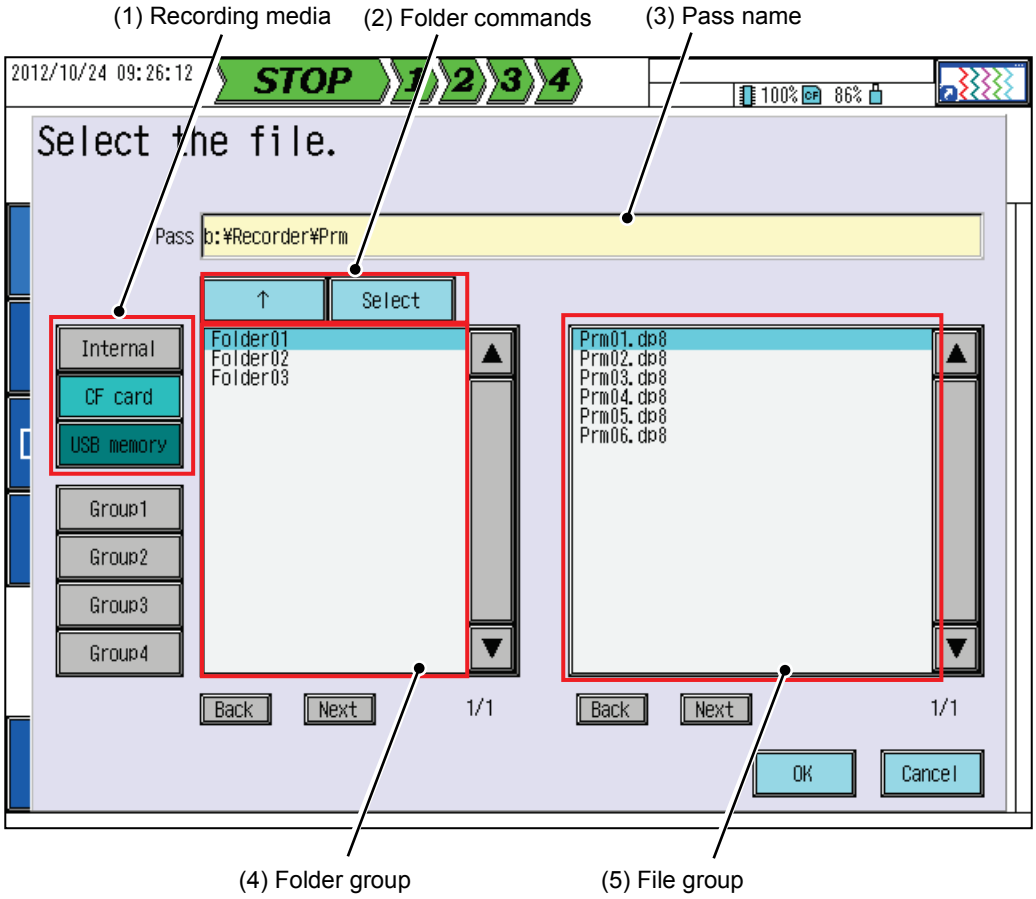
9.7 Loading Setting Values

[Operation]

System > Media > Setting value load

∗ If this operation is selected when no recording medium is inserted in the recorder, an error message is displayed. Insert a recording medium to the recorder and then retry.

Note: You cannot load settings during recording.



(1) Recording media

(2) Folder commands

(3) Pass name

(4) Folder group

(5) File group

For details of each item, see Section 9.6.

Select a settings file that is displayed in the file group area (5) and press the OK key to load the setting values in the file. (The file that is currently selected is displayed in an aqua background.)

9.8 Setting the IP Address

[Explanation]

Configuring communication settings (Ethernet and FTP) enables the following:

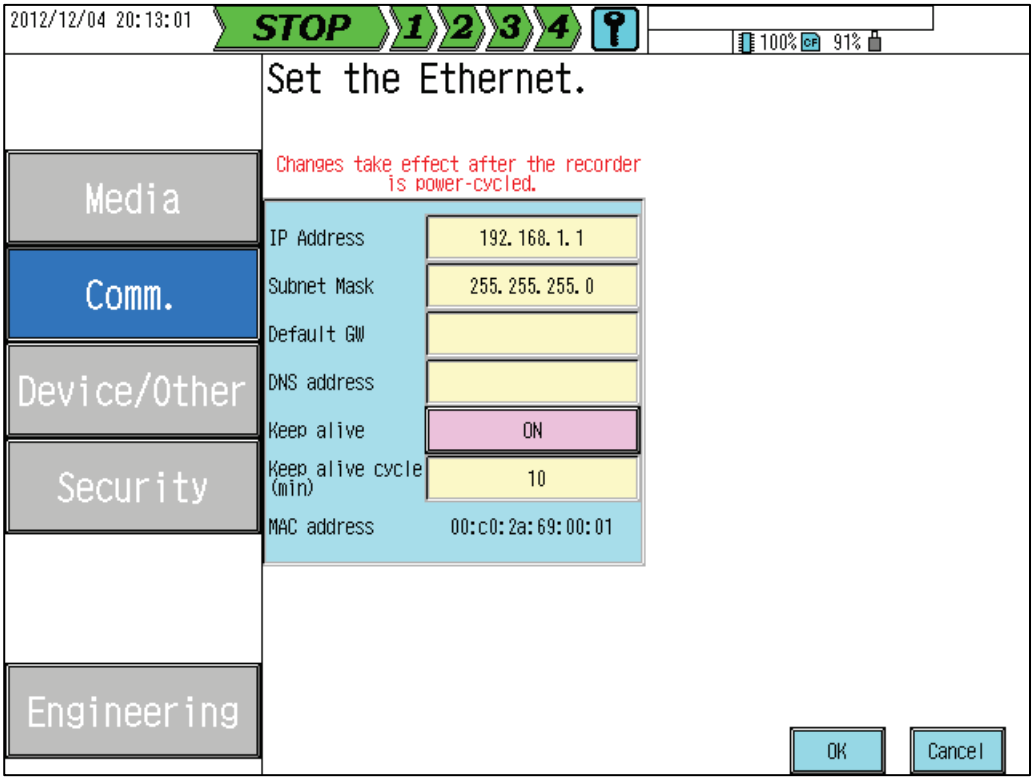
- Directly download the data, which is saved on the CF card set in the recorder, to a PC, using the Data Viewer software that comes with the recorder. (Network download)
- Display real-time trends using the Data Viewer software that comes with the recorder.
- Directly write settings to the recorder or directly load settings from the recorder, using the Parameter Loader software that comes with the recorder.

* To use the above functions, you need to change the option settings for the pertinent software.
(For further information, see Chapters 5 and 7 of the Data Viewer Instruction Manual and Chapter 6 of the Parameter Loader Instruction Manual.)

[Operation]

System > Comm. > Ethernet

Note: You cannot change settings during recording.



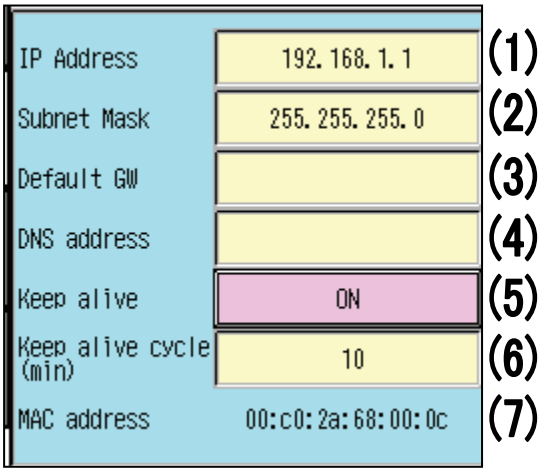
[Settings]

No.	Item	Setting
(1)	IP Address	Character input in ASCII (∗1)
(2)	Subnet Mask	
(3)	Default GW	
(4)	DNS address	
(5)	Keep alive	ON, OFF
(6)	Keep alive cycle	10～240(min)
(7)	MAC address	Shows the device-specific address.

∗1 The valid setting range is from 000.000.000.000 to 255.255.255.255.

∗ Changes to settings will take effect after the recorder is power-cycled.

9.8.1 IP Address



(1) IP address

The IP address must be specified considering the IP addresses of the devices to be connected to the recorder.

(2) Subnet mask

The subnet mask setting must match the subnet mask settings of the devices to be connected to the recorder.

(3) Default gateway

Set this item if the recorder needs to access what is outside the network it belongs to.

(This item can be omitted if external access is not required.)

(4) DNS server address

Set this item when the DNS server address is required.

(This item can be omitted if no DNS server address is required.)

∗ For network setting examples, see "● Example of setting the IP address on a PC" described later.

(5) Keep alive

Allows you to periodically check whether the network is normally connected even when data is not sent or received over the network.

(6) Keep alive interval

The interval at which the Keep Alive function checks the network connection status.

(7) MAC address

The MAC address assigned to each recorder.

● Example of setting the IP address

1) Confirming network settings on the PC

Perform the steps described later in "● Example of setting the IP address on a PC" to confirm the IP address set for the device to be connected to. (It is assumed here that the IP address is "192.168.0.2" and the default gateway is ""255.255.255.0.")

2) Setting the IP address of the recorder

Specify the IP address (1) and subnet mask (2) that match the network settings you have confirmed in step 1). This example sets "192.168.0.1" as the IP address and "255.255.255.0" as the default gateway.

(You can omit the default gateway (3) and DNS server address (4).)

Press OK to save the settings. (Changes to settings will take effect after the recorder is power-cycled.)

Caution

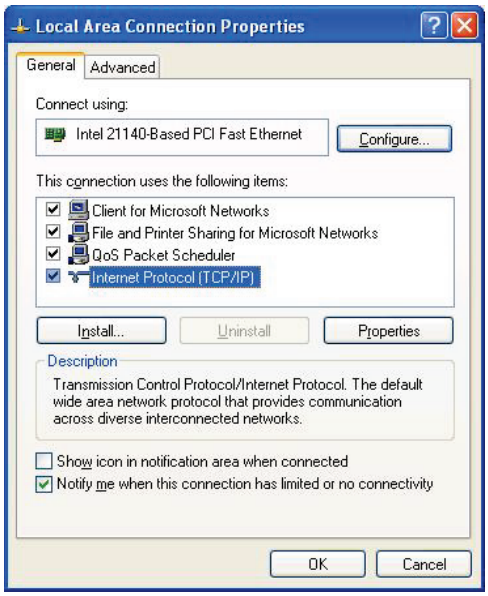
When changing the above settings, consult your network manager and be careful to enter the values correctly.

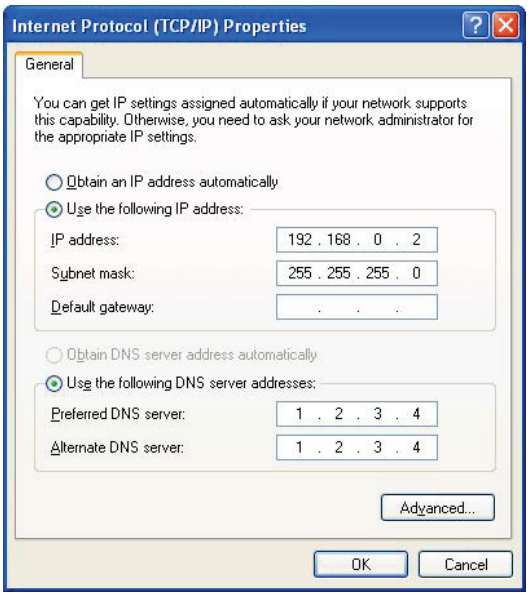
An incorrect setting could lead to a network failure.

●Example of setting the IP address on a PC (for Windows XP)

From the [Start] menu, open [Control Panel] and select [Network and Sharing Center].

Next, right-click [Local Area Connection] and then select [Properties] to open the Local Area Connection Properties window (left figure).

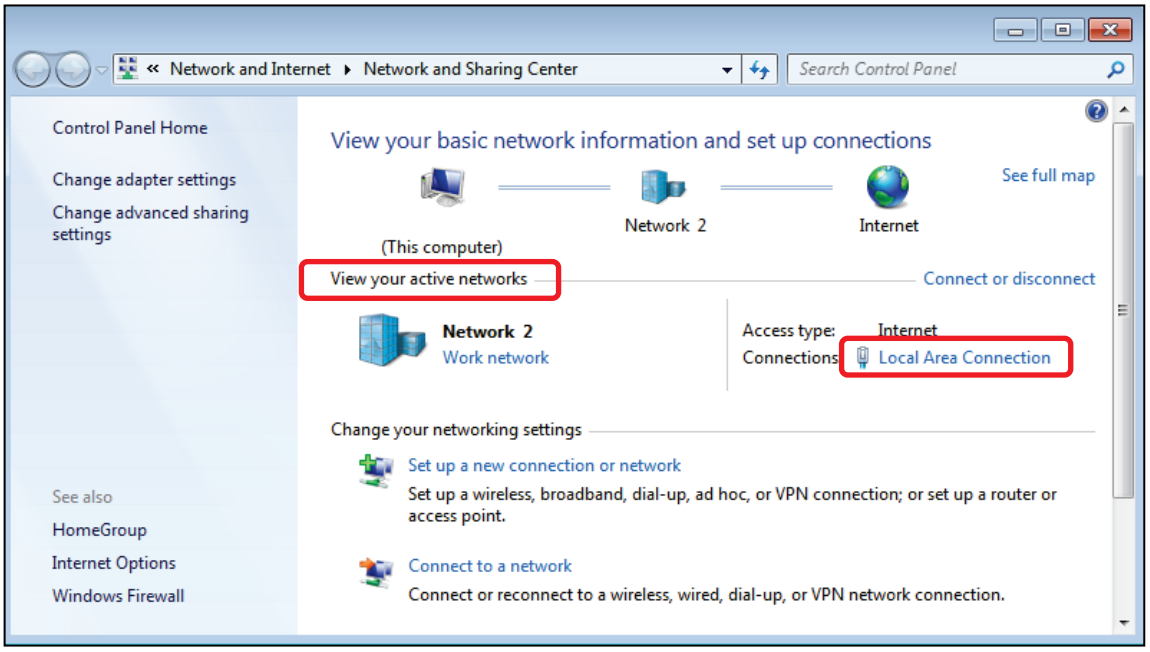




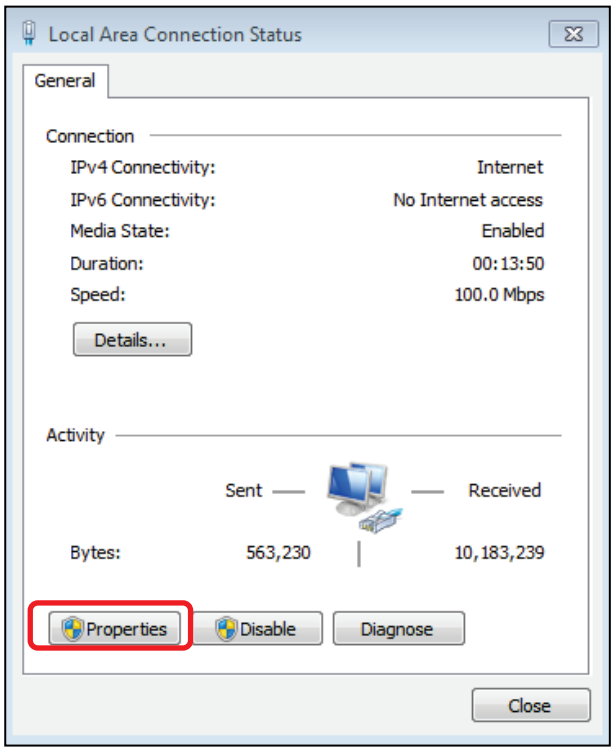
Select [Internet Protocol (TCP/IP)] and click [Properties] to open the [Internet Protocol (TCP/IP) Properties dialog (right figure). Specify the correct IP address and subnet mask. This example assumes that the IP address is "192.168.0.2" and the subnet mask is "255.255.255.0."

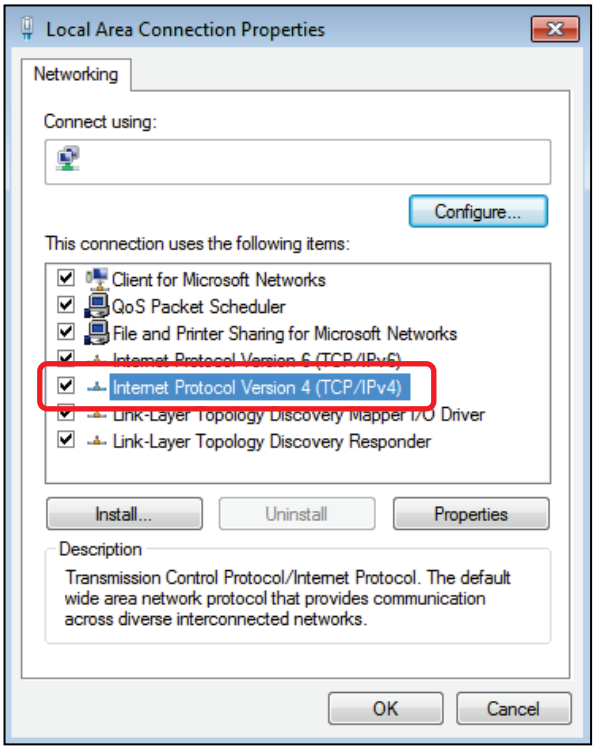
●Example of setting the IP address on a PC (for Windows 7)

- From the [Start] menu, open [Control Panel] and select [Network and Sharing Center].



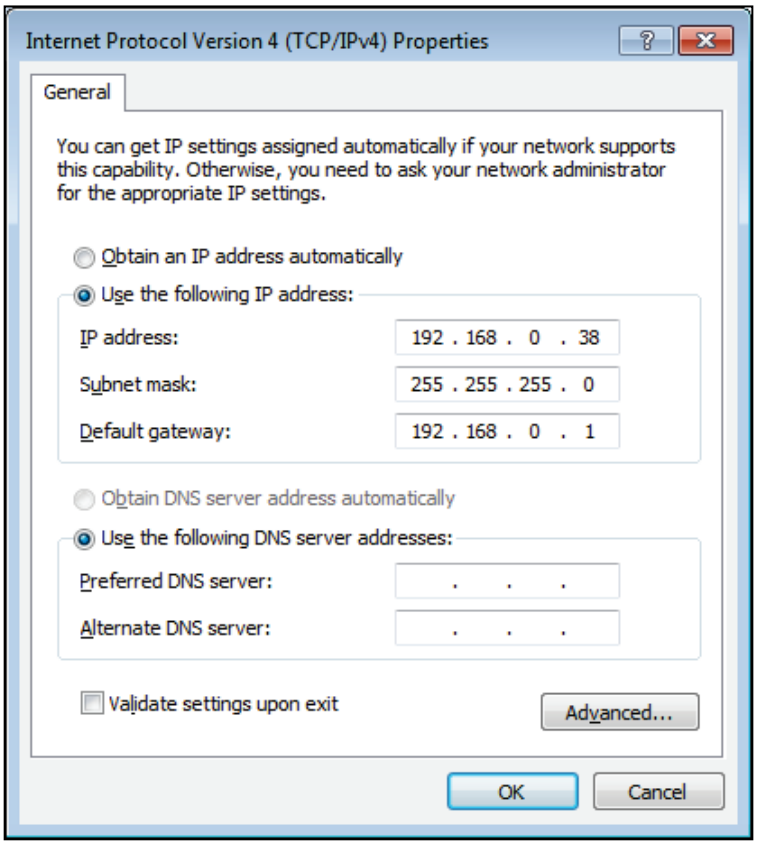
- Select [Local Area Connection] under [View your active networks] to open the window shown left.





- Select Properties to open the Local Area Connection Properties window (right figure).

- From the list, select [Internet Protocol Version 4 (TCP/IPv4)] to open the Internet Protocol Version 4 (TCP/IPv4) Properties window (figure below).



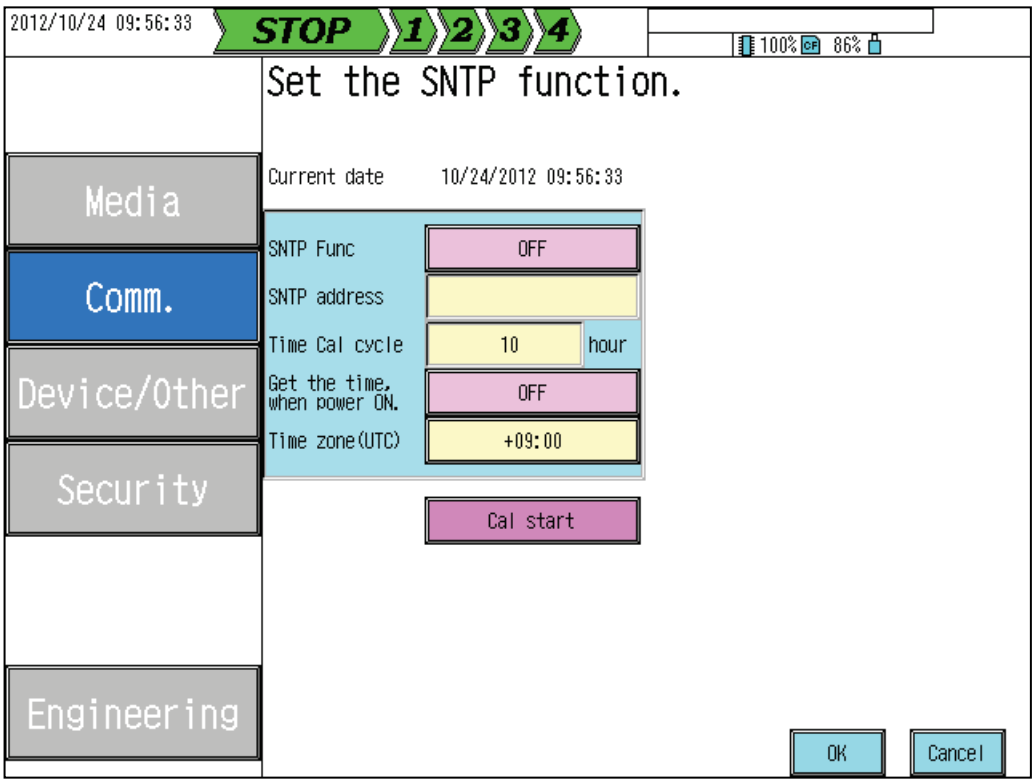
- Specify the pertinent IP address and subnet mask. This example assumes that the IP address is "192.168.0.38" and the subnet mask is "255.255.255.0."

9.9 Configuring the SNTP Function

[Operation]

System > Comm. > SNTP

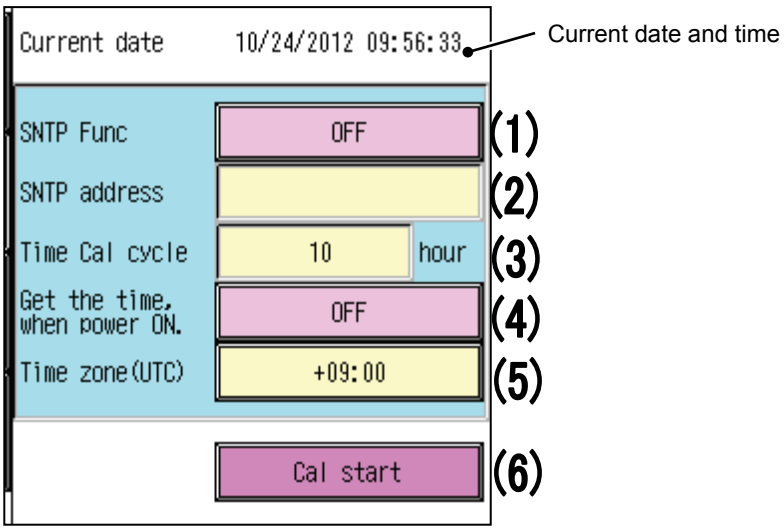
Note: You can change some settings even during recording.



[Settings]

No.	Item	Setting
(1)	SNTP Func	OFF, ON
(2)	SNTP address	Character input in ASCII
(3)	Time Cal cycle	1～200
(4)	Get the time when power ON.	OFF, ON
(5)	Time zone(UTC)	-12:00～+9:30
(6)	Cal start	Used for manual SNTP calibration.

9.9.1 SNTP



(1) SNTP Func (SNTP function)

Acquires the time data from an SNTP server for time calibration.

If an attempt to correct the time using the SNTP function is made when recording is in progress and the time difference from the current time is ±5 minutes or larger, the time will not be corrected. If the time difference is within ±5 minutes, the time will be corrected in incremental steps.

If an attempt to correct the time is made when recording is not in progress, the time will be corrected immediately after the SNTP function acquires the time data.

(2) SNTP address (SNTP server address)

Specify the address of the SNTP server from which the time data should be acquired.

(3) Time Cal cycle (time calibration cycle)

Specify the cycle at which time data should be acquired.

(4) Get the time, when power ON (time acquisition function)

This function acquires data from the SNTP server upon power-on.

(This function is available only when the SNTP function setting (1) is "ON.")

[Caution]

When the power is turned on with this item set to ON, recording will not start until the time data is acquired.

If a timeout occurs due to a communication error, it may cause a latency of up to about 30 seconds.

(5) Time zone (UTC)

Set the time zone (UTC).

(6) Cal start (calibration start)

Used to manually calibrate the time regardless of the time calibration cycle (3).

(Manual calibration cannot be performed when recording is in progress.)

9.10 Configuring the FTP Server

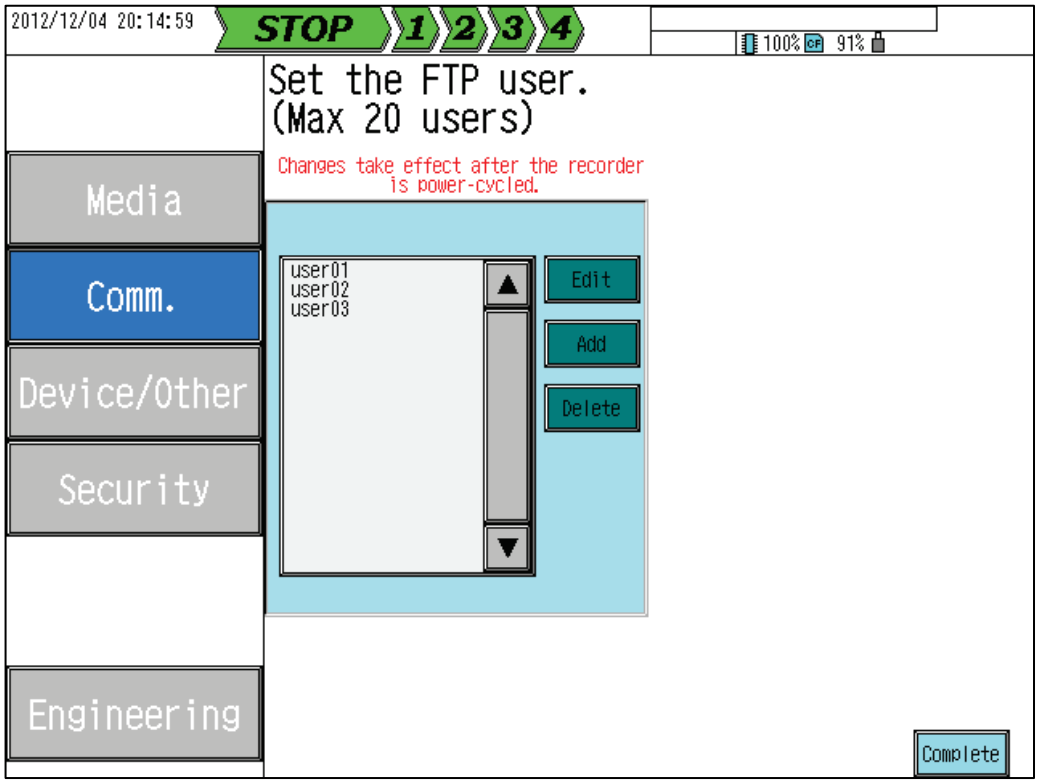
To use the FTP server functions, the IP address and other necessary information must be set.

For further information, see Section 9.8.

[Operation]

System > Comm. > FTP server

Note: You cannot change settings while recording is in progress.

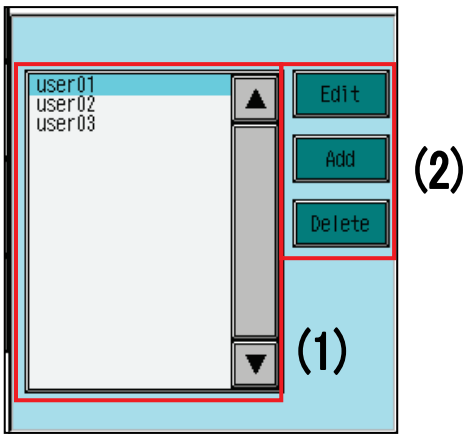


[Settings]

No.	Item	Setting
(1)	User group	Shows the registered user names.
(2)	User command	Edits, adds, or deletes a user.
(3)	User name	Character input in ASCII
(4)	password	
(5)	Level	Administrator, User

∗ Changes to settings will take effect after the recorder is power-cycled.

9.10.1 User Management



(1) User list

Shows registered user names (up to 20 users).

(2) User commands

Use these commands to edit registered user settings, delete registered users, or to add new users.

Edit : Edits the user who is currently selected as indicated by the aqua cursor.

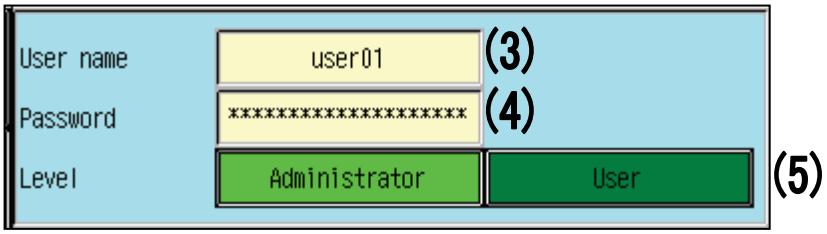
Add : Registers a new user. Add is unavailable if 20 users have already been registered.

Delete : Deletes the user who is currently selected as indicated by the aqua cursor.

∗ Pressing Edit or Add opens the user setting window.

(For further information, see the next section.)

9.10.2 User Settings



(3) User name

(4) Password

These items must match the corresponding settings on the FTP client software to be used.

(You can omit password entry.)

(This field always shows 20 asterisks (*), regardless of the number of entered characters.)

(5) Level

Specify the access level that applies when FTP client software is in use.

Administrator: Can read, write, or delete files from or to recording media.

User: Can only view (download) files from recording media.

∗ You can configure settings concerning the recording medium to be used by the recorder as the FTP server for file transfer. For this purpose, use [FTP server root drive]. (For further information, see Section 9.13.1.)

[Caution]

Before the Data Viewer or Parameter Loader, which come with the product as standard features, can be used as the FTP client software, the FTP settings for the software must match the FTP settings for the recorder.

(For the Data Viewer and Parameter Loader settings, see Chapter 7 of the Data Viewer Instruction Manual and Chapter 6 of the Parameter Loader Instruction Manual.)

9.11 Configuring the FTP Client

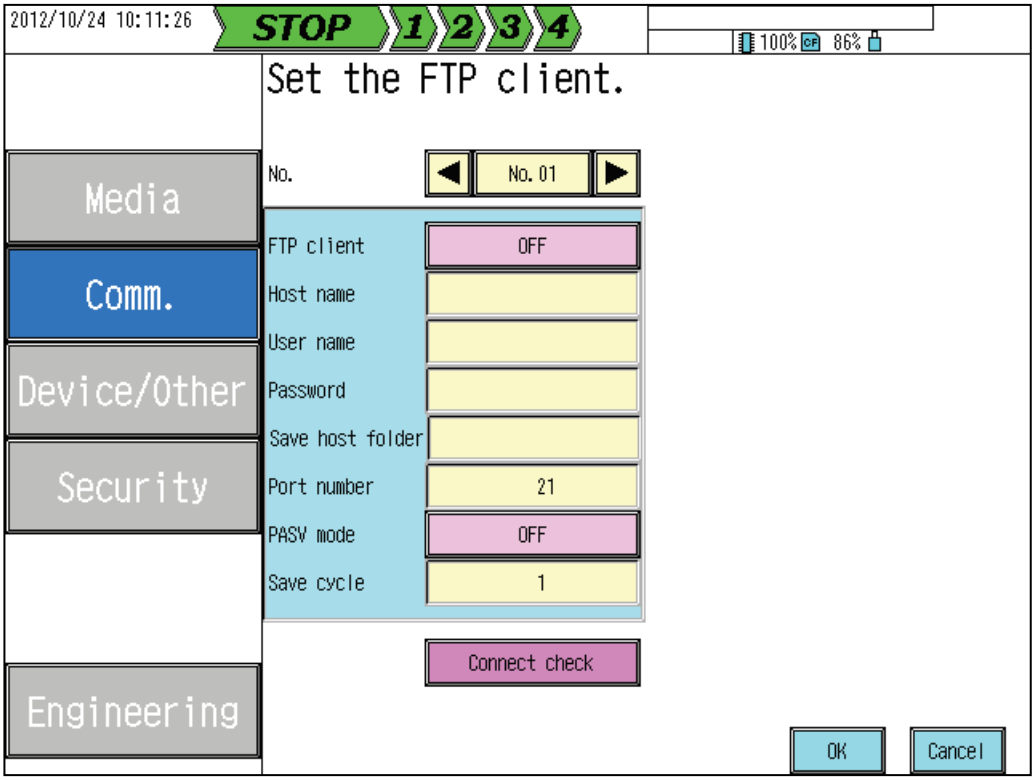
[Explanation]

Save files in an external FTP file server in synchronization with the record data save cycle.

[Operation]

System > Comm. > FTP client

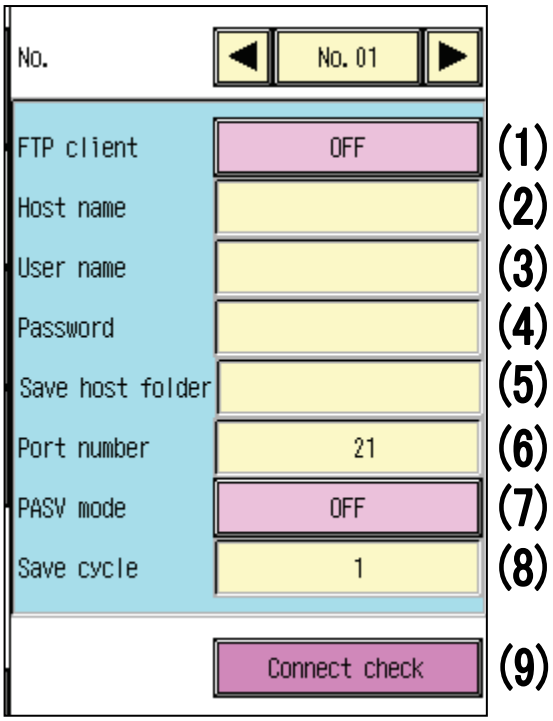
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	FTP Client	OFF, ON
(2)	Host name	Character input in ASCII
(3)	User name	
(4)	Password	
(5)	Save host folder	
(6)	Post number	1～65535
(7)	PASV mode	OFF, ON
(8)	Save cycle	1～100
(9)	Connect check	Tests FTP connection.

9.11.1 FTP Client



(1) FTP client (FTP client function)

Saves files in an external FTP file server in synchronization with the file save cycle.

(For information on file save cycles, see Section 8.16.1.)

(2) Host name

Specify the IP address or host name of the FTP server to be connected to.

∗ The host name can be specified only when the DNS server is configured and enabled.

(For information on DNS server configuration, see Section 9.8.1.)

(3) User name

(4) Password

Specify the user name and password to be used to log in to the connected FTP server.

(The password field (4) always shows 20 asterisks (*), regardless of the number of characters entered as the password.)

(5) Save host folder

Specify the folder that will receive files transferred to the connected FTP server.

(6) Port number

Specify the FTP port number to be used for communication with the connected FTP server.

(7) PASV mode

The PASV mode can be specified as the FTP connection mode.

(8) Save cycle

Specify the number of files needed to trigger transfer to the FTP server.

File transfer will start when the number of record files that have yet to be saved exceeds the value specified here.

For information on transfer to the server, see Section 7.5.2.

(9) Connect check (connection confirmation test)

Tests connection with the FTP server.

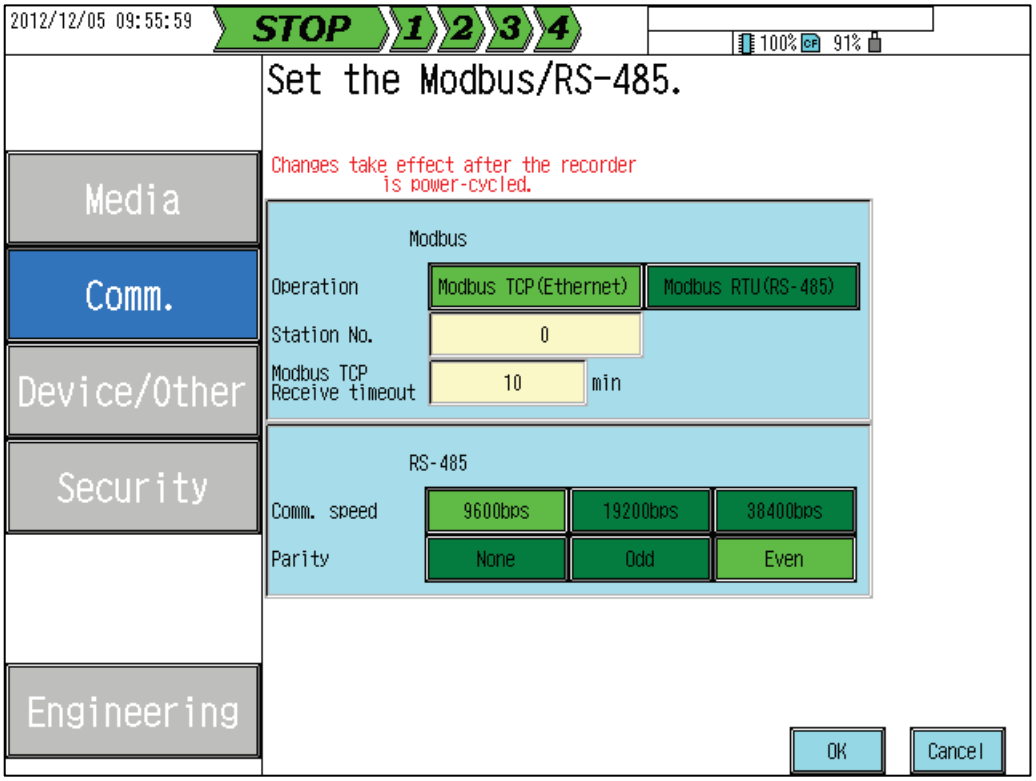
9.12 Configuring Modbus Settings

[Operation]

System > Comm. > Modbus/RS-485

The display content varies depending on whether the RS-485 option is selected.

Note: You cannot change settings during recording.



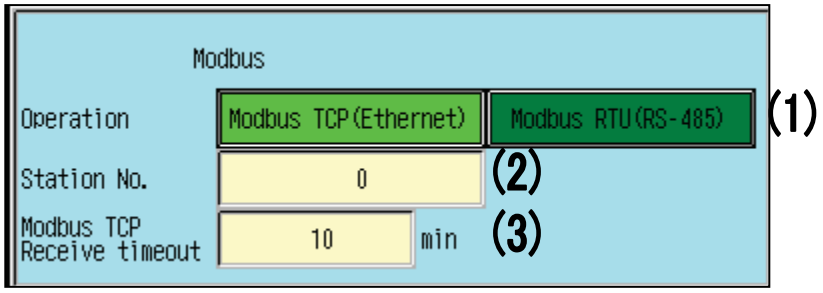
[Settings]

No.	Item	Setting
(1)	Operation	Modbus TCP (Ethernet), Modbus RTU (RS-485)
(2)	Station No.	0～247
(3)	Modbus TCP Receive timeout	10～240
(4)	Comm. speed	9600bps, 19200bps, 38400bps (∗1)
(5)	Parity	None, Odd, Even (∗1)

∗1 This item can be configured only when the RS-485 option is specified.

∗ Changes to settings will take effect after the recorder is power-cycled.

9.12.1 Modbus



(1) Operation

Select a Modbus operation mode.

Modbus TCP(Ethernet) : Only Ethernet will be used as the Modbus communication protocol.

Modbus RTU(RS-485) : Not only Ethernet, but also RS-485 will be used as the Modbus communication protocol.

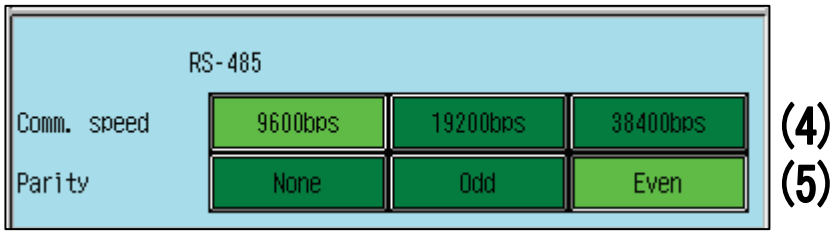
(2) Station No.

The station No. used for Modbus communication. (Effective only for Modbus RTU)

(3) Receive timeout

The receive timeout limit used during Modbus communication. (Effective only for Modbus TCP)

9.12.2 RS-485 (Optional)



∗ This item can be configured only when the RS-485 option is specified.

(4) Comm. speed

Specify the RS-485 communication speed.

(5) Parity

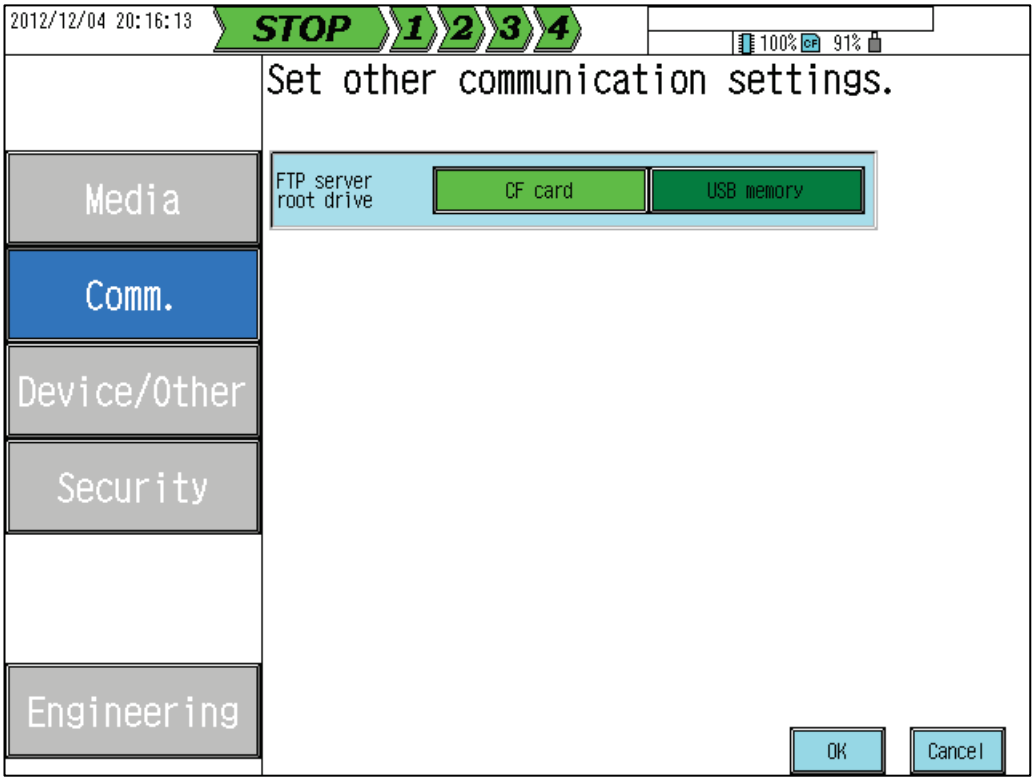
Specify the parity for RS-485 communication.

9.13 Configuring Other Communication Functions

[Operation]

System > Comm. > Other

Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	FTP server root drive	CF card, USB memory (*1)

*1 "USB memory" can be selected only when the USB memory option is specified.

9.13.1 FTP Server Root Drive

(1) FTP server root drive

Specify the root drive for FTP server login.

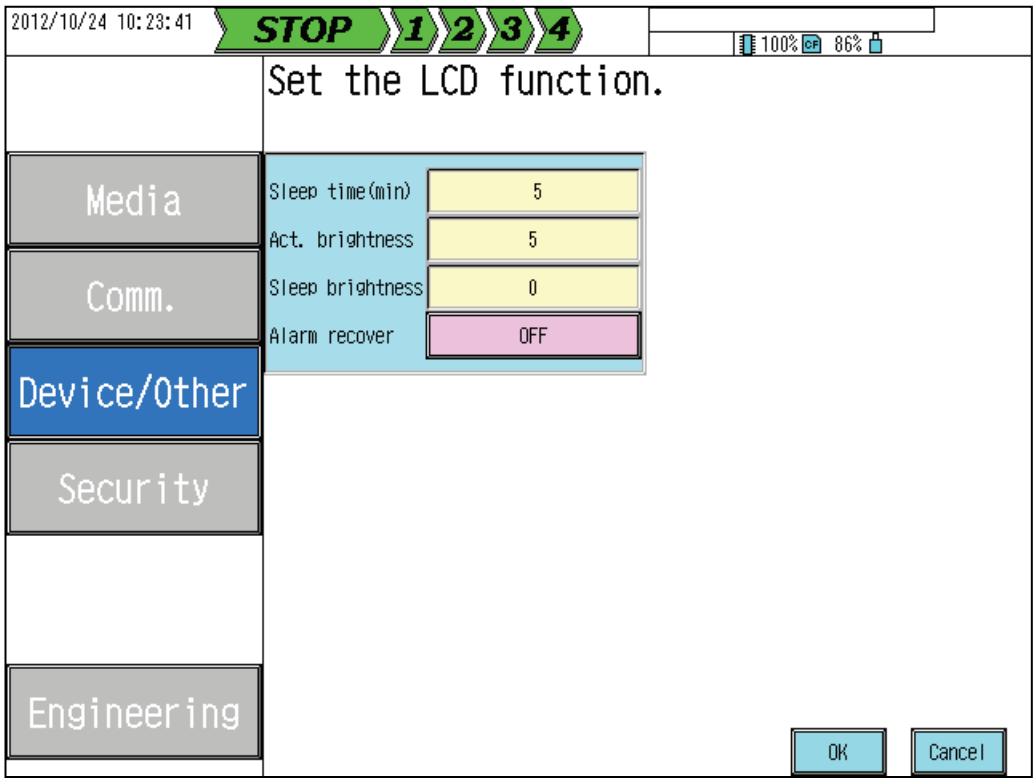
("USB memory" can be selected only when the USB memory option is specified.)

(For information on FTP server configuration, see Section 9.10.)

9.14 Setting the LCD Sleep Time

[Operation]

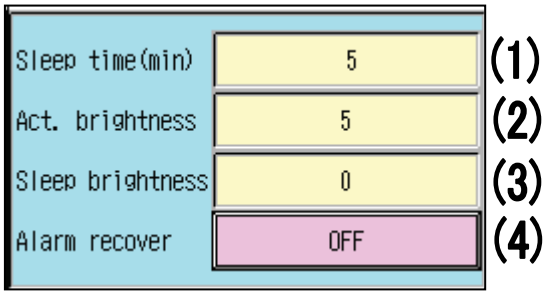
System > Device/Other > LCD



[Settings]

No.	Item	Setting
(1)	Sleep time	0～60 (min)
(2)	Act. brightness	2～5
(3)	Sleep brightness	0～4
(4)	Alarm recover	OFF, ON

9.14.1 LCD Settings



(1) Sleep time

Specify the idle time at which the LCD brightness will change to the specified sleep brightness (3). (A value of 0 disables the sleep function.)

(2) Act. brightness (active brightness)

(3) Sleep brightness

Specify the LCD brightness for active state and the LCD brightness for sleep state. A greater value corresponds to a higher brightness.

(4) Alarm recover

This function, upon alarm occurrence, automatically activates the LCD.

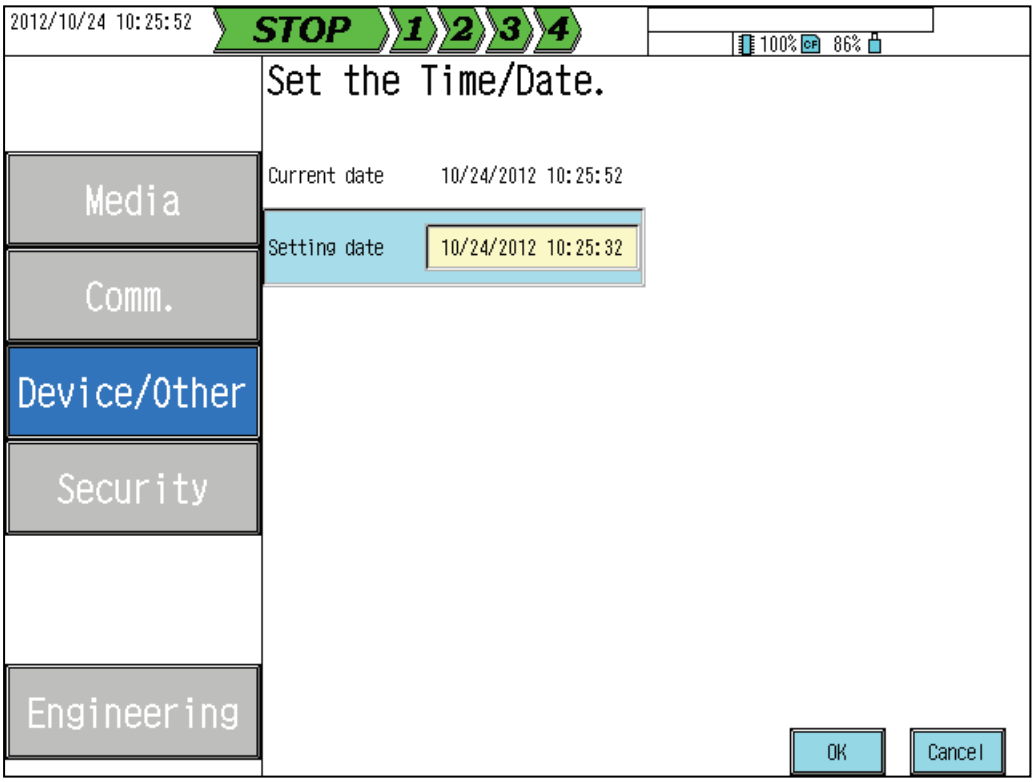
(While the alarm is ON, the LCD will be kept ON regardless of the specified sleep time (1). After the alarm is reset (turns OFF), the LCD will be turned OFF after the specified sleep time (1) (idle time) elapses.)

9.15 Setting the Time

[Operation]

System > Device/Other > Time

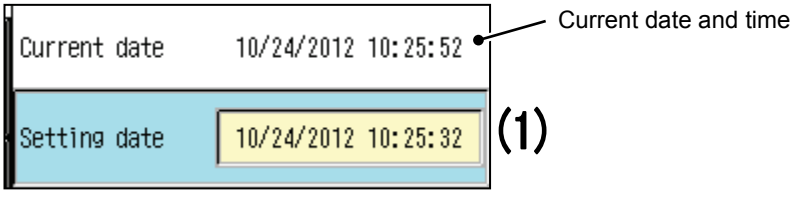
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Setting date	YYYY/MM/DD hh:mm:ss

9.15.1 Time Setting



(1) Setting date (new date and time)

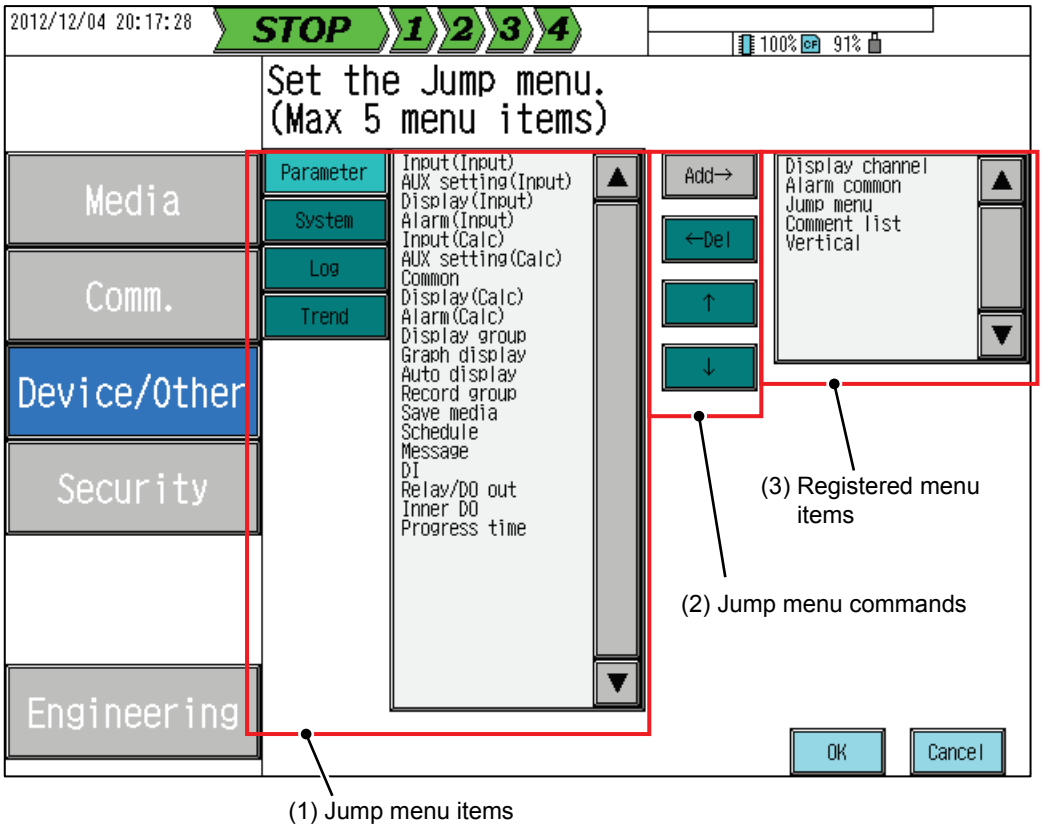
Change the time.

9.16 Setting the Jump Menu

[Operation]

System > Device/Other > Jump menu

Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Jump menu items	Shows a list of jump menus that can be configured.
(2)	Jump menu commands	Used to add, delete, or move jump menus.
(3)	Registed menu items	Shows the items that are registered with the jump menu.

(1) Jump menus

Shows the jump menus that can be configured.

[Setting items]

･Parameter		･System	
	Input(Input)		Ethernet
	AUX setting(Input)		SNTP
	Display(Input)		FTP server
	Alarm(Input)		FTP client
	Input(Calc.)		Modbus/RS-485
	AUX setting(Calc.)		Other
	Common		LCD
	Display(Calc.)		Clock
	Alarm(Calc.)		Jump menu
	Display group		Language
	Display channel		Key
	Graph display		User Registry
	Auto display		Modbus
	Record group	･Log	
	Save media		Event
	Schedule		Ethernet
	Message		Security
	DI		Comment
	Relay/DO out	･Trend	
	Inner DO		Horizontal
	Alarm common		Vertical
	Progress time		Bar graph
			Digital
			Over view

(2) Jump menu commands

Used to add, delete, or move jump menu items.

Add : Adds the items that are currently selected in the jump menus area (1), to the menu. (Up to five items can be added.)

Delete : Deletes the items that are currently selected in the registered menus area (3), from the menu.

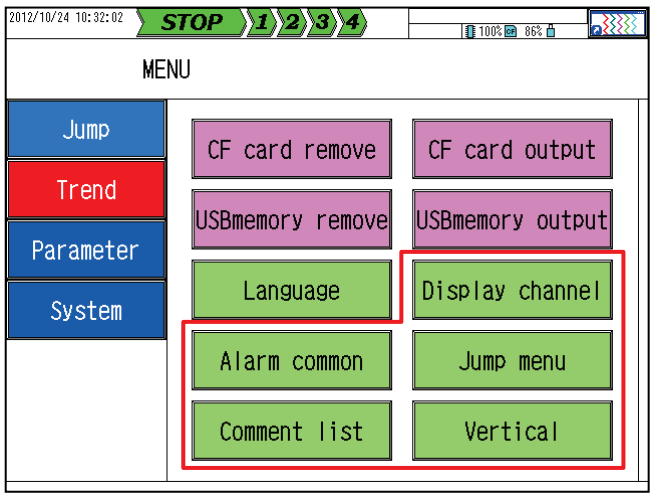
Move : Moves up or down the list of the items that are currently selected in the registered menus area (3).

(Items that are currently selected are displayed in an aqua background.)

(3) Registered menus

Shows the items that have been registered with the jump menu.

∗ Registering an item with the jump menu creates a short-cut key in the menu window (see the figure below). (Short-cut keys for "CF card remove," "CF card output," "USB memory remove," "USB memory output," and "Language" are always displayed at fixed positions in the menu window.)

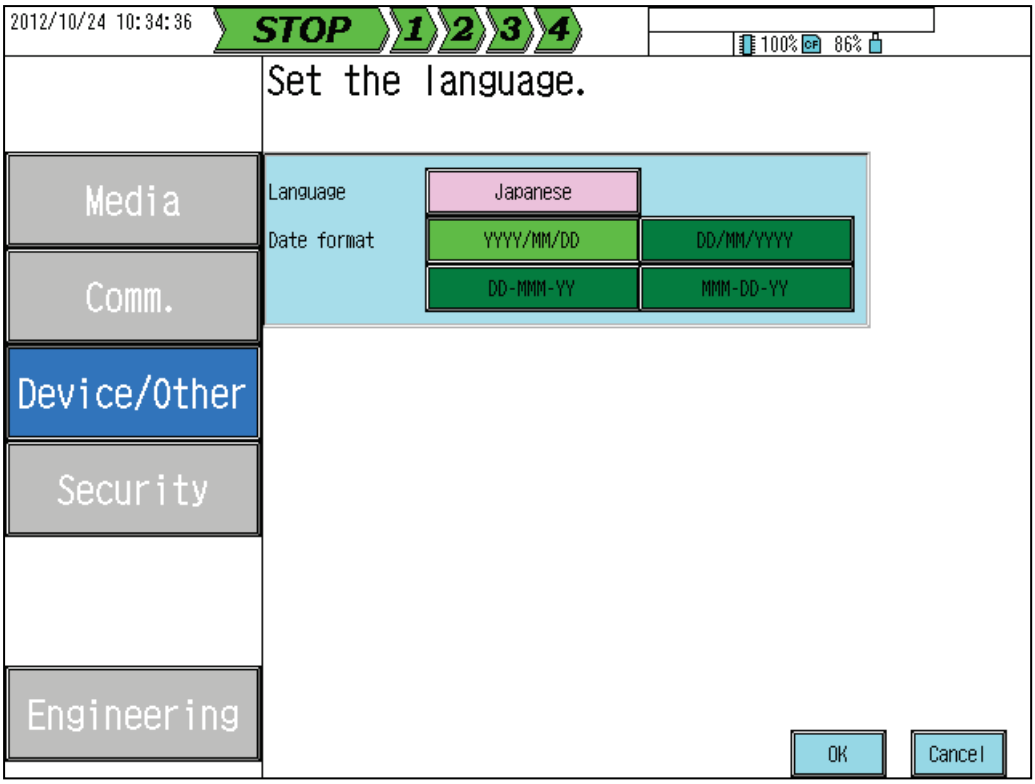


9.17 Setting the Language

[Operation]

System > Device/Other > Language

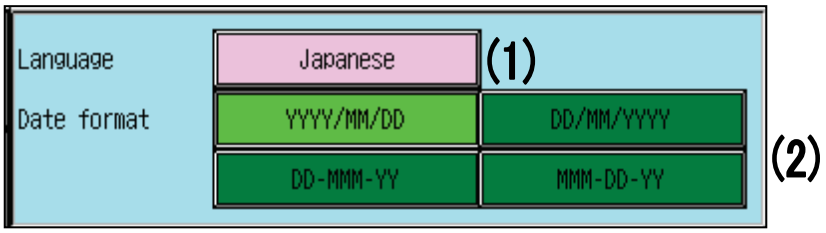
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Language	Japanese, English
(2)	Date format	YYYY/MM/DD, DD/MM/YYYY, DD-MMM-YY, MMM-DD-YY

9.17.1 Language



(1) Language

Specify the language to be used on the recorder.

Japanese : Information will be displayed in Japanese.

English : Information will be displayed in English.

(2) Date format

Specify the order of the year, month, and day for time display.

The display example of each option of this item is provided below (examples here display a date of April 1, 2012).

YYYY/MM/DD : 2012/04/01

DD/MM/YYYY : 01/04/2012

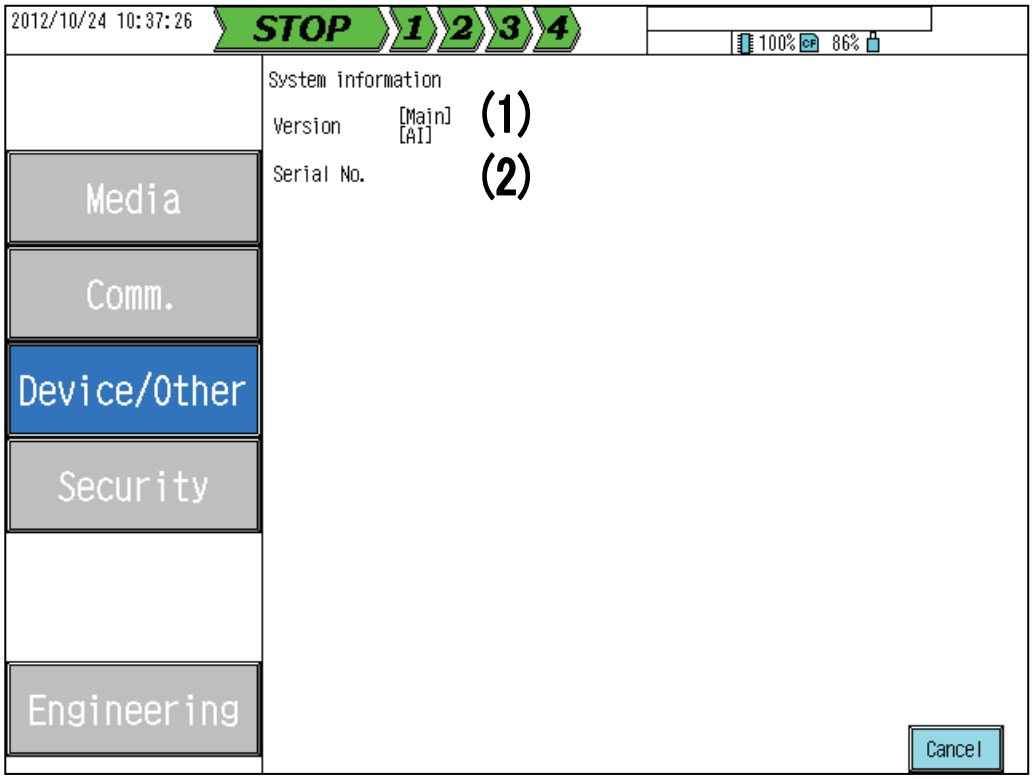
DD-MMM-YY : 01-Apr-12

MMM-DD-YY : Apr-01-12

9.18 Displaying System Information

[Operation]

System > Device/Other > Version



(1) Version

Shows the version information of the recorder.

Main : Shows the main software version.

AI : Shows the AI CPU version.

(2) Serial No.

Shows the serial number of the recorder.

9.19 Configuring the Key Security Function

[Operation]

System > Security > Key

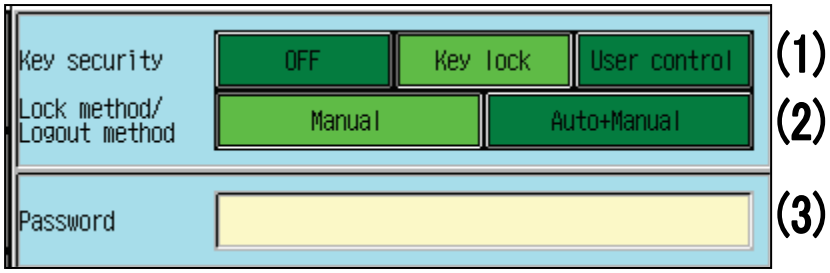
The display content varies depending on the key security setting.

Note: You cannot change settings during recording.

[Settings]

No.	Item	Setting
(1)	Key security	OFF, Key lock, User control
(2)	Lock method/ Logout method	Manual, Auto＋Manual
(3)	Password	Character input in ASCII
(4)	Unlock (unlocked items)	Select the items for which security control is disabled when the key lock applies.
(5)	Lock commands	Apply or reset the security lock on those items that are eligible for security lock.
(6)	Lock (locked items)	Select the items for which security control is enabled when the key lock applies.

9.19.1 Security Settings



(1) Key security

Select the security type.

OFF : Disables the security function.

Key lock : Restricts operation on the items specified in Locked items area (6) when the lock applies.

Once the lock is reset, operation on all setting items is permitted

User control : Permits each user to perform operations on the items specified for the user when the user is logged in.

When the user is logged out, operation on all setting items is restricted.

∗ You can select "User control" only if your registered user account level is "Administrator."

(For information on user registration, see Section 9.20.)

(2) Lock method/Logout method

This item can be configured only when the key security (1) setting is "Key lock" or "User control."

Specify the lock method to be used when the key lock applies and the logout method to be used when user control is enabled.

Manual : Key lock and logout processing will always be performed manually.

Auto + Manual : If the recorder is idle for 5 minutes, the key lock and logout processing is automatically performed. Manual operation is also possible.

∗ To perform manual key lock and logout processing, use the LOCK button on the front of the recorder.

(For further information, see "● Example of key lock setting" below.)

(3) Password

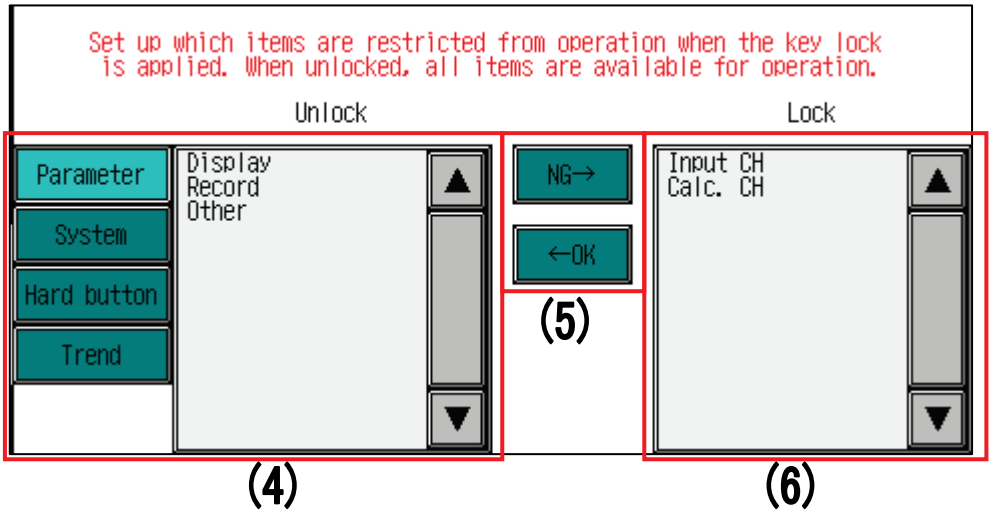
This item can be configured only when the key security (1) setting is "Key lock."

Specify the password required for key unlocking.

(You can omit password entry. If you omit password entry here, select OK while leaving the password field blank to perform unlocking.)

(This field always shows 20 asterisks (*), regardless of the number of entered characters.)

9.19.2 Locked Items



(4) Unlock (unlocked items)

Shows the items that are provisioned for operation when the key lock applies.

(5) Lock commands

Apply or reset the key lock on those items that are eligible for security setting.

Pressing NG→ moves the items that are currently selected in the unlocked items area (4) to the locked items area (6).

Pressing ←OK moves the items that are currently selected in the locked items area (6) to the unlocked items area (4).

(Items that are currently selected are displayed in an aqua background.)

(6) Lock (locked items)

Shows the items that are restricted from operation when the key lock applies.

* Once the key lock is reset, restrictions on all setting items are reset.

[Security setting items]

・Parameter		・hardware button	
	Input CH		START/STOP
	Calc. CH		MENU
	Display		FUNC
	Record		
	Others	・Trend	
			Comment
・System			Transient scale
	Media		
	Comm.		
	Device/Other		
	Security		

● Example of key lock setting

1) Parameter setting

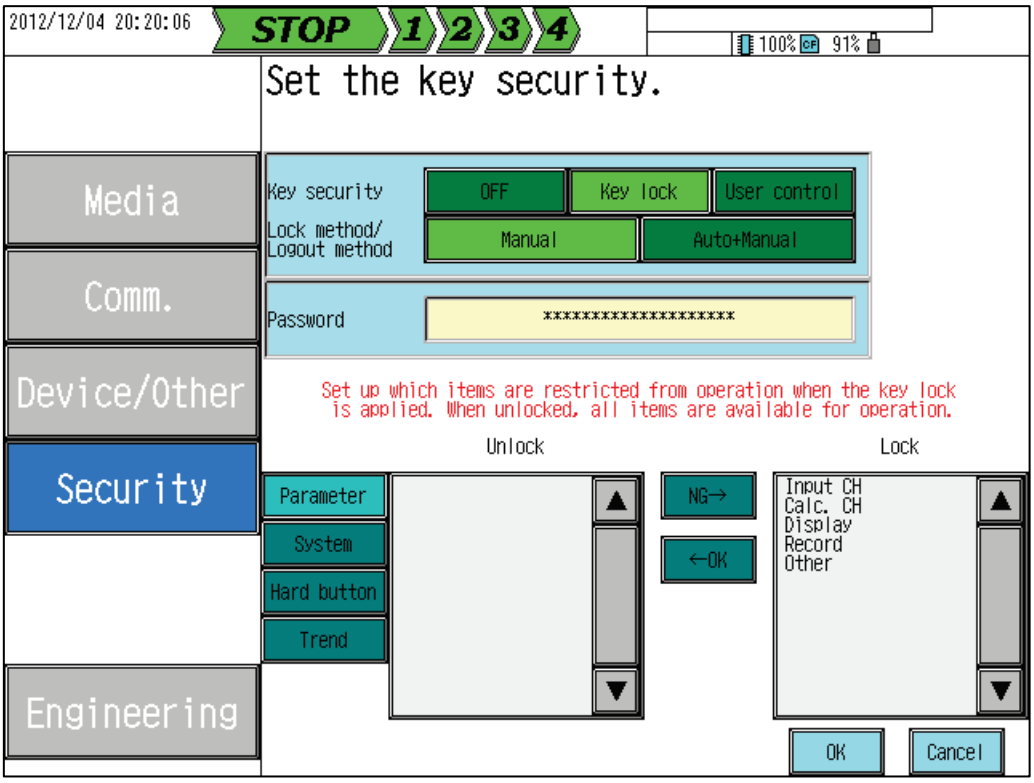
Open the key lock settings window.

Specify the key lock method. (This examples sets "Auto + Manual" as the key lock method.)

Specify the password. (This example sets "12345" as the password.)

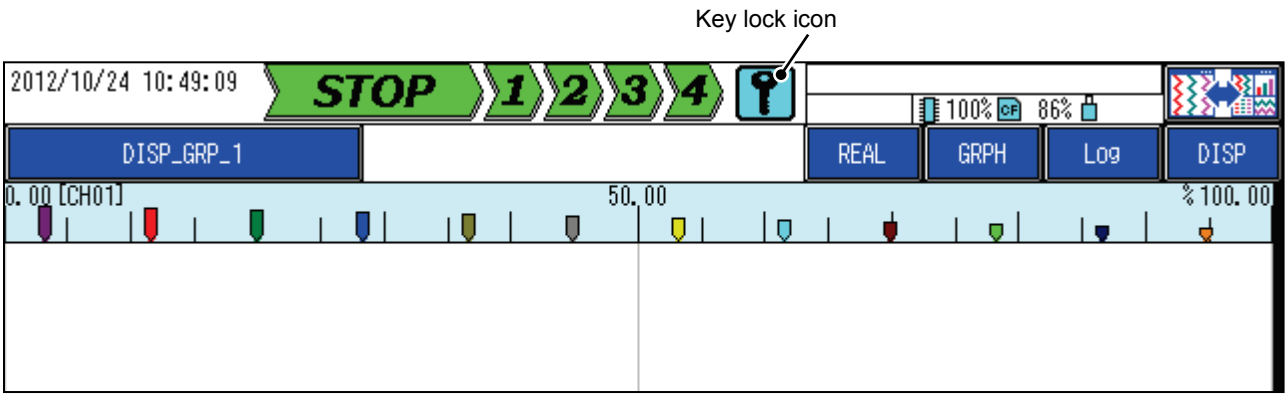
Specify the items you want to restrict operation on when the key lock applies. Select the items you want to restrict in the Unlock field (unlocked items area) and then press NG→. The selected items move to the Lock field (locked items area).

(In this example, the key lock applies to all [Parameter] items and all [Hard button] items.)



Press OK to save the settings.

＊ When you select "Manual" or "Auto + Manual" as the lock method (2), the recorder is locked and the key lock icon appears at the top of the screen.



2) Applying or resetting the key lock

Once the key lock setting is configured, you can apply or reset the key lock by using the LOCK button on the front of the recorder.

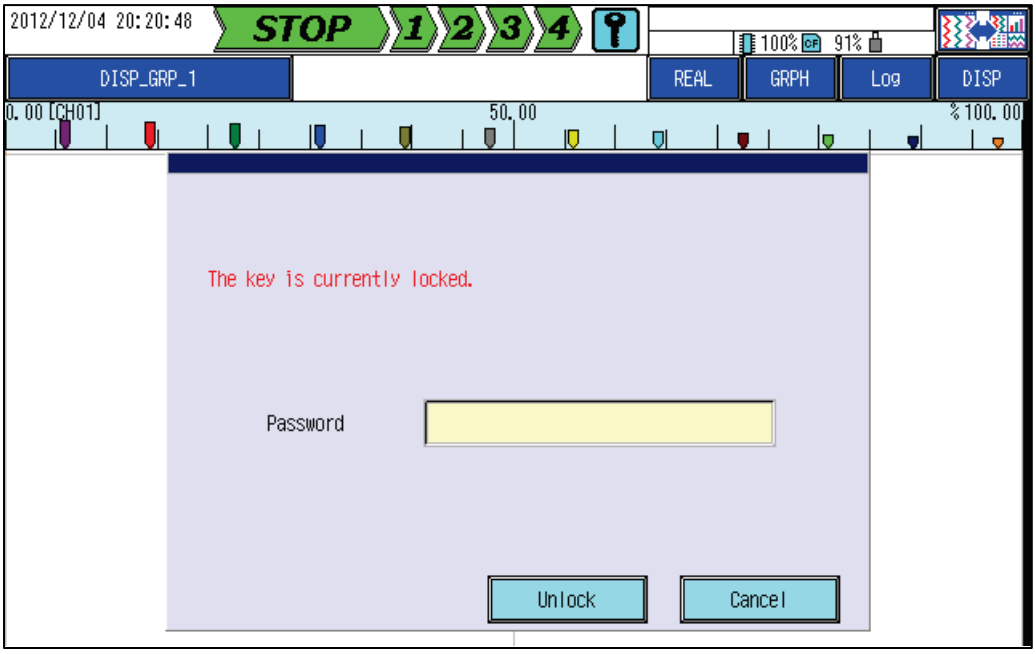
(Unless the key lock setting is configured, the LOCK button has no effect when it is pressed.)

To reset the key lock, enter the password "12345" specified in step 1) above and then press Unlock.

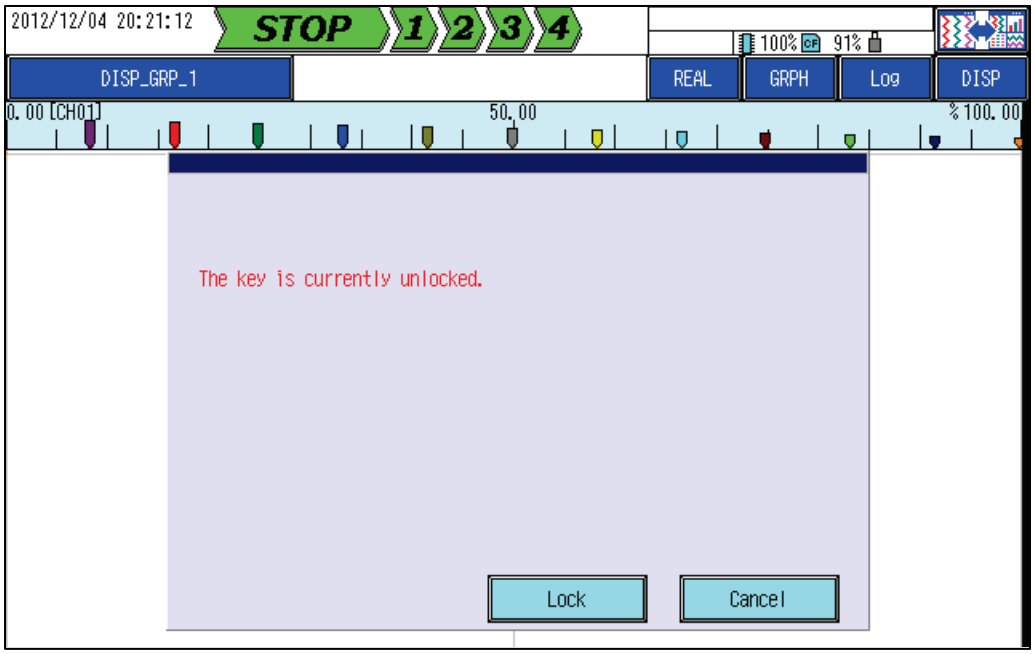
When the key lock does not apply, you can apply the key lock by pressing the LOCK button.

(Password entry is not required for key lock setting.)

[When the key lock applies]

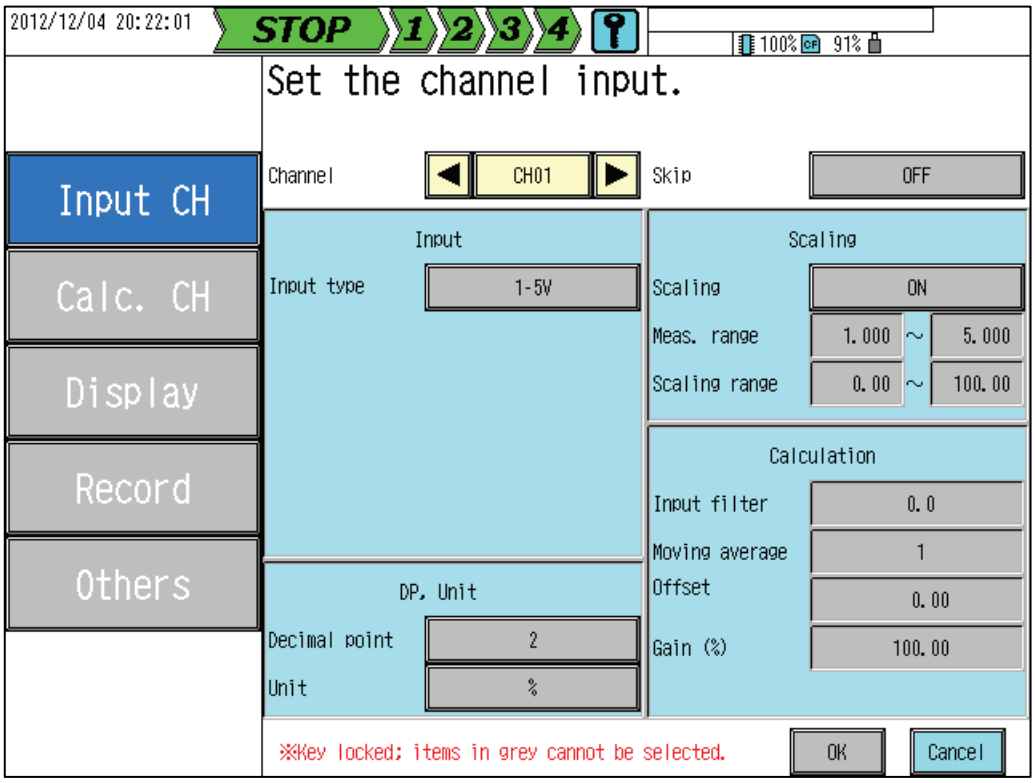


[When the key lock does not apply]

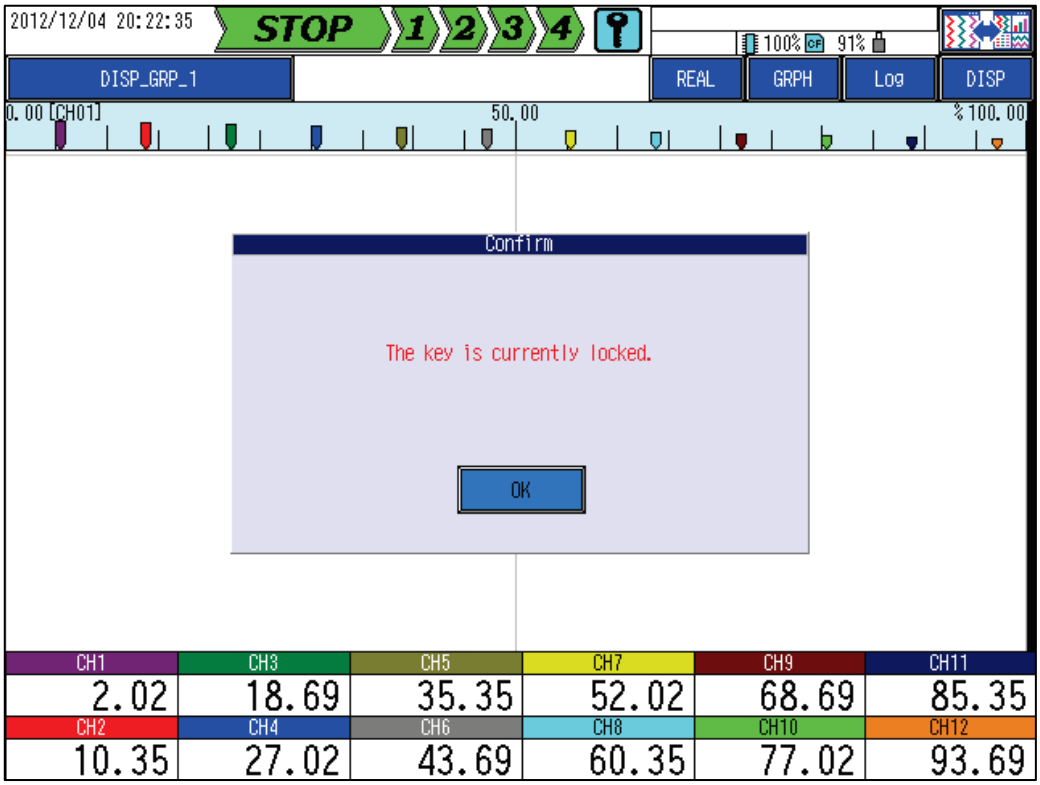


* Once the key lock is applied, the restrictions are placed on the menu window and hardware button operations as shown in the figures below.

[When the input settings window is locked (setting change not allowed)]



[When hardware buttons are locked (the START/STOP button is pressed)]



Caution

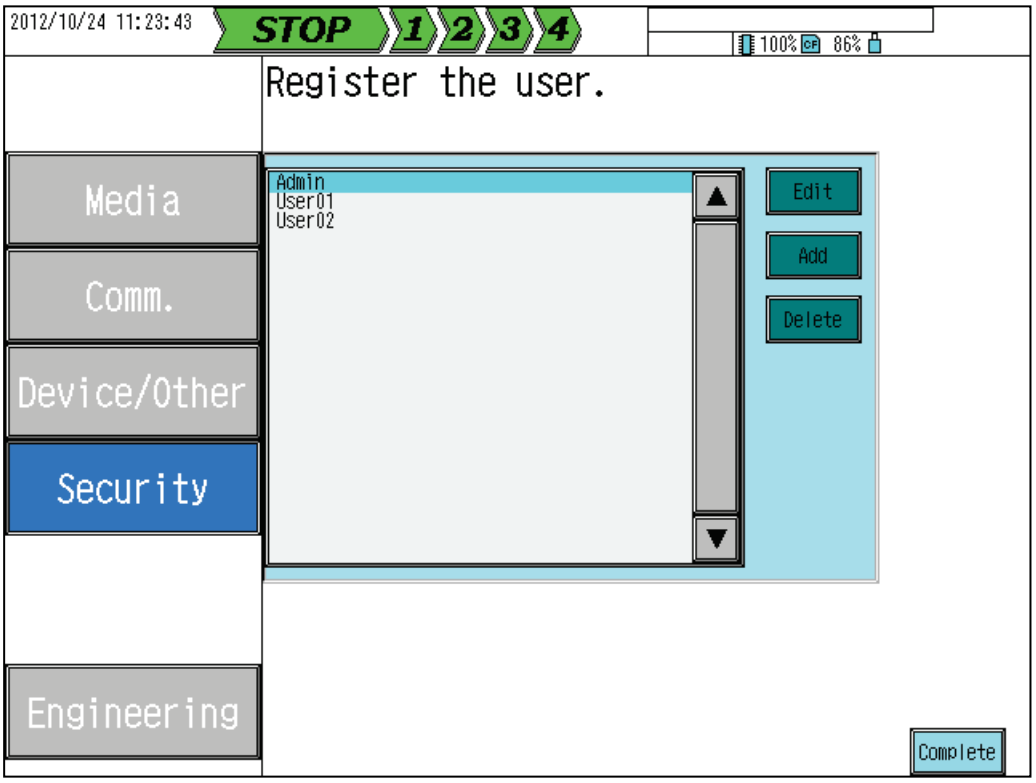
When the key lock function is in use, be sure to remember the specified password. If you forget the password, you cannot reset the key lock and may encounter problems with recorder operation.

9.20 Registering Users

[Operation]

System > Security > User Registry

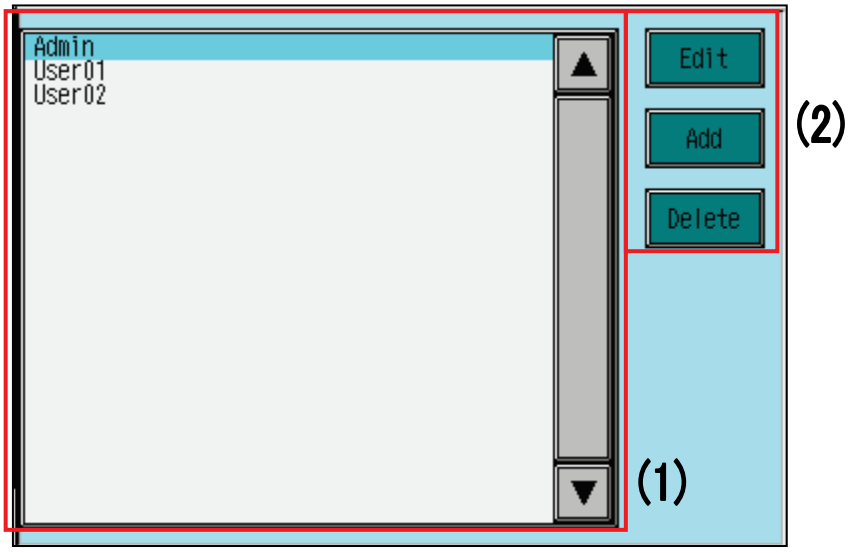
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	User group	Shows the registered user names.
(2)	User command	Edits, adds, or deletes a user.
(3)	User name	Character input in ASCII
(4)	Password	
(5)	Level	Administrator, User
(6)	Enable (operation -permitted items)	Select the items available for operation to the user when he/she is logged in.
(7)	Lock commands	Enable or disable user control on those items that are eligible for user control.
(8)	Disable (operation -inhibited items)	Select the items restricted from operation to the user when he/she is logged in.

9.20.1 User Management



(1) User group

Shows the registered user names. Up to 20 users can be registered.

(2) User commands

Use these commands to edit or delete registered users or to add new users.

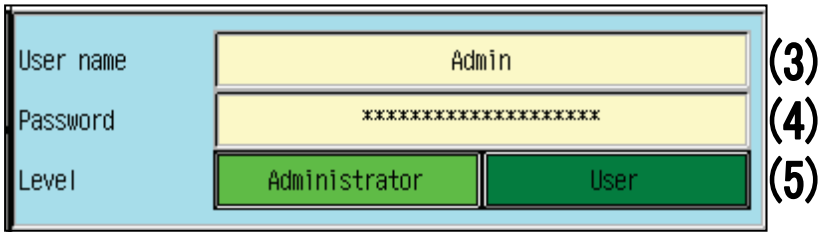
Edit	: Edits the user who is currently selected (indicated by the aqua cursor).
Add	: Registers a new user.
Delete	: Deletes the user who is currently selected (indicated by the aqua cursor).

∗ Pressing Edit or Add opens the user setting window.

[Caution]

You cannot select Add if 20 users have already been registered.
Before Edit or Delete can be executed on an "Administrator" level account, two or more "Administrator" level accounts must be registered.

9.20.2 User Settings



(3) User name

Specify the account name of the user.

The name specified for this item will be included in the list when a user is selected in the login window.

(4) Password

Specify the password to be used for login.

(You can omit password entry. If you omit password entry here, press OK while leaving the password field blank to log in.)

(This field always shows 20 asterisks (*), regardless of the number of entered characters.)

(5) Level

Specify the security level for each user.

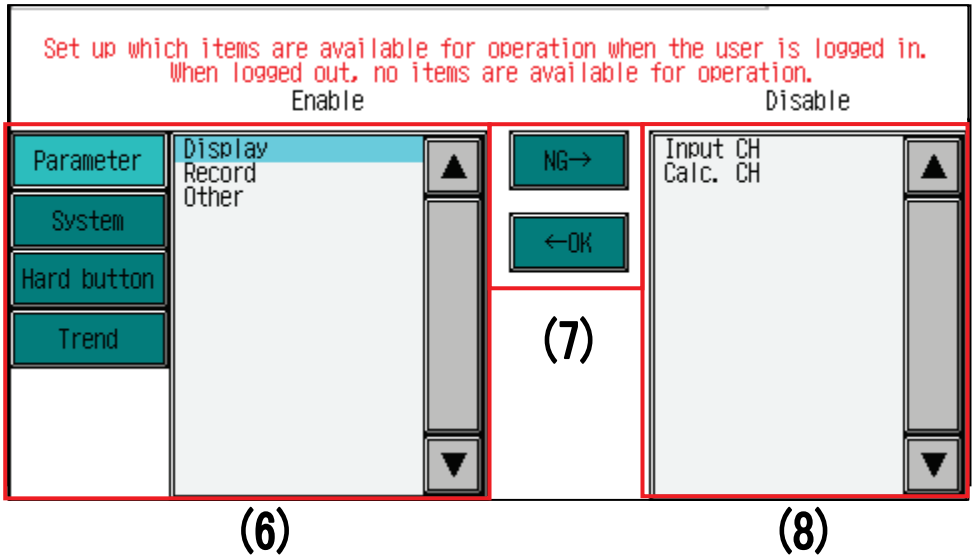
Administrator : Permitted to operate all setting items when in login state.

User : A user is permitted to operate the items specified for that user when the user is logged in.

[Caution]

To use the user control function, you need to register at least one "Administrator" level (5) account. (For information on user control, see Section 9.19.1.)

9.20.3 User Control



(6) Enable (operation-permitted items)

This item can be configured only when the level (5) is "User."

This area shows the items the user is permitted to operate when he/she is logged in.

(7) Lock commands

Enable or disable the user control on those items that are eligible for security setting.

Pressing NG→ moves the items that are currently selected in the Enable field (operation-permitted items area) (6) to the Disable field (operation-prohibited items area) (8).

Pressing ←OK moves the items that are currently selected in the Disable field (operation-prohibited items area) (8) to the Enable field (operation-permitted items area) (6).

(Items that are currently selected are displayed with an aqua background.)

(8) Disable (operation-prohibited items)

Shows the items the user is prohibited from operating when he/she is logged in.

∗ When the user is logged out, he/she is prohibited from operating all setting items.

[Security setting items]

・Parameter		・hardware button	
	Input CH		START/STOP
	Calc. CH		MENU
	Display		FUNC
	Record		
	Others	・Trend	
			Comment
・System			Transient scale
	Media		
	Comm.		
	Device/Other		
	Security		

●Examples of user control setting

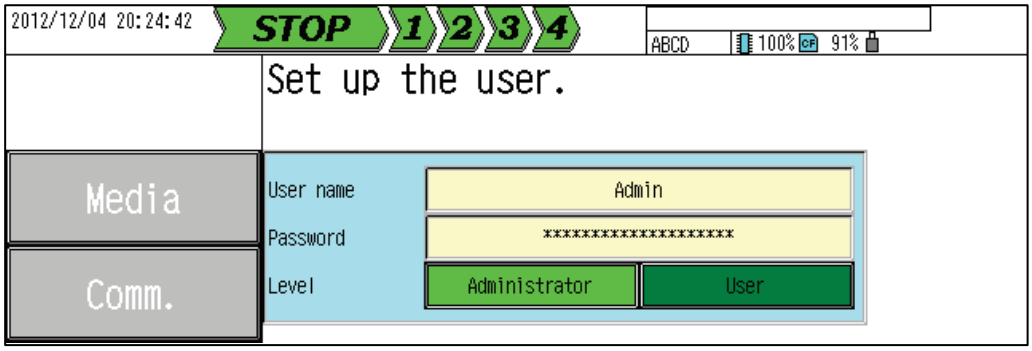
1) Parameter setting (administrator level)

Press Add to open the user account registration window.

Specify the user name. (This example specifies "Admin" as the user name.)

Specify the password. (This example specifies "12345" as the password.)

Specify the level. (This example specifies "Administrator" as the level.)



Press OK to save the settings.

2) Parameter setting (user level)

Press Add again to open the user account registration window.

Specify the user name. (This example specifies "User" as the user name.)

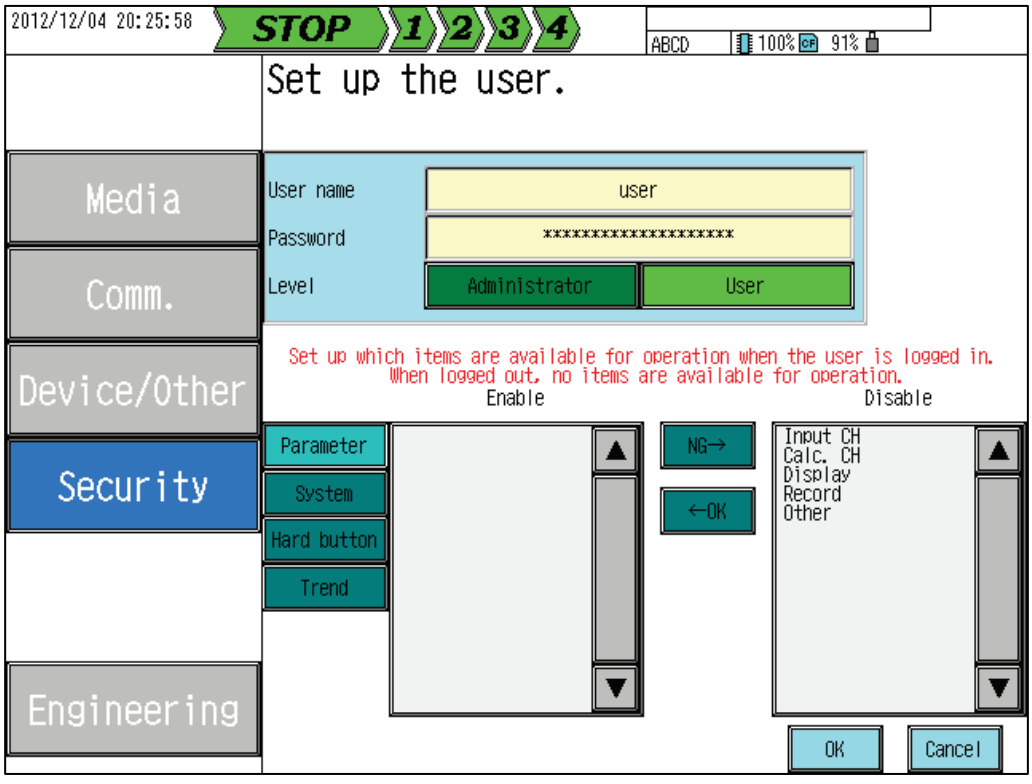
Specify the password. (This example specifies "12345" as the password.)

Specify the level. (This example specifies "User" as the level.)

Specify the items that should be restricted in operation when user control is enabled. Select the items you want to restrict operation on in the Enable field (operation-permitted items area) and then press NG→.

The selected items move to the Disable field (operation-inhibited items area).

(In this example, user control is enabled on all [Parameter] items and all [Hard buttons] items.)



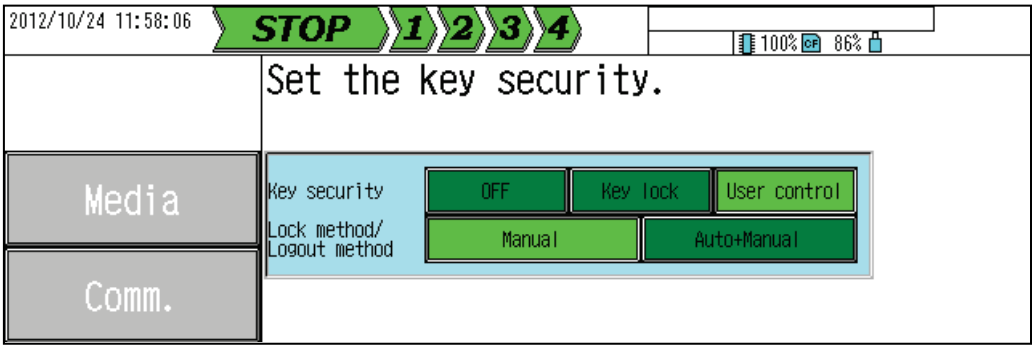
3) User control setting

Open the key security settings window (by selecting System > Security > Key).

(For information on key security, see Section 9.19.1.)

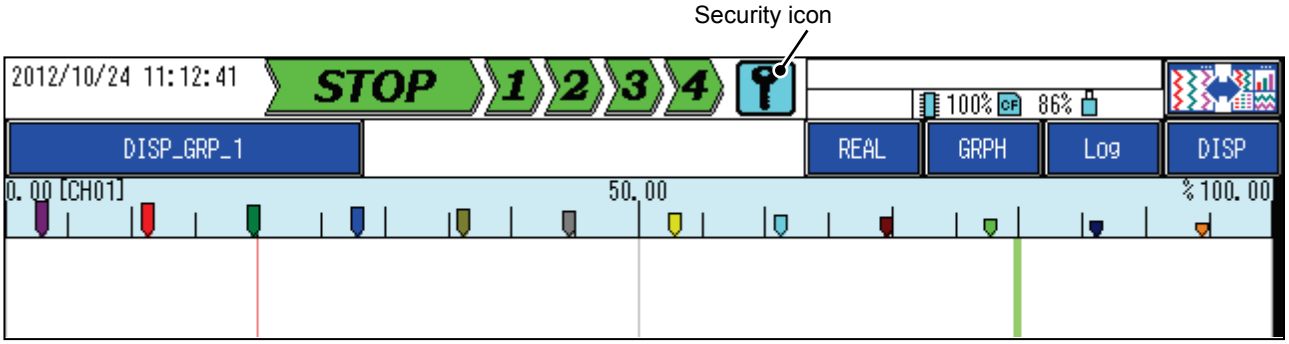
Specify the key security type. (This example specifies "User control" as the key security type.)

Specify the logout method. (This example specifies "Manual" as the logout method.)



Press OK to save the settings.

∗ When you select "Manual" or "Auto + Manual" as the logout method, the recorder is locked and the security icon appears at the top of the screen.



4) User login/logout

Once the user control setting is configured, you can perform user login/logout processing by using the LOCK button on the front of the recorder. (Unless the user control setting is configured, the LOCK button has no effect when it is pressed.)

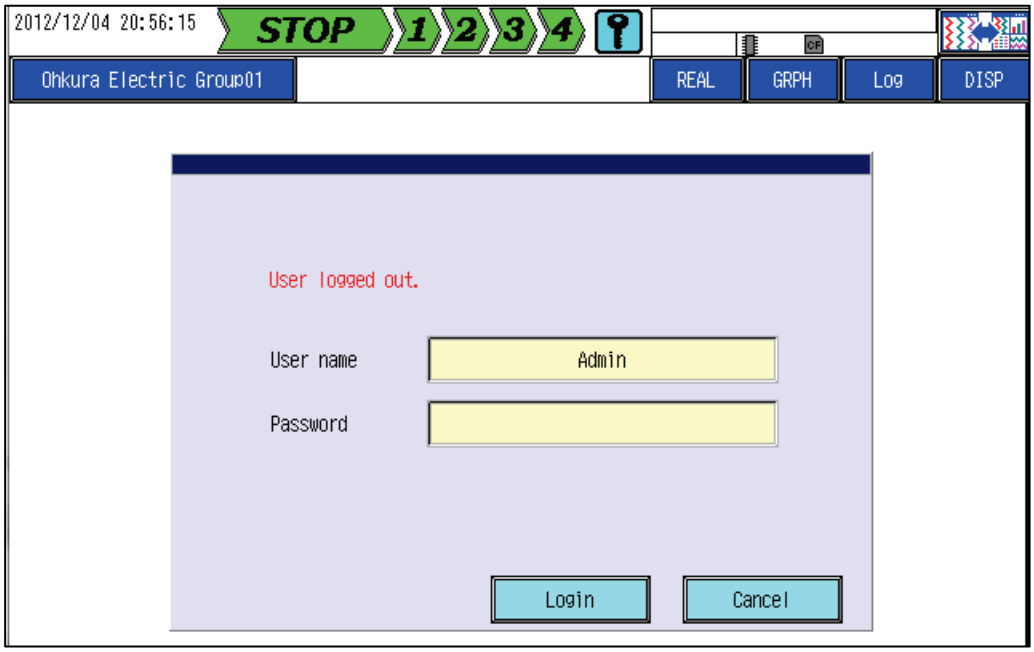
When you enter the login user name and the password "12345," which you have set in step 1 or 2, and press Login, the user logs in.

At the time of login, the name of the current login user is displayed in the [Security user] field.

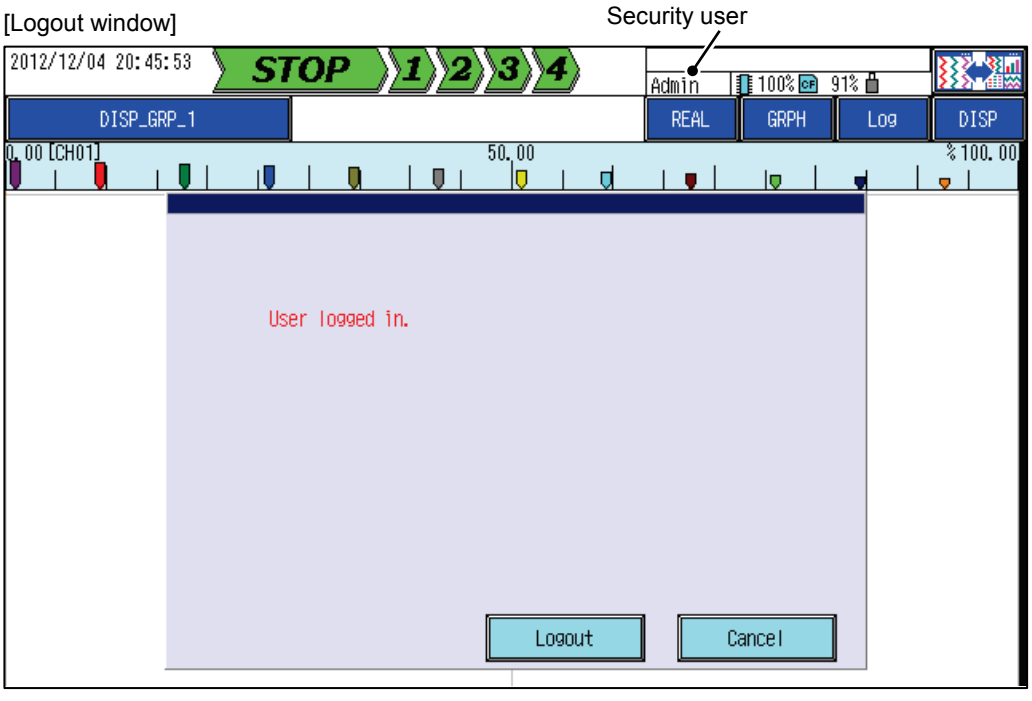
Pressing the LOCK button in login state opens the logout window.

(No password entry is required for logout.)

[Login window]

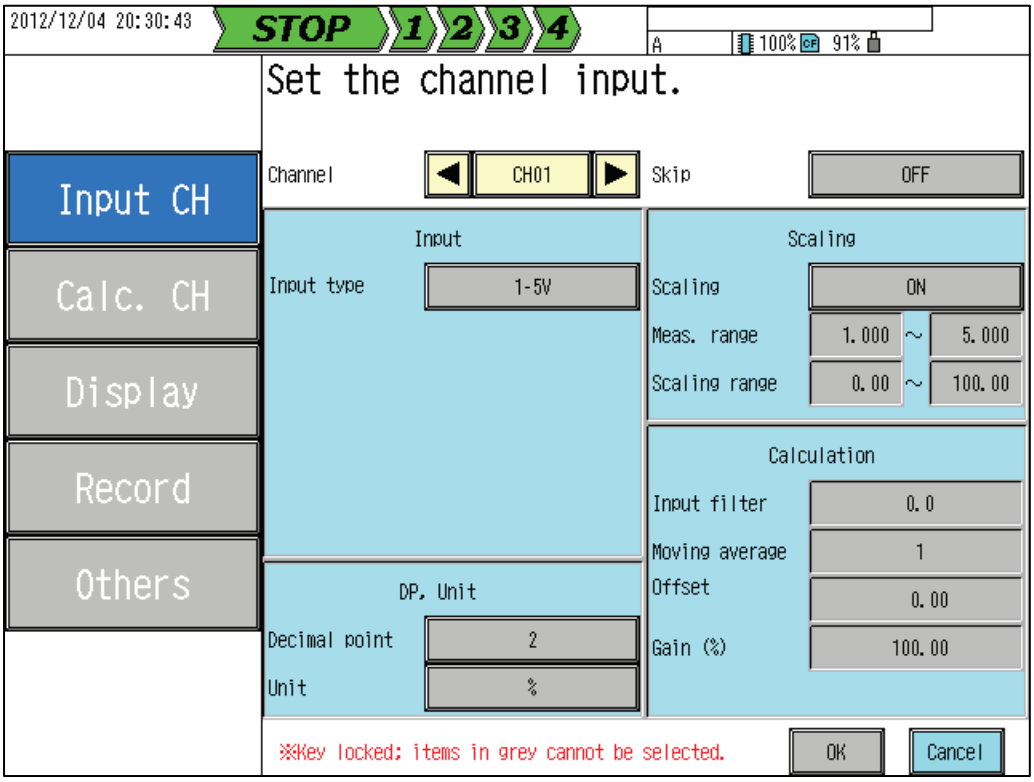


[Logout window]

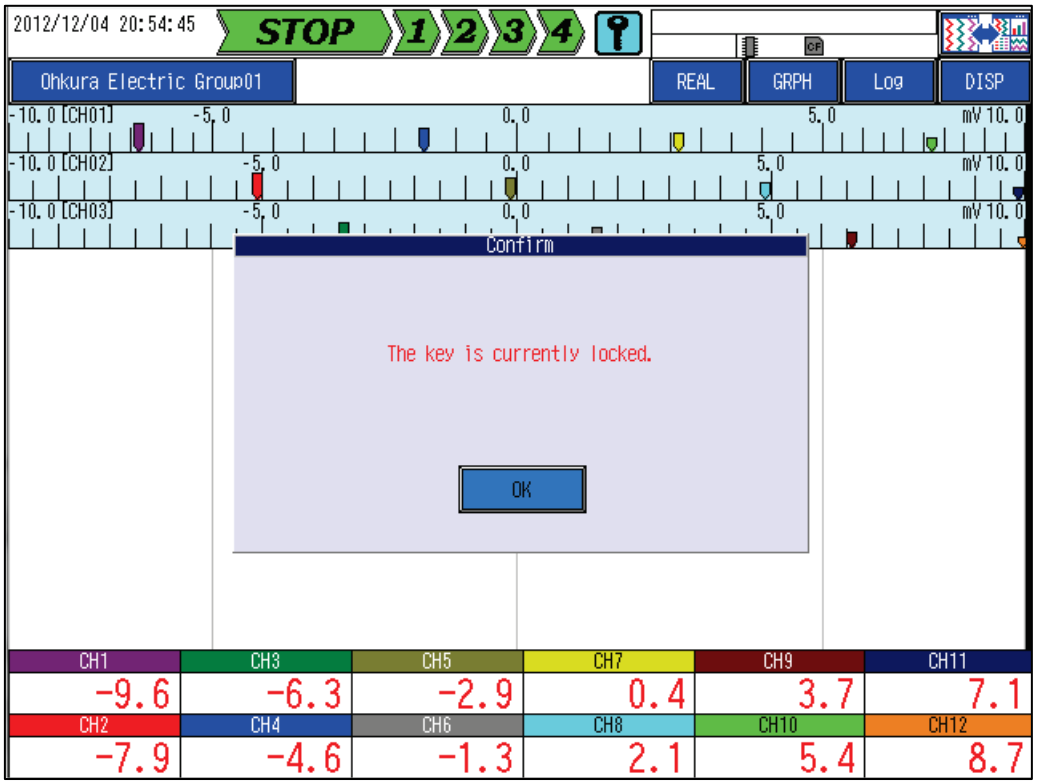


∗ Once user control is enabled, operations on the menu window and hardware buttons are restricted as shown in the figures below.

[When the input settings window is locked (setting change not allowed)]



[When hardware buttons are locked (the START/STOP button is pressed)]



Caution

When user control is active, be sure to remember the specified password. If you forget the password, you cannot log in and may encounter problems with recorder operation.

9.21 Configuring Modbus Security Settings

[Explanation]

Configure security for functions that use the Modbus protocol.

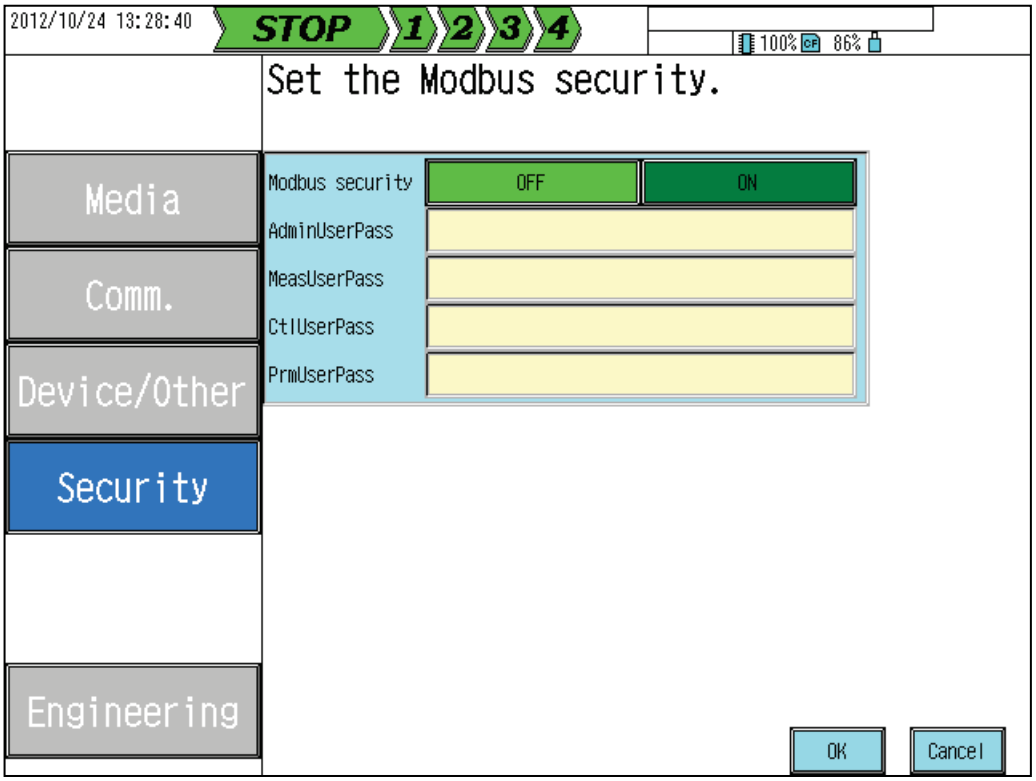
The main functions that can be restricted by Modbus security are indicated below together with information on the document that describes details.

- Operations on the Modbus map based on the address specification (Communication Instruction Manual)
- Start/stop recording on the recorder using the Data Viewer or function menu operations
  (Data Viewer Instruction Manual)
- Parameter read/write operations via communication using the Parameter Loader
  (Parameter Loader Instruction Manual)

[Operation]

System > Security > Modbus

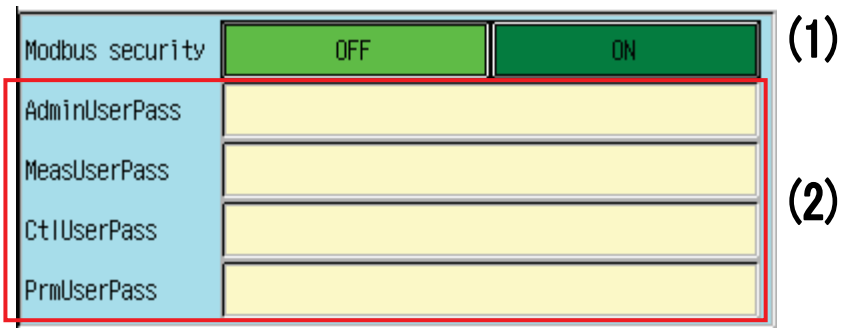
Note: You cannot change settings during recording.



[Settings]

No.	Item	Setting
(1)	Modbus security	OFF, ON
(2)	User Password	Character input in ASCII

9.21.1 Modbus Security



(1) Modbus security

Configure security for functions that use the Modbus protocol.

OFF : Disables Modbus security.

ON : Each user is permitted to use the Modbus functions only when he/she is logged in.

(2) User password

When Modbus security (1) is "ON," the password specified here is required to use Modbus functions.

What is permitted for each user while he/she is logged in is as follows:

AdminUser	: All functions relating to Modbus communication
MeasUser	: Mainly functions that read/write measurement values
CtlUser	: Mainly functions that start/stop recording on the recorder
PrmUser	: Mainly functions that read/write setting values

[Caution]

The password of each user can only be set on the recorder. The password entry location varies depending on the Modbus function in use.
(For further information on each function, see the pertinent section in the Communication Instruction Manual, Data Viewer Instruction Manual, or Parameter Loader Instruction Manual.)

9.22 Engineering

[Explanation]

This item is for factory adjustment. Do not change the setting.

10. Maintenance

10.1 Recommended Component Replacement Cycles

Component name	Cycle	Remarks
Lithium battery	5 years	You may not replace the battery by yourself. Be sure to contact your dealer or our sales representative.
LCD	50000 hours (the time for the brightness to halve at a temperature of 25°C)	
Power supply unit	10 years	
Built-in memory	10 years	

* The replacement cycle varies depending on the ambient environment and operating conditions.

10.2 Troubleshooting

When the recorder is in use, if an error occurs, it may display an error message in the history window. The table below lists error messages and actions to be taken.

● Error messages

If one of the errors listed below occurs, an error message is displayed in the event message display area at the top of the screen. To clear the error message, press the Fail Off key in the history window. (In the table, n denotes a number and XXX denotes a character string.)

History type	Error message	Action
Event	CHnn AD error	Contact your dealer or our sales representative.
Event	AI CPU error	
Event	SRAM data error (nn)	
Event	Internal battery exhausted	
Event	Parameter setting error	
Event	System setting error	
Event	Clock IC error	
Event	LAN IC error	
Event	Internal memory error	
Event	Graphic IC error	
Event	Internal memory write failure	
Event	Internal memory read failure	
Event	Device-specific data not configured	
Event	CHnn XXX un-calibrated error	
Event	Power failure recovery error (nn)	
Event	WDT error (nn)	
Event	Exception reset error	
Event	Configuration error (XXX)	
Event	Record group n recording start error	It is likely that the number of recording start/stop repetitions with a specified record trigger of "DI" or "Common alarm" has exceeded the limit. Check the DI contacts and review the alarm setting.

History kind	Error message	Action
Event	Auto save overwrite failure	Check whether the record folder on the CF card contains any file that was not output by the recorder. Delete any such files.
Event	CF card read failure	The CF card in use may be damaged. Replace the CF card and retry.
Event	CF card write failure	
Event	Network parameter error	Check the Ethernet settings to confirm that the address setting is correct.
Event	CF card overcurrent detected	The CF card may be faulty. Replace the CF card.
Event	CF card recognition impossible	
Event	USB memory overcurrent detected	The USB memory may be faulty. Replace the USB memory.
Event	USB memory recognition impossible	
Communication	Server n FTPC transfer failure - link down state	Check whether the Ethernet cable is connected correctly.
Communication	Server n FTPC transfer failure - server name error	Confirm the settings on the destination FTP server and on the recorder. Stop recording and conduct an FTP client connection test to check connection with the server.
Communication	Server n FTPC transfer failure - server connection failure	
Communication	Server n FTPC transfer failure - login failure	
Communication	Server n FTPC transfer failure - storage directory error	
Communication	Server n FTPC transfer failure - command error	
Communication	Server n FTPC transfer failure - file storage failure	
Communication	Server n FTPC transfer failure - other error	Contact your dealer or our sales representative.

11. Specifications

11.1 Input Specifications

Number of inputs : Select one of the following according to the model type (when purchasing the product):
6-ch terminal block type : 6, 12, 18, 24, or 30 inputs
12-ch terminal block type : 12, 24, 36, or 48 inputs
Input circuit : Inter-channel isolation
Measurement accuracy: See the "Accuracy ratings" table in Section 11.2
Measuring cycle : 100 milliseconds at every point
Input type : DC voltage, DC current (shunt resistor required*), Thermocouple, RTD, or Other channel
* An internal-shunt model is also available.
Burnout protection : Provided as a standard feature for thermocouple and mV inputs.
Select UP, DOWN, or None.
Reference junction compensation : Select OFF, Internal, DE connection, or DH connection.
Reference junction compensation accuracy : R, S, PR40-20, Au-Fe : ±1°C or less
(Internal compensation) K, E, J, T, G, C, N, PLII, U, L : ±0.5°C or less
CMRR : 140 dB or more (at 50/60±0.5 Hz)
NMRR : 60 dB or more (at 50/60±0.5 Hz)
Input resistance : mV or TC (without burnout protection) : 9 MΩ or more
mV or TC (with burnout protection) : 1 MΩ or more
V : 500 kΩ or more
mA : 100 Ω
(External or internal shunt resistor provided)
Allowable signal source resistance:
mV or TC (without burnout protection) : 10 KΩ or less
mV or TC (with burnout protection) : 0.14 μV/Ω or less
V : 500 Ω or less
RTD : 5 Ω or less (per wire)
Decimal point position : Can be freely specified in the range from 0 to 4.
Note however that the measurement value upper and lower limits are ±32000 as digital values.
Unit of measurement : Any unit can be created for display (up to 8 characters can be used for each unit).
TAG name : Up to 8 one-byte characters can be registered.
Channel exposition : Up to 52 one-byte characters can be registered.
Chanel skip : Channel skip can be enabled or disabled for each channel.
If skip is enabled for a channel, the channel will be ineligible for display and recording.
Input filtering function : Can be enabled or disabled for each channel (first order lag filter)
The time constant can be specified in the range from 0 to 99 seconds.
Moving average function: Can be enabled or disabled for each channel.
The number of samples for averaging can be specified in the range from 1 to 64.
Scaling function : Available for DC voltage (current) input.
Scalable range: ±32000
Square root extraction function: Scaling is based on the result of applying square root extraction to input values.
Scalable range: ±32000
Cut level: Always 1%. Linear scaling is assumed for the input range from 0 to 1%.
Multiple adjustment : Piecewise linear approximation can be applied to up to four points within the linear scaling.

11.2 Accuracy Ratings

Type	Range code	Range	Measurement Range	Unit	Maximum resolution	accuracy	
DCVoltage	000	mV	−10.00 ～ 10.00	−	10μV	±(0.1% + 1digit)	
	001	mV	−50.00 ～ 50.00	−	10μV	±(0.1% + 1digit)	
	002	mV	−200.0 ～ 200.0	−	100μV	±(0.1% + 1digit)	
	003	V	−1.000 ～ 1.000	−	1mV	±(0.1% + 1digit)	
	004	V	−5.000 ～ 5.000	−	1mV	±(0.1% + 1digit)	
	005	V	−20.00 ～ 20.00	−	10mV	±(0.1% + 1digit)	
	006	V	0.000 ～ 5.000	−	1mV	±(0.1% + 1digit)	
	007	V	1.000 ～ 5.000	−	1mV	±(0.1% + 1digit)	
Current Input	008	mA	4.00 ～ 20.00	−	0.01mA	±(0.1% + 1digit)	
Thermo couple	010	R1	0.0 ～ 1200.0	℃	0.1℃	±(0.1% + 1digit)	
	011	R2	0.0 ～ 1760.0	℃	0.1℃	±(0.1% + 1digit)	
	012	S	0.0 ～ 1760.0	℃	0.1℃	±(0.1% + 1digit)	
	013	B	0.0 ～ 1820.0	℃	0.1℃	±(0.1% + 1digit)	Ranges under a span of 0～400℃, can not guarantee accuracy
	014	K1	0.0 ～ 100.0	℃	0.1℃	±(0.1% + 1digit)	
	015	K2	0.0 ～ 600.0	℃	0.1℃	±(0.1% + 1digit)	
	016	K3	−200.0 ～ 1370.0	℃	0.1℃	±(0.1% + 1digit)	
	017	K4	0.0 ～ 1000.0	℃	0.1℃	±(0.1% + 1digit)	
	018	E1	0.0 ～ 150.0	℃	0.1℃	±(0.1% + 1digit)	
	019	E2	0.0 ～ 400.0	℃	0.1℃	±(0.1% + 1digit)	
	020	E3	−200.0 ～ 900.0	℃	0.1℃	±(0.1% + 1digit)	
	021	E4	−200.0 ～ 700.0	℃	0.1℃	±(0.1% + 1digit)	
	022	J1	0.0 ～ 150.0	℃	0.1℃	±(0.1% + 1digit)	
	023	J2	0.0 ～ 500.0	℃	0.1℃	±(0.1% + 1digit)	
	024	J3	−200.0 ～ 650.0	℃	0.1℃	±(0.1% + 1digit)	
	025	J4	−200.0 ～ 300.0	℃	0.1℃	±(0.1% + 1digit)	
	026	J5	−200.0 ～ 900.0	℃	0.1℃	±(0.1% + 1digit)	
	027	T1	0.0 ～ 150.0	℃	0.1℃	±(0.1% + 1digit)	
	028	T2	0.0 ～ 400.0	℃	0.1℃	±(0.1% + 1digit)	
	029	T3	−200.0 ～ 400.0	℃	0.1℃	±(0.1% + 1digit)	
	030	G(W-W26Re)	0.0 ～ 2315.0	℃	0.1℃	±(0.1% + 1digit)	
	031	C(W5Re-W26Re)	0.0 ～ 2315.0	℃	0.1℃	±(0.1% + 1digit)	
	032	N	0.0 ～ 1300.0	℃	0.1℃	±(0.1% + 1digit)	
	033	PR40-20	0.0 ～ 1880.0	℃	0.1℃	±(0.1% + 1digit)	Ranges of 0 to 300℃: ±(2%+1digit), 300 to 800℃: ±(1%+1digit)
	034	U	−200.0 ～ 400.0	℃	0.1℃	±(0.1% + 1digit)	Ranges of −200 to 0℃: ±(0.3%+1dlgit)
	035	L	−200.0 ～ 900.0	℃	0.1℃	±(0.1% + 1digit)	Ranges of −200 to 0℃: ±(0.3%+1dlgit)
	036	Au-Fe	0.0 ～ 300.0	K	0.1K	±(0.5% + 1digit)	
	037	PLⅡ	0.0 ～ 1360.0	℃	0.1℃	±(0.1% + 1digit)	
Resistance Temperature Detector	038	JPt100-1	−50.0 ～ 200.0	℃	0.1℃	±(0.1% + 1digit)	
	039	JPt100-2	−200.0 ～ 600.0	℃	0.1℃	±(0.1% + 1digit)	
	040	Pt100-1	−50.0 ～ 200.0	℃	0.1℃	±(0.1% + 1digit)	
	041	Pt100-2	−200.0 ～ 600.0	℃	0.1℃	±(0.1% + 1digit)	
Other	050	Other CH	− ～ −	−	−	−	

＊ For extended ranges of up to 3 times, the digital display accuracy is ±(0.3% + 1 digit). In the case of DC voltage input, for extended ranges of up to 4 times, the digital display accuracy is ±(0.3% + 1 digit).

The above table assumes the base conditions indicated below. The digital display accuracy does not include the reference junction compensation accuracy.

- Base conditions : Ambient temperature: 23±2°C
  Ambient humidity: 55±10% RH
  Supply voltage: 85 to 264 VAC
  Power frequency: 50/60 Hz±1%
  Warm-up time: 30 minutes or longer since power-on

11.3 Calculation Channel Specifications

Number of inputs : 48 (fixed to CH49 to CH96)

Calculation cycle : 100 milliseconds

Function : Select the function from the following:
Absolute value, Power, Square root, Common logarithm, Natural logarithm, Exponentiation, Relative humidity, Maximum (of 2 inputs, continuous input, or time series), Minimum (of 2 inputs, continuous input, or time series), Average (of 2 inputs, continuous input, or time series), Integrated value, F-value calculation, Rate of change, time elapsed (second, minute, hour, or day), Dew point, or Conditional branching

Timer : Available for the following functions: Maximum (time series), Minimum (time series), Integrated value, and Rate of change
Select either Absolute timer (second, hour, week, day) or Relative timer (second or minute).
The function will be reset at the specified time.

DI trigger : Available for the following functions: Maximum (time series), Minimum (time series), Integrated value, and Rate of change
Select one DI trigger from 1 to 4. The function will be reset upon DI trigger input.

11.4 Alarm Specifications

Number of alarms that can be set: Up to four alarms can be set for each channel.

Alarm types : Upper limit, lower limit, change rate upper limit, and change rate lower limit

Display : When an alarm occurs, it is displayed on the digital display.
The color of the right border of the horizontal trend display area or the bottom border of the vertical trend graph changes to red to indicate that an alarm has occurred.

Hysteresis : Can be configured for each channel.

Alarm delay : Delay time setting range: 0 to 3600 seconds

Alarm output (standard): Common alarm or FAIL alarm.

(Option) :8 ralay, 30 relays or 16DOs can be selected.

Alarm display latch function: A channel where an alarm has occurred is kept blinking until the user confirms the alarm.
Select ON or OFF.

New alarm : If an alarm event occurs, a new alarm is output to a specified relay for a specified time.
Relay: Can be selected from relays Nos. 1 to 8 or inner DOs 101 to 108.
Time: 0 to 999.9 seconds
A value of "0" specifies that the alarm should be output until it is reset.

11.5 Relay Output Specifications

Number of outputs : One common alarm output - C contact (standard)
One FAIL alarm output - C contact (standard)
8 relay output: C contact (No.1 to 8) (optional)
30 relay output: A contact (Nos. 1 to 30) (optional)

Contact capacity : 250 VAC at 3 A max. (resistive load)
30 VDC at 3 A max. (resistive load)
125 VDC at 0.5 A max. (resistive load)

Relay operation : Either OR or AND can be selected.

11.6 DO Output Specifications

Number of outputs : 16 (Nos. 9 to 24) (optional)

Contact capacity : 30 VDC at 20 mA max. (resistive load)

DO operation : Same as in the relay output specifications

11.7 Inner DO Specifications

Inner Dos : 48 DOs (Nos. 101 to 148)

Auxiliary inner Dos : 20 DOs (Nos. 201 to 220)
Always ON, Always OFF, Common alarm output, Fail output, Recording started/stopped state, Record group state, CF card empty, Reserved

Contacts : Can be assigned to 8 relays, 30 relays and 16 DOs.

11.8 Record Function

External recording media:

CF card (up to 8 GB, FAT16/FAT32 only)
- Mount the card from the front slot.
- Available for measurement data recording/reading and parameter reading/writing.
- Use genuine Ohkura supplies.

USB memory (optional, up to 8 GB, FAT32 only)
- Mount the memory from the front slot.
- Available for measurement data recording/reading and parameter reading/writing.
- Use our supplies.

Internal memory : About 450 MB; used for setting data storage and temporary measurement data storage

Recording method : Select from the following:
Start/stop recording by START/STOP button
Start/stop recording by the FUNC button
Start/stop recording by DI
Start/stop recording based on common alarm ON/OFF state
Perform recording according to the schedule (date/time specification)
* A new file name will be used each time recording starts.

Record content : Trends, events, and comment data
These types of data are integrated and recorded into a single file.

Extension : dpk

Data format : Binary only

Pre-record : A function that records the data that existed before recording is triggered by an alarm occurrence or DI ON/OFF.

Data record cycle : Can be specified for each record group.
The cycle at which data should be recorded can be selected from 100 ms, 1 s, 2 s, 3 s, 5 s, 10 s, 15 s, 20 s, 30 s, 1 min, 2 min, 3 min, 5 min, 10 min, 15 min, 20 min, 30 min, or 60 min.

Record groups : 4 groups
Display groups are assigned to record groups.

Record type : Select the data to be recorded during each record cycle, from the following:
Maximum/minimum values
Average values
Instant values

File save cycle : Record data is first saved in the internal memory, then written to the CF card at file save cycles. For one record file, you can select a file save cycle from 10 minutes, 1 hour, 2 hours, 6 hours, 12 hours, 1 day, 1 week, or 1 month.

Trend data : From the measurement data sampled, average values, instant values, or maximum and minimum values are saved at record cycles.

Event data : Recording started/stopped state, alarm ON/OFF, message content, etc. are displayed in the event log window.

Comment data : Comments on the record data can be registered at any point on the time axis. Once a comment is registered, you can confirm it in the comment list window and can jump from the list to the location where the event is registered.

Remaining memory capacity display: The remaining capacity of the internal memory or CF card is displayed as a percent value on the top of the recorder screen. It is possible to specify whether to stop saving to the CF card or delete the oldest data when the CF card capacity is exhausted,. (Recording will continue in either case.)

Save capacity : In the following conditions, data can be recorded for the time indicated in the table below.
[Conditions]
- CF card capacity: 1 GB
- Record type: Maximum/minimum recording
- Events (such as alarms and messages) are not included

Record cycle	1CH	24CH	48CH
0.1 second	80 days	19 days	10 days
1 second	1.5 years	100 days	50 days
1 minute	7 years	7 years	3.5 years

* If the product lifetime has expired, recording is not guaranteed.

11.9 Display Unit

Display screen : 10.4-inch TFT color LCD (640 x 480 dots)
The liquid crystal display may contain some pixels that are always on or always off or may be unevenly bright. Please note that these are due to LCD characteristics, not signifying a failure.

Resolution : 640 x 480 dots (VGA)

Display types : Real-time display
(Vertical/horizontal trend display, digital display, bar graph display, and overview display)
History display
(Historical trends, event log, communication log, and security log)

Trend display color : 16 colors

Group display : 8 groups
Up to 12 channels can be registered with one group.

Split display function : Splits the screen display so that up to 4 groups can be displayed at the same time.

Hardware buttons : Four buttons provided (START/STOP, MENU, FUNC, and LOCK)

START/STOP button	: Starts and stops recording.
MENU button	: Displays various setting windows.
FUNC button	: Executes the assigned function based on the user selection.
LOCK button	: Displays the key lock/unlock window.

Touch panel : Resistance membrane type

Screen savers : Backlight auto-OFF and alarm recovery functions
Brightness setting: 5 steps

Display language : Japanese or English

Backlight lifetime : 50,000 hours (it can be extended if the screen saver function is used)

Bitmap scaling function: A scale (such as triple scale) can be created. (For auxiliary support)
(Vertical/horizontal trend display, bar graph display)

Screen capture : The displayed content can be captured and output as a file.
File type: PNG
Output destination: CF card

11.9.1 Vertical Trend Display

Number of display channels: Up to 12 channels, displayed in display groups

Scale display : None, 1-level, 2-level, or 3-level can be selected.

Scale change : Touch the scale to switch to the desired channel's scale.

Alarm value display : The scale can be marked to indicate an alarm value.

Trip lines : Fixed lines can be added at any positions on the trend display.
Up to four trip lines can be set on each screen. Select from the range of 0-100%.

Trend display refresh cycle: Refreshed in synchronization with the record cycle.

Digital display : Show (ON) or hide (OFF) can be selected.
Either 6-point or 12-point display is automatically selected according to the number of registered display groups.

TAG display : The display content can be selected from the channel number, TAG name, and channel exposition.
The display can be scrolled if the entire TAG cannot be displayed within the field.

Alarm display : The digital values of channels on which an alarm has occurred are displayed in red (digital values are normally displayed in black.)

Split display : Can display in split-screen mode.

Digital display refresh cycle: Always refreshed in 1-second cycles.

11.9.2 Horizontal Trend Display

Number of display channels: Up to 12 channels, displayed in display groups

Scale display : None, 1-level, 2-level, or 3-level can be selected.

Scale change : Touch the scale to switch to the desired channel's scale.

Alarm value display : The scale can be marked to indicate an alarm value.

Trip lines : Fixed lines can be added at any positions on the trend display.
Up to four trip lines can be set on each screen. Select from the range of 0-100%.

Trend display refresh cycle: Refreshed in synchronization with the record cycle.

Digital display : Show (ON) or hide (OFF) can be selected.
Either 6-point or 12-point display is automatically selected according to the number of registered display groups.

TAG display : The display content can be selected from the channel number, TAG name, and channel exposition.
The display can be scrolled if the entire TAG cannot be displayed within the field.

Alarm display : The digital values of channels on which an alarm has occurred are displayed in red (digital values are normally displayed in black.)

Split display : Can display in split-screen mode.

Digital display refresh cycle: Always refreshed in 1-second cycles.

11.9.3 Bar Graph Display

Number of display channels: Up to 12 channels, displayed in display groups

Scale display : 1-level, 2-level, or 3-level can be selected.

Scale change : Touch the scale to switch to the desired channel's scale.

Alarm value display : Alarm value marks can be set near the bar.

Bar graph refresh cycle: Always refreshed in 1-second cycles.

Digital display : Show (ON) or hide (OFF) can be selected.
Either 6-point or 12-point display is automatically selected according to the number of registered display groups.

TAG display : The display content can be selected from the channel number, TAG name, and channel exposition.
The display can be scrolled if the entire TAG cannot be displayed within the field.

Alarm display : The digital values of channels on which an alarm has occurred are displayed in red (digital values are normally displayed in black.)

Split display : Can display in split-screen mode.

Digital display refresh cycle: Always refreshed in 1-second cycles.

11.9.4 Digital Display

Number of display channels: Up to 12 channels, displayed in display groups

Scale display : None

Alarm value display : None

TAG display : The display content can be selected from the channel number, TAG name, and channel exposition.
The display can be scrolled if the entire TAG cannot be displayed within the field.

Alarm display : All alarms in levels 1 to 4 are displayed at the same time.

Split display : Can be displayed in split-screen mode.

Digital display refresh cycle: Always refreshed in 1-second cycles.

11.9.5 Overview Display

Number of display channels: Up to 96 channels and effective channels are displayed regardless of groups.

Scale display : None

Alarm value display : None

TAG display : Channel numbers are always displayed as the TAG names.

Alarm display : If an alarm occurs, the channel is displayed in a red background. Channels where no alarm has occurred are displayed in a green background.

Split display : Can be displayed in split-screen mode.

Digital display refresh cycle: Always refreshed in 1-second cycles.

11.9.6 Historical Trend Display

Number of display channels: Up to 12 channels, displayed in display groups

Scale display : None, 1-level, 2-level, or 3-level can be selected.

Scale change : Touch the scale to switch to the desired channel's scale.

Digital display : Show (ON) or hide (OFF) can be selected.
Either 6-point or 12-point display is automatically selected according to the number of registered display groups.

TAG display : The display content can be selected from the channel number, TAG name, and channel exposition.
The display can be scrolled if the entire TAG cannot be displayed within the field.

Alarm display : The digital values of channels on which an alarm has occurred are displayed in red (digital values are normally displayed in black.)

Compressed time axis display: Compressed display in the ratio of 1/1, 1/2, 1/4, 1/8, or 1/16 is possible.

Split display : Not possible

11.9.7 Event Log Display

Display content : Alarm ON/OFF, recording started/stopped, message events, and various types of errors
Up to 200 event history records can be displayed.

11.9.8 Communication Log

Display content : FTP client/server connection log
Up to 200 communication history records can be displayed.

11.9.9 Comment Log

Display content : Comments registered for historical trend
Up to 200 comment history records can be displayed.

Comment jump : Jump to the historical trend display of the date/time the event occurred

11.9.10 Security Log

Display content : Recording started/stopped, CF card/USB memory attachment/detachment, and parameter change
Up to 200 security history records can be displayed.

11.10 Security Specifications

11.10.1 Key Lock Function

Parameter lock : A function that places restrictions on viewing and/or changing of parameter settings.

System lock : A function that places restrictions on viewing and/or changing of system settings.

User registry : Up to 20 users who can use the product can be registered. For each user, a level can be specified.

11.10.2 Communication Security Function

Modbus security : Places restrictions on Modbus write accesses using the login function.
Enable (ON) or disable (OFF) Modbus security can be specified.

11.10.3 Falsification Prevention Function

Damage warning function : A function that detects whether any change has been made to a measurement file after it is output to the recorder.(Data Viewer)

11.10.4 Parameter Log

Parameter log : A function that automatically saves parameter settings in an internal parameter file each time a setting change is made so that history data can be retained. The log can hold up to 200 entries.

Parameter log output : Log data can be output to a CF card or USB memory in form of a parameter file.

11.11 Communication Specifications

11.11.1 Ethernet (Standard)

Communication stantard : 100BASE-TX

Connection : Rear connection

FTP server :

File access : Record files saved in the CF card or USB memory can be downloaded or deleted.

Access authentication : FTP server access permission authentication can be configured.

FTP client : Data can be transferred to the FTP server.

HTTP server :

Measurement values display: Measurement values and alarm states of individual channels can be displayed as digital values on the PC.

SNTP client : The time can be synchronized with the SNTP server time.

Modbus TCP/IP:

Data loading : Measurement values and settings can be loaded using the Modbus TCP protocol.

Data write : Settings can be written using the Modbus TCP protocol.

11.11.2 RS-485 (Optional)

Protocol : Modbus RTU

Communication speed : 9600, 19200, or 38400 bps

Communication method : Two-wire half-duplex, start-stop synchronization

Data format : Data length : 8 bits
Stop bit : 1 bit
Parity : Even, Odd, or None

Maximum device connections: 32 including the master (multi-drop)

Communication distance: Up to 500 m (total length)

11.12 Power Supply Unit

Rated supply voltage : 00 to 240 VAC

Operating supply voltage range : 85 to 264 VAC

Rated power frequency : 50/60 Hz

Operating power frequency : 45 to 65 Hz

Instantaneous power failure : Normal operation possible if the failure duration is 50 ms or shorter.

Withstand voltage : 2 kVAC, 1 min between power and ground terminals
0.5 kVAC/1 min between input terminals

Insulation resistance : 20MΩ or more at 0.5kVDC (Between each terminal－ground terminal)

Power consumption:

Supply voltage	Power consumption
100 VAC	65 VA or less
240 VAC	100 VA or less

11.13 Standards compliance

CE Marking	: EMC Directive	: EN61326-1 (certification pending)
	Low Voltage Directive	: EN61010-1 (certification pending)

11.14 Conditions for Normal Operation

Ambient temperature	: 0 to 50°C
Ambient humidity	: 20 to 80% RH (at 0 to 40°C)
Mounting position	: Front inclination of 0°, rear inclination of within 30°, and horizontally level
Mounting method	: Panel-embedded (panel thickness: 2 to 15 mm)
Shock resistance	: 2 m/s^2 or less
Vibration resistance	: 10~60Hz, 1m/s^2 or less

11.15 Structure

Mounting method	: Panel-embedded mounting (vertical panel)		
Material	: Case	: Steel sheet	
	Front panel	: Aluminum die cast	
Coating color	: Case	: Metallic silver	
	Front panel	: Black (standard)	
Outside dimensions	: Short type		
	288 mm (W) x 288 mm (H) x 260 mm (D)		(6ch terminal block type)
	: 288 mm (W) x 288 mm (H) x 285 mm (D)		(12ch terminal block type)
	Long type		
	: 288 mm (W) x 288 mm (H) x 340 mm (D)		(6ch terminal block type)
	: 288 mm (W) x 288 mm (H) x 365 mm (D)		(12ch terminal block type)
Weight	: 6ch terminal block type	: 10 kg or less	
	12ch terminal block type	: 13 kg or less	

External terminal block: M4 screw terminals

11.16 Other

Clock	: Calendar function provided (calendar year)
	Accuracy ±10 ppm (monthly error of approximately 30 seconds) or less
	This value does not include errors at power ON/OFF.
Memory backup	: Parameter data is saved in internal memory.
	The clock data is backed up by the built-in lithium battery
	(the lifetime of which is power down the device 5 years).
Withstand voltage	: 2 kVAC, 1 min between power and ground terminals
	0.5 kVAC, 1 min between input and ground terminals
	0.5 kVAC/1 min between input terminals
Insulation resistance	: 20 MΩ or more at 0.5 kVDC between each terminal and the ground terminal

11.17 Transportation and Storage Conditions

Temperature : -10 to 60°C
Humidity : 5 to 90% RH
Vibration : 2.45 m/s^2 at 10 to 60 Hz
Shock : 249 m/s^2 or less (when packaged)

11.18 Additional Functions (Optional)

11.18.1 DIs

Number of DI inputs : Non-voltage contact inputs (5 or 24 inputs) sharing a common ground
DI input function : Selected from the following
Record group start/stop
Message
LCD backlight ON/OFF control
DI trigger
Alarm display unlatch
A DI input can also be used as a measurement value.
Recognizable pulse width : 500 ms or wider

11.18.2 Relays

Number of relay outputs : 8 or 30
Relay output function : See Section 11.5 for details.

11.18.3 DOs

Number of DO outputs: Open-collector output (16 outputs) sharing a common ground
DO output function : See Section 11.6 for details.

11.18.4 RS-485

See Section 11.11.2 for details

11.18.5 USB Port

Number of ports : One port at the front. The USB-A port is a female connector.
Function : USB memory connection
USB memory connection: Mass Storage Class
USB 2.0 High-Speed (HS) compatible
Used for measurement data recording/reading and for parameter reading/writing.

11.18.6 Anti-Seismic Option

anti-seismic specification	: vertical	±10 mm amplitude	2~7Hz
		19.6m/s^2 or less	7~33Hz
	: for quarters	±10 mm amplitude	2~10Hz
		39.2m/s^2 or less	10~33Hz

Be fixed by anti-seismic support.

11.19 Support Software

Supported PC models: PC/AT-compatible PCs

Disk device : CD-ROM drive supporting Windows XP/Vista/7

Hard disk capacity : Free space of at least 500 MB

OS : Windows XP/Vista/7

Printer : Printer and printer driver supporting Windows XP/Vista/7

11.19.1 Loader Software Running on PCs

Functions : Recorder parameter set-up and change

Calculation channel setting

File write

11.19.2 Data Viewer Software Running on PCs

Functions : Measurement data file viewing

Graph printing

Comment entry

11.20 Options

■ Options

Name	Model
Shunt resistor for DC current input (100 Ω ± 0.1%)	HMSU3081A07
CF card (1 GB)	WMSU0682A01
CF card (8 GB)	WMSU0682A08
USB memory (2 GB)	WMSU0683A02
Paperless Recorder Instruction Manual (printed version)	WMSU0685A0111
Data Viewer Instruction Manual (printed version)	WMSU0685A0001
Parameter Loader Instruction Manual (printed version)	WMSU0685A0002
Communication Function Instruction Manual (printed version)	WMSU0685A0211

11.21 Soft Option

CODE	FUNCTTON	DESCRIPTION
A01	Open input protection	Sets Indicator at over 100% or 0% per Inputs when input becomes open for TC or ± 50mV max. Input.
A02	Zone indicate	Indicating on the Chart track ranged per Inputs. (*1)
A03	Expanded/ compression indicate	Partial compression and enlargement in the same range can be done. (*1)
A08	Digital Filter	Applies a digital filter (first-order-lag filter) to measurement value, and performs display and record.
A10	Integration sum	Indicates and records sum among channels. (※ 2)
A11	Integration balance	Indicates and records balance among channels. (※ 2)
A12	Average among channels	Indicates and records average among channels. (※ 2)
A13	Moving average	Indicates and records the moving average results of the measurement value of a specification channel.
A14	Calculation channels	Uses the independent calculation function of a maximum of 48 channels, and indicates and records a result.
A15	Logarithmic scale	Indicates and records measurement value by logarithmic scale. (※2)
A16	Alarm display	Indicates the specified H and L alarm values on the scale.
A17	Trip line	Indicates a fixed line on the arbitrary parts on a graph.
A18	Auto display	Changes display groups automatically by a fixed cycle.
A19	Progress Time Counter	Indicates progress time, such as the record time, ON time of DI, alarm occurrence time.
E01	Temperature balance	The actual temperature after subtracting the reference temperature of reference channel is designated and recorded.
E02	New alarm	New alarm channel is output in one-shot relay.
E03	Multipoint Adjustment	Adjusts the input of a specification channel by a multipoint, and performs directions and record.
E10	Key lock	Restricts operation on the items specified in Locked items area when the lock applies. Once the lock is reset, operation on all setting items is permitted User control.
E11	User control	Permits each user to perform operations on the items specified for the user when the user is logged in. When the user is logged out, operation on all setting items is restricted.
E12	Special scale	Indicates arbitrary image on a scale. (only as for the recorder)
D02	DE connection	To execute the compensating temperature, taking in, the inside temperature of outside compensating box by thermocouple input of the set channel.
D03	DH connection	To execute the compensating temperature, taking in, the inside temperature of outside compensating box by the voltage wire (copper wire) of the set channel.
N01	FTP server	Enables access of a CF card from an external FTP client.
N02	FTP client	Outputs record data to an external FTP server automatically.
N03	SNTP Client	Acquires time information from an external SNTP server, and synchronizes.

*1 Indication accuracy rating may change by setup.

*2 Carry out using A14 operation channel. Please unite A14 and specify.

●DI REMOTE FUNCTION

CODE	FUNCTION	DESCRIPTION
B01	DI Record	Close : Recording start Open : Recording stop It can assign each recording group.
B02	LCD ON/OFF	Close : LCD ON Open : LCD OFF (according to the LCD settings)
B03	DI Trigger	Close : executes DI Trigger function.
B04	Alarm Reset	Close : execute Alarm reset
B05	Message Record	Close : execute Massage recording