INST.No.INE-815E

CHINO

Graphic Recorder

KR3000

General

Instruction Manual

INSTRUCTIONS

Thank you for purchasing the KR3000 series graphic recorder.
Before using your new recorder, please be sure to read this instruction manual that will advise you on how to use the instrument correctly and safely and how to prevent problems.

CHINO

CONTENTS

PREFACE

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Before using your new recorder, please be sure to read this instruction manual that will advise you on how to use the instrument correctly and safely and how to prevent problems.

1. Separate instruction manuals

This instruction manual describes the optional specifications of alarm output and report application of appendix as well as the operation of standard specifications. When the instrument is with the high order or low order serial communications interfaces (option), the separate instruction manual for communications interfaces is attached. For other options you specified, their instruction manuals are attached respectively. Read these instruction manuals together with this manual.

2. Request

- Request to instrumentation engineers, constructors, and sale agents
  Make sure to deliver this instruction manual to the operator of this instrument.
- Request to the operator of this instrument
  This instruction manual is necessary for maintenance, too. Keep this manual with care until the instrument is discarded.

3. Attention while unpacking

- Do not drop the recorder while taking it out of the box
- When transporting this recorder, pack the instrument in the original box and then put it with cushions in another box. We recommend keeping the original box for transport.
- When not using the recorder for a while after taking it from the panel, put the recorder in the original box and store at room temperature and in a dust free atmosphere.

4. Disposal

4-1.Disposal

Separate the box, plastic bags, and cushioning materials the recorder is packaged in according to the garbage collection method of the each community, and please cooperate to recycle.

Caution	1. A small amount of hazardous substance below the specified level with RoHS directive is included in this recorder.
	2. When disposing the recorder always request a professional to do it or contact your dealer or our nearest office.
	3. This recorder includes a lithium battery. When disposing the lithium battery, first remove the battery and always request a professional to do it.

⚠ Warning

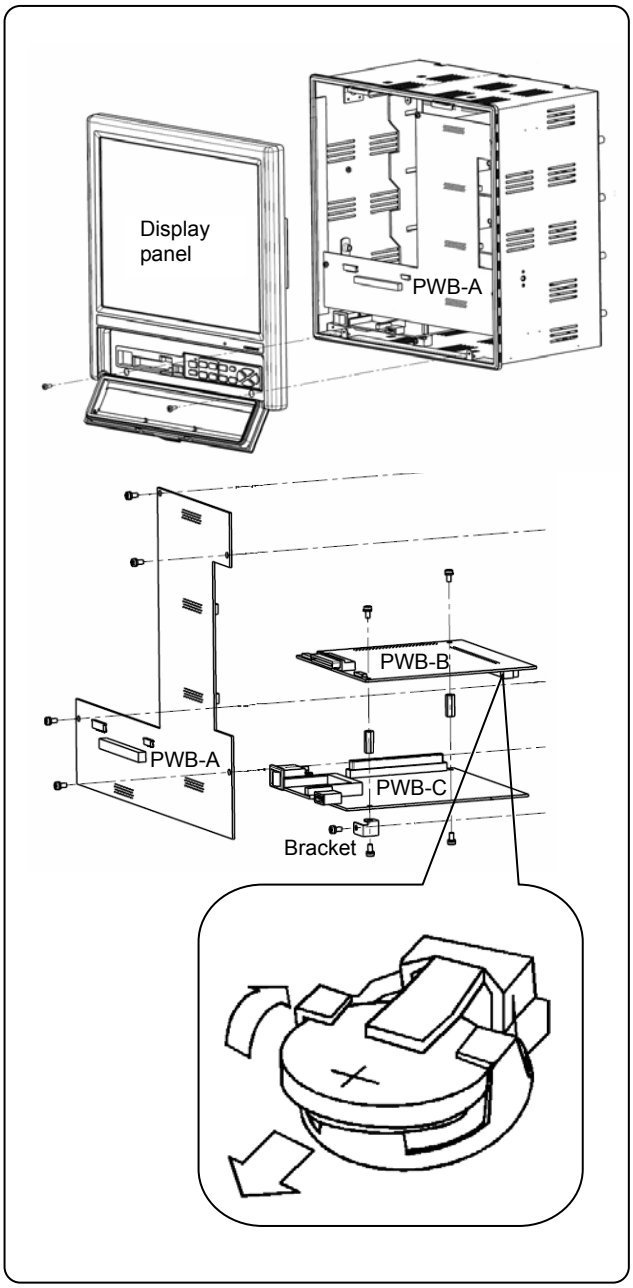
Perchlorate Material

This instrument uses battery with Perchlorate Material.
Special handling may apply, see
http://www.dtsc.ca.gov/hazardouswaste/perchlorate

4-2.Battery removal method

Do not replace the battery. Doing so might cause damage or malfunction. Do not remove the battery, except when disposing the recorder.

(1) Open the key cover and remove the 2 retaining screws.
(2) Pull the bottom of the front display panel toward you and lift up to remove the front display.
(3) The front display is connected to PWB-A by 1 type of cable. Disconnect it.
(4) PWB-A is connected by 3 types of cables. Disconnect them.
(5) Remove the 4 screws holding PWB-A, and pull it out.
(6) Remove the screw of the mounting bracket under PWB-C.
(7) Disconnect the connector for the power switch cable on the left side of PWB-C and pull out both PWB-B and –C as a set.
(8) Remove the 2 screws holding PWB-B and –C together, and separate PWB-B from PWB-C.
(9) The battery holder is attached to the underside of PWB-B. Lift the front of the battery with a tool having a nonconductive tip and pull the battery out of the holder.



1 For safe use

This section “For safe use” has been compiled to promote the correct use of the instrument in order to prevent human injury or damage to property before they occur. Please read the following information carefully and be sure to observe the warnings and cautions in it.

1. Preconditions for use

This instrument is designed for indoor use by mounting it on an indoor instrumentation panel.

2. Labels on this instrument

The following labels are used for safe use.

Label	Name	Meaning
	Alert symbol mark	Indicates the location which should refer to the manual in order to prevent an electric shock and injury.
	Protective conductor terminal	A terminal is provided for connection to the protective conductor of the power supply facility for the prevention of an electric shock.

3. Symbols in this manual

The cautions to be observed for preventing the damage of this instrument and unexpected accidents are sorted by the following symbols according to their importance degrees for enabling operators to use this instrument safely.

Warning	The nonobservance of information under this symbol may result in hazardous, critical or serious injury to the user.
Caution	The nonobservance of information under this symbol may result in a hazardous situation or a light injury to the user or in physical damage to the property.
Remarks	This symbol shows a caution when the instrument dose not function as specified or when such a possibility exists.
Reference	This reference servers as a supplement for handling and operation, and it may be convenient for the user.

Caution

■ Front glass

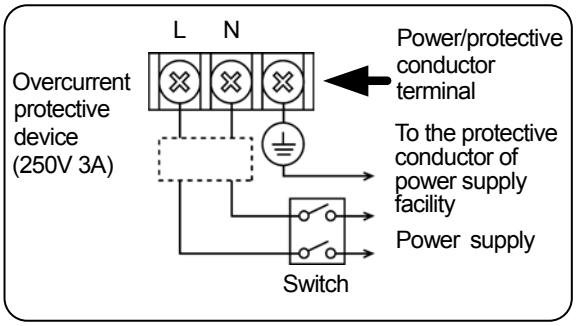
- The front of display part is made by glass. To avoid injuries due to broken glass, do not blow the glass hard.
- Do not rub or push the touch panel by a sharp edged tool or a sharp material.
- For dirt on the front glass, wipe it lightly with a soft cloth infiltrated with neutral detergent or alcohol into soft cloth.
- Coordinates cannot read normally if two points are pushed simultaneously. Push one point in operations.

⚠ Warning

This paragraph covers important warning for safety to be observed before reading the instructions. Fully understand the following warning before reading this manual. These warnings are important for preventing the damage to human bodies as well as accidents.

1. Switch and overcurrent protective device

This recorder is not provided with a replaceable overcurrent protective device. Prepare a switch and an overcurrent protective device for the power supply (circuit breakers, circuit protectors or the like) within 3m of this recorder in a location where the operator can access easily Use a switch and an overcurrent protective device conforming to IEC947-1 and IEC947-3.



2. Be sure to ground this instrument

Before turning the power on, connect the protective conductor terminal of this recorder to the protective conductor of the power supply facility. In order to prevent an accident by electric shock, do not disconnect this connection during operations.

Reference Fuse in the power supply

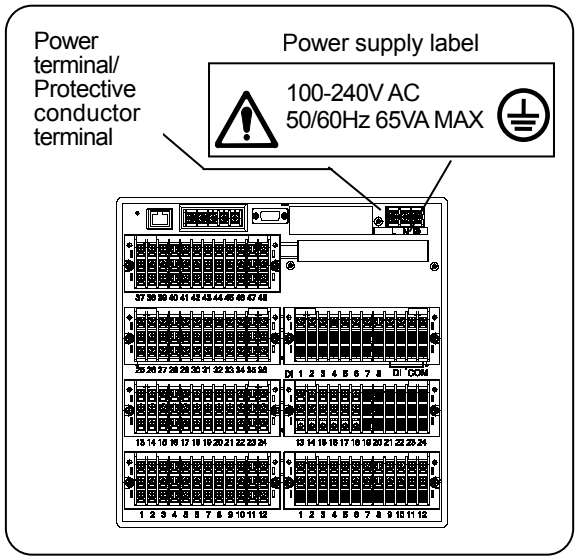
The following fuse is mounted in the power supply unit of this recorder for safety use. However, this fuse is not replaceable.

Maker: Daito Communication Apparatus Co., Ltd

Model: SBL32

3. Before turning on the power supply

In order to ensure safety, before turning on the external power switch, make sure that the power voltage is within the range indicated on the power supply label.



4. Don't repair or modify this instrument

Make sure that any persons other than service engineers approved by CHINO CORPORATION do not repair or modify this instrument by replacing parts. Otherwise it may be damaged or will not function normally or an accident such as electric shock may occur. For ordinary operation, it is not necessary to pull out the internal unit.

5.Use this recorder following this instruction manual

Use this recorder correctly and safely by following this instruction manual. CHINO CORPORATION will not be responsible for any injury, damage, lost profit or any other claim, which may result from its wrong use.

6. Turn off the power supply if an abnormal symptom occurs

Turn off the power supply immediately and contact your local CHINO's sales agent if any abnormal odor, noise or any smoke occurs, or if this recorder becomes high temperature that is too hot to be touched.

2 Main features and functions

Besides measuring temperature and various industrial quantities of multi channels and displaying real time trends, bar graphs, numeric values, etc. in various formats on 12.1 inch TFT color LCD, this recorder can store data into the internal memory or a memory card (a CF card) and replay them if required. Stored data can be used using commercial software like EXCEL, etc.

Easy management of measurement result	The monitoring of measurement results is easy since the data are displayed on various formats of screens. The previous data stored in the CF card can be read and the stored data can be managed using commercial software like EXCEL (Registered trademark of Microsoft Corporation), etc.
Various screen displays	Real time trends, bar graphs, data (in a table format) and combined displays of “real time trends and bar graphs”, “real time trends and numeric values” and “real time trends and historical trends” can be arbitrarily selected and monitored with most suitable screens to meet your requirements. As alarm display screen displaying past alarm activation status collectively and a marker list screen are also available. In addition, up to 6 groups can be registered. With easy operation, these screens can be switched and 4 separate screens can be displayed.
Various memory functions	Start/stop of data storage can be executed by arbitrary condition settings like key operation, alarm settings, time settings, etc. and the simultaneous storage to maximum 6 files can also be executed. In normal operations, data are stored into the internal memory and can be saved on the CF memory card.
Analog recorder feeling	As the trend screen displays data on a chart with scale plates and pointers, the data can be monitored like an analog recorder.
Marker function	Markers and marker texts (alphanumeric characters, maximum 30 characters) can be written on the trend screen. A marker text is written arbitrarily, and also 50 types of marker texts can be registered in advance and these marker texts can be written with key operations. The marker texts can be written on the historical trend screen (replay), too. Markings only without marker texts are also available.
MODBUS communication	Parameter settings, data acquisition and operation can be executed with the optional high order communication. As the communication protocol utilizes MODBUS, this recorder can communicate with a program indicator equipped with the MODBUS protocol without creating any communication software and the configuration of a system is easy. (MODBUS: The registered trademark of Schneider Electric SA)
Consumables not required	Since consumables like charts, pens and inks as used in recorders are not required, this recorder is clean and less time consuming.
Easy setup	The easy interactive parameter setting offers parameter settings by selecting a setting item from the menu screen with key or touch-panel operation and then by opening a window. Also the operation can be executed easily with the required parameter settings on the ”Simple settings (HOME)” screen.
Software package is available	Data analysis can be executed easily on the PC as software package for data analysis is available. ● Software for analysis : (Windows98,Me,2000,XP version)

3 Before use

Check the following items before using the recorder. If something is wrong, contact your local CHINO's sales agent.

3.1 Exterior check

Check that the instrument is not broken on the outer side.

3.2 Model check

The model number and serial number of this recorder can be confirmed by the label on the upper side of the case.
Check the model of your instrument from the model code before use.

■ Model code

KR31□ - □□A

Model (Check with model code.) — KR31✳✳-✳✳✳
Serial No. — K3✳✳✳✳✳✳✳
MADE IN JAPAN

Measurement point/Sampling rate
- 20: Universal input 12 points (100ms)
- 40: Universal input 24 points (100ms)
- 60: Universal input 36 points (100ms)
- 80: Universal input 48 points (100ms)
- 21: Universal input 12 points (1s)
- 41: Universal input 24 points (1s)
- 61: Universal input 36 points (1s)
- 81: Universal input 48 points (1s)

Communication interface (option)
- N: None
- R: High order communication (RS-232C)
- S: High order / Low order communication (RS-422A/RS-485)

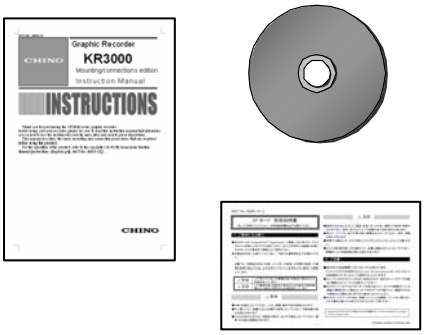
Alarm output, Contact iutput (option)
- 0: None
- 1: Mechanical relay output (12 points ‘a’ contact)
- 2: Mechanical relay output (6 points ‘c’ contact)
- 3: Mechanical relay output (24 points ‘a’ contact)
- 4: Mechanical relay output (12 points ‘c’ contact)
- 5: Mechanical relay output (12 points ‘a’ contact) + Mechanical relay output (6 points ‘c’ contact)
- A: No-voltage contact input (8 points)
- B: Mechanical relay output (12 points ‘a’ contact) + No-voltage contact input (8 points)
- C: Mechanical relay output (6 points ‘c’ contact) + No-voltage contact input (8 points)
- D: Mechanical relay output (24 points ‘a’ contact) + No-voltage contact input (8 points)
- E: Mechanical relay output (12 points ‘c’ contact) + No-voltage contact input (8 points)
- F: Mechanical relay output (12 points ‘a’ contact) + Mechanical relay output (6 points ‘c’ contact) + No-voltage contact input (8 points)

3.3 Checking attachments

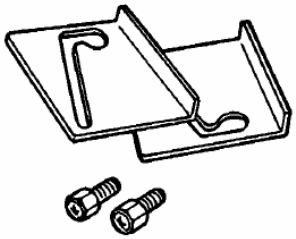
Package contains the following attachments. Please confirm.

Parts name	Quantity	Remarks
① Instruction manual	1	INE-815☐ (General) CD-ROM INE-817☐ (Communications interfaces)
	(1 copy)	INE-816☐ (Mounting/connections edition) A4 Booklet
	1	RZMC-01-☐ (CF card)
② Mounting bracket	1set	For panel mounting
③ Wrench	1	
④ Terminal screw	5	For input and alarm (digital input) terminals (M3.5) (Spares for missing)
⑤ CF card	1	RZ-CMC128 (128MB)
⑥ Touch pen	1	For touch panel operation

① Instruction manual



② Mounting bracket

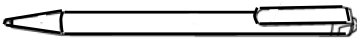


④ Terminal screws

③ Wrench

⑤ CF card

⑥ Touch pen



4 Installation

4.1 Mounting location

In order to avoid unfavorable effects on the measurement accuracy and recording operation, install this recorder at the following locations.

1) Industrial environment
Select a place away from a source generating an electric field and/or a magnetic field and where mechanical vibrations/shock is not existed.

● Over voltage category • • • • II (EN standard)	● Altitude • • • • • • • 2000m or less
● Pollution degree • • • • • • • • 2 (EN standard)	● Place of use • • • • Indoor

2) Ambient temperature/humidity
Keep away from direct sunlight and do not close an area around this recorder to avoid temperature increase.
- ●Place with stable ambient temperature of around 23°C and humidity 50%RH
- ●Place not exposed to hot blast (50°C or more) for avoiding deformation of the front panel
- ●Place where there are no wind and no heat source near terminals for avoiding measurement errors.

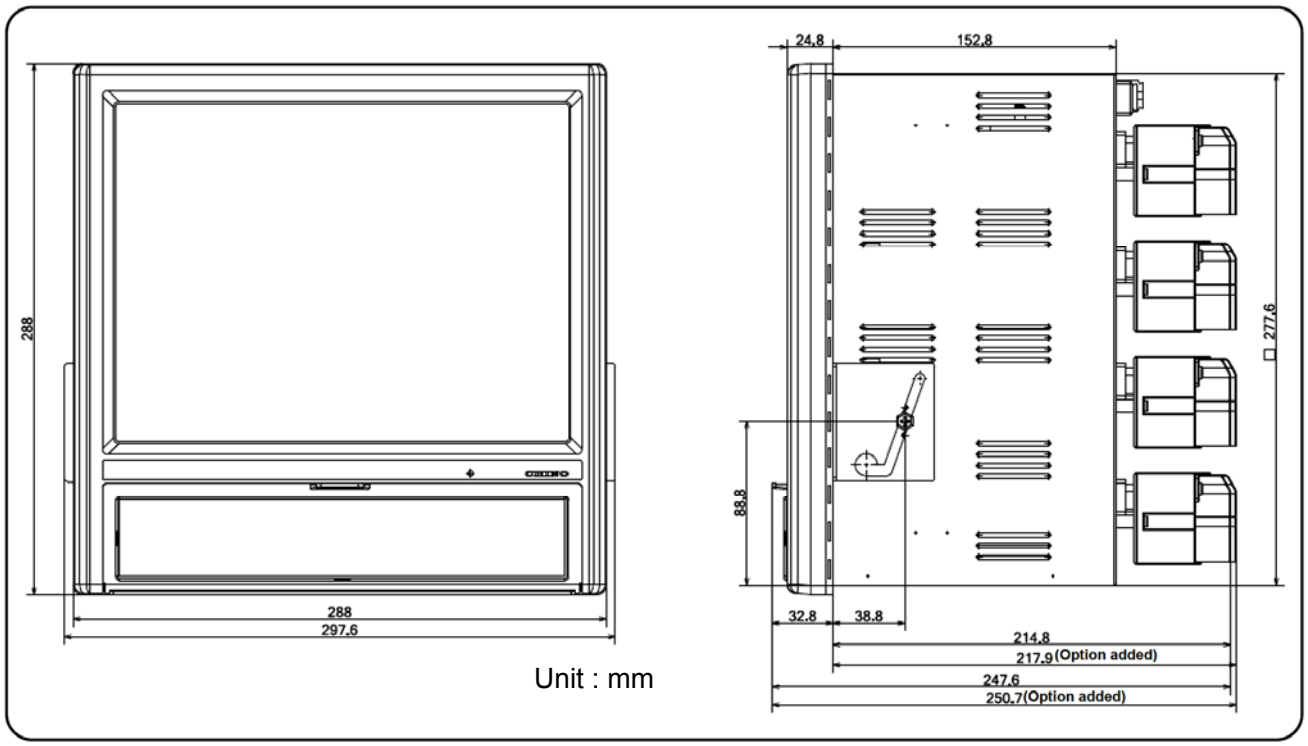
3) Atmosphere
- ●Avoid a place where flammable gases exist.
- ●Avoid a place with dust, smoke, vapors etc.

4) Mounting angle
- ●Lateral tilting • • • 0°
- ●Longitudinal tilting • • • Forward tilting: 0°, Backward tilting: 0-20°

Mounting angle other than the above angles will have unfavorable effects on recording operation.

4.2 External dimensions

The following figure shows the dimensions of this recorder with its mounting brackets.



Unit : mm

4.3 Method of mounting the panel

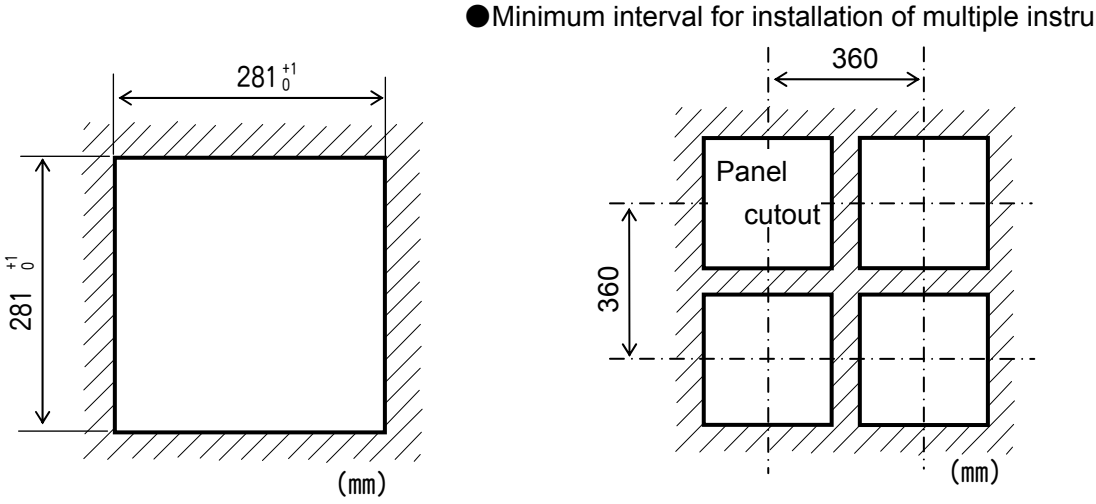
⚠Warning

■ Mount on the panel and use

(1) This instrument has been designed to be mounted on an indoor instrumentation panel.

(2) Use a panel made of a steel plate of 2mm to 6mm in thickness or a panel equivalent in strength.

1) Panel cutout size



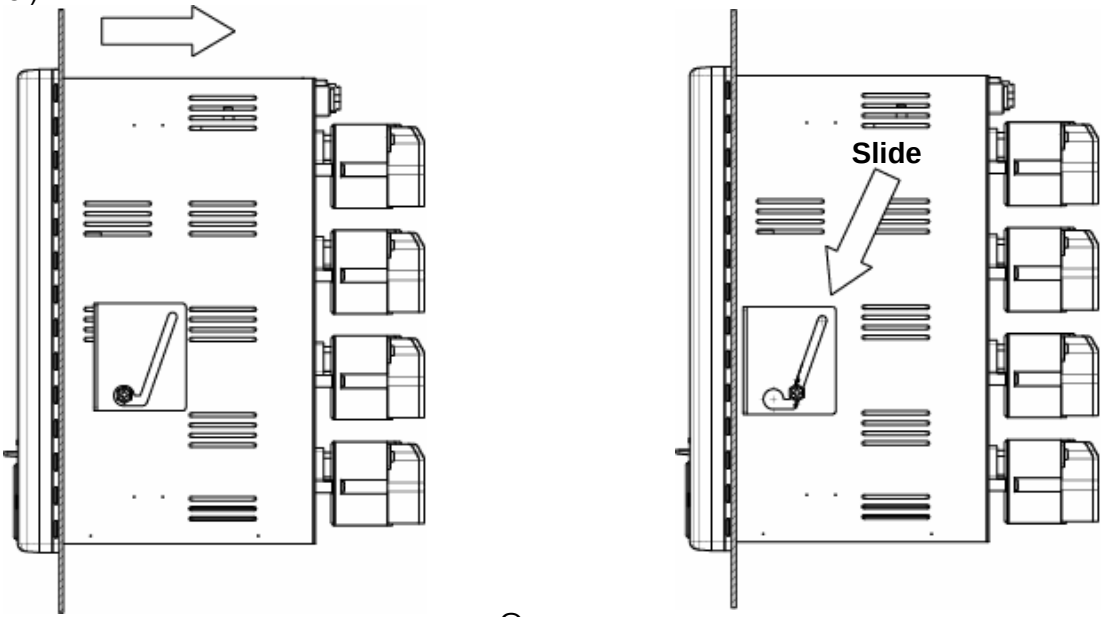
2) Mounting method

(1)Insert this recorder into the panel cutout part of an instrument panel.

(2)Since there is a screw hole each (a total of two holes) in the right and left sides of this recorder, screw 2 fixing screws attached in two holes lightly.

(3)Next, put the hexagon head of this screw to the circular hole of the fixing metal and push the recorder to the instrument panel firmly (from front) while making the fixing metal slide as shown in the figure. On this condition, tighten the fixing screw with the attached wrench or a Phillips screwdriver.

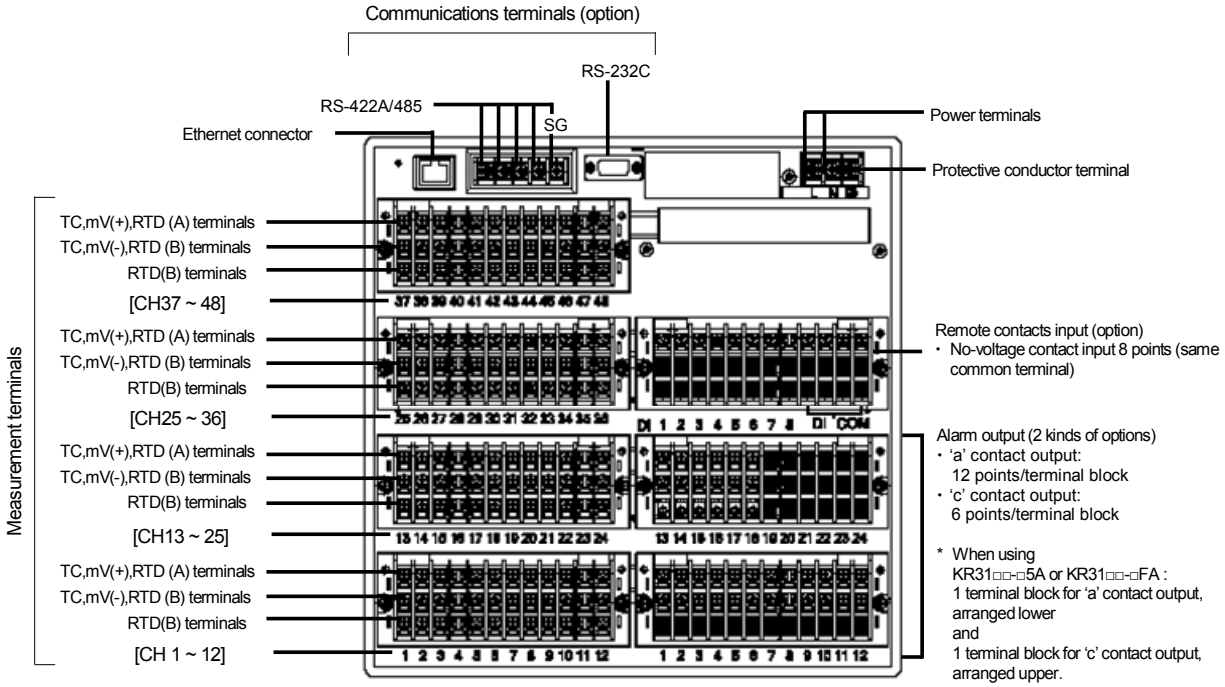
In addition, be careful that the mounting metals differ by right and left. (Install the recorder by two persons.)



5 Connections

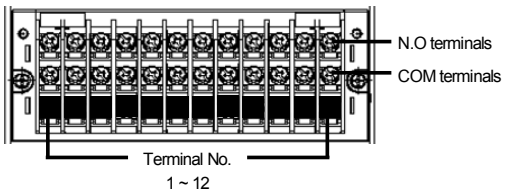
5.1 Terminal board arrangement

The following diagram shows the terminal board arrangement in which option (Alarm relay output [12 points ‘a’ contact], [6 points ‘c’ contact], communication interface) are mounted. Connecter for Ethernet is a standard mounting.

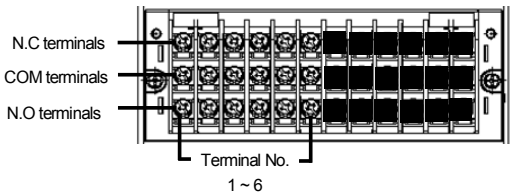


[Option terminal block (* May be changed.)]

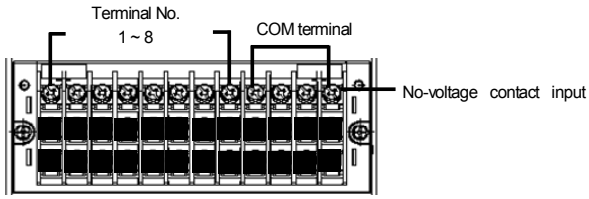
● Alarm relay output (12 points ‘a’ contact)



● Alarm relay output (6 points ‘c’ contact)



● Digital input (No-voltage contact input, 8 points)



⚠ Warning

■ Alert symbol marks (⚠) and places

The alert symbol mark (⚠) is pasted at danger places where may cause electric shock. (See the following table.)

Name of terminals	Power terminals	Measuring input terminals	Mechanical relay 'c' contact alarm terminals	Mechanical relay 'a' contact alarm terminals
Places marked with the symbol	Lower left of power terminals	Lower right of terminal cover	Lower right of terminal cover	Lower right of terminal cover

Reference Input terminal and alarm terminal blocks are removable

The input terminal block and alarm terminal block (including the contact terminal block) are removable for easy connections.

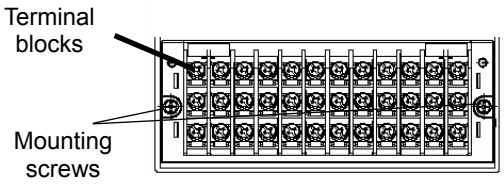
(1) Each terminal block can be removed by removing two mounting screws.

(2) Each terminal block is connected to the recorder by a connector.

⚠ Caution

■Turn off the power supply in advance

For mounting or dismounting the terminal block, turn off the external power switch to prevent the electric circuits from being damaged.



Remarks Replacement of thermocouple input terminal block

Thermocouple input terminal block cannot be replaced by terminal block of other instrument.

If replaced measurement error occurs.

5.2 Precautions while connections

Observe the following cautions during connections for securing safety and reliability.

1) Power supply

Use a single-phase power supply having a stable voltage without any waveform distortion for the purpose of preventing wrong operations.

⚠ Warning

(1) A switch and an overcurrent protective device

Prepare a switch and an overcurrent protective device (3A) to the power supply for preventing an electric shock accident during connection work. This recorder is not provided with any replaceable fuse.

(2) Turn off the power supply before connections.

Be sure to turn off the power supply before connecting cables to the power and the input/output terminals to prevent an electric shock.

2) Keep the input/output connections away from a high voltage power circuit

Don't place the input/output cables close or in parallel with any strong power circuits including power line. Place the cables 50 cm or more away from high voltage power circuits when they are placed close or in parallel to other circuits.

3) Keep the thermocouple input away from a heat source

For thermocouple inputs, keep the input terminals away from a heat source (a heating body) to reduce a reference junction compensation error. Don't expose the input terminals to direct sunlight, etc.

4) Keep all connection cables away from noises

Keep all connection cables away from noise source as far as possible, otherwise unexpected malfunction may occur. Provide a solution if the cables cannot be separated from a noise source due to unavoidable circumstances.

Major noise sources	• Electromagnetic switch, etc. • Power line having waveform distortion • Inverter • Thyristor regulator
Counter measures	Insert noise filters between power terminals and input/output terminals. A CR filter is often used.

5) Use crimp style terminals

(1) Fix crimp style terminals to termination of connection cables for preventing the looseness or disconnection of terminals and a short-circuit failure between terminals.

(2) Use the crimp style terminals with insulation sleeve for preventing an electric shock.

6) Unused terminals

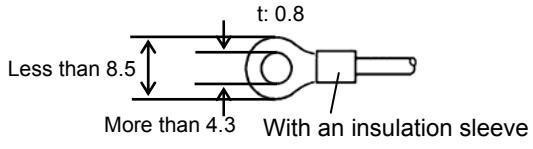
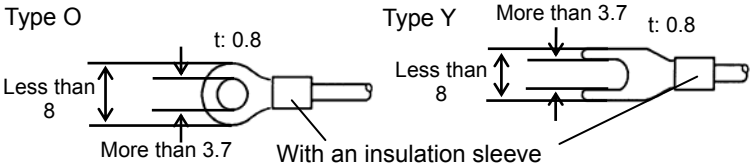
Don't use any unused terminals for relaying; otherwise the electric circuits may be damaged.

⚠ Warning

■ Secure the connected cables properly.

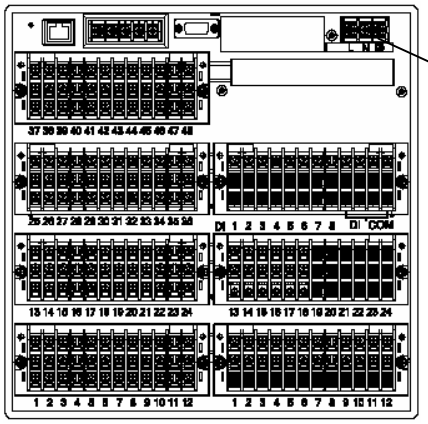
Secure the connected cables so as not to allow them to be hooked by a person or a substance, otherwise the connections may be cut and disrupted that may cause an electric shock or other accidents.

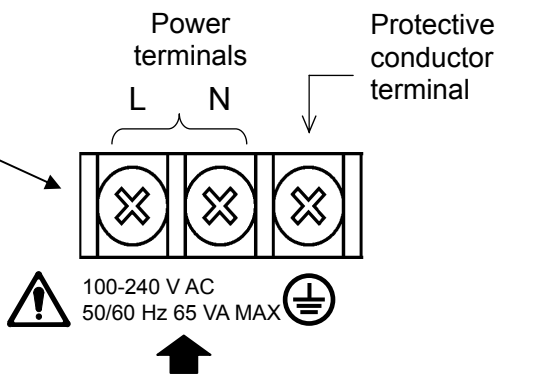
Kinds of terminals and termination

Terminal name	Screw diameter	Tightening torque	Termination (Unit: mm)
Power and protective conductor and communication terminals	M4	1.2N • m	Type O 
Terminals other than described above	M3.5	0.8N • m	Type O Type Y  *Use Type O whenever possible.

5.3 Connection of power and protective conductor terminals

1) Power and protective conductor terminals





Power supply (voltage, frequency, power consumption)

⚠Warning

■ Turn off the power supply.

Be sure to turn off the power supply before connecting cables to the power and protective conductor terminals to prevent an electric shock.

2) Connection of power terminals

For connection to the power terminals, use a 600 V PVC insulated cable terminated by the crimp style terminals with insulation sleeve.

Note) Use the cords approved by the following standards.

(1) IEC 227-3
(2) ANSI/UL817
(3) CSA C22.2 No.21/49

3) Connection of protective conductor terminal

Be sure to connect this terminal to the protective conductor of the power supply facility. For this connection, use a cable terminated by the crimp style terminals with insulation sleeve.

• Grounding wire:
Copper wire 2 mm^2 or more (green/yellow)

⚠Warning

■ ⚠ mark at power terminals

A voltage of 100 to 240 V AC is applied to the power terminals after connections. Be sure to mount the power terminal cover to prevent an electric shock.

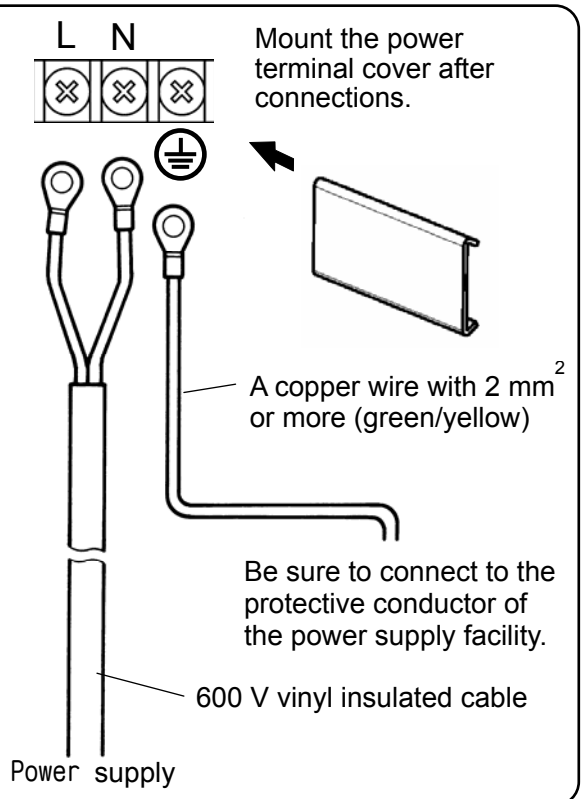
Remarks L/N indication of power terminals

This indication conforms to the CSA standard, Canada. The live side of the single-phase AC power supply is indicated as L, and the neutral side is indicated as N. Observe the L and N connections for obtaining satisfactory performance.

⚠Caution

■ Be careful with the power voltage and noises.

The power voltage of this instrument is indicated beside the power terminals.
Don't apply any voltage other than indicated; otherwise a malfunction may result.
If noise is generated at the power supply, provide a noise reduction transformer, etc.



5.4 Connection of measuring input terminals

1) Measuring input terminals

Be sure to turn off the power supply to prevent an electric shock.

- For the connections to the input terminals, use cables terminated by the crimp style terminals with insulation sleeve

⚠Caution

■ Allowable input voltage

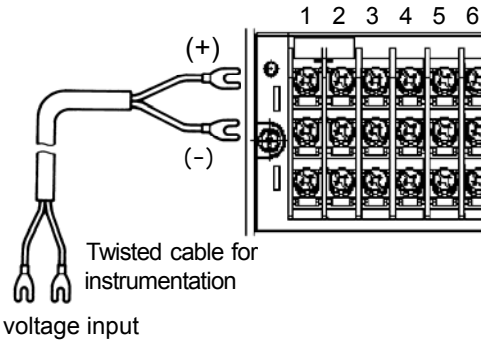
Input type	Allowable input voltage
Voltage, thermocouple input	±10 V DC*
Resistance thermometer input	±6 V DC

* ±60 V DC with channel settings to the ±5 V or higher range.

2) Connections of DC voltage (current) input

Use twisted cables for instrumentation as the input cables for the purpose of suppressing noises. For current inputs, mount shunt resistors to the channels to be measured before connections.

- DC voltage (current) input ⚠



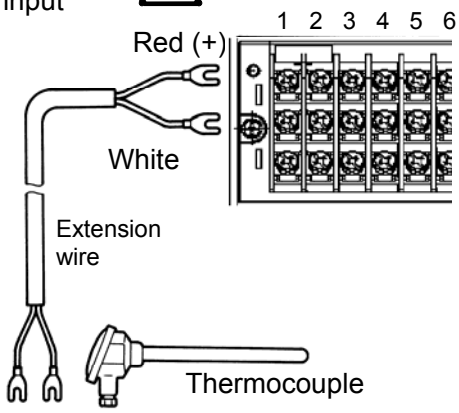
Remarks Isolation of measured input terminal

TC, mV(+), RTD(A) terminal and TC, mV(-), RTD(B) terminal are insulated each channels but RTD(B) terminal is short-circuited between channels. KR31*0 is short-circuited between channel 1 to 4, 5 to 8, 9 to 12 of each input terminal unit, and KR31*1 is short-circuit channel 1 to 12 of each unit.

3) Connections of thermocouple (TC) inputs

Be sure to use thermocouple wires (or extension wires) to the input terminals of this recorder. If a copper wire is used halfway, a noticeable measuring error occurs. Don't use a pair of thermocouple wires in parallel with other instruments (controller, etc.), otherwise a malfunction may occur.

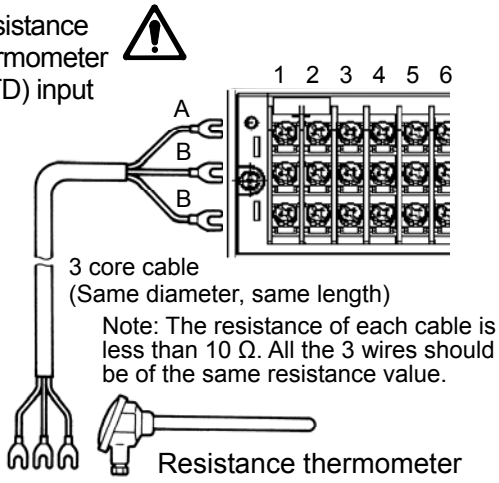
- Thermocouple (TC) input ⚠



4) Connections of resistance thermometer (RTD) inputs

Use a 3-core cable where each lead wire has an equal resistance value. Don't use one resistance thermometer in parallel with other instruments (controller, etc.).

- Resistance thermometer (RTD) input ⚠



⚠Warning

■ ⚠ mark of measuring input terminals

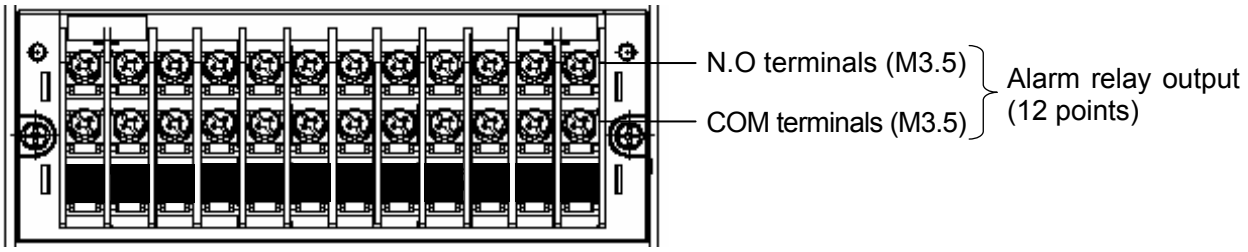
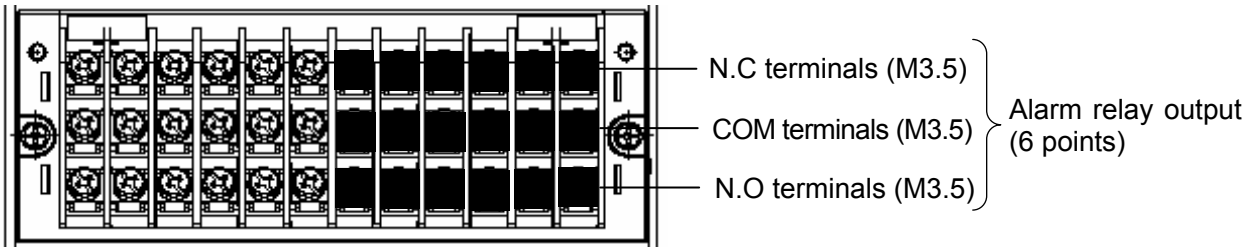
A high voltage may be applied to the measuring input terminals due to common mode noises. The allowable noise value is lower than 30 V AC or lower than 60 V DC. Make sure that the noises are lower than the allowable values. Mount the terminal cover after connections for the purpose of preventing an electric shock and to protect the input wires. In the case of thermocouple input, the mounting of the terminal cover can reduce the reference junction compensation error.

5.5 Connection of alarm output terminals (option)

This is for the recorder with alarm output terminals (option).

1) Alarm output terminals

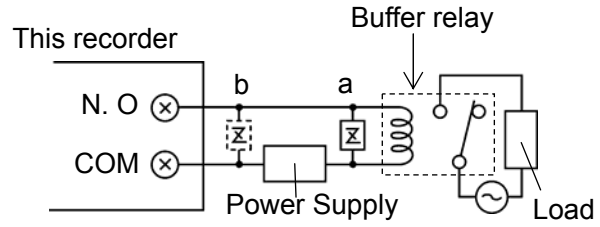
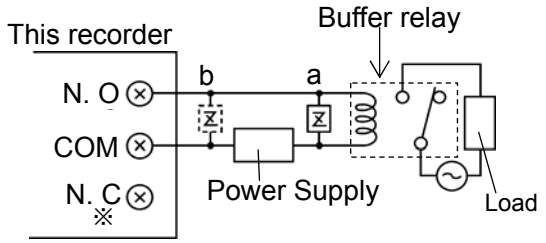
The terminal arrangement depends upon the type of alarm output.

Alarm relay output (1a)

Alarm relay output (1c)


2) Connections

Turn off the power supply and buffer relay power supply before connections to prevent an electric shock.

(1) Connect cables to the load via a buffer relay.
(2) Use cables with the crimp style terminals with insulation sleeves for the alarm output terminals.
(3) If a voltage of more than 30 VAC or 60 VDC is to be applied to the output terminals, use type O crimp style terminals with insulation sleeves. Furthermore, use double-insulated wires (dielectric strength of 2300 VAC or more) for the signal wires on which a voltage of more than 30 VAC or 60 VDC is to be applied. For all other wires, use basic insulated wires (dielectric strength of 1390 VAC). Be sure to mount the terminal cover to prevent an electric shock.

Example of mechanical relay 'a' contact outputs	Example of mechanical relay 'c' contact outputs
 Z : Contact protective element (It is recommended to mount this element on the a side)	 Z : Contact protective element (It is recommended to mount this element on the a side) ※N.C terminal - Open relay contact at alarm activation that is the reverse action to N.O terminal.

⚠ Warning

■ ⚠ mark of alarm output terminals

Connect a load not exceeding the specified contact capacity to the alarm output terminals. A buffer relay power supply is applied to the alarm output terminals after connections. Do not touch these terminals since an electric shock will occur. Be sure to mount the terminal cover after connections.

⚠ Caution

■ Take a safety measure.

An alarm output of this recorder may become defective caused by wrong operation, failures, and other abnormal inputs.
Take a safety measure against an output failure before use as occasion calls.

3) Precautions for connection

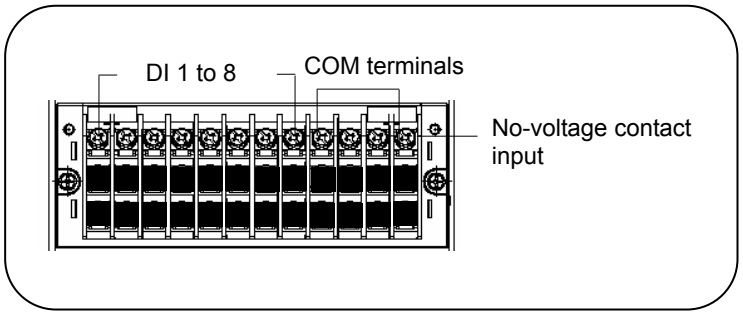
Be careful with the following cautions for connections.

Item	Contents
Contact rating of Mechanical relay outputs (Common to 'a' contact and 'c' contact)	Power supply / Resistive load / Inductive load: 100 V AC / 0.5 A / 0.2 A; 240 V AC / 0.2 A / 0.1 A; 30 V DC / 0.3 A / 0.1 A (Minimum load) 100μA 100mVDC
Mounting of contact protective element Z	● Mount a contact protective element conforming to the buffer relay. The relay is broken, if a signal exceeding the contact rating is applied even if momentarily. ● To prevent a malfunction being caused by a light load, the most effective mounting position for the element is on the coil side of the buffer relay ('a' in the connection diagrams under (2) on 5.5)
Selection of buffer relay	(1) Coil rating ..... Less than the contact rating of output terminals (2) Contact rating ..... More than twice the load current A coil surge absorption element built-in type relay is recommendable. Mount an additional buffer relay if a buffer relay satisfying the load rating is not available.
Selection of contact protective element	Mount a contact protective element if a surge absorption element built-in buffer relay is not available. This element is generally composed of C (capacitor) and R (resistor). <Reference values of C•R> C : 0.01 μF (Rating about 1 kV) R :100 to 150 Ω (Rating about 1 W)

5.6 Connection of digital input terminals and function selection (option)

This is for the recorder with digital input terminals (option)

1) Digital input terminal



Remarks Features of digital input terminal

- Voltage when the contact is open. : Approx. 5 V
- Current when the contact is short. : Approx. 2 mA

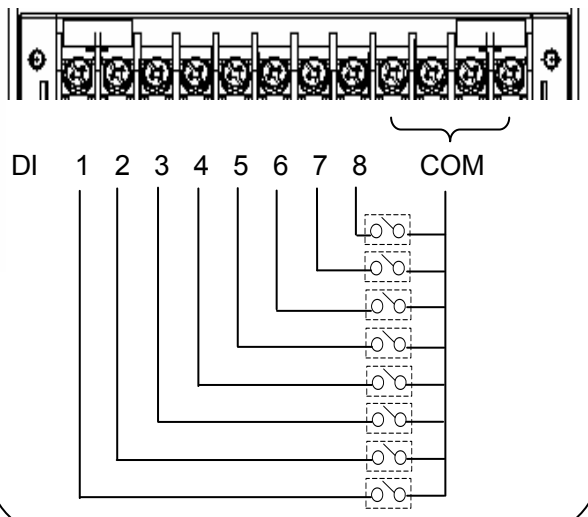
2) Connections

Turn off the power supply before connections to prevent an electric shock.

(1) Apply a no-voltage contact signal to digital input terminals.

(2) Use cables terminated by crimp style terminals with insulation sleeves for the digital input terminals.

■ Connection example



⚠Caution

■ No-voltage contacts

For the contacts to be connected to the Digital input terminals, use a switch or relay driven at lower than 30 V AC or lower than 60 V DC, or manual contacts for very light loads.

■Functions of terminals

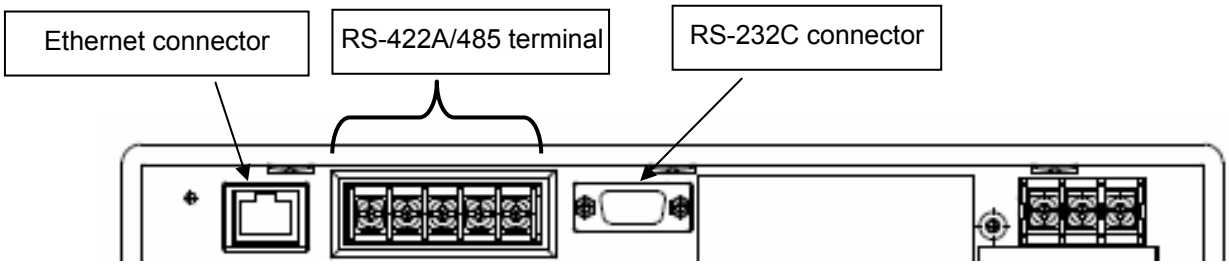
(1) Digital input	ON/OFF (short/open) state can be measured. Select the range type as DI. (Refer to Para.13.2 Input operation settings.)
(2) Pulse input	Used as the pulse input. Select the range type as Pulse (+) and Pulse (-). (Refer to Para.13.2 Input operation settings.)
(3) Totalizer reset	The reset of totalizer is executed. When the digital input terminal specified becomes ON, the totalizer reset is executed. (Refer to Para.13.6 Totalizer reset settings.)
(4) Marker	The writing of marker. The marker can be written on the trends when the digital input terminals become ON. (Refer to Para. 13.8 Marker text settings.)
(5) File drive	The recording start/stop of data file in the internal memory is executed. The recording starts or stops when the digital input terminals become ON or OFF. (Refer to Para. 13.5 File settings.)

● Each function requires a short circuit of 0.1 second or more between the COM terminal and each terminal.

5.7 Connection of communication I/F terminal (partly option)

The KR3000 can be communicated with a master unit via Ethernet and RS-232C, RS-422A or RS-485, and with a slave unit via RS-422A or RS-485.

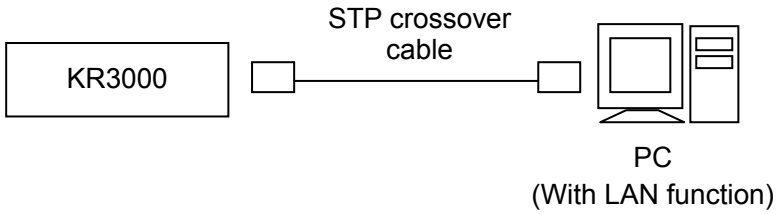
*RS-232C /422A /485 terminal and serial communication function are optional.



1) In case of high order communications via Ethernet

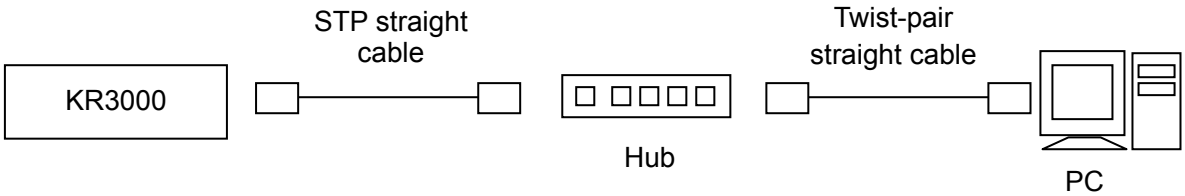
[In case of connection with a PC by 1 to 1]

For the connection of a PC and the Ethernet IF by 1 to 1, use the STP crossover cable.

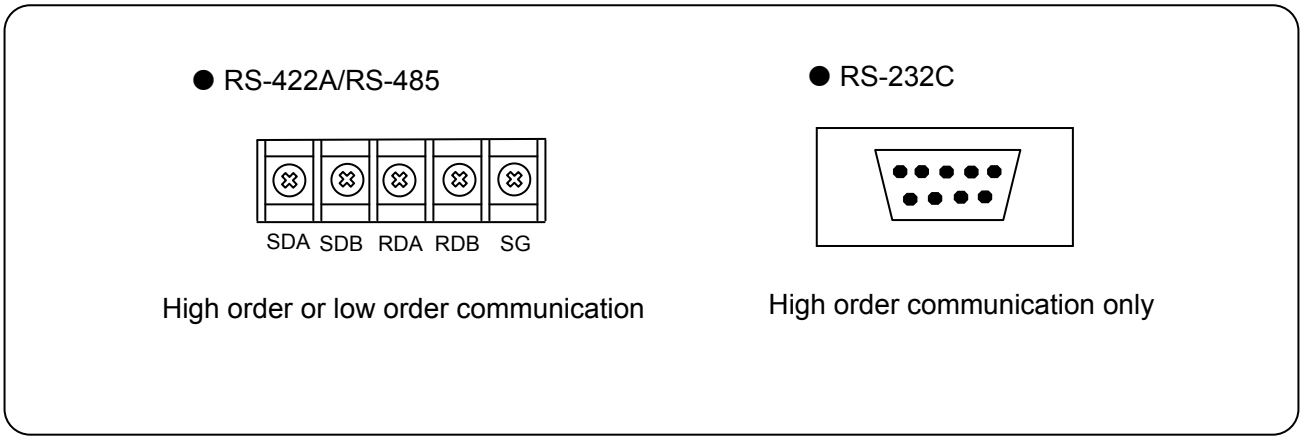


[In case of connections with PCs by N to N]

For the connection to multiple PCs or an existing LAN, use a switching hub and an STP straight cable between the hub and the Ethernet IF.



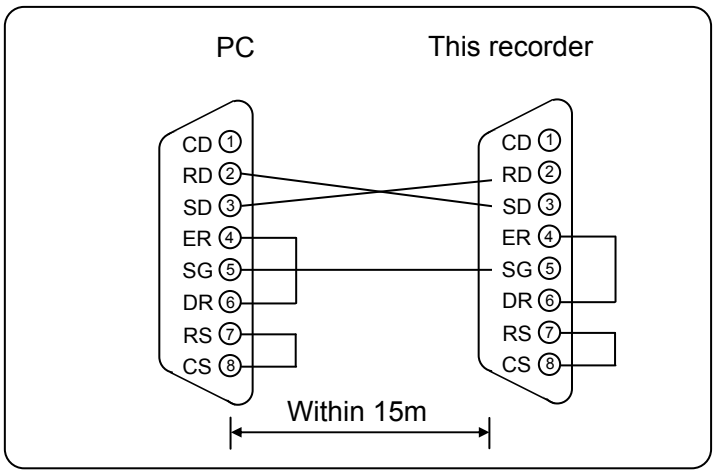
2) Types of communication terminals



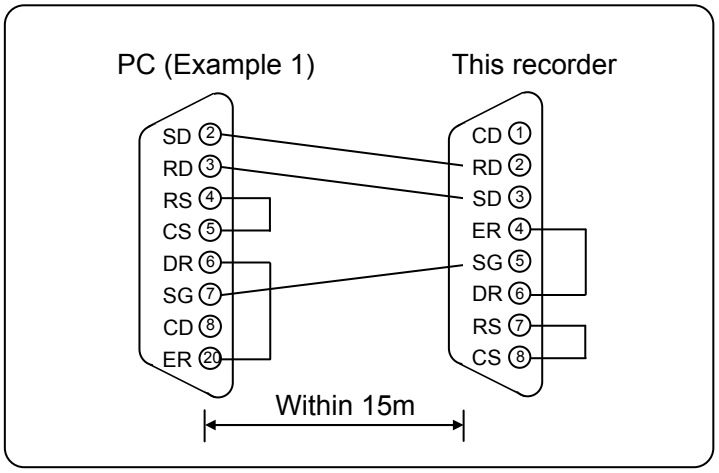
3) Connections of High order communication RS-232C

The communication terminals of this recorder are three terminals of SD, RD and SG and a control signal is not used. General personal computers use the control signal. Wiring processing for control signal in a connector depends upon how the control signal is used in a personal computer. For details, refer to the instruction manual for your personal computer.

(1) Example of 9-pin connector

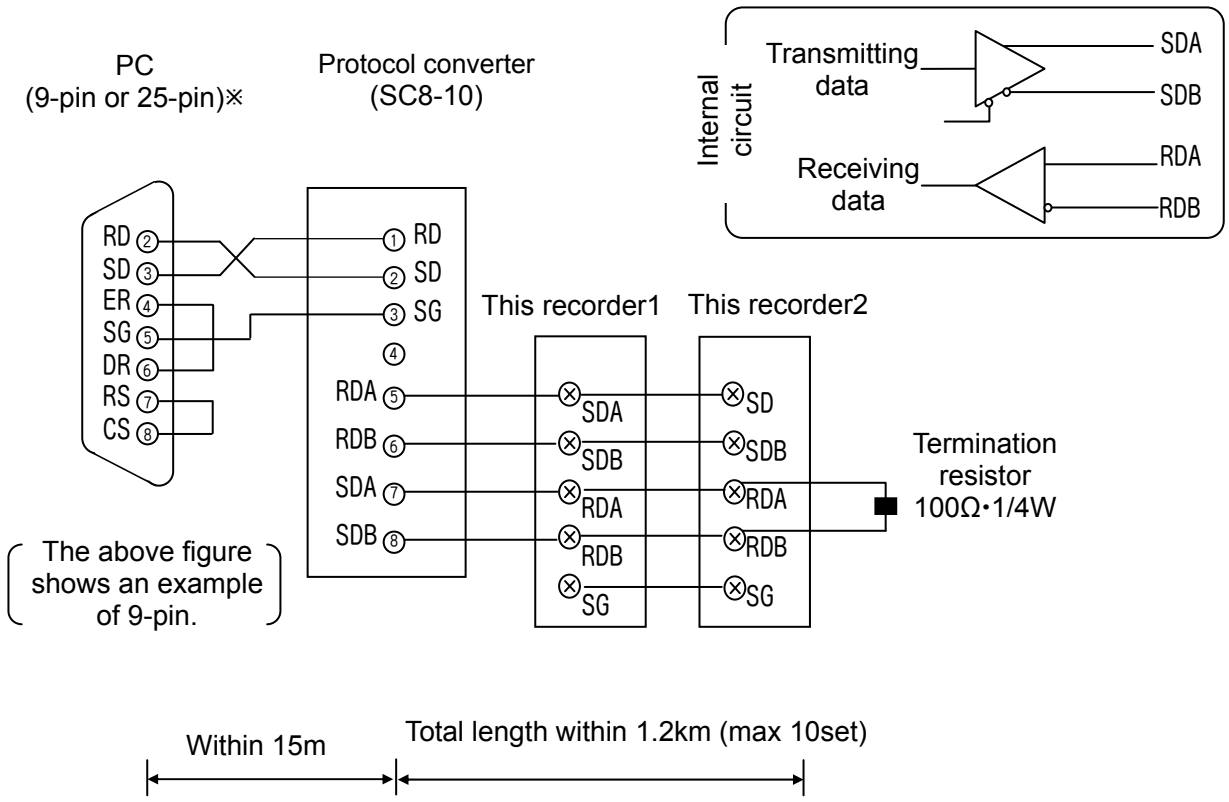


(2) Example of 25-pin connector



4) Connections of High order communication RS-422A

The RS-422A communications interface is connected to a personal computer via a protocol converter (our Model SC8-10: sold separately). Three signals of SD, RD and SG are used between the protocol converter and a personal computer and a control signal is not used.



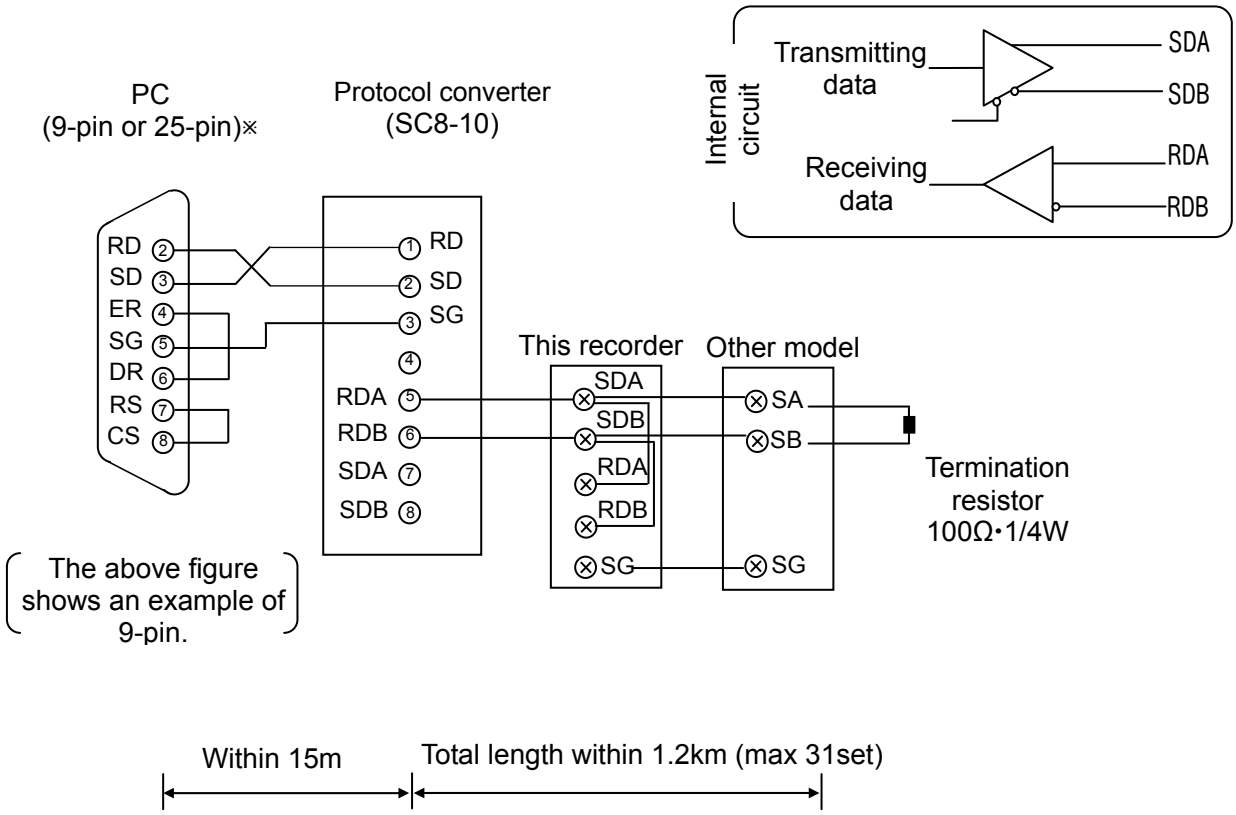
※For wiring process of connector, refer to “3) Connection of High order communication RS-232C”.

Remarks Mounting termination resistor

To ensure the transmission of data via RS-422A communications, mount a termination resistor at the ends of receiving lines. When the protocol converter (SC-8) is at an end of a transmission circuit, short the terminals of ④ and ⑤ of the unit to insert the termination resistor automatically.

5) Connections of High order communication RS-485

The RS-485 communications interface is connected to a personal computer via a protocol converter (our Model SC8-10: sold separately). Three signals of SD, RD and SG are used between the protocol converter and a personal computer and a control signal is not used.



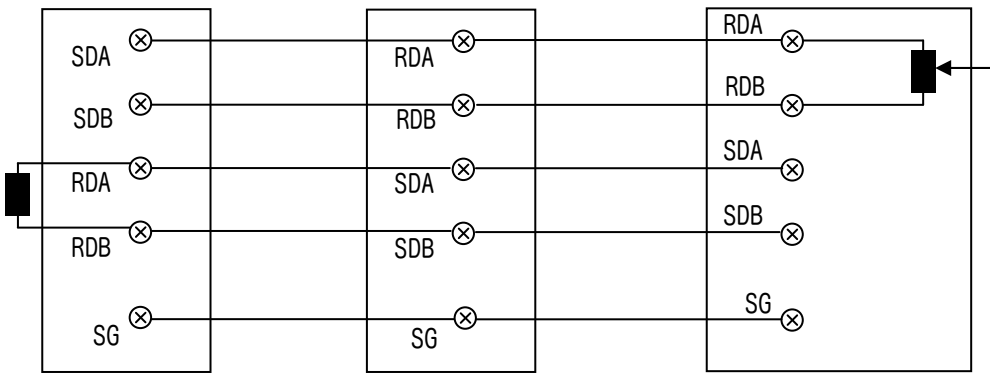
※For wiring process of connector, refer to “3) Connection of High order communication RS-232C”.

Remarks Mounting termination resistor

To ensure the transmission of data via RS-485 communications, mount a termination resistor at both ends of transmission lines. When the protocol converter (SC-8) is at an end of a transmission circuit, short the terminals of ④ and ⑤ of the unit to insert the termination resistor automatically.

6) Connections of Low order communication RS-422A

Example of connection 1

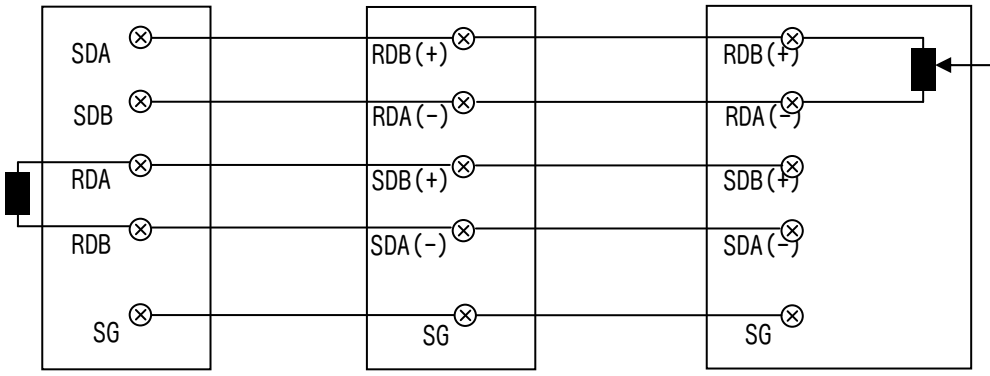


KR3000 Low order communication terminal

KE3000 etc.

SE3000, MELSEC etc.

Example of connection 2 (SYSMAC)



KR3000 Low order communication terminal

SYSMAC

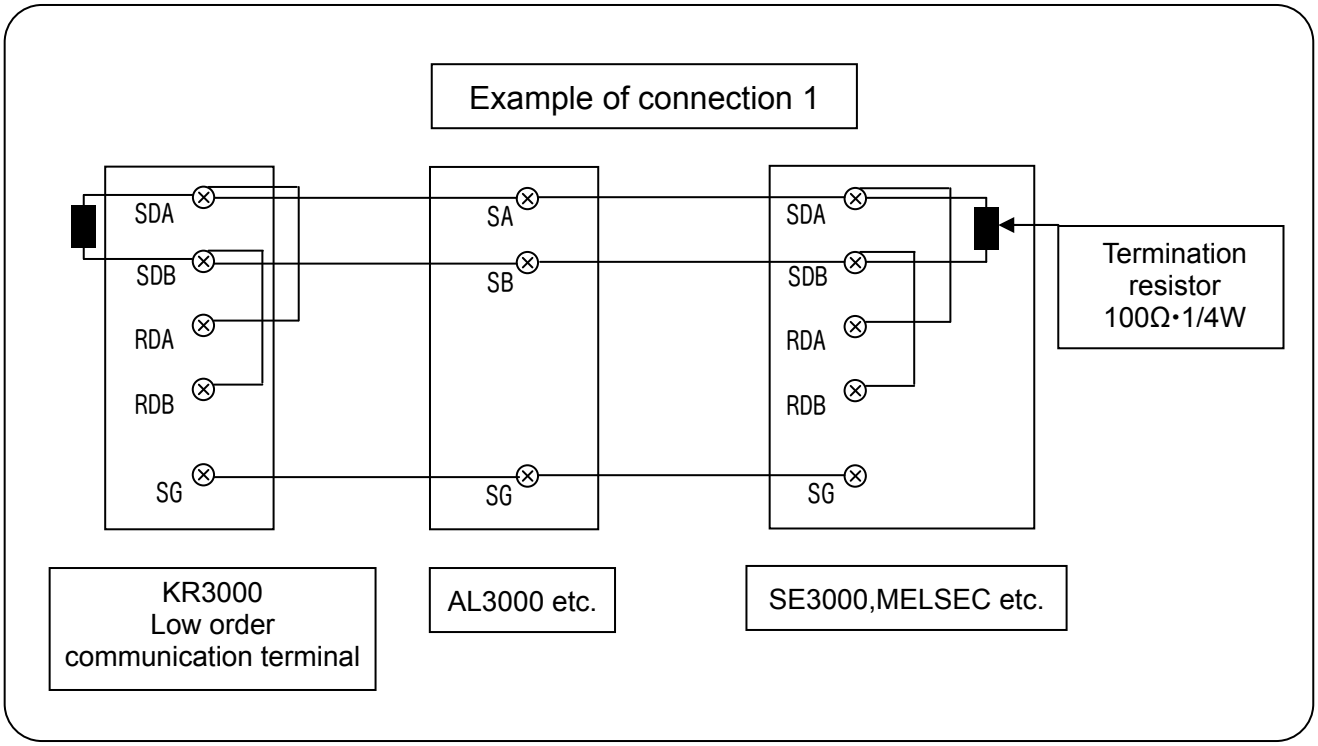
SYSMAC

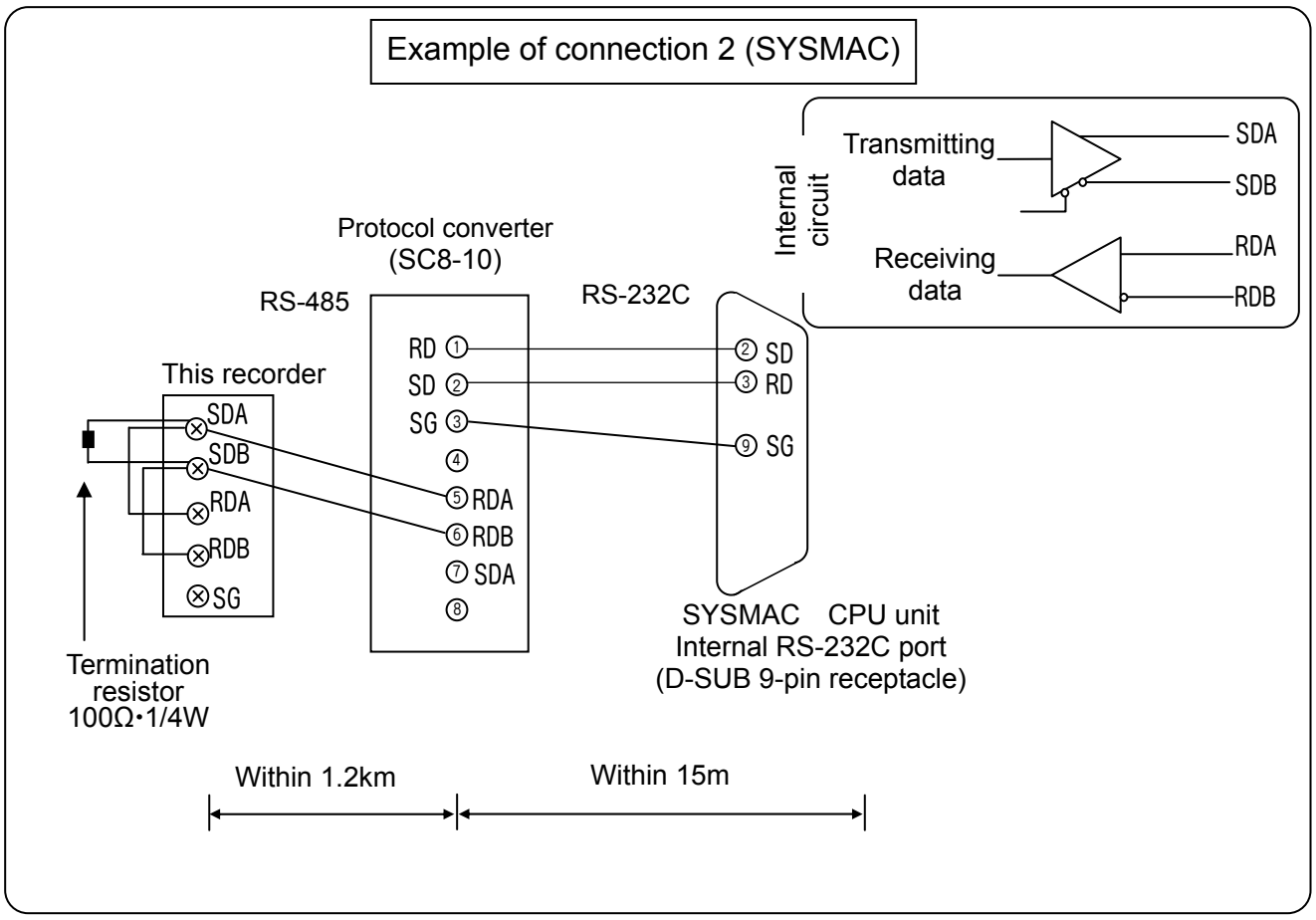
※ Please note that the polarity of A and B of the communication terminal is different from SYSMAC and this product.

Remarks Mounting termination resistor

To ensure the transmission of data via RS-422A communications, mount a termination resistor at the ends of receiving lines.

7) Connections of low order communication RS-485



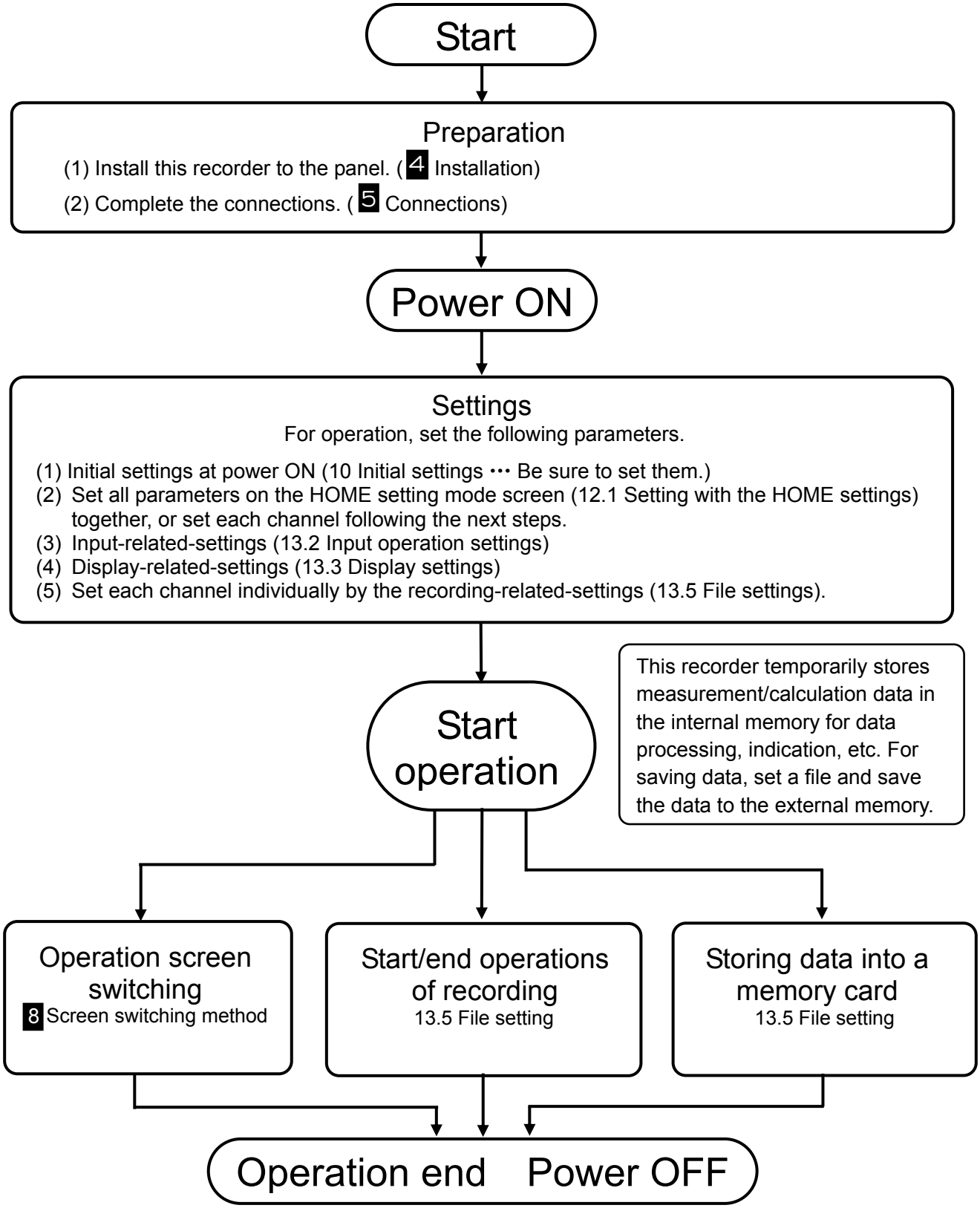


Remarks Mounting termination resistor

To ensure the transmission of data via RS-485 communications, mount a termination resistor at both ends of transmission lines. When the protocol converter (SC8-10) is at an end of a transmission circuit, short the terminals of ④ and ⑤ of the unit to insert the termination resistor automatically.

6 Operation (Be sure to read Para. 1 for safety.)

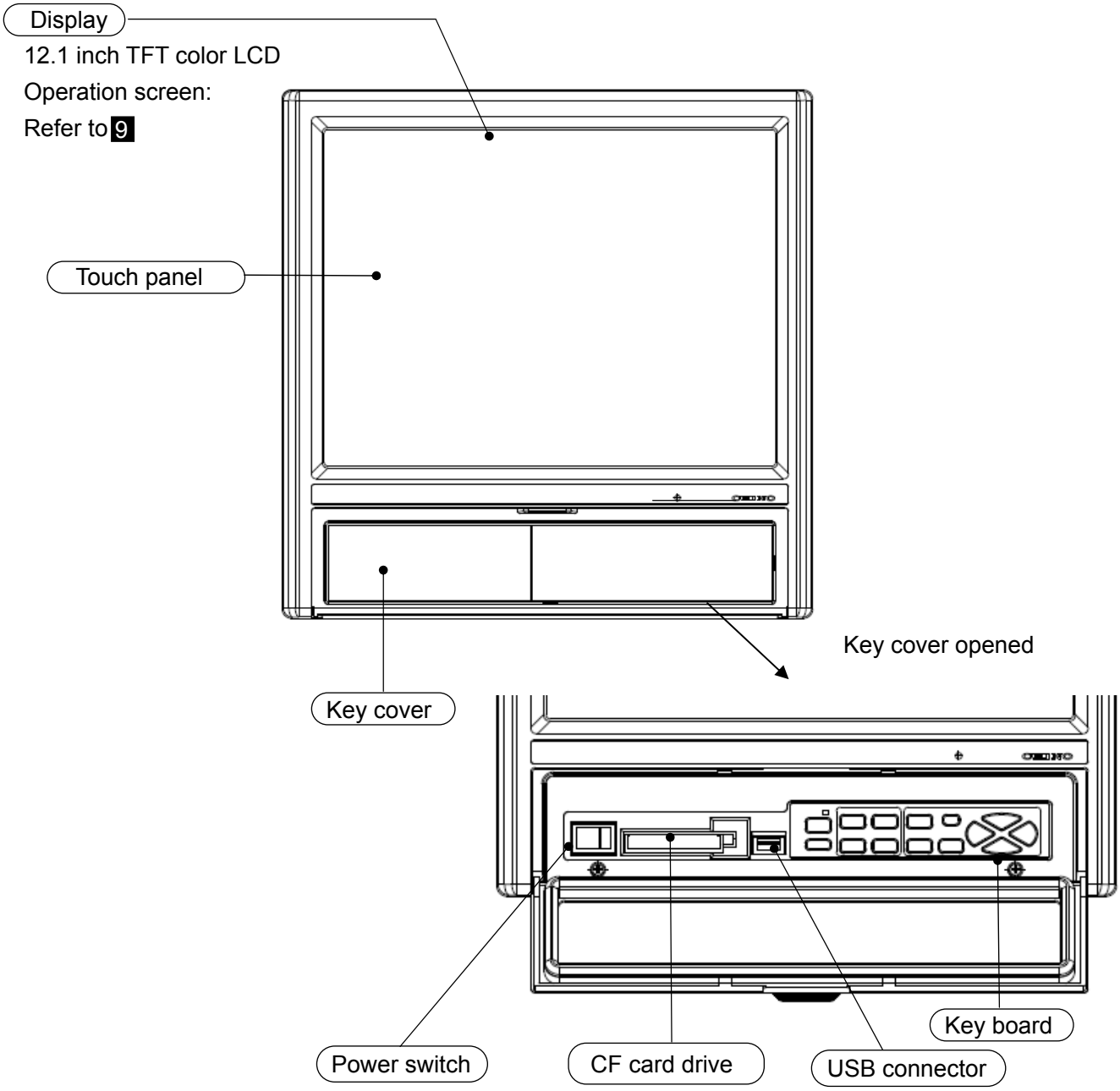
Default setting values have been set at the factory. For actual operation, be sure to execute the following settings.



● On part of the LCD screen, some pixels may always be lit or not lit, and unevenness in brightness may arise from the characteristic of the liquid crystal, but these are not malfunctions.

7 Name of each part

7.1 Name of the front panel and its major function



⚠Caution

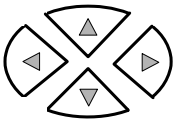
■ Front glass

- The front of display part is made by glass. To avoid injuries due to broken glass, do not blow the glass hard.
- Do not rub or push the touch panel by a sharp edged tool or a sharp material.
- For dirt on the front glass, wipe it lightly with a soft cloth infiltrated with neutral detergent or alcohol into soft cloth.
- Coordinates cannot read normally if two points are pushed simultaneously. Push one point in operations.

7.2 Names of keys and their functions

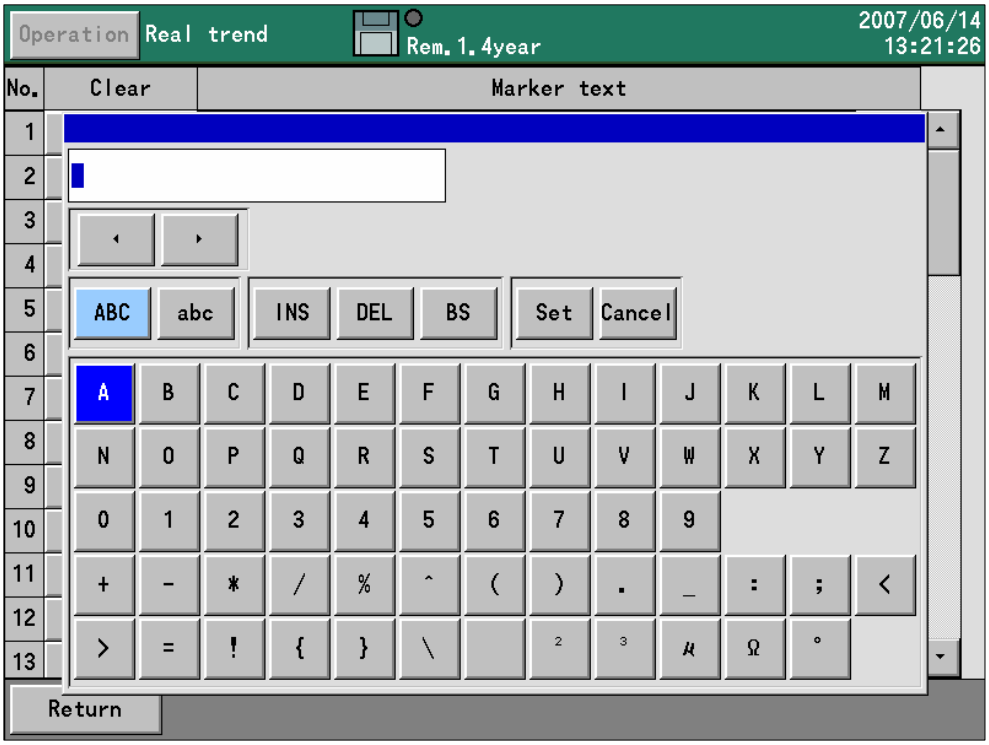
Usage and functions of keys differ depending on the operation screen and the setting screen.

Operations of all keys can be performed on the touch panel. Therefore, all operations enable with the key cover closed.

Key	Keys and major usage/functions of each screen	
	Operation screen	Setting screen
START	The recording starts.	Not used
STOP	The recording stops.	Not used
SCROLL	Used for switching of the scroll mode and for moving to the historical trend screen.	Not used
CURSOR	Used for switching the cursor mode in the historical trend screen.	Not used
MARKER	Used to write a marker on the trend screen.	Not used
DISP	Used to display the DISP menu.	A snapshot is taken by pressing this key for a long time.
HOME	Used to display the HOME settings menu.	Used to quit the Home screen.
MENU	Used to display the MENU settings menu.	Used to return a previous screen.
ESC	Used for cancelling menus or for returning to a previous screen.	Used to return from the setting screen to the operation screen or return to a previous screen.
ENTER	Used to enter a menu item or display the ENTER menu.	Used to open a selected menu or enter a numeric value, a character, etc. selected by the cursor. Also, used to store a parameter when the setting screen returns to the operation screen.
 Direction keys	Used to select a menu item or change a display group and a channel.	Used to move the cursor to the left, right, up and down.

7.3 Character entering method

This screen is used for setting a tag name, a marker text character string and setting/entering a password.



When the character input screen is displayed, by pressing the “ABC” or the “abc”, keys arranged on the lower column are changed to indications corresponding to the key pressed. Press a character to enter. Then, the character selected is displayed on the character display column. When a character is touched on the character display column, the cursor moves to its position and a character can be inserted (or overwritten) at the cursor position.

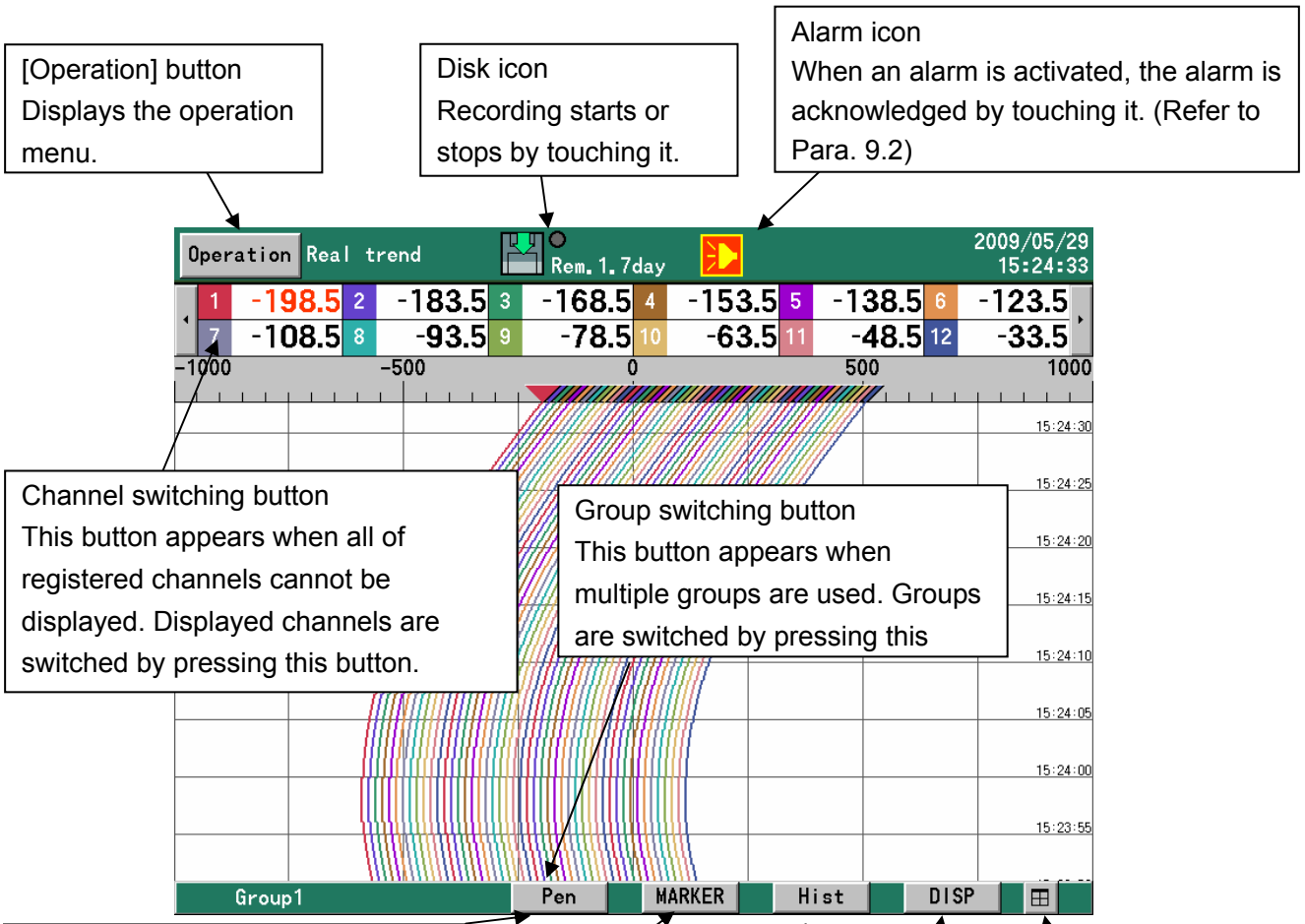
ABC	Alphabet capital letters, symbols and numeric can be entered.
abc	Alphabet small letters, symbols and numeric can be entered.
INS	Inserting or overwriting can be selected. (Inserting and overwriting are switched each time this key is pressed.)
DEL	A character selected on the character input column is deleted.
BS	The character being one position before the character selected on the character input column is deleted.
Set	Inputted characters are entered. Inputted characters are also entered by pressing the ENTER key after moving the focus to the character input column.

7.4 Touch panel operation method

All operations of this recorder can be executed on the touch panel.
In case of abnormality in the touch panel or same operation as the KR2000 series is required, execute operations with the keyboard.

On this recorder, operations can be executed sensuously by tapping the touch panel. In this paragraph, the basic screen operation method is described. For special operations of each screen, read the explanations about each screen in Para. 9.

7.4.1 Tapping on the operation screen



< [Operation] menu >

Menu item	Operation
START	The recording starts. Same function as the START key
STOP	The recording stops. Same function as the STOP key.
HOME settings	The HOME settings open. Same function as the HOME key
MENU settings	The MENU settings open. Same function as the MENU key

< [DISP] menu>

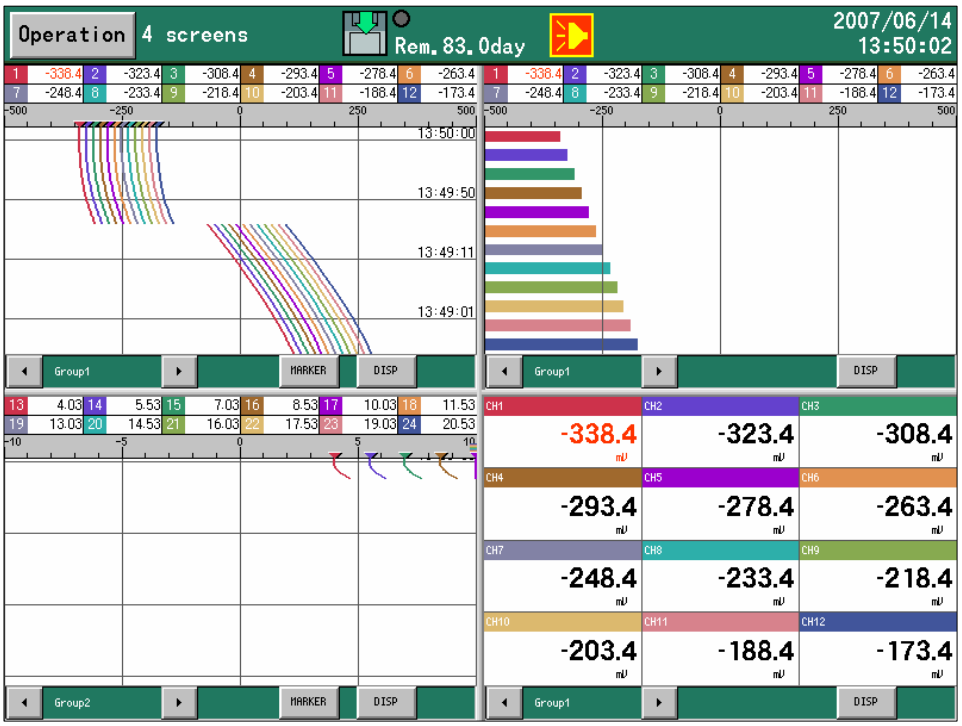
Menu item	Operation
Select display	Used to change the operation screen type.
Select group	Used to change the display group.
Auto switching	Used to turn or off the automatic switching of the group and channel. The switching becomes active by checking. When the automatic switching time is set to 0, this switching is not valid.
Snapshot	Used to save a hard copy of a screen to the CF card (SNAPSHOT folder).
Pause	Screen updates are stopped except status bar. When press any key, the screen is displayed again. All operations except describing of data recording and recording processing are performed during pause. When the DISP key is pushed in the Pause, the Snapshot is executed.
Display OFF	Used to turn off LCD display. The LCD is turned on again by pressing any of buttons.
4 screens	Used to display 4 separate screens.
Magnify/reduce	The trends are displayed by compressing the time axis. (Same magnification to 1/60)

<Tapping operation on 4 separate screens>

By tapping the DISP button, the display type and group can be selected in each frame.

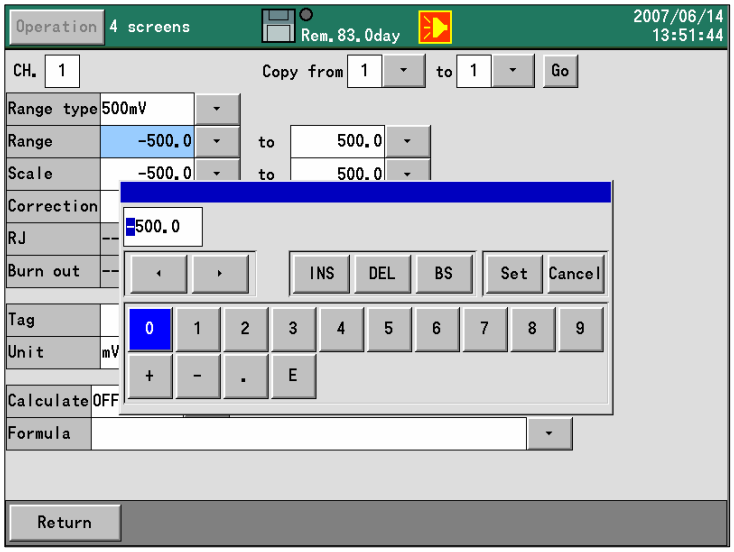
For the details of operation, refer to Para. 7.5.

In addition, by pressing the group switching button and the marker button on each frame, their operations for each frame are executed.

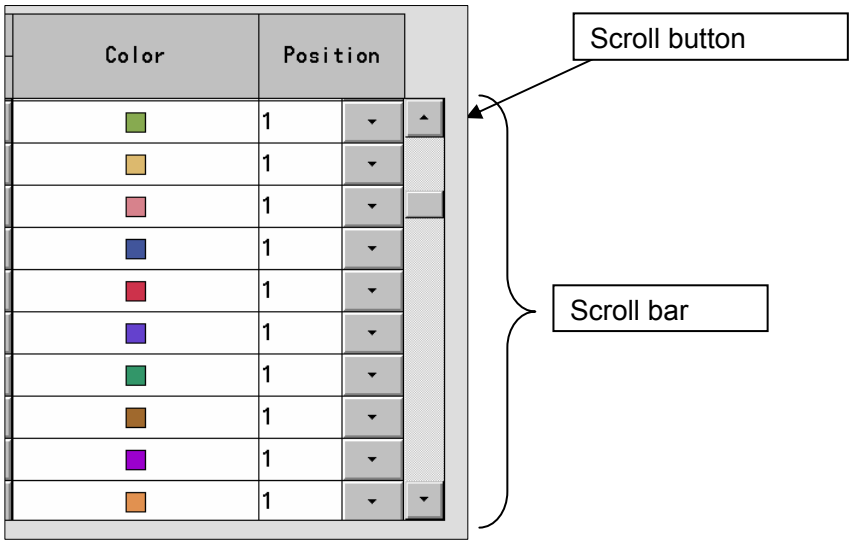


7.4.2 Tapping operation on the setting screen

On the MENU setting and the HOME setting screens, setting operations can be executed more smoothly by tapping each item. For inputting into each item, tap a button with the ▼ mark.
For returning to a previous screen, press the [Set] button.



On a screen with a scroll bar, information can be scrolled with tapping the scroll button. The screen is scrolled one by one by tapping the scroll bar above or below the scroll bar.



Remarks Cautions for using the touch panel

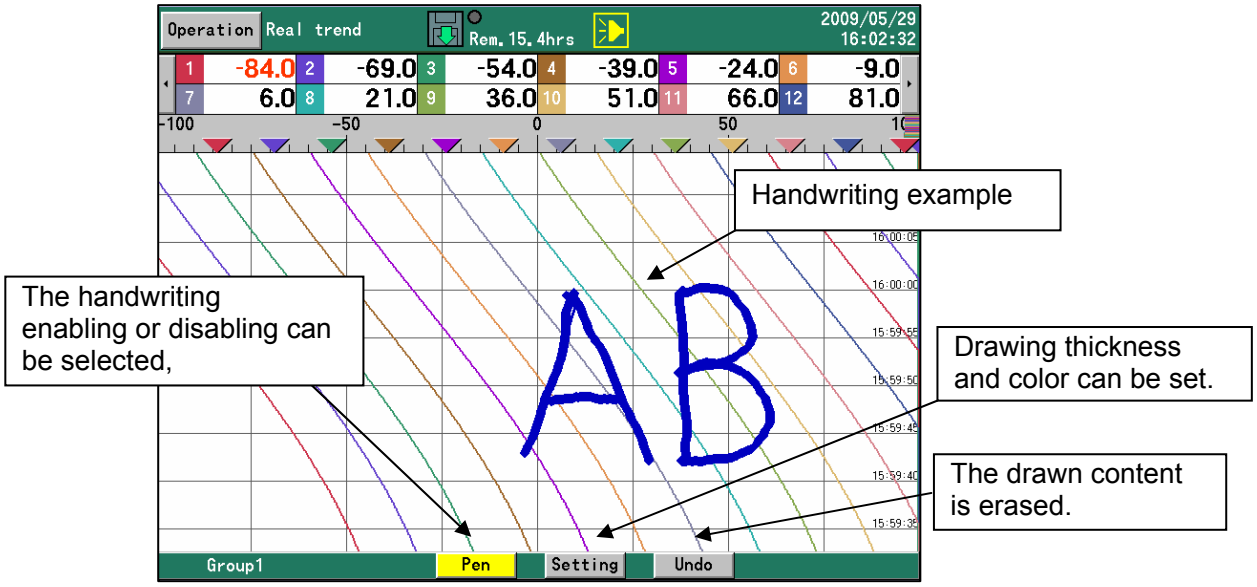
- Do not rub or push the touch panel by a sharp edged tool or a sharp material.
- Avoid storing and using the touch panel in the environment with water, organic solvent or acid, or in the condition of touching them.
- Avoid using the touch panel in a place with direct sunlight.
- For dirt on the front glass, wipe it lightly with a soft cloth infiltrated with neutral detergent or alcohol into soft cloth. When medicine, etc. adheres to the touch panel accidentally, wipe off it immediately in the state where there is no influence in a human body.
- The dew condensation generated inside the touch panel is not unusual since the dew condensation is a natural phenomenon. When the temperature of the touch panel reaches to the room temperature, the dew condensation will disappear automatically, but avoid using the touch panel with the dew condensation since it causes failure.

7.4.3 Handwriting operations on the trend screen

On the real time trend screen and the historical trend screen, handwriting operations can be executed with free handwriting feeling by tapping and skimming the display.

For executing the handwriting operations, tap [Pen] once to enable the handwriting.

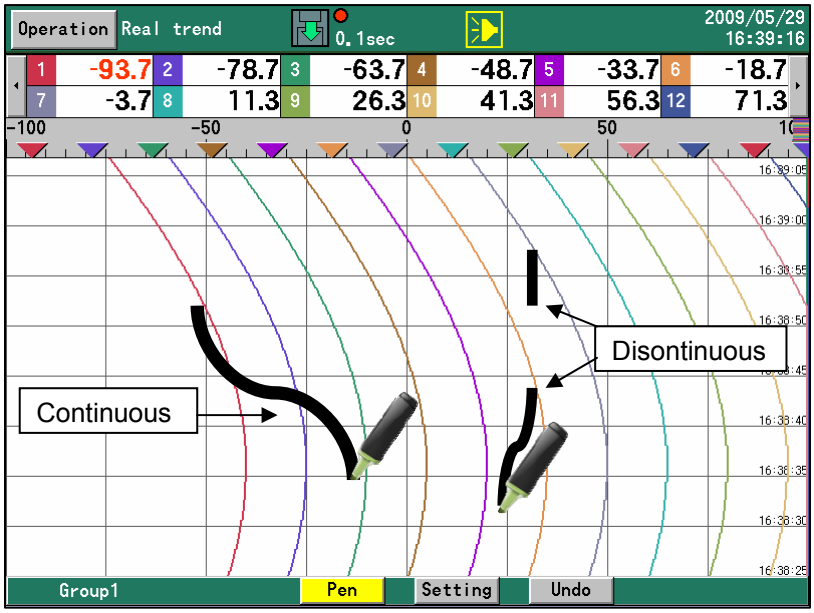
When the handwriting is enabled, [Pen] is displayed as shown in the figure below.
By tapping the pen button again, a drawn content is fixed and saved, and the handwriting is switched to disable. After then, the normal tapping operations can be executed. The drawn contact can be read again by a CF card or a USB memory in addition to the internal memory. (Ref. Para. 9.10 CF card/USB memory screen)



(Erasing operation)

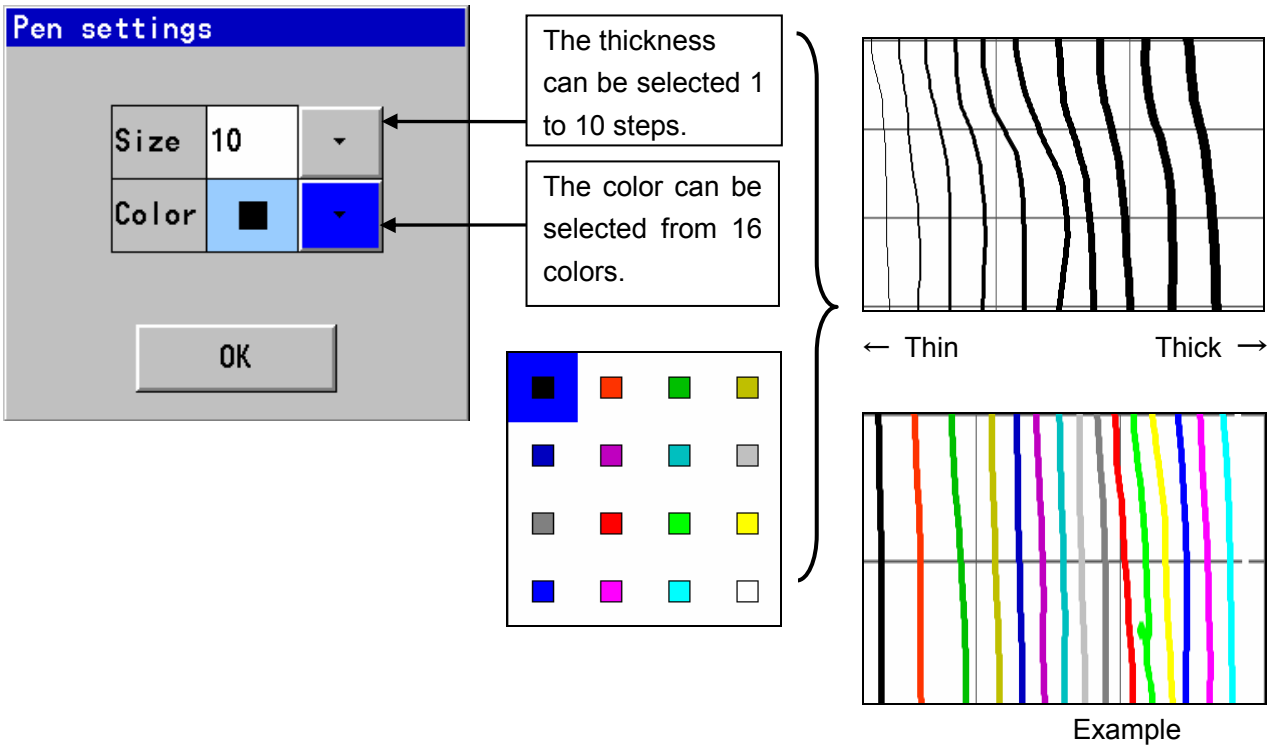
When [Undo] is tapped in the handwriting operations, the content written just before is erased.
When a drawn content is by continuous trajectory, the whole content is erased at once. When the content is by discontinuous trajectory, the trajectory written just before is erased first and the drawn trajectory is erased in an order from a new one.

Caution: When the content is saved once by tapping the pen button, the retroactive trajectory cannot be erase.



(Setting operation)

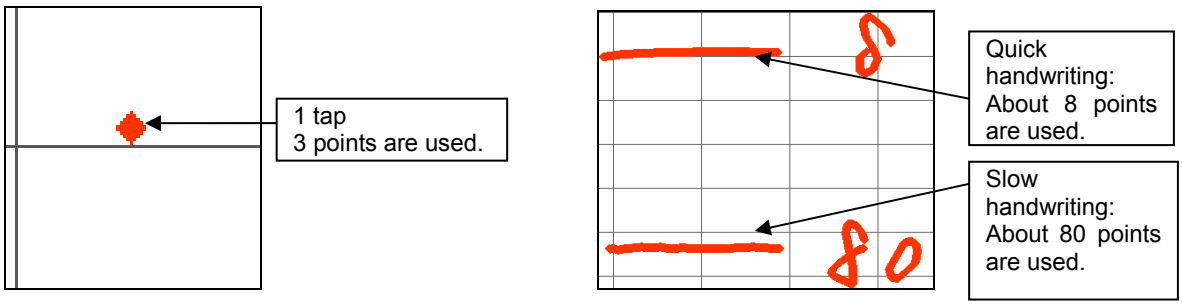
When Setting is tapped in the handwriting operations, the thickness and the color of the drawn point can be changed from the dialog box shown below.



Supplement

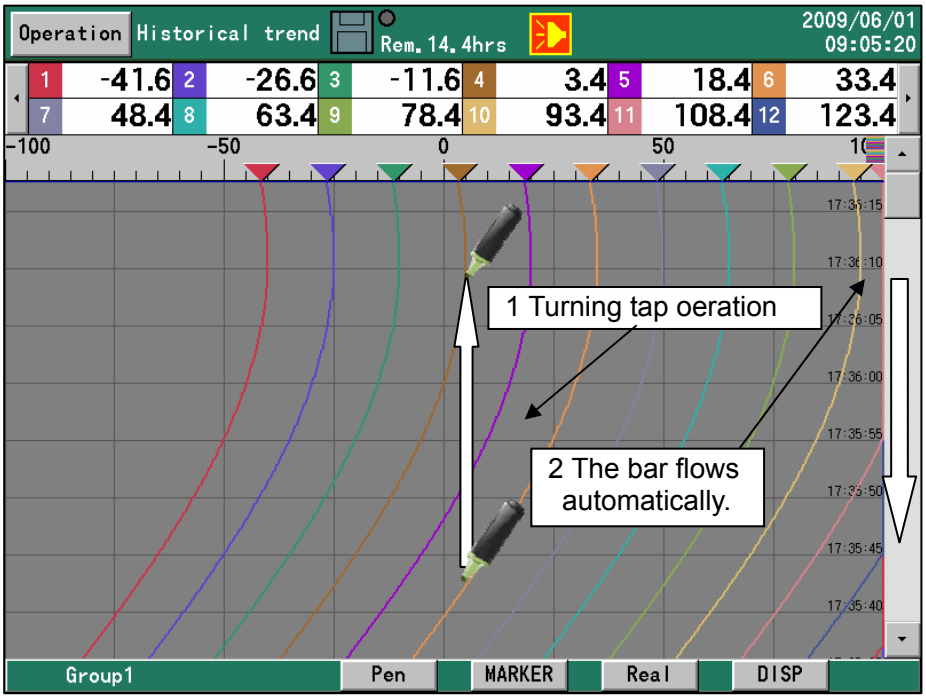
About the number of handwriting input points

The number of handwriting points is the one got by detecting and sampling, periodically at a fixed cycle, the coordinate data when the touch panel is touched.
On the performance, 8000 points are the upper limit of input, and when the number is exceeded, the point is erased from the oldest one.
It is difficult to distinguish the number of inputs visually directly by seeing the drawing.
Since the number of points is the one sampled at a fixed cycle, slow pen writing consumes the number of points more and quick wiring makes consumption of number of points few.
The length of a trajectory, the thickness of a font, and a color are not directly related to consumption of number of points.
The figure below shows the reference figure about the number of points confirmed by treatment of the instrument.

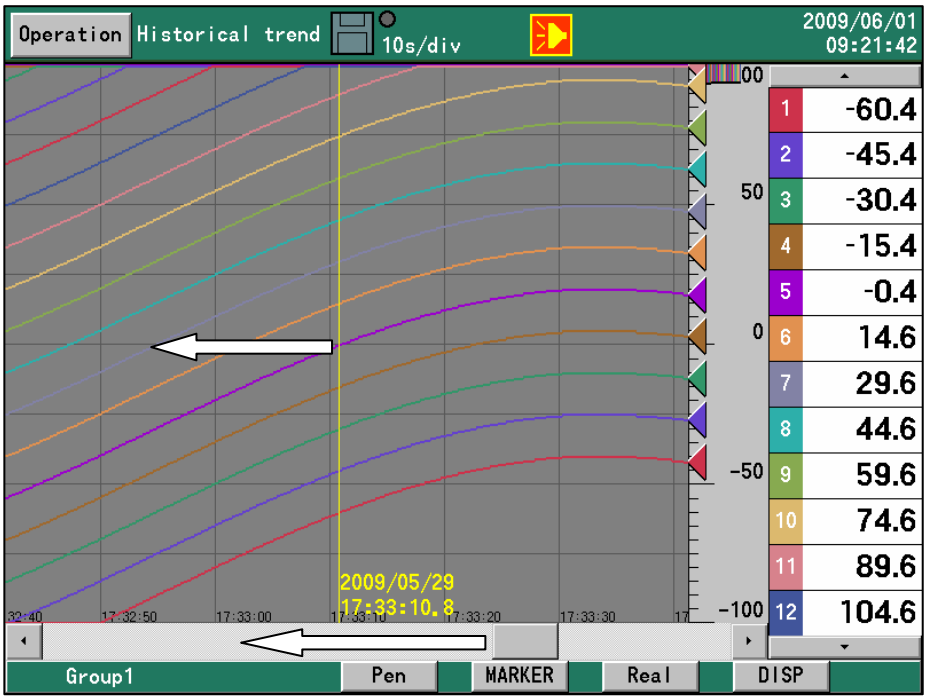


7.4.4 Automatic scroll operation on the historical trend screen

In Para 7.4.2, the tapping operations on the screens with the scroll bar are described. Furthermore, on the historical trend screen (Ref. "9.6 Historical trend screen" for details) that can reproduce record data and on the dual trend screen (Ref. "9.7 Dual trend screen" for details), when the scroll bar is displayed, the scroll bar can be flowed automatically by taking eliminating action like turning over a screen while tapping on the trend screen along the direction that the trend flows. Accordingly the trend screen moves automatically and the automatic scroll stops by tapping anyplace on the screen again.
In addition to the internal memory, the automatic scroll is available on the historical trends read from an external memory.



The automatic scroll is enabled with the cursor displayed. The cursor position follows in each case.



7.5 Operation method of 4 separate screens

This recorder can split a screen into 4 and can display 4 screens divided simultaneously.
On the separated screens, display types selectable are restricted. Only the screens of the real time trend, the numerical display and the bar graph are selectable.

< Switching method from 1-screen display to 4-screen display >

- Select the [4 screens] from the DISP menu.
- Tap the  icon lower right.

The screen can be switched to the 4-screen display in one of the above methods.

< Switching method from4-screen display to 1-screen display >

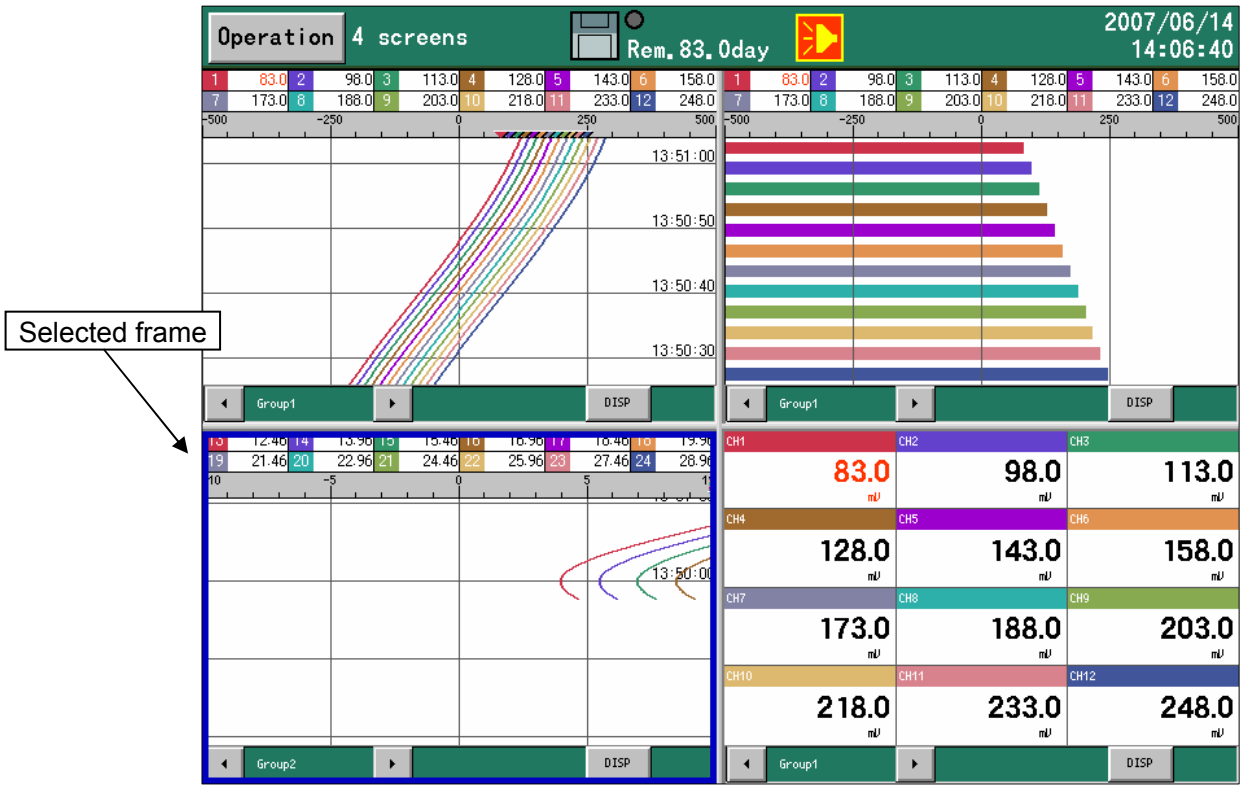
- Tap inside the frame required to expand the display.
- Tap the DISP button of the frame required to expand the display and select the [1 screen].
- After pressing the DISP key to move to the frame selection mode (*), select the frame required to expand the display by pressing the direction key and then press the ENTER key.

The screen can be switched to the 1-screen display in one of the above methods.

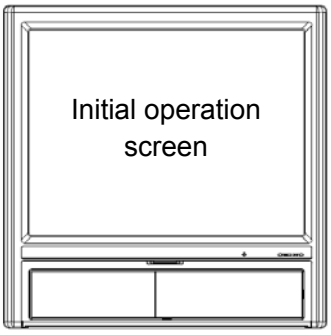
(* Frame selection mode)
By pressing the DISP key at the 4-screen display, the mode is switched to the frame selection mode. In the frame selection mode, the frame is shifted with the direction key for selection and the following key operation enables.

ENTER	The frame selected is displayed with 1-screen display.
DISP	The DISP menu for the frame selected is displayed. The contents selected with this DISP menu are reflected to the frame selected.
ESC	The frame selection mode is cancelled.

Frame selection mode: The frame selected is enclosed with the blue frame.



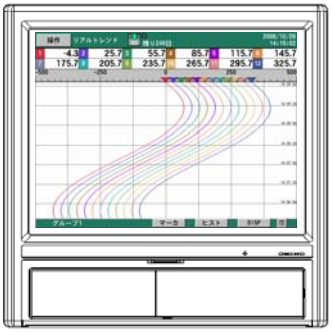
8 Screen switching method

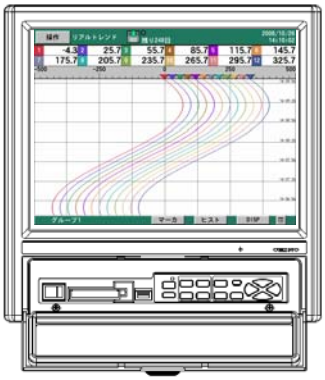


When the power is turned on, the operation screen is displayed after performing the initial operation for about 10 to 30 seconds. (Default settings at the factory: Real time trend screen). When the power is turned on after changing the operation screen, the “operation screen that was selected when the power was turned off” is displayed.

About 10 to 30 seconds

Switching to the setting screen
When the key shown in the right is pressed on the operation screen, the screen is switched to the setting screen for setting each parameter.





Tap the [Operation] button and then tap the [HOME settings]. Or press the [HOME] key.

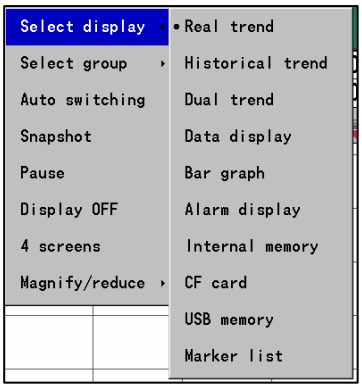
Tap the [Operation] button and then tap the [MENU settings]. Or press the [MENU] key.

Open the key cover. (For key operations)

Operation screen switching method

The operation screen switching is executed by selecting the DISP menu. Switch to a desired screen with the following procedures.

(1) Tap the [DISP] button or press the [DISP] key to display the DISP menu.



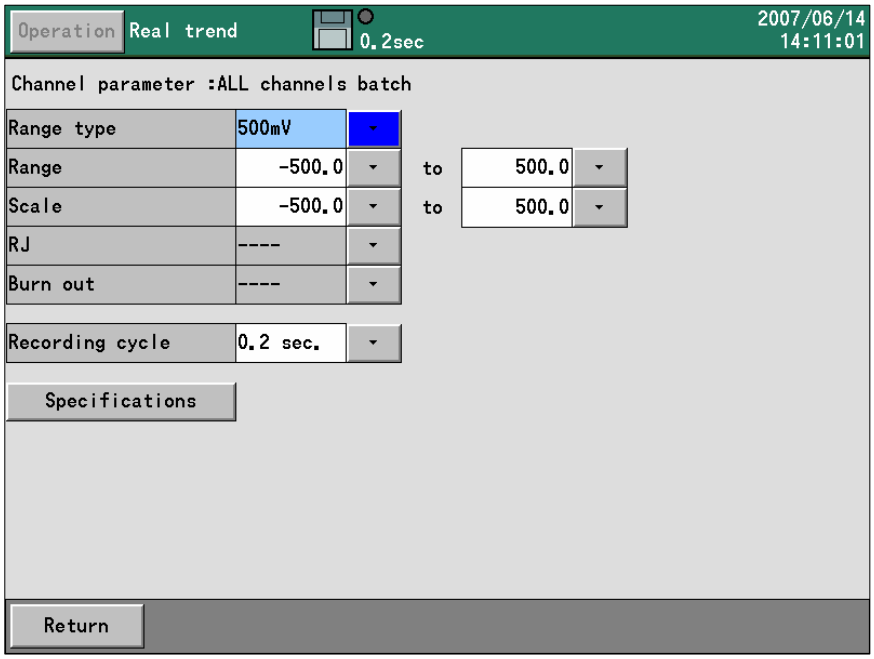
(2) Select a menu by tapping operations, or with the direction key and press the [ENTER] key to display a screen selected.

- Display selection: For selecting the display type (Real time trend, numeric display, etc.) of the screen
- Group selection: For selecting the group to be displayed.

* When the [Auto switching] is selected (with checking), the display group is automatically switched at a fixed interval.

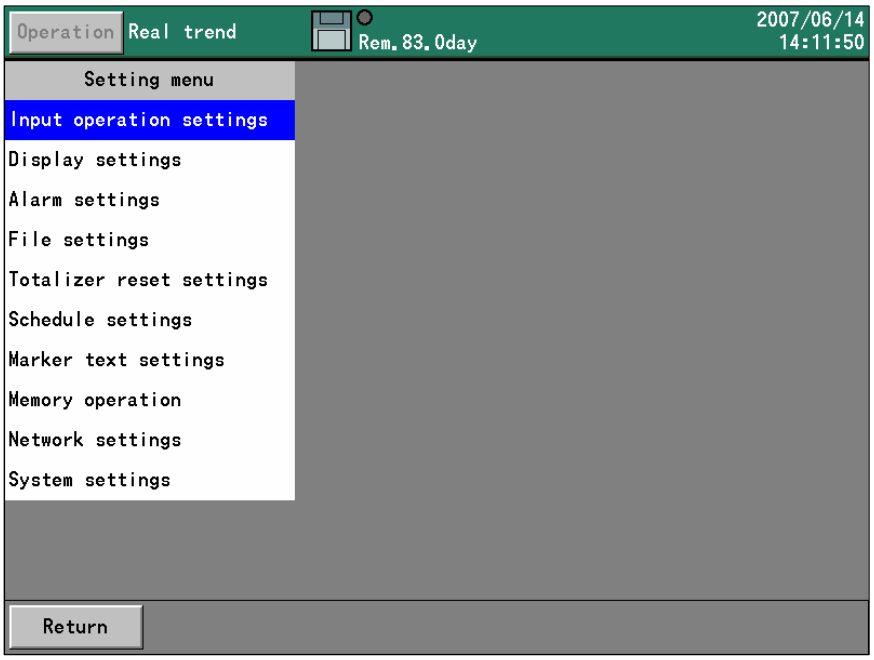
<HOME settings>

The settings are used to execute same settings to all channels easily. The items settable are limited. The settings cannot be used during recording.



<MENU settings>

The settings are used for normal settings. All items can be set and seen during recording, but there are some items not settable. The items not settable are displayed in gray.



9 Names and functions of the operation screen

9.1 Common operations of the operation screen

(Using method of each key)

START

The recording is started. The data of the groups, of which recording conditions are established, are stored into the internal memory. The groups, of which recording conditions are not established, become the standby state and their recording starts at the time of establishment of conditions. The groups, of which recording conditions cannot be established, become the standby state for recording. The storing into the CF card is automatically executed at certain storing intervals when the saving to a file is completed.

(Tapping operation)

Tap the [Operation] button. Then tap the [START] or the disk icon.

STOP

The recording is stopped. The recording of all groups becomes the stop state. The file in saving is completed and data is stored into the CF card.

(Tapping operation)

Tap the [Operation] button. Then tap the [STOP] or the disk icon.

DISP

The DISP menu is displayed.

Menu item	Operation
Select display	Used to change the operation screen type.
Select group	Used to change the display group.
Auto switching	Used to turn or off the automatic switching of the group and channel. The switching becomes active by checking. When the automatic switching time is set to 0, this switching is not valid.
Snapshot	Used to save a hard copy of a screen to the CF card (SNAPSHOT folder).
Pause	Screen updates are stopped except status bar. When press any key, the screen is displayed again. All operations except describing of data recording and recording processing are performed during pause. When the DISP key is pushed in the Pause, the Snapshot is executed.
Display OFF	Used to turn off LCD display. The LCD is turned on again by pressing any of buttons.
4 screens	Used to display 4 separate screens.
Magnify/reduce	The trends are displayed by compressing the time axis. (Same magnification to 1/60)

(Tapping operation)

Tap the [DISP] button.

HOME MENU

Each setting screen is displayed. (Refer to Para. 7.2.)

(Tapping operation)

Tap the [Operation] button and then tap the [HOME settings].

Tap the [Operation] button and then tap the [MENU settings].

ENTER

The ENTER menu is displayed. Menu contents differ depending on the screens.

(Tapping operation)

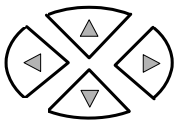
The operation differs depending on the screens.

ESC

The screen is returned to a previous screen. In case of the screens of the real time trend, the bar graph and the numerical display, the screens do not return to a previous screen.

(Tapping operation)

Tap the [Return] button. (On the setting screen)



For the vertical trend
The display group is switched with the up and down keys and the displayed channel is switched with the left and right keys.
For the horizontal trend
The display group is switched with the left and right keys and the displayed channel is switched with the up and down keys.

(Tapping operation)

Not available

(Displayed data)

Measured data displayed on each screen

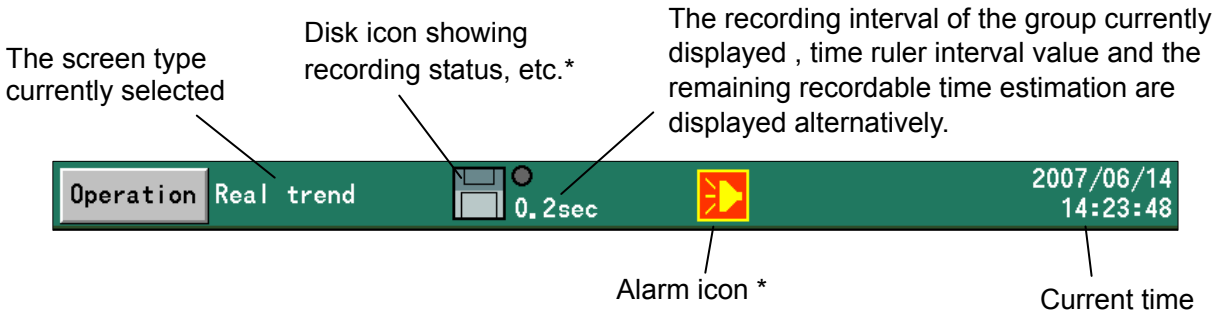
Measured data	Contents
(Numeric value)	The values are displayed based on the display scale settings of each channel. The values are displayed with the number of digits after decimal point of the maximum and minimum values of the display scale.. When the type is “Exponent”, the values are displayed in such exponential format as”1.2E+3”. In this case, up to 2 digits after the decimal point of the significand can be set but only 1 digit is displayed depending on the screen.
BURN	Open between terminals
OVER	A value above the measurable high limit value (upper limit value + 5% of range) is inputted. Or calculated value is above the value that can be indicated (*).
UNDER	A value below the measurable low limit value (lower limit value - 5% of range) is inputted. Or calculated value is below the value that can be indicated (*).
CAL ER	Calculation error
RJ ERR	The recorder is abnormal.

* Range that can be indicated for calculated result as follows.
Display format is “standard”
Numeric value that exclude decimal point is within ±30000 (Example: -30.000 to +30.000)
Display format is “index”
1.00E-15 to 9.99E+15

Excluding the historical data displayed part of the historical trends and the dual trends, the current data (with 0.5 second interval) irrespective of the recording interval, etc. is displayed as the numeric displayed data. For slowing down the updating speed, change “Numeric value display update interval”. (Refer to Para. 13.3.3.)

9.2 Status bar

The status bar is displayed on the top of the screen and displays the status, etc. of this recorder. Normally the back color is green but, when the schedule (Refer to Para. 13.7) is set, the back color becomes gray for the period other than the scheduled period.



Disk icon

The arrow indication shows the recording status of the group currently displayed.

Arrow	Status
Displaying vertically.	Recording
Blinking.	The START key was pressed but the recording is in the standby state since recording conditions are not established.
Not displayed.	The START key is not pressed. (In the state that the recording is stopped by pressing the STOP key)

The back color shows the state of the CF card.

Back color	Status
Gray	Normal
Yellow	The remaining space of the CF card is less than 10%. [When the overwriting mode (Para. 13.11.4) has been set, the back color does not become yellow.]
Red	The CF card has no space. [When the overwriting mode (Para. 13.11.4) has been set, the back color does not become yellow.]

When X is displayed on the disk mark, the CF card is not inserted.

The circle on the upper right of the icon shows the access status to the CF card. If the CF card is removed when the color is red, data may be damaged. Remove the CF card when the circle is gray.

Color	Status
Gray	Not accessing to the CF card
Yellow	Writing in the CF card is executed within about 5 seconds.
Red	Accessing to the CF card

When the “USB memory” is selected in the “Select external memory”, the “USB” is displayed on the icon. In this case, the data are stored into the USB memory connected. For the USB memory, refer to “15. Storing data into the USB memory”.

Alarm icon

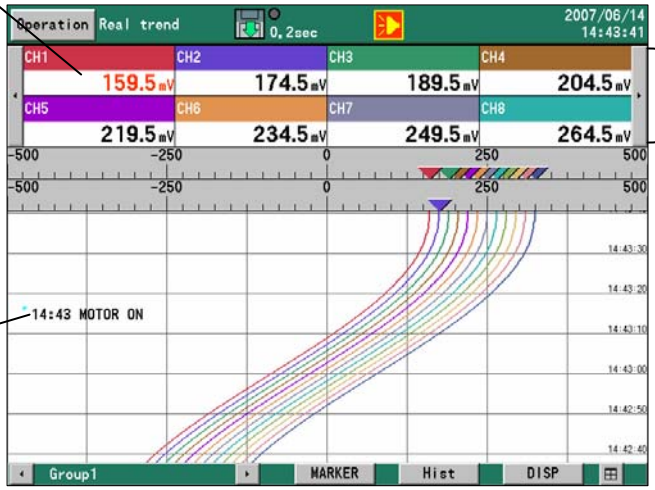
The icon shows the activation status and the confirmation status of alarms. The confirmation (ACK) of alarm is executed with the ENTER menu or by tapping on the alarm icon on the operation screen.

Icon status	Alarm status	Confirmation (ACK) status
Lit	Activated	Confirmed
Icon inside blinking	Activated	Not confirmed yet
Icon blinking	Not activated	Not confirmed yet
Not displayed	Not activated	—

9.3 Real time trend screen

The trends of measured values can be seen like an analog recorder. The pens are displayed on the scale plates corresponding to the values of “Position” parameters of each channel. When the same “Position” is set to multiple channels, the scale plates, trends and pens are displayed in the contents of the display scale of the smallest channel number in the group.

The measured data of the channel in alarm activated is displayed in red.



This part can be selected from the data display (with/without tag), the bar graph and non-display.

Maker display

ENTER menu function

Magnify/reduce	The trends are displayed by compressing the time axis. (Same magnification to 1/60)

(Tapping operation)

In the DISP menu, the same item is available.

Key operations other than the common operations (Para. 9.1)

SCROLL

The historical trend (or the dual trend) screen is displayed. This key operation is same as selecting the Historical trend (or the Dual trend) in the DISP menu. When the Historical trend is selected in the DISP menu, the trends are displayed from then and, when the dual trend is selected, the trends are displayed from then.

(Tapping operation)

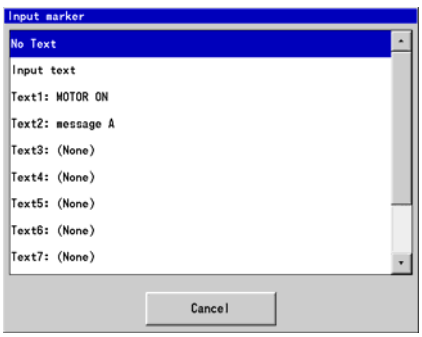
Tap the [Hist] button.

MARKER

The marker-write dialog box is displayed. The marker writing cannot be executed during the record stop. Select a marker text registered with the MENU settings beforehand and write the text on the trends by pressing the ENTER key. When the “Input Text” is selected, the keyboard screen is displayed for writing a text desired.

(Tapping operation)

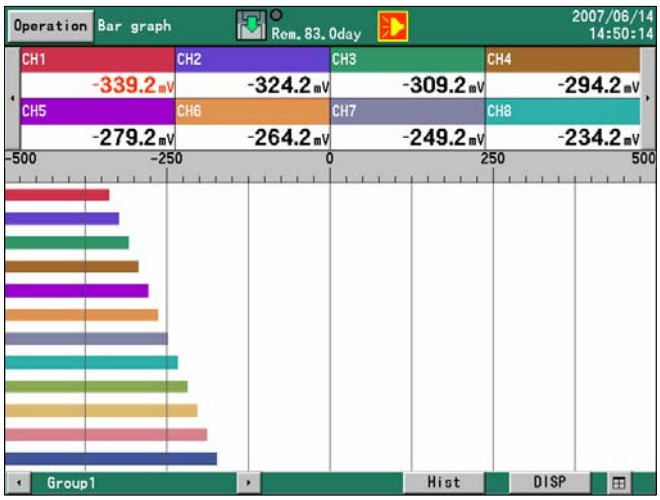
Tap the [MARKER] button.



9.4 Bar graph screen

The measured values of the channels are displayed with the bar graphs in real time and can be seen visually. The length of the bars and scale plates is displayed in the contents of the display scale with the smallest channel number in the group.

This part can be selected from the data display (with/without tag) and non-display.



ENTER menu function
Not available

Key operations other than the common operations (Para. 9.1)

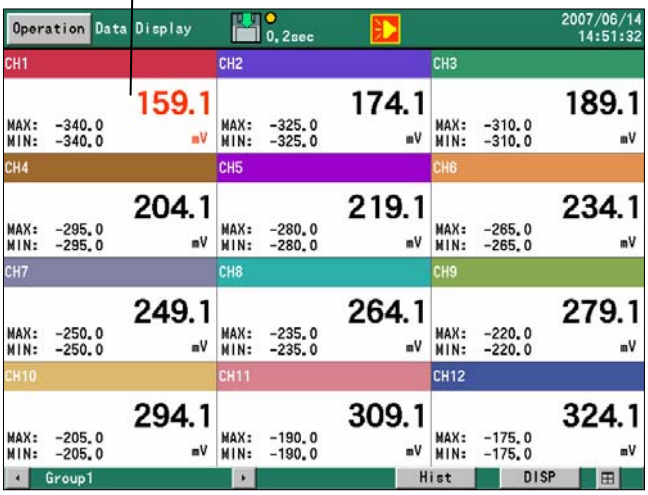
SCROLL Same as Real time trend

9.5 Data screen

The “Measured data of channels” and the “Alarm activation status” are displayed. Depending on the “Data display frames” or the number of groups registered, data of 1,2,3,4,6,8,9,10,12,24,36,48 or 56 channels are displayed.

The measured data of the channel in alarm activated is displayed in red.

When the number of displayed channels is less than 12, maximum and minimum values of these channels can be displayed.
The values are reset at the record start. Non-display of these values is available.
(Refer to Para. 13.3.3)



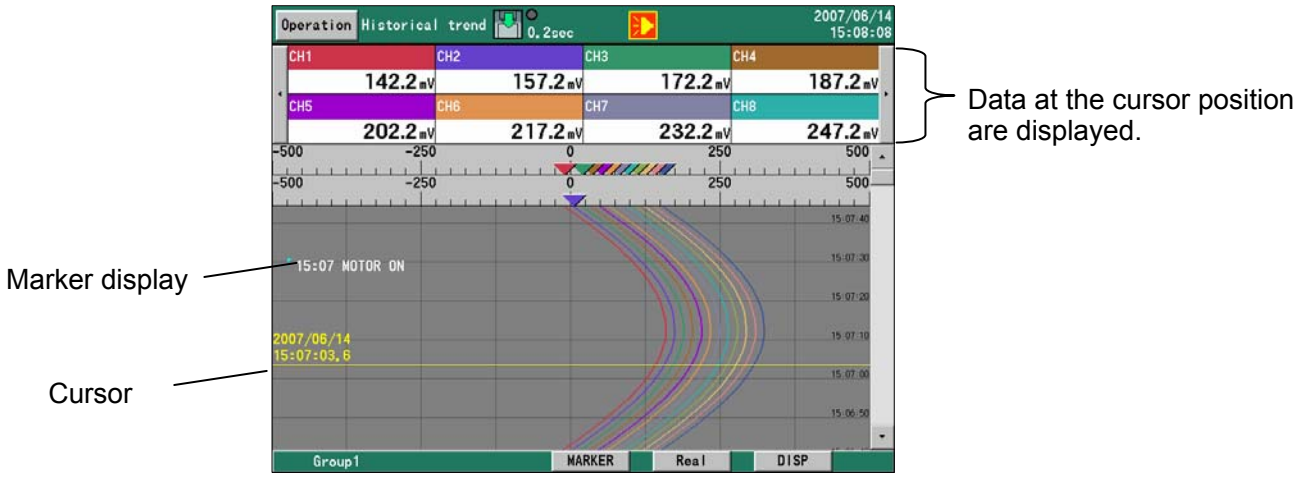
ENTER menu function
Not available

Key operations other than the common operations (Para. 9.1)

SCROLL Same as Real time trend

9.6 Historical trend screen

The recorded data are replayed and displayed as the trend display. When the “Historical trend” is selected in the DISP menu (or when the “SCROLL” key on the real trend screen is pressed), data in the internal memory are displayed. When a file is selected in the “Internal memory” screen, the “CF card” screen, or “USB memory” screen, data of the selected file are displayed. The historical trend operation method is the same for each selection. The display method of the scale plates, trends and pens is same as the real time trend screen.



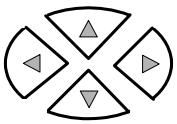
ENTER menu function

Magnify/reduce	The trends are displayed by compressing the time axis. (Same magnification to 1/60)

(Tapping operation)

In the DISP menu, the same item is available.

Key operations other than the common operations (Para. 9.1)



For vertical trend

Left and right keys: Switching the displayed channel

Up and down keys: Scrolling the trend graph and moving the cursor when the cursor mode is ON

For horizontal trend

Left and right keys: Switching the displayed channel

Up and down keys: Scrolling the trend graph and moving the cursor when the cursor mode is ON

SCROLL

Press this key to switch to the scroll mode. When this key is pressed once, the scroll bar is enclosed with a yellow frame and the scroll mode becomes ON. In this status, by pressing the direction key, the trends are scrolled one screen by one screen. When the scroll key is pressed again, the scroll mode becomes OFF and the trends are scrolled one dot by one dot by pressing the direction key.

CURSOR

Press this key to switch to the cursor mode. When this key is pressed once, the cursor line is displayed in yellow color and the cursor mode becomes OFF. In this status, by pressing the direction key, the cursor line moves without scrolling and the data at the cursor position are displayed on the numeric value display (or bar).

(Tapping operation)

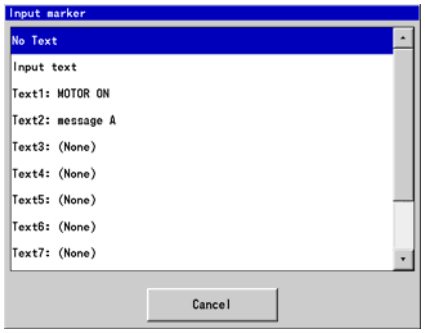
Switching the displayed channel → Tap channel switching buttons at left and right of the data display part.

Moving the cursor → Tap on a trend.

Scroll → Operate the scroll bar.

MARKER

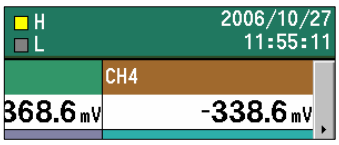
The marker-write dialog box is displayed. Select a marker text registered with the MENU settings beforehand and write the text at the cursor position by pressing the ENTER key. When the “Input Text” is selected, the keyboard screen is displayed for writing a text desired.



(Tapping operation)
Tap the [MARKER] button.

HOME

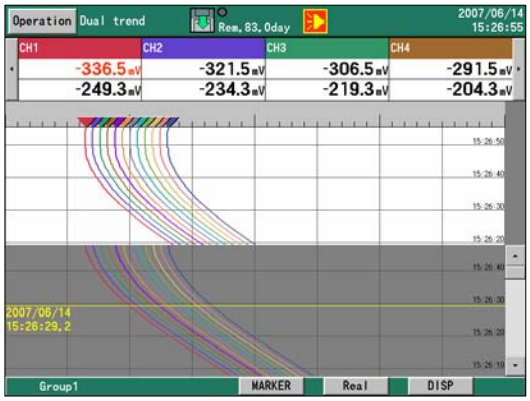
When the “data format” of the file to be displayed is “Maximum/Minimum”, the values displayed in the numeric value display (or bar) are switched to the maximum and minimum values. Other operations are same as the HOME key.
Either of the current display is shown in H or L display on the status bar.



(Tapping operation)
Tap the H or L icon on the status bar.

9.7 Dual trend screen

The real time trends and the historical trends are displayed by dividing the screen up and down, and the current data and the past data can be compared. Also the data display displays the current values and values at the cursor position of the historical trends by dividing the screen up and down.
The displaying method of the trends and positions of pens is same as the real time trend screen. However, in case of the setting that multiple scale plates are displayed, only 1 scale plate is displayed, and the numeric values on the scale plate are not displayed.
The operation method is the same as the historical trend screen.



Up: Current measured values
Down: Display of data at the cursor position on the historical trends

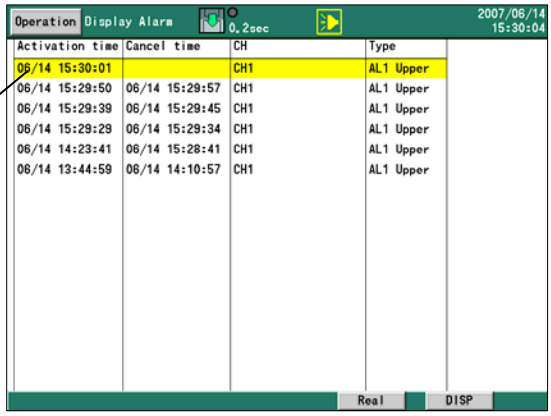
ENTER menu function
Same as the historical trends (Refer to Para. 9.6.)

Key operations other than the common operations (Para. 9.1)
Same as the historical trends (Refer to Para. 9.6.)

9.8 Alarm display screen

The alarms being activated are displayed as a list. Activation date/time, cancel date/time (cancelled alarms only), channels (tag names) and alarm types are displayed in the reverse chronological order (latest on the top). Irrespective of the groups, all alarms being activated in this recorder are displayed.
Maximum 1000 alarm data are recorded. When the alarm data exceeds 1000, the data are deleted in chronological order.

The selected row is displayed in yellow.

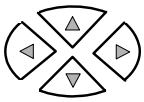


ENTER menu function

Trend display	The screen is jumped to the trend at the activated date/time of the selected row. When the alarm was not recorded at its activation or the file is not found, the screen cannot be jumped. The file search in this case is executed in the order of the internal memory → the CF card.

(Tapping operation)
By tapping a row in the list, the ENTER menu appears.

Key operations other than the common operations (Para. 9.1)



Up/down keys: Moving the row for selection
Left/right keys: Not used

SCROLL

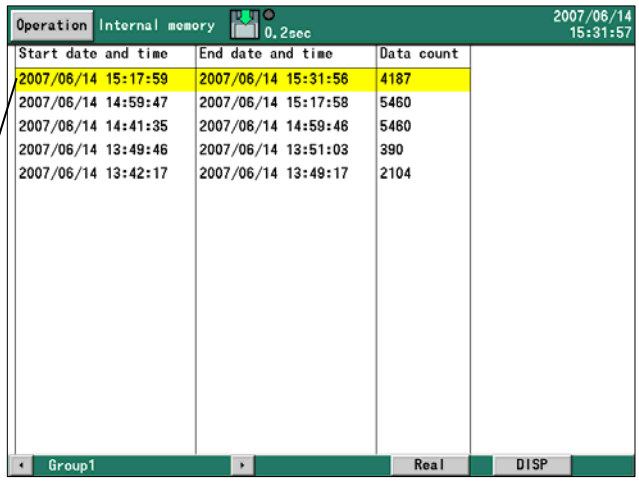
Press this key to switch to the scroll mode. When this key is pressed once, the scroll bar is enclosed with a yellow frame and the scroll mode becomes ON. In this status, by pressing the direction key, the trends are scrolled one screen by one screen. When the scroll key is pressed again, the scroll mode becomes OFF and the trends are scrolled one line by one line by pressing the direction key.

(Tapping operation)
Operate the scroll bar.

9.9 Internal memory screen

The list of files recorded in the internal memory is displayed. The start date and time, the end date and time (the latest data time for a file being recorded) and the data count are displayed. The files are displayed in the reverse chronological order (latest on the top). All files only of the selected group are displayed.

The selected row is displayed in yellow.

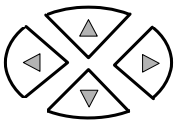


ENTER menu function

Trend display	The trends recorded in the file of the selected row are displayed.

(Tapping operation)
By tapping a row in the list, the ENTER menu appears.

Key operations other than the common operations (Para. 9.1)



Up/down keys: Moving the row for selection
Left/right keys: Not used

SCROLL

Press this key to switch to the scroll mode. When this key is pressed once, the scroll bar is enclosed with a yellow frame and the scroll mode becomes ON. In this status, by pressing the direction key, the trends are scrolled one screen by one screen. When the scroll key is pressed again, the scroll mode becomes OFF and the trends are scrolled one line by one line by pressing the direction key.

(Tapping operation)
Operate the scroll bar.

Internal memory

This recorder records all recorded data into the internal memory as a file. The data are copied to the CF card at a certain storing interval when the recording to this file is completed

<Limitations of internal memory>
(File capacity)
1 file is completed with maximum volume (refer to the following list). The file size can be calculated with the followings.
Data volume x Number of channels x Number of records
(Usually the data volume is 4 bytes. When the data format is “Maximum/minimum”, the data volume is 6 bytes.)
When the recording is stopped due to recording conditions not established, by pressing the STOP key or by power off, etc. the file is completed at the time before reaching to maximum volume of file.

Number of groups used	Maximum volume of file (KB)	Recording frequency when 12 points are used (4 byte data)
1	3904	83280
2	1920	40960
3	1216	25940
4	896	19110
5	704	15010
6	576	12280

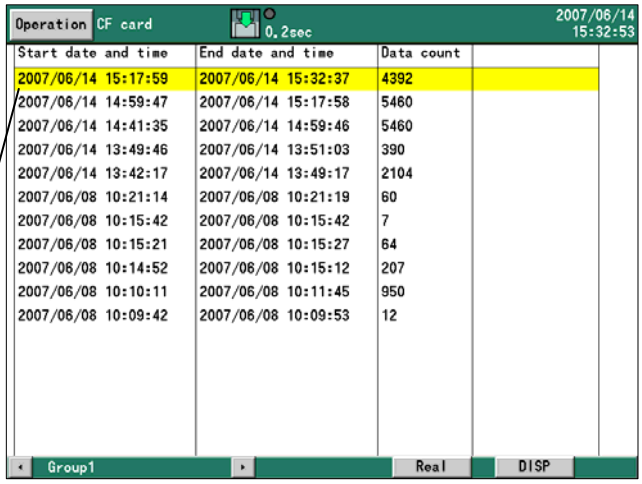
(Number of files)
The number of files that can be saved in the internal memory is maximum 250 files (In each group, “250 ÷ Number of groups used” [Fraction is rounded down.]).

(Volume of all files)
The total volume of files that can be saved in the internal memory is 64KB x (125 ÷ (Number of groups used) – 2). If the volume exceeds it, the files are deleted in chronological order.

9.10 CF card/USB memory screen

The list of files stored in the CF card or the USB memory is displayed. The start date and time, the end date and time (the latest data time for a file being recorded) and the data count are displayed. The files are displayed in the reverse chronological order (latest on the top). All files only of the selected group are displayed.

The selected row is displayed in yellow.

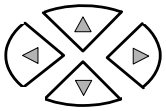


ENTER menu function

Trend display	The trends recorded in the file of the selected row are displayed. (Binary only)
Delete	The file of the selected row is deleted.
FTP transmission	The file of the selected row is transferred with FTP.
Copying to USB memory (CF card screen only)	The file of the selected row is copied to the USB memory. When the USB memory is not inserted, this menu is not displayed.

(Tapping operation)
By tapping a row in the list, the ENTER menu appears.

Key operations other than the common operations (Para. 9.1)



Up/down keys: Moving the row for selection
Left/right keys: Not used

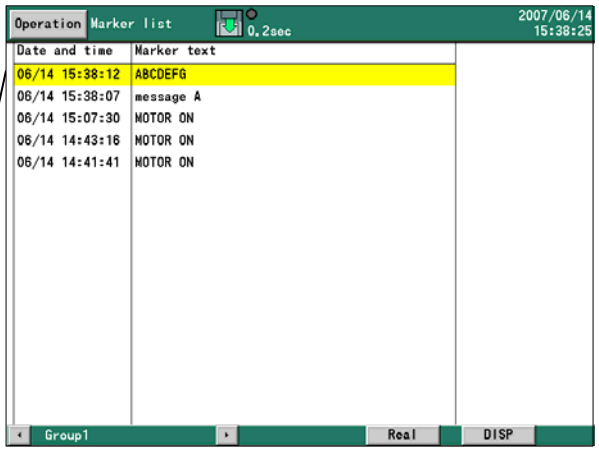
SCROLL

Press this key to switch to the scroll mode. When this key is pressed once, the scroll bar is enclosed with a yellow frame and the scroll mode becomes ON. In this status, by pressing the direction key, the trends are scrolled one screen by one screen. When the scroll key is pressed again, the scroll mode becomes OFF and the trends are scrolled one line by one line by pressing the direction key.

(Tapping operation)
Operate the scroll bar.

9.11 Marker list screen

The list of markers recorded on the trends is displayed. The date and time and the marker text are displayed in the reverse chronological order (latest on the top). The markers recorded in the selected group are displayed.
Maximum 200 markers are recorded. When the recorded marker exceeds 200, the markers are deleted in chronological order.



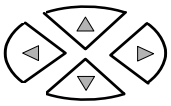
The selected row is displayed in yellow.

ENTER menu function

Trend display	The screen is jumped to the trend position of the marker of the selected row. When the file is not found, the screen cannot be jumped.
Delete	The marker of the selected row is deleted.
Delete all	All markers in the list are deleted.

(Tapping operation)
By tapping a row in the list, the ENTER menu appears.

Key operations other than the common operations (Para. 9.1)



Up/down keys: Moving the row for selection
Left/right keys: Not used

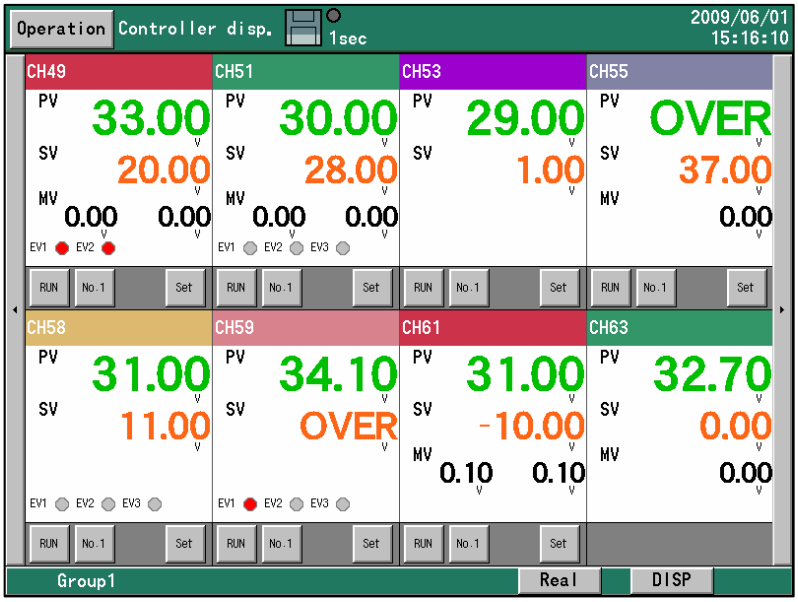
SCROLL

Press this key to switch to the scroll mode. When this key is pressed once, the scroll bar is enclosed with a yellow frame and the scroll mode becomes ON. In this status, by pressing the direction key, the trends are scrolled one screen by one screen. When the scroll key is pressed again, the scroll mode becomes OFF and the trends are scrolled one line by one line by pressing the direction key.

(Tapping operation)
Operate the scroll bar.

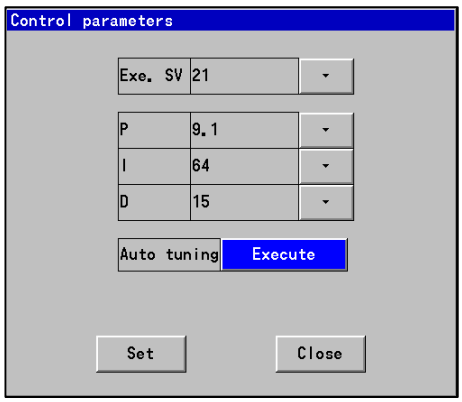
9. 12 Controller display screen

When controllers are connected with low order communications and registered in a group, the controllers can be displayed.
By dividing the channel registered in the group selected into a frame for each controller, PV, SV, and MV are displayed.
Moreover, RUN/READY selection, SV1/2 selection, AUTO/MANUAL selection, PID, etc. in each frame can be set.
The controllers up to 16 sets can be displayed and up to 8 sets are displayed on 1 screen. In case of 9 sets or more, the controllers are displayed by switching with the arrow buttons displayed on right and left.



Contents of each function button

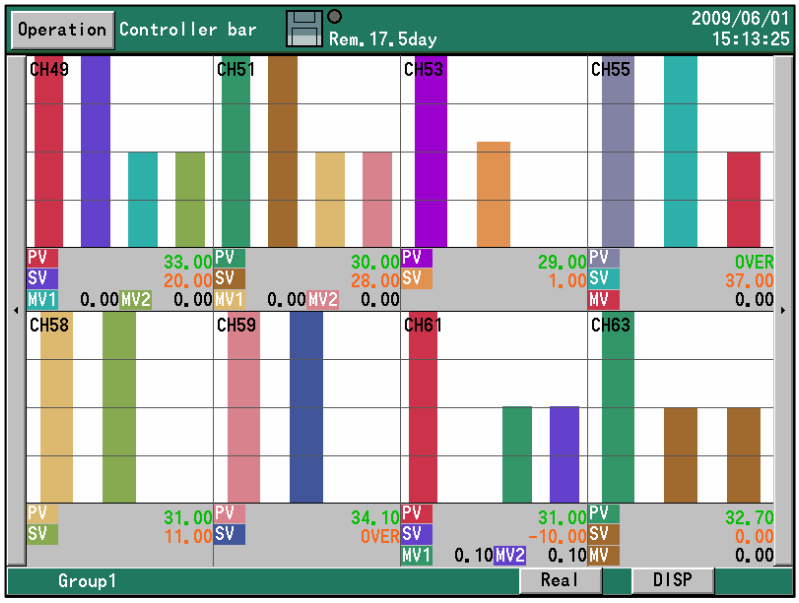
For DP-G series controllers, function buttons are not displayed. Data display is only enabled.

RUN/READY	Selects RUN/READY of a controller
SV1/2	Selects execution SV1/2 of a controller This button is not displayed for LT series controllers except LT400 series.
AUTO/MANUAL	Selects the modes of AUTO/MANUAL of a controller This button is not displayed for LT series controllers except LT400 series.
SET	The following setting screen is displayed to enable settings.  SV, MV, P, I, D: Each parameter of a controller is set. Auto-tuning: Starts auto-tuning

For this screen, settings can be executed on the touch panel only.

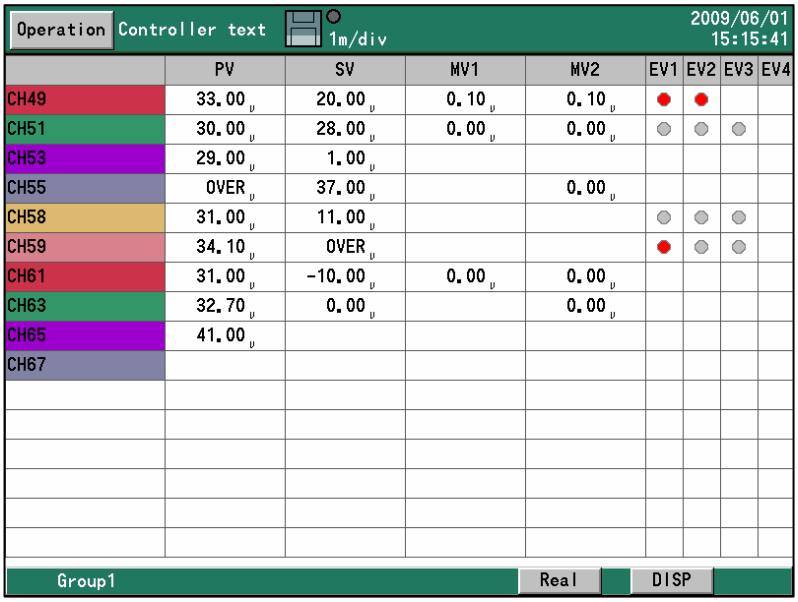
9.13 Controller bar graph screen

When controllers are connected with low order communications and registered in a group, the controller bar graph screens can be displayed.
By dividing the channel registered in the group selected into a frame for each controller, PV, SV, and MV are displayed with bar graphs.
The controllers up to 16 sets can be displayed and up to 8 sets are displayed on 1 screen. In case of 9 sets or more, the controllers are displayed by switching with the arrow buttons displayed on right and left.



9.14 Controller text screen

When controllers are connected with low order communications and registered in a group, the controller text screens can be displayed.
By dividing the channel registered in the group selected into a frame for each controller, PV, SV, and MV are displayed with texts. Moreover, alarm activation state (EV) of a controller can be confirmed.
The controllers up to 16 sets can be displayed.

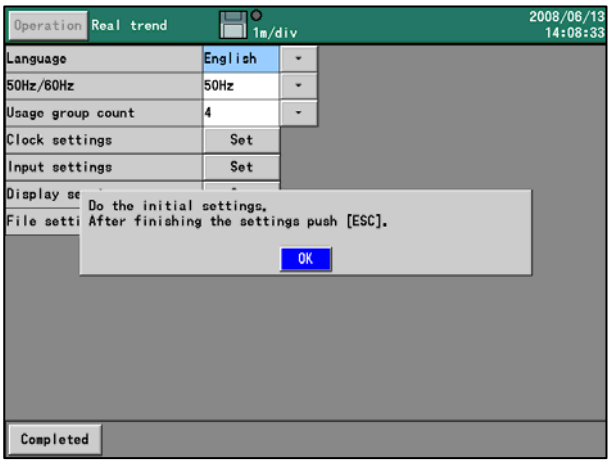


10 Initial settings

When the power supply is turned on under the default settings at the factory or when the settings are initialized, the initial settings screen is displayed. Set the indispensable following parameters on use.

You can exit without setting the parameters. In that case, this recorder operates with the default settings at the factory.

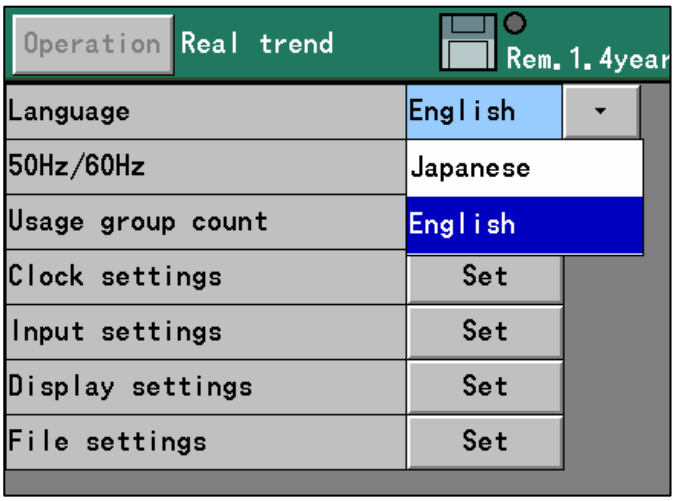
- Language
- Power frequency 50Hz/60Hz
- Setting of the usage group count
- Clock settings
- Input settings
- Display settings
- File settings



By pressing the ENTER key or touching the [OK] button, the message disappears and the settings are enabled.

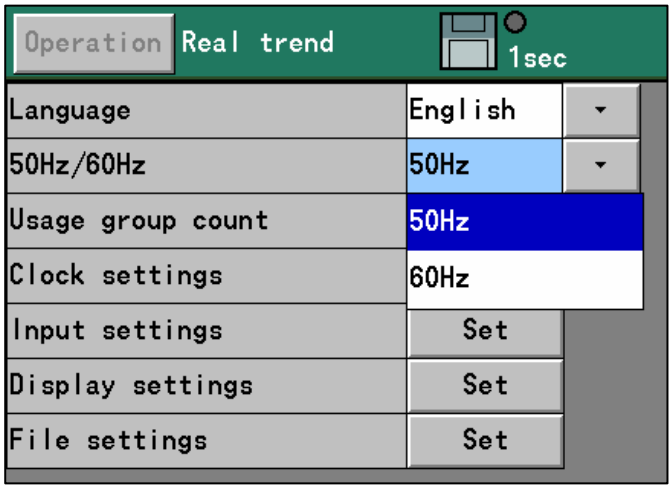
(1) Setting of the language

By tapping the ▼ button of the Language, the pulldown menu is displayed.
Tap English or Japanese in the pulldown menu for setting.



(2) Setting of the power frequency

By tapping the ▼ button of the 50Hz/60Hz, the pulldown menu is displayed.
Tap 50Hz or 60Hz in the pulldown menu for setting.
Confirm and set the power frequency being used.

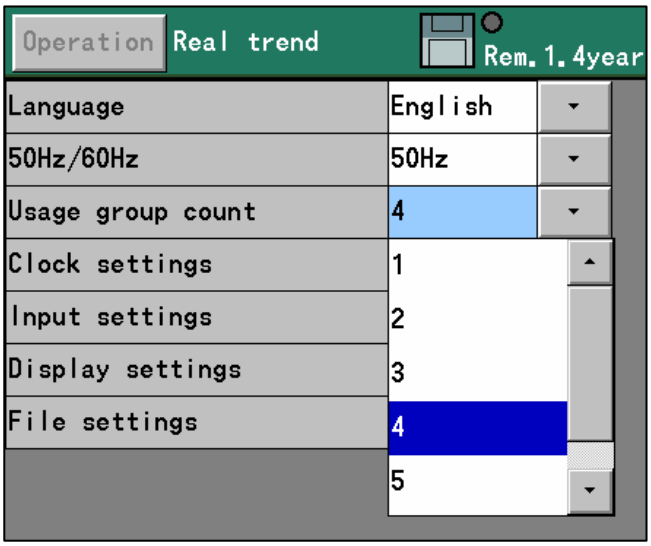


参考 About the setting of the power supply

This setting is set for noise (Industrial frequency) filter of the input. Please switch whenever it uses with 60Hz band and the industrial frequency noise influences it and use it. (The noise removal characteristic might improve it by the thing adjusted to 60Hz side.)

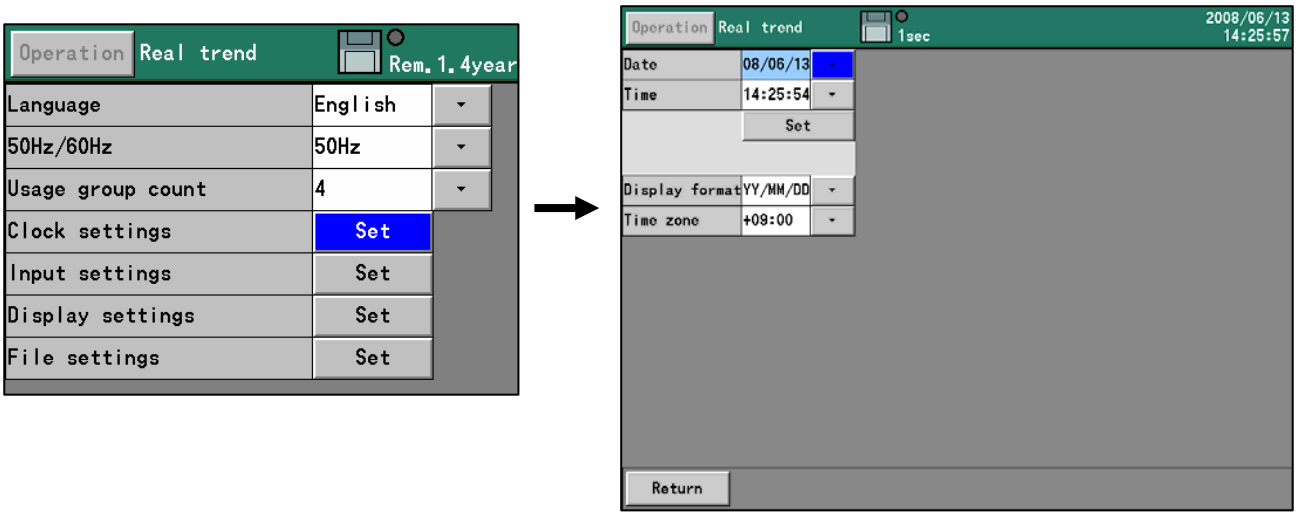
(3) Setting of the usage group count

By tapping the ▼ button of the item of the usage group count, the pulldown menu is displayed.
Select usage group count in the pulldown menu and press the ENTER key.



(4) Clock settings

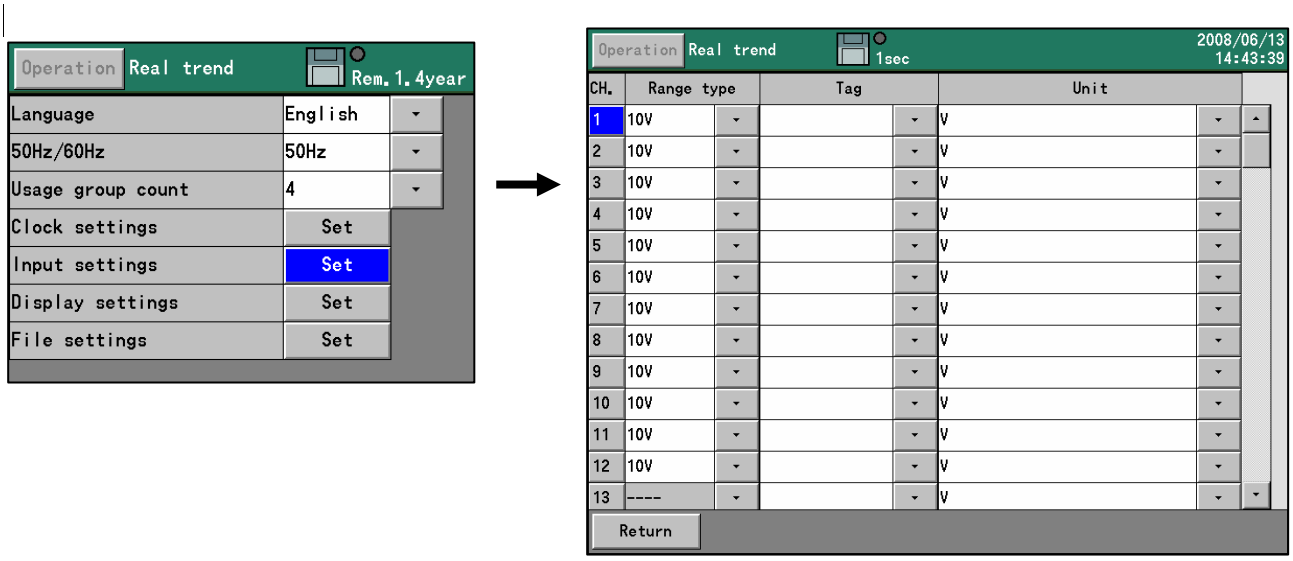
By tapping the [Set] button of the clock settings, the following clock settings screen is displayed.



* For detailed settings, refer to [13.11.1 Clock settings].

(5) Input settings

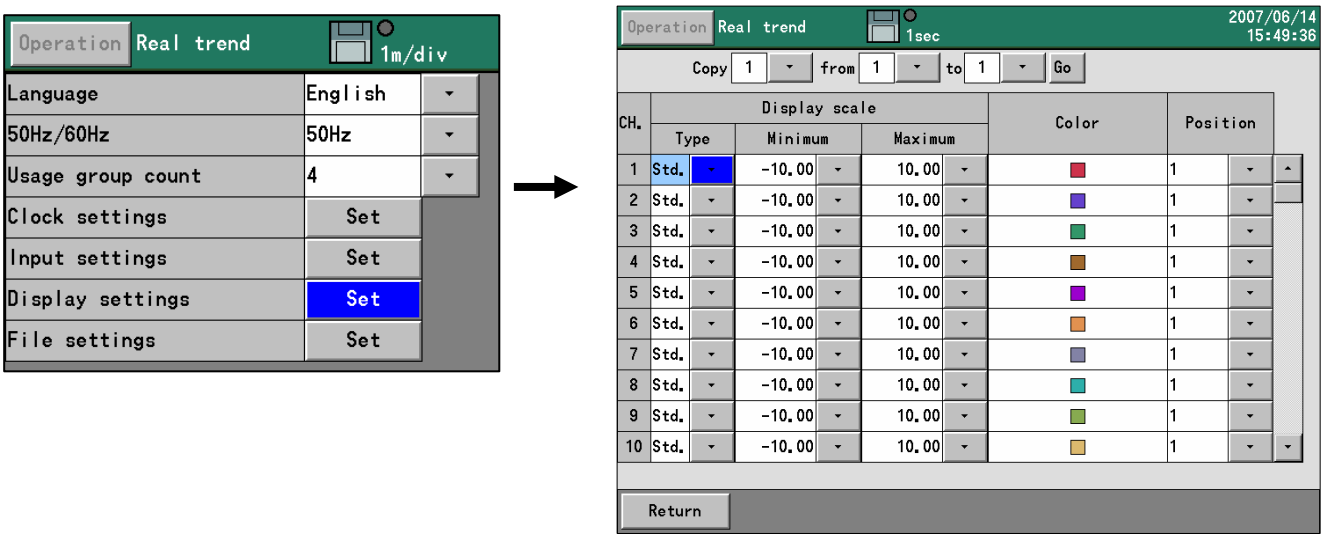
By tapping the [Set] button of the input settings, the following input settings screen is displayed.



* For detailed settings, refer to [13.2 Input operation settings].

(6) Display settings

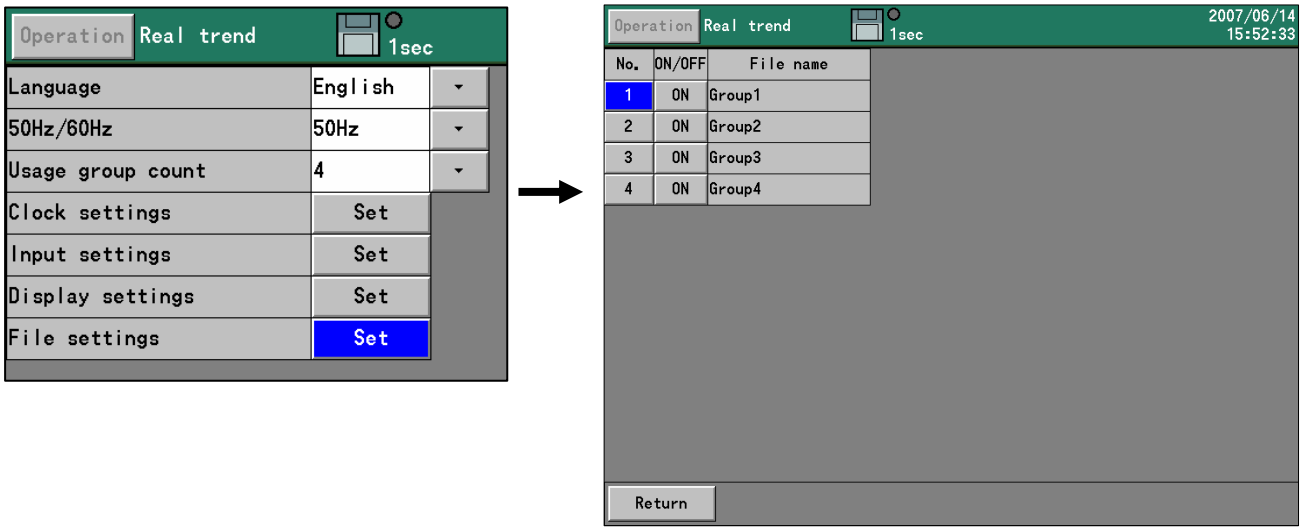
By tapping the [Set] button of the display settings, the following display settings screen is displayed.



* For detailed settings, refer to [13.3.1 Channel parameters].

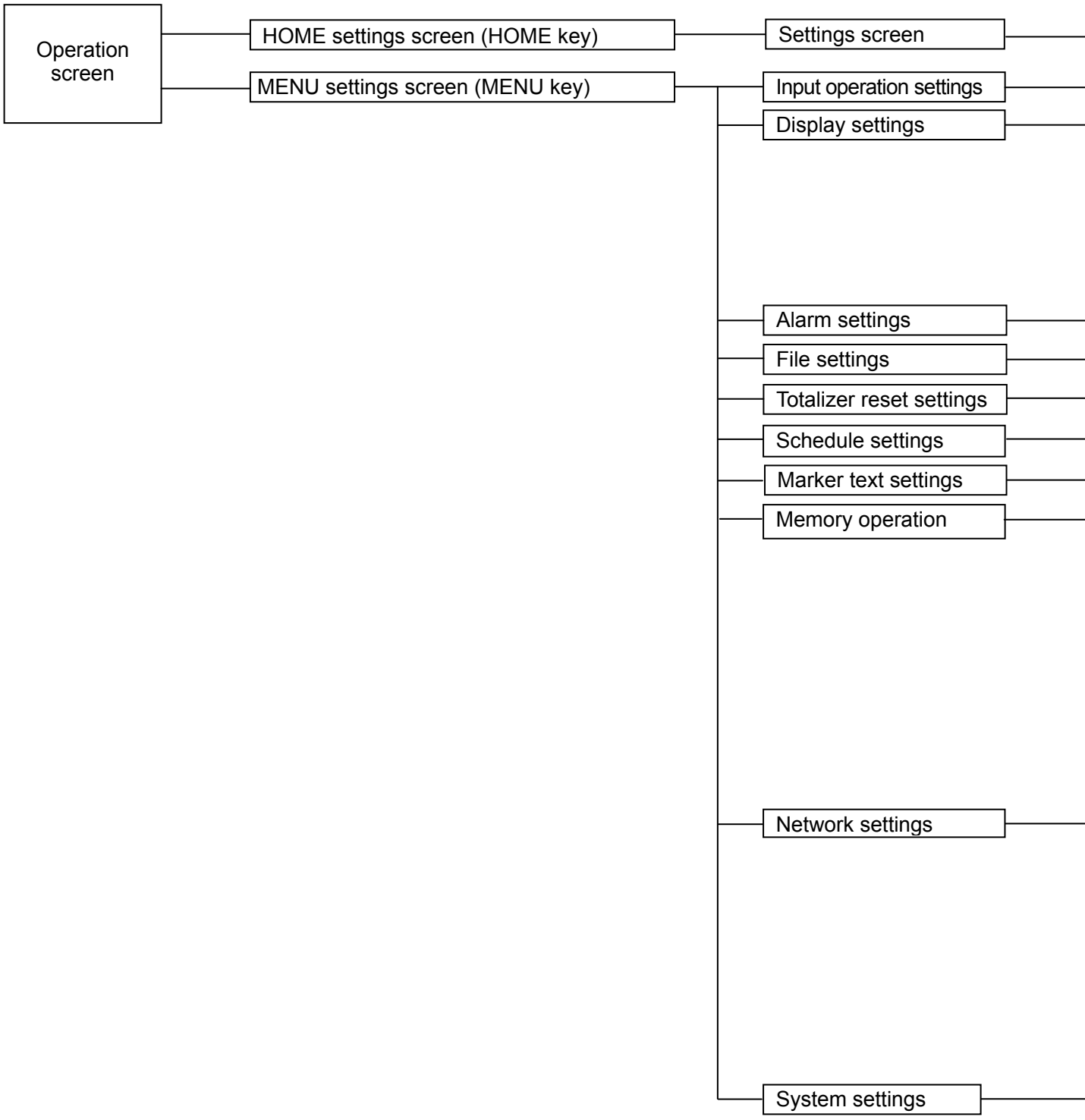
(7) File settings

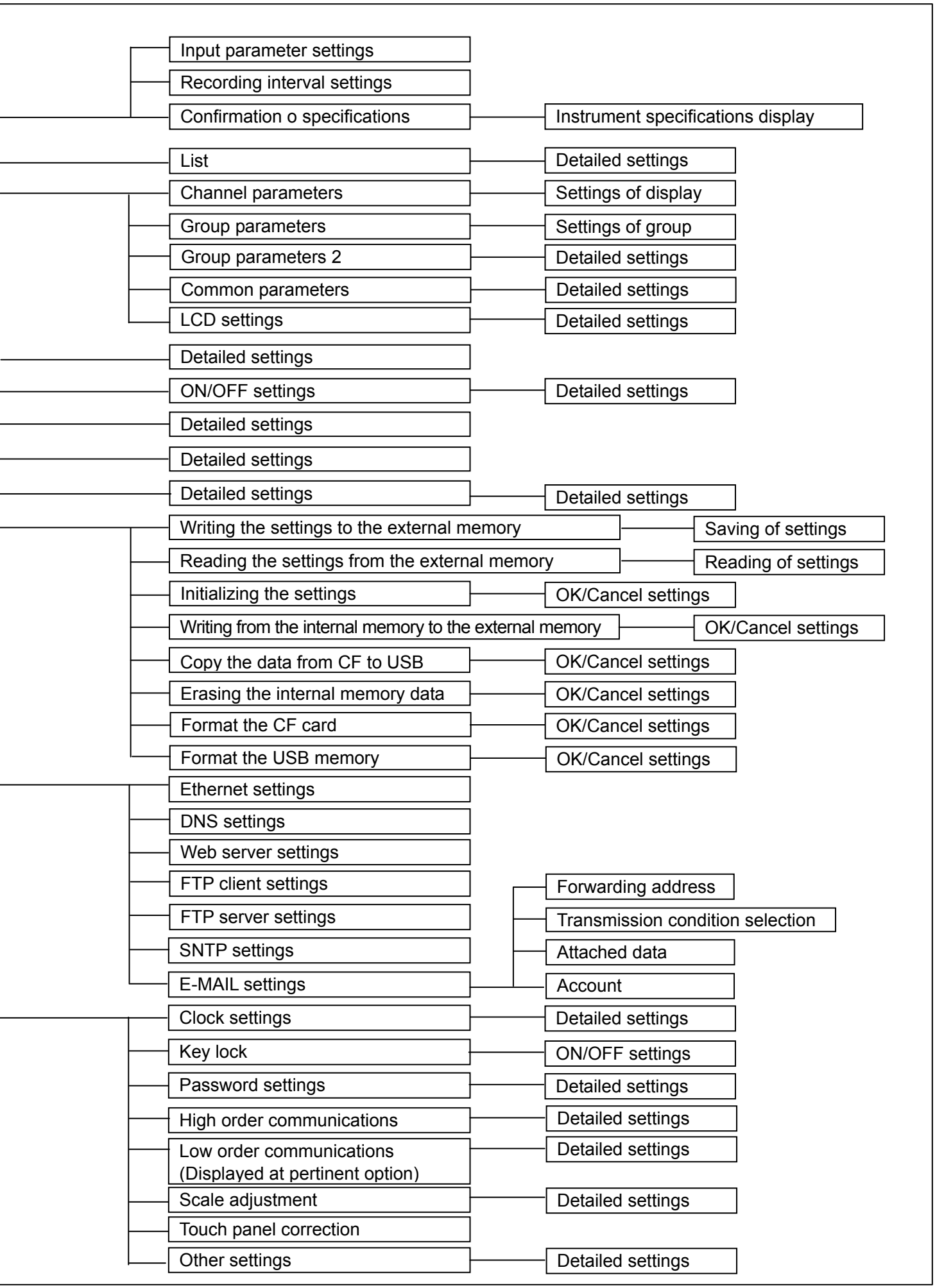
By tapping the [Set] button of the file settings, the following file settings screen is displayed.



* For detailed settings, refer to [13.5 File settings].

11 Flow chart of HOME settings and MENU settings




Input parameter settings
Recording interval settings
Confirmation o specifications
Instrument specifications display
List
Detailed settings
Channel parameters
Settings of display
Group parameters
Settings of group
Group parameters 2
Detailed settings
Common parameters
Detailed settings
LCD settings
Detailed settings
Detailed settings
ON/OFF settings
Detailed settings
Detailed settings
Detailed settings
Detailed settings
Detailed settings
Writing the settings to the external memory
Saving of settings
Reading the settings from the external memory
Reading of settings
Initializing the settings
OK/Cancel settings
Writing from the internal memory to the external memory
OK/Cancel settings
Copy the data from CF to USB
OK/Cancel settings
Erasing the internal memory data
OK/Cancel settings
Format the CF card
OK/Cancel settings
Format the USB memory
OK/Cancel settings
Ethernet settings
DNS settings
Web server settings
FTP client settings
FTP server settings
SNTP settings
E-MAIL settings
Forwarding address
Transmission condition selection
Attached data
Account
Clock settings
Detailed settings
Key lock
ON/OFF settings
Password settings
Detailed settings
High order communications
Detailed settings
Low order communications
(Displayed at pertinent option)
Detailed settings
Scale adjustment
Detailed settings
Touch panel correction
Other settings
Detailed settings

12 HOME settings

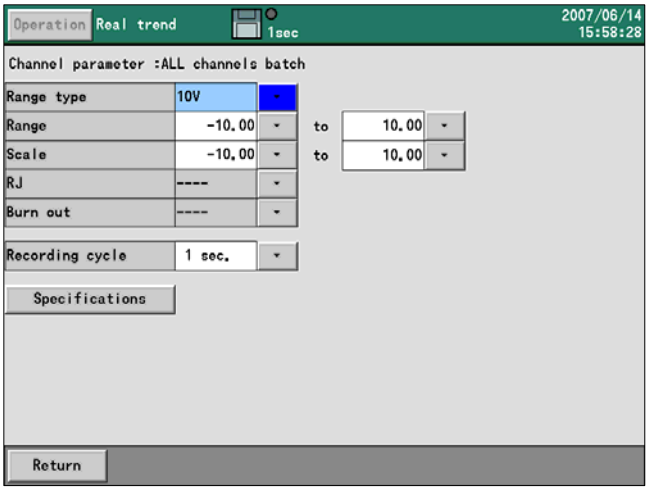
12.1 Setting with HOME settings

When the [HOME settings] is used, the inputs and recordings of all channels together can be set for the confirmation of input/recording simply.

☐ Operation screen

Press the HOME key or tap [Operation] – [HOME settings]

☐ HOME settings screen



Press the HOME key on the operation screen to move to the HOME settings. For the settings, move the cursor (blue) to the desired item with the direction key and press the ENTER key, or tap the ▼ button of the desired item. Then a selection screen is displayed for setting.

■ Setting the range type

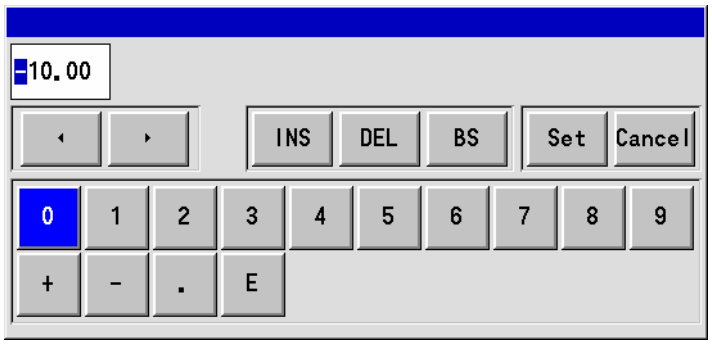
DC voltage	13.8mV, 27.6mV, 69mV, 200mV, 500mV, 2V, 5V, 10V, 20V, 50V
Thermocouple	K, E, J, T, R, S, B, N, W-WRe26, WRe5-WRe26, PR40-20, NiMo-Ni, CR-AuFe, Platinel2, U, L
Resistance thermometer	Pt100, JPt100, Pt50, Pt－Co

■ Setting the range

・Set the range. (It is decided by the range type.)

■ Setting the scale

・Set the scale. (It is decided by the range type.)



Since the number of digits after decimal point set here becomes the number of digits after decimal point for the measured value, enter a value correctly.

■ Setting the RJ (Reference junction compensation)

・Set whether the RJ is internal or external.

■ Setting the burn out

None	The burnout function is not used.
UP	Set to the upscale burnout.
DOWN	Set to the downscale burnout.

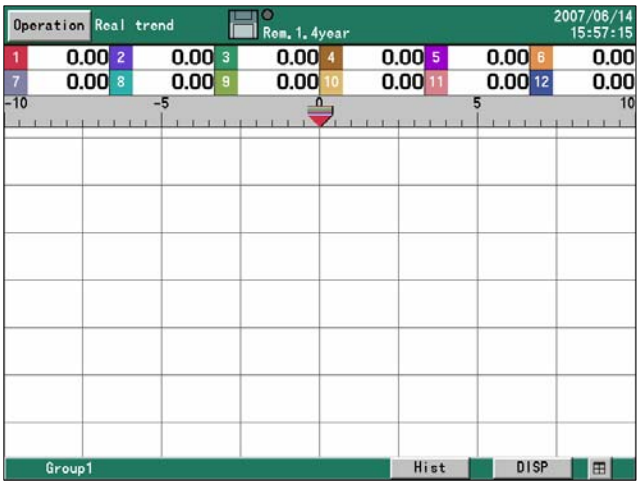
■ Setting the recording cycle

Second	0.1 second, 0.2 seconds, 0.5 seconds, 1 second, 2 seconds, 3 seconds, 5 seconds, 10 seconds, 15 seconds, 20 seconds, 30 seconds
Minute	1 minute, 2 minutes, 3 minutes, 5 minutes, 10 minutes, 15 minutes, 20 minutes, 30 minutes, 60 minutes

12.2 Confirming the specifications with HOME settings screen

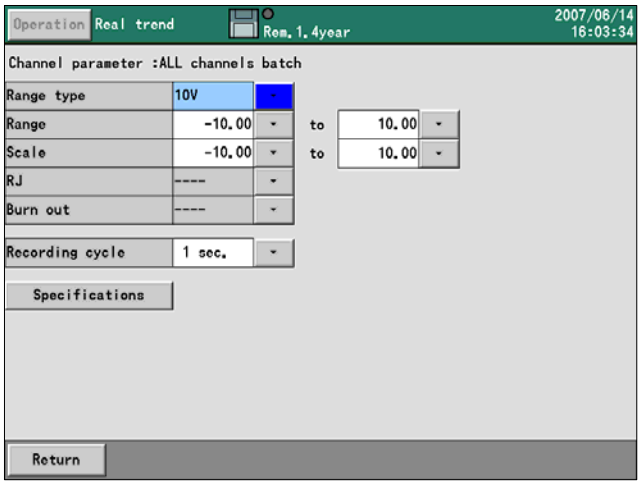
- The information of specifications of this recorder can be confirmed.
- When you have any question on this recorder, contact your nearest distributor after confirming specifications by this screen.

☐ Operation screen



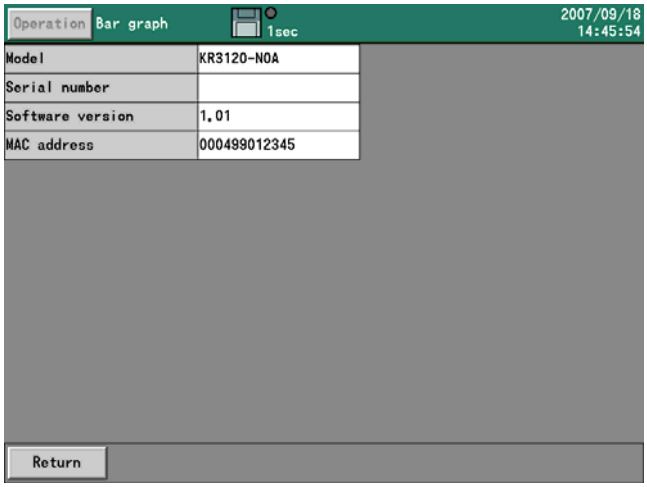
Tap [Operation] – [HOME settings] or press the HOME key.

☐ HOME setting screen



Tap Specifications .

☐ Specifications confirmation screen



In the specifications confirmation screen, the followings can be confirmed.

- Model
- Serial number
- Software version
- MAC address

13 MENU settings

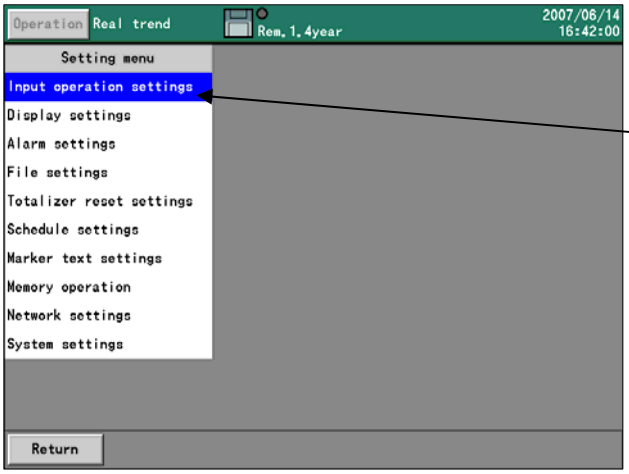
13.1 Setting MENU settings screen

☐ Operation screen

For setting parameters, tap the [Operation] button on the operation screen and then tap the [MENU settings] to display the parameter items.
By tapping an item, the screen is switched to the parameter settings screen of this item.
Click.

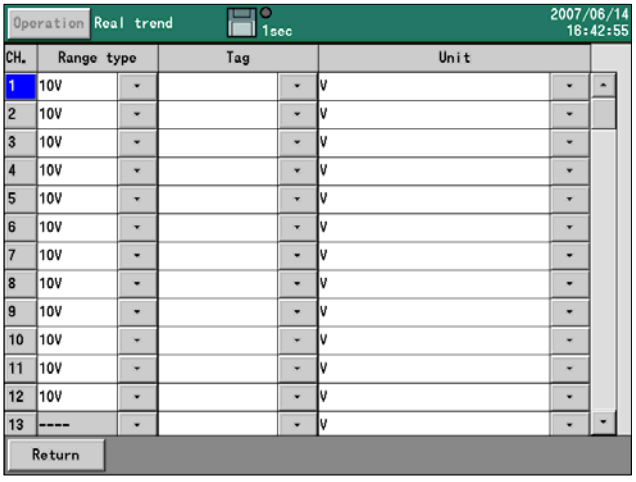
Tap [Operation] – [MENU settings] or press the MENU key.

☐ Setting menu screen



The list box of the parameters is displayed. Tap the parameter item to be set.

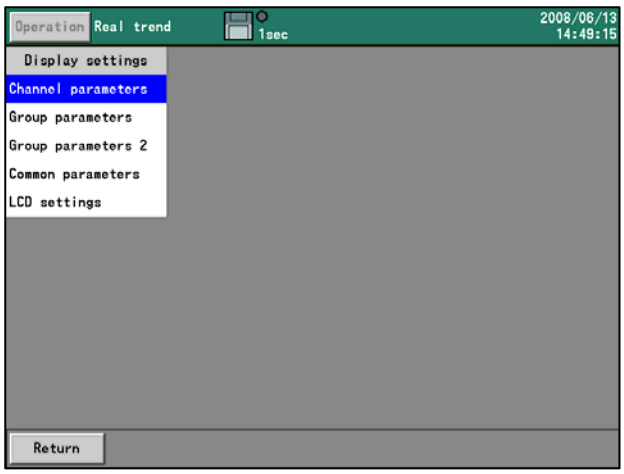
☐ Input operation settings screen
Selection in the “Input operation settings”



Input operation settings

Refer to “13.2 Input operation settings”.

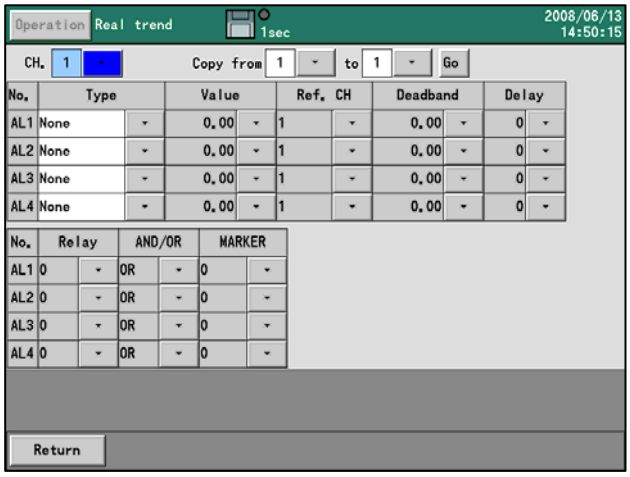
☐ Display settings screen
Selection in the “Display settings”



Display settings

Refer to “13.3 Display settings”.

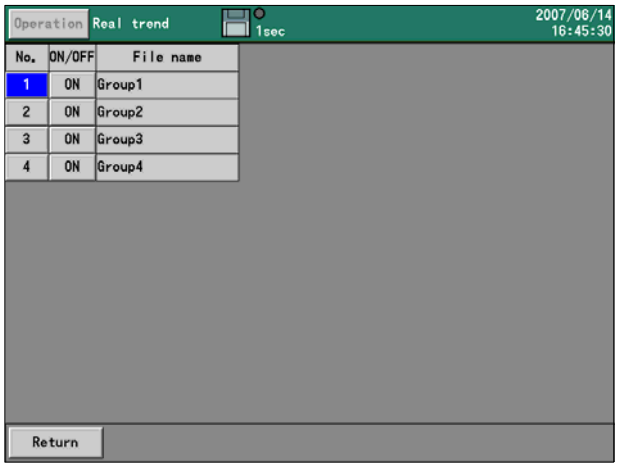
☐ Alarm settings screen
Selection in the “Alarm settings”



Alarm settings

Refer to “13.3 Alarm settings”.

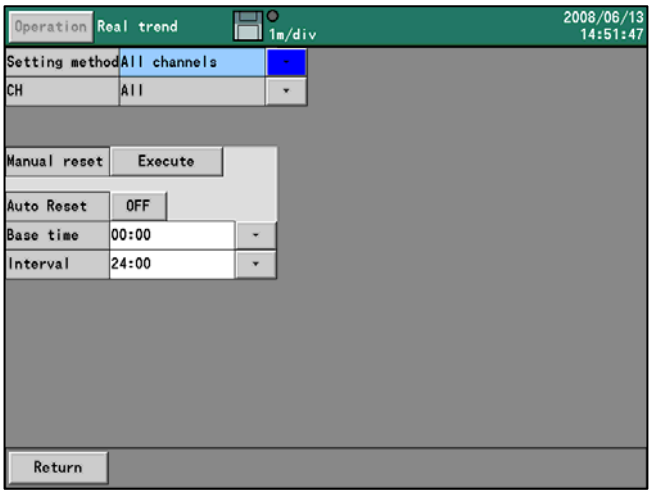
☐ File settings screen
Selection in the “File settings”



File settings

Refer to “13.5 File settings”.

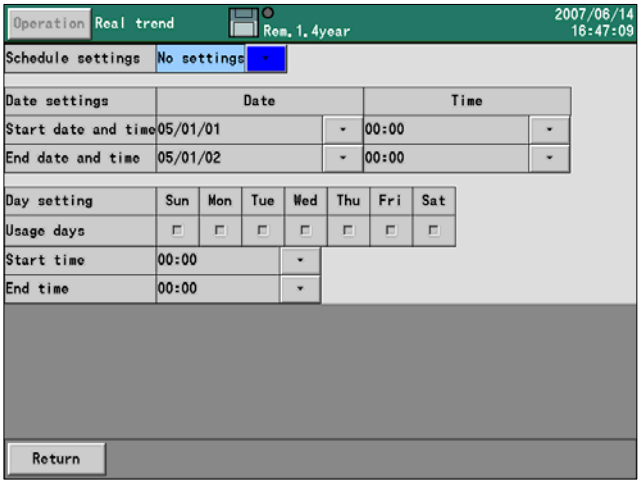
☐ Totalizer reset settings screen
Selection in the “Totalizer reset settings”



Totalizer reset settings

Refer to “13.6 File settings”.

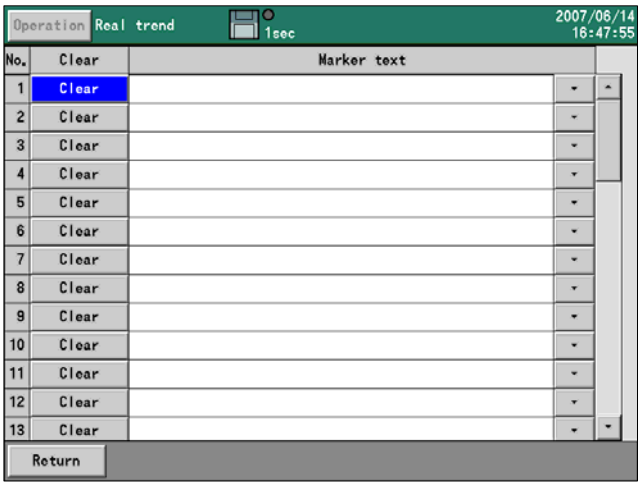
☐ Schedule settings screen
Selection in the “Schedule settings”



Schedule settings

Refer to “13.7 Schedule settings”.

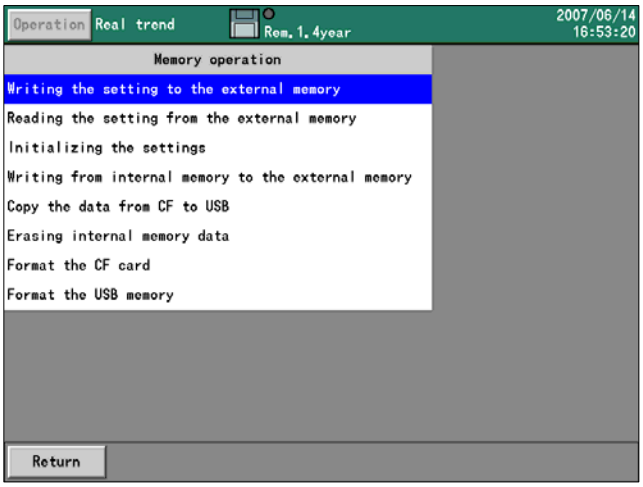
☐ Marker text settings screen
Selection in the “Marker text settings”



Marker text settings

Refer to “13.8 Marker text settings”.

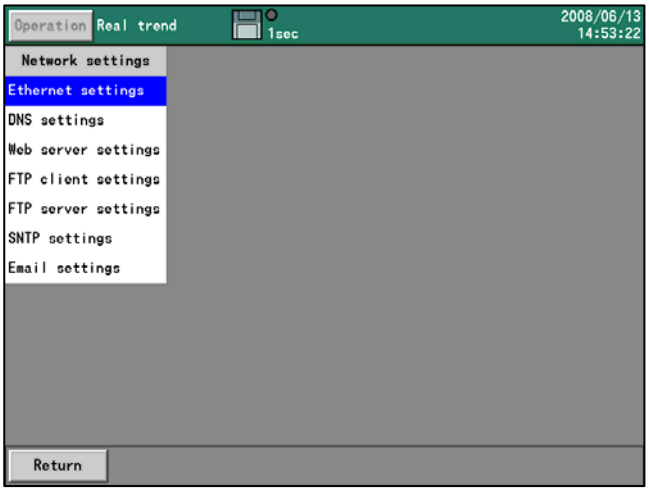
☐ Memory operation screen
Selection in the “Memory operation”



Memory operation

Refer to “13.9 Memory operation”.

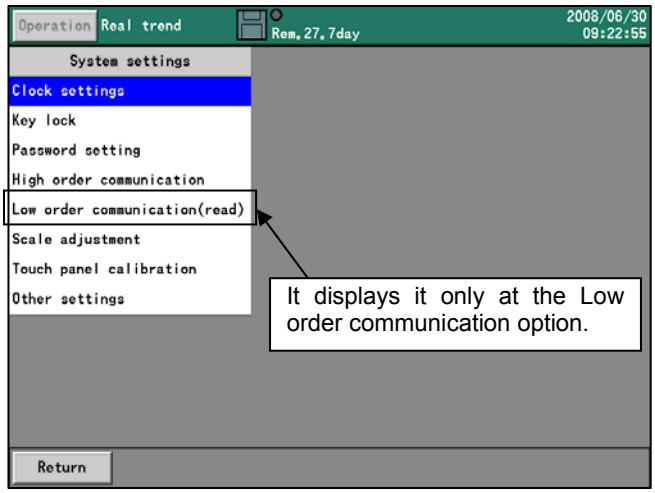
☐ Network settings screen
Selection in the “Network settings”



Network settings

Refer to “13.10 Network settings”.

☐ System settings screen
Selection in the “System settings”



System settings

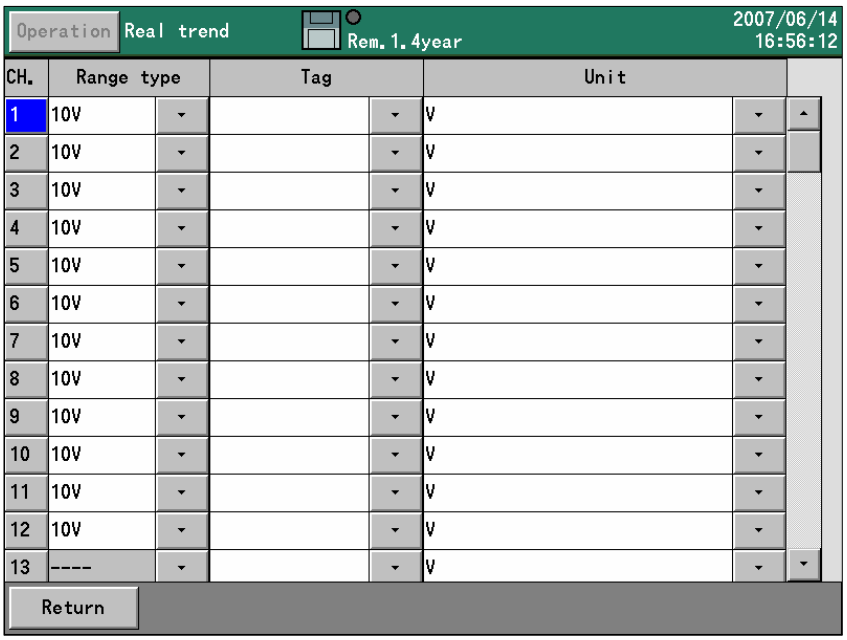
Refer to “13.11 System settings”.

13.2 Input operation settings

13.2.1 Setting contents

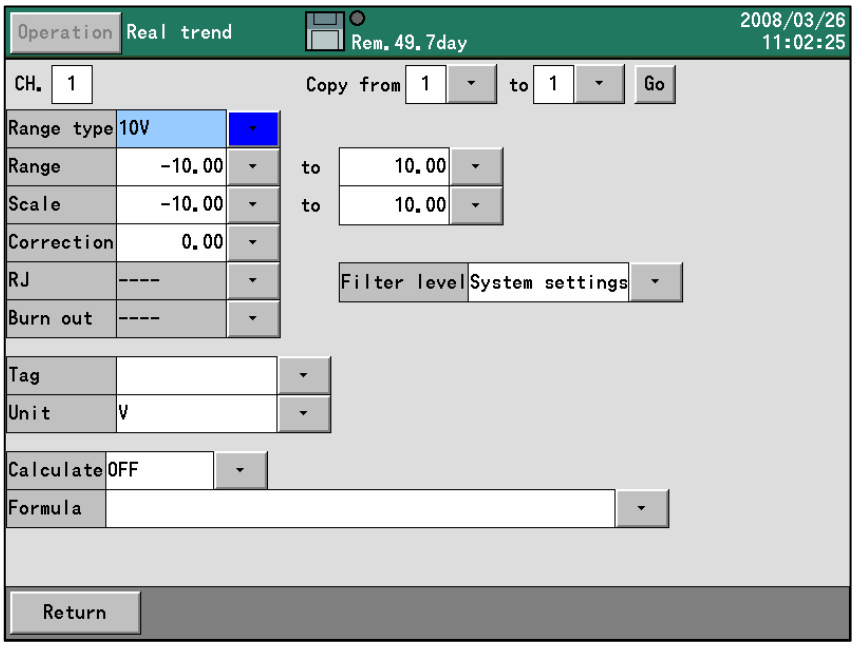
- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the “Input operation settings” on the setting menu screen, the following screen is displayed.



*When Low order communication(read) option is effective, the item for the low order communication registration is added. Please see "16. Low order communication(read) setting (option)" also.

By touching a CH number, the detailed setting screen for this channel is displayed.



■ Setting the range type

(Analog input)KR3120,KR3121: CH1 to 12, KR3140,KR3141: CH1 to 24
KR3160,KR3161: CH1 to 36, KR3180,KR3181: CH1 to 48

DC voltage	13.8mV, 27.6mV, 69mV, 200mV, 500mV, 2V, 5V, 10V, 20V, 50V
Thermocouple	K, E, J, T, R, S, B, N, W-WRe26, WRe5-WRe26, PR40-20, NiMo-Ni, CR-AuFe, Platinel2, U, L
Resistance thermometer	Pt100, JPt100, Pt50,Pt－Co

(Digital input) ∗For the optional digital input specified CH121 to 128

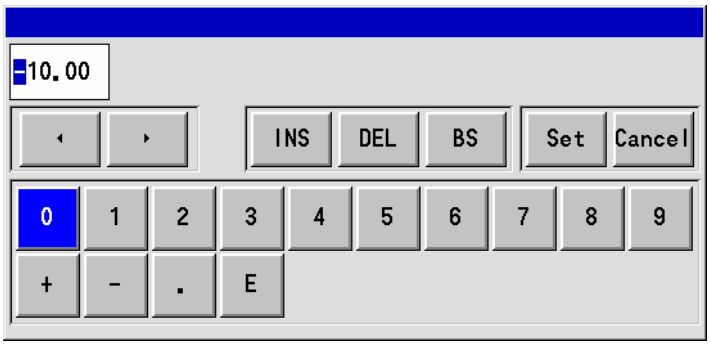
Digital input	DI
Pulse input	Pulse(+), Pulse(-)

■ Setting the range

・Set the range. (It is decided by the range type.)

■ Setting the scale

・Set the scale. (It is decided by the range type.)



Since the number of digits after decimal point set here becomes the number of digits after decimal point for the measured value, enter a value correctly.

■ Setting the sensor correction

・Set a value (shift value) added to the input value.

■ Setting the RJ (Reference junction compensation)

・Set whether the RJ is internal or external.

■ Setting the burn out

None	The burnout function is not used.
UP	Set to the upscale burnout.
DOWN	Set to the downscale burnout.

■Setting the filter level

・The input filter level can be set from 0 to 3. 0 means no-filter, and 3 means the strongest filter. When [system settings] is selected, settings are following [system settings] – [other settings].

■ Setting the tag

・Setting a tag name (Setting for displaying the tag name instead of the channel number) When the display of the data of a [Display settings]-[Common parameters] is set with tag, it is effective.

■ Setting the unit

・Set the engineering unit of its channel.

■ Setting the usage of calculation

OFF	The input data are displayed and recorded as the measured date of its channel.
ON	The results processed by the calculation formula are displayed and recorded as the measured data of its channel.

■ Setting the formula

・When the calculation usage is ON, set the formula of its channel.

■ Copying the parameters with the copy function

The above shows the setting for copying Channel 01 from Channel 02 to Channel 05. By tapping the [Go], the parameters of Channel 01 are copied from Channel 02 to Channel 05.

13.2.2 Setting method of formula

1) Formula types

Mathematical calculation
Four arithmetic operations are performed.

	Symbol	Example	Remarks
Addition	+	*X* **+***Y*	
Subtraction	-	*X* **-***Y*	
Multiplication	*	*X* ***Y*	
Division	/	*X***/***Y*	
Reminder	%	*X* **%***Y*	
Exponential	^	*X* **^***Y*	

* *X* and *Y* indicate the formula or the numeric value.

Comparison calculation
The comparison calculation is performed and the result is;
1 (established) or
0 (not established)

	Symbol	Example	Remarks
Equal value	==	*X* **==***Y*	
Unequal value	!=	*X* **!=***Y*	
More than	>>	*X* **>>***Y*	
Less than	<<	*X* **<<***Y*	
Equal or more than	>=	*X* **>=***Y*	
Equal or less than	<=	*X* **<=***Y*	

* *X* and *Y* indicate the formula or the numeric value.

Logic operation
The logic operation for 1 or 0 is performed and the result is returned as 1 or 0.

	Symbol	Example	Remarks
Logical AND	AND	*X* **AND***Y*	
Logical OR	OR	*X* **OR***Y*	
Exclusive OR	XOR	*X* **XOR***Y*	
Negation	NOT	**NOT(***X* **)**	Put the object being negative in brackets.

* *X* and *Y* indicate the formula or the numeric value. Express *X* and *Y* as *0* or *1.*

General calculation functions
The function calculation is performed.

	Symbol	Example	Remarks
Round up after the decimal	CEL	**CEL(***X* **)**	
Round down after the decimal	FLR	**FLR(***X* **)**	
Absolute value	ABS	**ABS(***X* **)**	
Square root	SQR	**SQR(***X* **)**	
Power of e	EXP	**EXP(***X* **)**	
Natural logarithm (The base is e.)	LOG	**LOG(***X* **)**	
Common logarithm (The base is 10.)	LOG10	**LOG10(***X* **)**	

* *X* indicates the formula or the numeric value.

Channel data calculation functions

The function calculation is performed.
When an error data (OVER, UNDER, etc.) is included in the measured data, it becomes “CAL ER”.

	Symbol	Example	Remarks
Measured data	CH	**CH(***X***)**	X is channel No.
Calculation result data	PCH	**PCH(***X***)**	
Previous calculated result data	OCH	**OCH(***X***)**	Data at the previous scanning (before 0.1 seconds)
Totalizer	ITG	**ITG(***X***)**	Refer to 2) Totalizing operation
24-hour totalizing	ITG24	**ITG24(***X***)**	Refer to 2) Totalizing operation
F value	FV	**FV(***X#To#Z#R)*	Refer to 3) F value
Relative humidity	RH	**RH(***D#W***)**	Refer to 4) Relative humidity
Dew-point temperature	DEW	**DEW(***T#H***)**	Refer to 5) Dew-point temperature
Moving average (an hour)	AVE	**AVE(***X#T***)**	Refer to 6) Moving average
Moving average (5 minutes)	AVEH	**AVEH(***X#T***)**	Refer to 6) Moving average
Past data (an hour)	OLD	**OLD(***X#T***)**	Refer to 7) Past data
Past data (5 minutes)	OLDH	**OLDH(***X#T***)**	Refer to 7) Past data
First-order leg filter	IIR	**IIR(***X#T***)**	Refer to 8) First- order filter
Increment per time	PLS	**PLS**(X**#**T)	Refer to 9) Increment per time

* *X* indicates the channel number.

* When the channel data calculation is specified for executing with the settings of the designated channel number, the calculated results of the designated channel number are used. In addition, when the designated channel number is greater than the channel number for calculation, the calculation results obtained previously at the designated channel are used.

System information acquisition function

	Symbol	Example	Remarks
CF card remaining space	CF	**CF(***A* **)**	A = Unit of remaining space 0: MB 1: Minute 2: Hour 3: Day

Other function

	Symbol	Example	Remarks
Wind display	AZI	**AZI(***A***)**	Refer to 10) Wind display

2) Totalizing operation

For the totalizer, the ITG function or the ITG24 function is used.
Do not use the totalizing function more than two times in one formula. The results are not calculated correctly. The totalizing function can be used in calculations other than the totalizer.
Example: ITG(1)+ITG(2), ITG24(1)-ITG(1), ITG(1)/100
For the totalizer reset, refer to Para. 13.6.

(1) Standard totalizing operation
The totalized values are reset at the totalizer reset reference time or at every interval.

Entering method of the formula
ITG(d)
d: Channel number to be totalized

Calculation contents

$D_n = D_{n-1}+[(PV_n + PV_{n-1})\times(T_n-T_{n-1})]\div 2$

D_n: Totalized result — D_{n-1}: Previous totalized result
PV_n: Data to be totalized — PV_{n-1}: Data totalized at the previous calculation
T_n: Time of calculation — T_{n-1}: Time of the previous calculation (before 0.1 second)

When error data (OVER, UNDER, etc.) are included, the calculation is not performed and the previous results are used.

(2) 24-hour totalizing operation
The totalized values are reset only at the totalizer reset reference time or at every interval.

Entering method of the formula
ITG24(d)
d: Channel number to be totalized

The calculation contents are same as the standard totalizing operation.

3) F-value

Entering method of the formula
FV (X#To#Z#R)
X: Channel to be calculated, To: F-value calculation reference temperature, Z: Z-value,
R: F-value calculation starting temperature

The following formula is used for the F-value calculation.
$\int 10^A dt$ Provision: $A=(T-To)\div Z$ T: channel data to be calculated

When T exceeds R, the F-value is reset to 0.

4) Relative humidity

Entering method of the formula
RH (D#W)
D: Dry bulb temperature, W: Wet bulb temperature

The following formula is used for the relative humidity calculation.
$((B-0.000662\times 1013.0\times(D-W))\div A)\times 100$
Provision: A; Dry bulb saturated water vapor pressure, B: Wet bulb saturated water vapor pressure

The following formula is used for the calculation of the saturated water vapor pressure.
$6.1121\times EXP((17.502\times T)\div(240.9+T))$ T: Temperature

5) Dew-point temperature

Entering method of the formula

DEW (T#H)

T: Temperature data channel, H: Relative humidity channel

The following formula is used for the dew-point temperature.

t: Temperature data

h: Relative humidity data

D: Dew-point temperature

1. K=t+273.15
2. In case of t≥0

   W=EXP(-5800.2206/K+1.3914993+K×(-0.048640239+K×(0.41764768E-4
   -0.14452093E-7×K))+6.5459673×LOG(K))/1000

   In case of T<0

   W=EXP(-5674.5359/K+6.3925247+K×(-9.677843E-3+K×(0.62215701E-6
   +K×(0.20747825E-8-9.484024E-13×K)))+4.1635019×LOG(K))/1000
3. S=W×h/100
4. P=S×1000
5. Y=LOG(P)
6. In case of P≥611.2

   D=-77.199+Y×(13.198+Y×(-0.63772+0.071098×Y))

   In case of P<611.2

   D=-60.662+Y×(7.4624+Y×(0.20594+0.016321×Y))

6) Moving average

Entering method of the formula

AVE (X#T)

AVEH (X#T)

X: Data channel number, T: Time series interval (second)

Mean value of past T seconds is calculated.
Difference between AVE and AVEH are the following.

	AVE	AVEH
Sampling cycle	1 second	0.1 seconds
Range of T	1 to 3600	1 to 300

7) Past data

Entering method of the formula

OLD (X#T)

OLDH (X#T)

X: Data channel number, T: Time in which go back (second)

Mean value of past T seconds is calculated.
Difference between OLD and OLDH are the following.

	OLD	OLDH
Sampling cycle	1 second	0.1 seconds
Range of T	1 to 3600	1 to 300

8) First-order leg filter

Entering method of the formula

IIR (X#T)

X: Data channel number, T: Time constant (second)

First-order calculate is performed in the data of channel X.

Contents of calculation

{dt÷(dt+t)} × (x-d) +d

dt: Sampling cycle (0.1 seconds fixed), t: time constant, x: current value of channel X, d: previous calculation result

9) Increment per time

Entering method of the formula

PLS (X#T)

X: Data channel number, T: Unit time (second)

Calculate increment per unit time T. X is specified from the channel that is set totalizer or the channel that is selected pulse range in 121 to 128.

As for the PLS function, when the totalized value is reset excluding reset by the overflow at time etc. , the data when resetting it becomes illegal (To do the same processing as overflow reset internally). Please do the operation construction noting the resetting operation when using it.

10) Wind display

Entering method of the formula

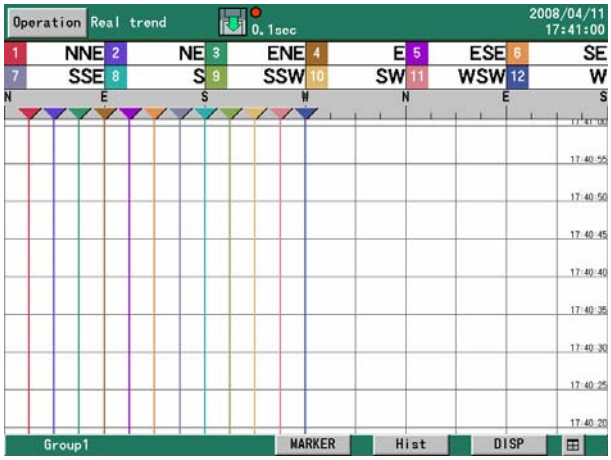
AZI (A)

A: Wind data

Display the compass point which is changed from direction.
Relation of the displayed direction of wind data is in the following list.
If A is fractional value, display closest direction. Example: 1.2 → NNE

A	Display
• • •	• • •
-3	WNW
-2	NW
-1	NNW
0	N
1	NNE
2	NE
3	ENE
4	E
5	ESE
6	SE
7	SSE
8	S
9	SSW
10	SW
11	WSW
12	W
13	WNW
14	NW
15	NNW
16	N
17	NNE
18	NE
• • •	• • •

In addition, scale plate which is registered channel that is used this calculation is displayed wind scale.



Display coordinate on the trend is same as normal numeric data.

11) Example of formula combining calculations

・**(CH(1)*3-20)/6**

(“Raw data of Channel 1”×3-20)÷6

・**(CH(1)+CH(2))<< 300**

When the total of the raw data of Channel 1 and Channel 2 is less than 300, it becomes 1.

・**ABS(CH(1))>=50**

When the absolute value of Channel 1 is 50 or more, it becomes 1.

・**(PCH(1)>=100)AND(PCH(2)<=50)**

When the data of Channel 1 is 100 or more and the data of Channel 2 is 50 or less, it becomes 1.

Remarks Conbination of functions

The following functions can not be used together. The results are not calculated correctly.

ITG, AVE, AVEH, OLD, OLDH, IIR

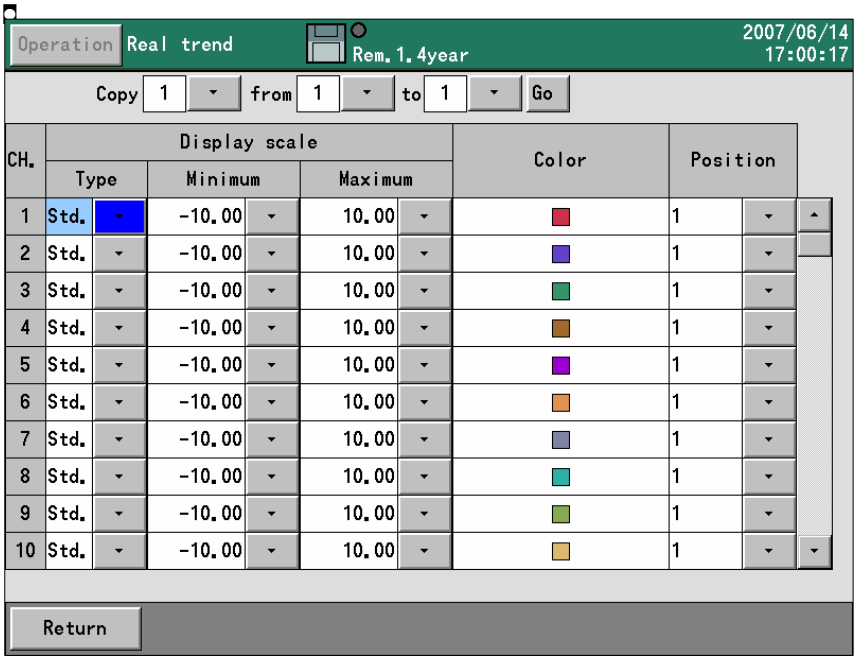
Example: AVE (OLD (1#10)#60) → NG

13.3 Display settings

13.3.1 Channel parameters

- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the display settings on the setting menu screen and then selecting the channel parameters, the following screen is displayed.
Set the wave pattern type, maximum/minimum values of the display scale, color and the display position of each channel.



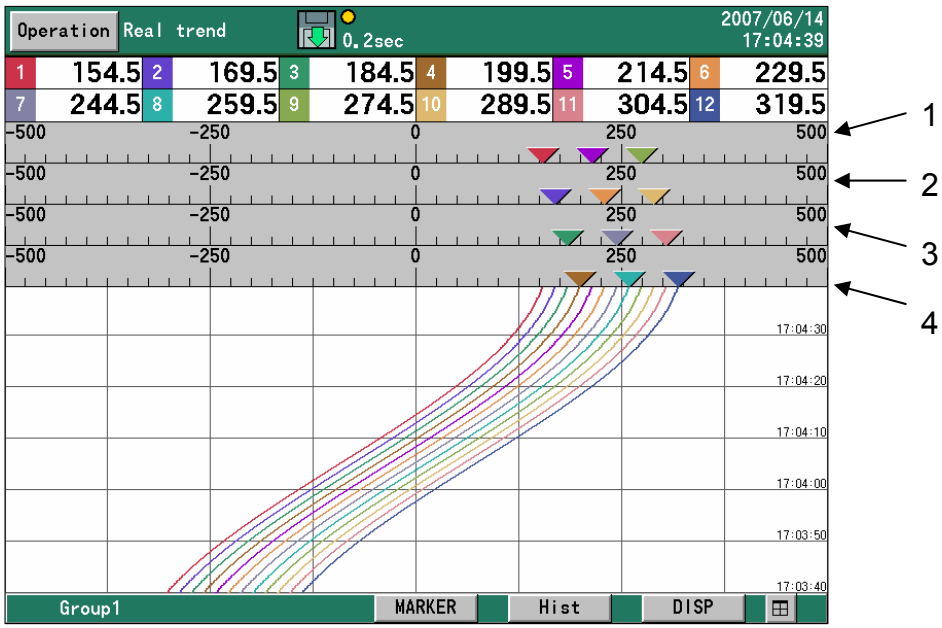
(Setting the display scale
The data are displayed on the screen with the setting contents of the display scale.

Item	Contents
Type	"Std.": Minimum and maximum values can be set in the range of ±30000. The screen is displayed in the standard format. "Expo": Minimum and maximum values are set in the exponent format. The screen is also displayed in the exponent format. The significand of minimum and maximum values is 1 to 9.99 and the exponent part can be set in the range of ±15.
Minimum/maximum	・In the trend display, the minimum value is positioned at the extreme left (low) and the maximum value is positioned at the extreme right (up) by coordinate calculation. ( ) for horizontal direction When there are multiple channels displayed at the same position, the minimum and maximum values of the channel with the smallest number are displayed on the scale plate and the maximum and minimum values of each channel are used for the coordinate for each pen. ・ The maximum and minimum values are displayed with the number of digits after decimal point displayed in the screen.

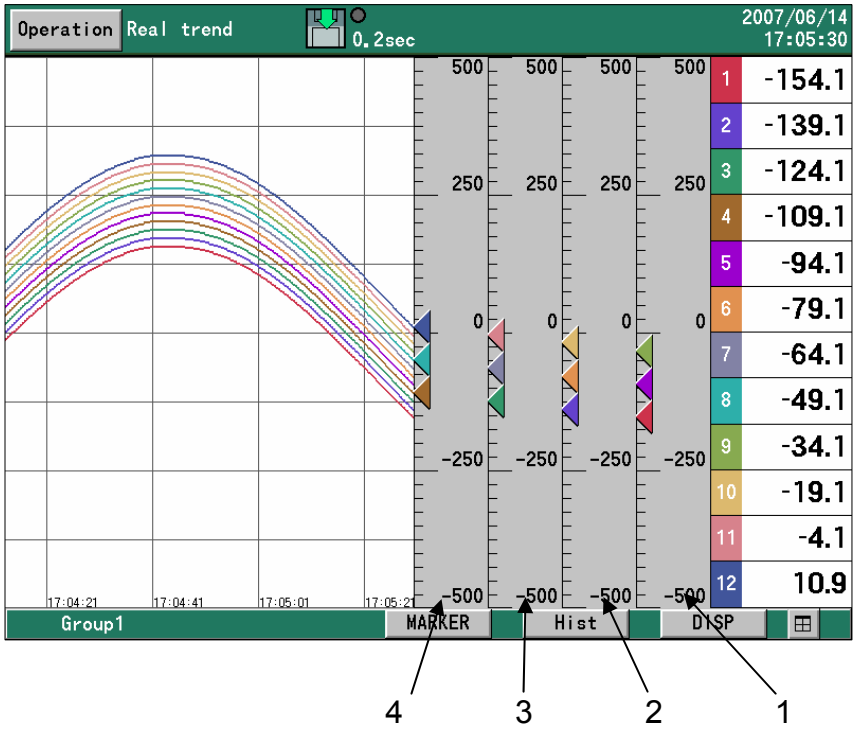
■ Setting the display position

The position (1, 2, 3 and 4) indicates the position of the scale plate.

For the vertical trend graph



For the horizontal trend graph



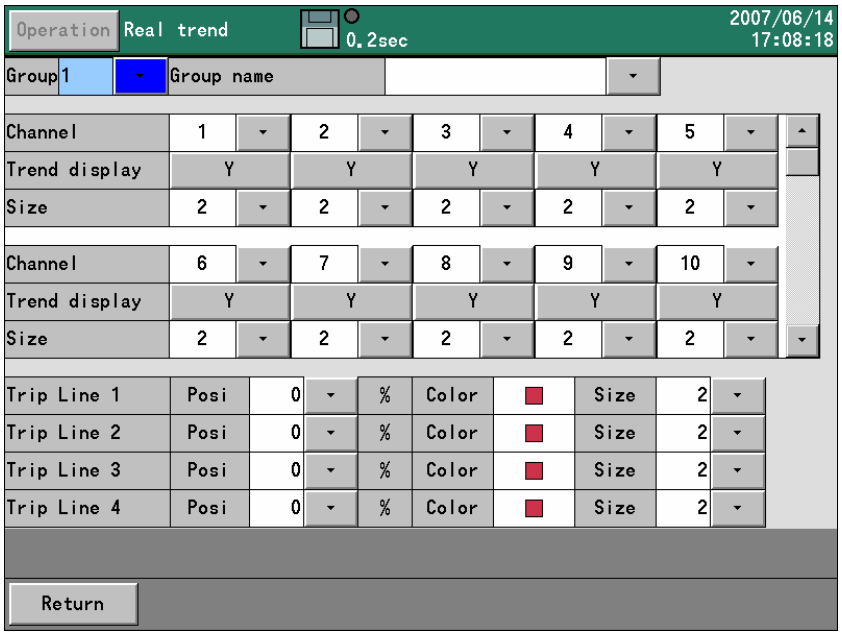
■ Copying the parameters with the copy function

The above shows the setting for copying Channel 1 from Channel 1 to Channel 5. By tapping the [Go], the parameters of Channel 1 are copied from Channel 1 to Channel 5. Colors are not copied.

13.3.2 Group parameters

- Proceed from the MENU mode.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the display settings on the setting menu screen and then selecting the group parameters, the following screen is displayed.
The group being specified by the number in the upper left "Group" can be set.



■ Setting the group name

- Set the group name. This group name is used in the screen display and used as the file name of the recorded data.

■ Channel

- Set the channel to be registered in the group. The registration is cancelled by setting blank.

■ Trend display

- Every time the ENTER key is pressed after selecting “Y” and ”N” are switched alternatively. The trend with N is not displayed even if the channel has been registered. The data of channel with N selected are not recorded in the file.

■ Size

- It is the thickness of the trend line. It can be selected from 1 to 5.

■ Setting the trip line

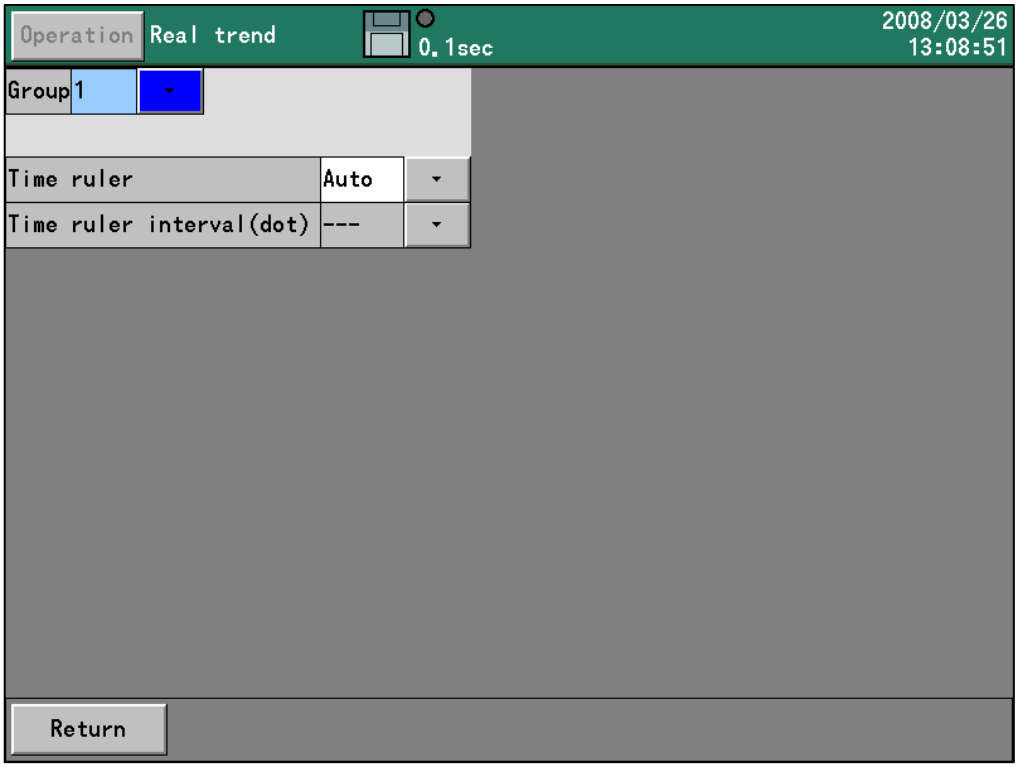
Set the trip line (dotted line) to be displayed on the trends.

- Position
  Set the display position of the trip line in the range 0-99% of the display width.
- Color
  Select the color of the trip line.
- Size
  Select the thickness of the trip line from 1 to 5.

13.3.3 Group parameter 2

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the display settings on the setting menu screen and then selecting the group parameter 2, the following screen is displayed.
The group being specified by the number in the upper left "Group" can be set.



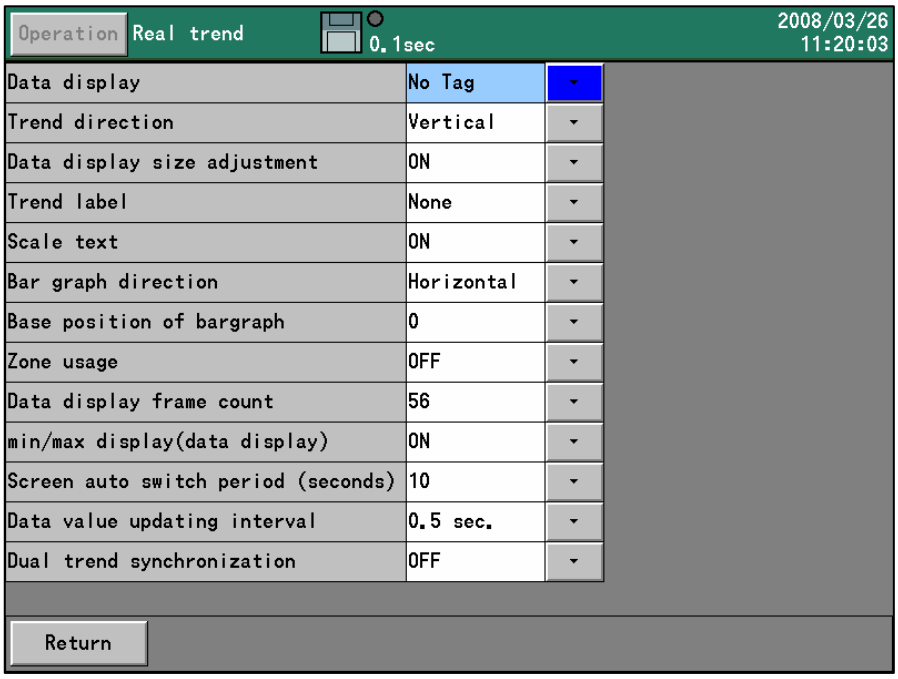
■Time ruler
Select auto or specified. In case of auto, ruled line interval is decided by recording interval.

■Time ruler interval
Time ruler interval of trend is specified. Even number of 12 to 510 can be set. This function is effected when select ‘specified’ in ‘time ruler’.

13.3.4 Common parameters

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the display settings on the setting menu screen and then selecting the common parameters, the following screen is displayed.



■ Setting the data display

・Set the upper side (or right side) display of the trend screen to indicate the tag name, the bar graph or nothing.

No tag	With tag	Bar graph	Nothing

■ Setting the trend direction

・Set the waveform direction to be vertical or horizontal.

■Setting the data display size adjustment

・This is the function which automatically sizes up data display on the trend screen when registered channel numbers are small. In the following cases, data is displayed by lager font.

Data display	Trend direction	Number of the registered CH
No tag	Vertical	Less than 4
With tag	Vertical	Less than 5
No tag	Horizontal	Less than 7
With tag	Horizontal	Less than 5

■Setting the trend label

・Set the label for displaying on the trend.

OFF	Channel	Tag

■ Setting the scale text

・Set the scale plate to display the numerical values or not.

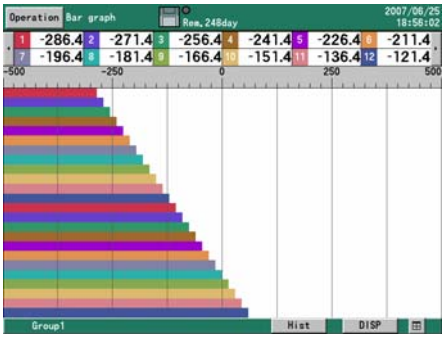
■ Setting the bar graph direction

・Set the bar graph direction on the bar graph screen to be vertical or horizontal.

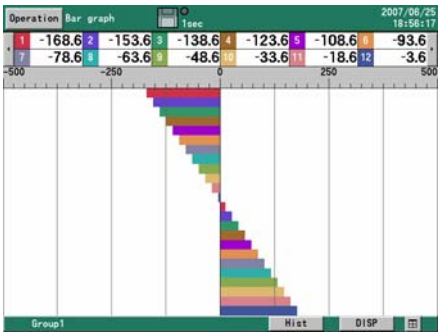
■ Setting the base position of the bar graph

・Set the base position of the bar graph from 0 to 100 on the bar graph screen. When the base position is 0, the bar is displayed based on leftmost (or bottommost). When the base position is 100, the bar is displayed based on rightmost (or uppermost).

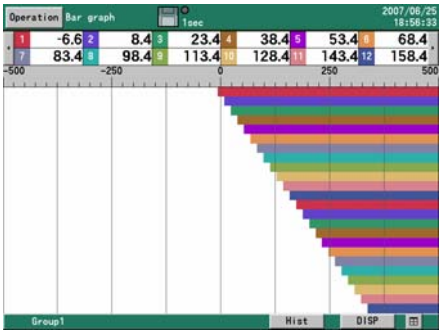
When standard position is 0



When standard position is 50



When standard position is 100



■ Setting the zone usage

・The display range of the measured/calculated data is called zone. When the zone is set to ON, the display range can be divided into zones. The details are described in the next page.

■ Setting the data display frame count

・Set the division number of the numeric display frame.

1	2	3	4	6	8	9	10	12	24	36	48	56

■ Minimum/maximum display (data display)

・Select [ON] or [OFF]. When select [ON], display minimum and maximum of channel data on the numeric display screen. However, if data display frame count is more than 24, minimum and maximum is not displayed.

■ Screen auto switch period

・Set the switching period if the “Auto switching” has been set to ON with the DISP menu.

■ Data value update period

・Select the numeric value updating period of measured data to be displayed on the screen.

0.5 second	1 second

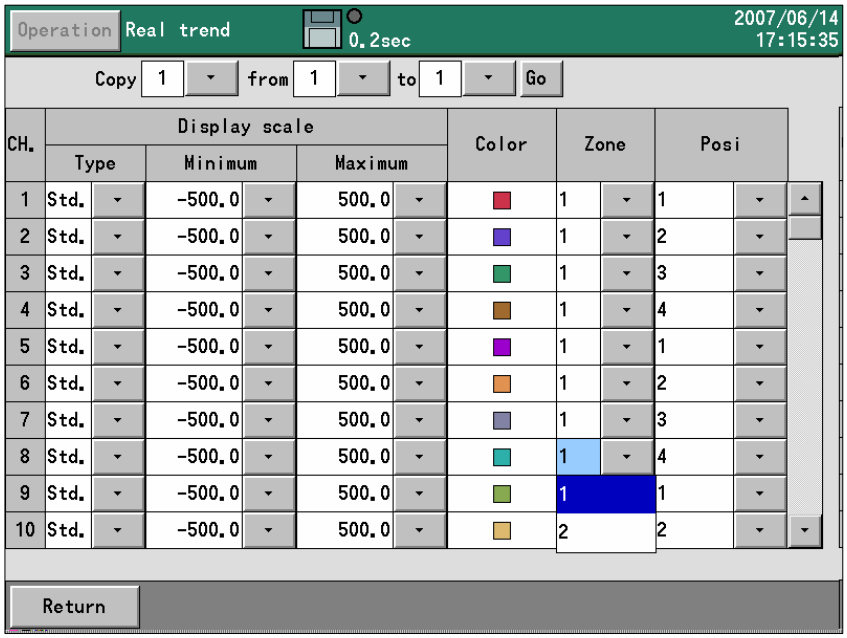
■Dual trend synchronization

・When previous file is opened by dual trend during ‘ON’, the file is scrolled as fast as real trend. When scroll end of the file, if there is continuous file, the file is opened automatically and scrolling is continued.

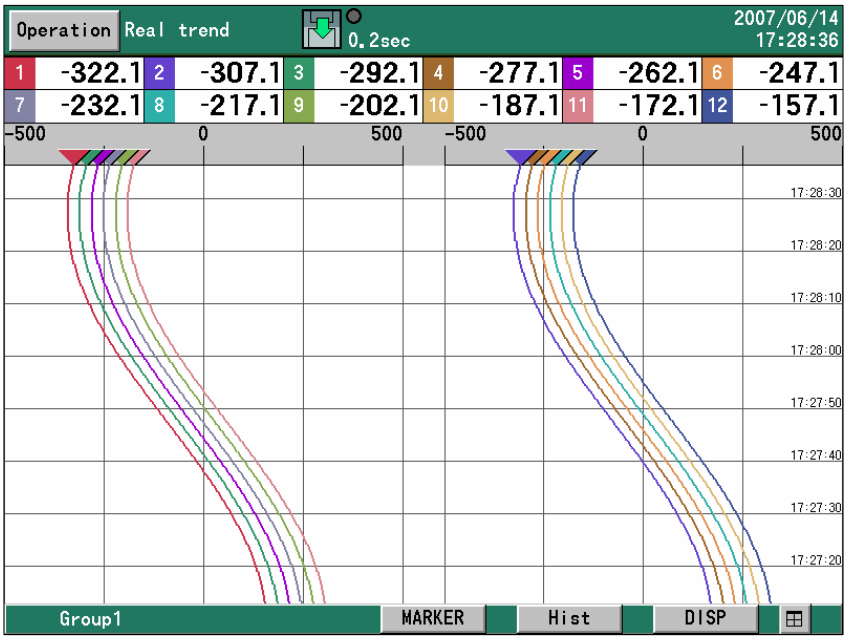
Zone

The display range of the measured/calculated data is called zone. Since the data can be displayed by setting the zone for each channel, the data can be easily read by displaying the waveforms in separate zones.

Select “ON” in the zone usage. Then, selecting the display settings in the setting menu screen and selecting the channel parameters, the following screen with the zone added is displayed.



When the zone is set to either 1 or 2, the display of wave format in the trend screen is divided into 2. Channels set by 1 are displayed in Zone 1 and channels set by 2 are displayed in Zone 2.

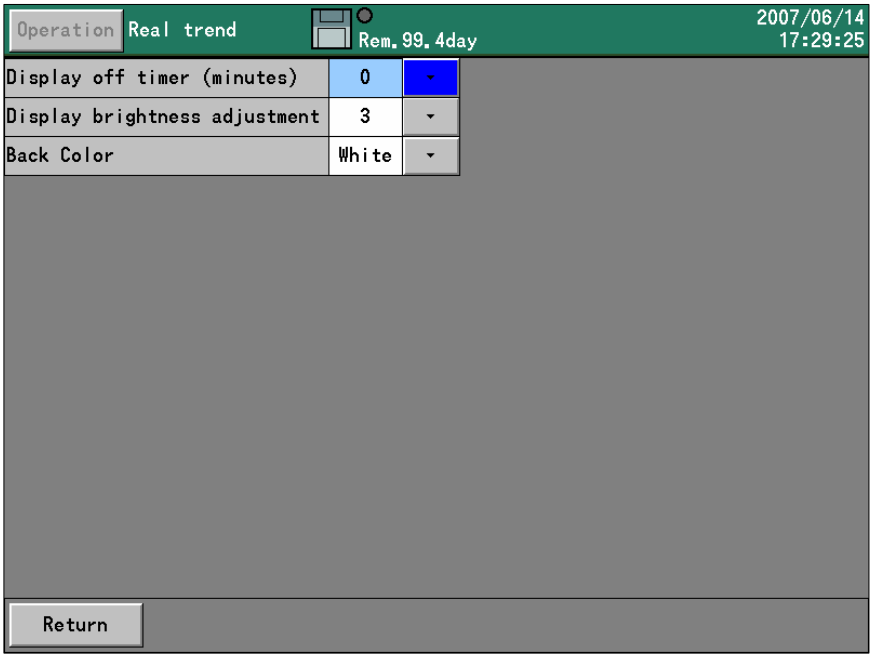


Zone 1 Zone 2

13.3.5 LCD settings

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the display settings on the setting menu screen and then selecting the LCD settings, the following screen is displayed.



■ Setting the display off timer (minute)

・The display-off timer for the LCD can be set from 1 to 60 minutes.
・For canceling the display off, tap any key.

■ Setting the display brightness

・Select the brightness of the LCD backlight from 4 steps. 1 is the brightest and 4 is the darkest.

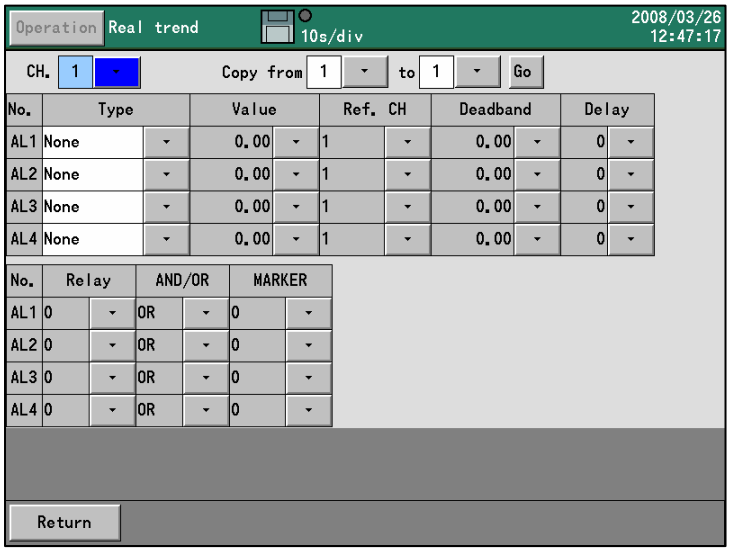
■ Setting the back color

・Select the back color of the screen from white or black.

13.4 Alarm settings

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the alarm settings on the setting menu screen, the following screen is displayed.



■ Setting the type and the setting value

・Set the alarm type and the setting value for judgment.
The alarms are activated by the following conditions.

None	Not activated		
Upper	The measured value is the set value or more.	Lower	The measured value is the set value or less.
Diff. upper	In case that the absolute value of the difference between the measured value and the reference CH is the setting value or more	Diff. lower	In case that the absolute value of the difference between the measured value and the reference CH is the setting value or less
Error	The measured value is not a numerical value. (BURN, OVER, UNDER, CAL ER, RJ ERR)		

■ Setting the reference CH

・Set the reference channel for the differential high limit alarm/differential low limit alarm.

■ Setting the deadband

・Set the alarm deadband between the alarm value and its release. (Refer to the next page.)

■ Setting the delay

・Set the delay time for the alarm. (0 to 3600 seconds)
The alarm is not output until the delay time has elapsed after the data exceeds the alarm value.

■ Setting the relay

* The alarm output terminal (option) is necessary for outputting alarms actually.

・The relays can be set regardless of whether the alarm output terminal is used.
・Set the relays with the alarm output terminal number 0 ~ 24. When 0 is set, the alarm is not outputted.

■ Setting the alarm output mode

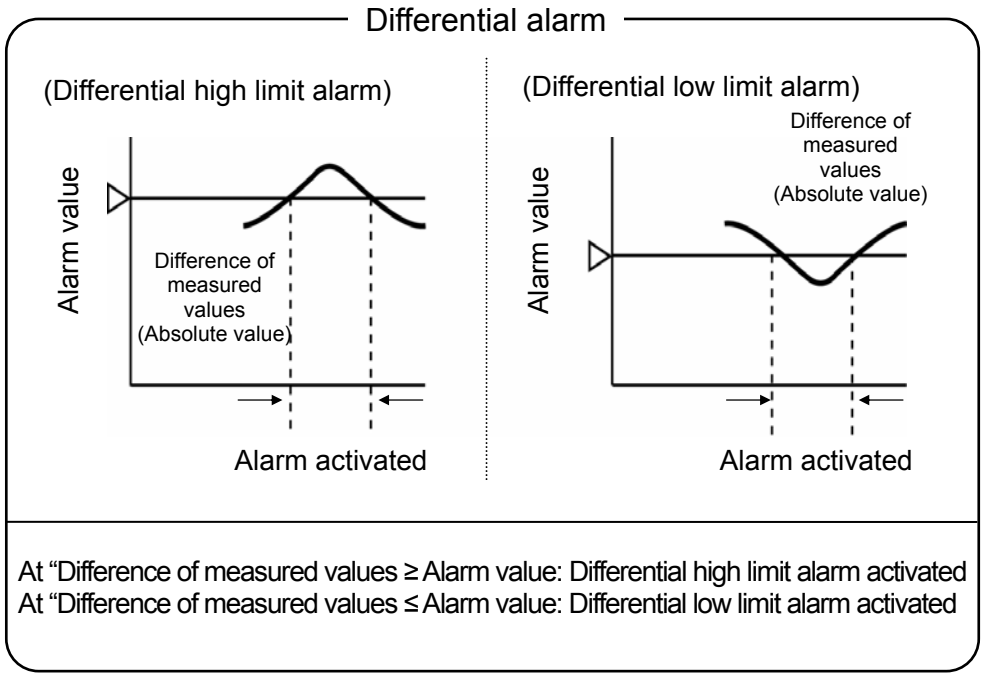
AND	The relay becomes ON when all alarms set in one alarm output terminal are activated.
OR	The relay becomes ON when any of alarms set in one alarm output terminal are activated.

When both of “AND” and “OR” are set to one relay channel, the relay becomes ON when either of “AND” of all alarms set with “AND” or all “OR” of alarms set with “OR” is established.

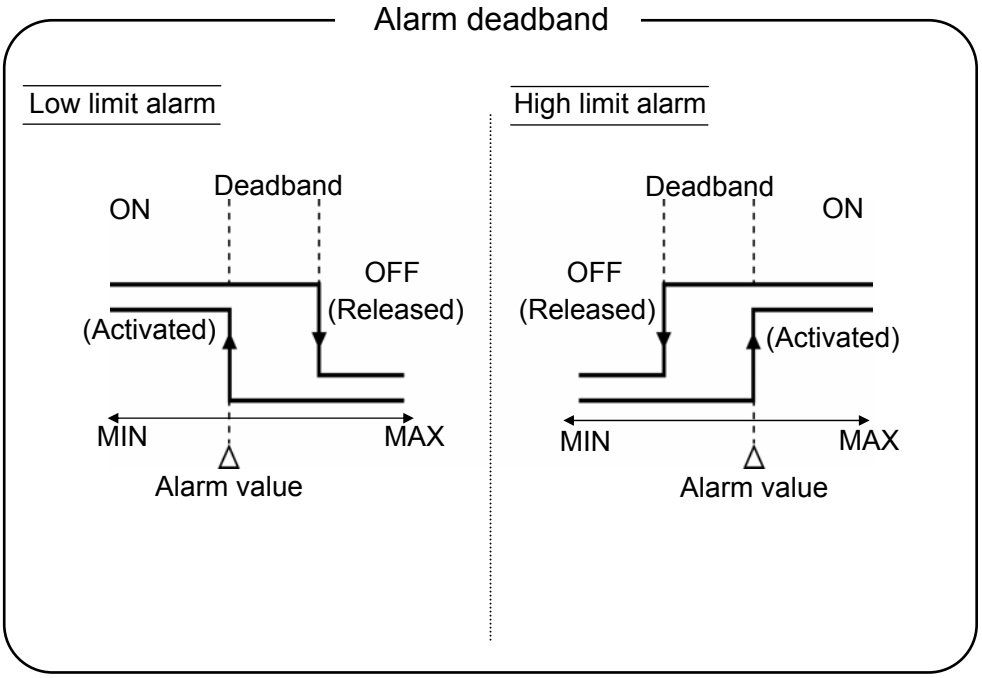
■Setting the maker

・Set the automatically written maker on the trend for alarm activation. When 0 is set, the maker is not written.

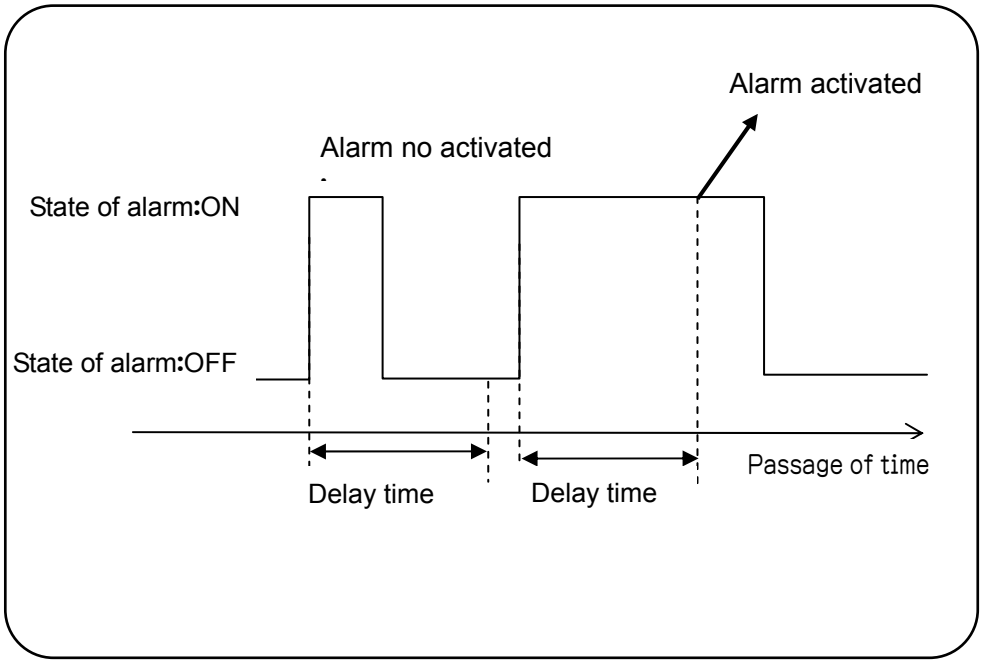
Differential alarm



Alarm deadband



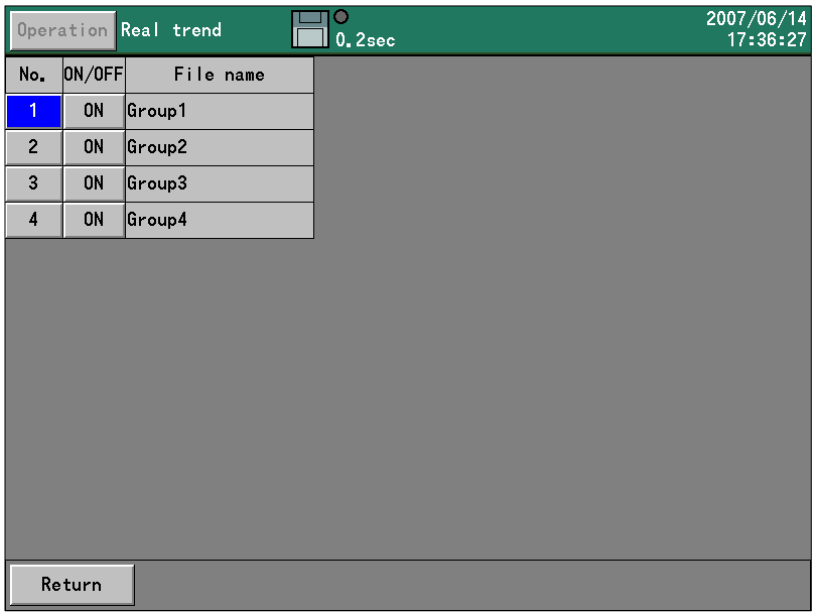
About alarm DeLay



13.5 File settings

- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

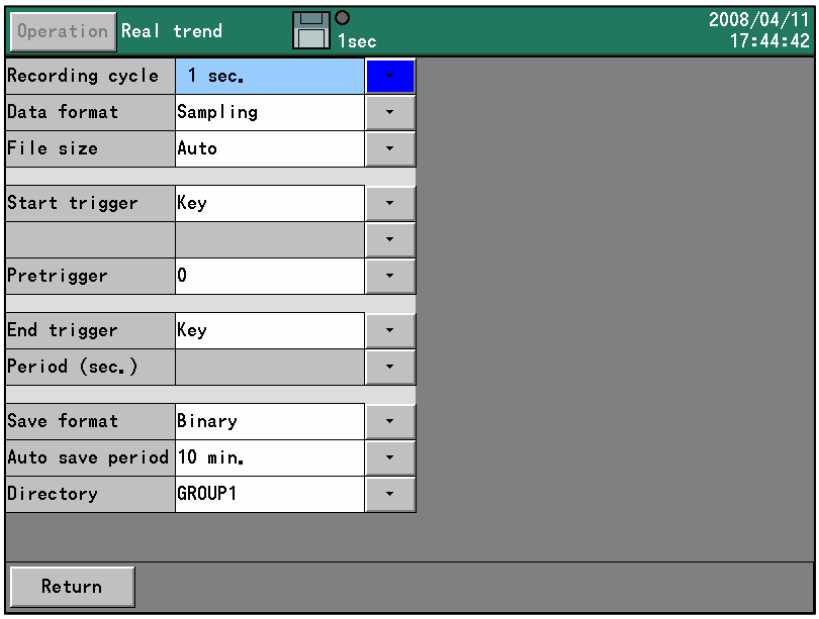
By selecting the file settings on the setting menu screen, the following screen is displayed.



■ No.
By selecting the number and pressing the ENTER key, the file setting screen of the selected group is displayed. Detail of the setting method is explained in next page.

■ ON/OFF
When ON is displayed, data is recorded, and when OFF is displayed, data is not recorded.

<File settings screen>



■ Setting the recording cycle

Seconds	0.1 sec, 0.2 sec, 0.5 sec, 1 sec, 2 sec, 3 sec, 5 sec, 10 sec, 15 sec, 20 sec, 30 sec
Minutes	1 min, 2 min, 3 min, 5 min, 10 min, 15 min, 20 min, 30 min, 60 min

■ Setting the data format

When the recording cycle is 0.1 second, the sampling is only selectable.
In recording the data into the file, the average, maximum, minimum or maximum/minimum values in the period of the recording cycle can be recorded. When the maximum/minimum is selected, the data size becomes 1.5 times larger.

Sampling	Average	Maximum	Minimum	Maximum/minimum

■Setting the file size

Select the file size (period). When the file reaches specified size, the file is completed, and the data after completed is recorded by another name. When “Auto” is selected, recording is completed by. maximum file size.

Pause of [minute] and [hour] is calculated based on 0:00, pause of 1 week is calculated based on 0:00 of Sunday, and pause of 1 month is calculated based on 0:00 of first day.

Minute	10 minutes, 15 minutes, 20 minutes, 30 minutes, 60 minutes
Hour	2 hours, 3 hours, 4 hours, 6 hours, 8 hours, 12 hours, 24 hours
Other	1 week, 1 month

When recording is stopped before reaching the file size, or the data reaches maximum file size (refer to 9.9 Internal memory), file is completed.

■ Setting the start trigger

The recording starts by the following trigger.

Key	Alarm	Digital input (option)

Trigger type	Contents
Key	The recording starts without any conditions.
Alarm	The recording starts when the alarm relay becomes ON. When this item is selected, the relay terminal number can be selected.
Digital input (option)	The recording starts when the digital input terminal becomes ON. When this item is selected, the input terminal number can be selected.

■ Setting the pretrigger (0 ~ 950)

When the recording starts, the past data retroactive to the count set here are recorded.

Example: When the recording starts at 13:00:00 with the pretrigger “10” and the recording cycle “2 seconds”, the data from 12:59:40 to 12:59:58 are added to the beginning of the file.

Note: When the power is turned off or the settings are changed, the data for the pretrigger are cleared, and the data in the interval specified here may not be enough. In this case, only the data being saved are added to the beginning of the file.

■ Setting the end trigger

Select the condition for the end of recording. The same contents as the start trigger are displayed in the first item.

Key (Alarm)	Period (seconds)

Trigger type	Contents
Key (Alarm)	The recording stops when the start conditions are not established.
Period	After recording the data for the specified period (seconds), the recording stops. At the time, if the start trigger conditions are established, the recording starts again immediately (within 1 second).

■ Setting the period (seconds) (0 to 30000)

After starting record by start trigger, if trigger becomes OFF, the data is recorded for set period and then stopped. However, when recording is stopped by STOP key, recording is stopped despite of this setting.

■Setting the save format

Select the file format for recording the data into a CF card.

Binary	CSV	CSV (continuance)

Save format	Contents
Binary	The data are recorded with the binary file (extension “krf”). For the replay, this recorder or analytical software is necessary.
CSV	The data are recorded with the CSV formatted text file. The data can be read with spreadsheet application software like Excel (Microsoft), etc. In addition, the data can be used in the attached report application software. When the decimal marker is set to “,”, the data becomes the tab-delimited text file with the extension of “txt”.
CSV (continuance)	The format is same as the above, however when recording is stopped by trigger, the data is recorded same file continuously after restarting. In above case, when recording is stopped, the file is completed, and the data is recorded by new file after restarting.

■ Setting the auto save period

This is the interval for coping the file in the internal memory to an external memory.
In addition to this interval, each file is copied to the CF card at its completion. (Refer to Para. 9.9.)

Minutes	No settings, 1 min, 2 min, 3 min, 5 min, 10 min, 20 min, 30 min, 60 min

■ Setting the directory (Maximum length 16 characters)

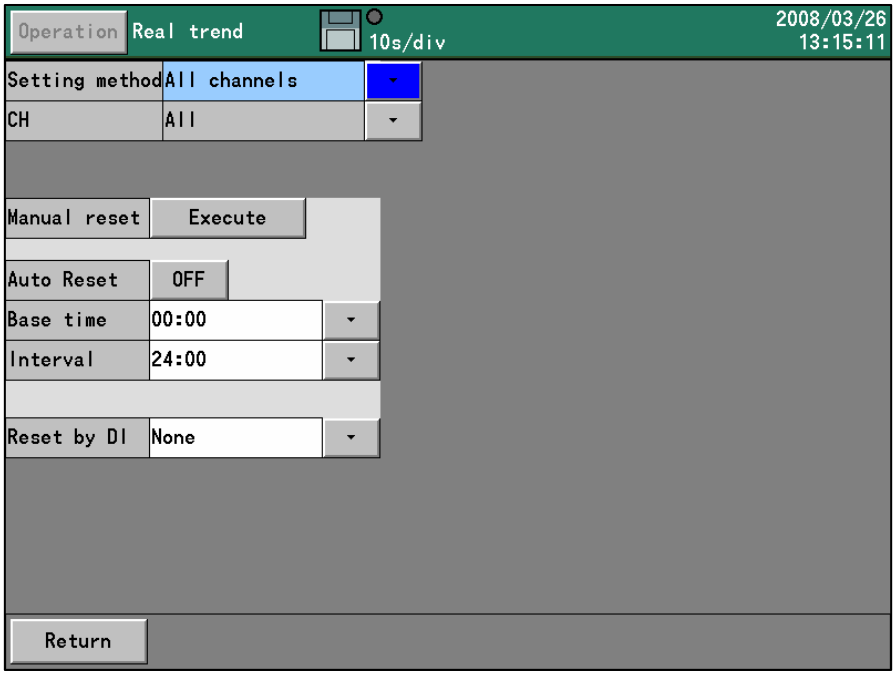
- For saving the data to an external storage media, the directory name for saving can be set.
- The hierarchy can also be specified. The delimiting symbol is “¥” (backslash).
  Refer to Para. “7.3 Character entering method”.

13.6 Totalizer reset settings

The totalizer is executed by the calculation settings of each channel. On this screen, set the procedure for resetting the totalized data to 0.
All calculations are reset in this setting except ITG24. ITG24 is reset only in base time and not reset every interval.

- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the totalizer reset settings on the setting menu screen, the following screen is displayed.



■Setting method

- Select ‘all channels’ or ‘individual channel’.
  In case of ‘all channels’, setting contents are accommodated all channels.
  In case of ‘individual channel’, individual reset setting is accommodated each channel.

■CH

- When select ‘individual channel’, setting is performed to specified channel.

■ Manual reset

- The totalized data is reset to 0 manually.

■ Auto reset

- When the auto reset of totalizer is used, set it to ON.
  Set it to OFF when it is not used.

■ Base time and interval

- The totalizer reset is executed at the following time.
  Base time + (Interval x n) n = 0, 1, 2, 3, •••

Example: When the base time is set at 0:00 and the interval is set at 04:00, the totalized value is reset at 0 o’clock, 4 o’clock, 8 o’clock, 12 o’clock, 16 o’clock and 20 o’clock.

■ Reset by digital input (option)

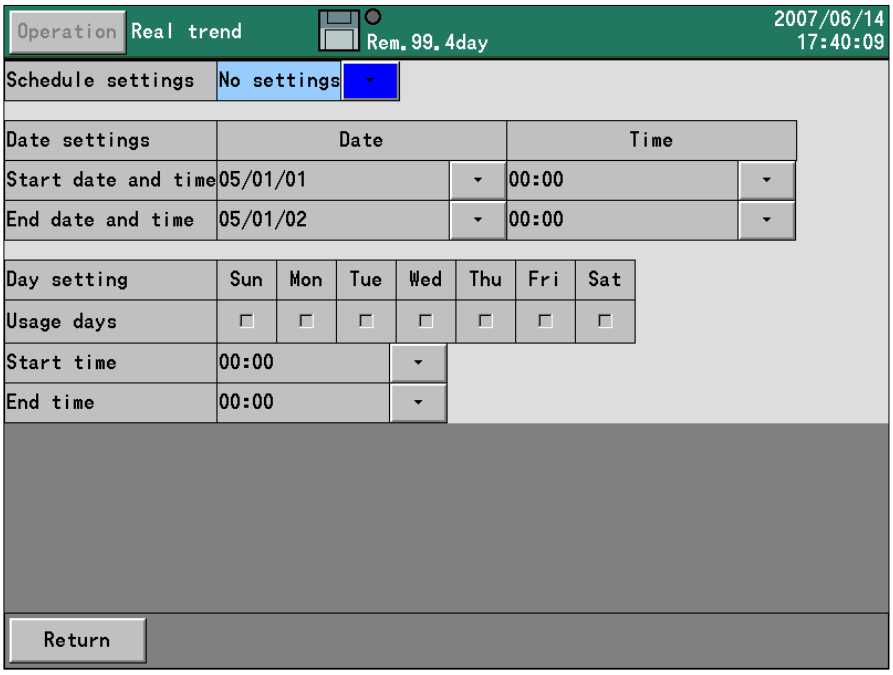
*When the instrument has not the digital input option, this item is not displayed.

- The totalizer reset is executed when the specified digital input terminal becomes ON.
  Select “None” when it is not used.

13.7 Schedule settings

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the schedule settings on the setting menu screen, the following screen is displayed.



When the schedule is set on this screen, the recording is executed for its set period only.
Even though the conditions specified with the file settings are established, the recording cannot be executed if it is not in the scheduled period.
The status bar is displayed in gray for out-of-scheduled period.

■ Setting the schedule
・Select it from No settings, date or day.
・By these settings, the following settings become enabled.

■ Setting the parameters for the date settings
・Set the start date/time and the end date/time.

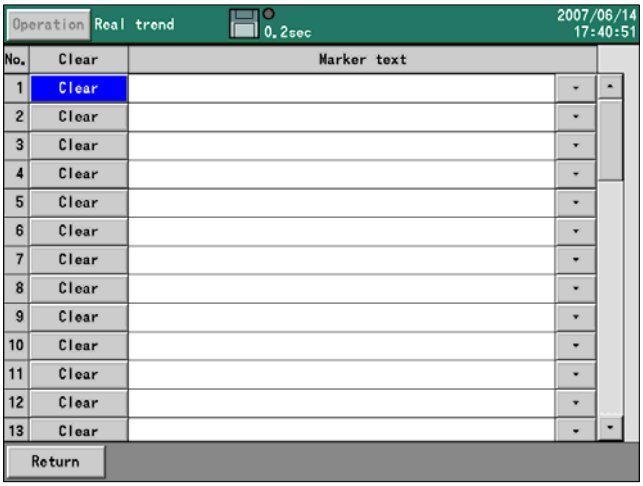
■ Setting the parameters for the day setting
・Check the day for using.
・Set the start time and the end time.

13.8 Marker text settings

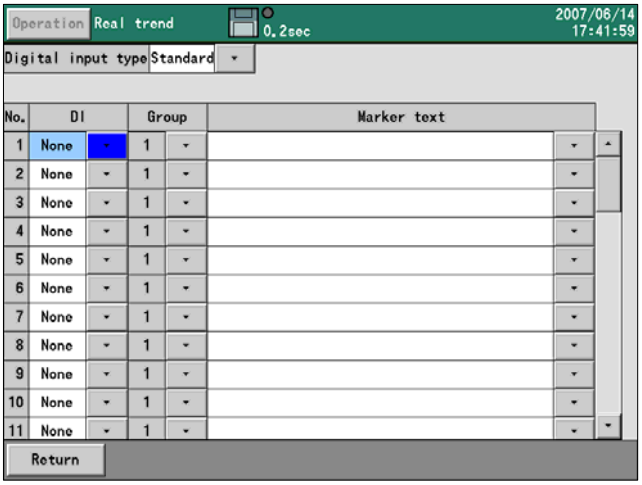
- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the marker text settings on the setting menu screen, the following screen is displayed.

Without optional digital input



With optional digital input



On this screen, up to 50 marker texts (max. 30 characters) to be written on the trends can be registered in advance. For writing the marker text, refer to Para. 9.3.
Even when texts are not registered on this screen, texts can be created at the writing of markers.

- By selecting the “Clear”, the marker text is erased.
- By selecting the message column, the character entering screen is displayed.

(Maker writing with the digital input (option))
The maker can be written on the trends with ON from the digital input terminal.

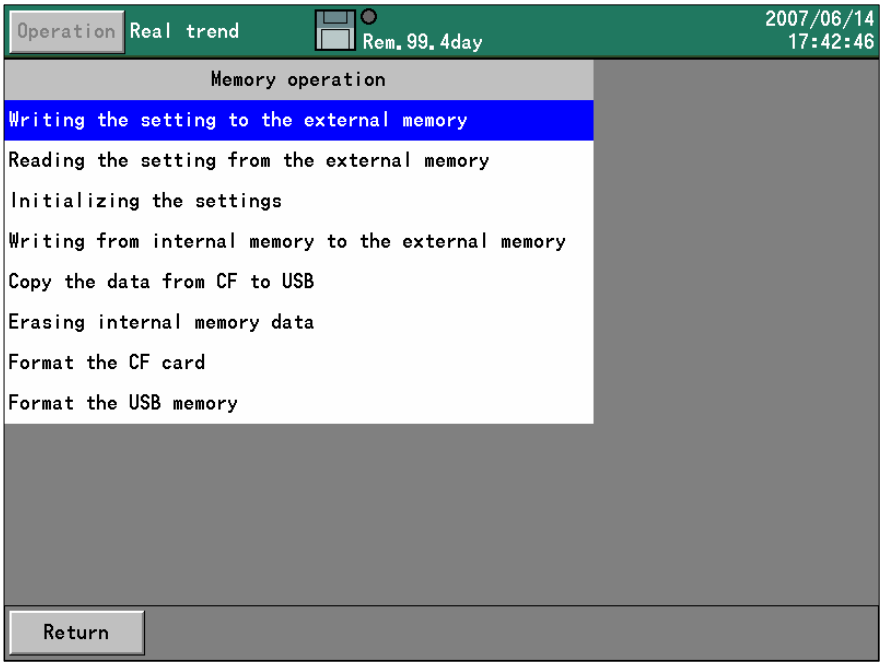
<Digital input --- Standard>
When the input terminal designated for the [digital input] becomes ON, the corresponded maker is written on the trends of the specified group.

<Digital input --- Binary>
Set the maker text number 1 to 50 by using the digital input terminal 1 to 7 (Binary expression of low bit at terminal 1 side and high bit at terminal 7 side).
When terminal 8 is turned on under condition of the contact status of 1 to 50 at the terminal 1 to 7, the markers corresponding to the marker text numbers are written on the trends of the specified group.

13.9 Memory operation

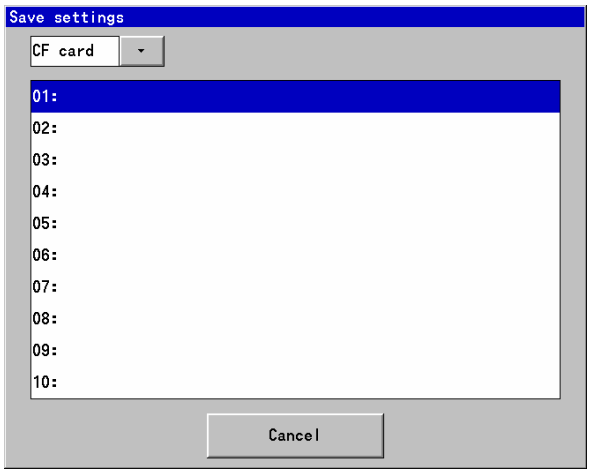
・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the memory operation on the setting menu screen, the following screen is displayed.



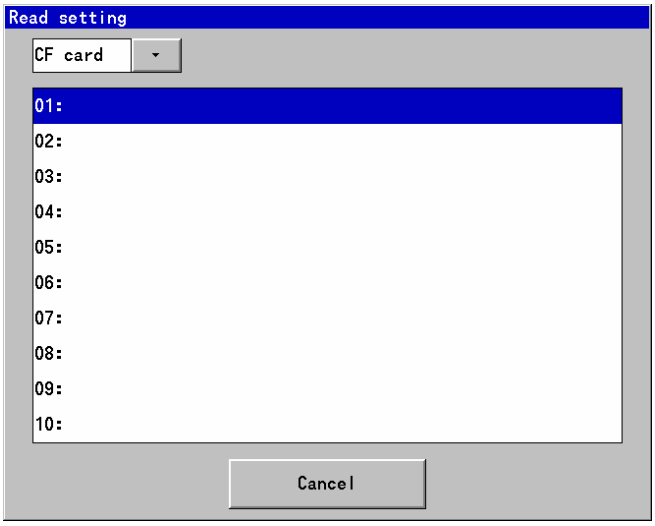
■ Writing the settings to the external memory

Up to 100 current setting contents can be written in an external memory.



The dialog box shown above is displayed. By selecting which file to be read from the CF card or the USB memory, the list of the setting files in the “SETUP” folder in it is displayed.
In case of overwriting the existing file, tap its file and in case of creating a new file, tap a vacant number, or press the ENTER key after selecting the file or the number.
By entering a file name and pressing the [ENTER] key, the setting contents are written.
The file with the extension of “.krs” is saved in the "SETUP" folder in the CF card.
The setting file can also be read and used in other KR3000.

■ Reading the settings from the external memory
The setting file is read from the CF card and the current settings are overwritten.



The dialog box shown above is displayed. By selecting which file to be read from the CF card or the USB memory, the list of the setting files in the “SETUP” folder in it is displayed.
Tap the line of the file to be read or press the ENTER key after selecting it.

■ Initializing the settings
The current settings are overwritten with the default settings at the factory.

■ Writing from internal memory to the external memory
All data in the internal memory are written in an external memory (CF card or USB memory).

■ Copy the data from CF to USB
The data (files in the current writing destination directory) of all groups stored in the CF card are written in the USB memory.

■ Erasing the internal memory data
All data in the internal memory are erased.

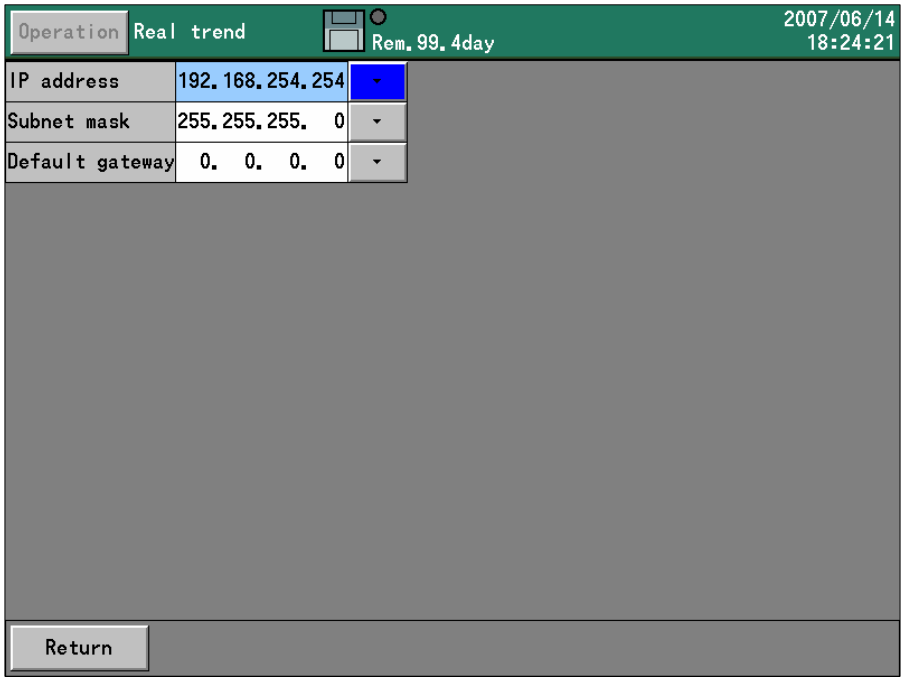
■ Format the CF card
The CF card is quick formatted.

■ Format the USB memory
The USB memory is quick formatted.

13.10 Network settings
13.10.1 Ethernet settings

- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the network settings on the setting menu screen and then selecting the Ethernet settings, the following screen is displayed.



Set IP address, etc. for using this recorder on the Ethernet.

■ IP address
Set IP address of this recorder. The DHCP (automatic assignment of IP addresses) cannot be used. Ask the IP address to the administrator for the network to connect.

■ Subnet mask
Set the subnet mask of this recorder.

■ Default gateway
If there is a gateway like a router, etc. on the network, set the default gateway address.

Example of usage in a small network

When this recorder is used in a small network without connecting to an interoffice LAN or Internet via a router, set the IP address as follows.

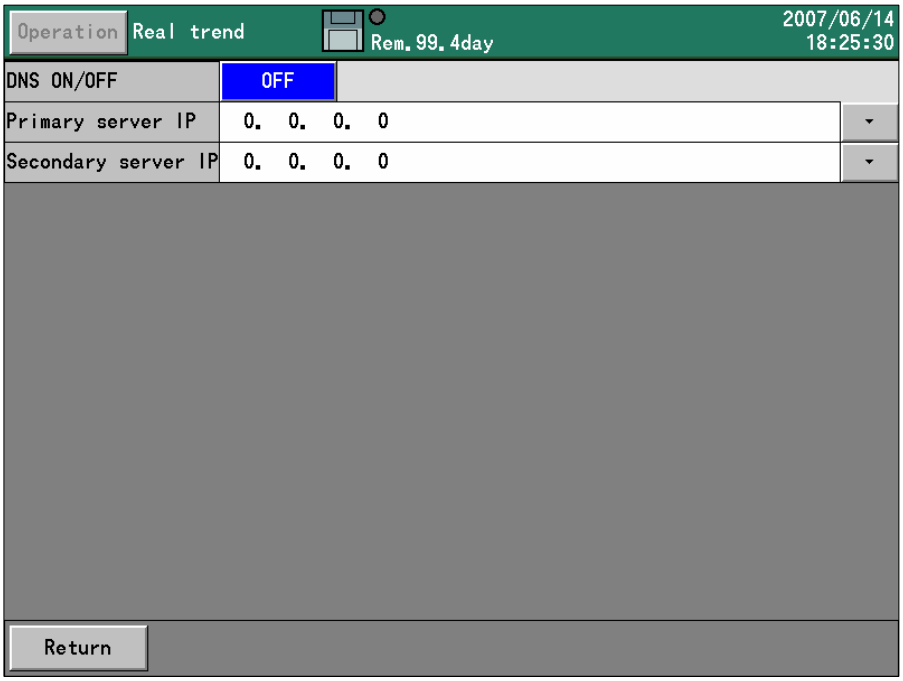
Instrument	IP address	Subnet mask
KR3000 A	192.168.254.254	255.255.255.0
KR3000 B	192.168.254.253	255.255.255.0
• • •	• • •	• • •
PC A	192.168.254.1	255.255.255.0
PC B	192.168.254.2	255.255.255.0
• • •	• • •	• • •

13.10.2 DNS settings

The DNS server is for converting the address specified with a name into the IP address. When the addresses of the FTP server, POP3 server, SMTP server, etc. are entered with names, make sure to set the DNS server.

- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the network settings on the setting menu screen and then selecting the DNS settings, the following screen is displayed.



■ DNS ON/OFF

- Select the DNS from ON (enabled) or OFF (disabled).

■ Primary server IP, Secondary server IP

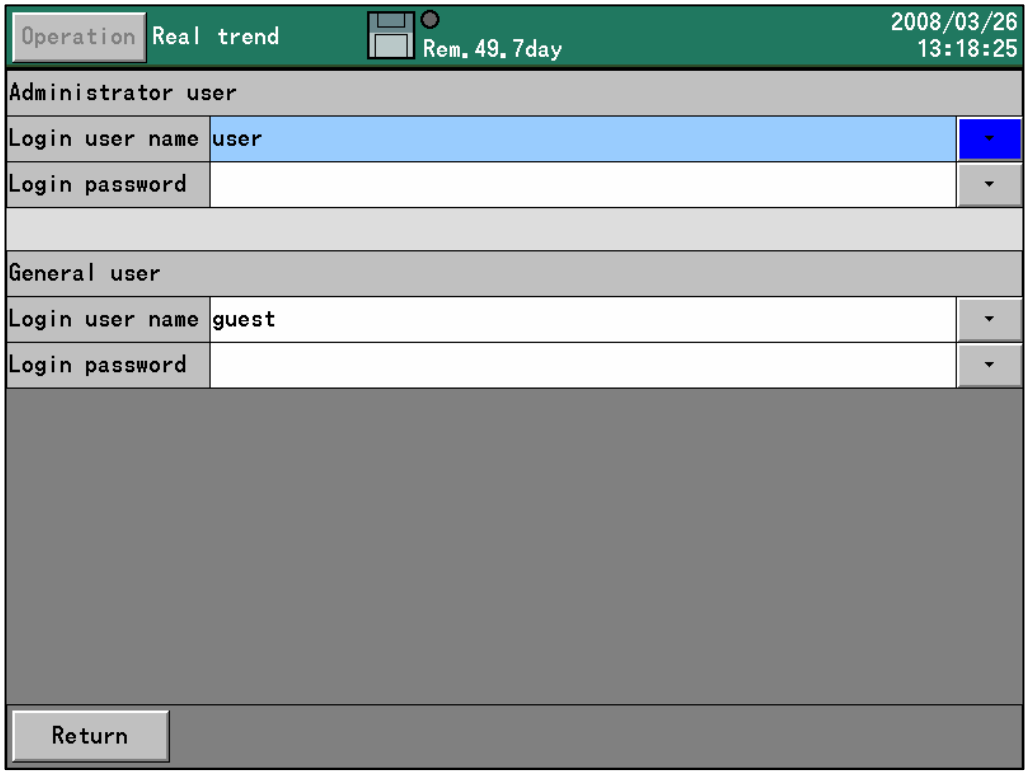
- Enter the address of the DNS server. If the primary server is not found, use the address of the secondary server. When there is only one DNS server, it is no problem not to enter any address to the secondary server.

13.10.3 Web server settings

Set the login user name and password for accessing web server.

- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen

By selecting the network settings on the setting menu screen and then selecting the Web server settings, the following screen is displayed.



Select ‘Administrator user’ or ‘General user’.

Administrator user	All items are operated.
General user	Recorder display and data display are operated. Only the screen update is operated on the recorder display.

■ Login user name

- Set the login user name of administrator user/general user.

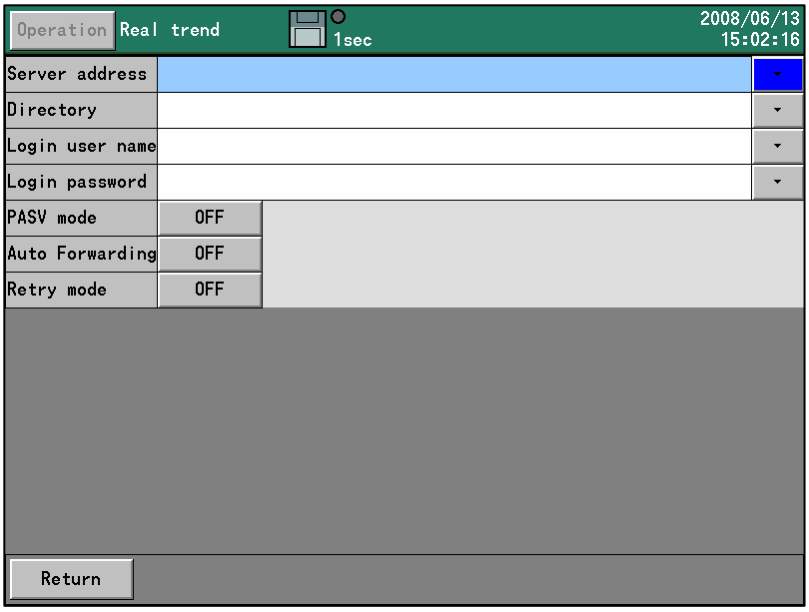
■ Login password

- Ser the login password of administrator user/general user.

13.10.4 FTP client settings

- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the network settings on the setting menu screen and then selecting the FTP client settings, the following screen is displayed.



Execute the settings for using the FTP client function of this recorder.

■ Server address
Specify the address of the server for transferring the file. When the address is set with a name (○○.co.jp, ○○.com, etc.), not the IP address, make sure to set the DNS (13.10.2).

■ Directory
Set the directory for writing the file. If there is no directory, the automatic creation cannot be executed.

■ Login user name
Set the user name for logging into the FTP server.

■ Login password
Set the password for logging into the FTP server.

■ PASV mode
Set to ON when the file is transferred with the PASV mode.

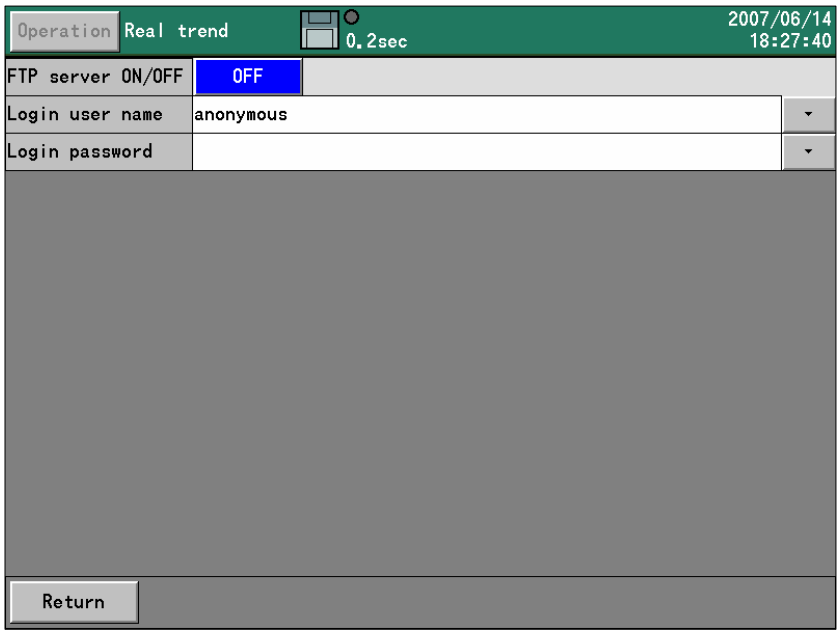
■ Auto Forwarding
Set to ON for transferring the file created automatically at the switching of the file for recording.

■Retry mode
When FTP transfer is failed three times on ‘OFF’, error message is displayed on the screen and stop transfer. When retry mode is ‘ON’, try to transfer until succeeding. However, when transfer-waiting files become over 360, files after 360 are not transferred. When turns off the power of the instrument, transfer–waiting files are not transferred after tuning on the power.

13.10.5 FTP server settings

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the network settings on the setting menu screen and then selecting the FTP server settings, the following screen is displayed.



Execute the settings for using the FTP client function of this recorder.

■ FTP server ON/OFF
When the FTP server is set to ON, the FTP server function is executed. Set it OFF when FTP server function is not in use.

■ Login user name
Set the user name for logging into the FTP server.

■ Login password
Set the password for logging into the FTP server.

Using method of FTP server

By using the function of the FTP server, the file in the CF card of this recorder can be read from a PC on the network. The followings are the connection method for using a Web browser (Internet Explorer, Netscape, Opera).

Note: In case of connecting to the FTP server by using the Web browser, if a user name other than “anonymous” is set, the normal connection may not be possible.

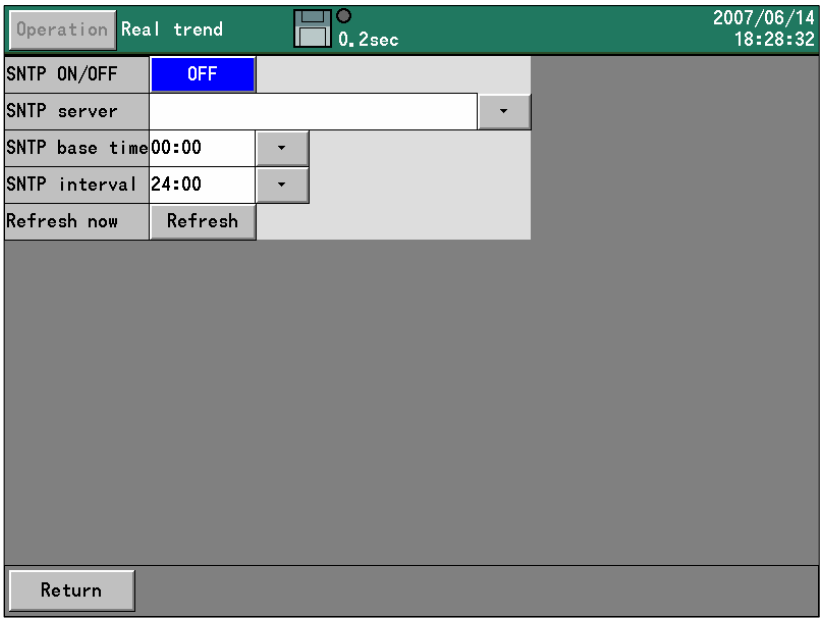
(1) Enter “ftp://(IP address of this instrument)/ “ into the address bar in the browser and press the ENTER key of the PC
(2) The list of files and folders is displayed in the browser.
(3) From then, like the Windows explorer, file operations of moving, copying, opening, etc. can be executed. However, writing to this recorder is not permitted.

For the connection using a FTP client software other than the Web browser, set the software to log in by the user name and password set with this recorder and execute the connection.

13.10.6 SNTP settings

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the network settings in the setting menu screen and then selecting the SNTP settings, the following screen is displayed.



Execute the settings for using the SNTP function of this recorder.

■ SNTP ON/OFF
Set to “ON” when the automatic time synchronization by the SNTP is executed. If not executed, set to “OFF”.

■ SNTP server
Specify the address of the SNTP server. When the address is set with a name (○○.co.jp, ○○.com, etc.), not the IP address, make sure to set the DNS (13.10.2).

■ SNTP base time/ SNTP interval
・The time synchronization is executed at the following time.
base time + (interval x n) n = 0, 1, 2, 3, •••

Example: In case that the “SNTP base time” is 0:00 and the “SNTP interval” is 04:00, the time synchronization by the SNTP is executed at 0 o’clock, 4 o’clock, 8 o’clock, 12 o’clock, 16 o’clock and 20 o’clock.

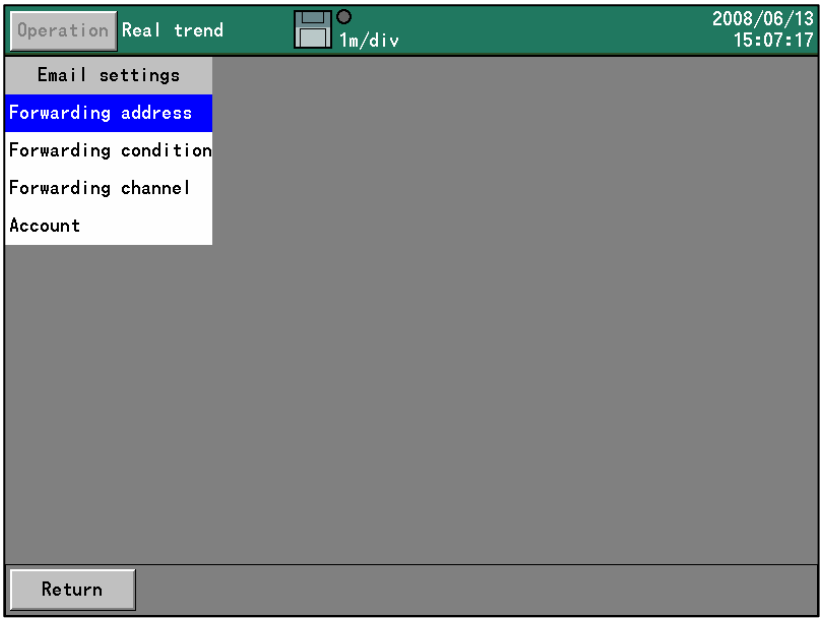
■ Refresh now
When the “Refresh” button is tapped, the time synchronization with the SNTP server is executed.

13.10.7 E-MAIL settings

This recorder can send e-mails by the event of alarm or time.
Specify 8 forwarding addresses in advance. E-mails are sent to the addresses selected from them when the event (Maximum 8 conditions can be registered) is activated.

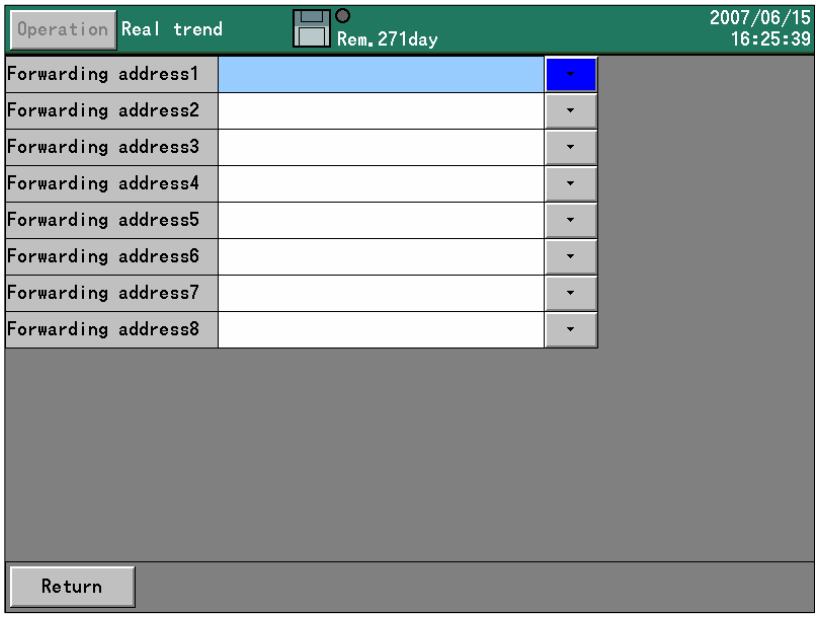
- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the network settings on the setting menu screen and then selecting the E-MAIL settings, the following screen is displayed.



Forwarding address

By selectingt, the following screen is displayed. (For the settings of the forwarding address name, refer to “7.3 Character entering method.)

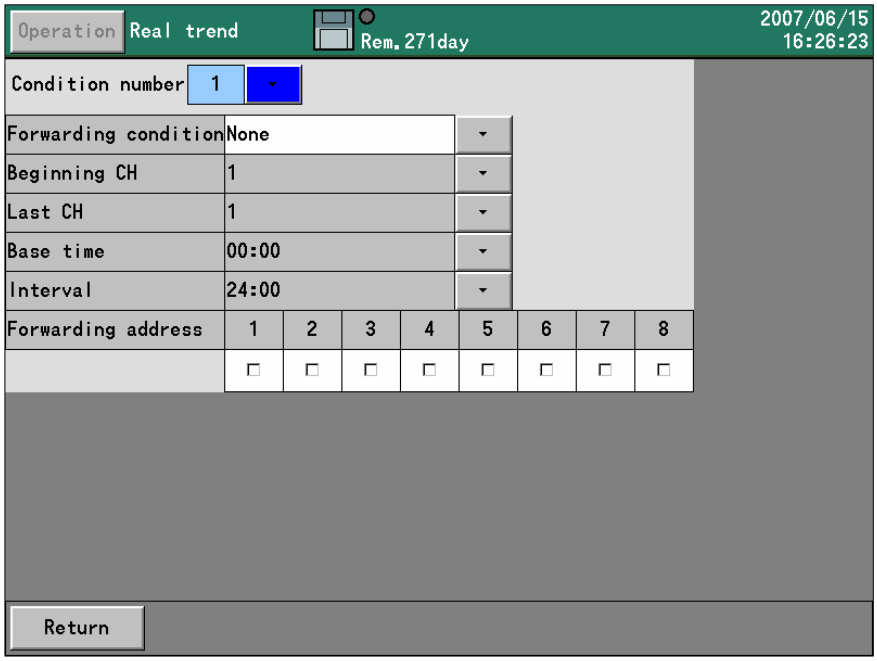


Set the forwarding address.

- Up to 8 forwarding addresses can be set.

Forwarding condition

By selecting, the following screen is displayed.



■ Selecting the condition number

・Up to 8 types of the e-mail forwarding condition can be registered. On this screen, set conditions for the number selected here.

■ Selecting the forwarding condition

・Set the condition for forwarding the e-mail to the forwarding addresses.

Item	Contents
None	This condition is not used.
Alarm activation time	The e-mail is forwarded when the alarm is activated at the specified channel.
Fixed interval	The e-mail is forwarded at every interval time based on the base time.

■ Beginning CH, Last CH

・These settings are effective then the “Alarm activated time” is selected in the forwarding condition. The e-mail is forwarded when the alarm is activated in the channels specified by the starting channel and the ending channel.

■Base time, Interval

・These settings are effective when the “Fixed interval” is selected in the forwarding condition.

・The e-mail is forwarded at the following time.
Base time+ (Interval x n)　n = 0, 1, 2, 3, •••

Example: In case that the “Base time” is 0:00 and the “Interval” is 04:00, the e-mail is forwarded at 0 o’clock, 4 o’clock, 8 o’clock, 12 o’clock, 16 o’clock and 20 o’clock.

■ Forwarding address

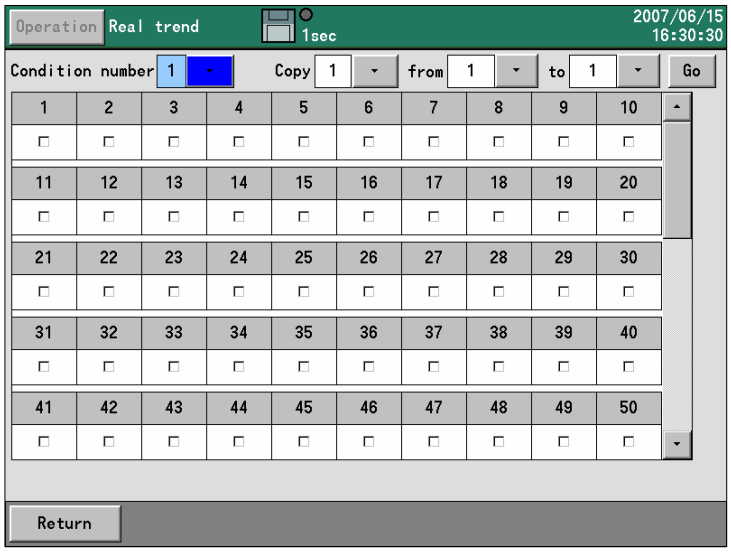
・Check the addresses for forwarding.

Forwarding channel

By selecting, the following screen is displayed.

When the “Alarm activation time” is specified for the Forwarding condition, the e-mail is forwarded by writing the data of the channels, which are registered on this screen, into the message body. When no channel is selected, the e-mail is forwarded by writing the data of the alarm activation channels.

When the “Fixed interval” is specified for the Forwarding condition, the e-mail is forwarded by writing the data of the channels, which are registered on this screen, into the message body.



■ Condition number

・Select the e-mail forwarding condition number for the settings.

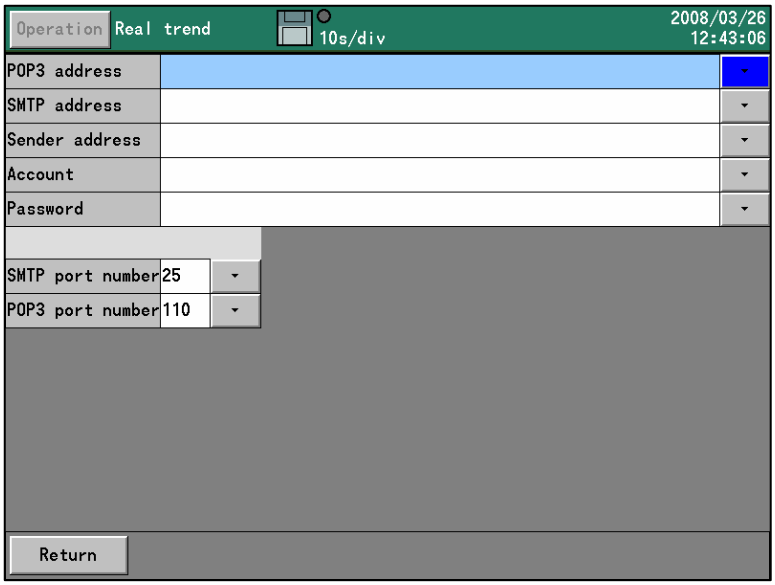
■ Setting the fixed interval sending CH data

・Check the channel numbers for attaching the data.

■ Copying the parameters with the copy function

The above shows the setting for copying Channel 1 from Channel 1 to Channel 5. By tapping the [Go], the parameters of Channel 1 are copied from Channel 1 to Channel 5.

By selecting the “Account”, the following screen is displayed.



■ POP3 address

・This address is used when the SMTP server requires the POP3 authentication. Enter the address of the POP3 server. Do not enter anything when POP3 authentication is not required.

■ SMTP address

・Enter the address of the SMTP server.

■ Sender address

・Enter the e-mail address obtained for this recorder. When this address is not correct, some SMTP servers do not accept the transmission of the e-mail.

■ Account

・Enter the mail account for logging into the mail server.

■Password

・Enter the password for logging into the mail server.

■SMTP port number

・Enter the port number of SMTP. Standard saver is 25.

■POP3 port number

・Enter the port number of pop3. Standard saver is 110.

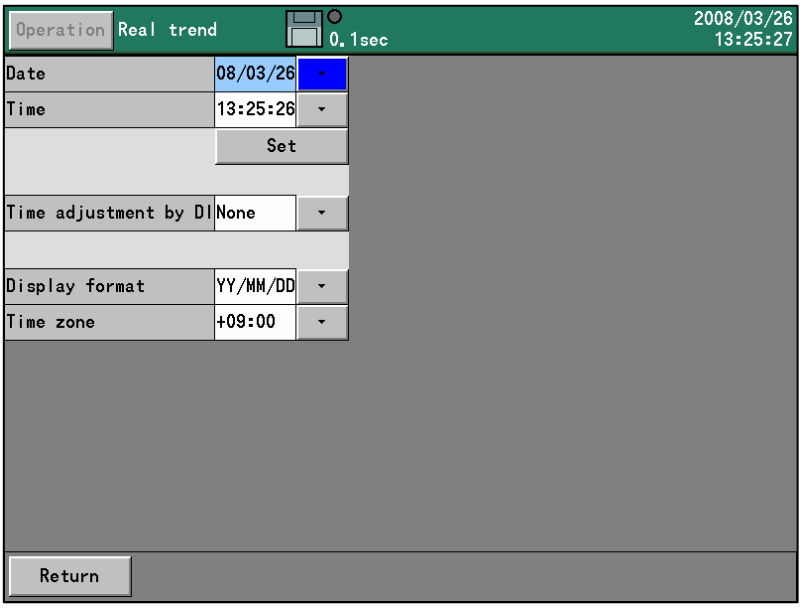
13.11 System settings

13.11.1 Clock settings

Set the date/clock of the internal clock of this recorder.

- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the system settings on the setting menu screen and then selecting the clock settings, the following screen is displayed.



■Date / Time

- Enter the date in the same way as the character entering.
- The writing to the internal clock is executed at tapping the “Set” button. Tap the “Set” button by the time signal, etc.

■Time adjustment by DI (Displayed at a pertinent option)

- When specified digital input is turned ON, if ‘second’ of the time is less than 30, second is 0 and if ‘second’ is more than 30, ‘second’ is 0 and add 1 to ‘minute’.

■Display format

Select the display format of the date.

YY/MM/DD: Year/month/day
MM/DD/YY: Month/day/year
DD/MM/YY: Day/month/year

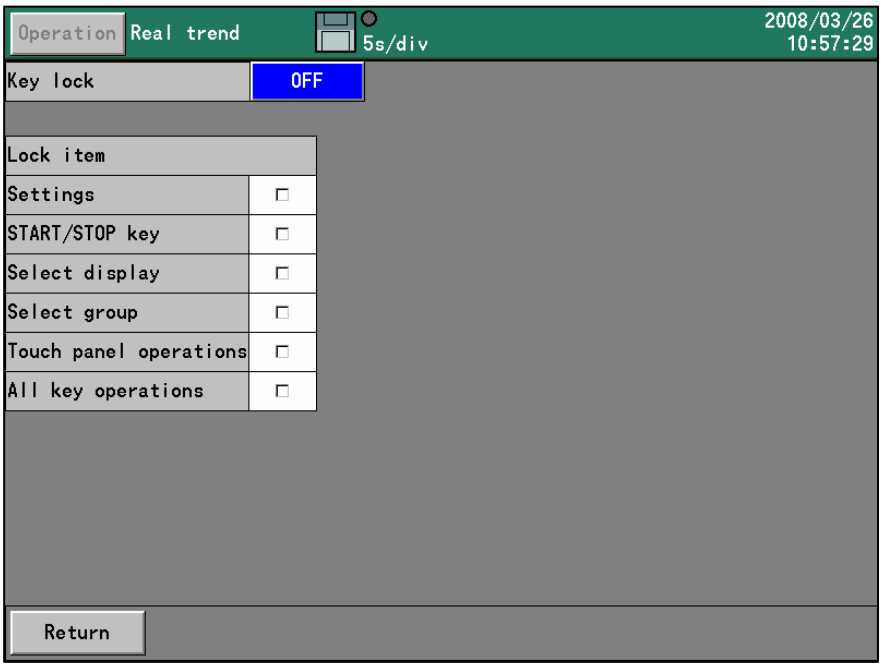
■Time Zone

- Set the time difference from Greenwich mean time (GMT). This setting is reflected in sending time of e-mail header.

13.11.2 Key lock

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the system settings on the setting menu screen and then selecting the key lock, the following screen is displayed.



When the MENU settings or the HOME settings is selected with the key lock ON, entering into the setting screen is disabled without a password. Set the password using “Password settings” on the next page.

■ Setting the key lock
・Set the key lock to ON or OFF.

■Setting the lock item
・Set the lock item by key lock.

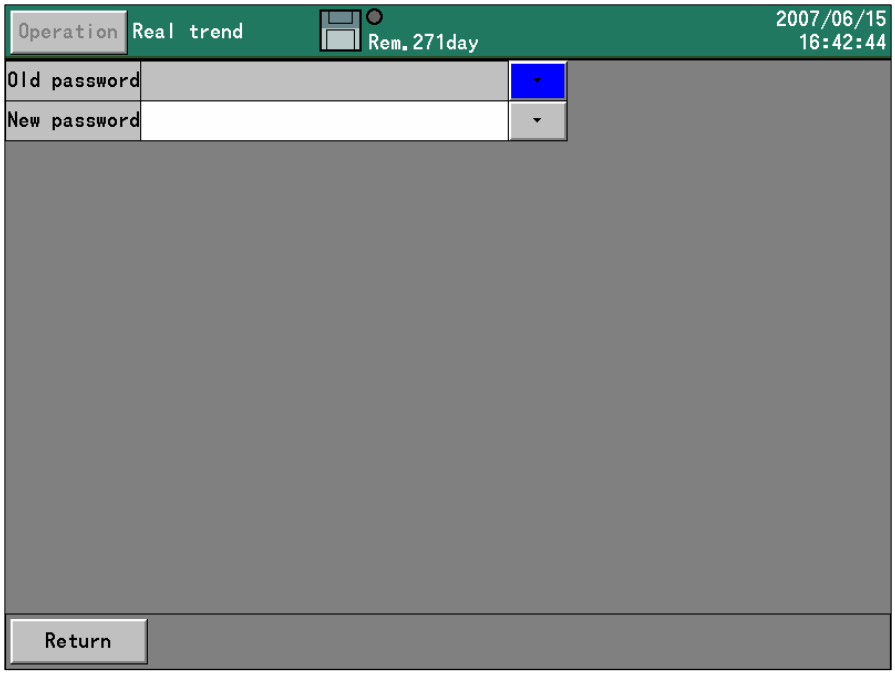
Item	Content
Settings	Lock for operation to enter the setting screen in the MENU/HOME settings.
START/STOP key	Lock for operation of START/STOP.
Select display	Lock for display selection of DISP menu.
Select group	Lock for group selection of DISP menu.
Touch panel operations	Lock the touch panel operations.
All key operations	Lock all key operations. However, operation of entering MENU setting screen and operation of key on MENU setting screen can be operated.
Controller operations	Lock for operations on the controller screen.

13.11.3 Password setting

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the system settings on the setting menu screen and then selecting the password setting, the following screen is displayed.

This password is used for the followings.
・For releasing the key lock
・Login password for displaying the web page



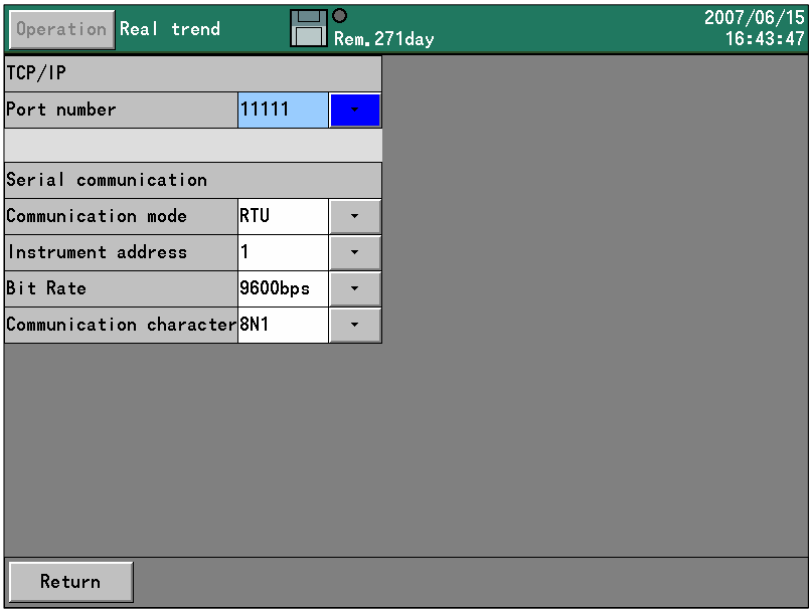
■ Setting the password (For entering the password, refer to [7.3 Character entering method].)
・Set the password for the key lock.

■ For changing the password
・The password can be changed by entering the current password into the old password field and then by entering a new password into the new password field.

13.11.4 High order communication settings

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the system settings on the setting menu screen and then selecting the high order communication, the following screen is displayed.



■ TCP/IP Port number

・Set the port number for executing the high order communications by TCP/IP.
・When port number is set 502, it is possible to communicate by Modbus-TCP. When port number is set other than 502, this instrument communicates by own communication method.
When use our company's PC software such as CISAS, TRWIN, KIDS and PASS for high order application, set the number except 502. When use the PC software corresponding commercial Modbus-TCP, set 502.

■ Serial communication (option)

*When the instrument has not communication interface option, or with the option and "High order" is selected in "13.11.7 Select the communication", this category is not displayed.

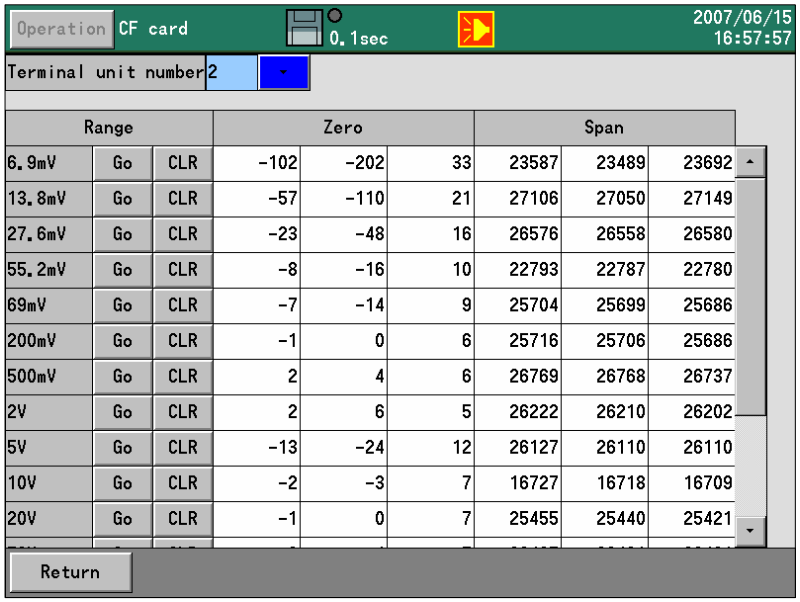
Set the following items according to the settings of the high order application.

・Communication mode
Select the communication mode from "RTU" or "ASCII".
・Instrument address
Set a value from 1 to 31.
・Bit rate
Select the bit rate from "9600bps" or "19200bps".
・Communication character
Select a combination of the data bit, parity and stop bit.

13.11.5 Scale adjustment

- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the system settings on the setting menu screen and then selecting the scale adjustment, the following screen is displayed.



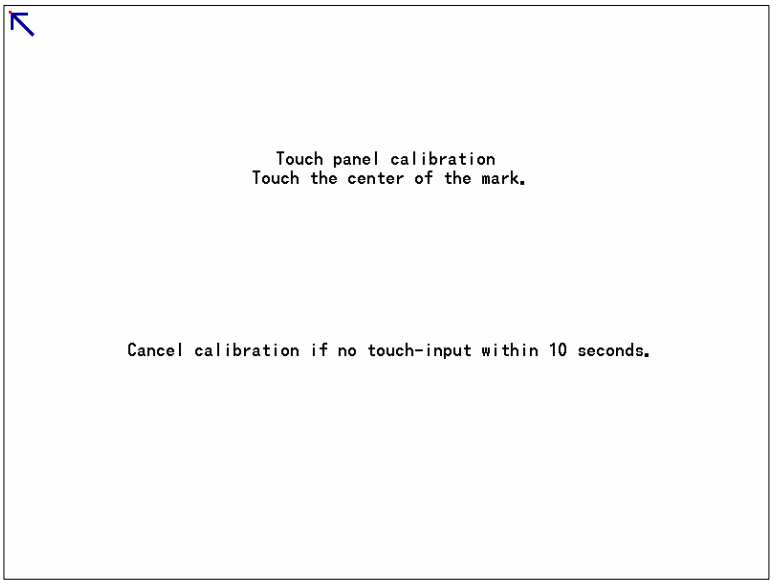
Range			Zero			Span		
6.9mV	Go	CLR	-102	-202	33	23587	23489	23692
13.8mV	Go	CLR	-57	-110	21	27106	27050	27149
27.6mV	Go	CLR	-23	-48	16	26576	26558	26580
55.2mV	Go	CLR	-8	-16	10	22793	22787	22780
69mV	Go	CLR	-7	-14	9	25704	25699	25686
200mV	Go	CLR	-1	0	6	25716	25706	25686
500mV	Go	CLR	2	4	6	26769	26768	26737
2V	Go	CLR	2	6	5	26222	26210	26202
5V	Go	CLR	-13	-24	12	26127	26110	26110
10V	Go	CLR	-2	-3	7	16727	16718	16709
20V	Go	CLR	-1	0	7	25455	25440	25421

For use of the scale adjustment, refer to Para. 18.

13.11.6 Touch panel calibration

- Proceed from the MENU settings.
- By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the network settings on the setting menu screen and then selecting the touch panel calibration, the following screen is displayed.



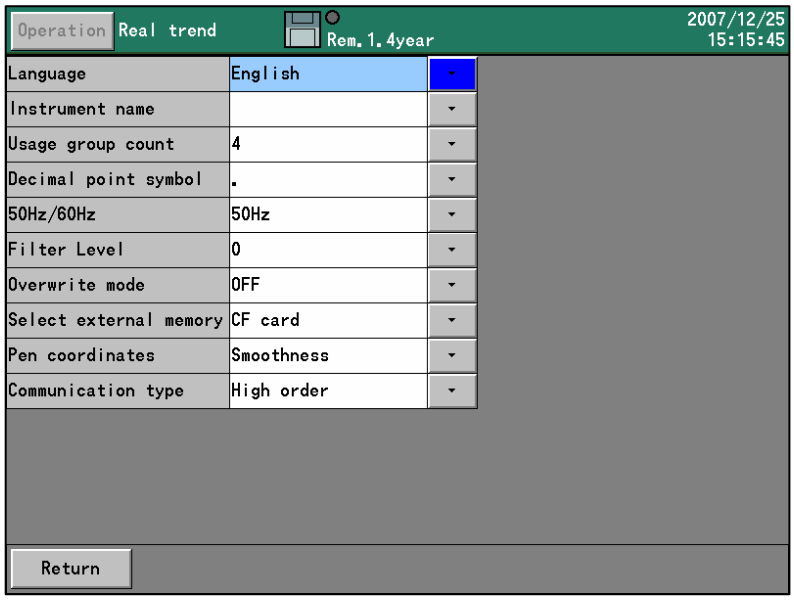
The touch panel has been calibrated at the factory but the coordinates may be out of alignment as time passes.
In this case, execute the coordinate calibration of the touch panel on this screen.

Tap the top of the arrow with the stylus. The arrow moves when the tapping is recognized. The coordinate calibration of the touch panel is completed by repeating this operation up to 5 locations.

13.11.7 Other settings

・Proceed from the MENU settings.
・By tapping the ▼ button of the item for setting, the screen moves to the input screen.

By selecting the network settings on the setting menu screen and then selecting the other settings, the following screen is displayed.



■ Language
・Select the language from Japanese or English.
■ Instrument name
・It is used in the subject for forwarding the e-mail. ” Message from (instrument name)” is used as the subject.
・When it is in blank, the subject becomes "Message from Recorder".
■ Setting the usage group count
・The usage group count can be set from 1 to 6.
・The smaller the usage group count, the longer the period for recording it in internal memory. (Refer to 9.9 Internal memory screen).
■ Setting the decimal point symbol
・Select “. (dot)”, or “, (comma)” for the decimal point.
・When the decimal point is a comma and the file save format is the CSV, the file becomes the tab delimited text file. (Refer to 13.5 File settings.)
■ Setting 50Hz/60Hz
・Select the power frequency from 50Hz or 60 Hz.
■ Setting the filter level
・The input filter level can be set from 0 to 3.
0 means no-filter and 3 means the strongest filter.

■ Setting the overwrite mode

・With the overwrite mode is ON and the CF card remaining space decreases, the data is continuously written in the CF card by deleting the old file. When the overwrite mode is OFF and the CF card remaining space is insufficient, the data is not written in the CF card any more (The data recording is continued in the internal memory).

■ Selecting an external memory

・Select the destination of data from the CF card or the USB memory.

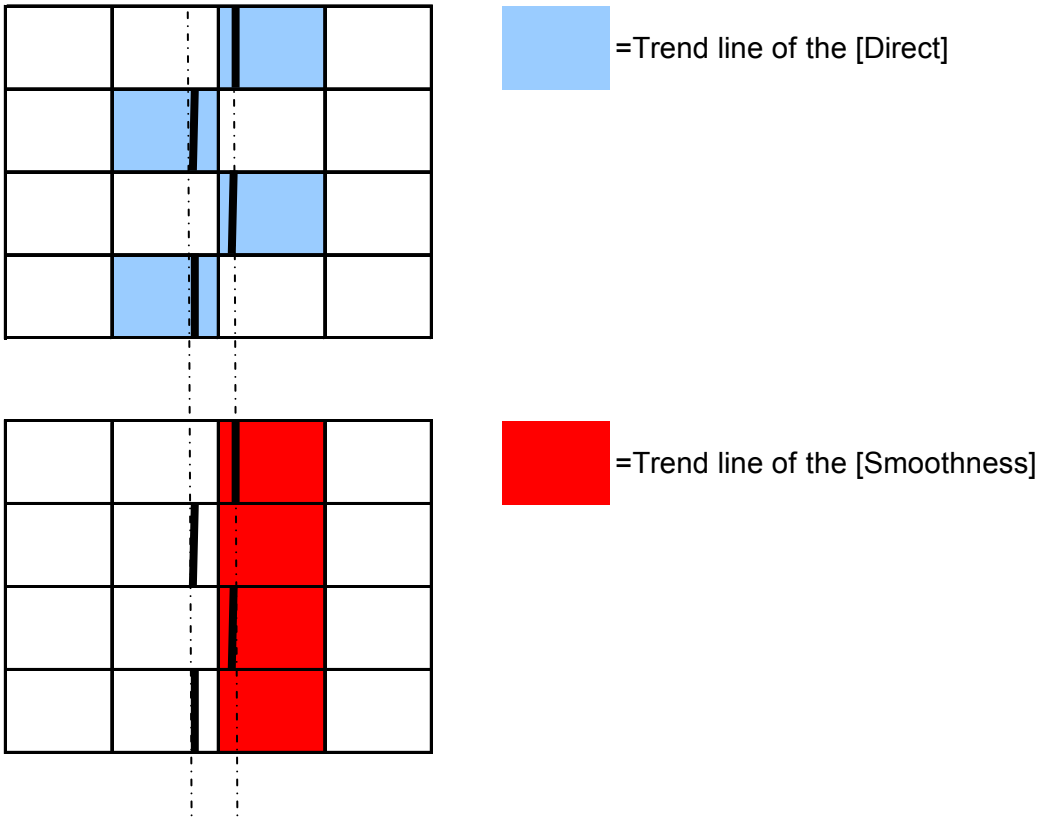
■Setting the pen coordinate

・Select the coordinates calculation way of trend from smoothness/direct.

・In case of selecting the [Smoothness], even if the trend coordinate is changed by changed data, the trend coordinate is not changed from previous value until changing of the data exceed equivalent of 1 dot on the trend. When data is changed less than equivalent of 1 dot of trend coordinate, trend line does not swing.

・When select the [Direct], the trend coordinate from data is drawn directly.

(Example of drawing for [Direct] and [Smoothness])



■Setting the communication type (option)

・Select the communication type from [High order], [Low order (read)], or [Low order (write)]. Each communication types are following.

High order	Use for the data acquisition, parameter setting and operation by instrument or computer that is connected high order.
Low order (read)	Record the data in PLC and input data of the product of our company that is connected low order.
Low order (write)	Transfer the input data of KR3000 to PLC.

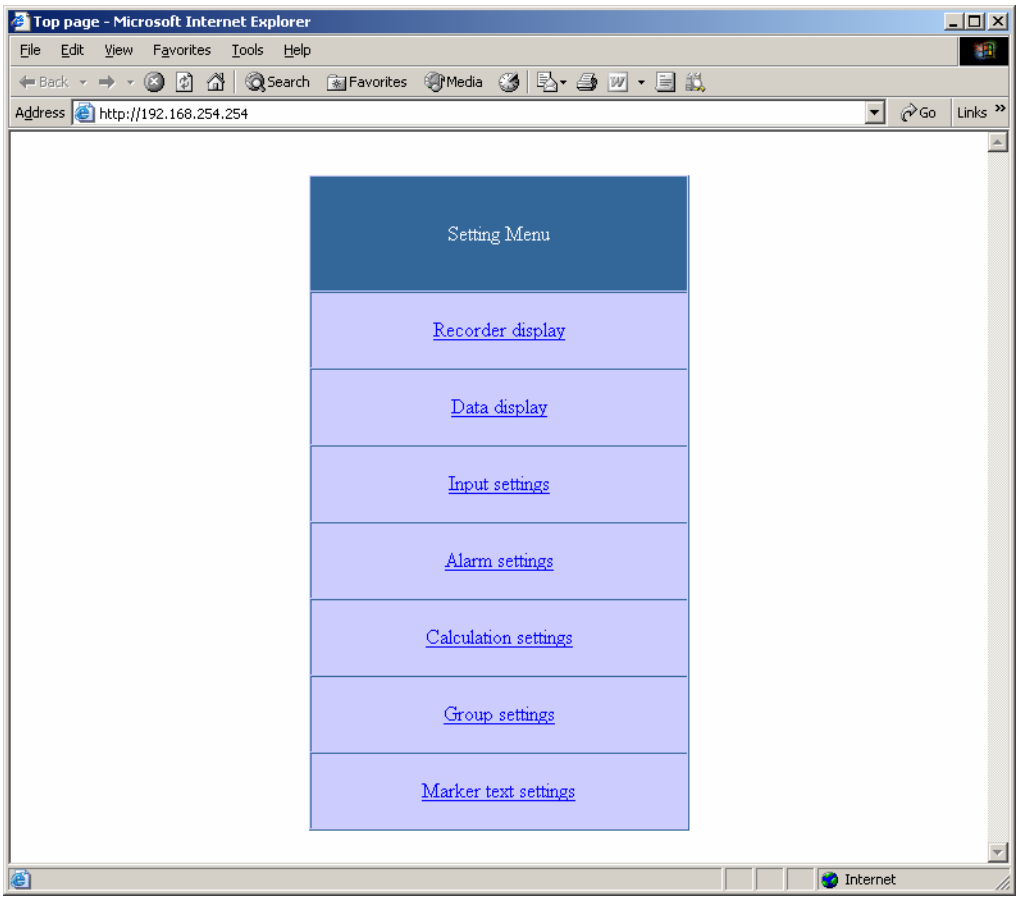
14 Setting/displaying on Web screen

14.1 Display and settings using the Web screen

By using the web browser, the settings relating to inputs and records of this recorder can be configured and the data can be displayed.

14.1.1 Top page

By accessing to the IP address of this recorder via the web browser (The figure shows Internet Explorer.), the following screen is displayed after the password authentication.
The user name used for the password authentication is fixed as the “user” and cannot be changed. However, the password can be changed to arbitrary characters at this recorder side. When the Link button is clicked, the screen moves to the “Recorder display” for displaying the same screen, on which the same operation can be executed, as this recorder on the browser, the “Data display” for displaying the data of each recording channel, the “Input settings” for setting input parameters of every channel, the “Alarm settings” for setting alarm parameters, the “Calculation settings” for setting formulas of every channel, the “Group settings” for setting record-related-items and the “Marker text setting” for setting marker texts.

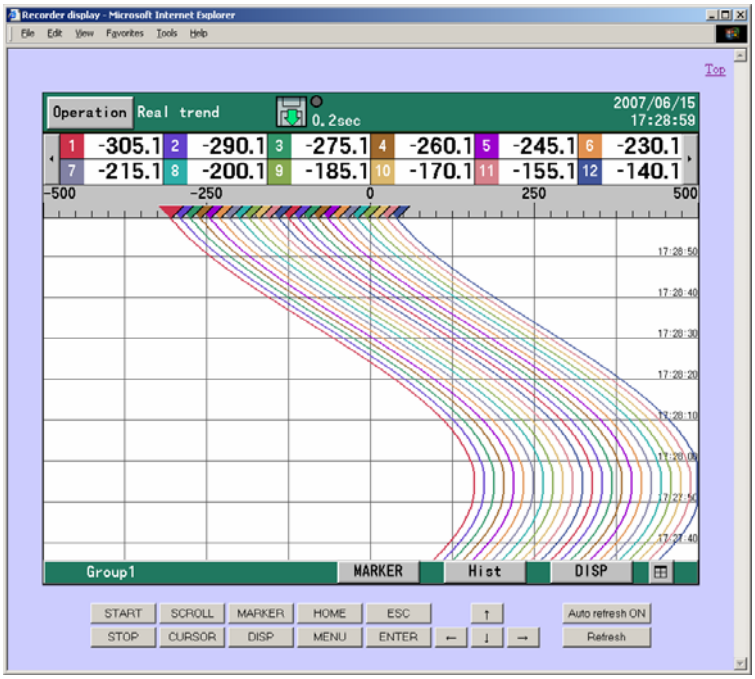


14.1.2 Recorder display

The same contents as this recorder are displayed. The keys arranged at the lower part of the screen can be operated like the keys of this recorder. If click the screen by mouse, it is possible to operate as same as touch panel operation like the main instrument. Because of the image file used, it takes more time for loading than other screens. For preventing operational error, do not operate this recorder and this screen together at the same time.

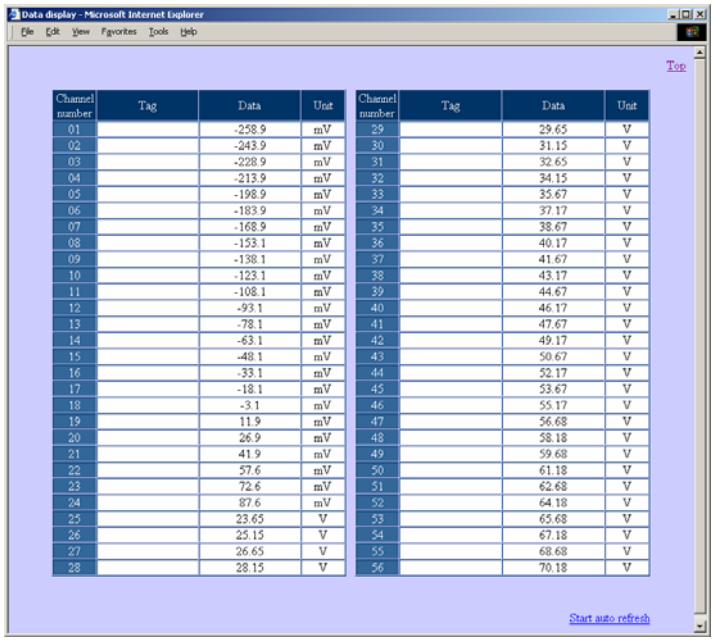
Do not use the “Refresh”, “Back”, “Forward”, etc. on the browser and use the keys at the lower part screen.

When the ‘Refresh’ key at the lower right of the screen is clicked, the current display is reloaded. By clicking the “Auto refresh ON”, the screen is updated at about 1 minute interval. For stopping the auto refresh, click the “Auto refresh OFF”.



14.1.3 Data display

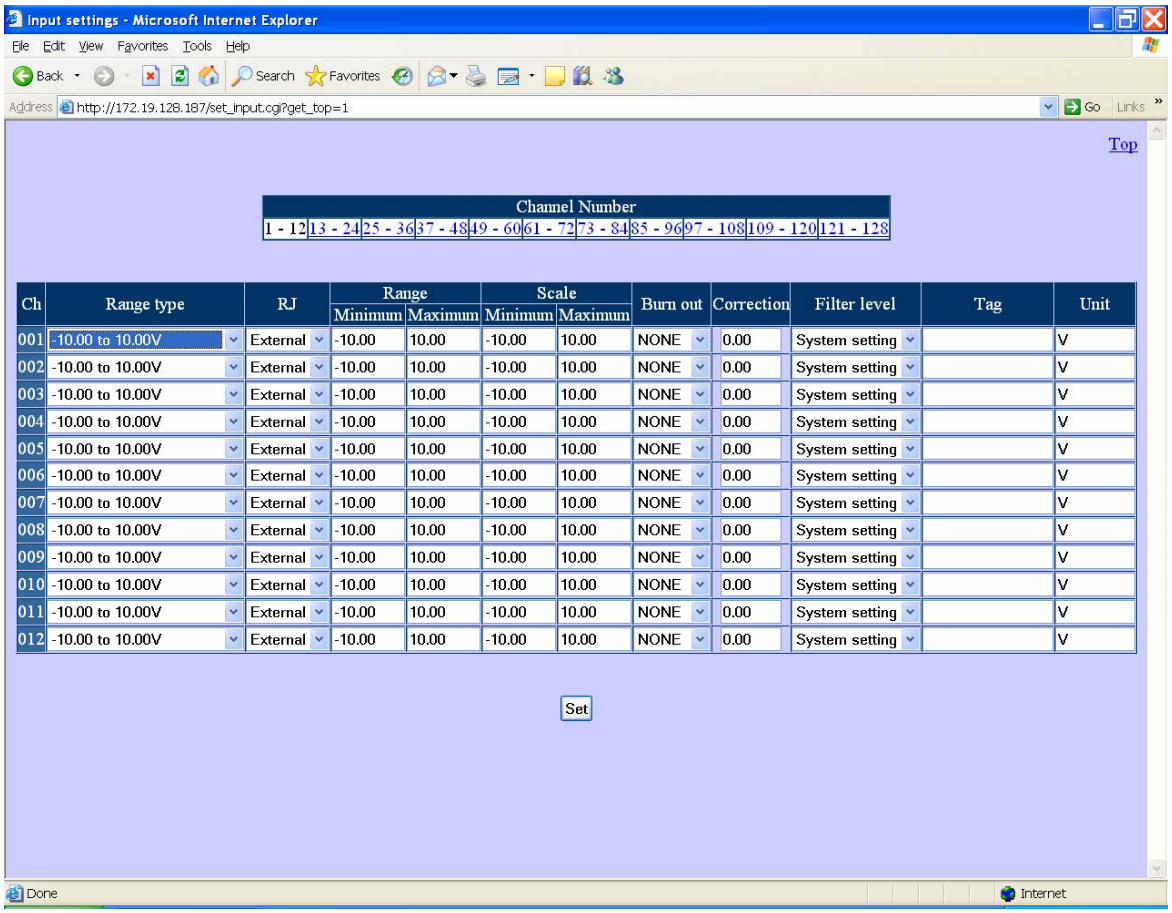
The data of 128 channels of this recorder are displayed with tag names and engineering units. Two kinds of screens are selectable, the screen fixedly displaying data obtained at the time of displaying it and the screen displaying data automatically updated every 10 seconds. When the link is clicked on the top page, the screen moves to the screen fixedly displaying data obtained at the time of displaying it. For moving to the automatic updating screen, click the “Start auto refresh” link at the lower part of the screen. Also, for moving to the fixed display during the automatic updating display, click the “Stop auto refresh” link at the lower part of the screen.



Channel number	Tag	Data	Unit	Channel number	Tag	Data	Unit
01		-258.9	mV	29		29.65	V
02		-243.9	mV	30		31.15	V
03		-228.9	mV	31		32.65	V
04		-213.9	mV	32		34.15	V
05		-198.9	mV	33		35.67	V
06		-183.9	mV	34		37.17	V
07		-168.9	mV	35		38.67	V
08		-153.1	mV	36		40.17	V
09		-138.1	mV	37		41.67	V
10		-123.1	mV	38		43.17	V
11		-108.1	mV	39		44.67	V
12		-93.1	mV	40		46.17	V
13		-78.1	mV	41		47.67	V
14		-63.1	mV	42		49.17	V
15		-48.1	mV	43		50.67	V
16		-33.1	mV	44		52.17	V
17		-18.1	mV	45		53.67	V
18		-3.1	mV	46		55.17	V
19		11.9	mV	47		56.68	V
20		26.9	mV	48		58.18	V
21		41.9	mV	49		59.68	V
22		57.6	mV	50		61.18	V
23		72.6	mV	51		62.68	V
24		87.6	mV	52		64.18	V
25		23.65	V	53		65.68	V
26		25.15	V	54		67.18	V
27		26.65	V	55		68.68	V
28		28.15	V	56		70.18	V

14.1.4 Input settings

This is for changing the settings of the input parameters of this recorder. By clicking the “Set” button after entering each item, the setting contents are written in this recorder. The settings of 12 channels are displayed on 1 screen and the displaying channel block can be switched by selecting the link from the "Channel number" table at the upper part of the screen. The settings cannot be changed during recording.

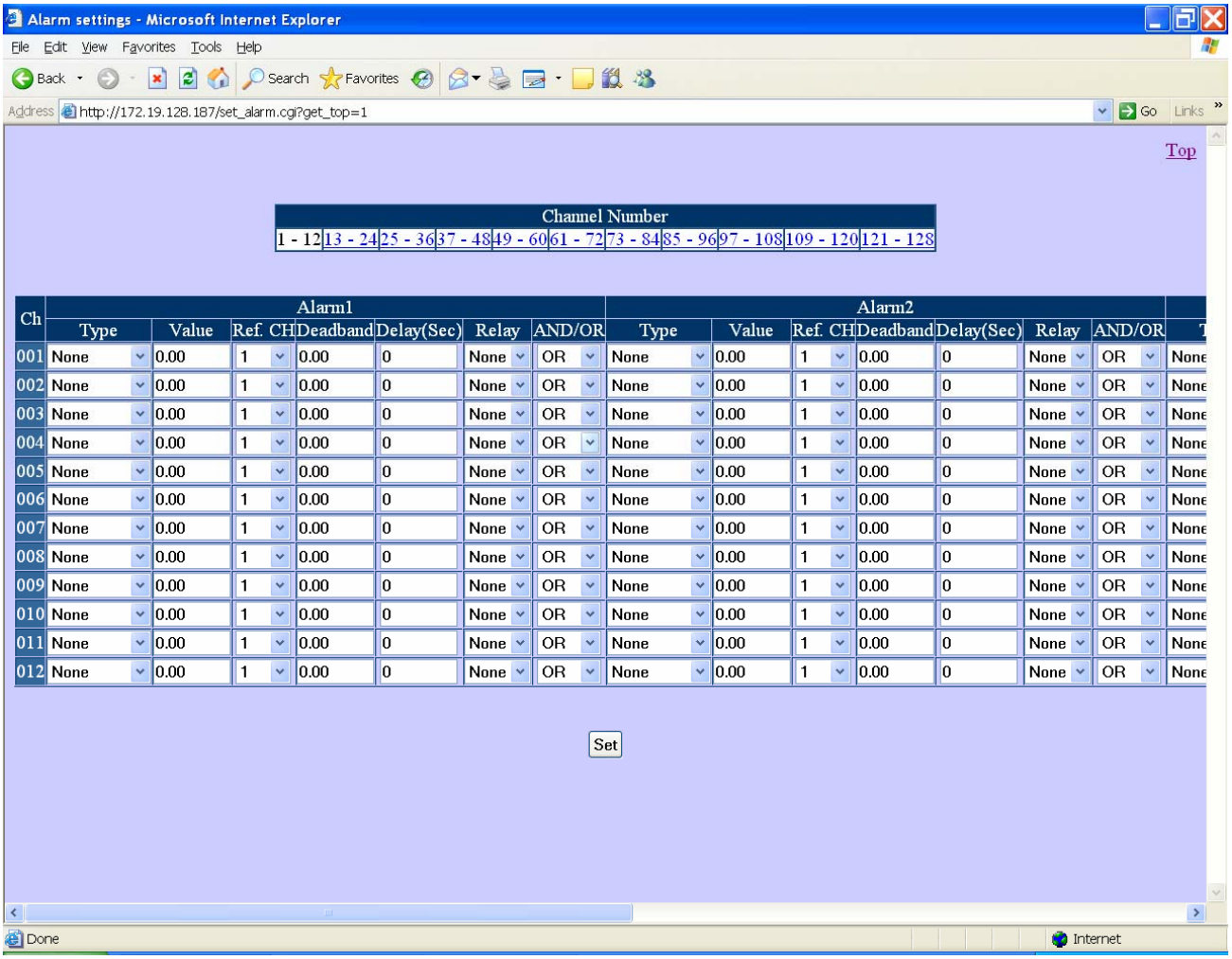


Contents of each setting

Setting items	Contents
Range type	Select the input range.
RJ	Select the reference junction compensation from internal or external.
Range Minimum	Set the minimum value of the range.
Range Maximum	Set the maximum value of the range.
Scale Minimum	Set the minimum value of the scale.
Scale Maximum	Set the maximum value of the scale.
Burn out	Select the burn out from up, down or none.
Correction	Set the value (shift value) added to the input value.
Filter level	The input filter level can be set from 0 to 3. 0 means no-filter, and 3 means the strongest filter. When [system settings] is selected, settings are following [system settings] – [other settings].
Tag	Set the tag name for the data with maximum 15 characters.
Unit	Set the engineering unit for the data with maximum 7 characters.

14.1.5 Alarm settings

This is for changing the settings of the alarm parameters of this recorder. By clicking the “Set” button after entering each item, the setting contents are written in this recorder. The settings of 12 channels are displayed on 1 screen and the displaying channel block can be switched by selecting the link from the "Channel number" table at the upper part of the screen.

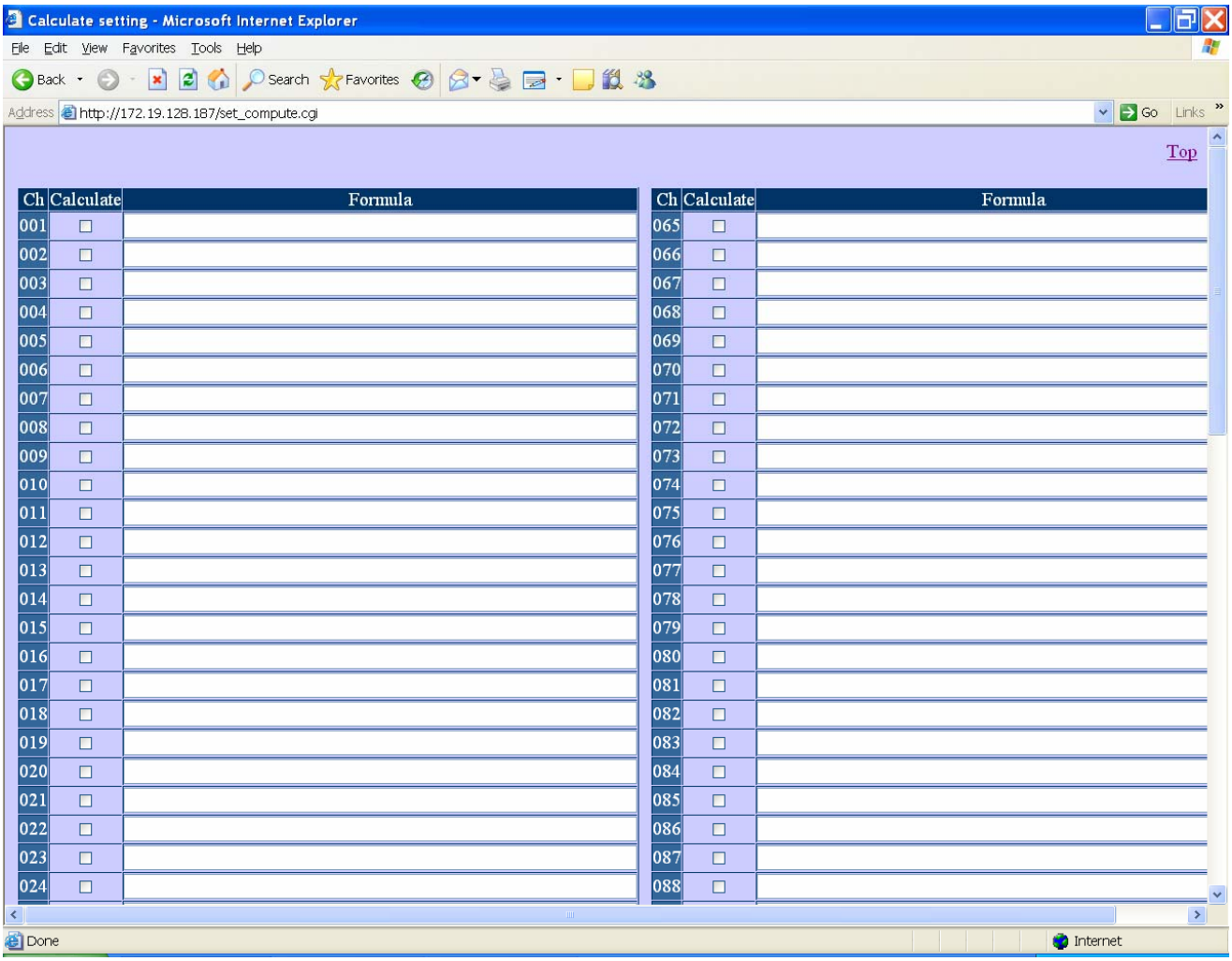


Contents of each setting

Setting items	Contents
Alarm 1 to 4 Type	Select the alarm type.
Alarm 1 to 4 Alarm value	Set the alarm value of each alarm.
Alarm 1 to 4 Reference CH	When the differential alarm is set in the alarm type of each alarm, select the reference channel.
Alarm 1 to 4 Dead band	Set the dead band of each alarm.
Alarm 1 to 4 Delay	Set the delay of each alarm from 0 to 3600 seconds.
Alarm 1 to 4 Relay	Select the output destination relay number at the activation of each alarm.
Alarm 1 to 4 AND/OR	Set the alarm output mode.

14.1.6 Calculation settings

This is for selecting whether the calculation for each channel of this recorder is used or not, and for setting the formula. When the “Set” button is clicked after entering each item, the setting contents are written in this recorder. The settings cannot be changed during recording.

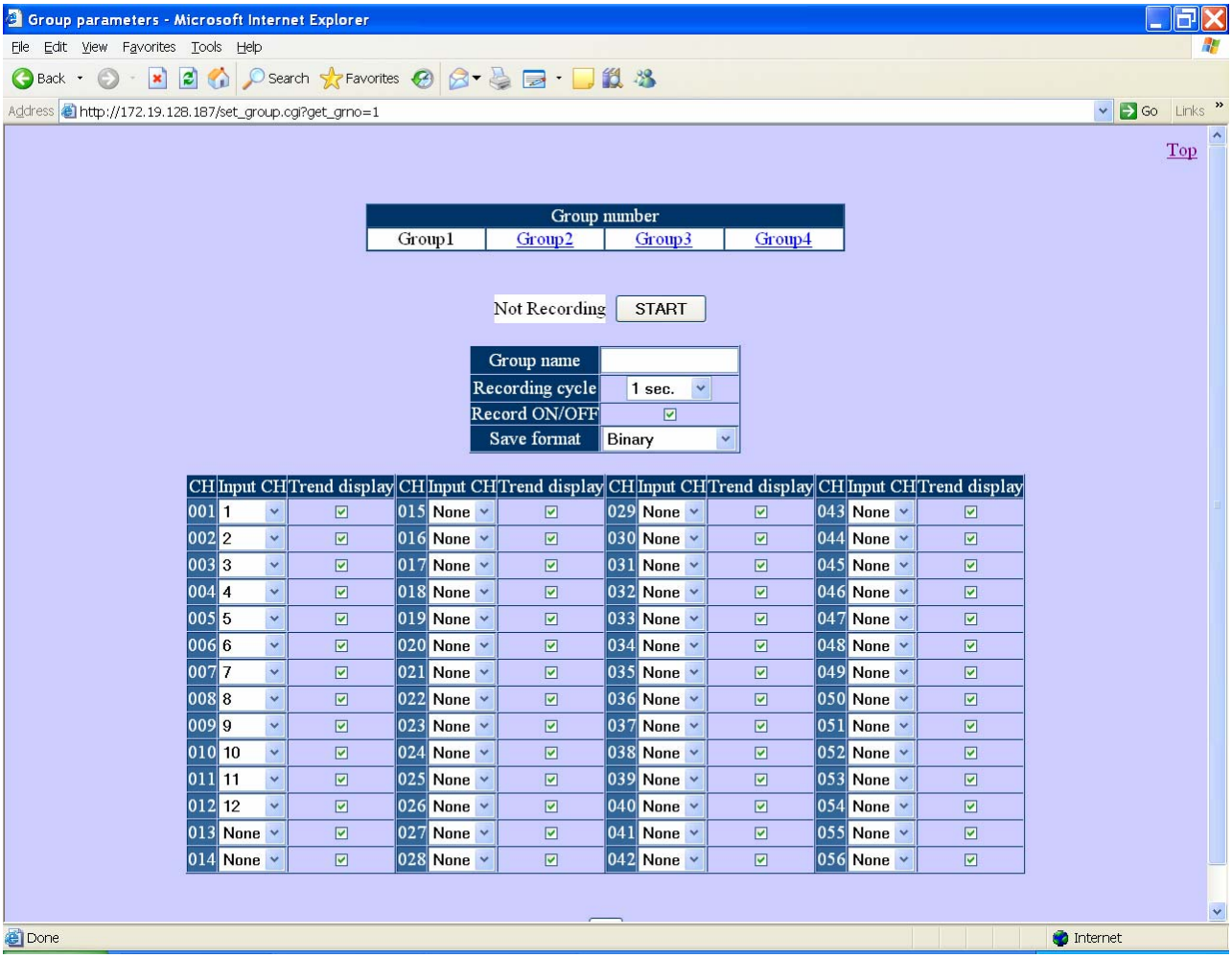


Contents of each setting

Setting items	Contents
Calculate	Select whether the calculation is used or not.
Formula	Set the formula with maximum 48 characters.

14.1.7 Group settings

This is for changing the settings of the record-related-parameters of this recorder. When the “Set” button is clicked after entering each item, the setting contents are written in this recorder. The settings of one group are displayed on one screen. The group to be displayed can be switched by selecting from the "Group number" table on the upper part of the screen. The group that can be selected here is the groups from the Group 1 to the usage group count set in “System settings” → “Other settings” of this recorder. The settings of the group with the Record ON checked cannot be changed during recording.

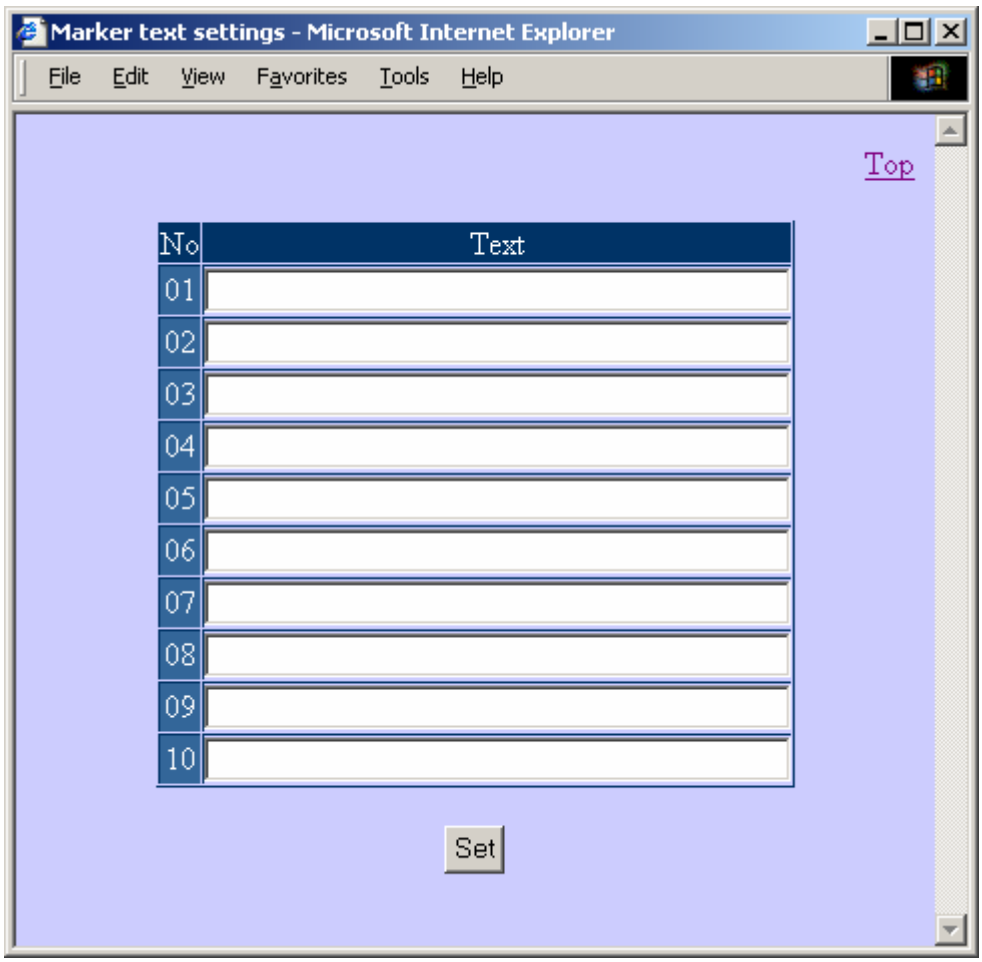


Contents of each setting

Setting items	Contents
Group name	Set the group name with maximum 16 characters.
Recording period	Select the time interval for displaying and recording the data.
Record ON/OFF	Select whether its group is recorded or not.
Save format	Select the file format for recording the data into a CF card. (refer to 13.5)
Input CH	Select the input channel number to be recorded in each recording channel.
Trend display	Select whether the trends of each channel are displayed or not on the screen.

14.1.8 Maker text settings

This is for changing the settings of the maker text parameters of this recorder. When the “Set” button is clicked after entering each item, the setting contents are written in this recorder. By setting the text at the last column (No. 10 in the figure), 10 more columns are displayed. Up to 50 texts can be registered. Refer to Para. 9.3 and 9.6 for writing the maker text on the trends.



Contents of each setting

Setting items	Contents
Text (No. 01 to 50)	Set the marker text with maximum 30 characters.

15 Recording in a USB memory

15.1 Outline

By using the USB port equipped with this recorder, the data can be stored in the USB memory instead of the CF card, or the data stored in the CF card can be copied to the USB memory.

15.2 Connectable media

Do not connect any media other than the following. If not, this recorder may be damaged.

USB flash memory (Up to 8GB)

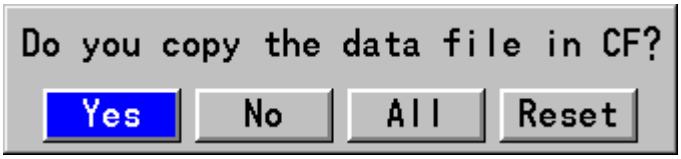
Operation of all USB flash memories is not guaranteed.

External media, such as a hard disk, ZIP, MO, an optical disc, cannot be used.

15.3 Usage

The USB memory has the following usage in this recorder.

(1) Used as an external media for storing the data (Refer to Para. 13.11.7 - [Selecting an external memory])
(2) The data is copied when the USB memory is inserted.
When the USB memory is inserted, the following message is displayed.



[Yes]: The files after copying last time are copied.
[No]: Nothing is done. At the next insertion, the files are copied on the basis of the time at copying last time.
[All copy]: All stored filed in the CF card are copied.
[Reset]: Nothing is done. At the next insertion, the files are copied on the basis of this time.

(3) Copying all data stored in the CF card together (Refer to Para. 13.9 - [Memory operation])
(4) Reading/writing the setting file (Refer to Para. 13.9 - [Memory operation])

During accessing to the USB memory, the round mark beside the disk icon on the status bar changes to red like the time of writing in the CF card. Do not extract the USB memory in the meantime.

Remarks In noise environment

Under the environment with noise, the writing in the USB memory may not succeed. Perform the writing in the USB memory under the environment without noise.

16 Low order communications (read) (option)

16.1 Outline

***When use low order communications, set communications type to [Low order (read)] (Refer to 13.11.7).**

Low order communications are functions that this recorder works as a master unit (high order instrument) communications and reading data of the other instruments which are connected as slave units (low order instruments) assigned for input channel of this recorder and then displaying and recording the data. This recorder and low order instruments communicate by serial communication of RS-485 communication standard compliance.

The “range”, “scale”, “RJ”, and “burn out” settings can be set for lower order instrument.*1

Data requirement for each instrument is approximately 1 second (all points per 1 instrument). When connect 5 instruments to low order side, data renewal period is approximately 5 seconds.*3

*1 LT230, LT350/370, LT830, JU, JW has only data collective function, not setting.

*2 Data renewal time is different depending on regulated points only JW.
Less than 10 points: number of connection lower-order communication instrument x 1 (second)
10-13 points: number of connection lower-order communication instrument x 2 (seconds)
More than 13 points: number of connection lower-order communication instrument x 3 (seconds)

*3 Except JW

*4 Data of following PLC made of Mitsubishi Electric can be read.
- MELSEC AnACPU series
- MELSEC QnACPU series
- MELSEC QnASCPU series
- MELSEC QCPU series
- MELSEC FX series

Need the communication unit etc. that is corresponded communication control procedure model 4.
Following devices can be imported.
- D0000 to D1023
- M0000 to M2047

※It is necessary to change the setting of MELSEC to being checksum.

*5 The data of PLC made of Omron can be read.
- The instrument which is corresponded SYSMAC C mode command communication.

Following channels can be inputted.
- Data memory (DM) area: D0000 to D9999
- CIO (input and output relay etc.) area: 0 to 6143

When PLC of Omron communicate with RS-485, need line convertors (SC8-10) same as the number of PLC (refer to 5-7(6)(7)). When communicate with RS-422A, need communication unit that is corresponded high order link C mode command.

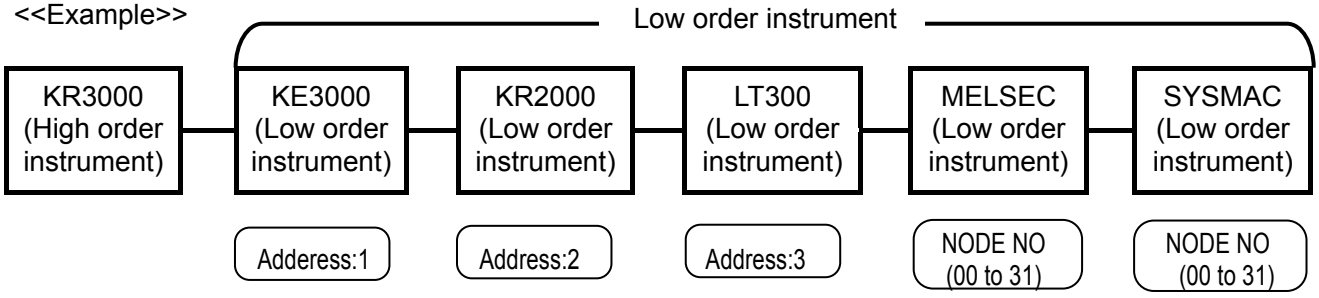
—Instrument can be connected low order side—
1. BR
2. AL3000
3. AH3000
4. SE3000
5. KE3000
6. LE5000
7. KR2000/3000
8. LT230
9. LT350/370
10. LT450/470
11. LT830
12. DB1000/2000
13. DP-G
14. JU
15. JW
16. MELSEC series *4
17. SYSMAC series *5

■ Lower-order communication (read) outline
- Model:KR31□□－S□□
- Connection quantity: Maximum 16
- Maximum reading points*: 120 to analog input points
  *Possible to register on channel which has not input in the recorder.
- Data renewal period: approximately 1 second per 1 instrument.*
  * Display of renewal may delay in this instrument depending on the condition of data renewal or communication response delay of low order side instrument.
- Communication time out: approximately 1 second for each instrument* (no retry). Retain the data of last value.
  *When communication time out is occur for the 60th times in a row, display and record “UNDER”.

16.2 Procedure of connection setting to low order instrument

After connecting between low order communication terminal of this recorder and low order instruments, set this recorder (high order instrument) and low order instruments following the procedure. See “5.7 Connection of communication I/F terminal”, instruction manual of communication interface of each instrument, and connection instruction manual for detail of connection. (Terminal resistance is installed to the instrument which is set one end or both ends of standard communication line, however terminal resistance is not installed depend on the environment.)

<<Example>>



16.2.1 Setting of low order instrument

(1) Set communication address (instrument number) of low order instrument from 1 to 16 without overlap. (Node number of PLC is optional number which is not overlapping.)

(2) Set communication of each low order instrument by specification of below. See instruction manual of each instrument for setting method.

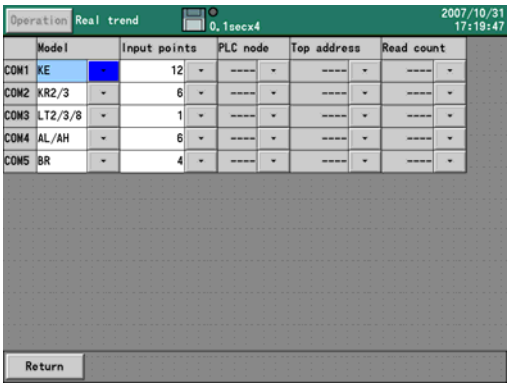
Baud rate :9600 bps
Length of data :8 bit
Stop bit :1 bit
Parity :None

16.2.2 Register to the instrument (product of our company)

(1) Press the Menu key in operation screen of the instrument, and select “system setting” → “low order communication (read)” in the list, then press the ENTER key. (Display “lower communication (read)” only in lower communication (read) option product)

(2) Select appropriate name of the model from a list of “model”. Register low order instrument corresponding each communication address (instrument number) 1 - 16 to COM1-COM16.

(3) Register points to “input points”



◆ Example of setting
COM1:KE/60points
COM2:KR2/44points
COM3:LT3/1point
COM4: AL/6points
COM5: BR/4points

Name of instrument which is displayed on the list is displayed convenient. *1

On the list	Model of our company
SE3	SE3000
AL/AH	AL3000/AH3000
KR2/3	KR2000/KR3000
LE5	LE5000
LT2/3/8	LT230/LT350/370/LT830
LT4	LT450/470

Data of LT (each series), JU, and JW is assigned like below for CH data.

JW	
CH01	Voltage level (average)
CH02	Current value (average)
CH03	Electric value
CH04	None assigned
CH05	Voltage level (between U phase and V phase)
CH06	Current value (U phase)
CH07	Load resistance value (U phase)
CH08	Voltage level (between V phase and W phase)
CH09	Current value (V phase)
CH10	Load resistance value (V phase)
CH11	Voltage level (between W phase and U phase)
CH12	Current value (W phase)
CH13	Load resistance value (W phase)
CH14	Initial resistance value (U phase)
CH15	Initial resistance value (V phase)
CH16	Initial resistance value (W phase)

JU	
CH01	Voltage level
CH02	Current value
CH03	Electric value
CH04	Load resistance value

※ The data of LT, DB, and DP is allocated in KR3000 as CH data.
When an invalid parameter is set, it is displayed on the screen as "UNDER".

		Model name					
CH／Parameter		LT8	LT2	LT3	LT4	DB	DP－G
CH01	PV	○	○	○	○	○	○
CH02	SV	○	○	○	○	○	○
CH03	MV1	○	○	○	○	○	○
CH04	MV2	○	○	○	○	○	○
CH05	ExecutionSV	×	○	○	○	○	○
CH06	EV1	※○	○	○	○	○	○
CH07	EV2	※○	○	○	○	○	○
CH08	EV3	×	×	○	○	○	○
CH09	EV4	×	×	×	○	○	○
CH10	P	×	○	○	○	○	○
CH11	I	×	○	○	○	○	○
CH12	D	×	○	○	○	○	○
CH13	ExecutionNo	×	○	○	○	○	×

○ : The display is possible. × : UNDER display

Remarks Difference matter with real screen

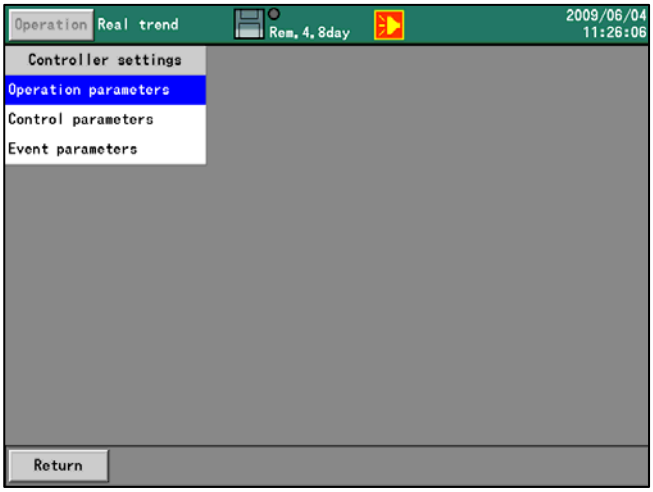
The value of "EV1" "EV2" "P" "I" "D" "Execution No" in a real screen becomes "UNDER" display only as for the LT8 series.
However, a normal value is displayed on the control plan side (controller display, bar, and text).
Please note becoming in recorded data "UNDER".

16.2.3 Settings to controllers

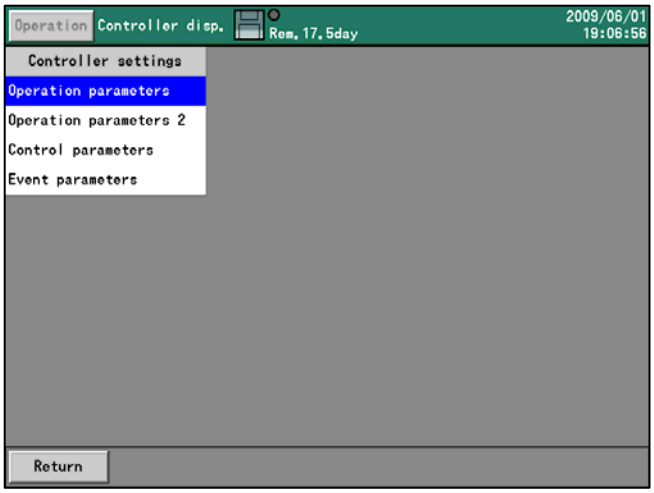
On the registration screen of instruments, by pressing the [COM] button of the row, that a controller (LT, DB,) is registered, a portion of parameters for a controller can be set.
The menu of the following figure is displayed first and, by selecting each menu, the corresponding parameter can be set.
(DP-G series doesn't change to controllers menu even if the "COM" button is pushed because only reading is possible.)

・Controller setting

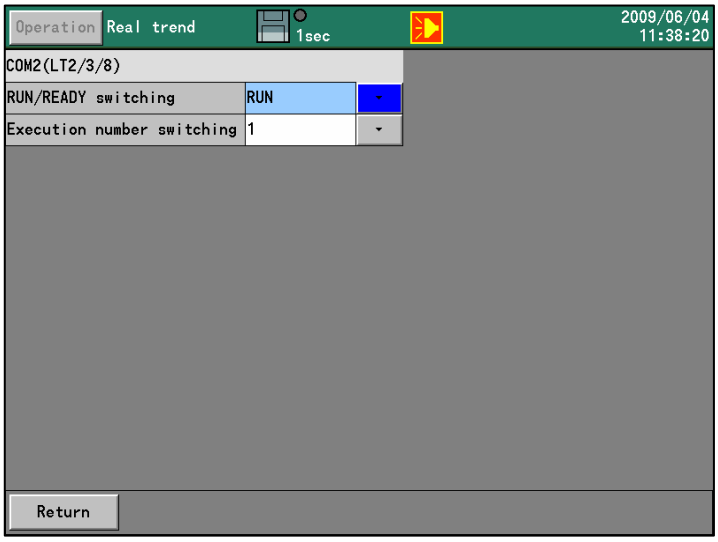
[LT2/3/8]Display



[LT4][DB]Display

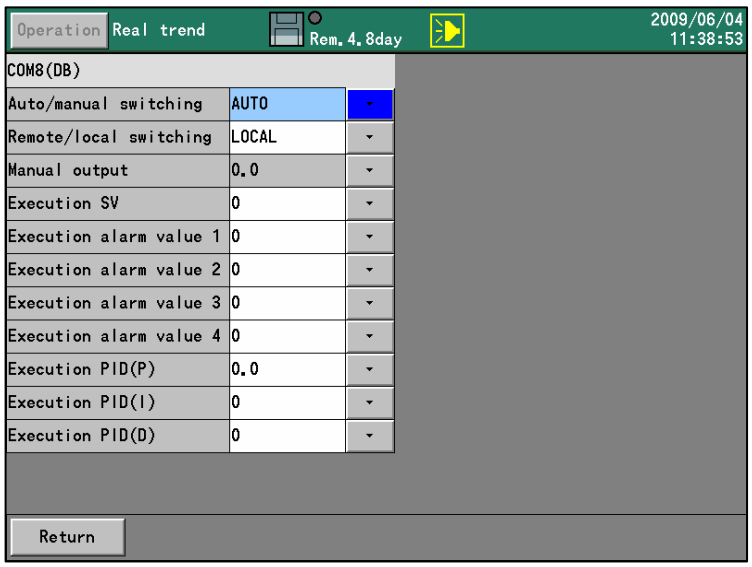


(1) Operation parameters



For the controllers connected, the following operations can be executed.
・RUN/READY selection
・Execution number selection (Execution No.1 and Execution No2 only)
The switch of the LT800 series is improper.

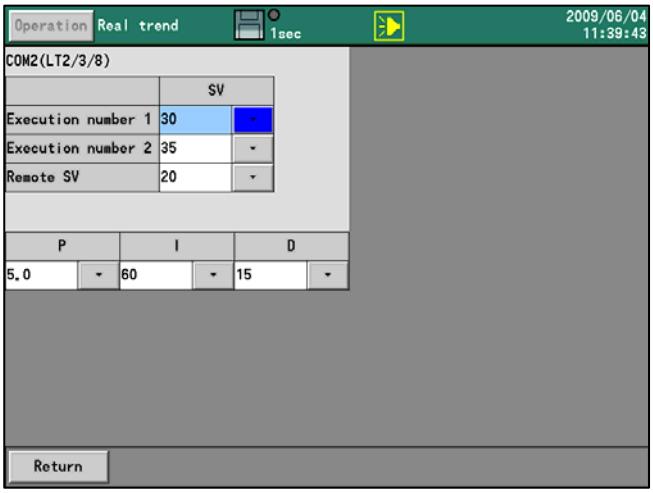
(2) Operation parameters 2



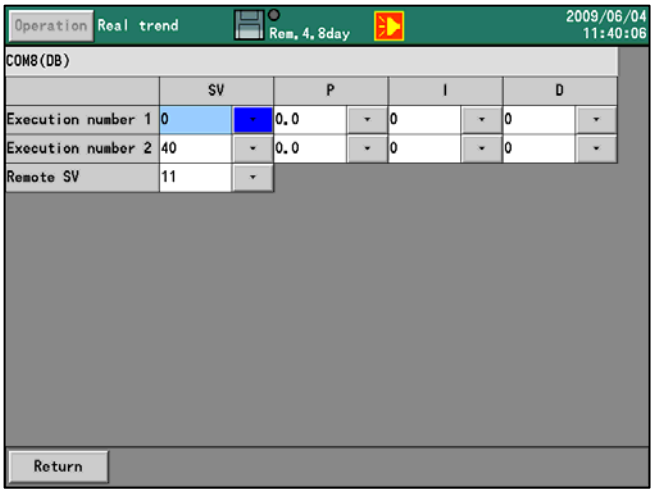
It can be used for LT400 series and DB/KP series controllers.
For the controllers connected, the following operations can be executed.
・AUTO/MANUAL selection
・REMOTE/LOCAL selection
・Execution number selection (No.1 and No.2 only)
・Execution alarm value, Executing PID (DB series controllers only)

(3) Control parameters

[LT2/3/8]Display



[LT4][DB]Display



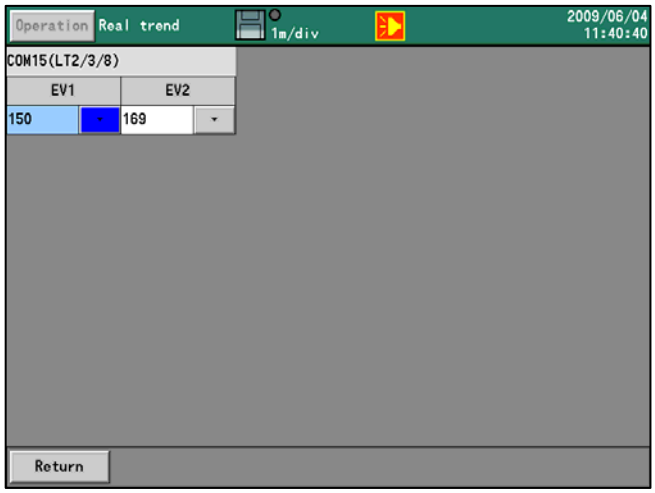
For the controllers connected, the following operations can be executed.
・Setting of a SV and PID values of execution No. 1 and 2
(The LT8 series becomes a gray display because it cannot change execution No.2.)
・Setting a remote SV value

Remark About SV limit

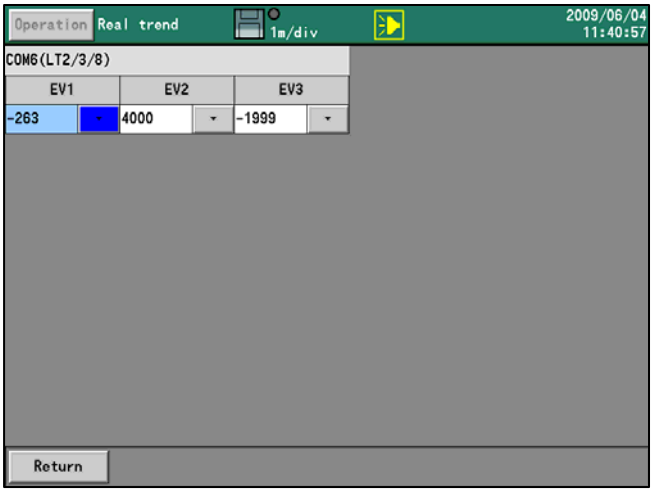
Please set the SV limit upper bound value or less from the limit lower bound of the adjustment meter to the SV value and the remote SV value.
When the value is set outside the range, it is not reflected.

(4) Event parameter

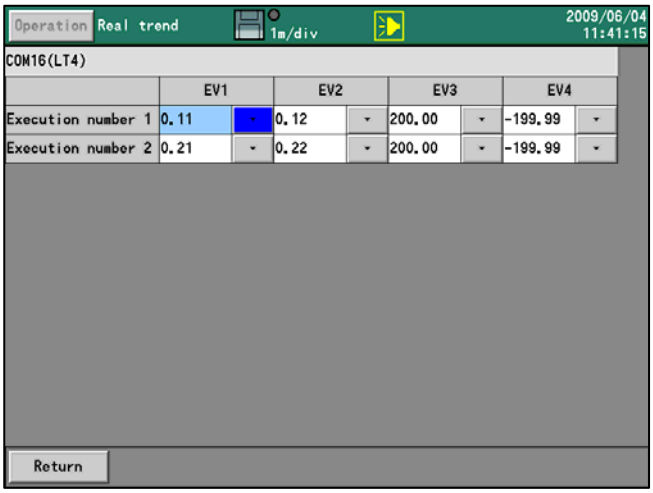
[LT2/8]Display



[LT3]Display



[LT4][DB]Display



For the controllers connected, the following operations can be executed.
・Setting of event parameters 1 ~ 4 of execution No. 1 and 2.

When the setting that exceeds the maximum and the minimum value of the EVENT value of each equipment is done, the error message is displayed.

・The table below shows the change parameter of the ⊂ontroller in the system setting.
（R：Read only、R／W：Read and Write）

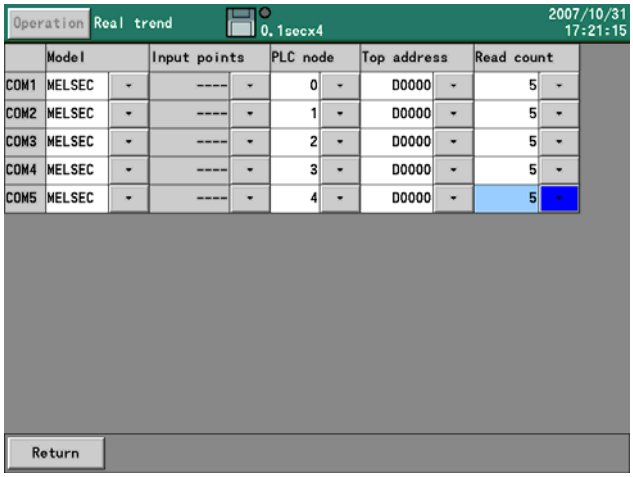
		Model name				
Controller menu	Parameters name	LT8	LT2	LT3	LT4	DB
Operation parameters	RUN/READY switching	R／W				
	Execution number switdhing	×	R／W			
Operation parameters 2	Auto/manual switching	×	×	×	R／W	
	Remote/local switching	×	×	×	R	R／W
	Manual output	×	×	×	R／W	
	Execution SV	×	×	×	×	R／W
	Execution alarm value 1	×	×	×	×	R／W
	Execution alarm value 2	×	×	×	×	R／W
	Execution alarm value 3	×	×	×	×	R／W
	Execution alarm value 4	×	×	×	×	R／W
	Execution PID(P)	×	×	×	×	R／W
	Execution PID(I)	×	×	×	×	R／W
	Execution PID(D)	×	×	×	×	R／W
Control Parameters	Execution number 1(SV)	R／W				
	Execution number 1(P)	R／W				
	Execution number 1(I)	R／W				
	Execution number 1(D)	R／W				
	Execution number 2(SV)	×	R／W			
	Execution number 2(P)	×	×	×	R／W	
	Execution number 2(I)	×	×	×	R／W	
	Execution number 2(D)	×	×	×	R／W	
	Remote SV	R／W				
Event parameters	Execution number 1(EV1)	R／W	R／W	R／W	R／W	R／W
	Execution number 1(EV2)	R／W	R／W	R／W	R／W	R／W
	Execution number 1(EV3)	×	×	R／W	R／W	R／W
	Execution number 1(EV4)	×	×	×	R／W	R／W
	Execution number 2(EV1)	×	×	×	R／W	R／W
	Execution number 2(EV2)	×	×	×	R／W	R／W
	Execution number 2(EV3)	×	×	×	R／W	R／W
	Execution number 2(EV4)	×	×	×	R／W	R／W

16.2.4 Register to the instrument(PLC)

(1) Select “system setting” → “low order communications (read)” on the menu screen of the recorder.
* “low order communication (read)” is displayed when the recorder has low order communication (read) option.

(2) Select the name of the model from the list of “model”. Then register PLC on each COM1 to COM5.

(3) Register administrate address of the recorder on “top address” and “read address”.

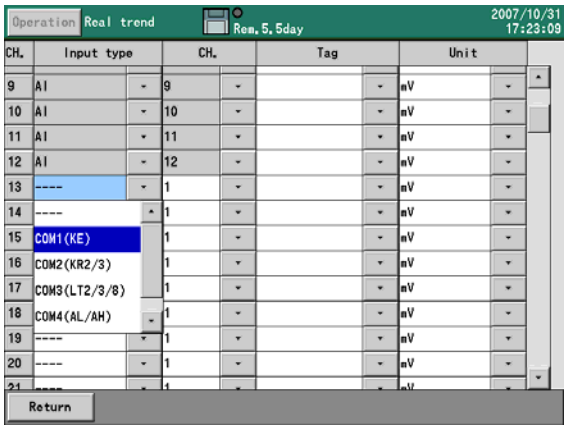


16.2.5 Register CH number of low order instrument

(1) Tap the MENU key at the operation screen of the recorder, and select “input computation programming” on the list.

(2) Tap the ▼ of “input type” of CH which is registered low order instrument.
Select model which is registered “16.2.2 Setting of low order instrument” from the displayed list.

(3) Set CH number of low order instrument which is resisted “CH” column of third row.

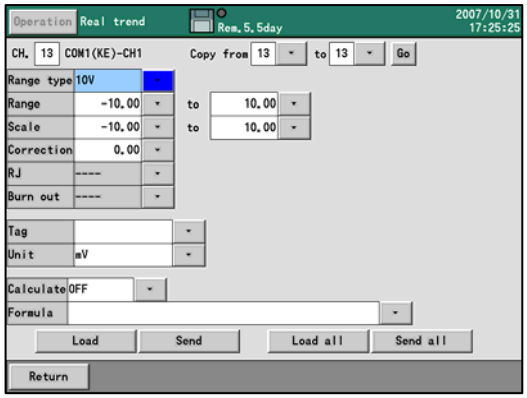


Remark About input setting of low order instrument

When a model that registers by the low order communication setting and an actual connected model have the difference, the selection item of the input kind of might not be normally displayed. Please use externals where there is no difference in connected model and the main body setting.

16.2.6 Input setting of low order instrument

(1) Tap “input computation programming” of “CH” of the left side.
Display detail setting screen like below.



(2) Tap INPUT button for getting setting contents of relevant CH of low order instrument. Tap All points input button for getting setting contents of all registered points.
Following message is shown when input of setting contents is done normally.

Tap OK button for returning.
If the input is incorrect, the following message is displayed.

Tap OK button for returning, and tap INPUT button again. When message of “INPUT Complete” is not shown, communication is not normal. Check the setting and connection of this instrument and low order instruments again.

(3) When changing the setting from this recorder for appropriate CH of low order instrument, perform following procedure. (The instrument which is not change the setting is not displayed transfer all points transfer button.)
When change the setting only displayed CH, tap transmitting button. In case of changing and setting of all needed CH, tap all points button after finishing the change of all setting. Following message is shown when input of setting contents is done normally. After sending contents of setting is complete, the following message is displayed.

Tap OK button for returning.
If the input is incorrect, the following message is displayed.

Tap OK button for returning, and tap INPUT button again. When message of “INPUT Complete” is not shown, communication is not normal. Check the setting and connection of this instrument and low order instruments again.

(4) After finish the setting of CH, tap the ESC key and save the setting.

(5) After setting of the above procedure, start data acquisition. When register the CH which is allotted to low order instrument at [display setting] – [group parameter], data of low order instrument can be displayed and recorded (refer to 13.3.2).

17 Low order communications (write) (option)

17.1 Outline

***When use low order communications, set communication type to [Low order (write)] (Refer to 13.11.7)**

Low order communications (write) has the function that communicate for high order instrument and write measurement and calculation data of this recorder to connected low order instrument This recorder and a low order side instrument perform serial communication of RS-422A or RS-422A communication standard compliance.

—Instrument can be connected low order side—
1. MELSEC series[*1]
2. SYSMAC series[*2]

*1 Data of following PLC made of Mitsubishi Electric can be read.
- MELSEC AnACPU series
- MELSEC QnACPU series
- MELSEC QnASCPU series
- MELSEC QCPU series
- MELSEC FX series

Need the communication unit etc. that is corresponded communication control procedure model 4.

Following devices can be inputted.
- D0000 to D1023
- M0000 to M2047

*2 Data of following PLC made of Omron can be read.
- The instrument which is corresponded SYSMAC C mode command communication.

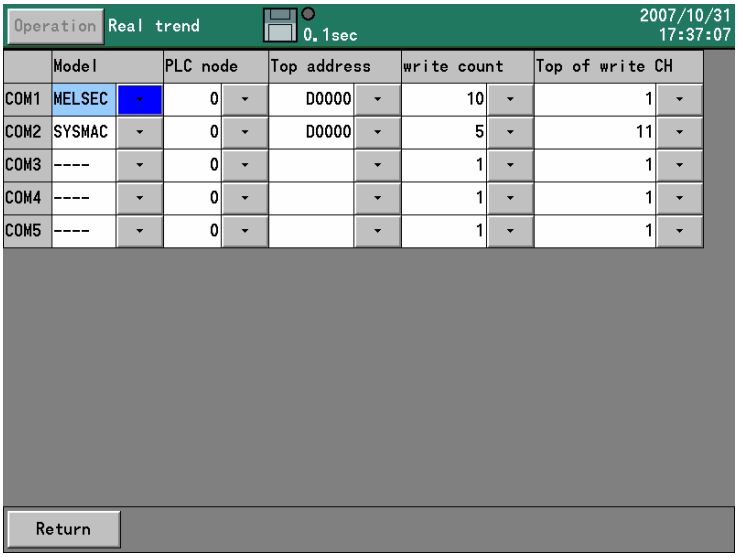
Following channels can be inputted.
- Data memory (DM) area: D0000 to D9999
- CIO (input and output relay etc.) area: 0 to 6143

When communicate with PLC of Omron, need line convertors (SC8-10) same as the number of PLC (refer to 5-7(6)(7)). When communicate with RS-422A, need communication unit that is corresponded high order link C mode command.

■ Low order communications (write) specification outline
- Model: KR31□□-S□□
- Connection quantity: Maximum 5
- Maximum writing points*: 128
  *Possible to write all channels data of this instrument.
- Data renewal period: Approximately 1 second per 1 instrument*
  *Display of renewal may delay in this instrument depending on condition of data renewal or communication response delay of low order side instrument.
- Communication time out: Approximately 1 second for each instrument *(no retry).
  *When the instrument includes communication time out and has communication error for 60th times, display error message.

17.2 Register to the instrument

(1) Select “system setting” → “low order communications (read)” on the menu screen of the recorder
*“low order communication (write)” is displayed when the recorder has low order communication (write) option.
(2) Select the name of the model from the list of “model”. Then register PLC on each COM1 to COM5.
(3) Resister address which is written from this recorder on “top address” and “write count”.
(4) Resister top channel of source of write on “top CH”.



On the setting of the above,
COM1: Write the data of CH1 to 10 of KR to “D0000 to D0009” of MELSAC of PLC node “0”.
COM2: Write the data of CH11 to 15 of KR to “D0000 to D0004” of SYSMAC of PLC node “0”.

18 Scale calibration

18.1 Scale calibration

To maintain the measurement accuracy, it is recommended to calibrate this recorder every year.

Calibration name	Description
Zero/span adjustment	Execute the adjustment by inputting the zero and span of each measurement range. * As for this recorder, the AD converter and one KR31*1 every four channels do the input process to KR31*0 with one AD converter every twelve channels. Therefore, KR31*1 inputs and adjusts zero and the span of each cooking stove of each input terminal unit of each input terminal unit three times once to KR31*0.

* The sensor correction (shift of value) for each channel can also be performed.（Refer to 13.2 Input operation settings.）

18.2 Calibration environment

Items	Reference conditions
Ambient temperature	23°C±2°C
Ambient humidity	50%±10%
Power voltage	100VAC± 1 %
Power frequency	50Hz or 60Hz±0.5%

18.3 Preparation

18.3.1 Preparation of tools

Tools	Input types			Remarks
	DC voltage	Thermocouple	Resistance thermometer	
DC voltage current generator	○			Accuracy: Better than ±0.05%
Reference junction compensator		○		0°C±0.2°C
Thermocouple for test		○		Same type of thermocouple as the input
Standard variable resistor			○	Accuracy: Better than ±0.05%
3 -core copper wire			○	Same resistance value per core

18.3.2 Before calibration

(1) Attach the terminal board cover and turn the power on.
(2) Take the warm-up time for more than 30 minutes until this recorder stabilizes. (The ideal warm-up period is more than 1 hour.)

Remarks About adjustment

The check and adjustment of measured values need careful cautions for the adjustment work besides tools such as standard tools and reference conditions.
When the check and adjustment of measured values are required, contact your local CHINO's sales agent.

18.4 Connections

Connections depend upon the input types. Connect tools such as standard tools to the measuring input terminals to be adjusted.

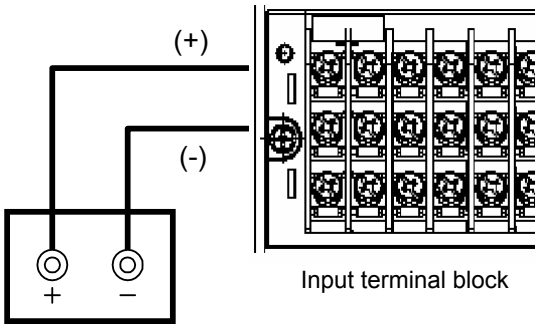
⚠ Caution

■Turn off the power source before connections
Turn off the power source before connections for preventing electric shock.

<For KR31∗0>

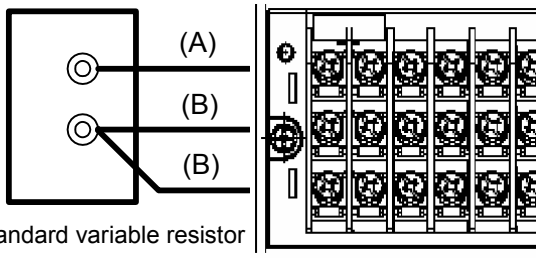
(1) In case of the DC voltage input
The 2nd, 5th and 11th terminals of each input terminal unit are the terminals for adjustment.
For the adjustment, connect to the 2nd, 5th and 11th terminals all together as shown in the right figure.

The 1st to 4th terminals are adjusted by the adjustment of the 2nd terminal.
The 5th to 8th terminals are adjusted by the adjustment of the 5th terminal.
The 9th to 12th terminals are adjusted by the adjustment of the 11th terminal.



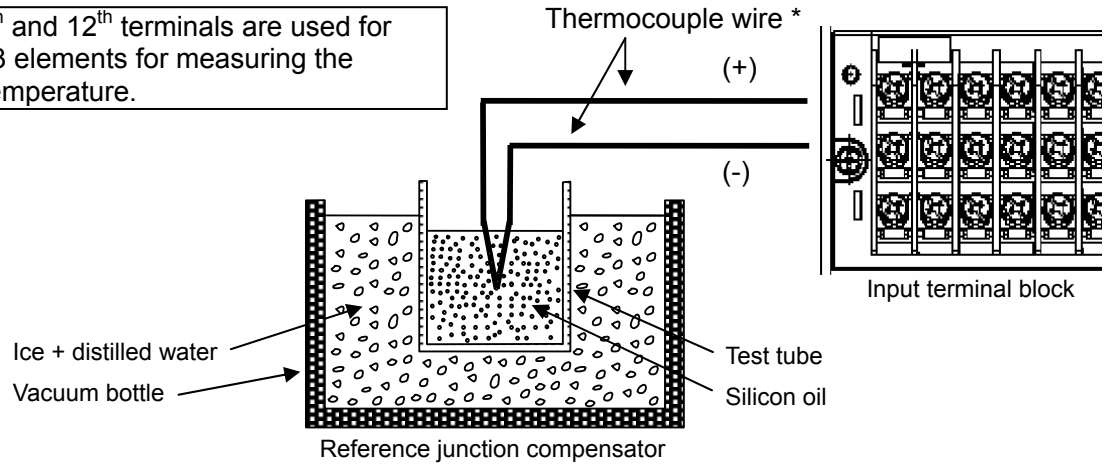
(2) In case of the resistance thermometer input
The 2nd, 5th and 11th terminals of each input terminal unit are the terminals for adjustment.
For the adjustment, connect to the 2nd, 5th and 11th terminals independently as shown in the right figure.

The 1st to 4th terminals are adjusted by the adjustment of the 2nd terminal.
The 5th to 8th terminals are adjusted by the adjustment of the 5th terminal.
The 9th to 12th terminals are adjusted by the adjustment of the 11th terminal.



(3) In case of the thermocouple input
The 1st, 6th and 12th terminals of each input terminal unit are the terminals for adjustment. For the adjustment of thermocouples, connect to the 1st, 6th and 12th terminals independently as shown in the right figure.

■ The 1st, 6th and 12th terminals are used for adjusting 3 elements for measuring the terminal temperature.

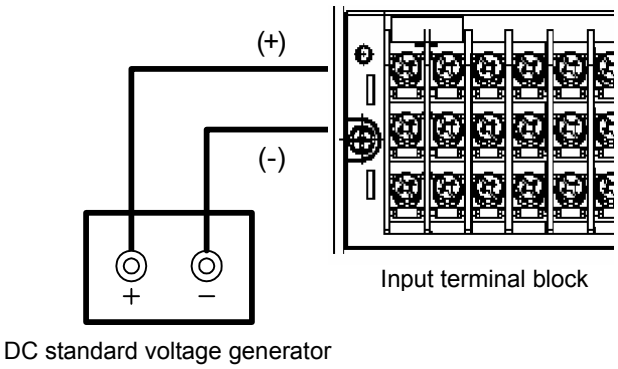


The electromotive force of the thermocouple input becomes small by the electromotive force equivalent to the temperature at terminals. The instrument itself compensates for its value. This is called the reference junction compensation. The input for the adjustment is entered with the reference electromotive force (0°C at reference). Accordingly, the reference junction compensator is used for reducing the reference junction compensated value.

<For KR31∗1>

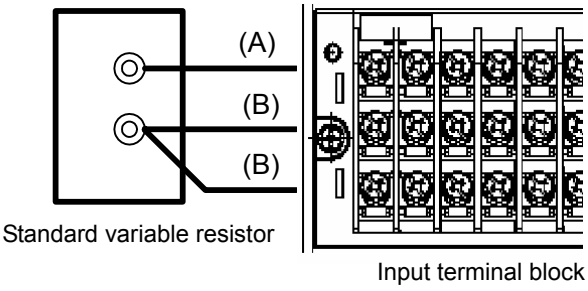
(1) In case of the DC voltage input
The 2nd terminal of each input terminal unit is for the terminal for adjustment.
For the adjustment, connect to the 2nd terminal as shown in the right figure.

All terminals of its unit are adjusted by the adjustment of the 2nd terminal.



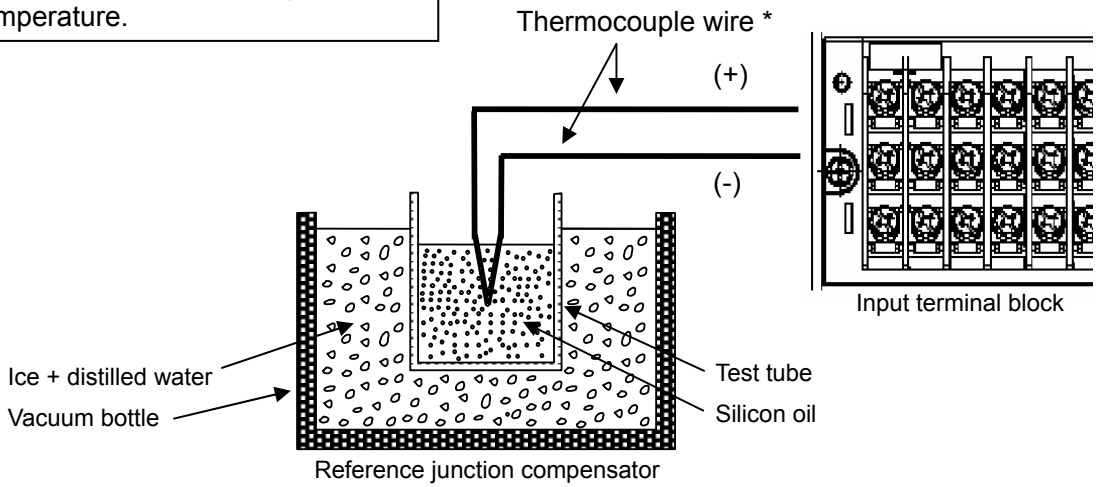
(2) In case of the resistance thermometer input
The 2nd terminal of each input terminal unit is for the terminal for adjustment.
For the adjustment, connect to the 2nd terminal as shown in the right figure.

All terminals of its unit are adjusted by the adjustment of the 2nd terminal.



(3) In case of the thermocouple input
The 1st, 6th and 12th terminals of each input terminal unit are the terminals for adjustment. For the adjustment of thermocouples, connect to the 1st, 6th and 12th terminals independently as shown in the right figure.

■ The 1st, 6th and 12th terminals are used for adjusting 3 elements for measuring the terminal temperature.



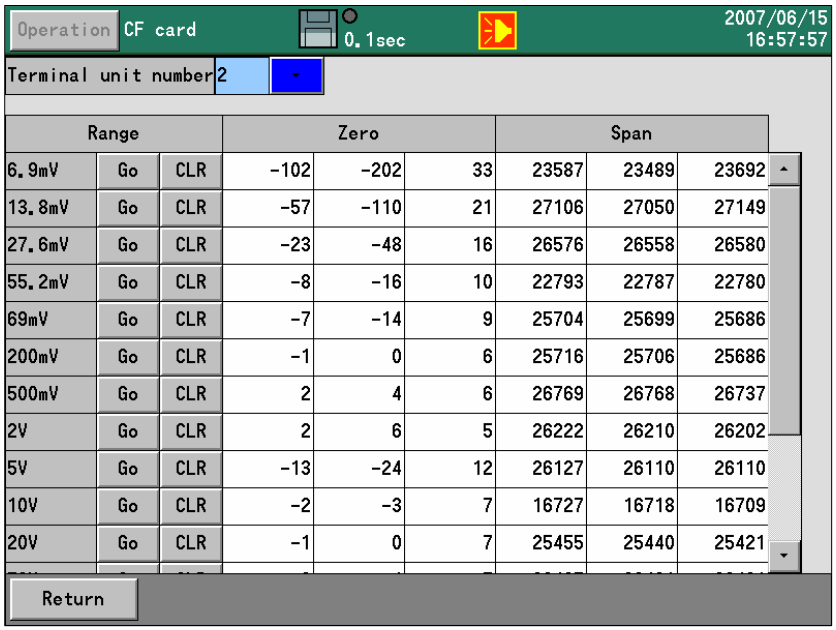
The electromotive force of the thermocouple input becomes small by the electromotive force equivalent to the temperature at terminals. The instrument itself compensates for its value. This is called the reference junction compensation. The input for the adjustment is entered with the reference electromotive force (0°C at reference). Accordingly, the reference junction compensator is used for reducing the reference junction compensated value.

18.5 Zero and span adjustment

18.5.1 Calibration screen

- Execute the range adjustment by inputting the zero and span values of the input range to each input terminal for adjustment.
- Press the “Go” button at the range to be adjusted to move to the adjustment mode.
- Terminal unit number 1: Channel 1 to 12, 2: Channel 13 to 24, 3* 25 to 36, 4: 37 to 48

By selecting the “Operation” – “Menu settings” and then selecting the “System settings” – “Scale calibration”, the following calibration screen is displayed.
The data displayed show the AD account values after adjustment.

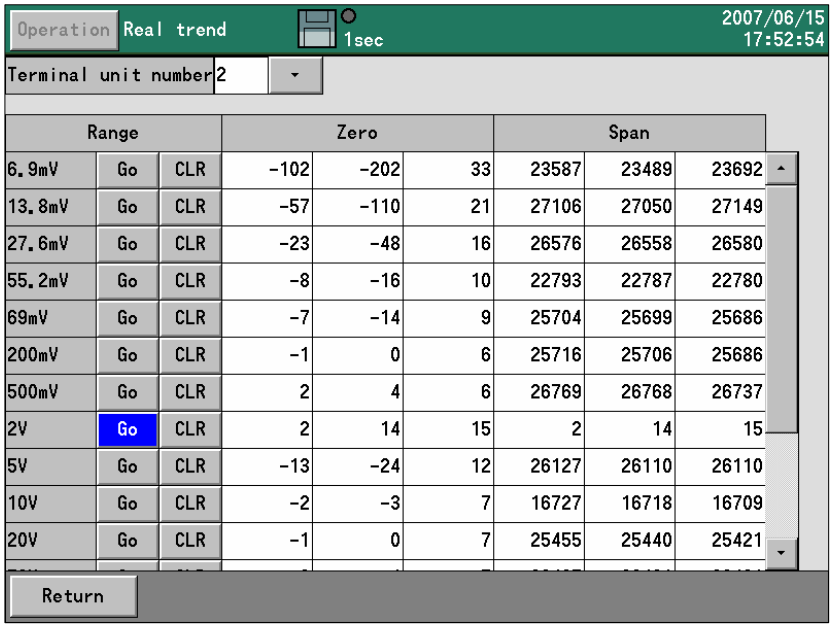


Range			Zero			Span		
6.9mV	Go	CLR	-102	-202	33	23587	23489	23692
13.8mV	Go	CLR	-57	-110	21	27106	27050	27149
27.6mV	Go	CLR	-23	-48	16	26576	26558	26580
55.2mV	Go	CLR	-8	-16	10	22793	22787	22780
69mV	Go	CLR	-7	-14	9	25704	25699	25686
200mV	Go	CLR	-1	0	6	25716	25706	25686
500mV	Go	CLR	2	4	6	26769	26768	26737
2V	Go	CLR	2	6	5	26222	26210	26202
5V	Go	CLR	-13	-24	12	26127	26110	26110
10V	Go	CLR	-2	-3	7	16727	16718	16709
20V	Go	CLR	-1	0	7	25455	25440	25421

18.5.2 Adjustment of the DC voltage input range

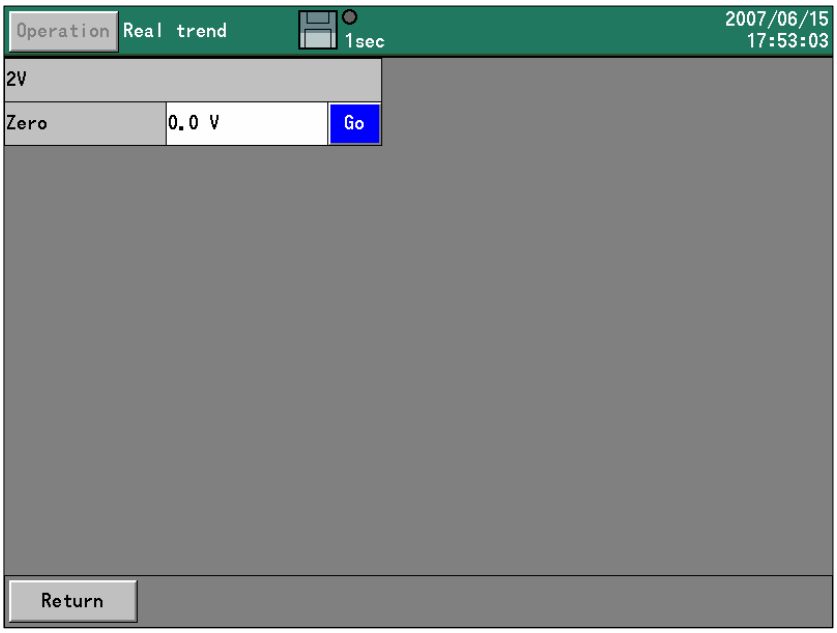
Connect as shown in “18.4 Connection (1) In case of the DC voltage input”. Execute the adjustment by inputting the voltage for the adjustment range.

(1) Click the “Go” button at the range to be adjusted.

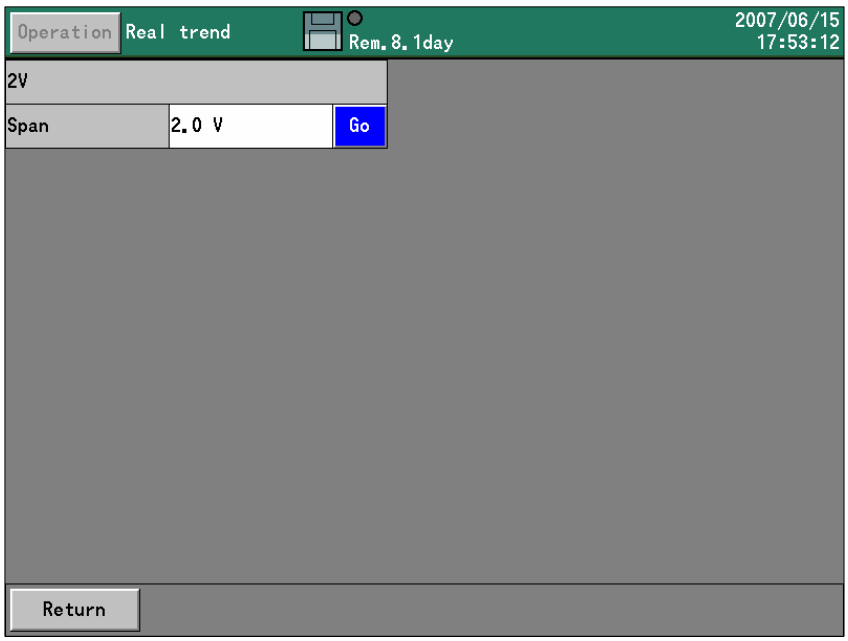


Range			Zero			Span		
6.9mV	Go	CLR	-102	-202	33	23587	23489	23692
13.8mV	Go	CLR	-57	-110	21	27106	27050	27149
27.6mV	Go	CLR	-23	-48	16	26576	26558	26580
55.2mV	Go	CLR	-8	-16	10	22793	22787	22780
69mV	Go	CLR	-7	-14	9	25704	25699	25686
200mV	Go	CLR	-1	0	6	25716	25706	25686
500mV	Go	CLR	2	4	6	26769	26768	26737
2V	Go	CLR	2	14	15	2	14	15
5V	Go	CLR	-13	-24	12	26127	26110	26110
10V	Go	CLR	-2	-3	7	16727	16718	16709
20V	Go	CLR	-1	0	7	25455	25440	25421

(2) Since the window indicating the voltage value for inputting is displayed, input its value to this recorder.



(3) Adjust the zero point.
(Example) For the adjustment of the ±2V range
・Input the voltage of 0V with the DC standard voltage generator.
(4) After inputting the zero point for about 5 seconds, click the “Go” button.
(5) Adjust the span point.
(Example) For the adjustment of the ±2V range
・Input the voltage of +2V with the DC standard voltage generator.



(6) After inputting the span point for about 5 seconds, click the “Go” button.
(7) After the adjustment of the span point, the screen is returned to the calibration screen for all ranges.
(8) Repeat from (1) to (6) for the adjustment of other ranges.

18.5.3 Adjustment of the resistance thermometer input range

Connect as shown in “18.4 Connection (2) In case of the resistance thermometer input”. Execute the adjustment by inputting the resistance value for the adjustment range.

(1) Click the “Go” button at the range to be adjusted.
(2) Since the window indicating the resistance value for inputting is displayed, input its value to this recorder.
(3) Adjust the zero point.
(Example) For the adjustment of the Pt150 range
・Input the resistance of 100Ω with the standard variable resistor.
(4) After inputting the zero point for about 5 seconds, click the “Go” button.
(5) Adjust the span point.
(Example) For the adjustment of the Pt150 range
・Input the resistance of 157.33Ω with the standard variable resistor.
(6) After inputting the span point for about 5 seconds, click the “Go” button.
(7) After the adjustment of the span point, the screen is returned to the calibration screen for all ranges.
(8) Repeat from (1) to (6) for the adjustment of other ranges.

* When the channel to be calibrated is kept being open, the adjustment at this channel is not performed.

18.5.4 Adjustment of the thermocouple input range ･･･ Adjustment of the reference junction compensation (RJ at 0°C)

Remarks

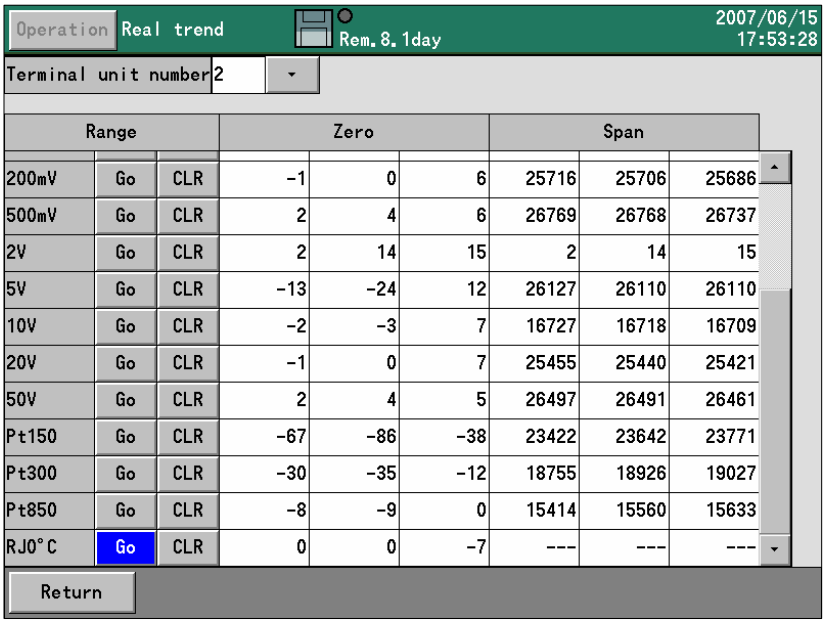
After the adjustment of the DC voltage input range, execute the adjustment of the thermocouple input range. If the adjustment of the DC voltage input range is performed after the adjustment of the thermocouple input range, the adjustment results are influenced.

Connect as shown in “18.4 Connection (3) In case of the thermocouple input”. Execute the adjustment by connecting the thermocouple for adjusting to each of the 1st, 6th and 12th terminals.

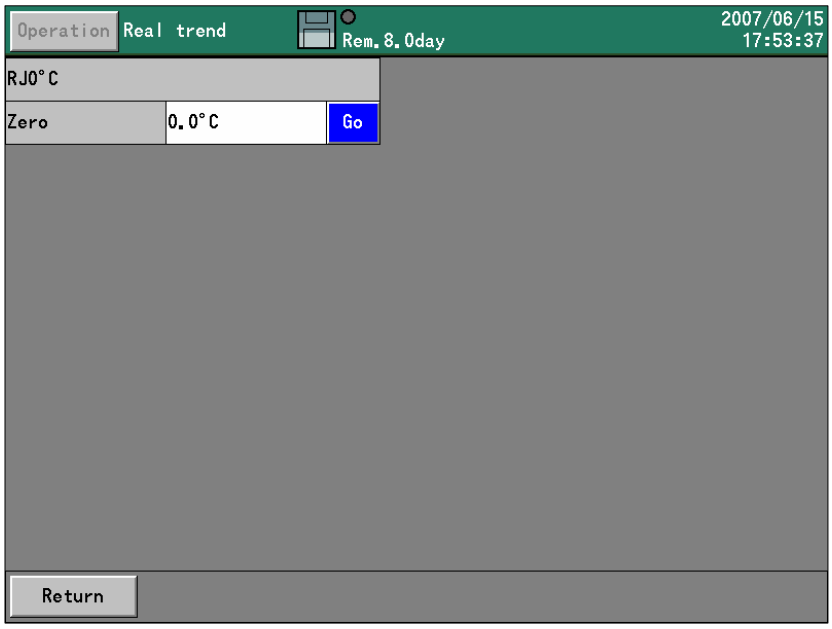
(1) Before moving to the calibration screen, set the input of the 1st, 6th and 12th terminals to the followings.
(Refer to “13.2.1 Setting contents”.)

Range type	Thermocouple connected
Range	Set 1 for the decimal point position of the range setting value. Recommendation: Measuring range of which the reference range is ±13.8mV and the display resolution becomes 0.1°C (Refer to “21 Specifications ○Measuring Range, Accuracy Rating and Display Resolution”.)
RJ	Internal
Burn out	None

(2) Click the “Go” button at the range of RJ0°C on the calibration screen.



(3) After about 30 seconds passed, click the “Go” button.



(4) After the adjustment, the screen is returned to the calibration screen for all ranges.
(5) When the adjustments are completed, click the “Return” button to return to the setting menu screen.

Remarks

■ When the input to this recorder was wrong or some inconvenience occurred, try to execute the scale calibration again.
■ When the “CLR” button is clicked on the calibration screen, the adjustment data are cleared and returned to the default data set at the factory.

19 Recommended parts replacement interval

It is recommended to exchange parts periodically as preventive maintenance for using this recorder under good conditions for a long time

⚠Warning

For replacing parts, ask the service personnel authorized by CHINO. Otherwise, this instrument may not recover properly and also accident may occur.
Contact your local CHINO's sales agent to perform parts replacement.

19.1 Operating conditions

The reference of the parts exchange intervals is under the following standard conditions. The intervals become shorter if environmental conditions are worse than the standard conditions.

Items	Conditions
Temperature	20 to 25°C
Humidity	20 to 80%RH
Operation time	8 hours/day
Corrosive gas	Not existed

Items	Conditions
Others	1) A place without dust, moisture or oily smoke 2) A place without vibrations or shocks 3) A place where the operation is not adversely affected

19.2 Reference of parts exchange intervals

Part name	Reference of exchange	Remarks
Power supply unit	5 years	At the ambient temperature of 25°C
LCD	5 years	∗
Key	5 years	
Relay (For mechanical alarm output)	70,000 times	Resistance load (Less than the rated contact rating)
	20,000 times	Inductive load (Less than the rated contact rating)
Lithium battery	5 years	

∗ When the LCD reduces its brightness to half, exchange it. The reduction of brightness differs depending on the usage conditions.
The replacement interval can be extended by using the screen saver function or by setting the brightness control small.

20 Troubleshooting

Troubleshooting methods are shown by symptoms. Read corresponding symptom items.

1. Not working

Check	Causes and remedial measures
1) Check if power is supplied to power terminals	Turn ON the external source power supply.
2) Check if the power supply is as specified	Feed power supply as specified (100 to 240 VAC 50/60Hz).
3) Check if connections to power terminals are correct.	Connect the cable to power terminals (L, N) correctly.
4) POWER switch is not turned ON.	Turn ON the POWER switch.
5) Try turning OFF and ON the external source power supply.	

2. Abnormal measurement

Symptoms	Causes and remedial measures
1) Measured values unstable	●Check measuring terminals for looseness. ●Check if the input signal is unstable.
2) An error occurs	●Check if the input signal is correct. ●Check if extension wire is connected to input terminals. (Thermocouple input only) ●Check input value, if error found, perform calibration with reference to Adjustment (par. 16).
3) Influences by ambient temperature (Thermocouple input only)	●Check if the terminal cover is mounted

When problem cannot be solved

If problem cannot be solved by performing the troubleshooting, contact your sales agent or CHINO with information of
1. Model, 2. Serial No., 3. Description of problem, 4. Other notes.
When repair of the instrument is needed, understand the following before having it repaired.
The data of internal memory may be deleted during repairing for unexpected trouble. Backup the data to the CF card before having the instrument repaired. We are not responsible for the lost or damaged data.

21 Specifications

■ General specifications

Rated power voltage: 100-240 VAC, 50/60 Hz
(Universal power supply)

Power consumption: 65VA MAX

Operating conditions:
・Reference operating condition
… Ambient temperature/humidity range
21 to 25ºC 45 to 65%RH
Power voltage 100VAC ±1%
Power frequency 50/60Hz ± 0.5%
Attitude Left/Right 0° Forward tilting 0° Backward tilting 0°
Warm-up time: 30 minutes or more
・Normal operating condition
… Ambient temperature/humidity range
0 to 50ºC, 20 to 80%RH
Power voltage 90 to 264VAC
Power frequency 50/60Hz ± 2%
Attitude Left/right 0° Forward tilting 0°
Backward tilting 0 to 20°
・Transportation condition,
… In the packed condition for shipment from the factory
Ambient temperature/humidity range
-20 to +60ºC, 5 to 90%RH (no dew condensation)
Vibrations 10 to 60Hz, 0.5G or less
Impact 40G or less
・Storage condition,
… Ambient temperature/humidity range
-20 to 60ºC, 5 to 90% RH (no dew condensation)

Power failure protection:
Settings are stored by FLASH memory and SRAM.
Data are stored by FLASH memory.
RAM for clock and parameters are backed up by a lithium battery for more than 5 years. (Provided that the daily operating hours is 8 hours or more)

Insulation resistance:
Between secondary and protective conductor terminals
…… More than 20MΩ at 500VDC
Between primary and protective conductor terminals
…… More than 20MΩ at 500VDC
Between primary and secondary terminals
…… More than 20MΩ at 500VDC
Between alarm output (mechanical relay) and other secondary terminals
…… More than 20MΩ at 500VDC

Dielectric strength:
Between secondary and protective conductor terminals
…… 1 minute at 500VAC
Between primary and protective conductor terminals
…… 1 minute at 1500VAC
Between primary and secondary terminals
…… 1 minute at 2300VAC
**Primary terminals: Power terminals, alarm output terminals
Secondary terminals: Input terminals, digital input terminals, communication terminals

Case assembly material: Door flame……ABS resin
Case and power supply part…… Steel
Color: Door frame…… Black (Equivalent to Munsell N3.0),
Case……Gray (Equivalent to Munsell N7.0)
Weight: Approx. 7.2kg (48 points input with full options)
Mounting: Panel mounting
Clock accuracy: ±2 minutes per 30 days (excluding errors due to power ON/OFF under the reference operating conditions.)

Terminal screws: Power terminal……M4.0
Protective conductor terminal……M4.0
Input terminals……M3.5
Alarm output terminals……M3.5
Digital input terminal……M3.5
Communication terminals……M4.0

■ Standards

CE marking: *Only the CE corresponding model applies.
EMC directive EN61326-1 Class A
EN61000-3-2
EN61000-3-3
Low voltage directive EN61010-1
・Overvoltage(Installation) category Ⅱ
・Pollution degree2
・Measurement category Ⅱ
IP: IEC529 IP54 (front part) compliance
*The indication equivalent to 1mV may vary under the test environment by EMC directives.

■ Input specifications

Measuring points: 12 points, 24 points, 36 points, 48 points
Input types: Universal input
DC voltage… ±13.8mV, ±27.6mV, ±69.0mV, ±200mV, ±500mV, ±2V, ±5V*, ±10V*, ±20V*, ±50V*
(* With built-in voltage dividing resistors)
DC current… Available by adding shunt resistors externally
T/C… B, R, S, K, E, J, T, N, NiMo-Ni, CR-AuFe, PtRh40-PtRh20, WRe5-WRe26, W-WRe26, Platinel II, U, L
RTD… Pt100, JPt100, Pt50, Pt-Co

Range setup: Setting of input types and ranges by key operation
The measuring range is selected automatically according to the setting range.

Scale setup: Setting of minimum values, maximum values and engineering units by key operation

Accuracy rating: Refer to the table of measurement range/ accuracy rating/display resolution.

Temperature drift: ±0.01% of full scale/°C [Other input types than the resistance thermometer inputs are converted into the reference range (Refer to the accuracy rating table.).]

Sampling rate: KR31□0… About 100ms/48 points
KR31□1… About 1 second/48 points
Reference junction (RJ) compensation accuracy:
K, E, J, T, N, Platinel II … ±0.5ºC or less
R, S, NiMo-Ni, CR-AuFe, WRe5-WRe26, W-WRe26, U, L … ±1.0ºC or less
(The above errors are added to the accuracy ratings for the internal reference junction compensation)

Input resolution: Approx. 1/32,000 (converted into reference range)

Burnout: Input signal disconnection detection for thermocouple and resistance thermometer inputs. Up-scale burnout, down-scale burnout or burnout disabled can be selected for each input.

Allowable signal source resistance:
Thermocouple inputs (burnout disabled), DC voltage inputs (±2V or less) .... 1KΩ or less
DC voltage inputs (±5 to 50V) ... 100Ω or less
Resistance thermometer inputs (Pt100, JPt100)
… Less than10Ω per wire -- common to 3 wires

Input resistance:
Thermocouple input……Approx. 1MΩ
DC voltage input…… ±2V or less: Approx. 1MΩ
±5V to ±50V: Approx. 1MΩ
Maximum input voltage:
Thermocouple inputs (burnout disabled),
DC voltage inputs (±2V or less) Maximum ±10VDC
DC voltage inputs (±5 to ±50V) Maximum ±60VDC
Thermocouple inputs (burnout enabled),
Resistance thermometer inputs Maximum ±6VDC
Maximum common mode voltage: 30VAC
Dielectric strength between channels:
1000V AC or more between each channel
High strength semiconductor relay used
(B terminal of resistance thermometer is shorted inside between channels)
Common mode rejection ratio: 120dB or more (50 or 60Hz)
Series mode rejection ratio: 50dB or more (50 or 60Hz)
However, the peak value of the noise including signal should be equal to or less than 1.5 times the reference range.

■ Recording specifications

Internal memory: 8MB

Recording cycle:

Second	0.1, 0.2, 0.5, 1, 2, 3, 5, 10, 15, 20, 30 sec
Minute	1, 2, 3, 5, 10, 15, 20, 30, 60 min

Recording data:
Measured data (Simultaneous storage: Max. 6 files)
・Measured data …Group name, recording start date/time, recording cycle, measured data, alarm data, maker text
・Setting parameters … All parameters

Recording measured data: 4-byte binary/1 data
(For recording maximum and minimum values - 6 byte/1 data)
Recoding into internal memory:
* The following conditions can be selected by key settings.
・Key operations
・Trigger signals (alarm activation)
・Start/end by day and time
* Pre-triggering is available in the key operations and trigger signals.
Pre-triggering measurement count =950 data
* Storage channel and recording cycle are set for each file.
Memory usage display:
The amount of memory used in each file is displayed on the operation screen by the icon.

External memory: CF card or USB flash memory
(FAT16, FAT32 formatted)
CF card : Recommend…made of Apacer Technology
made of TDK
USB flash memory…Operation of all USB flash memories is not guaranteed.

■ Display specifications

Display: 12.1-inch TFT color LCD (800 x 600 dots)

Trend display colors: 48 colors (selectable)

Operation screens:
Screens are switched with tapping, the DISP key, Left/right/up/down arrow key, or the ENTER key.
Screens of 6 groups can be switched except for the alarm summary screen (max. 56 channels/1 group).
・Trend screens…One of the real-time trend, historical trend or dual trend displays can be selected. (Scale plate and pointer displays) vertical or horizontal orientation is selectable. Data display enabled or disabled is selectable. Scrolling is available.
・Bar graph screen…Data display enabled or disabled is selectable.
・Data screen… (Data + Tag + Engineering unit + Alarm activation status)
・Alarm summary screen… Current alarm output status + alarm log (Channel, level, alarm activation/ cancellation time)

Skip function: On the trend and data screens, the channels to be skipped in display can be set for each group.

Scroll function: On the historical trend screens, previous data can be referred with the cursor operation.
・Historical trends…Entire memory file area
・Dual Trend…Historical trends are only available.

Replay function (historical trend): Historical data is displayed by specifying a file.
* Replay by the scroll function or by time specified
* Replay from the CF card or the USB memory is enabled.

Data search (historical trend):
Historical trend display by selecting from the alarm display or the marker list

Marker display: Markers can be displayed on the trends record by the key operation or by digital input, and stored in the measured data file. Display and storage on the historical trends are enabled.
＊ Pre-registration of marker text is enabled.
(Maximum 50 texts, maximum 30 characters/text)

Display updating interval: Same as storing interval
LCD saver: When no key is operated for the specified period of time, the backlight goes off. The period can be set from 1-60 minutes.

■ Setting/operation specifications

Operation method: Touch panel operation or exclusive keys operation
Key: 14 keys

START STOP SCROLL
CURSOR MARKER DISP
HOME MENU ESC ENTER

Direction key: right, left, up, down

Touch panel specifications
Type: Analog resistive-film type
Chemical resistance: Toluene, trichloroethylene, acetone, alcohol, gasoline, machine oil, ammonium water, glass cleaner, mayonnaise, ketchup, wine, salad oil, vinegar, lipstick, etc.

■ Alarm specifications

Number of alarms: Up to 4 alarms/channel

Alarm types: High limit, low limit, differential high limit and differential low limit
Alarm memory: Alarm activation/cancellation time and alarm types are stored.
＊ Storage of latest 200 data for all channels

Alarm output (Option): 24 points

○ Measurement ranges, Accuracy ratings and Display resolutions

Note) The accuracy is under the reference operation condition. For the thermocouple inputs (internal RJ), the reference junction compensation accuracy is not included.

Input type		Measurement range	Reference range	Accuracy rating	Display resolution
Thermocouple	K	-200.0 to 300.0 °C	±13.8 mV	±0.1% ±1digit	0.1 °C
		-200.0 to 600.0 °C	±27.6 mV		0.1 °C
		-200 to 1370 °C	±69.0 mV		1 °C
	E	-200.0 to 200.0 °C	±13.8 mV		0.1 °C
		-200.0 to 350.0 °C	±27.6 mV		0.1 °C
		-200 to 900 °C	±69.0 mV		1 °C
	J	-200.0 to 250.0 °C	±13.8 mV		0.1 °C
		-200.0 to 500.0 °C	±27.6 mV		0.1 °C
		-200 to 1200 °C	±69.0 mV		1 °C
	T	-200.0 to 250.0 °C	±13.8 mV		0.1 °C
		-200.0 to 400.0 °C	±27.6 mV		0.1 °C
	R	0 to 1200 °C	±13.8 mV		1 °C
		0 to 1760 °C	±27.6 mV		1 °C
	S	0 to 1300 °C	±13.8 mV		1 °C
		0 to 1760 °C	±27.6 mV		1 °C
	B	0 to 1820 °C	±13.8 mV		1 °C
	N	-200.0 to 400.0 °C	±13.8 mV	±0.15% ±1digit	0.1 °C
		-200.0 to 750.0 °C	±27.6 mV		0.1 °C
		-200 to 1300 °C	±69.0 mV		1 °C
	W-WRe26	0 to 2315 °C	±69.0 mV		1 °C
	WRe5-Wre26	0 to 2315 °C	±69.0 mV	±0.2% ±1digit	1 °C
	PtRh40-PtRh20	0 to 1888 °C	±13.8 mV		1 °C
	NiMo-Ni	-50.0 to 290.0 °C	±13.8 mV		0.1 °C
		-50.0 to 600.0 °C	±27.6 mV		0.1 °C
		-50 to 1310 °C	±69.0 mV		1 °C
	CR-AuFe	0.0 to 280.0 °C	±13.8 mV		0.1 °C
	Platinel II	0.0 to 350.0 °C	±13.8 mV	±0.15% ±1digit	0.1 °C
		0.0 to 650.0 °C	±27.6 mV		0.1 °C
		0 to 1395 °C	±69.0 mV		1 °C
	U	-200.0 to 250.0 °C	±13.8 mV		0.1 °C
		-200.0 to 500.0 °C	±27.6 mV		0.1 °C
		-200.0 to 600.0 °C	±69.0 mV		0.1 °C
	L	-200.0 to 250.0 °C	±13.8 mV	±0.1% ±1digit	0.1 °C
		-200.0 to 500.0 °C	±27.6 mV		0.1 °C
		-200 to 900 °C	±69.0 mV		1 °C

K, E, J, T, R. S. B, N: IEC584, JIS C1602-1995
U (Cu-CuNi), L (Fe-CuNi): DIN43710
W-Wre26, Wre5-Wre26, PtRh40-PtRh20,
NiMo-Ni, CR-AuFe, Platinel II: ASTM

Input type		Measuring range	Reference range	Accuracy rating	Display resolution
DC Voltage		-13.80 to 13.80 mV	±13.8 mV	±0.1% ±1digit	10 µV
		-27.60 to 27.60 mV	±27.6 mV		10 µV
		-69.00 to 69.00 mV	±69.0 mV		10 µV
		-200.0 to 200.0 mV	±200.0 mV		100 µV
		-500.0 to 500.0 mV	±500.0 mV		100 µV
		-2.000 to 2.000 V	±2 V		1 mV
		-5.000 to 5.000 V	±5 V		1 mV
		-10.00 to 10.00 V	±10 V		10 mV
		-20.00 to 20.00 V	±20 V		10 mV
		-50.00 to 50.00 V	±50 V		10 mV
Resistance thermometer	Pt100	-140.0 to 150.0 °C	160 Ω	±0.15% ±1digit	0.1 °C
		-200.0 to 300.0 °C	220 Ω	±0.1% ±1digit	0.1 °C
		-200.0 to 850.0 °C	400 Ω		0.1 °C
	JPt 100	-140.0 to 150.0 °C	160 Ω	±0.15% ±1digit	0.1 °C
		-200.0 to 300.0 °C	220 Ω	±0.1% ±1digit	0.1 °C
		-200.0 to 649.0 °C	400 Ω		0.1 °C
	Pt50	-200.0 to 649.0 °C	220 Ω	±0.1% ±1digit	0.1 °C
	Pt-Co	4.0 to 374.0 K	220 Ω	±0.15% ±1digit	0.1 K

Pt100 : IEC751 (1995), JIS C1604-1997
JPt100 : JIS C1604-1981, JIS C1606-1989
Pt50 : JIS C1604-1981

○ Exception of accuracy rating

Input range	Measuring range	Accuracy rating
K, E, J, T, L	-200 to 0 °C	±0.2%±1digit
R, S	0 to 400 °C	±0.2%±1digit
B	0 to 400 °C	Not specified
	400 to 800 °C	±0.15%±1digit
N, U	-200 to 0 °C	±0.3%±1digit
W-WRe26	0 to 100 °C	±4%±1digit
	100 to 400 °C	±0.5%±1digit
PtRh20-PtRh5	0 to 100 °C	±4%±1digit
	100 to 400 °C	±0.5%±1digit
PtRh40-PtRh20	0 to 300 °C	±1.5%±1digit
	300 to 800 °C	±0.8%±1digit
CR-AuFe	0 to 20 K	±0.5%±1digit
	20 to 50 K	±0.3%±1digit
Pt100('97)	700 to 850 °C	±0.15%±1digit
Pt-Co	4 to 50 K	±0.3%±1digit

*The indication equivalent to 1mV may vary under the test environment by EMC directives.
*Only the CE corresponding model applies.

Appendix A. Report Application (Sample)

Remarks

This application is a sample application. Inquiries about usage and malfunction cannot be accepted. Please understand it before using.

Reports such as daily/monthly reports can be created by using the report application included in the CD attached. Installation operations on the PC are required for using this application. Moreover, Excel (97 or later) should be installed.
In this software, the editing is executed on the data acquired by this recorder and imported to a PC. CSV formatted file can be used for the data.

A-1 Operation environment

OS	Windows98, Me Windows2000, XP
CPU	Pentium300MHz or higher
Memory	64MB or more
Others	Excel 97 (Microsoft) or later

A-2 Installation method

Insert the attached CDROM in the CD drive of the PC in which the report application is to be used, and run the “setup.exe” in the “report (English)” folder. Follow the instructions on the screen to install this application.

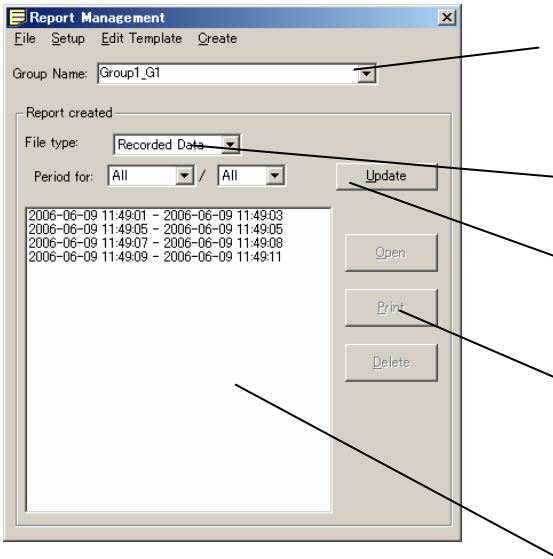
A-3 Uninstallation method

Open “Add/Remove programs (or Add/Remove applications depending on the OS)” from the control panel and remove the report application.

A-4 Operation method

A-4-1 Main screen

When the application is started, the basic screen is displayed. Perform various operations based on this screen.



Select the group to be operated. The group names, based on the data of the stored data folder specified by the “Setup”, are registered in the list. Enter the group name with the keyboard when there is no group to be selected.

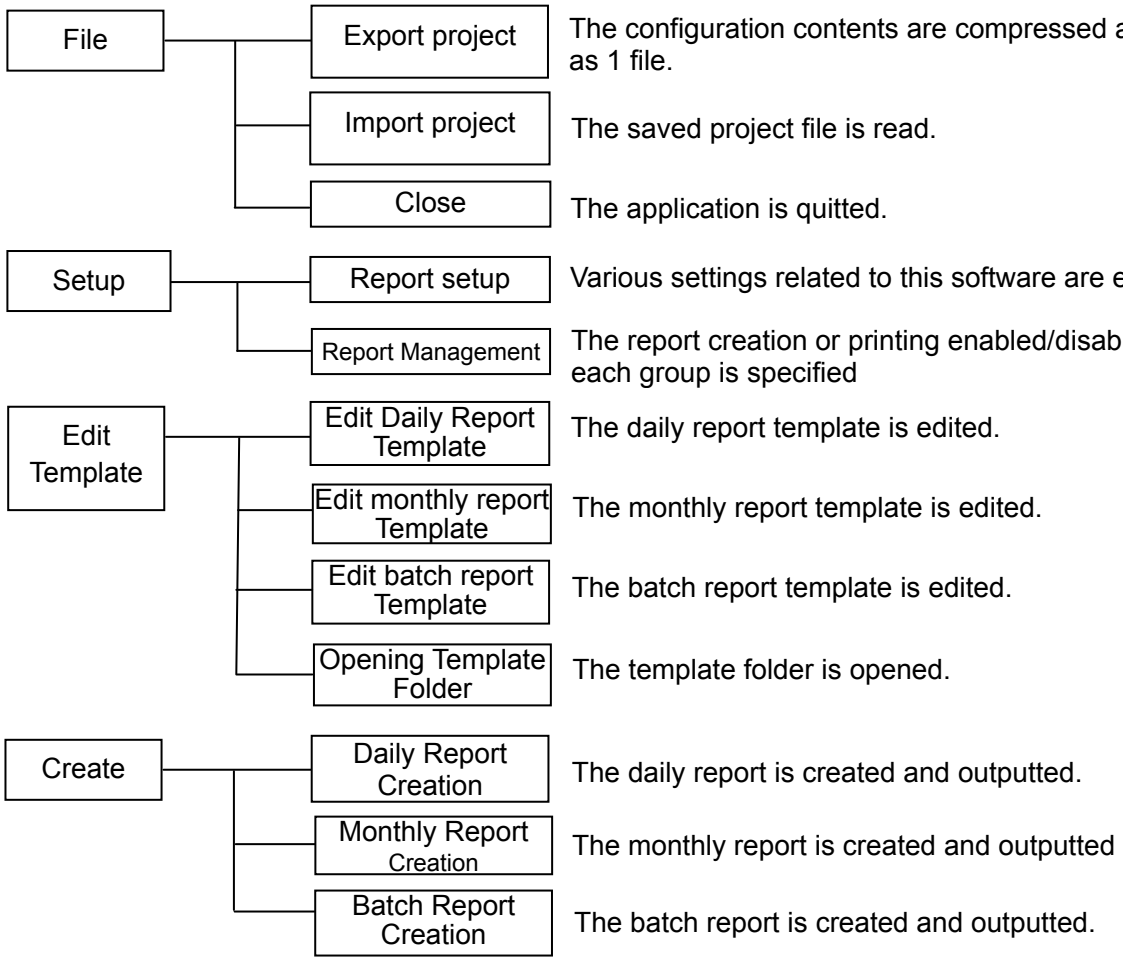
The created report file with the conditions specified here is displayed in the list box below.

Update the contents from the following list box to the latest status.

Operations such as “Open” “Print” “Delete” can be executed for the file selected in the list box in the left.

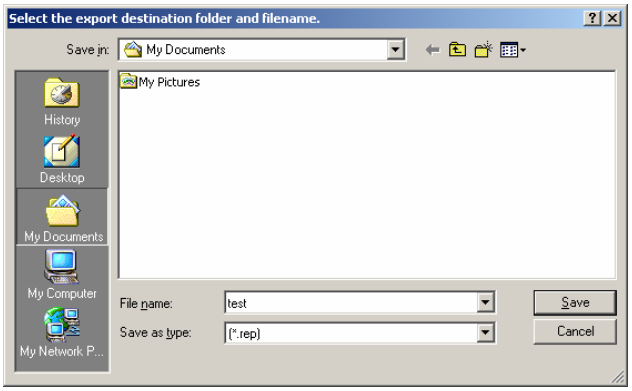
The data and time of the report files, in the folder designated, matching with the conditions specified in the above combo box, is displayed in list.

A-4-2 Menu structure

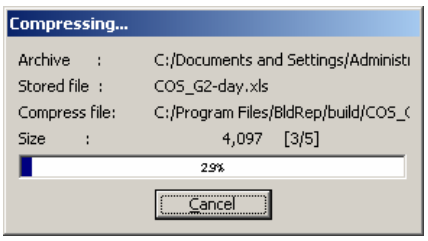


A-4-3 Exporting Project

Specify the save destination and the file name.

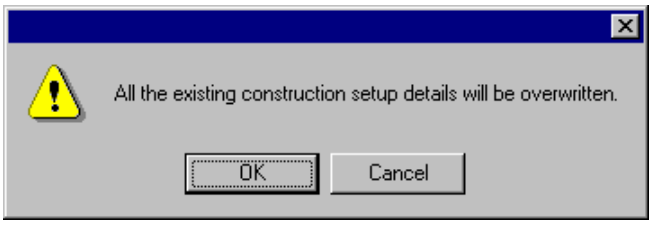


The compressed saving is executed and the file is created.

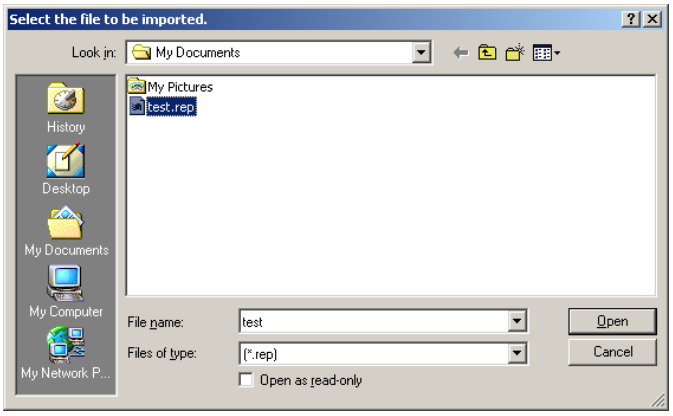


A-4-4 Importing project

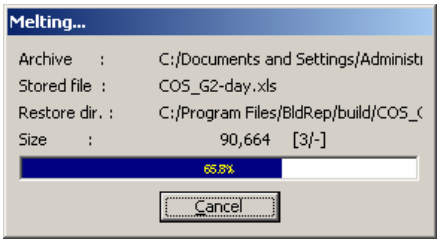
① Confirmation dialog box for overwriting the configuration is displayed. Click the “OK”.



② Select the file to be read.



③ Read the file.



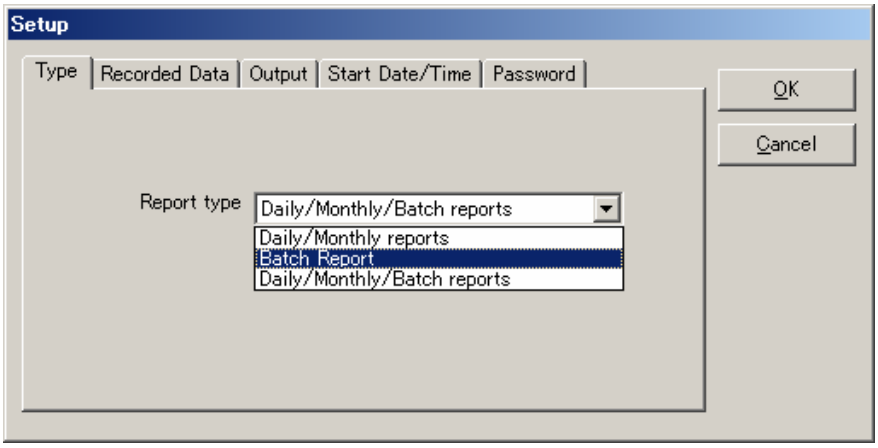
A-4-5 Report settings

The setting tables of the Type, Recorded Data, Output, Start Date/Time and password are displayed. The contents of each tab are described below.

(Type)

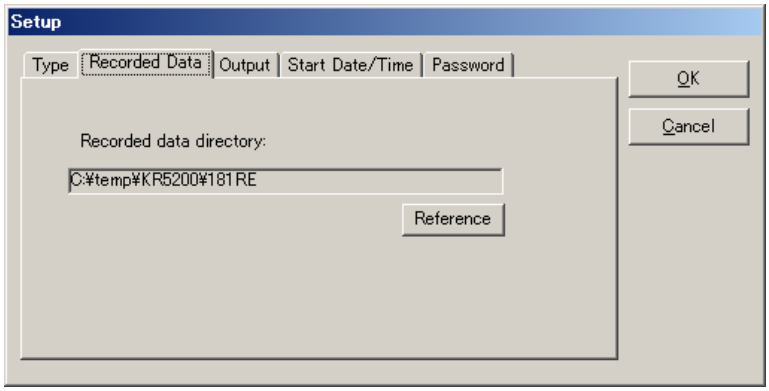
Select the report type to be used from the following 3 patterns.

- Daily report and Monthly report
- Batch report
- Daily report, Monthly report and Batch report

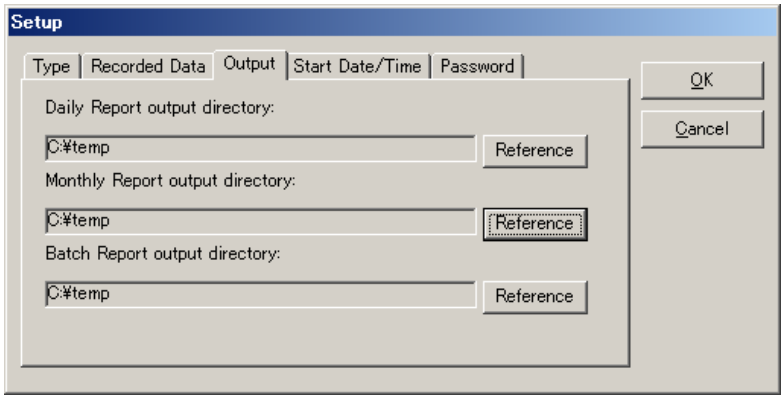


Daily report … The report is created by compiling the data stored in a day.
Monthly report … The report is created by compiling the data stored in a month.
Batch report …The report corresponding to the stored data file.

(Stored data)
Specify the folder in which the stored data is saved. For setting, use the folder selection screen by clicking “Reference”. Copy the file of this recorder to this directory, or specify the data saving directory of the CF card and insert the CF card when the report is created.
Only the CSV formatted file can be used for the stored data. Set the “Save format” to the “CSV” in the file settings of this recorder.



(Output)
Specify the output destination (save destination) of the report file. For setting, use the folder selection screen by clicking “Reference”. The required setting items are displayed by selection at the “Type” tab. The following figure is for the Daily/Monthly reports.

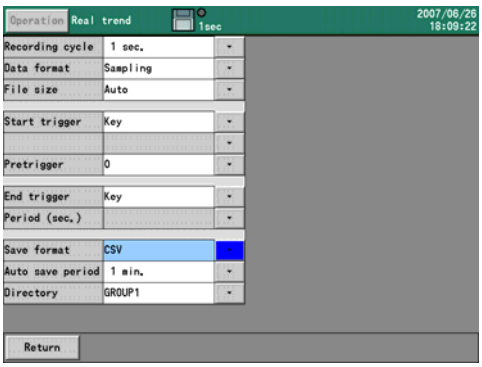


Settings of KR3000

Set KR3000 as shown below for using the report application.

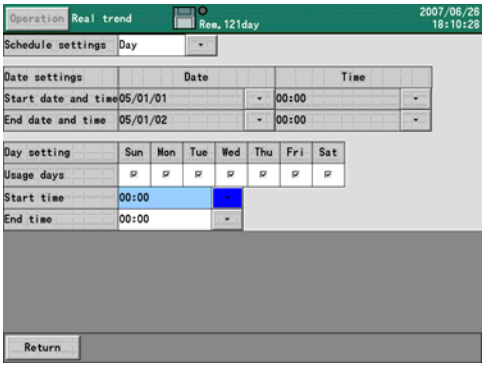
(1) File save format

Select the “CSV” for the file save format. This application cannot be used in case of Binary.



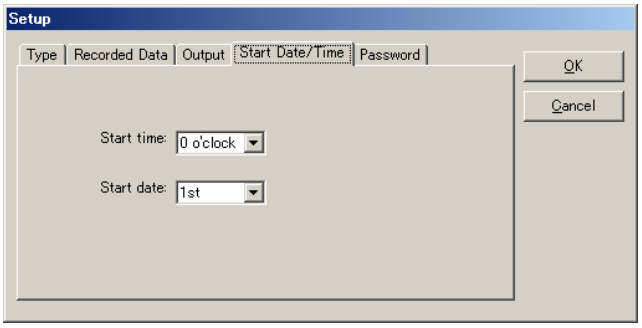
(2) Schedule settings

When using the daily report, it is convenient if the “Day” is selected with the KR3000 schedule settings, the required day is checked, and set the start and end time is set to the date change time of the daily report because the file is divided at that point.



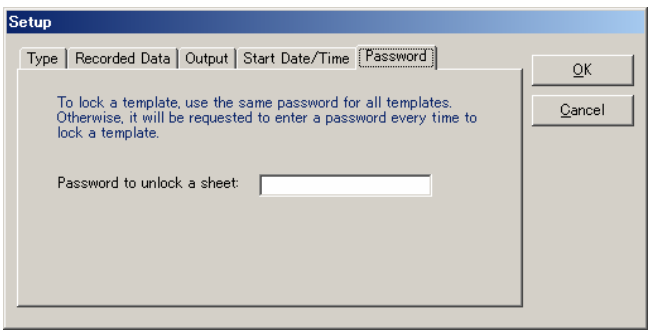
(Start Date/Time)

Set the starting time of a day for creating the daily report and the starting date in a month for creating the monthly report. With this settings, set the time range for data to be used for creating the daily report or the monthly report.



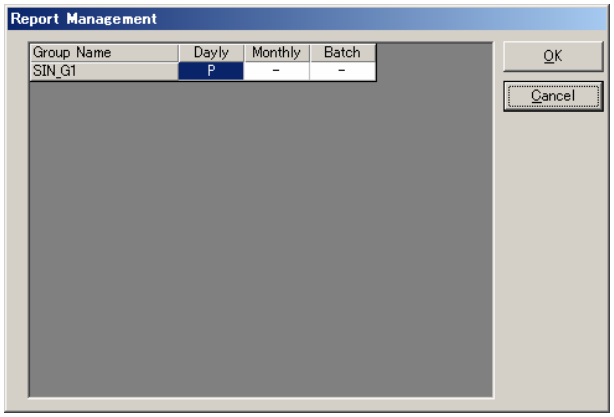
(Password)

Register the password for locking the report template with. Use the same password for all templates. When the template is locked, the report cannot be created if the password is not entered or a wrong password is entered.



A-4-6 Report Management

Specify whether each report is created for every group.
Each time each column is clicked, it changes from * → (Blank) → P. The "— " indicates that the template is not created. The report is not created if the template is not created.
The report marked with "✱" is created but the report marked with blank is not created. The report marked with "P" is created and then printed out.



A-4-7 Edit sheet

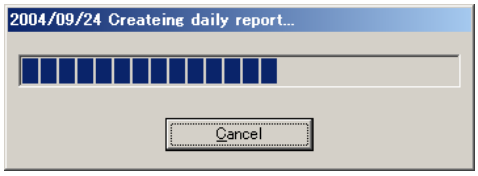
The template editing is described in A-5 Edit report template.

A-4-8 Create daily report

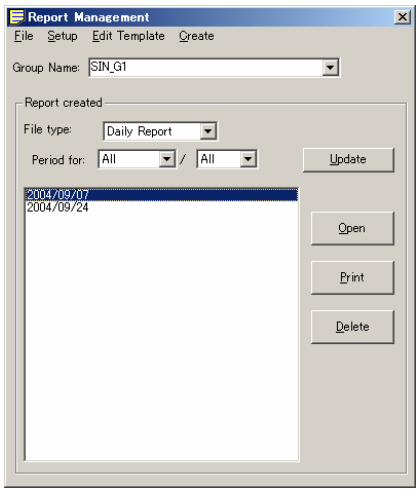
The daily reports of the groups marked with "✱" in the daily report column of the report management is created based on the contents in the daily report template.

1. Specify the period for creating the daily report. Select the start date and the end date.

2. The daily report is created after reading the stored data.



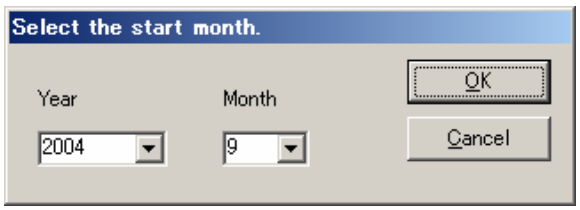
3. After the daily report is created, it is added to the list in the "Report created".

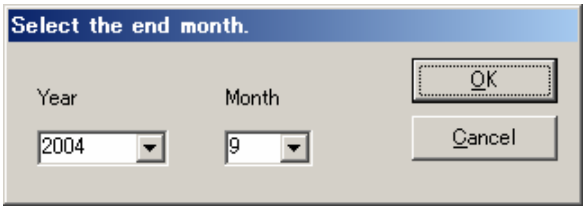


A-4-9 Monthly report creation

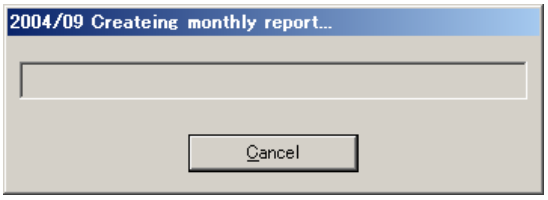
The monthly reports of the groups marked with "✱" in the monthly report column of the report management is created based on the contents in the monthly report template.

1. Specify the period for creating the monthly report. Select the start month and the end month.

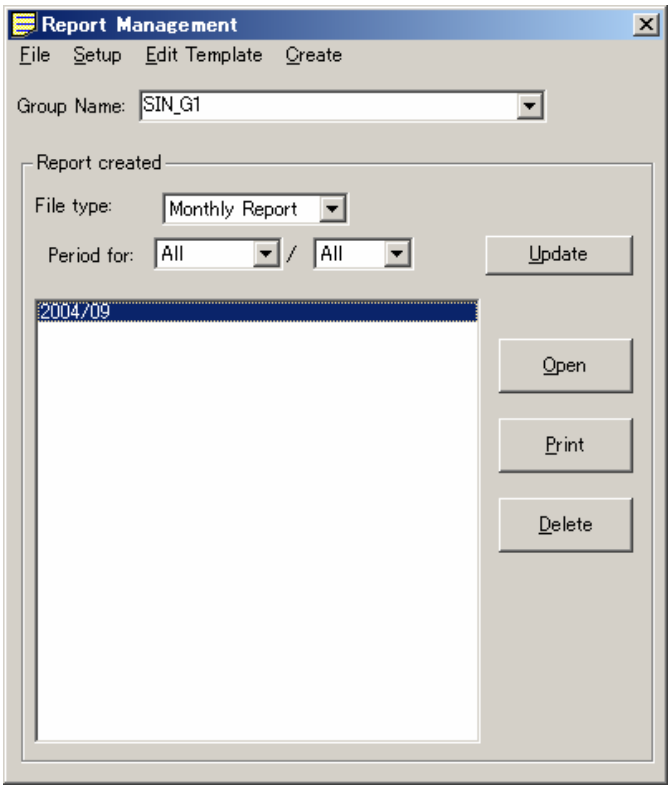




2. The monthly report is created after reading the daily report.

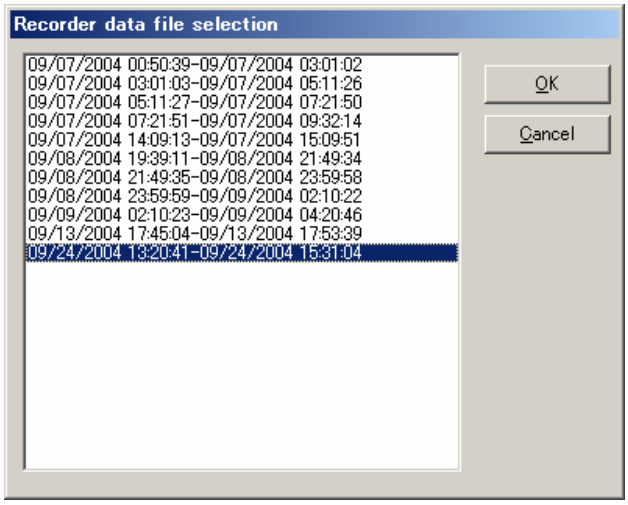


3. After the monthly report is created, it is added to the list in the "Report created".

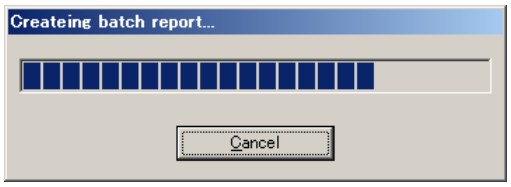


A-4-10 Create batch report

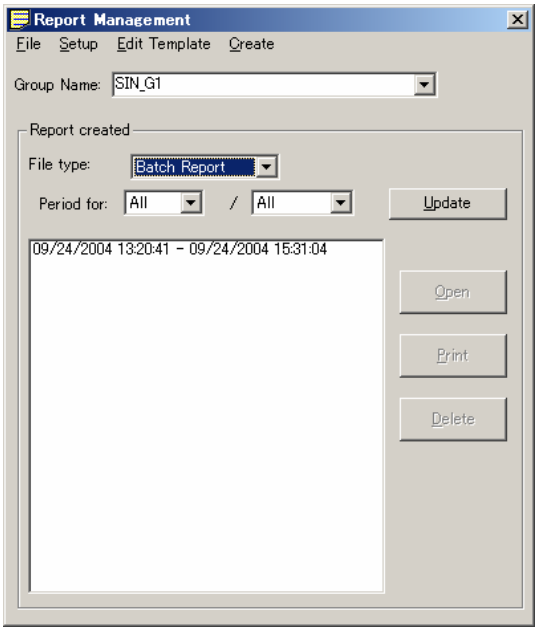
1. Select the stored data file for the report.



2. The batch report is created after reading the stored data.



3. After the batch report is created, it is added to the list in the “Report created”.



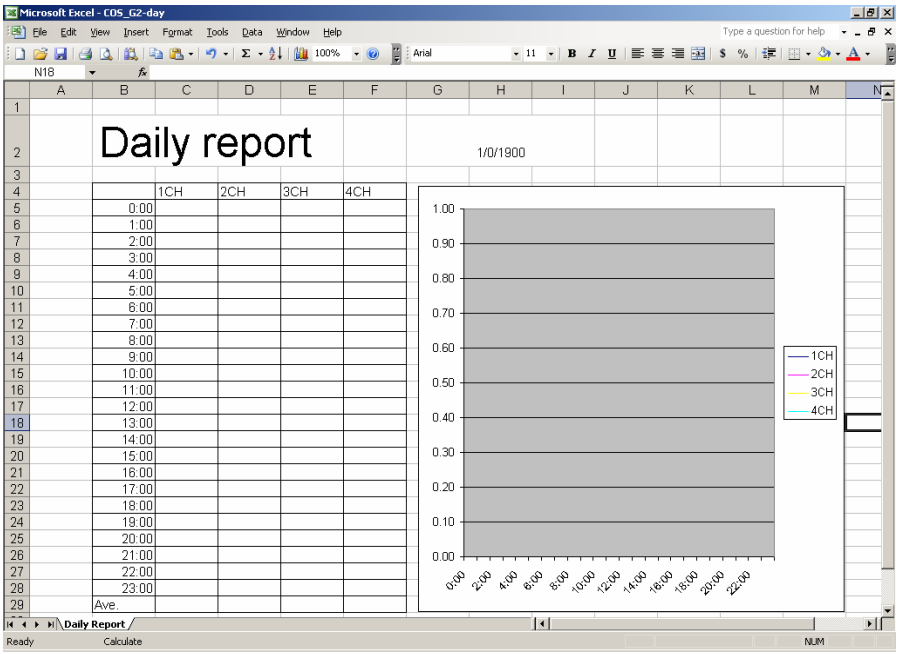
A-5 Edit Report Template

Each report is created on the respective template. On the template, create frame of table, fonts, formula indicating cell contents, fixed characters, printing-related-settings, etc. beforehand.

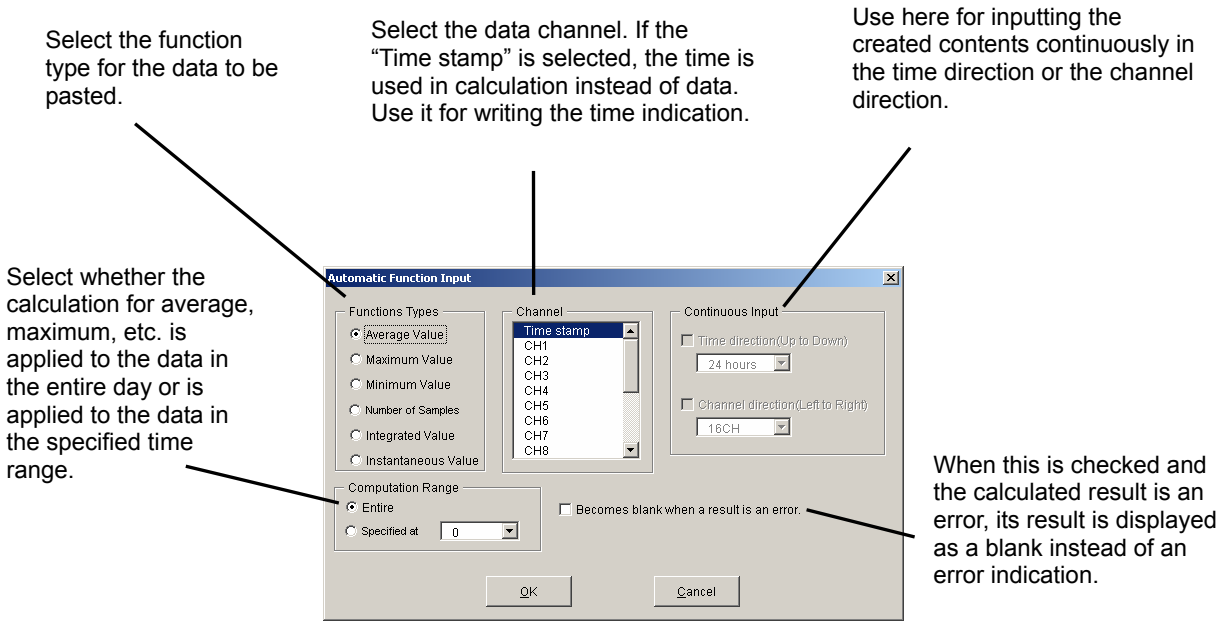
A-5-1 Edit daily report template

The contents created on the “daily report” sheet are outputted as the daily report.

1. Create frames, fixed characters, etc. for the daily report.



2. Open the input screen by double-clicking on the cell where the data is to be pasted.

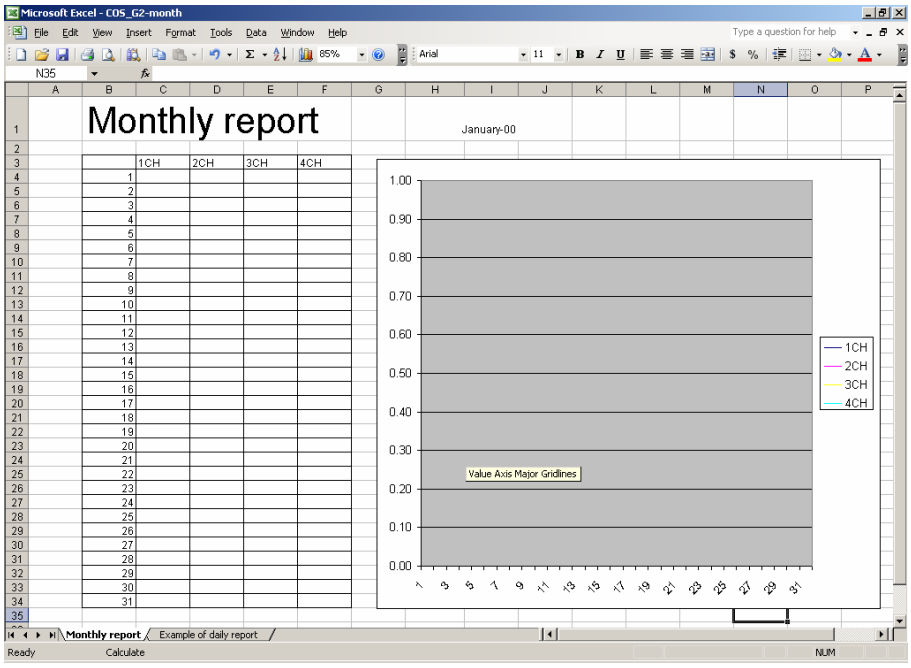


3. By clicking the “OK” after setting all items, the formula is written in the cell.
4. After the creation is complete, execute the overwrite-save of the file and quit.

A-5-2 Edit monthly report template

The contents created on the “monthly report” sheet are outputted as the monthly report.

1. Create frames, fixed characters, etc. for the monthly report.

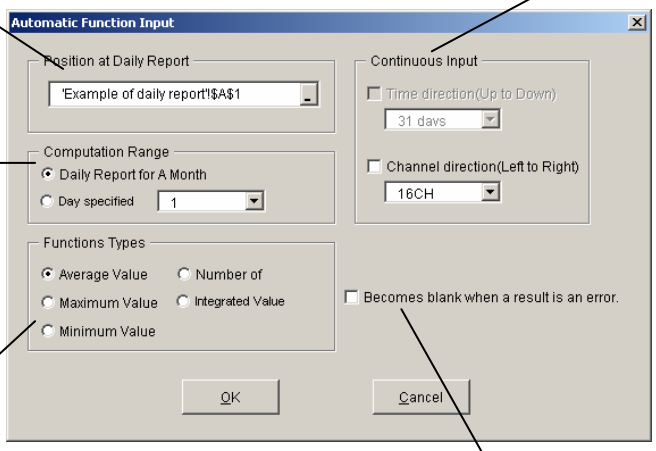


2. Open the input screen by double-clicking on the cell where the data is pasted.

Specify the position of the daily report data to be used. Since the daily report contents is displayed when the cursor is placed here, click on the desired cell.

Use here for inputting the created contents continuously in the time direction or the channel direction.

Select whether the calculation for average, maximum, etc. is applied to the data in the entire month or is applied to the data in the specified days. When the “Day specified” is selected, the function type is not selectable and the data in the specified position in the specified day are only used.



Select the function type for the data calculated.

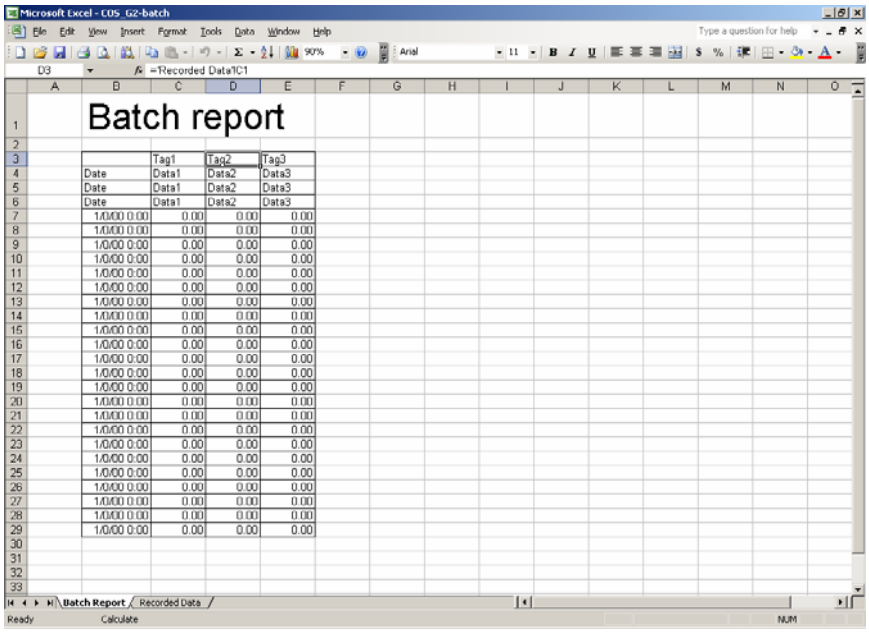
When this is checked and the calculated result is an error, its result is displayed as a blank instead of an error indication.

3. By clicking the “OK” after setting all items, the formula is written in the cell.
4. After the creation is complete, execute the overwrite-save of the file and quit.

A-5-3 Edit batch report sheet

The contents created on the “batch report” sheet are outputted as the batch report. The stored data file is pasted on the “stored data” sheet. Create the report on the “batch report” sheet based on the data on the “stored data” sheet. The automatic input of the functions is not available.

1. The edit screen is displayed. Create the report on the batch report sheet.



2. After the creation is complete, execute the overwrite-save of the file and quit.

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