CHINO

# Graphic Recorder KR2S/3S 【General】

# Instruction Manual

Thank you for purchasing the KR 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.

― 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.

CHINO

# PREFACE

Thank you for purchasing the KR 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.

## Product warranty scope

This product is warranted for one year from the date of delivery. If it is damaged during the warranty period, when used normally based on the cautions in the instruction manual labels attached to the product, etc., it will be repaired without any charge (only in Japan). In the case, we are sorry to trouble you, but please contact your dealer or nearest our sales office.
However, in cases of the followings, it will be repaired at your expense even during warranty period.

1. Failure or damage caused by improper use or connection, or invalid repair or modification.
2. Failure or damage caused by fire, earthquake, wind or flood, thunderbolt, or other extraordinary natural phenomena, or pollution, salt, harmful gas, abnormal voltage, or use of unspecified power.
3. Replacement of parts or accessories that have reached the end of their life.

Furthermore, the term 'warranty' in this sense covers only a CHINO's product itself. Therefore, we are not responsible for compensation for whatever the damage that is triggered by failure of our product.

## Important notes for users

1. No part of this manual can be reproduced or copied in any form without permission.
2. The contents of this manual may be altered without prior notice.
3. This manual has been documented by making assurance doubly sure.
   However, if any question arises or if any error, an omission, or other deficiencies are found, please contact your nearest CHINO's sales office.
4. CHINO is not responsible for any operation results of this software.

## Attention while unpacking

1. Do not drop the recorder while taking it out of the box.
2. 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.
3. 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.

# Disposal

■ 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 cooperates to recycle.

| Warning | · A small amount of hazardous substance below the specified level with RoHS directive is included in this recorder.<br>· When disposing the recorder always request a professional to do it or dispose it in accordance with local regulations.<br>· This recorder includes a lithium battery. When disposing the lithium battery, first remove the battery and always request a professional to do it. |
|---|---|

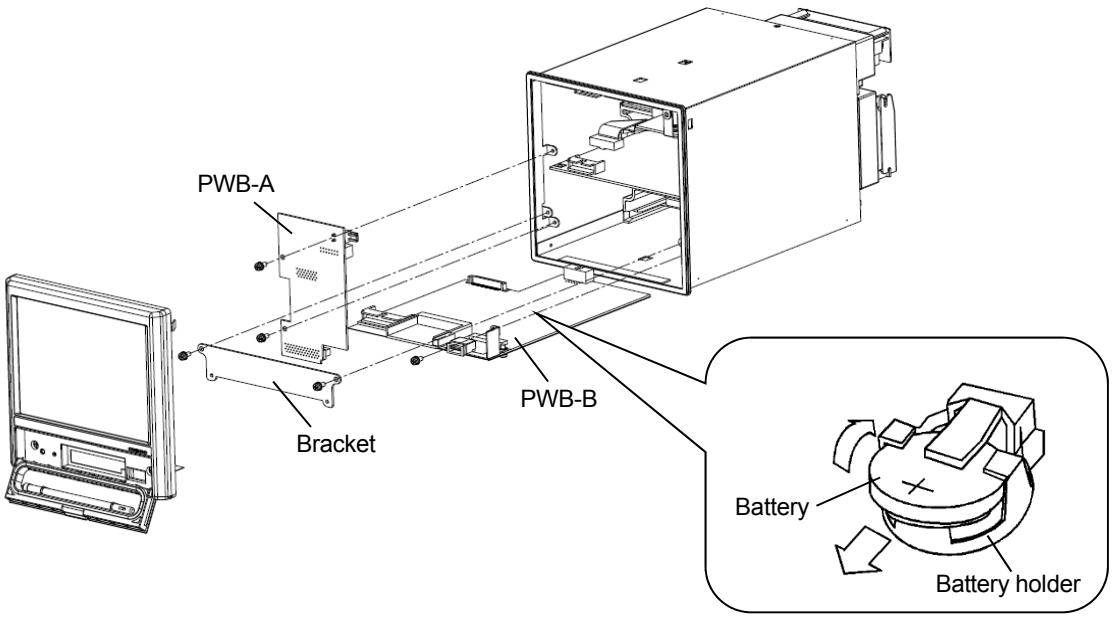
| Caution | Perchlorate Material<br>This instrument uses battery with Perchlorate Material.<br>Special handling may apply, see<br>http://www.dtsc.ca.gov/hazardouswaste/perchlorate |
|---|---|

■ 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.

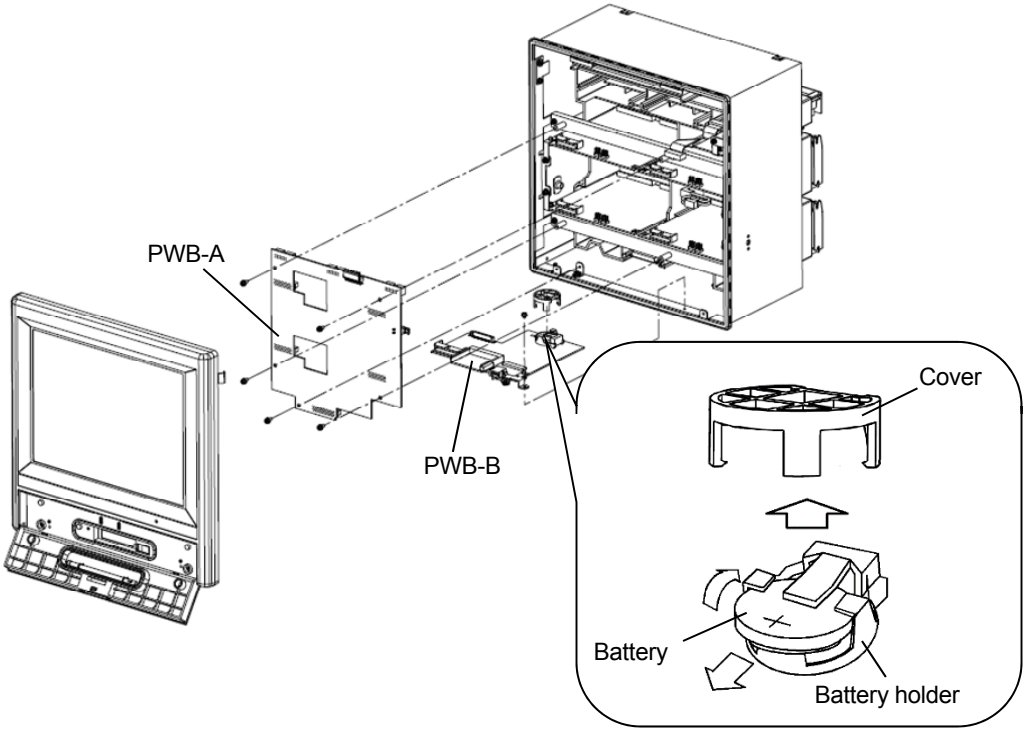
<KR2S>

(1) Open the 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-B by 1 type of cable. Disconnect it.
(4) Remove the 2 retaining screws holding Bracket and pull it out.
(5) Remove the 2 screws holding PWB-A, and pull it toward you.
(6) Remove the 1 screws holding PWB-B, and pulls it toward you.
(7) The battery holder is attached to the topside of PWB-B. Lift the front of the battery with a tool having a nonconductive tip and pull the battery out of the holder.



<KR3S>

(1) Open the 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-B by 1 type of cable. Disconnect it.
(4) Remove the 2 screws holding PWB-A, and pull it toward you.
(5) Remove the 1 screws holding PWB-B, and pulls it toward you.
(6) The battery holder is attached to the topside of PWB-B. The cover is fixed with 4 hooks along side, unhook them for removing the cover. Lift the front of the battery with a tool having a nonconductive tip and pull the battery out of the holder.




■ Disposal of this recorder

This section describes disposal method of this recorder subjected to the condition stated in Directive on Waste Electrical and Electronic Equipment (hereinafter referred to as WEEE) [2002/96/EC]. This directive is valid only in European Union.

● Marking

This recorder is governed and constructed by WEEE [2002/96/EC] marking requirement. Attached label indicates that this electrical and electric equipment must not dispose as general household waste.

● Product category

With the reference to the equipment types in WEEE [2002/96/EC] ANNEX I, this recorder is classified as a "Monitoring and control instruments". Do not dispose as general household waste.

When disposing discarded recorder, please contact local CHINO sales agent.

# Table of Contents

# 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. If this instrument is used other than description of this document, protection provided by the instrument may be vitiated. Please read the following information carefully and be sure to observe the warnings and cautions in it.

## 1-1 Preconditions for use

This instrument is a component type general product to be mounted on an indoor instrumentation panel. Do not use this instrument in different situations (except for portable type).
Before using this instrument, ensure the system safety by taking appropriate measures such as fail-safe designing and periodic maintenance for the equipment to which this instrument is installed. Connection, adjustment or operation of this instrument should be performed by a professional engineer with knowledge of instrumentation.
Also, a person who handles this instrument should read this instruction manual to fully understand the cautions and basic operations.

## 1-2 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. |

## 1-3 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.** |

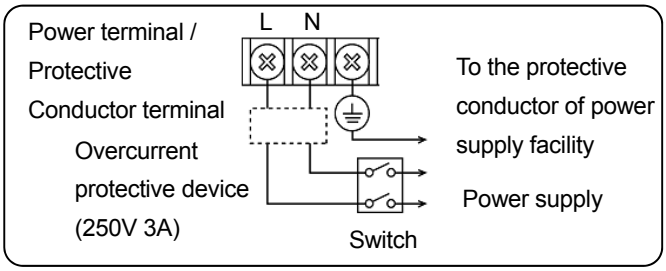
| | |
|---|---|
| Remarks | This symbol shows a caution when the instrument dose not function as specified or when such a possibility exists. |

| | |
|---|---|
| Reference | This reference servers as a supplement for handling and operation, and it may be convenient for the user. |

**⚠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.**

◆ 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.

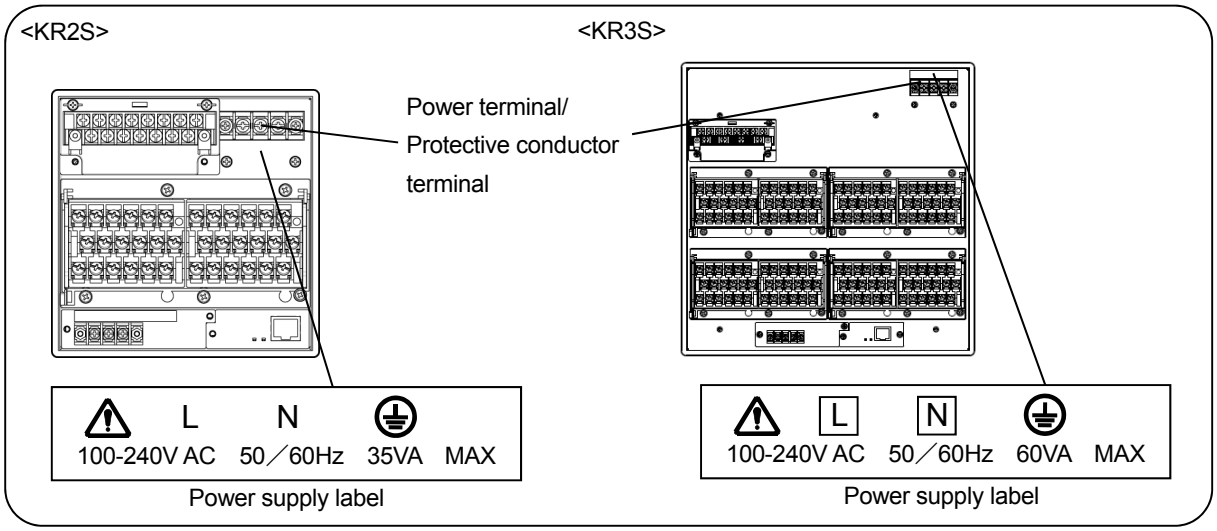



◆ Be sure to ground this instrument

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.

◆ 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.




◆ 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 and burn may occur by putting your hand and a tool in the internal unit. For ordinary operation, it is not necessary to pull out the internal unit.

◆ 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.

◆ Installing the safety device

Regarding the use of devices that anticipates a big loss due to failure of this instrument, always install a safety device for preventing these losses and implement fail safe design in the final instrumentation. Do not use this instrument in important in facilities related to, human life, atomic energy, aviation and space.

◆ 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.

| | |
|---|---|
| Remarks | ■ Fuse in the power supply<br>The following fuse is mounted in the power supply unit of this recorder for safety use.<br>However, this fuse is not replaceable<br><KR2S>Maker: Nippon Seisen Co., Ltd Model: SLT 250V 2.5A<br><KR3S>Maker: Littelfuse, Inc Model: 215 250V T3.15AH |

# 2 Before use

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

## 2-1 Exterior check

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

## 2-2 Model check

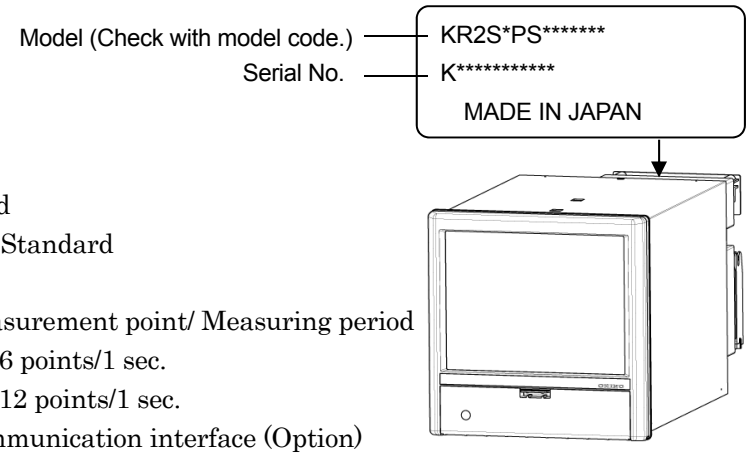
The model number and serial number of this recorder can be confirmed by the label on the upper side of the case.

Check the model of your instrument from the model code before use.

Model code

<KR2S>

KR2S□PS□□□□□□□




Kind
- S: Standard

Measurement point/ Measuring period
- 6: 6 points/1 sec.
- 2: 12 points/1 sec.

Communication interface (Option)
- G: Ethernet + low/high order communications (RS-485)
- E: Ethernet
- B: Ethernet + low order communications (RS-232C D-Sub9Pin) *1 *2
- N: None

Alarm output, Contact input (Option)
- 0: None
- 2: Mechanical relay output (4 points 'c' contact)
- 7: No-voltage contact input (4 points)
- 8: Mechanical relay output (2 points 'c' contact) + No-voltage contact input (2 points)

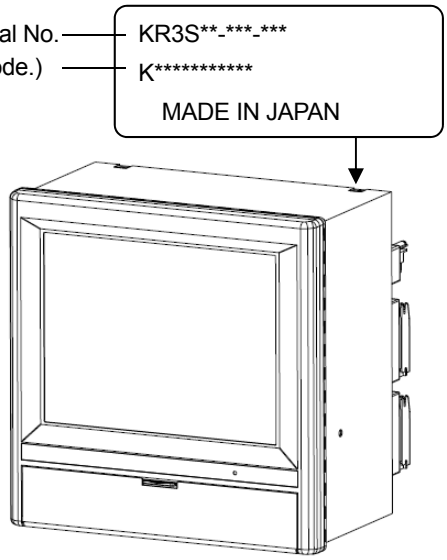
Installation type
- A: Panel mounting type
- T: Portable type (Grip and rubber feet attached) *2

Others (Option)
- NNN: None
- 1NN: Custom Graphic function
- 2NN: KT-M input *3 *5
- 3NN: Custom Graphic function + KT-M input *3 *5
- N1N: Barcode reader specifications (Barcode reader is sold separately) *2 *4
- N2N: Barcode recipe specifications (Barcode reader/ others are sold separately) *3
- NNP: Past profile replay

*1: Barcode reader specifications only.
*2: Not Comply with CE mark.
*3: Specification of communication interface (option) G can select this.
*4: Specification of communication interface (option) B can select this.
*5: When the first digit is 2 or 3, only N can be selected for the second digit.

<KR3S>

KR3S□□-□□□-□□□




Kind
S: Standard

Measurement point/ Measuring period
21: 12 points/1 sec.
41: 24 points/1 sec.
61: 36 points/1 sec.
81: 48 points/1 sec.

Communication interface (Option)
G: Ethernet + low/high order communications (RS-485)
E: Ethernet
B: Ethernet + low order communications (RS-232C D-Sub9Pin) *1 *2
N: None

Alarm output, Contact input (Option)
0: None
2: Mechanical relay output (4 points 'c' contact)
7: No-voltage contact input (4 points)
8: Mechanical relay output (2 points 'c' contact) + No-voltage contact input (2 points)

Installation type
A: Panel mounting type
T: Portable type (Grip and rubber feet attached) *2

Others (Option)
NNN: None
1NN: Custom Graphic function
2NN: KT-M input *3 *5
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N1N: Barcode reader specifications (Barcode reader is sold separately) *2 *4
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NNP: Past profile replay

*1: Barcode reader specifications only.
*2: Not Comply with CE mark.
*3: Specification of communication interface (option) G can select this.
*4: Specification of communication interface (option) B can select this.
*5: When the first digit is 2 or 3, only N can be selected for the second digit.

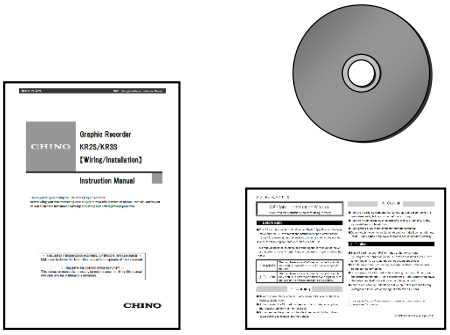
## 2-3 Checking attachments

Package contains the following attachments. Please confirm.

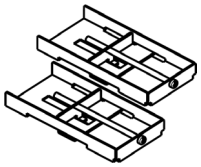
<KR2S>

| Parts name | Quantity | Remarks |
|---|---|---|
| Instruction manual | 1 | INE-881□(General) CD-ROM<br>INE-883□(Communication interface) |
| | 1 | KR3S-02-□(Wiring/Installation) A4 Booklet |
| | 1 | RZMC-01-□(CF card) |
| Mounting bracket | 2 | For panel mounting |
| Terminal screw | 5 | M3.5 for measuring input terminals (Spares for missing) |
| CF card | 1 | RZ-CMC256(256MB) |

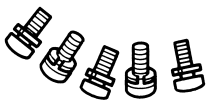
①Instruction manual




②Mounting bracket



③Terminal screws

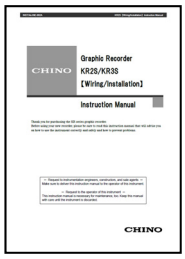


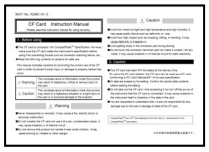
④CF card

<KR3S>

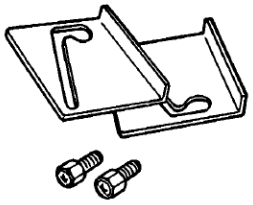
| Parts name | Quantity | Remarks |
|---|---|---|
| Instruction manual | 1 | INE-881□(General) CD-ROM<br>INE-883□(Communication interface) |
| | 1 | KR3S-02-□(Wiring/Installation) A4 Booklet |
| | 1 | RZMC-01-□(CF card) |
| Mounting bracket | 2 | For panel mounting |
| Wrench | 1 | |
| Terminal screw | 5 | M3.5 for measuring input terminals (Spares for missing) |
| CF card | 1 | RZ-CMC256(256MB) |

①Instruction manual



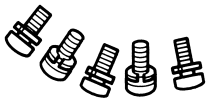



②Mounting bracket



③Wrench

④Terminal screws



⑤CF card

# 3 Installation

| Caution | Make sure to read and understand this instruction manual to prevent any accident. |
|---|---|

## 3-1 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)
- ●Pollution degree ..... 2 (EN standard)
- ●Altitude .....2000m or less
- ●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 and explosive gases exist.
- ●Avoid a place with dust, smoke, vapors, oil, chemical, corrosive gas, saline, iron, conducting substance (carbon and iron), etc.

### 4. Mounting angle

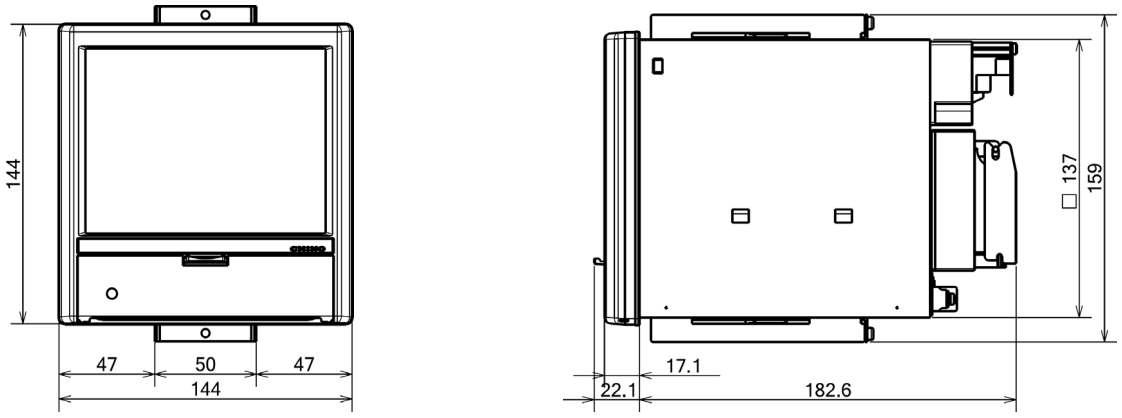
- ●Lateral tilting ……0°
- ●Longitudinal tilting ……Forward tilting: 0°, Backward tilting: 0-20°

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

## 3-2 External dimensions

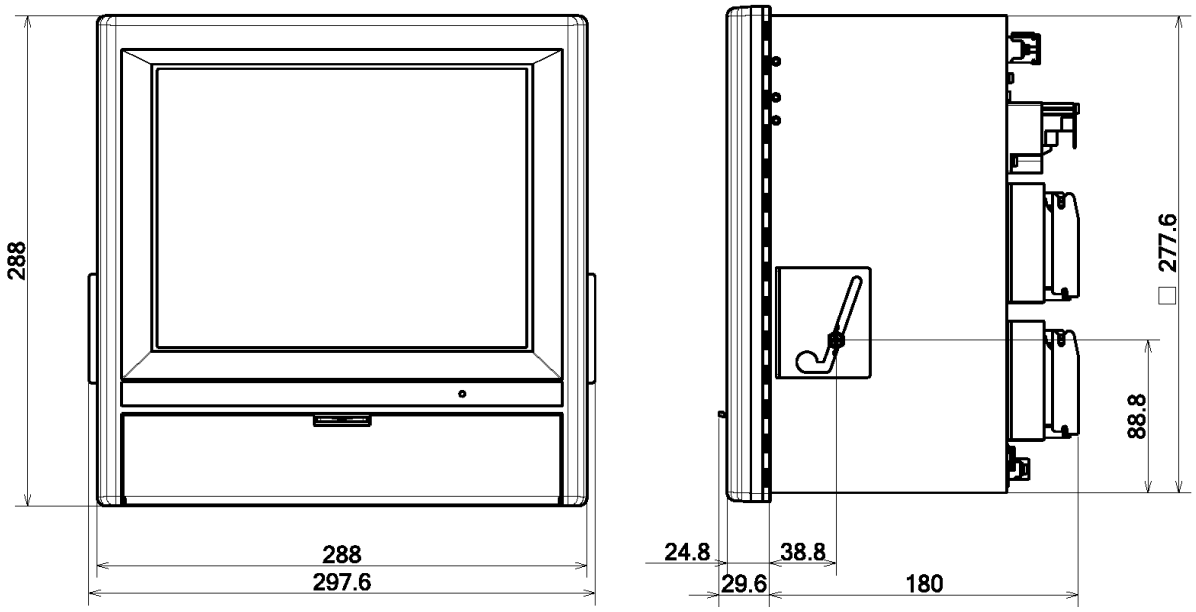
The following figure shows the dimensions of this recorder with its mounting brackets.

<KR2S>




Unit : mm

<KR3S>




Unit : mm

## 3-3 Method of mounting the panel

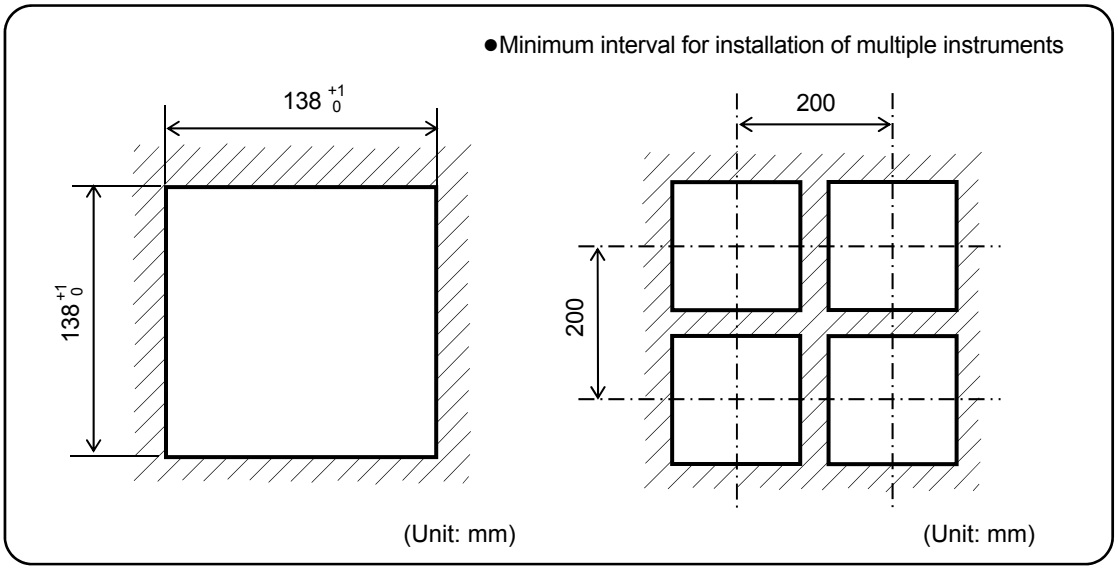
**Caution**

Mount on the panel and use

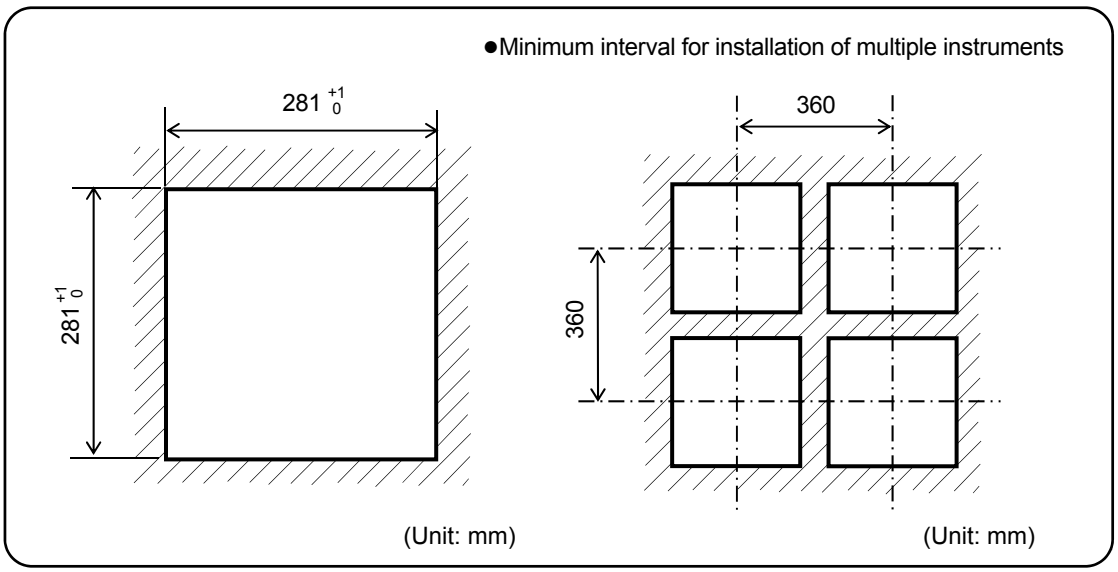
- This instrument has been designed to be mounted on an indoor instrumentation panel.
- Use a panel made of a steel plate of 2mm to 6mm in thickness or a panel equivalent in strength. Please consider the instrument's dimensions and its weight when you select the panel thickness along with the panel structure.
- When you attach this instrument to a panel, be careful of the injury by fall.

1. Panel cutout size

<KR2S>




<KR3S>



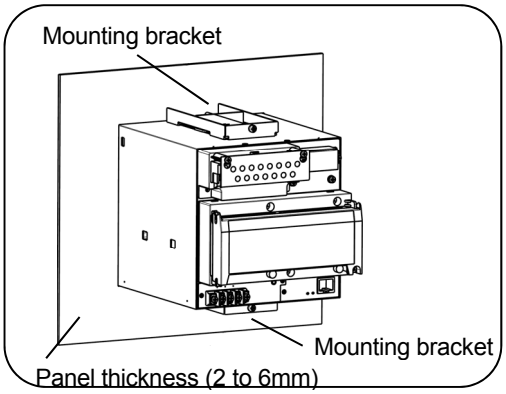
## 2. Mounting method

| Caution | Tightening torque<br>· If tightening more than recommended tightening torque, changing shape of the case and damage of brackets may occur. |
|---|---|

<KR2S>

(1) Insert this recorder into the panel cutout from the front of the panel.

(2) Insert the brackets into the holes of front side on the top and bottom surface (or right and left surface) of the instrument and fix the instrument to the panel by tightening the screws using a Philips head screwdriver. Recommended tightening torque of screw is 0.6 to 0.8 N・m (when using Philips-head screwdriver).

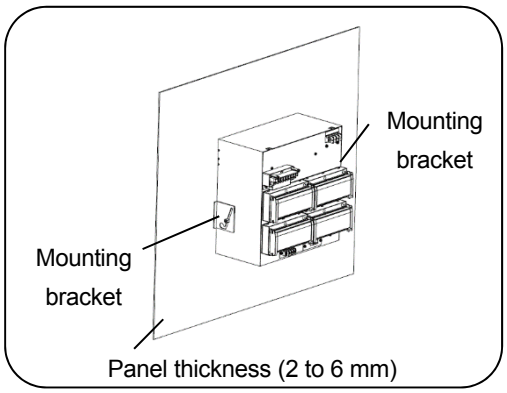



<KR3S>

(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 mounting bracket and push the recorder to the instrument panel firmly (from front) while making the mounting bracket slide as shown in the figure. On this condition, tighten the fixing screw with the attached wrench or a Phillips screwdriver.



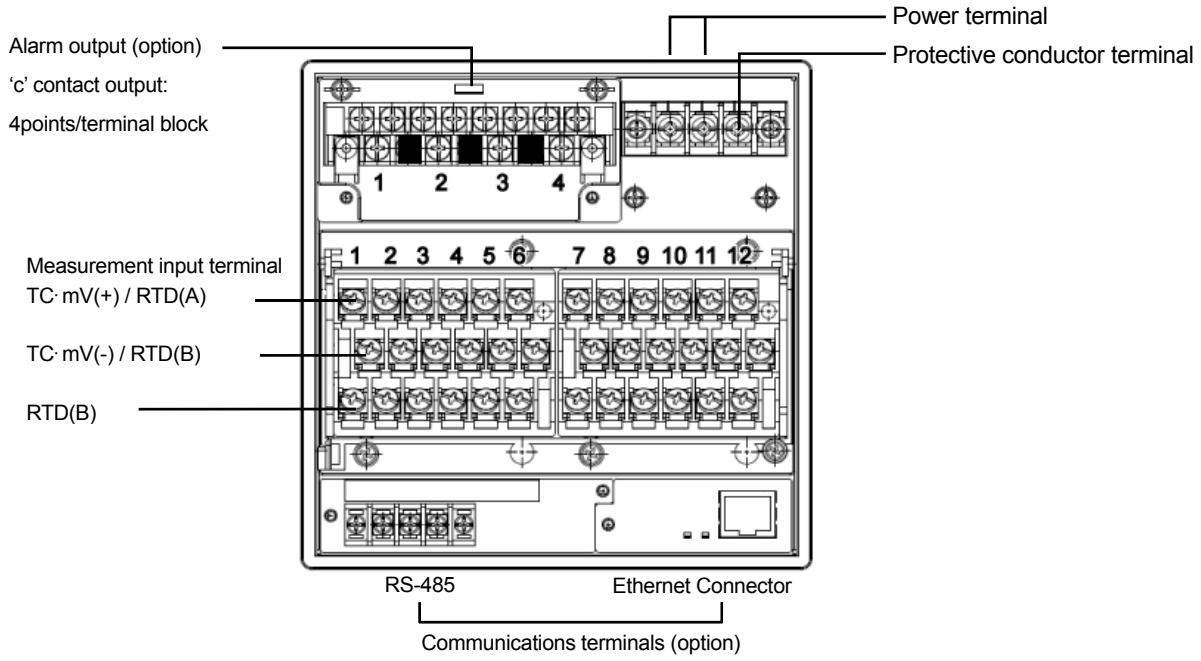

Note that the mounting brackets used at the right and left sides are different.
Recommended tightening torque of screw is 2.0 N・m (when using Philips-head screwdriver).
* Mounting work should be performed by two persons.

# 4 Connections

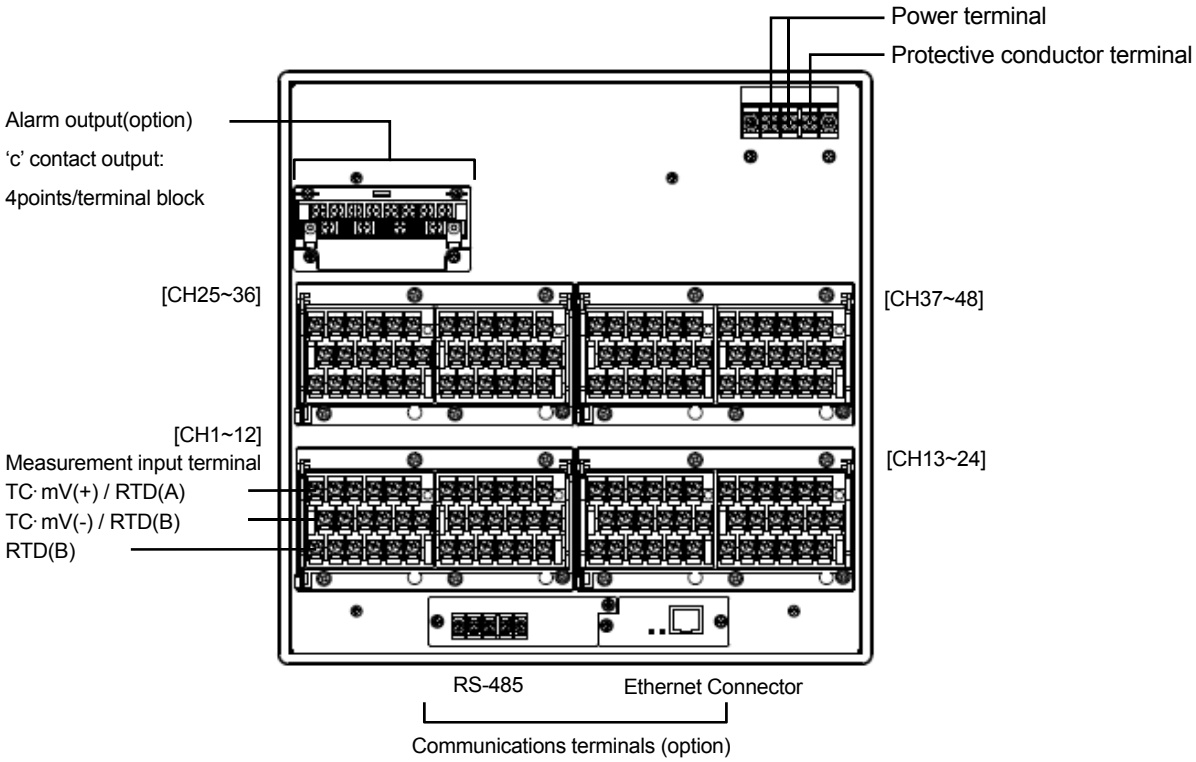
## 4-1 Terminal board arrangement

The following diagram shows the terminal board arrangements in which option (Alarm relay output [4 points 'c' contact], communication interface) are mounted.

<KR2S>

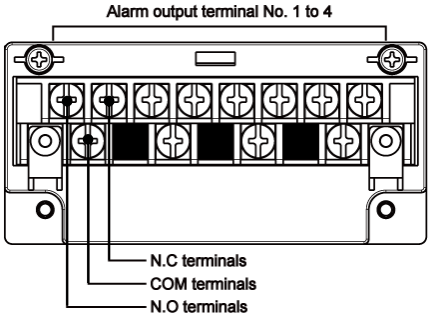



<KR3S>

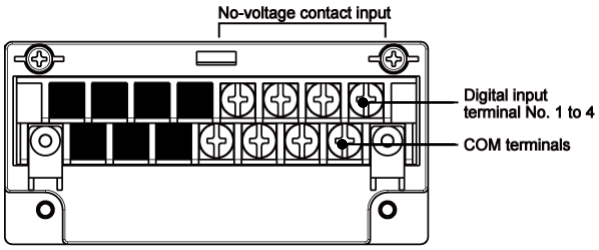


[Option terminal block]

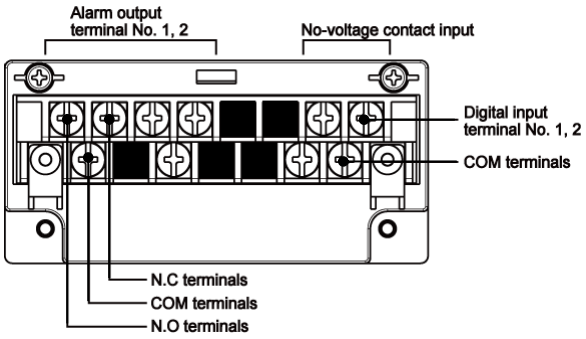
- Alarm relay output (4 points 'c' contact)



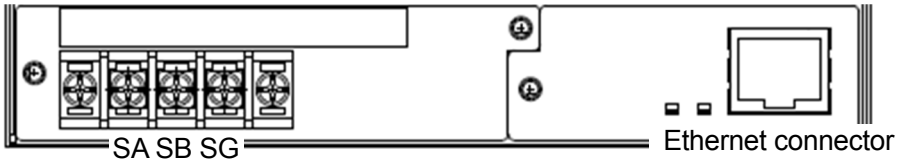

- No-voltage contact input (4 points)




- Alarm relay output (2 points 'c' contact) + No-voltage contact input (2 points)




- Communication terminals　Ethernet + low/high order communications (RS-485)




- Communication terminals　Ethernet + low order communications (RS-232C)

*RS-232C is only for barcode hand-held scanner.

**Warning**

**Alert symbol marks (⚠) and places**

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

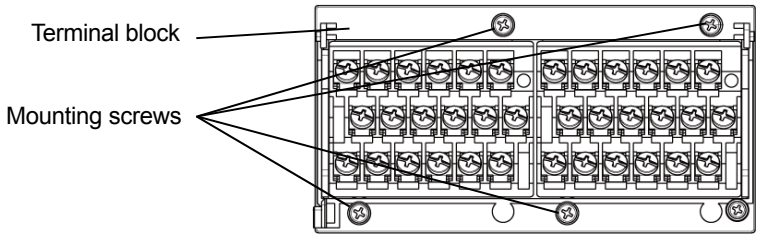
| Name of terminals | Places marked with the symbol | |
|---|---|---|
| | KR2S | KR3S |
| Power terminals | Lower left of power terminals | Upper of power terminals |
| Measurement input terminals | Upper left of terminal cover | Lower of Terminal cover |
| Mechanical relay 'c' contact alarm terminals | Lower left of terminal cover | Lower left of terminal cover |

Reference

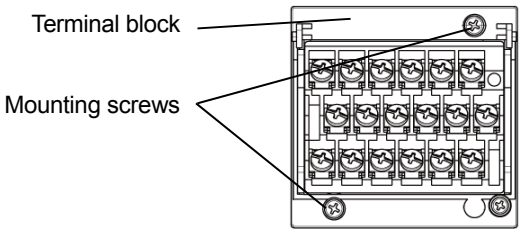
■ Input terminal block is removable

The input terminal block is removable for easy connections.

(1) Each terminal block can be removed by removing mounting screws.
(2) Each terminal block is connected to the recorder by a connector.




Input 12 points




Input 6 points

**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 input terminal block
Input terminal block cannot be replaced by other terminal block.
If replaced measurement error occurs.

# 4-2 Precautions while connections

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

## 4-2-1 Power supply

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

**⚠Warning**

- **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.**

- **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.**

## 4-2-2 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.

## 4-2-3 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.

## 4-2-4 Keep all connection cables away from noises

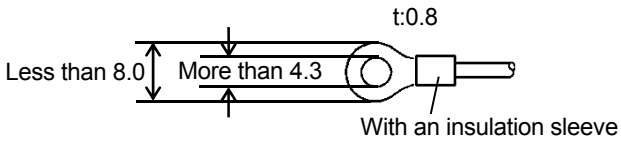
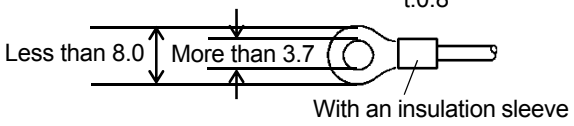
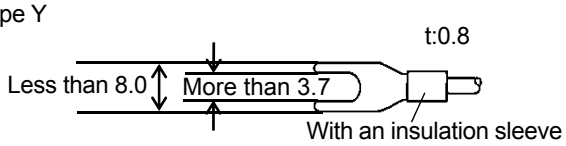
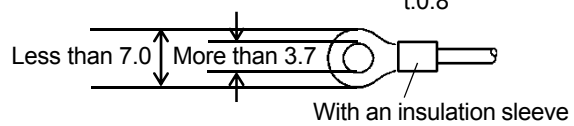
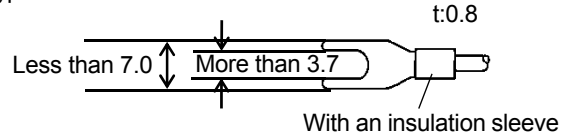
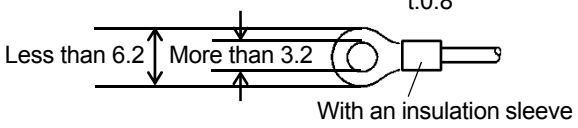
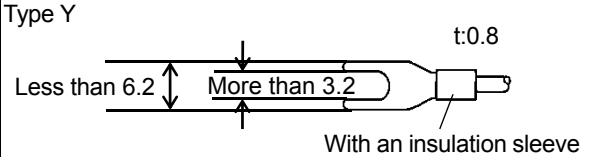
Keep all connection cables away from noise source as far as possible, otherwise unexpected malfunction may occur. Provide a solution if the cables cannot be separated from a noise source due to unavoidable circumstances.

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

## 4-2-5 Use crimp style terminals

Fix crimp style terminals to termination of connection cables for preventing the looseness or disconnection of terminals and a short-circuit failure between terminals.
Use the crimp style terminals with insulation sleeve for preventing an electric shock.

Kinds of terminals and termination

| Terminal name | Screw diameter | Tightening torque | Termination (Unit: mm) |
|---|---|---|---|
| Power and protective conductor and communication terminal | M4 | 1.2N·m | Type O<br>  |
| Input terminal | M3.5 | 0.8N·m | Type O<br>  <br>Type Y<br>  <br>*Use Type O whenever possible. |
| Alarm relay output, non-voltage contact input terminal | M3.5 | 0.8N·m | Type O<br>  <br>Type Y<br>  <br>*Use Type O whenever possible. |
| Communication terminal RS-485 | M3 | 0.5N·m | Type O<br>  <br>Type Y<br>  <br>*Use Type O whenever possible. |

### 4-2-6 Unused terminals

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

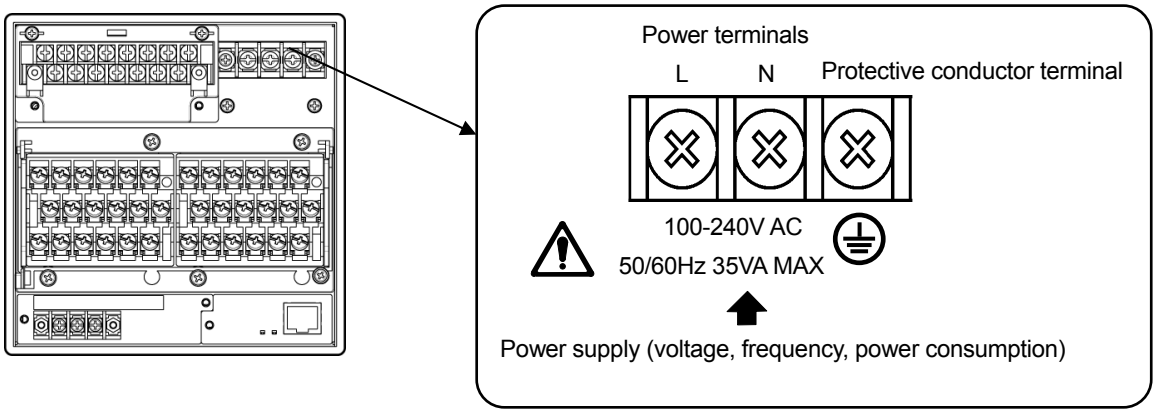
**Warning**

■ **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.**

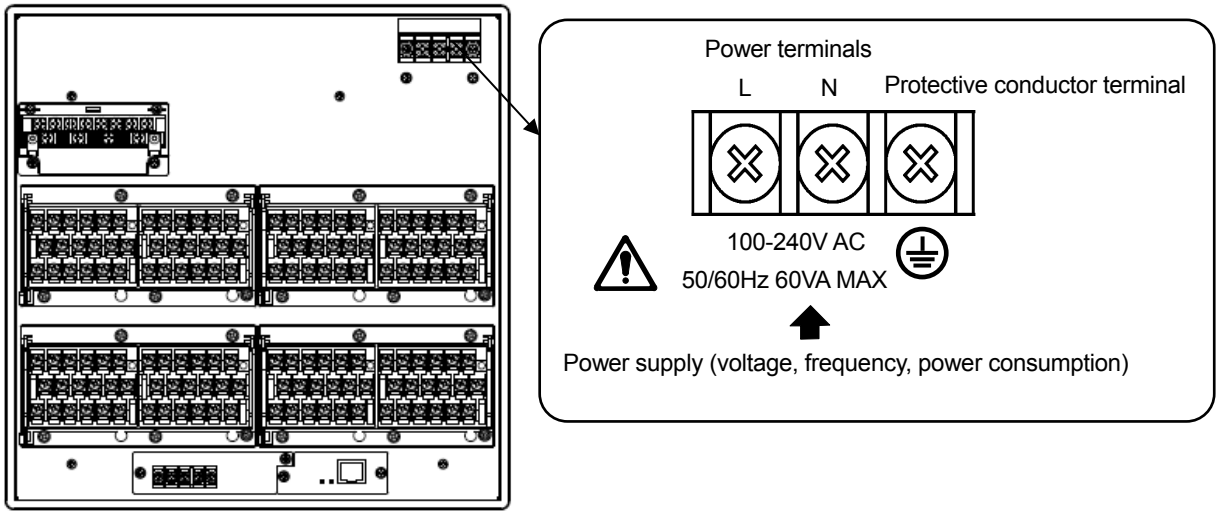
# 4-3 Connection of power and protective conductor terminals

## 4-3-1 Power and protective conductor terminals

<KR2S>




<KR3S>




| **Warning** | Turn off the power supply<br>Be sure to turn off the power supply before connecting the cable to the power supply and protective conductor terminals to prevent an electric shock. |
|---|---|

### 4-3-2 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

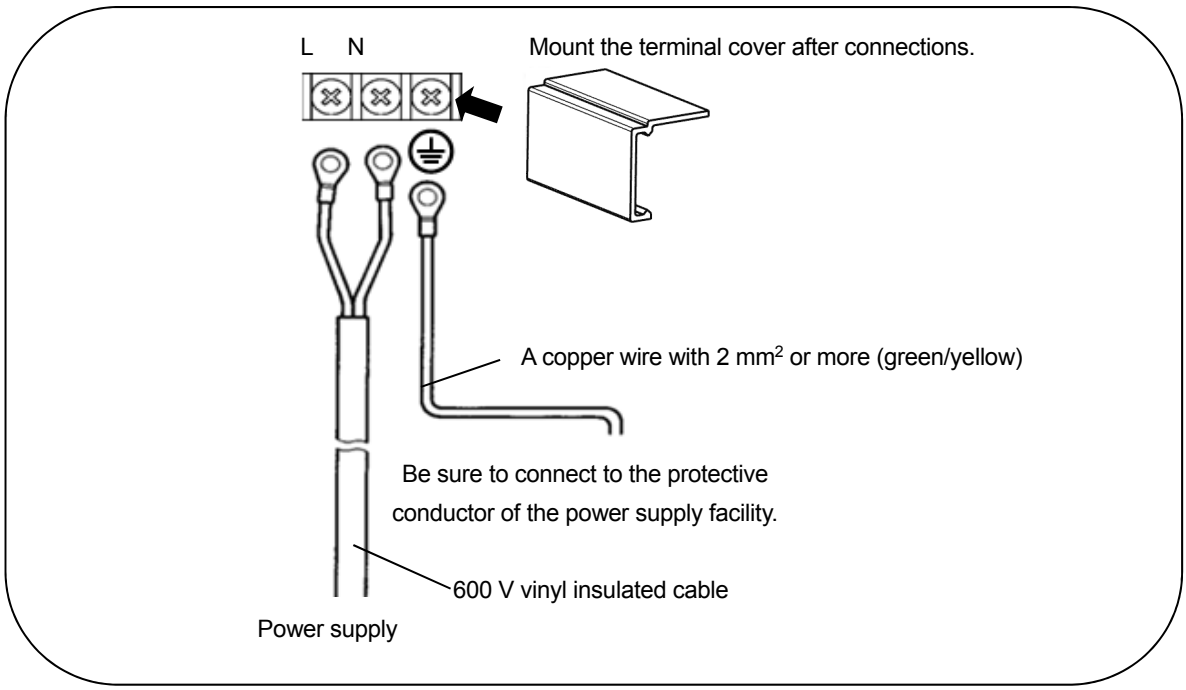
### 4-3-3 Connection of protective conductor terminal

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**<br>**A voltage of 100 to 240 V AC is applied to the power terminals after connection. Be sure to mount the power terminal cover to prevent an electric shock.** |
|---|---|

| **Caution** | **Be careful with the power voltage and noise**<br>**The power voltage of this instrument is indicated beside the power terminals.**<br>**Don't apply any voltage other than indicated; otherwise a malfunction may result.**<br>**If noise is generated at the power supply, provide a noise reduction transformer, etc.** |
|---|---|

| Remarks | ■ L/N indication of power terminals<br>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. |
|---|---|



# 4-4 Connection of measuring input terminals

## 4-4-1 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**

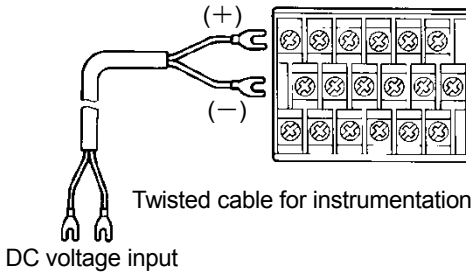
| Input type | Allowable input voltage |
|---|---|
| Voltage, thermocouple input | ± 10VDC* |
| Resistance thermometer input | ± 6VDC |

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

## 4-4-2 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

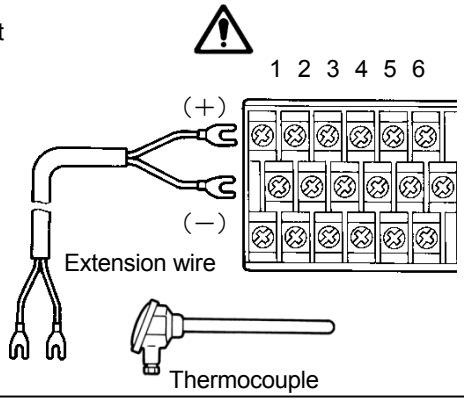



| Remarks | ■ Isolation of measured input terminal<br>TC· mV(+) / RTD(A) terminal and TC· mV(-) / RTD(B) terminal are insulated each channels but RTD(B) terminal is short-circuited between channels. |
|---|---|

## 4-4-3 Connection 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. If using a pair of thermocouple wire in parallel, it may have an influence on the measurement.
When it is necessary to operate the instrument in this situation, check for no influence while operating the instrument before using.

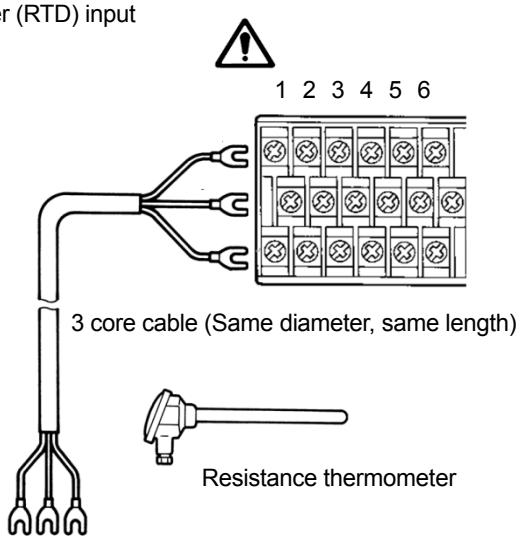
●Thermocouple (TC) input



## 4-4-4 Connection of resistance thermometer (RTD) input

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




*The resistance of each cable is less than 10 Ω. All the 3 wires should be of the same resistance value.

**Warning**

⚠ mark of measuring input terminals

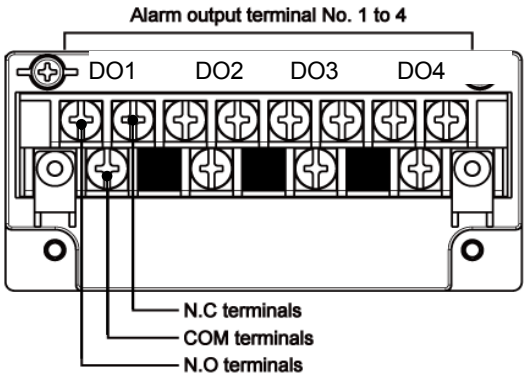
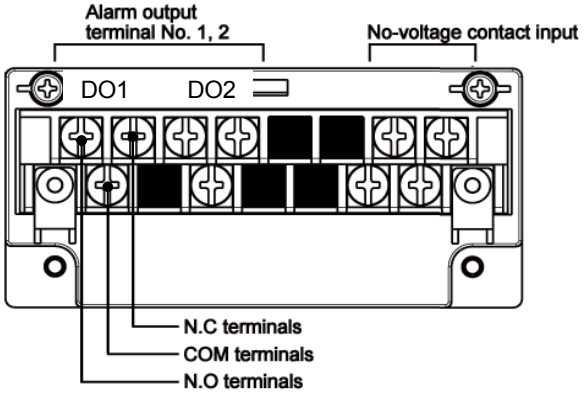
A high voltage may be applied to the measuring input terminals due to common mode noises. The allowable noise value is lower than 30 VAC or lower than 60 VDC. Make sure that the noises are lower than the allowable values. Mount the terminal cover after connections for the purpose of preventing an electric 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.

# 4-5 Connection of alarm output terminals (Option)

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

## 4-5-1 Alarm output terminal

The terminal arrangement depends upon the type of alarm output.

| Alarm relay output 4 points ('c' contact) |
|---|
|  |
| Alarm relay output 2 points ('c' contact) |
|  |

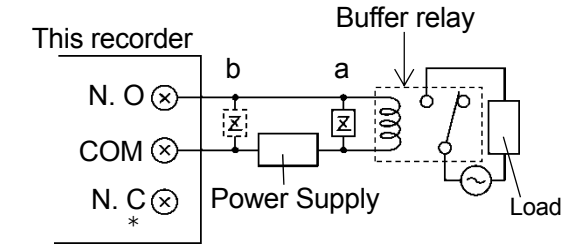
## 4-5-2 Connections

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. Only one crimp style terminal is allowed to connect to the terminal.

Example of mechanical relay 'c' contact outputs




: 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. If the voltage more than 30VAC/60VDC is to be applied to the alarm output terminal, use type O crimp style terminal with an insulation sleeve to connect double-insulated wires (dielectric strength of 2300 VAC or more) for the signal wires and for the other signal wire use basic insulated wires (dielectric strength of 1390 VAC), If the voltage more than 30VAC/60VDC is to be applied to either alarm output terminal of channel, use double-insulated wires or reinforced insulation for external circuit of all the channels. A buffer relay power supply is applied to the alarm output terminals after connections. Do not touch these terminals, the 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.**

## 4-5-3 Precautions for connection

Be careful with the following cautions for connections.

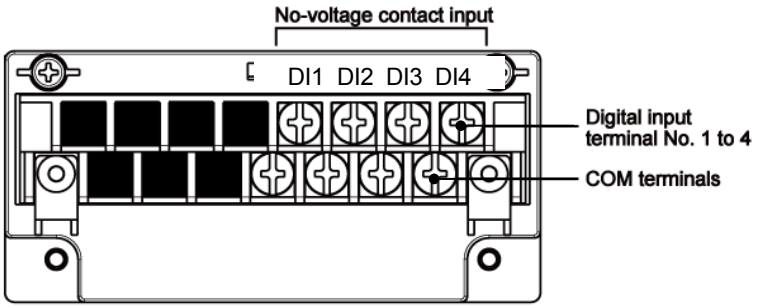
<table>
<tr><th>Item</th><th>Contents</th></tr>
<tr><td>Contact rating of Mechanical relay outputs ('c' contact)</td><td>
<table>
<tr><th>Power supply</th><th>Resistive load</th><th>Inductive load</th></tr>
<tr><td>100V AC</td><td>3A</td><td>1.5A</td></tr>
<tr><td>240V AC</td><td>3A</td><td>1.5A</td></tr>
<tr><td>30V DC</td><td>3A</td><td>1.5A</td></tr>
</table>
(Minimum load)<br>100mA 5VDC
</td></tr>
<tr><td>Mounting of contact protective element Z</td><td>●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.<br>●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 (refer to "4-5-2 Connection" example of mechanical relay 'c' contact outputs diagrams)</td></tr>
<tr><td>Selection of buffer relay</td><td>(1) Coil rating.....Less than the contact rating of output terminals<br>(2) Contact rating ...More than twice the load current<br><br>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.</td></tr>
<tr><td>Selection of contact protective element</td><td>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).<br><Reference values of C・R> C: 0.01 μF(Rating about 1 kV)<br>R:100 to 150 Ω(Rating about 1 W)</td></tr>
</table>

# 4-6 Connection of digital input terminals and function selection (Option)

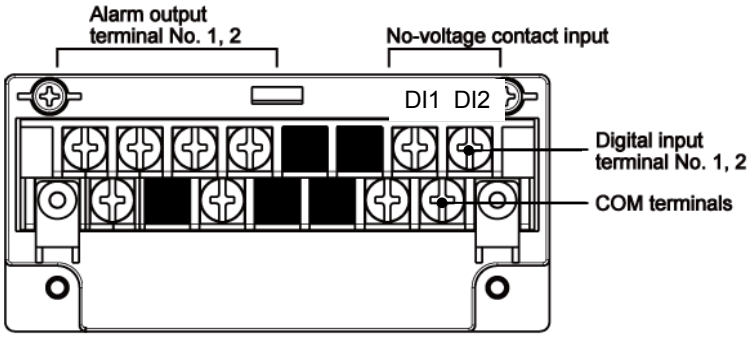
This is for the recorder with digital input terminals (Option)

## 4-6-1 No-voltage contact input terminal

No-voltage contact input (4 points)




No-voltage contact input (2 points)



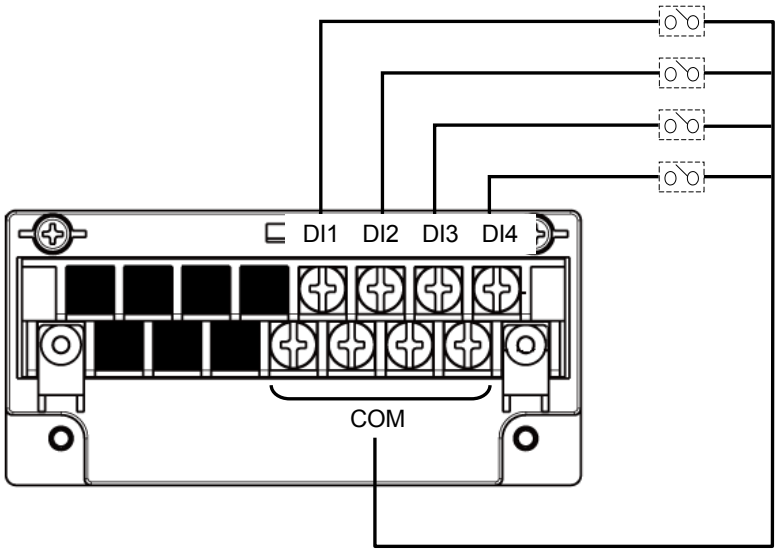

| Remarks | ■ Features of digital input terminal<br>Voltage when the contact is open.: Approx. 5 V<br>Current when the contact is short.: Approx. 2 mA |
|---|---|

## 4-6-2 Connections

Turn off the power supply before connections to prevent an electric shock.
Apply a no-voltage contact signal to digital input terminals.
Use cables terminated by crimp style terminals with insulation sleeves for the digital input terminals.

| Caution | No-voltage contacts<br>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. |
|---|---|

Example of connections (No-voltage contact input (4 points))




## 4-6-3 Functions of terminals

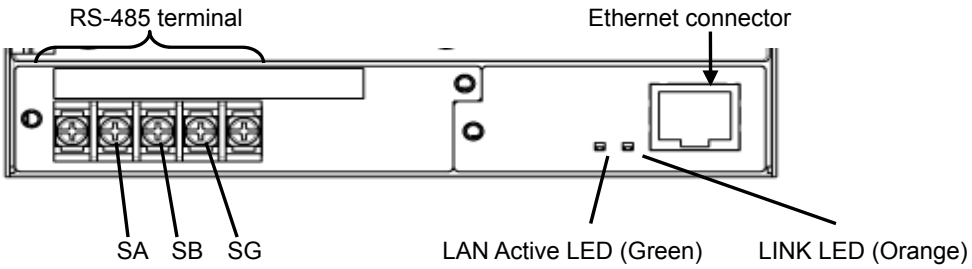
Digital input ……ON/OFF (short/open) state can be measured. Select the range type as DI.
(Refer to '9-1 input operation settings'.)
Pulse input ……Used as the pulse input. Select the range type as Pulse (+) and Pulse (-).
(Refer to '9-1 input operation settings'.)
Totalizer reset ….he reset of totalizer is executed. When the digital input terminal specified becomes ON, the totalizer reset is executed.
(Refer to '9-6 Totalizer reset settings'.)
Marker ……The writing of marker. The marker can be written on the trends when the digital input terminals become ON.
(Refer to '9-8 Marker text settings'.)
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 '9-5 File settings'.)

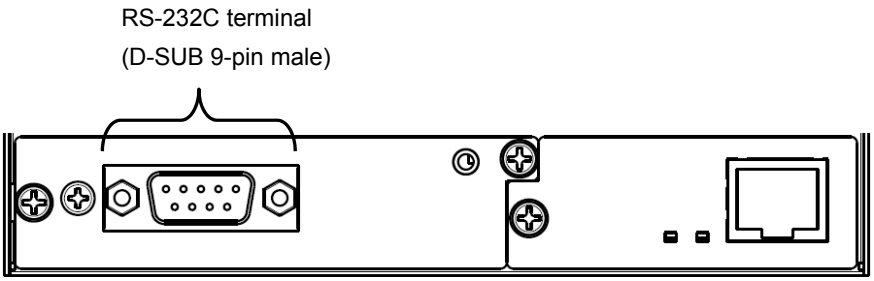
●Each function requires a short circuit of 0.1 second or more between the COM terminal and each terminal.

# 4-7 Connection of communication I/F terminal (Option)

KR can communicate with a master unit via Ethernet and RS-485, and with slave units via RS-485 and RS-232C.

*Ethernet, RS-485 and RS-232C communication function are optional. RS-232C is only for barcode hand-held scanner.

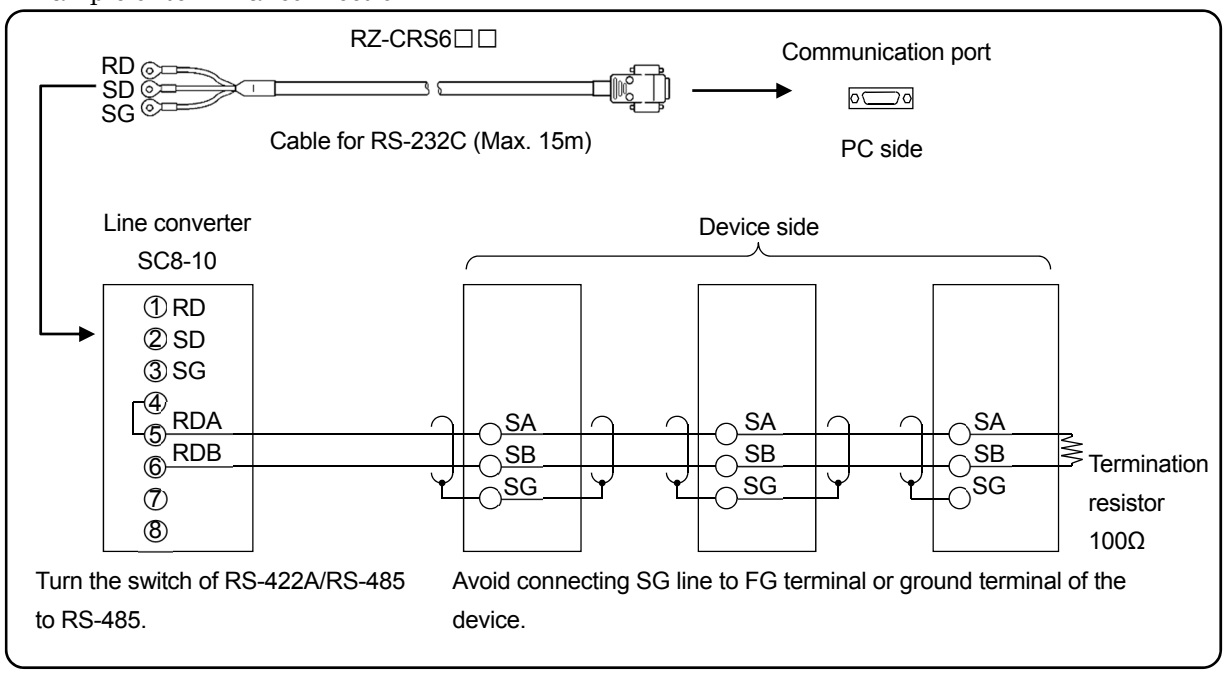



## 4-7-1 Connections of High order communication RS-485

PC and multiple devices are connected with RS-485. A line converter is required.
RS-485 cables within 1.2km of total extension and up to 31 devices can be connected.
Install a resistor of 100Ω to the last edge of the transmission line device side.
(General metal film resistors will be fine. They are available from us, place an order.)

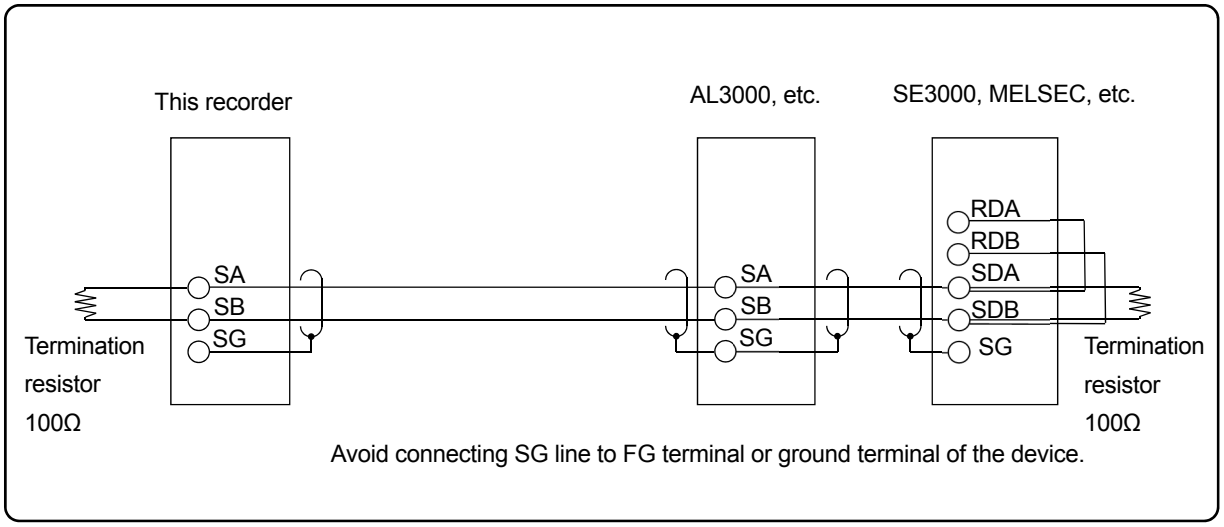
Example of terminal connection



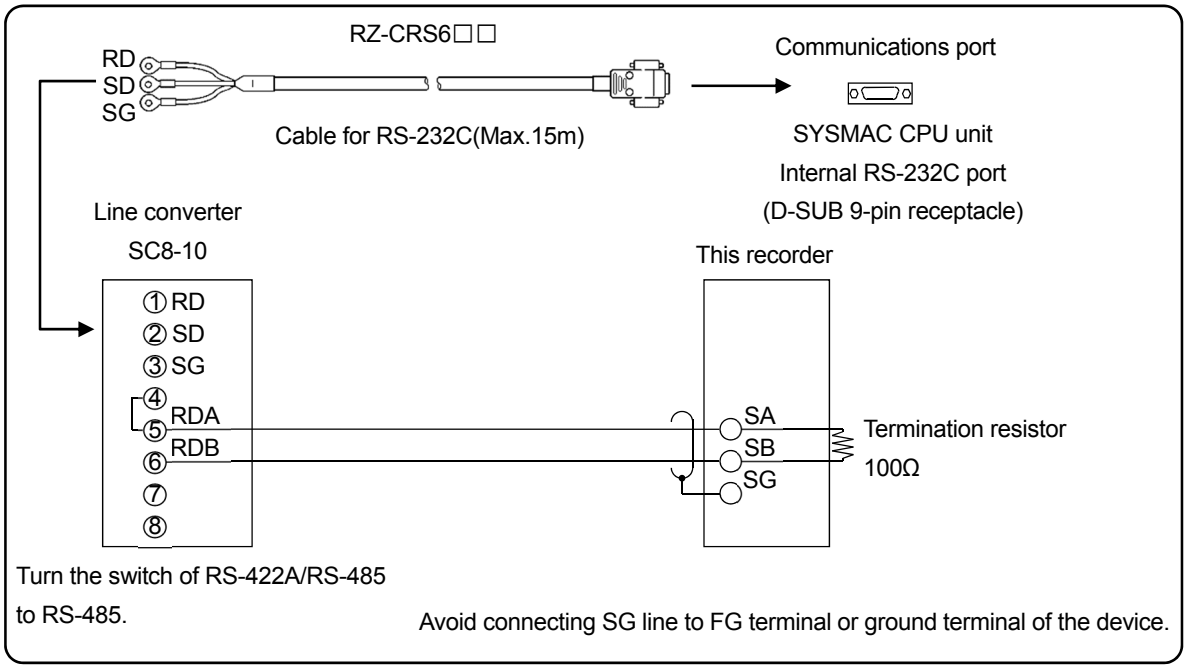
## 4-7-2 Connections of low order communication RS-485

Connect SA, SB of this recorder and SA, SB of low order connected instrument like the following figure. Refer to instruction manual of each instrument for detail method of low order instrument connection.

Example of terminal connection 1

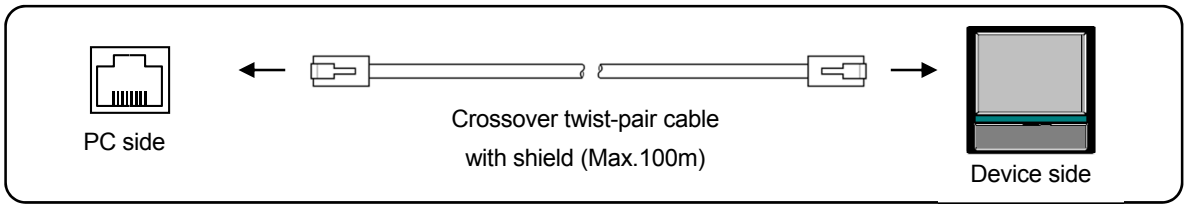



Example of terminal connection 2 (SYSMAC)

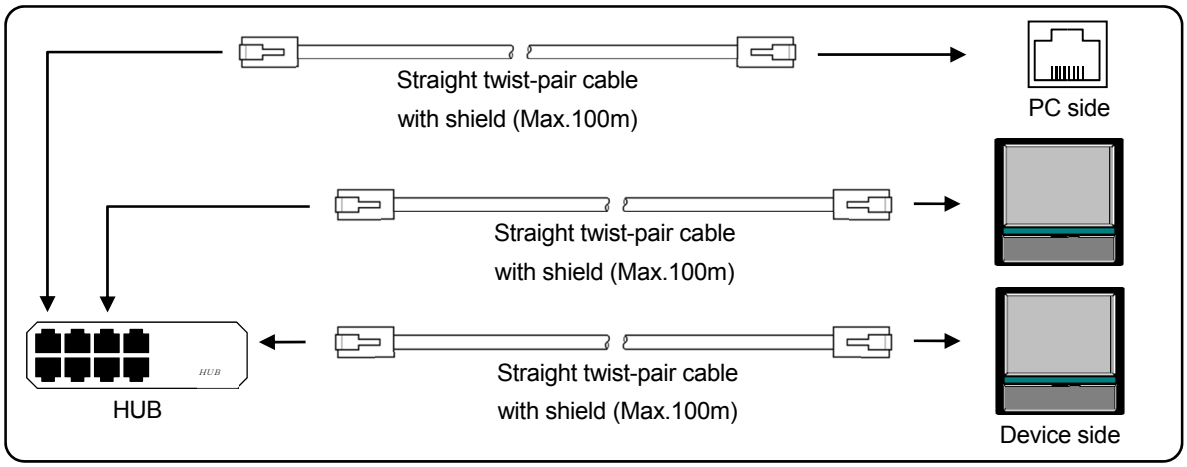


## 4-7-3 Ethernet wiring

(1) Example of connection between PC and Ethernet devices (one-to-one connection)



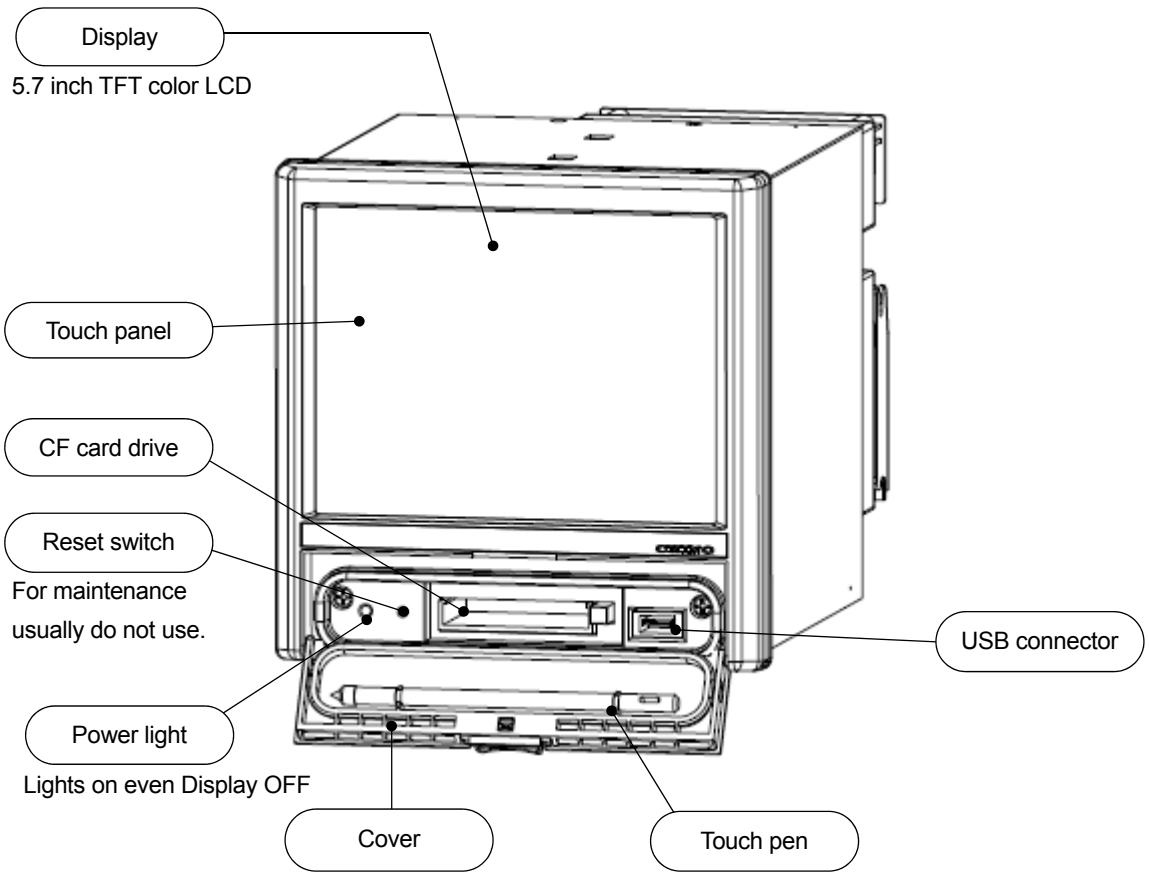

(2) Example of connection between PC and HUB/Ethernet devices (one-to-N connection)



# 5 Name of each part

## 5-1 Name of the front panel and its major function

<KR2S>

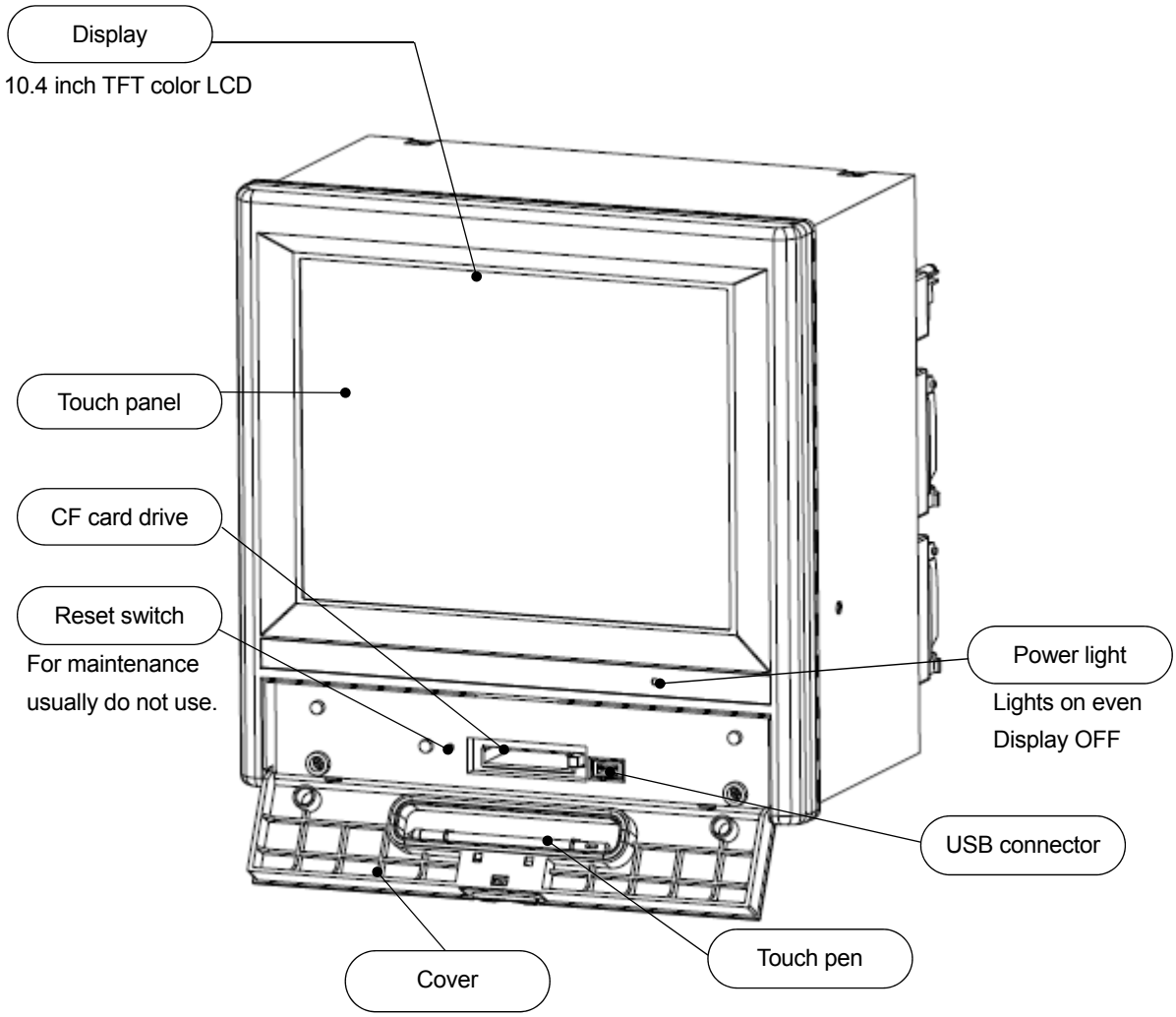



**Caution**

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.
- Coordinates cannot read normally if two points are pushed simultaneously. Push one point in operations.
- When you put the touch pen in the cover, please fix the groove of the touch pen to nail of the cover.
- Please pull the nail of cover downward to open since it easily bends when it is pulled upward.

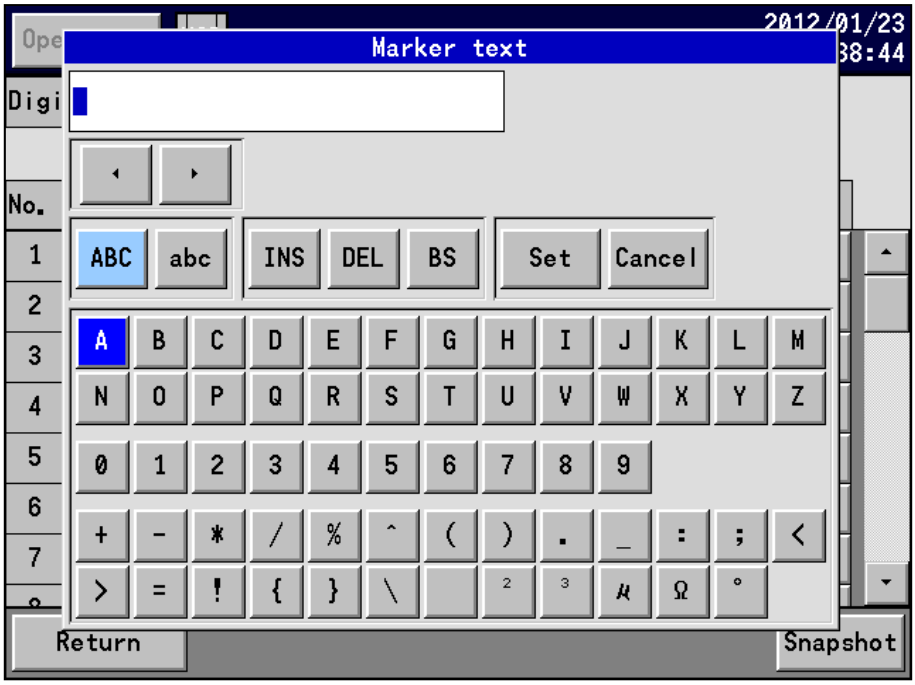
<KR3S>




| Caution | Front glass<br>• The front of display part is made by glass. To avoid injuries due to broken glass, do not blow the glass hard.<br>• Do not rub or push the touch panel by a sharp edged tool or a sharp material.<br>• For dirt on the front glass, wipe it lightly with a soft cloth infiltrated with neutral detergent or alcohol.<br>• Coordinates cannot read normally if two points are pushed simultaneously. Push one point in operations.<br>•When you put the touch pen in the cover, please fix the groove of the touch pen to nail of the cover.<br>•Please pull the nail of cover downward to open since it easily bends when it is pulled upward. |
|---|---|

## 5-2 Character entering method

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



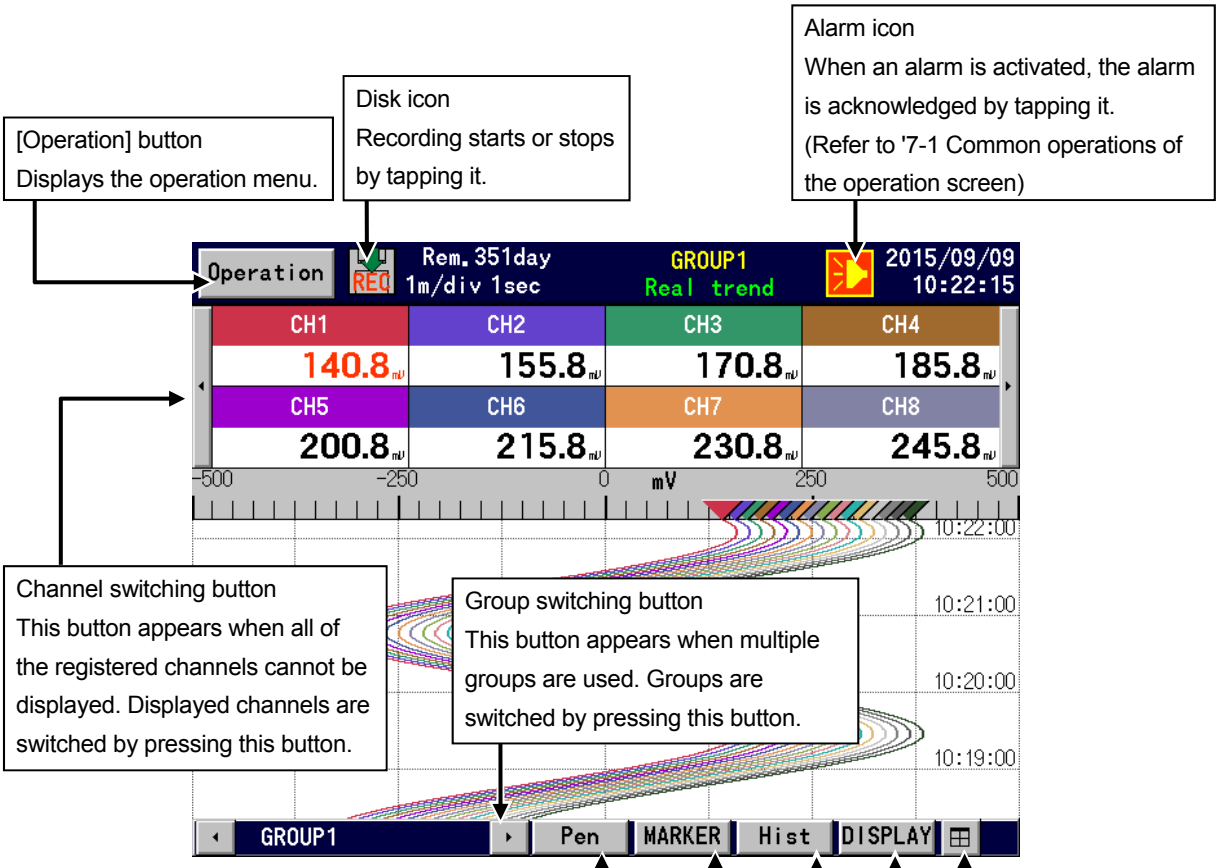

When the character input screen is displayed, by pressing the "ABC" or the "abc", keys arranged on the lower column are changed to indications corresponding to the key pressed. Press a character to enter. Then, the character selected is displayed on the character display column. When a character is taped 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.<br>(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. |
| Cancel | Cancels character input. |

# 5-3 Touch panel operation method

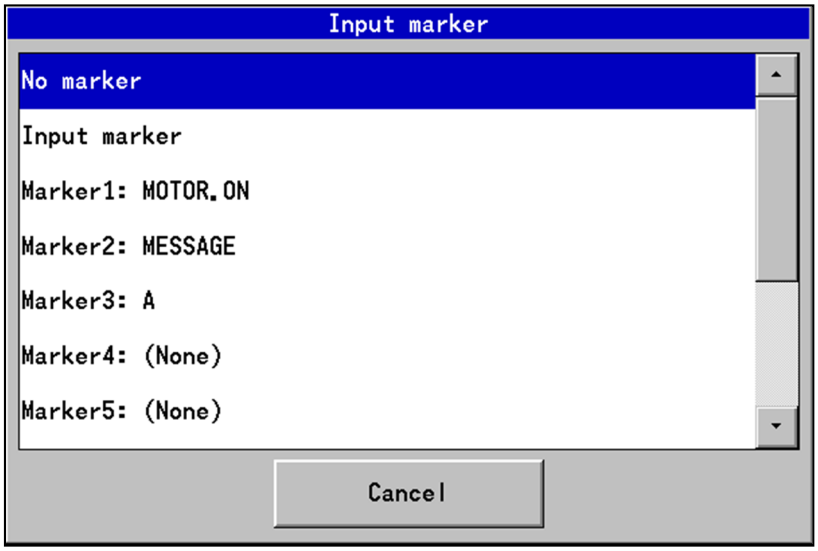
In this paragraph, the basic screen operation method is described.

## 5-3-1 Tapping on the operation screen



■ About the [MARKER] button

Displays marker input dialog. It cannot be operated during the recording is stopped.
By tapping [MENU settings] - [Marker text settings], register marker text beforehand.
[Input marker] list is displayed, tap and write marker on the trend.
By selecting the [Input marker], key board display is appeared and texts are able to input.




■ [Operation] menu

| Menu item | Operation |
|---|---|
| START | The recording starts. |
| STOP | The recording stops. |
| HOME settings | The HOME settings open. |
| MENU settings | The MENU settings open. |

■ [DISPLAY] 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 on/off the automatic switching of the channel. The switching becomes active by checking the box. When the automatic switching time is set to 0, this switching is invalid. |
| Snapshot | Used to save screen hardcopy to the external memory (CF card/USB memory). |
| Pause | Screen updates are stopped except for status bar. Tap the screen to restart display update. All operations such as data acquisition and recording processing except for drawing are executed during pause. *When an alarm is activated, pause is cancelled. |
| Display OFF | Used to turn off LCD display. The display is turned on again by tapping the screen. |
| Split screen | Used to display 2 or 4 separate screens. * only KR3S |
| Magnify/reduce | The trends are displayed by compressing the time axis. (Same magnification to 1/60) |

■ Operate method of 2 or 4 separate screens

This recorder can divide the screen and display it and the number of divisions is 2 or 4.
Select the number of divisions from Display Settings - Common Parameters - Number of split screen.
On the separated screens, selectable display types selected limited. Only the screens of the real time trend, the numerical display and the bar graph can be selected.

1. Switching method from 1-screen display to 4-screen display

- Select the [Split screen] from the DISP menu.
- Tap the  icon low right.

The screen can be switched to the 2 or 4-screen display in one of the above method.

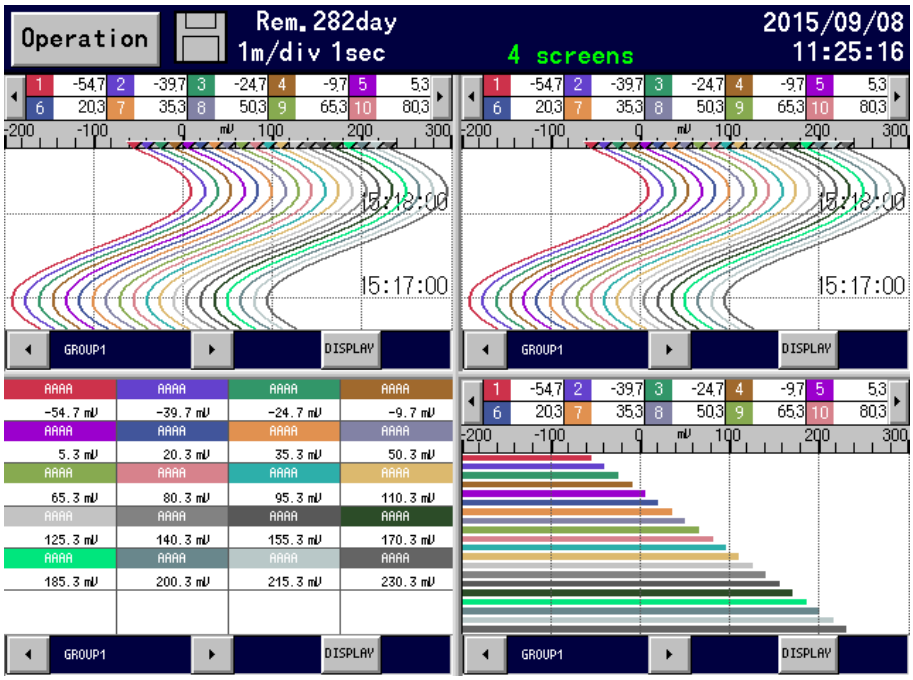
2. Switching method from 2 or 4-screen display to 1-screen display

- 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].

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

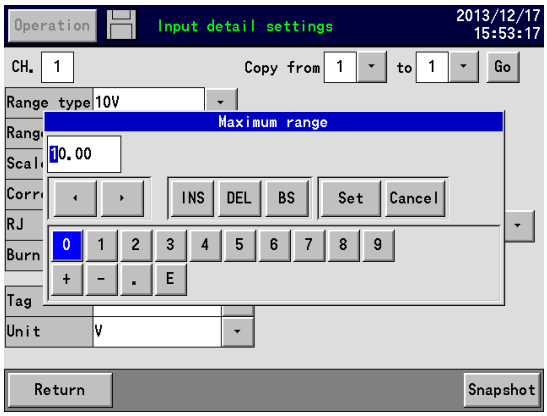
3. Tapping operation on 2 or 4 separate screens

By tapping the DISP button, the display type and group can be selected in each frame.
In addition, by pressing the groups switching button and the marker button on each frame, their operations for each frame are executed.

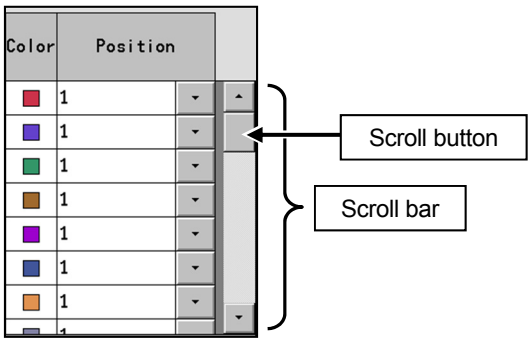


## 5-3-2 Tapping operation on the setting screen

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, tap the [Return] button.




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




**Caution**

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 damped with neutral detergent or alcohol. This recorder uses plastic components, therefore do not use organic solvent. It may be a possibility of discoloration, deform and damage. 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 naturally, but avoid using the touch panel with the dew condensation since it causes failure.
- Do not impact or push the touch panel by a strong force. It may be a possibility of damage.

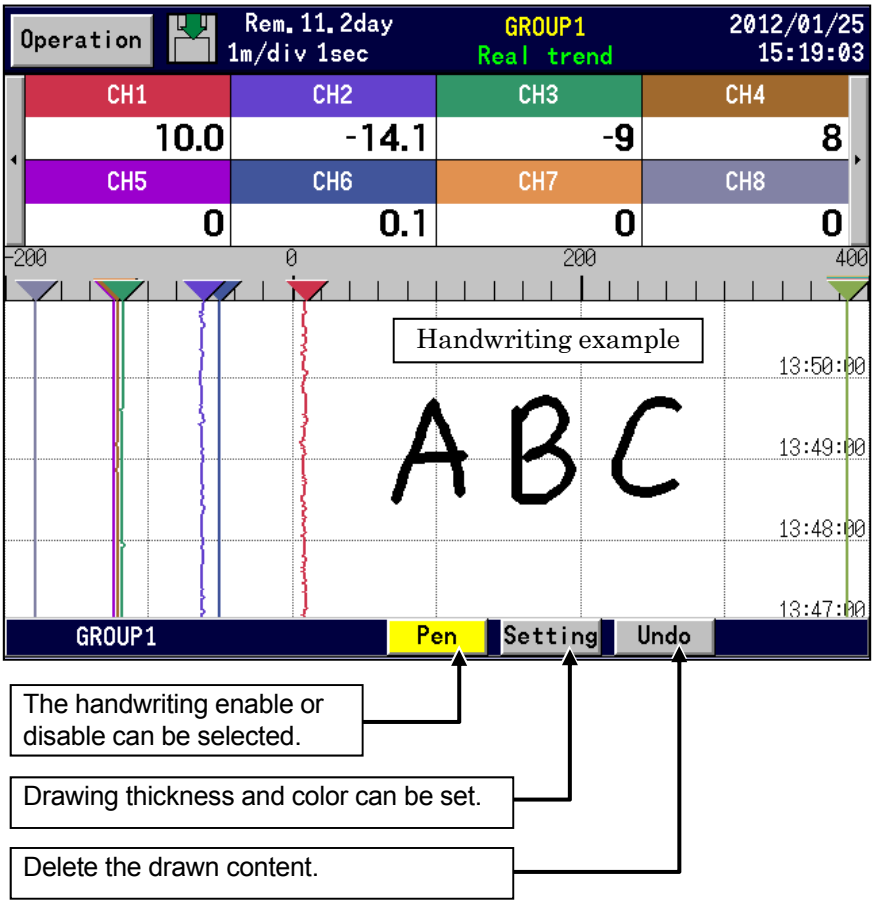
## 5-3-3 Handwriting operations on the trend screen

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. '7-9 CF card/USB memory screen')




| Remarks | In order to draw by handwriting operation, the space where the trend line of the record data is drawn on the screen is necessary. If there is no record data or just after the start of recording, drawing can not be done due to insufficient space, so please draw after a while after leaving time after recording start. |
|---|---|

■ Erasing operation

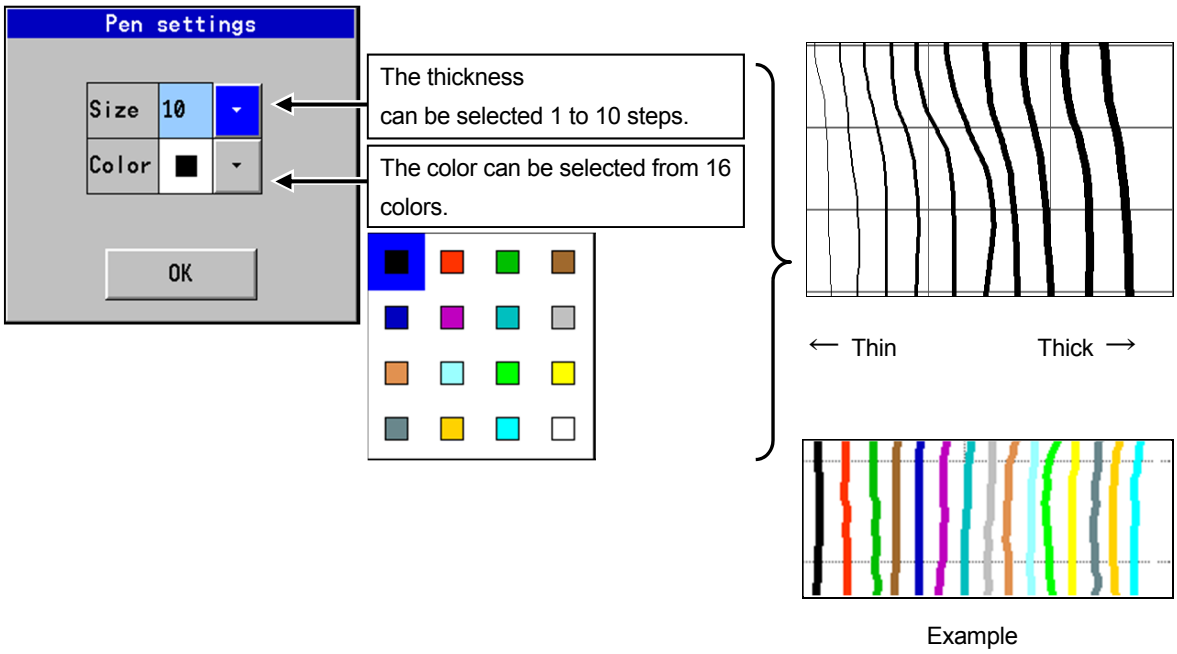
When [Undo] is tapped in the handwriting operations, the content written just before is erased.

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.

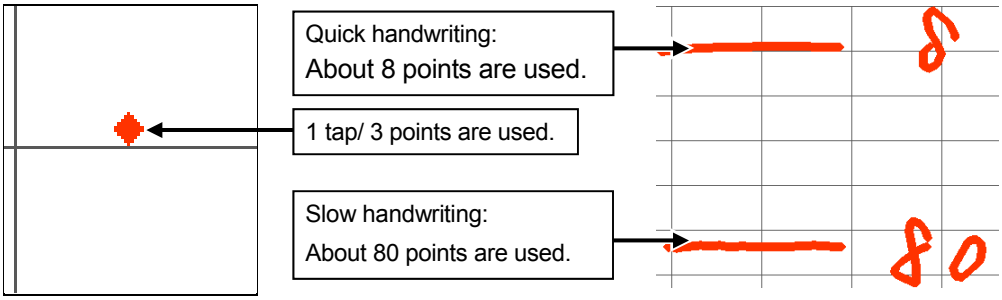
| Remarks | When the content is saved once by tapping the pen button, the retroactive trajectory cannot be erased. |
|---|---|

■ 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.




Example

| | |
|---|---|
| Supplement | The number of handwriting points is gotten by detecting and sampling the coordinate data periodically at a fixed cycle, when the touch panel is on contact.<br>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.<br>It is difficult to distinguish the number of inputs visually directly by seeing the drawing.<br>Since the number of points is sampled at a fixed cycle, slow pen writing consumes more number of points and quick writing makes consumption of number of points less.<br>The length of a trajectory, the thickness of a font, and the color are not directly related to consumption of number of the points.<br>The figure below shows the reference figure about the number of points confirmed by treatment of the instrument.<br>  |

# 5-4 Recording separator

In this paragraph, recording separator drawn on trend display (real trend, historical trend and dual trend) at recording start is described.
On this recorder, recording separator parallel to the time axis is drawn at recording start and old and new recording ranges can be seen at the same time.

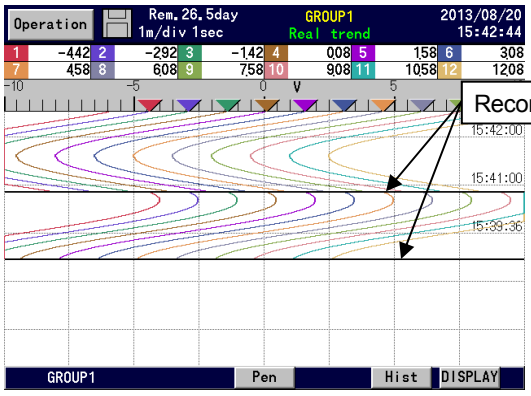
■ Display method

Tap the [Operation] button and then tap [MENU settings] - [Display settings] - [Common parameters]. At the [Common parameters] set [Separator line of data] 'ON'.
(Refer to '9-3-5Common Parameters'.)

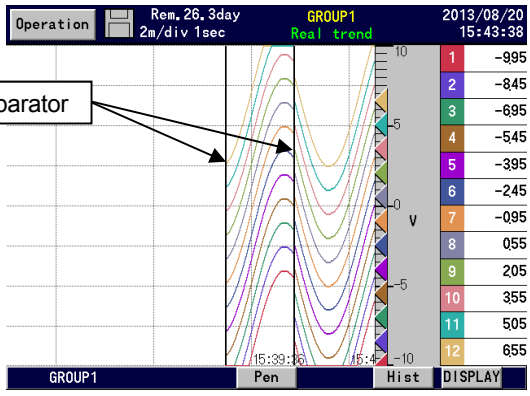
There are following restrictions for displaying recording separator.

- Recording separator is not displayed if the trend direction is 'Circle'.
- Recording separator is not displayed if a file is selected from the external memory (CF card/USB memory) then displayed as historical trend
- If the setting of the background color is 'white', color of the separator is 'black' (same for the case of historical trend).
- If the setting of the background color is 'black', color of the separator is 'white' (same for the case of historical trend).

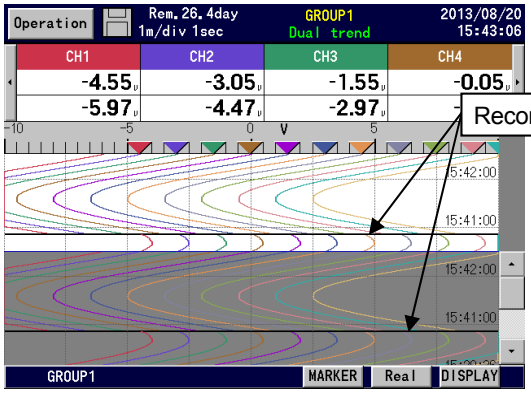
Following shows example of the separator on each trend display.



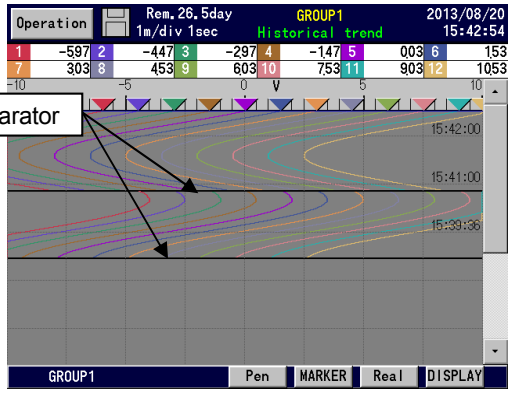

Real trend (trend direction: Vertical)




Real trend (trend direction: Horizontal)




Dual trend




Historical trend

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

## 6-1 Language Setting

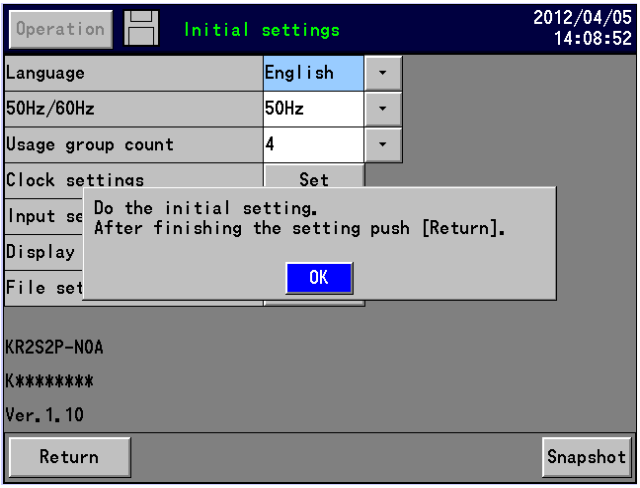
When at initial power on or turning on the power again in the initial settings screen, the language setting screen is displayed.
By tapping the ▼ button of the Language Setting, the pull-down menu is displayed.
Tap English or Japanese in the pull-down menu for setting.
Tapping the [OK] button, the startup screen is displayed.


## 6-2 Initial settings

After language selection in the previous section or when the settings are initialized, the initial settings screen is displayed. Set the indispensable following parameters on use.

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

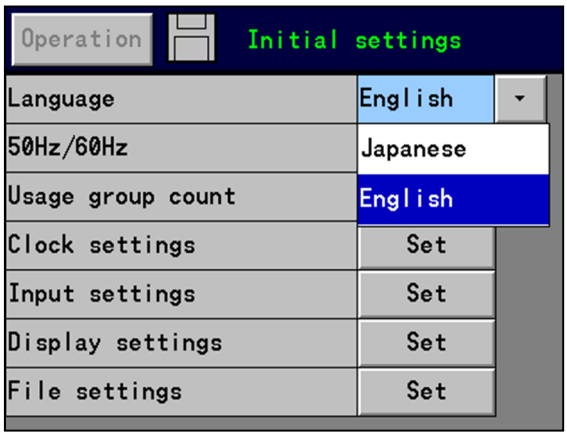
You can exit without setting the parameters. In that case, this recorder operates with the default settings at the factory.




Tapping the [OK] button, the message disappears and the settings are enabled.

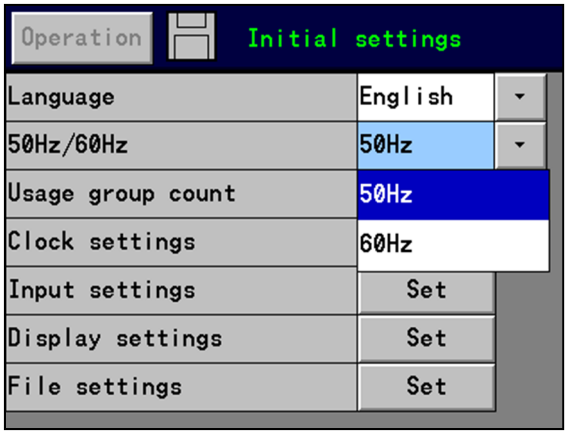
## 6-2-1 Setting of the language

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




## 6-2-2 Setting of the power frequency

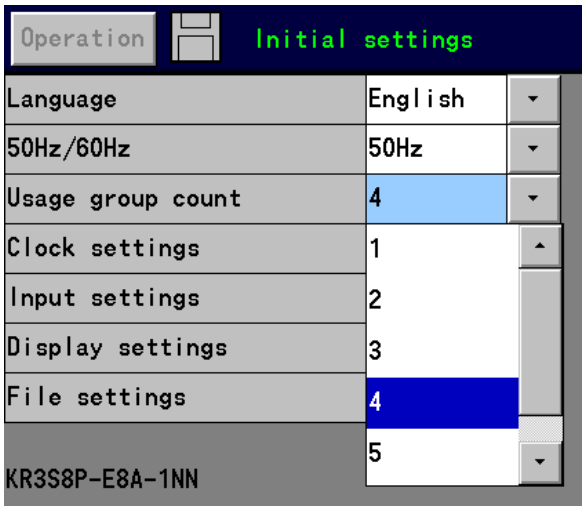
By tapping the ▼ button of the 50Hz/60Hz, the pull-down menu is displayed.
Tap 50Hz or 60Hz in the pull-down menu for setting.
Confirm and set the power frequency being used.




| Reference | ■ About the setting of the power supply frequency<br>This setting is set for noise (Industrial frequency) filter of the input.<br>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.) |
|---|---|

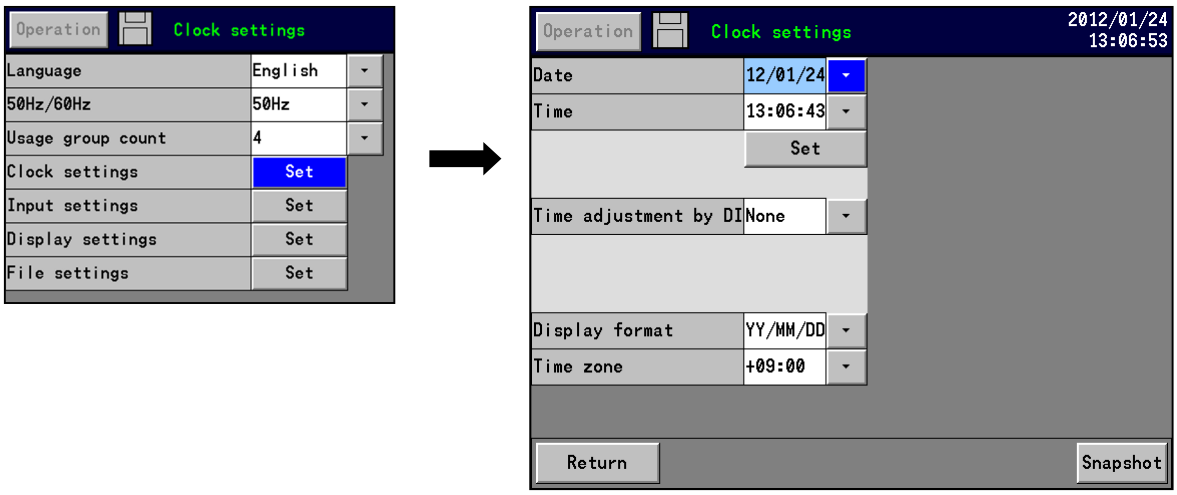
## 6-2-3 Setting of the usage group count

By tapping the ▼ button of the item of the usage group count, the pull-down menu is displayed.
Select usage group count in the pull-down menu. (<KR2S>1 to 5, <KR3S>1 to 6 group)
Less the usage group count, longer the time to record in the internal memory. (Refer to '7-8 Internal memory screen')




## 6-2-4 Clock settings

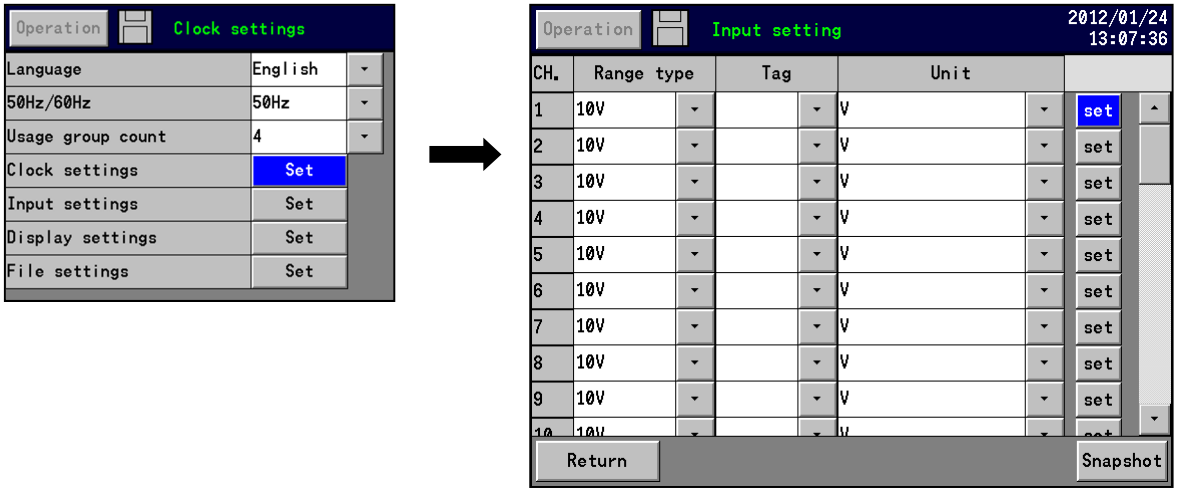
By tapping the [Set] button of the clock settings, the following clock settings screen is displayed.




*For detailed settings, refer to [9-11-1 Clock settings].

## 6-2-5 Input settings

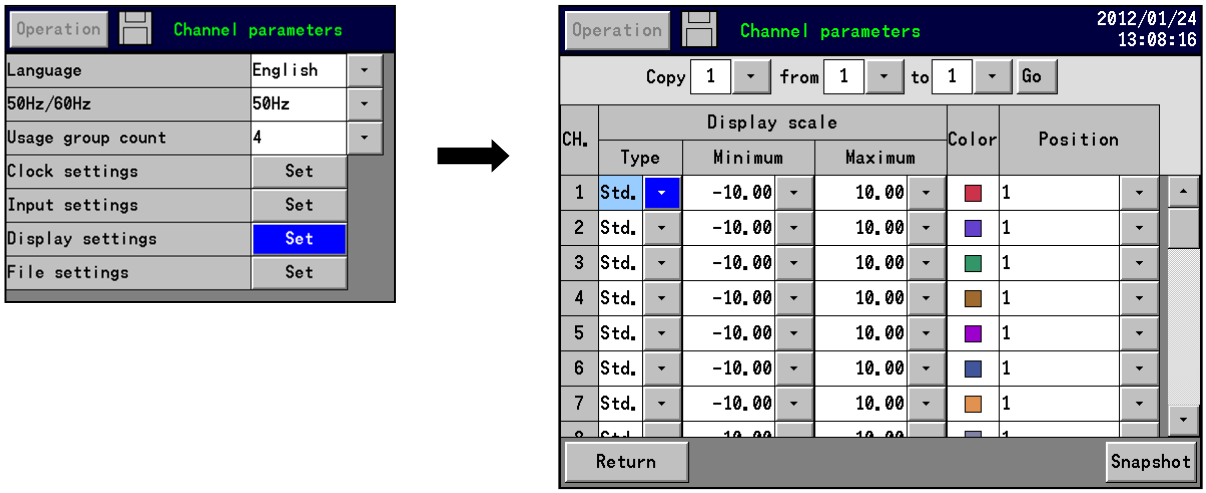
By tapping the [Set] button of the input settings, the following input settings screen is displayed.




*For detailed settings, refer to [9-1 Input operation settings].

## 6-2-6 Display settings

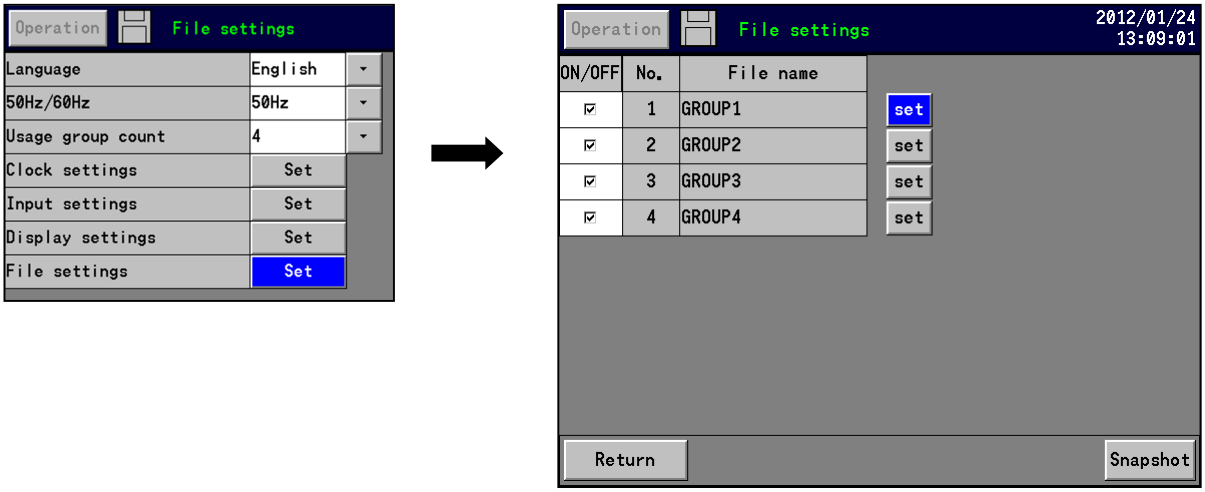
By tapping the [Set] button of the display settings, the following display settings screen is displayed.




*For detailed settings, refer to [9-3-1Channel parameters].

### 6-2-7 File settings

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




*For detailed settings, refer to '9-5File settings'.

## 6-3 Start/Stop operations of recording

### 6-3-1 START

Tap icon or on the top of the screen, or tap [Operation] - [START].

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 external memory (CF card or USB memory) is automatically executed when the saving to a file is completed and at certain storing intervals.

### 6-3-2 STOP

Tap icon or on the top of the screen or tap [Operation] - [STOP].

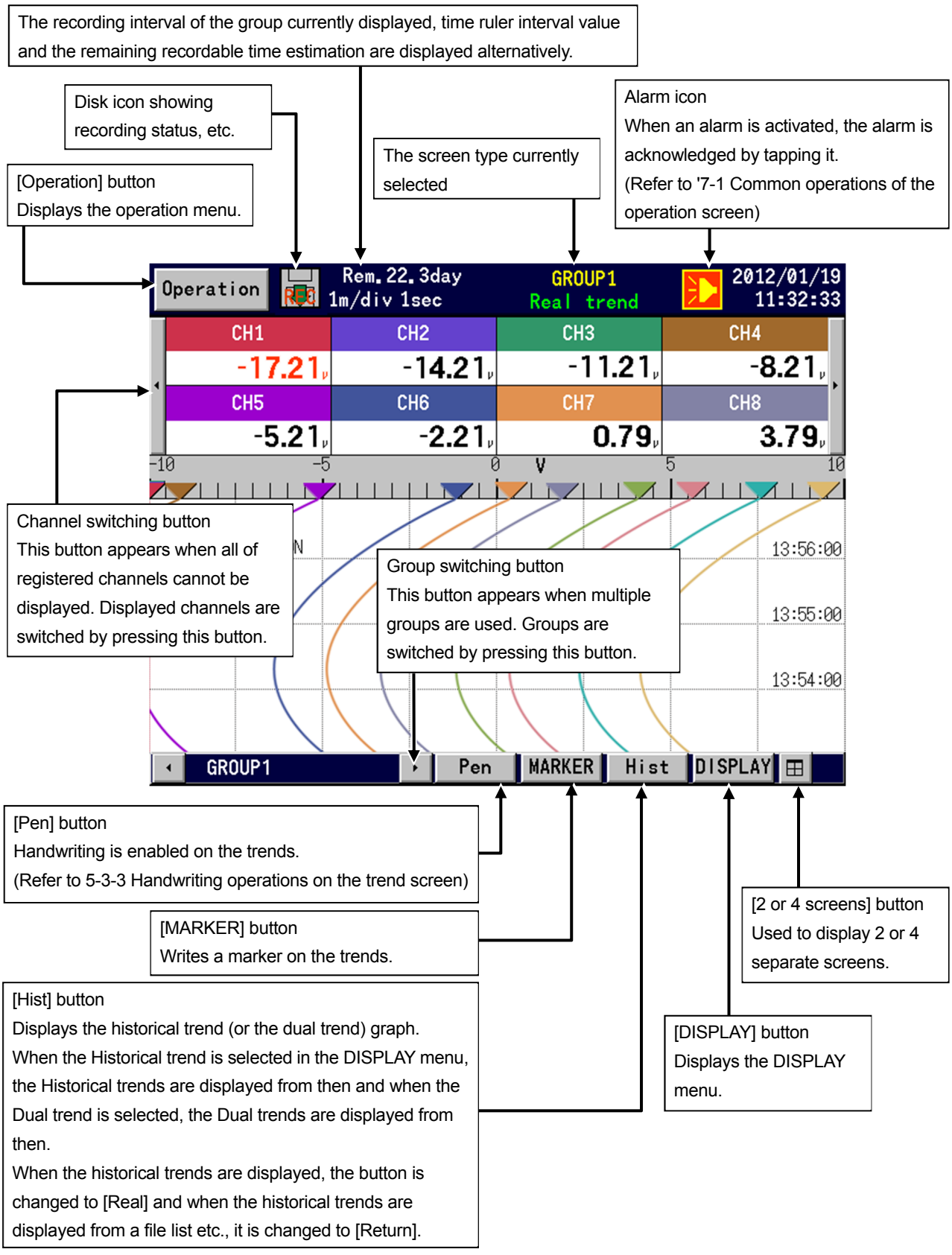
The recording of all groups becomes the stop state. The file in saving is completed and data is stored into the external memory (CF card or USB memory).

| Remarks | When the red circle (●) is on the upper right of the icon, it is writing to the external memory, so do not remove the external memory. Files in the external memory may be damaged. |
|---|---|

# 7 Names and functions of the operation screen

## 7-1 Common operations of the operation screen

The status bar is displayed on the top of the screen and displays the status, etc. of this recorder. Normally the back color of the status bar is navy blue but, when the schedule is set, the back color becomes gray for the period other than the scheduled period. (Refer to '9-7 Schedule settings')



■ [Operation] menu

| Menu item | Operation |
|---|---|
| START | The recording starts. |
| STOP | The recording stops. |
| HOME settings | The HOME settings open. |
| MENU settings | The MENU settings open. |

■ [DISPLAY] 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 screen hardcopy to the external memory (CF card/USB memory). |
| Pause | Screen updates are stopped except status bar. Tap the screen to restart display update. All operations such as data acquisition and recording processing except drawing are executed during pause. *When an alarm is activated, pause is removed. |
| Display OFF | Used to turn off LCD display. The display is turned on again by tapping the screen. |
| Split screen | Used to display 2 or 4 separate screens. * only KR3S |
| Magnify/reduce | The trends are displayed by compressing the time axis. (Same magnification to 1/60) |

■ 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 significant can be set but only 1 digit is displayed depending on the screen. |
| BURN | On thermocouple input and resistance thermometer input, disconnection of the input signal is detected. |
| 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 occurs. |
| RJ ERR | The recorder is abnormal. |

* Range that can be indicated for calculated result as follows.

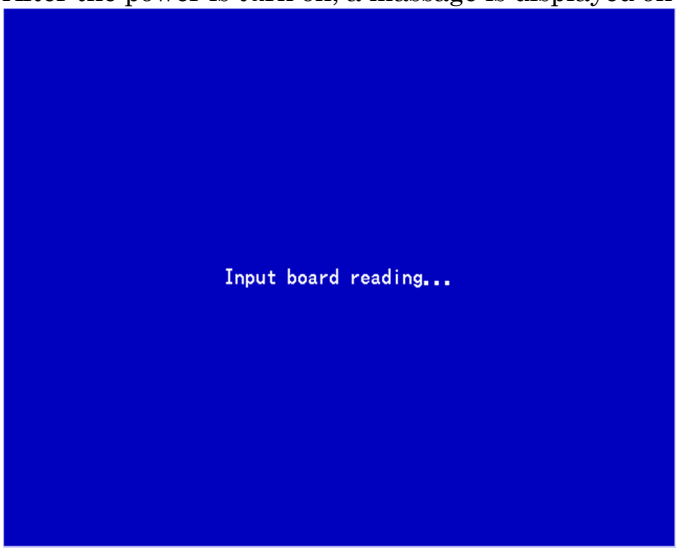
■ Display format is "standard"
Numeric value that excludes decimal point is within ±30000 (Example: -30.000 to +30.000)

■ 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 '9-3-5Common Parameters'.)

Reference

■ At the starting up
After the power is turn on, a massage is displayed on the blue screen as follows.



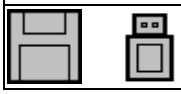

| Message | Contents |
|---|---|
| Initializing… | Reading setting files. |
| Input board reading… | Identifying model of input device and checking communications of input device. |
| Input board writing… | Setting input device. |
| File reading… | Reading measured data from the internal memory. |

Reference

■ Disk icon

'CF card' or 'USB memory' can be selected on [Select external memory] for data saving destination (Refer to '9-11-9 Other settings'). Icon changes by selected external memory.

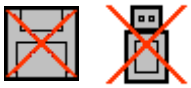
'REC' display and an arrow indicate the status of recording.

| Icon | Arrow | Status |
|---|---|---|
|  | Green, moving vertically. | Recording. |
|  | Gray | The recording is in the stand by state since recording conditions are not established. |
|  | Not displayed | The recording is in the stop state. |

The back color indicates the status of external memory.

| Back color | Status |
|---|---|
| Gray | Remaining space of the internal memory is 11% or more. |
| Yellow | Remaining space of the internal memory is 10% or less. |
| Red | Remaining space of the internal memory is 8M byte or less. |

When X is displayed on the disk icon, the external memory is not inserted.



The circle on the upper right of the icon shows the access status to the external memory.

| Color | Status |
|---|---|
| Not displayed. | Not writing the external memory. |
| Red(●) | Writing the external memory. |

Reference

■ Alarm icon

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

The icon indicates alarm status.

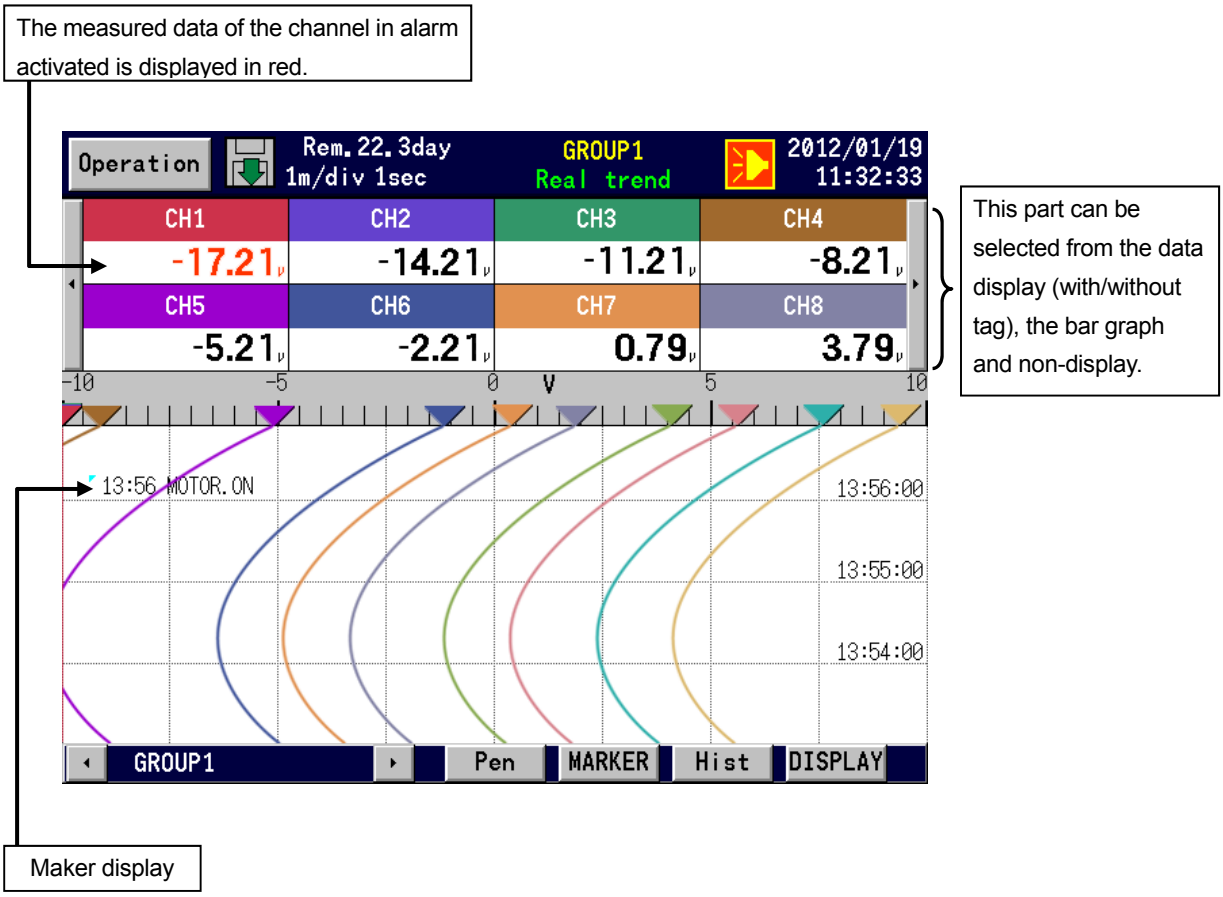
| Icon status | Alarm status | Confirmation (ACK) status |
|---|---|---|
| Lit | Activated | Confirmed |
| Icon blinking | Activated | Not confirmed yet |
| Icon inside blinking | Canceled | Not confirmed yet |
| Not displayed | Canceled or not activated | — |

# 7-2 Real time trend screen

The measuring values and trend at current state can be seen as 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.

■ Display method

Tap [DISPLAY] - [Real trend].



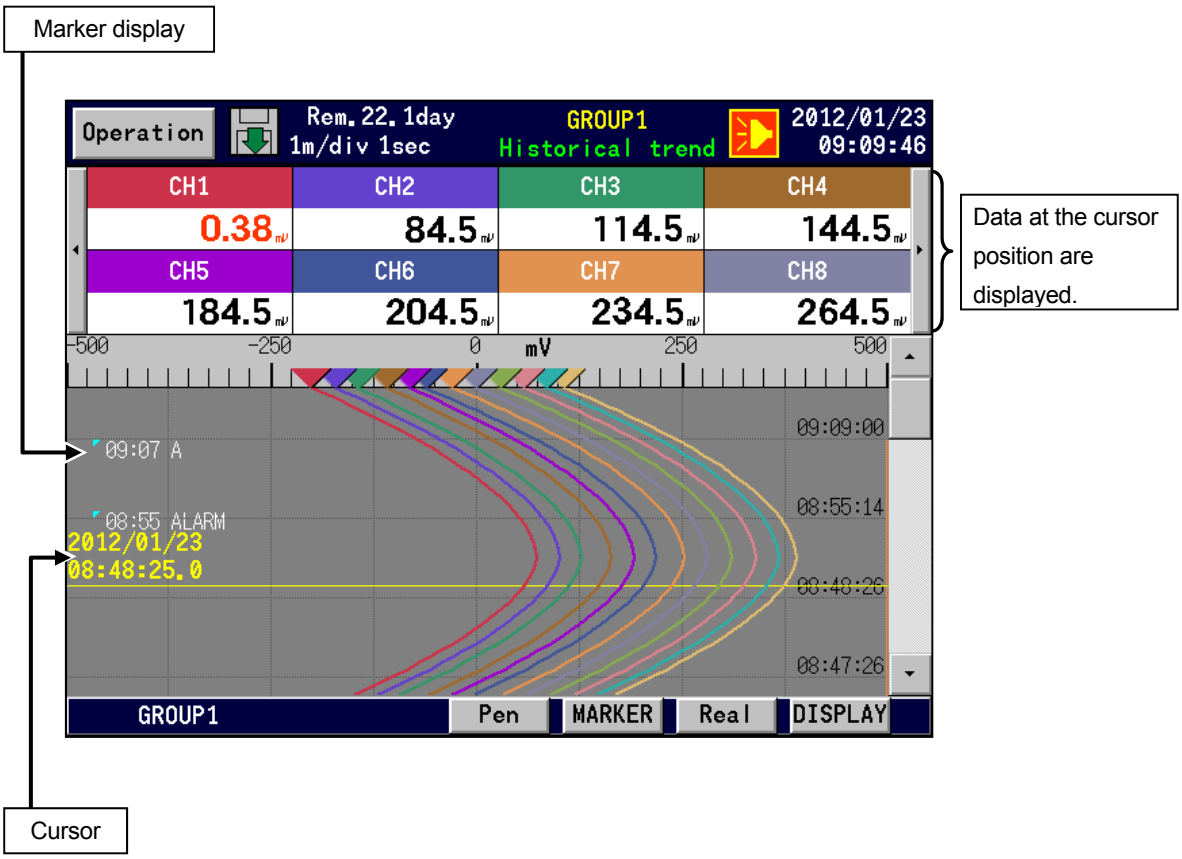

| Remarks | When treatment load of the recorder is high, the recorder prioritizes recording operation. Therefore, display update period of real trend screen changes temporally according to following conditions.<br>・ Writing to the CF card continues more than 1min. ⇒ 'Data value update period' × 5<br>・ Writing to the CF card continues more than 2min. ⇒ 'Data value update period' × 10<br>・ Writing to the CF card continues more than 3min. ⇒ 'Data value update period' × 20<br><br>When high load (state of writing to the CF card continues more than 1min.) and deleting old file at overwrite mode<br>⇒ stops screen update and 'Deleting old file. Please wait.' is displayed.<br>Refer to '9-3-5 Common Parameters' for 'Data value update period'. |
|---|---|

# 7-3 Historical trend screen

Display recorded data that is saved in the internal memory.
Tapping the trend displays a cursor and shows measuring values at the current state.

■ Display method

Tap [DISPLAY] - [Historical trend]. Displayed data is the latest recording data. If real trend is displayed, screen can be switched by tapping on [Hist] button on the bottom of the screen.



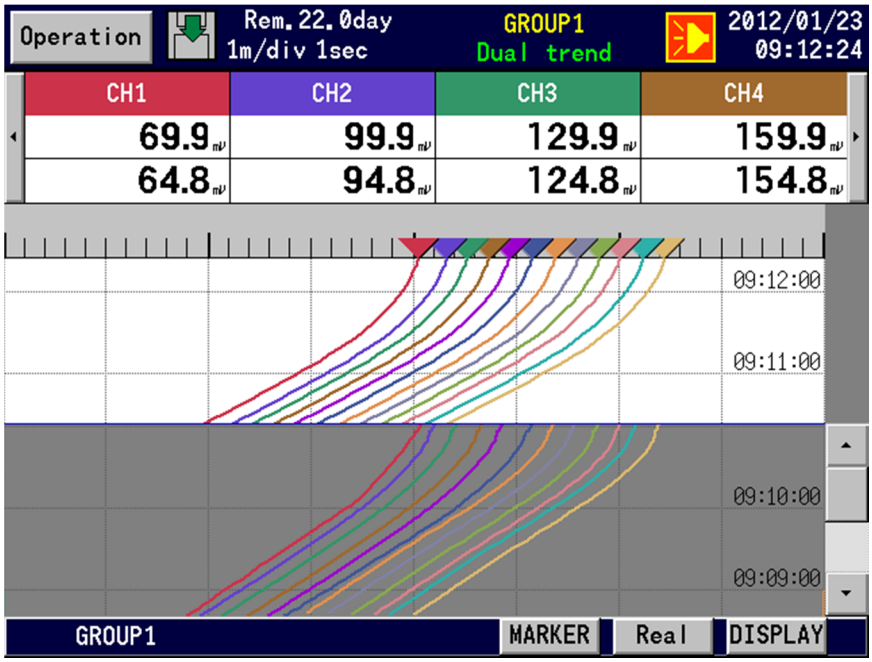

When the data format of the file to be displayed is 'Maximum/Minimum', 'H/L' is displayed on the screen upper right. This indicates the values displayed are maximum or minimum.
Tap H/L icon to switch.

# 7-4 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 the first scale plate is displayed.

■ Display method

Tap [DISPLAY] - [Dual trend].

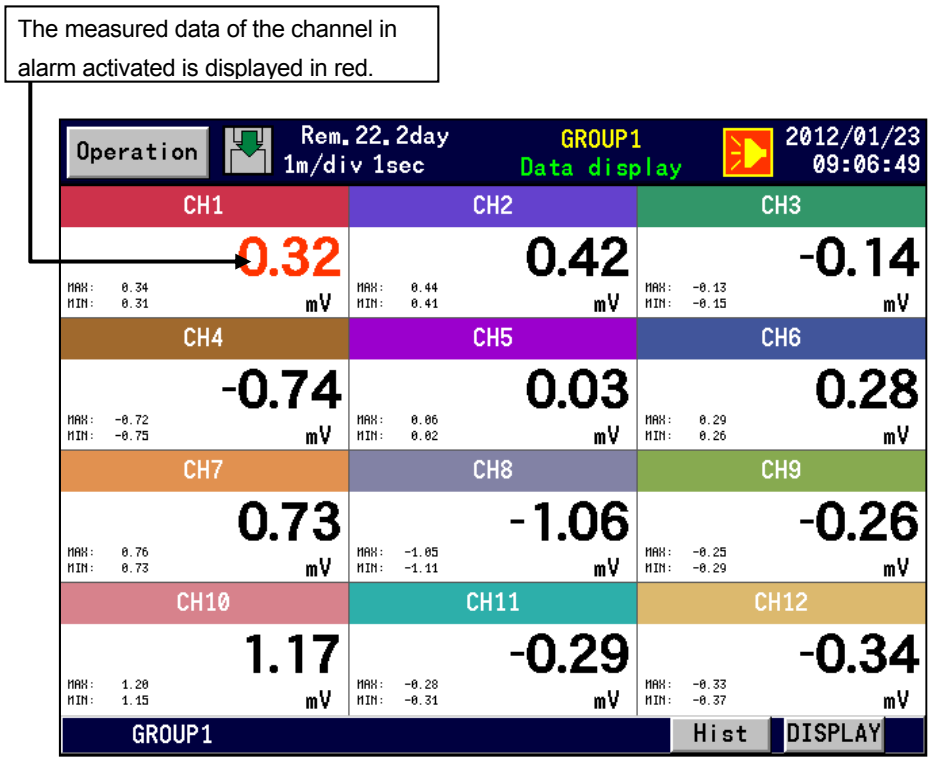



Up: Current measured values
Down: Display of data at the cursor position on the historical trends

# 7-5 Data screen

Displays the 'measured data of channels'.
Displays 'data display frames' or the frame data that is registered at channel settings.
Number of the frames <KR2S>1, 2, 3, 4, 6, 8, 9, 10, 12, 24, 44
<KR3S>1, 2, 3, 4, 6, 8, 9, 10, 12, 24, 36, 48, 56

■ Display method
Tap [DISPLAY] - [Data display].



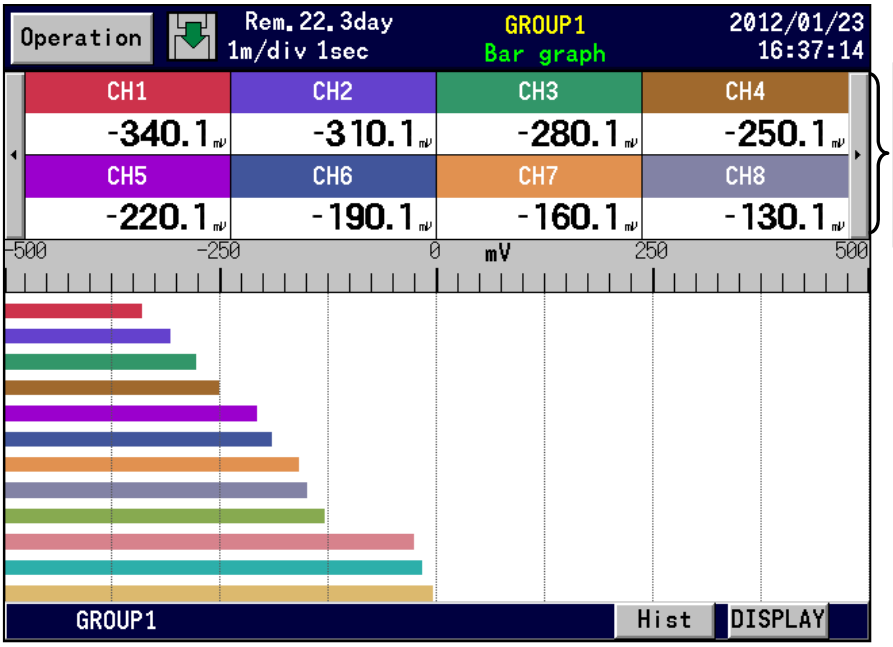

When the number of displayed channels is less than 12, maximum and minimum values of these channels can be displayed.
The values are reset at the record start. Non-display of these values is available.
(Refer to 9-3-5 'Common parameters')

# 7-6 Bar graph screen

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

■ Display method

Tap [DISPLAY] select [Bar graph] from the menu.




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

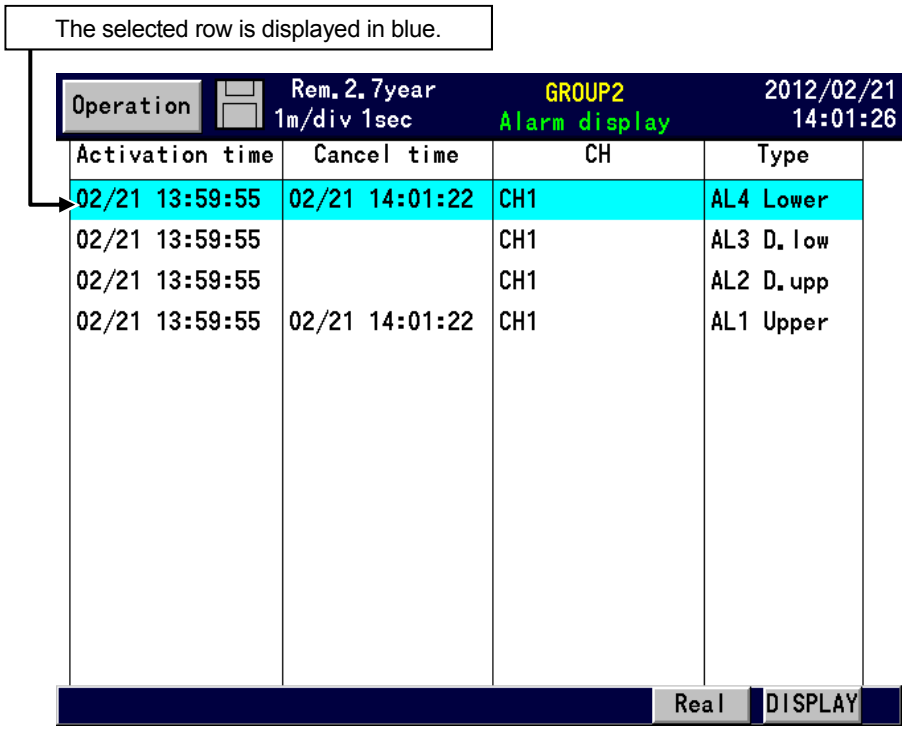
*The reference position of the bar graph can be set.
(Refer to '9-3-5 Common parameters')

# 7-7 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.

■ Display method

Tap [DISPLAY] select [Information] - [Alarm display] from the menu.




By tapping the row of the list, small screen is displayed.

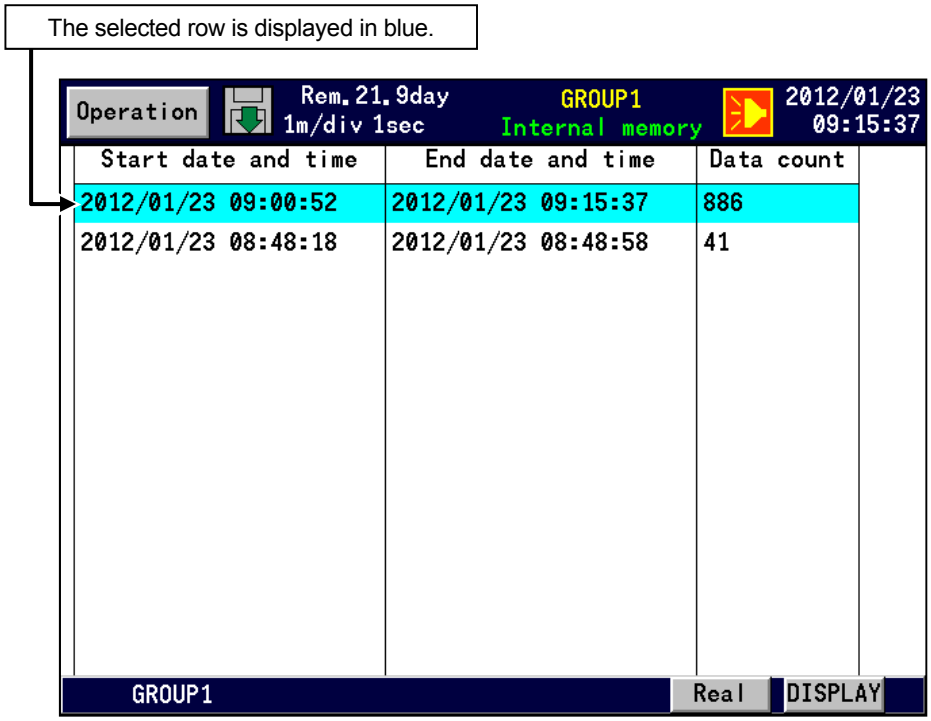
| | |
|---|---|
| Trend display | The screen is jumped to the trend at the activated date/time of the selected row. When the alarm was not recorded at its activation or the file is not found, the screen cannot be jumped. |

# 7-8 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.

■ Display method

Tap [DISPLAY] select [Information] - [Internal memory] from the menu.




By tapping the row of the list, small screen is displayed.

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

Reference

■ 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, tapping [SPOT] 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)

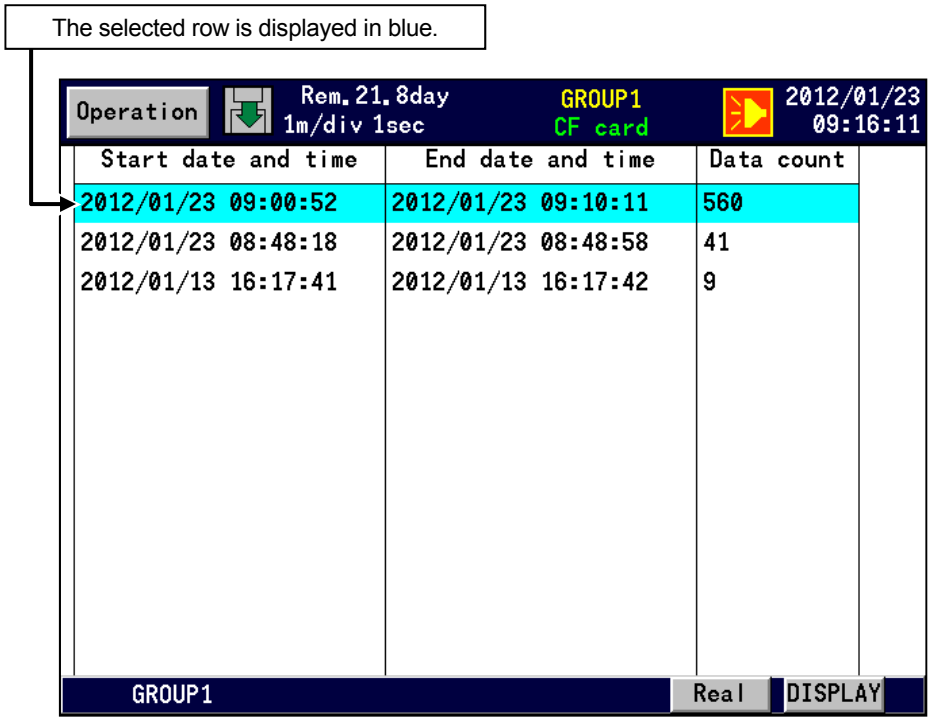
The total volume of files that can be saved in the internal memory is 64KB x (125 ÷ (Number of groups used) – 2). If the volume exceeds it, the files are deleted in chronological order.

# 7-9 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.

■ Display method

Tap [DISPLAY] select [Information] - [CF card]/ [USB memory] from the menu.




By tapping the row of the list, small screen is displayed.

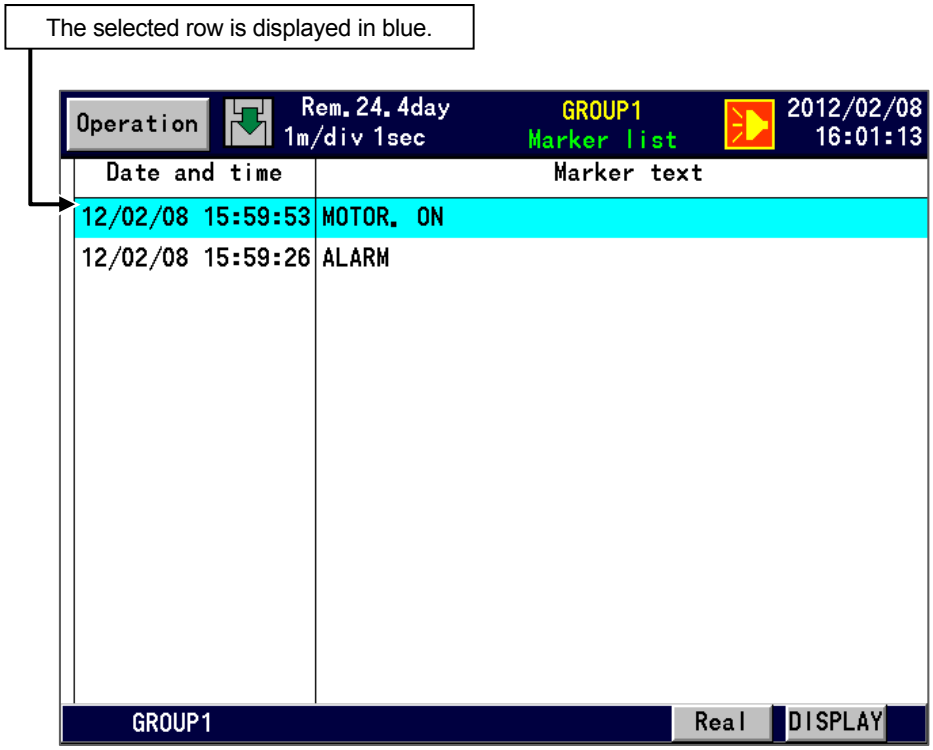
| | |
|---|---|
| Trend display | The trends recorded in the file of the selected row are displayed. (Binary only) |
| Delete | The file of the selected row is deleted. |
| FTP transmission | The file of the selected row is transferred with FTP. |
| Copying to the USB memory (Only for the CF card screen) | The file of the selected row is copied to the USB memory. This item is not displayed if the USB memory is not inserted. |
| File information | Displays detail information of each file. (Binary only) |

# 7-10 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.

■ Display method

Tap [DISPLAY] select [Information] - [Marker list] from the menu.

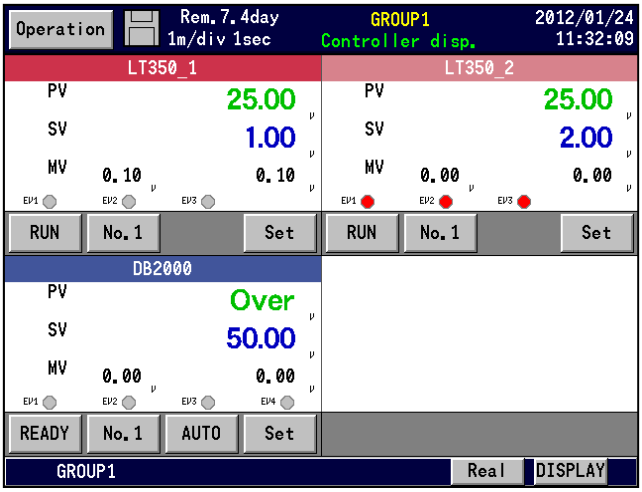



By tapping the row of the list, small screen is displayed.

| | |
|---|---|
| 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. |

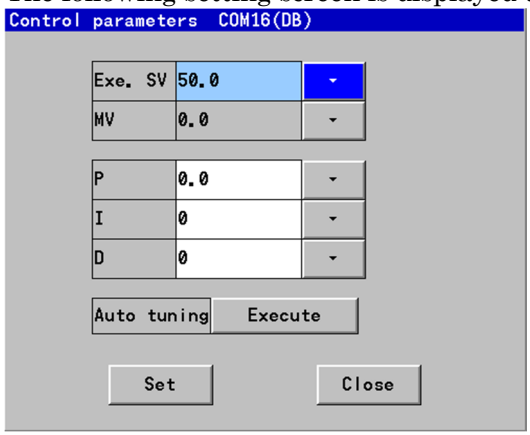
# 7-11 Controller display screen

When controllers are connected with low order communications and channels are registered, 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 4 sets are displayed on 1 screen. In case of 5 sets or more, the controllers are displayed by switching with the arrow buttons displayed on right and left.



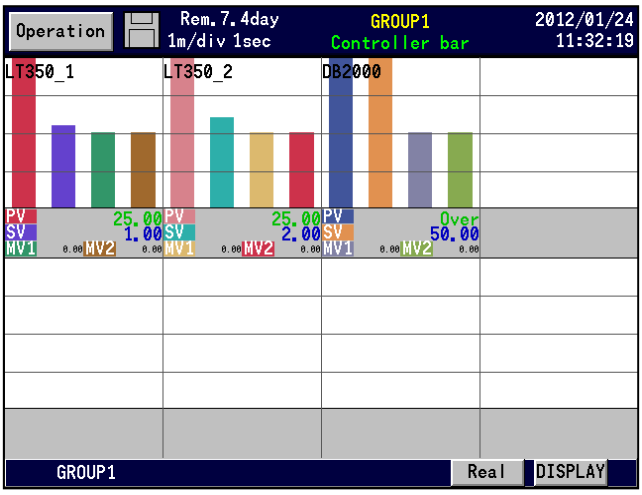

■ Contents of each function button

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

| | |
|---|---|
| RUN/READY | Selects RUN/READY of a controller |
| No.1/2 | Selects execution SV1/2 of a controller<br>This button is not displayed for LT series controllers except for LT8 series. |
| AUTO/MANUAL | Selects the modes of AUTO/MANUAL of a controller<br>This button is not displayed for LT series controllers except for LT400 series. |
| SET | The following setting screen is displayed to enable settings.<br>  <br>SV, MV, P, I, D: Each parameter of a controller is set.<br>*P, I, D setting is only enabled on DB.<br>Auto-tuning: Starts auto-tuning |

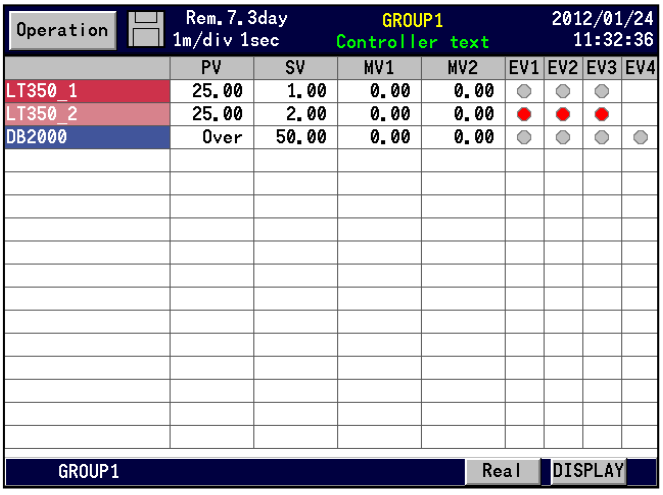
# 7-12 Controller bar graph screen

When controllers are connected with low order communications and channels are registered, 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, MV1, and MV2 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.




# 7-13 Controller text screen

When controllers are connected with low order communications and channels are registered, the controller text screens can be displayed.
By dividing the channel registered in the group selected into a frame for each controller, PV, SV, MV1, and MV2 are displayed with texts. Moreover, alarm activation state (EV) of a controller can be confirmed. If the alarm is activated, it shows ●.
The controllers up to 16 sets can be displayed.



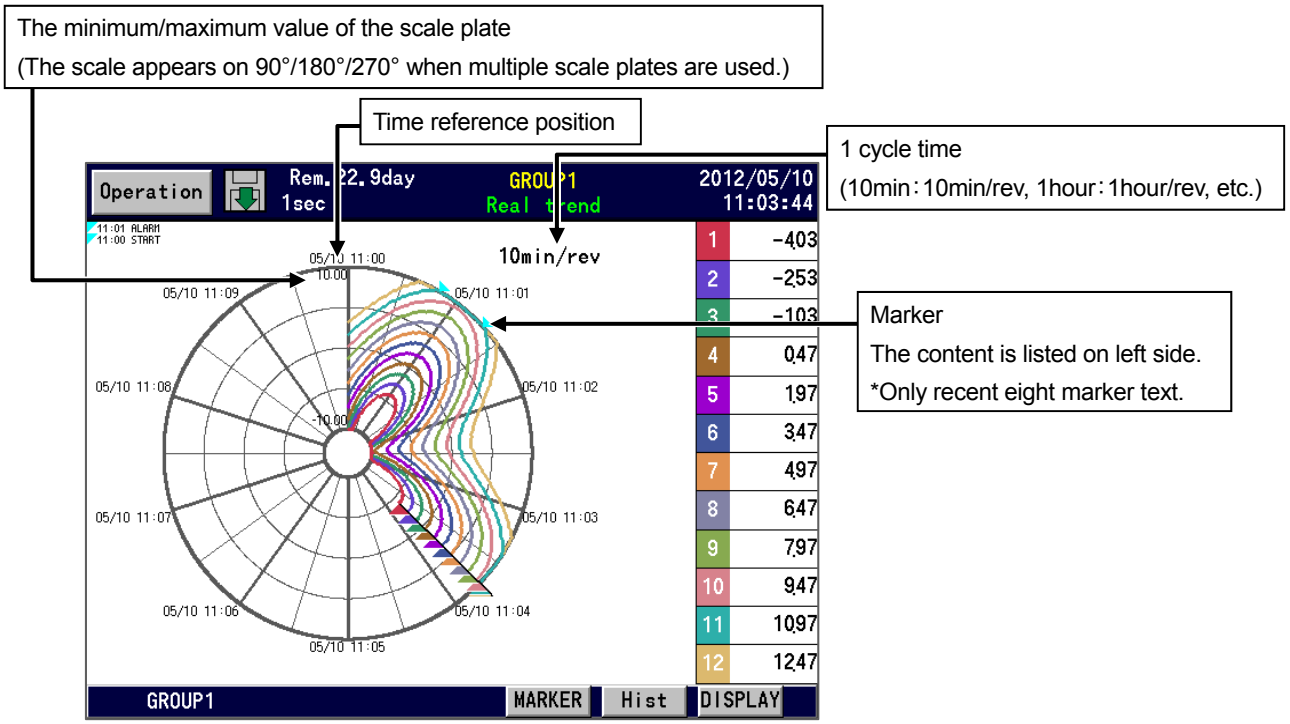
# 7-14 Circular trend screen

The data can be displayed as circular trend.

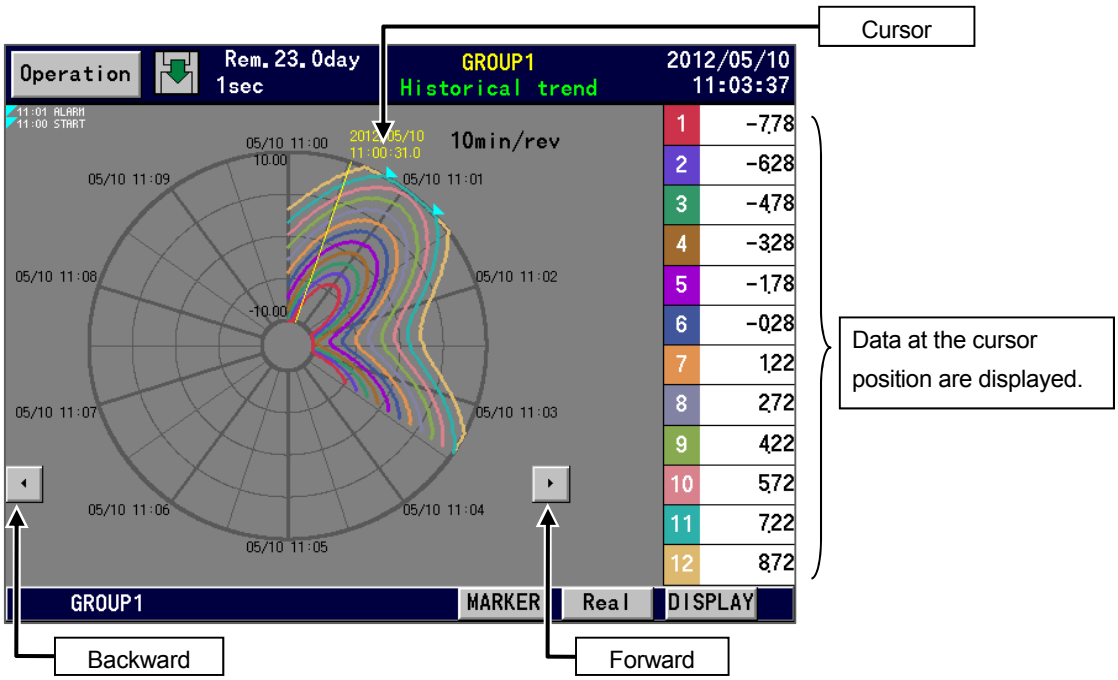
■ Display method

Tap the [Operation] button and then tap [MENU settings] - [Display settings] - [Common parameters]. At the [Common parameters] set [Trend direction] 'Circle'.
(Refer to '9-3-5Common Parameters'.)
The detailed setting method refer to '9-3-7Circular settings'.

## 7-14-1 Real time trend screen

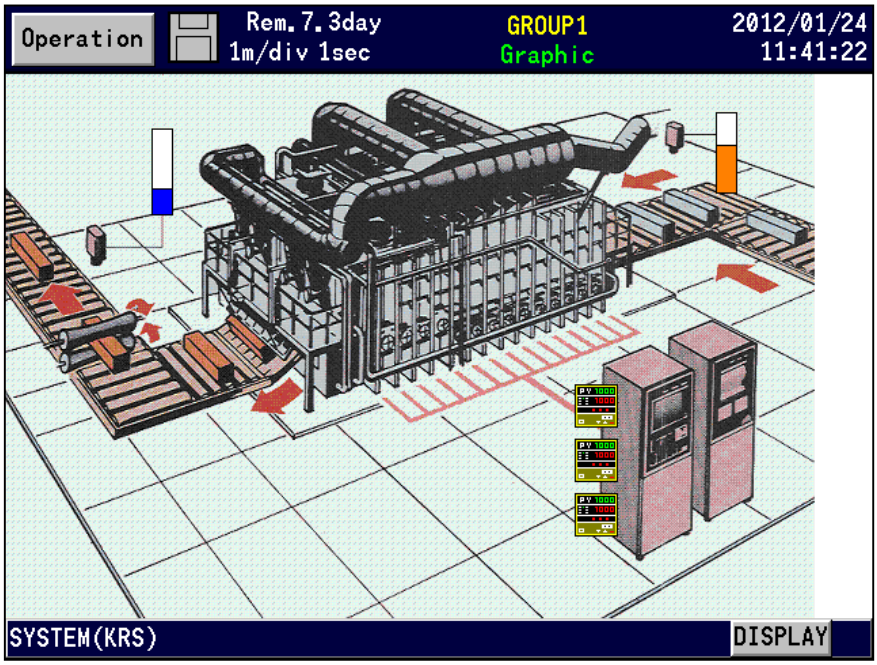



## 7-14-2 Historical trend screen



# 7-15 Graphic screen (option)

On the KR screen, user original screen is available with the preconfigured including character (label), channel measured value (data), shapes (rectangle, square, oval, and circle) and image (.icon, .bmp file). *inside of the ( ) indicate the words of the KR Screen Designer.
Up to 5 graphic screens are able to register.
Low order communications with controller (CHINO's product) provide part of setting change in the low order instruments on the KR screen (compatible instrument: LT series, DB series).



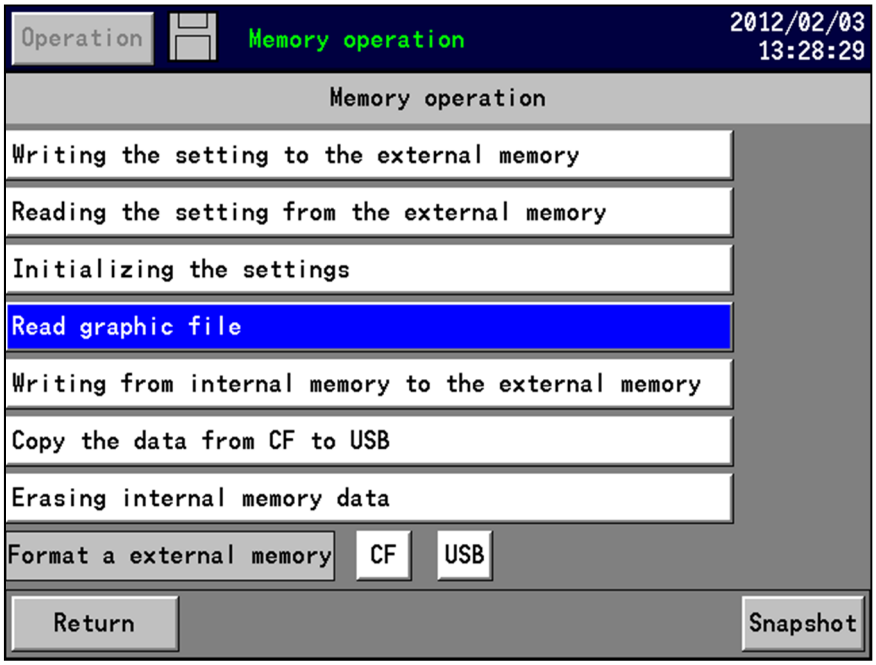

## 7-15-1 Graphic screen reading method

Reading procedure differs from before the operation and during the operation.
(1) Before the operation.
(2) During the operation.

(1) Before the operation
Set CF card (which the graphic screen configured file is stored) into the KR during power is turned off.
When the power is turned on, information of the graphic screen is started to be read automatically.

(2)During the operation

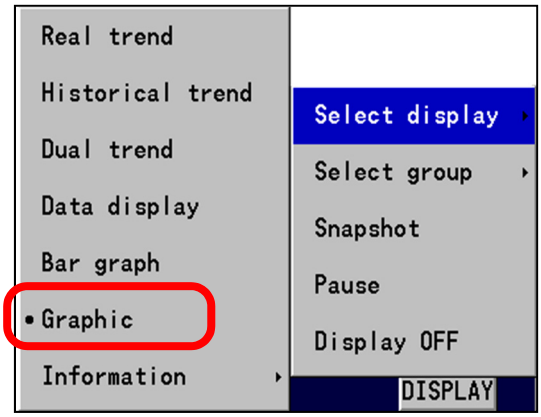
When reading the information of the graphic screen during the operation, operate from setting menu. Set CF card (which the graphic screen configured file is stored) into the KR. On the operation screen, tap [operation] button and then tap [MENU settings]-[Memory operation]-[Read graphic file]. Confirmation dialog is appeared, selecting [Yes] allows start reading the information of the graphic screen.




Next, it will describe operation after the reading.

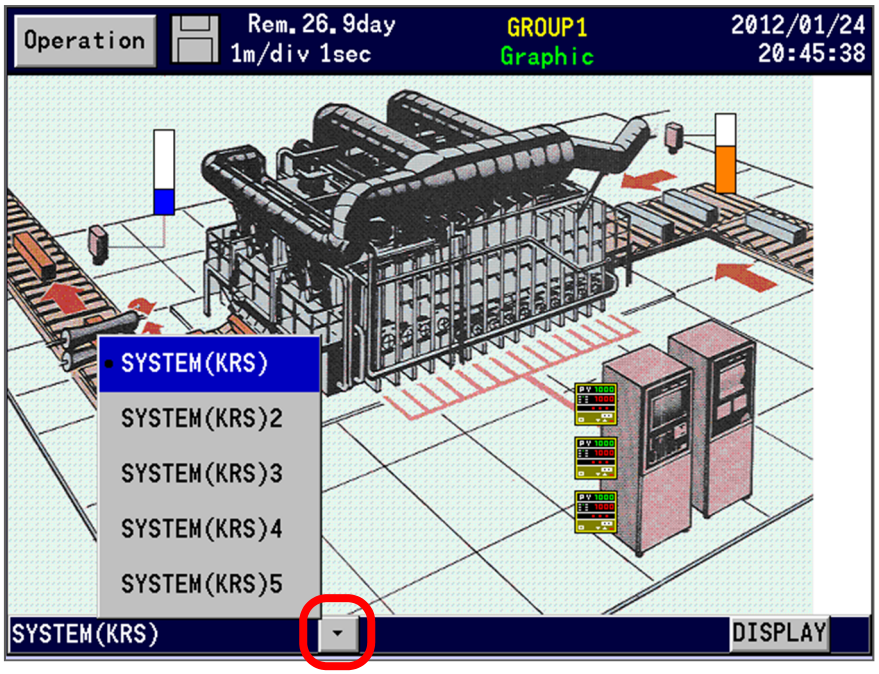
## 7-15-2 Display method

On the operation screen, tap [DISPLAY] button, and then select [Graphic] from the list of [Select display].



## 7-15-3 Graphic screen switching method

By tapping the [▼] on the bottom of the screen, screen list is displayed and switching of graphic screen is enabled.

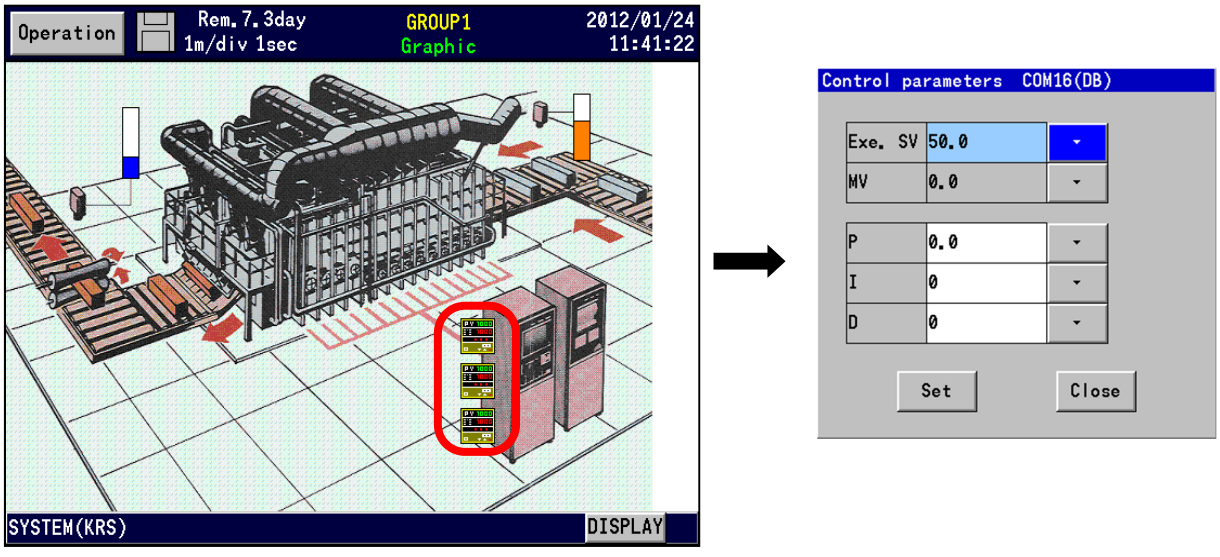



## 7-15-4 Operation on the graphic screen

Following functions are available to the parts of which channel registration and the low order instrument number are registered.

■ Low order instrument number (controller of our company) is registered part.
By tapping the part, controller settings screen is displayed.
Applied instrument: LT series, DB series

[Control parameter]
Execution SV, MV, P, I, D
*In P, I, D setting, DB is only enabled.

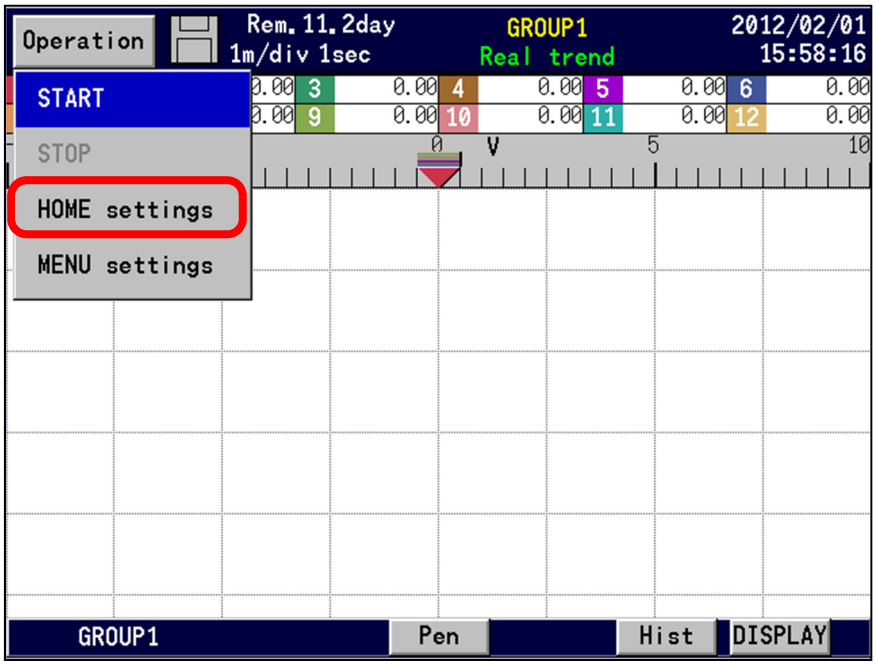


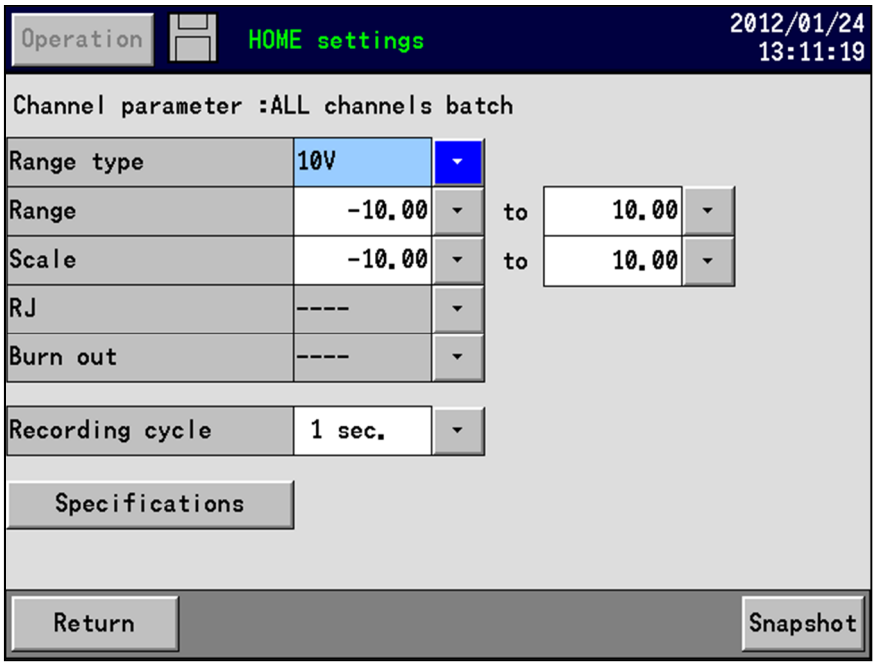
# 8 HOME settings

## 8-1 Setting in 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.

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



■ Setting the range type

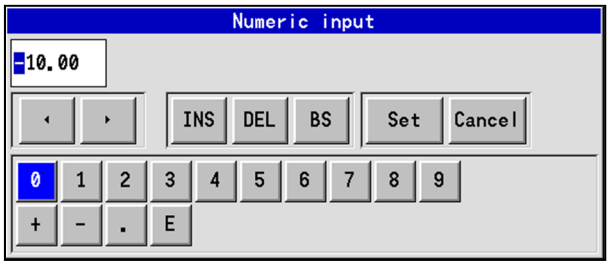
| | |
|---|---|
| DC voltage | 13.8mV, 27.6mV, 69mV, 200mV, 500mV, 2V, 5V, 10V, 20V, 50V |
| Thermocouple | K, E, J, T, R, S, B, N, W-WRe26, WRe5-WRe26, PR40-20, NiMo-Ni, CR-AuFe, Platinel2, U, L |
| Resistance thermometer | Pt100, JPt100, Pt50, Pt-Co |

■ Setting the range

Set the range.

■ Setting the scale

Set the scale.




*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. |

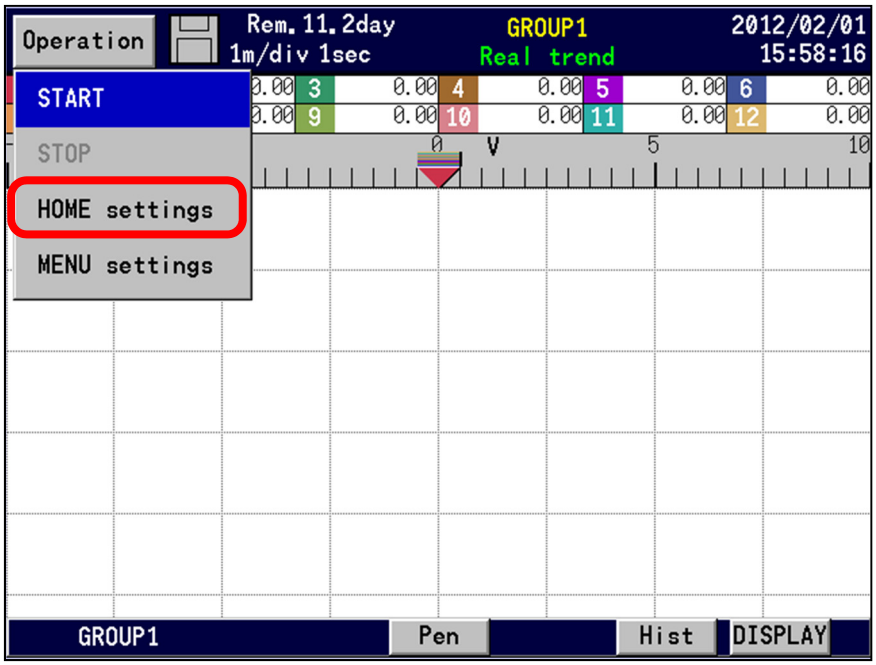
■ Setting the recording cycle

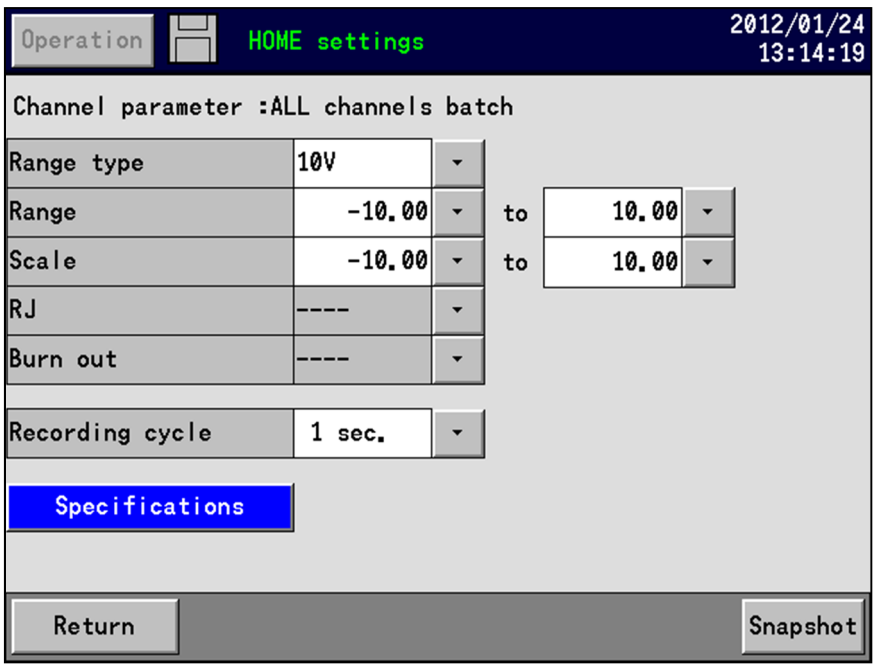
| | |
|---|---|
| Second | 1 second, 2 seconds, 3 seconds,<br>5 seconds, 10 seconds, 15 seconds, 20 seconds, 30 seconds |
| Minute | 1 minute, 2 minutes, 3 minutes, 5 minutes, 10 minutes, 15 minutes,<br>20 minutes, 30 minutes, 60 minutes |

## 8-2 Confirming the specifications in HOME settings screen

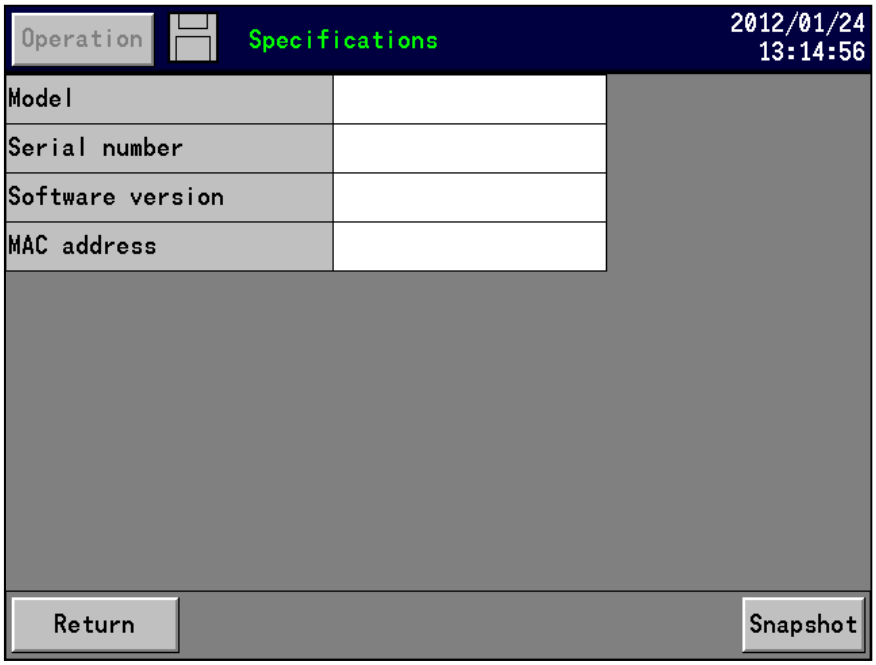
The information of specifications of this recorder can be confirmed.
When you have any question on this recorder, contact your nearest distributor after confirming specifications by this screen.

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




Tap [Specifications].

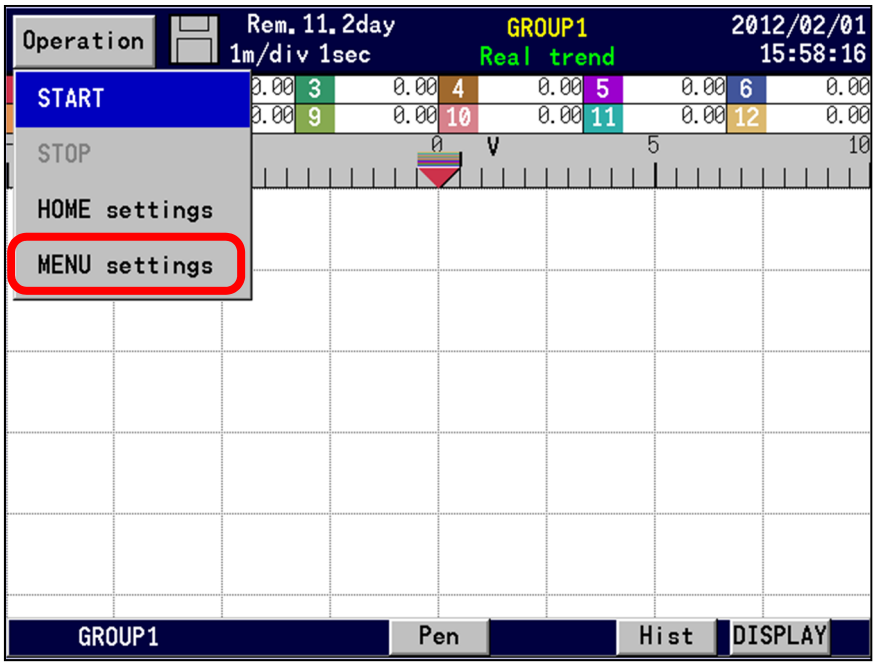


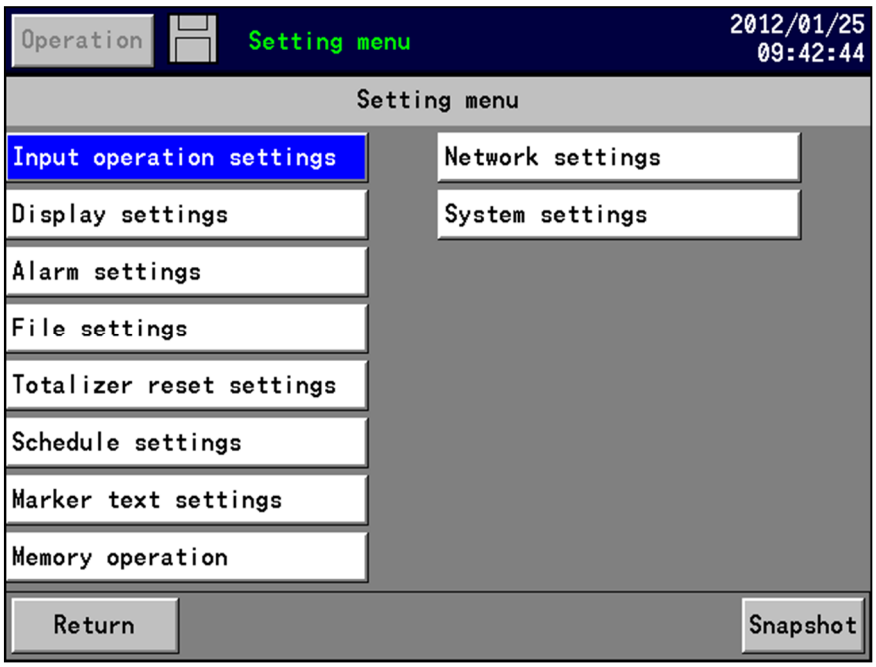

In the specifications confirmation screen, the followings can be confirmed.

- Model
- Serial number
- Software version
- MAC address

# 9 MENU settings

Tap the [Operation] button and then tap [MENU settings], the screen is switched to the parameter settings screen.

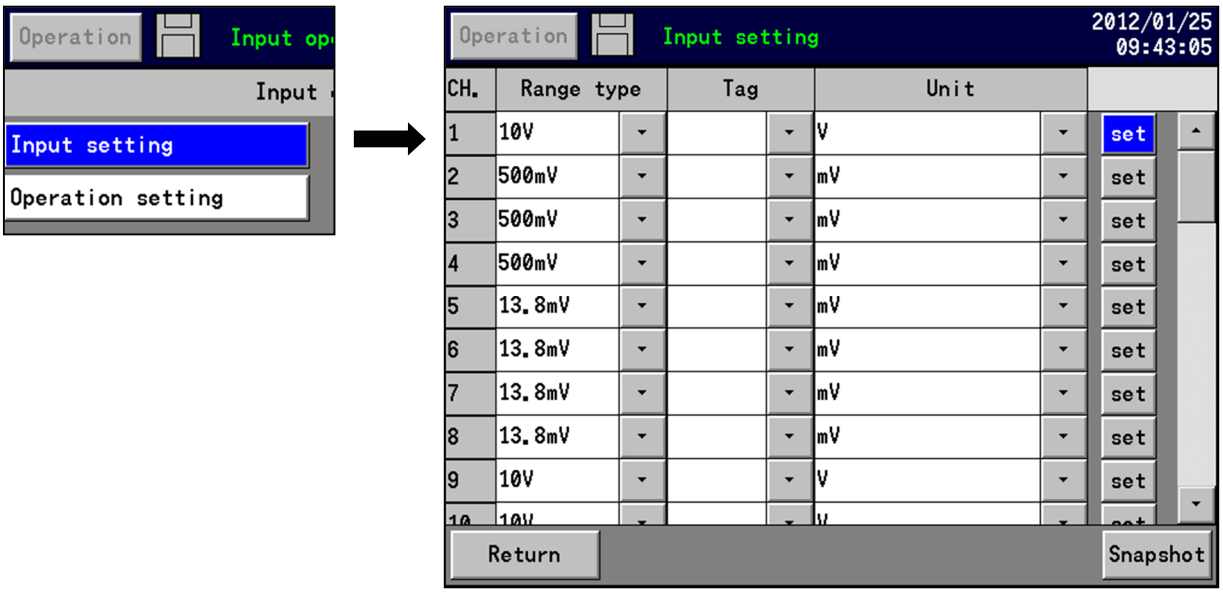



Setting menu is displayed, tap an item to set.

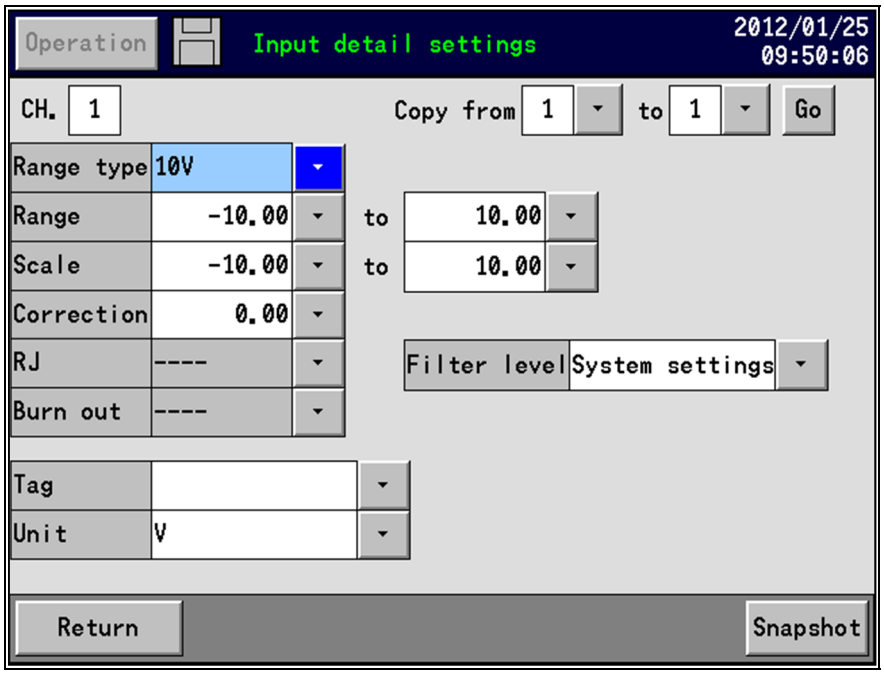
# 9-1 Input settings

Tap the [Operation] button and then tap [MENU settings] - [Input operation settings] - [Input setting].
On this screen, range, channel tag, etc. of the each channel can be set.




*When Low order communication (read) option is effective, the item for the low order communication registration is added. Please see '12-2 Compatible low order (read)' also.

By tapping a [Set], the detailed setting screen for this channel is displayed.



■ Setting the range type

(Analog input)

KR2S6* : CH1 to 6 KR2S2* : CH1 to 12

KR3S2* : CH1 to 12 KR3S4* : CH1 to 24 KR3S6* : CH1 to 36 KR3S8* : 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

KR2S**-*7* : CH41 to 44 KR2S**-*8* : CH41 to 42

KR3S**-*7* : CH121 to 124 KR3S**-*8* : CH121 to 122

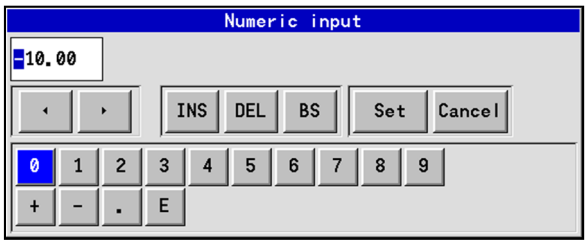
| | |
|---|---|
| Digital input | DI |
| Pulse input | Pulse(+)、Pulse(-) |

■ Setting the range

Set the range.

■ Setting the scale

Set the scale.




*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.

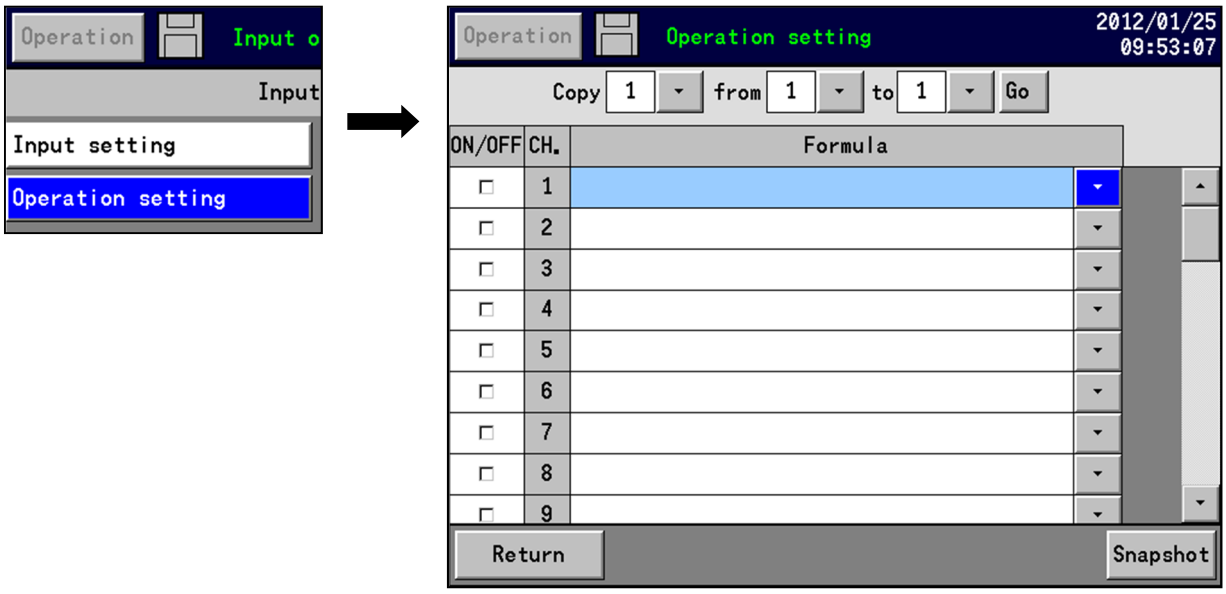
■ Copying the parameters with the copy function


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

| Remarks | ■ Combination of functions<br>The alarm settings are changed automatically so that the channel to which the input settings (range and scales, etc.) was changed to correspond to the input settings.<br>Please see '9-4 Alarm settings' also. |
|---|---|

# 9-2 Operation settings

Tap the [Operation] button and then tap [MENU settings] - [Input operation settings] - [Operation setting], the following screen is displayed.
On this screen, calculation of each channel can be set.




■ 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

Tapping the [▼] of the formula column, the character entering screen is displayed. Enter the characters (maximum of 48 characters).
Alphabetic characters used in formula are all capital letters.

## 9-2-1 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 | / | $X / Y$ | |
| Remainder | % | $X \% Y$ | |
| Exponential | ^ | $X \wedge Y$ | |

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

■ Comparison calculation

The comparison calculation is performed and the result is returned as 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.

Let *X* and *Y* express 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)* | Refers to the value of specified channel previous to its calculation*1 |
| Calculation result data | PCH | *PCH(X)* | |
| Previous calculated result data | OCH | *OCH(X)* | Data at the previous scanning (before 0.1 seconds)*3 |
| Totalizer | ITG | *ITG(X)* | Refer to 2) Totalizing operation*2 |
| F value | FV | *FV(X#To#Z#R)* | Refer to 3) F value*2 |
| 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*2 |
| Moving average (5 minutes) | AVEH | *AVEH(X#T)* | |
| Past data (an hour) | OLD | *OLD(X#T)* | Refer to 7) Past data*2 |
| Past data (5 minutes) | OLDH | *OLDH(X#T)* | |
| First-order leg filter | IIR | *IIR(X#T)* | Refer to 8) First- order leg filter*2 |
| Increment per time | PLS | *PLS(X#T)* | Refer to 9) Increment per time |

*1 Specify analog input channel or DI input channel.

*2 Do not use same function more than twice in a calculation formula. Result will not be correct.

*3 If referring to a channel performing a totalization in operation settings, please note that OCH function cannot be used.

* *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 |
|---|---|---|---|
| Internal memory remaining space | CF | *CF(A)* | A = Unit of remaining space<br>0: MB<br>1: Minute<br>2: Hour<br>3: Day |
| Instrument abnormal detection* | KRERR | *KRERR()* | Instrument abnormal detection<br>0: Normal<br>1: Abnormal |

*Instrument abnormal: data saving memory error (not enough space, malfunction etc.), abnormality in temporary storage memory, malfunction in input board

■ Other function

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

## 2. Totalizing operation

For the totalizer, the ITG 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),~~ ITG(1)/100

For the totalizer reset, refer to '9-6 Totalizer reset settings'.

(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
$D_n = Dn\text{-}1+[(PVn + PVn\text{-}1)\times(Tn\text{-}Tn\text{-}1)]\div 2$
$D_n$ : 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.

*Totalizing operation is executed every 0.1 second regardless of the sampling rate.

## 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.
$\int 10Adt$ Provision: $A = (T\text{-}To) \div Z$ 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.
$((B\text{-}0.000662\times1013.0\times(D\text{-}W))\div A)\times100$
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 second |
| 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 second |
| 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 calculation 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.

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 direction display

Entering method of the formula

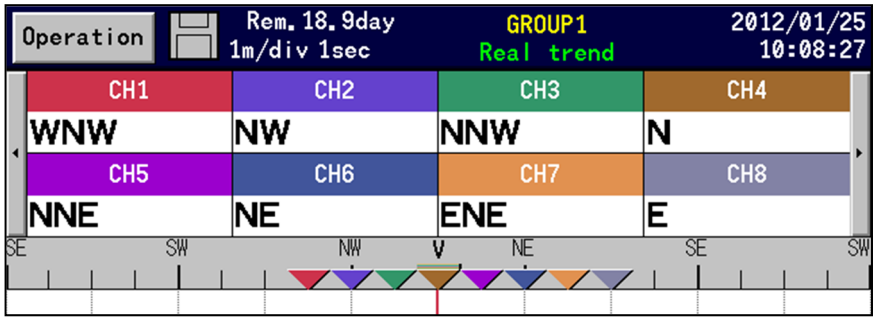
AZI(A)

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

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)**

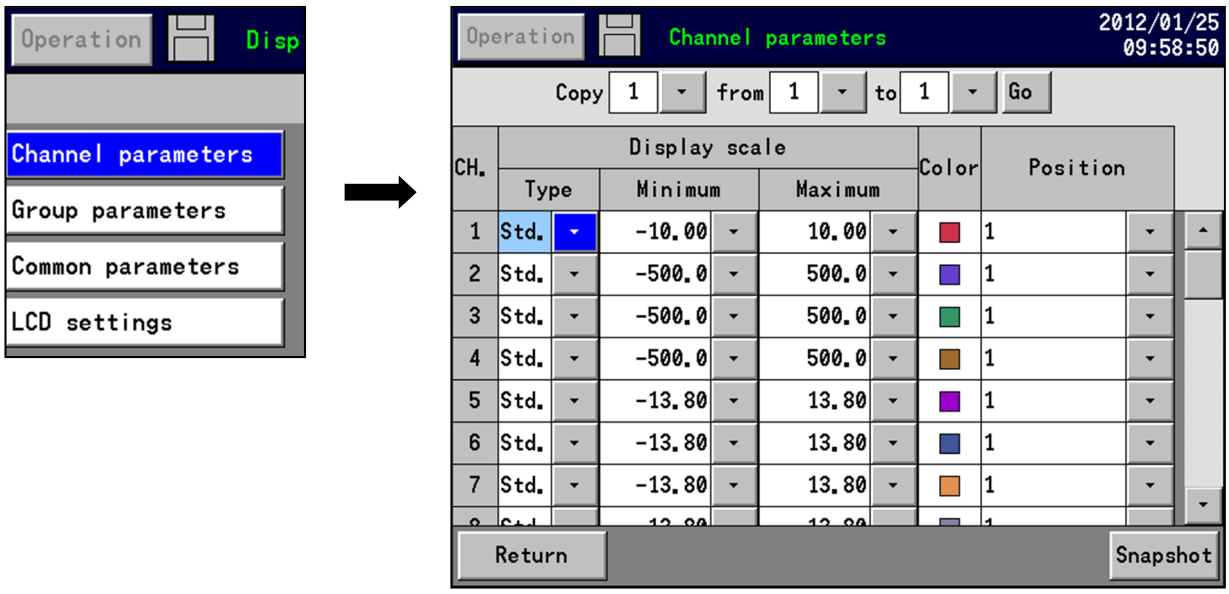
When the data of Channel 1 is 100 or more and the data of Channel 2 is 50 or less, it becomes 1.

| Remarks | ■ Combination of functions<br>The following functions cannot be used together. The results are not calculated correctly.<br>ITG, AVE, AVEH, OLD, OLDH, IIR<br>Example: AVE(OLD(1#10)#60) → NG |
|---|---|

# 9-3 Display settings

## 9-3-1 Channel parameters

Tap the [Operation] button and then tap [MENU settings] - [Display settings] - [Channel parameters], the following screen is displayed.
On this screen, types of display, display scale of the each channel can be set. Color of the waveform graph and display position can also be set.




■ 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.<br>[Expo]: Minimum and maximum values are set in the exponent format. The screen is also displayed in the exponent format. The significant 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<br>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.<br>The maximum and minimum values are displayed with the number of digits after decimal point displayed in the screen. |

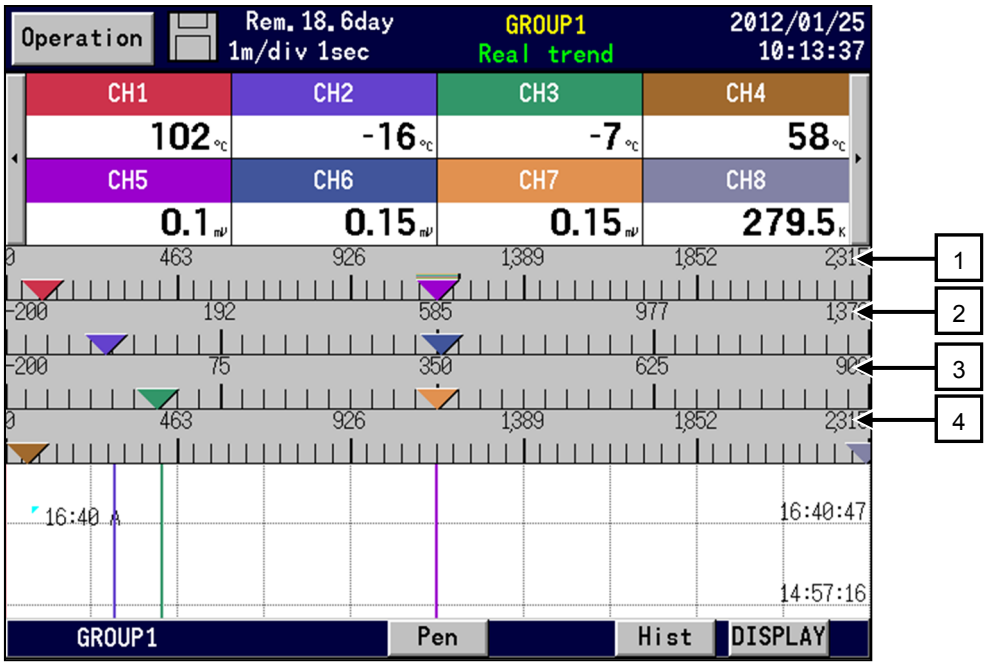
■ Setting the color of the graph waveform

Select the color of the graph waveform.
KR2S……12 colors
KR3S……48 colors

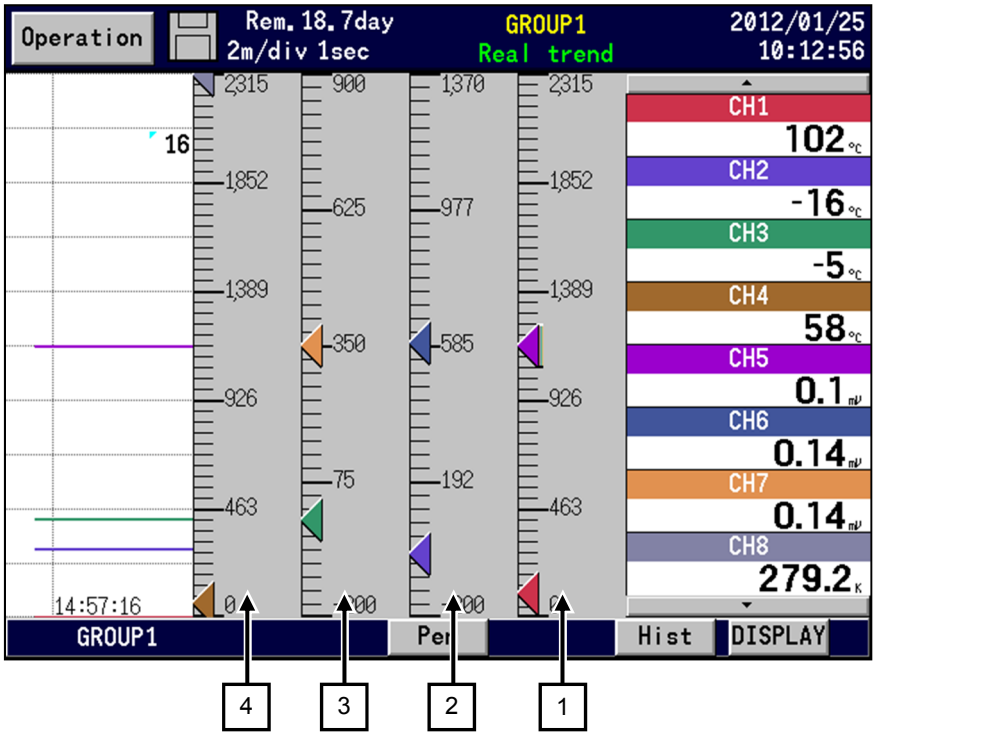
■ Setting the scale position

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

For the vertical trend graph




For the horizontal trend graph

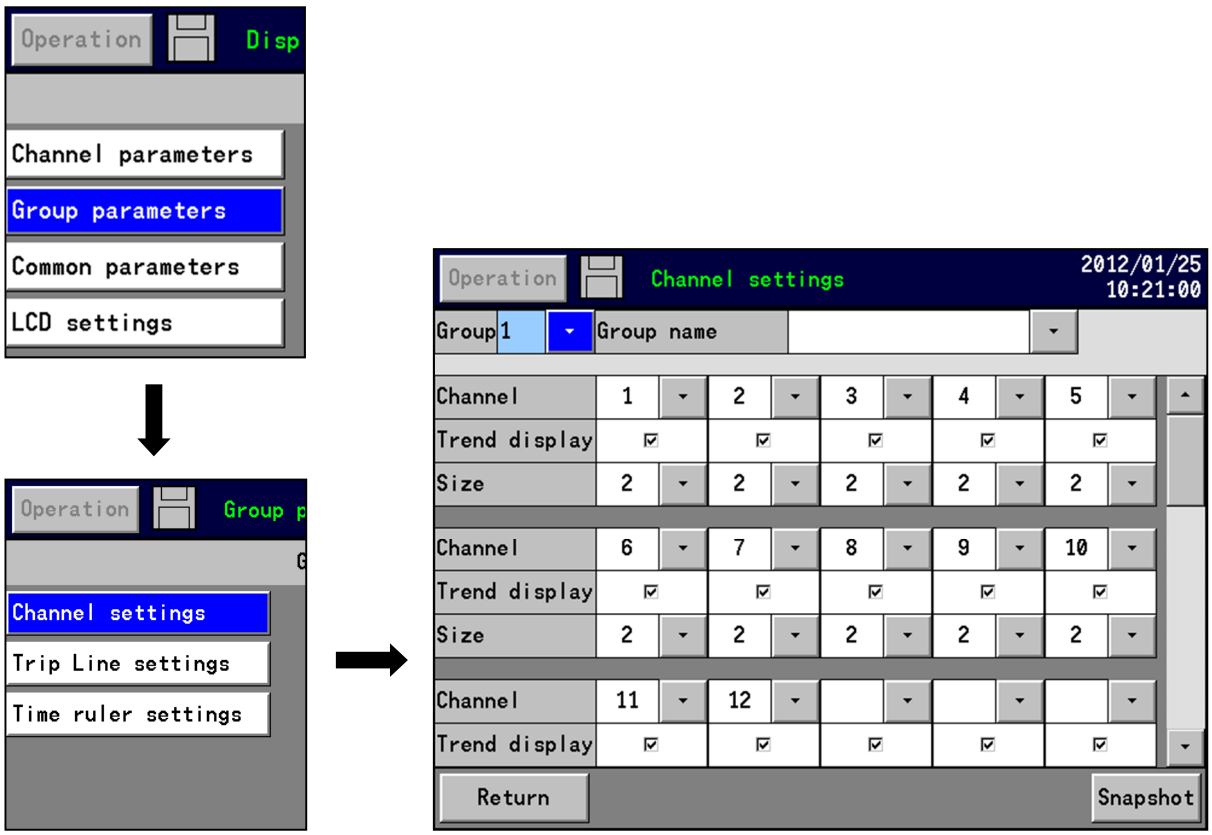



■ Copying the parameters with the copy function


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.

## 9-3-2 Channel settings

Tap the [Operation] button and then tap [MENU settings] - [Display settings] - [Group parameters] - [Channel settings], the following screen is displayed.
The setting items on this screen are managed by each group.
By select a group number, registering channels to be displayed on the group's graph is available.




■ 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

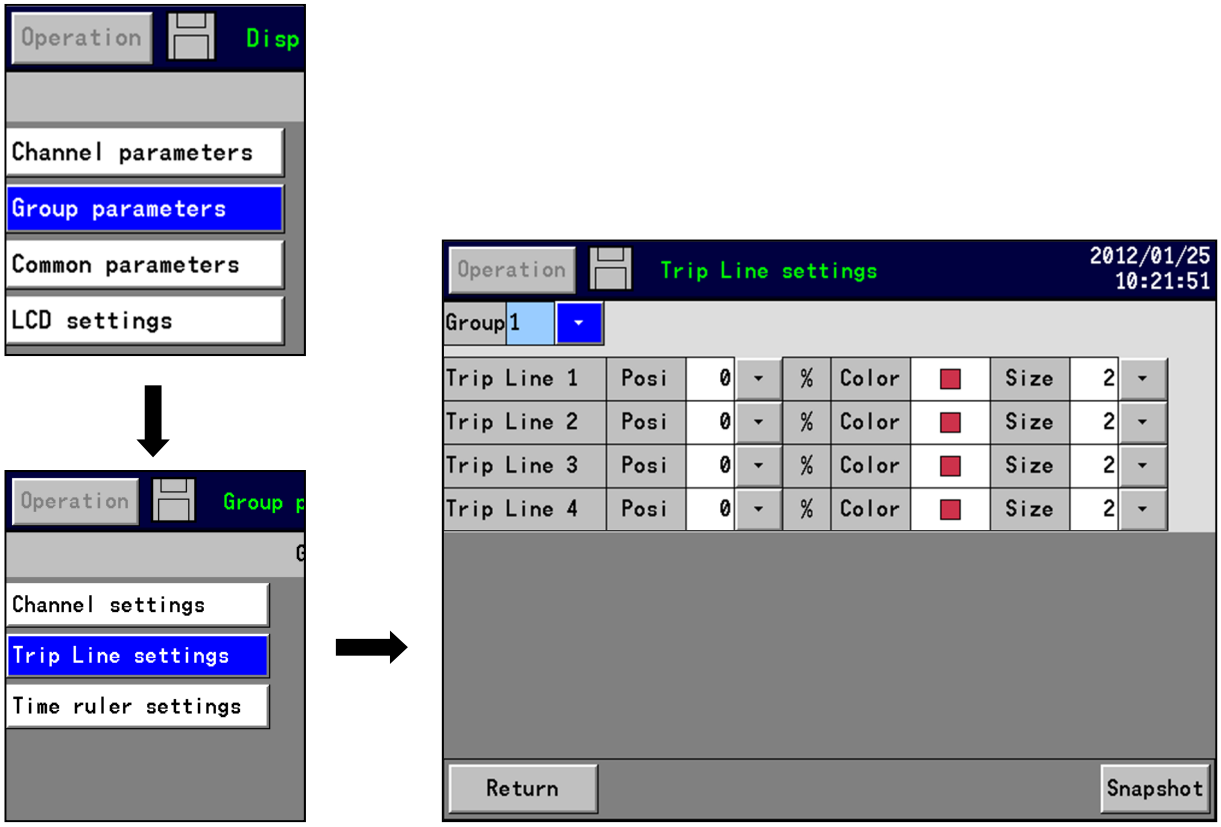
By tapping trend display switches check/un-check.
The trend with un-check is not displayed even if the channel has been registered; however the data is recorded in the file.

■ Size

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

## 9-3-3 Trip line settings

Tap the [Operation] button and then tap [MENU settings] - [Display settings] - [Group parameters] - [Trip Line settings], the following screen is displayed.
The setting items on this screen are managed by each group.
By select a group number, setting trip line to be displayed on the group's graph is available.



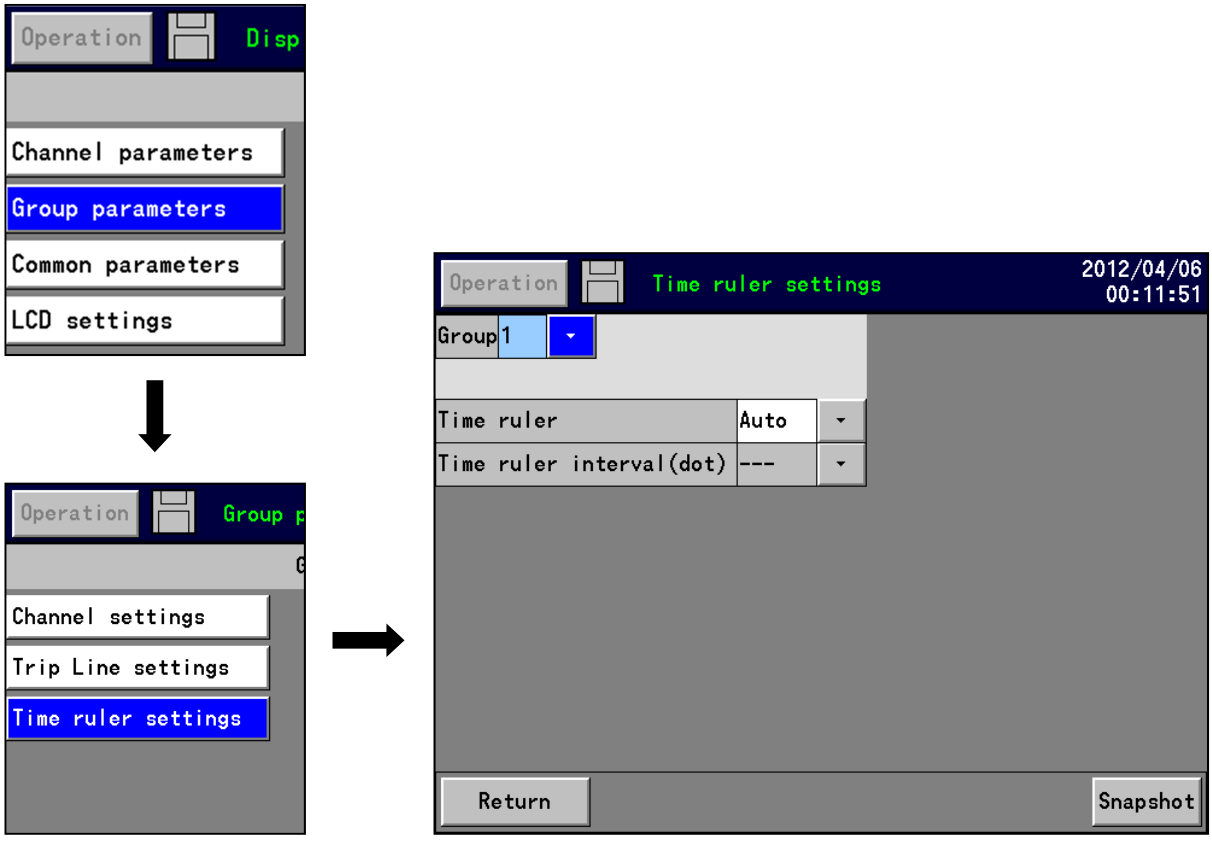

■ Setting the trip line

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

| Item | Contents |
|---|---|
| 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.<br>KR2S……12 colors<br>KR3S……48 colors |
| Size | Select the thickness of the trip line from 1 to 5. |

## 9-3-4 Time Ruler setting

Tap the [Operation] button and then tap [MENU settings] - [Display settings] - [Group parameters] - [Time Ruler setting], the following screen is displayed.
The setting items on this screen are managed by each group.
By select a group number, setting ruler interval of the group's graph is available.




■ Time ruler

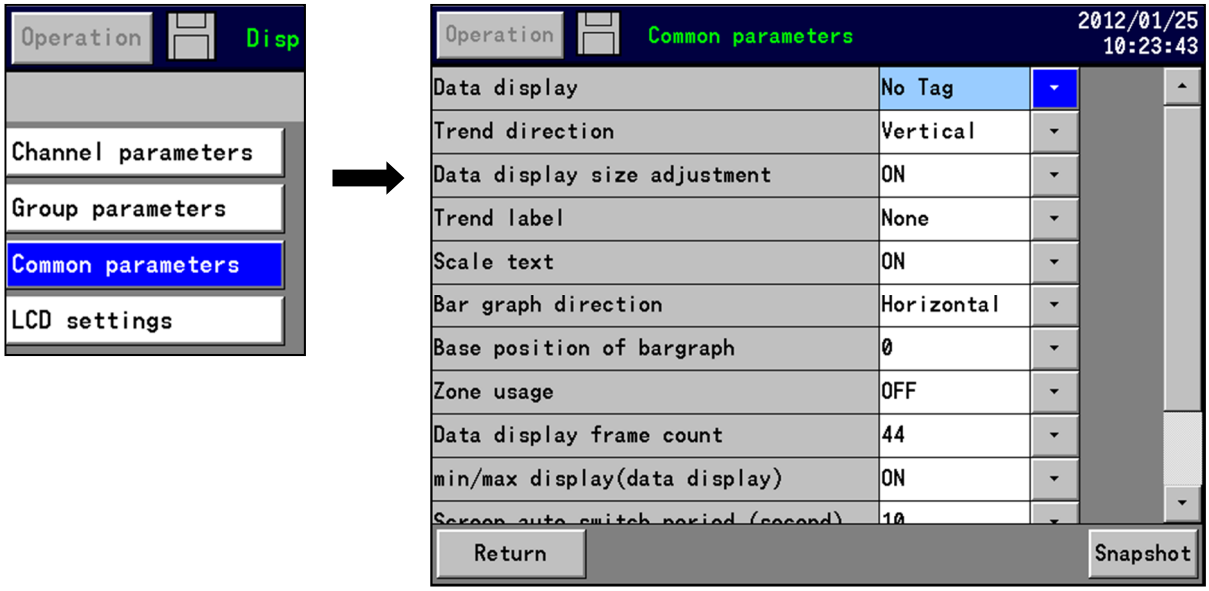
Select auto or specified. In case of auto, ruled line interval is decided by recording interval.

■ Time ruler interval

Time Ruler interval of trend is specified. Even number of 12 to 510 can be set. This function is effective when selecting [specified] in [Time ruler].

## 9-3-5 Common parameters

Tap the [Operation] button and then tap [MENU settings] - [Display settings] - [Common parameters], the following screen is displayed.
On this screen, settings related to the graph such as direction of the graph to display and zone usage can be set.




■ 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, None)

■ Setting the trend direction

Set the waveform direction.
(Vertical, Horizontal, Circle)

■ 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 3 |
| With tag | Vertical | Less than 4 |
| No tag | Horizontal | Less than 6 |
| With tag | Horizontal | Less than 4 |
| No tag | Circle | Less than 6 |
| With tag | Circle | Less than 3 |

■ Setting the trend label

Set the label for displaying on the trend.
(None, Channel, Tag)

■ Setting the scale text

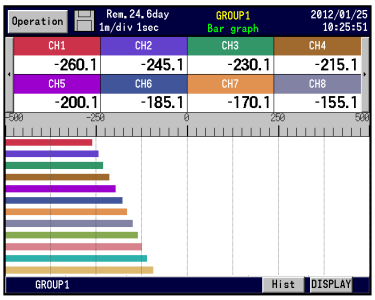
Set the scale plate to display the numerical values or not.

■ Setting the bar graph direction

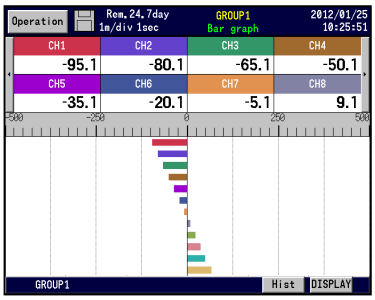
Set the bar graph direction on the bar graph screen to be vertical or horizontal.

■ Setting the base position of the bar graph

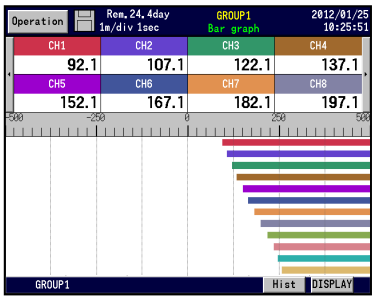
Set the base position of the bar graph from 0 to 100 on the bar graph screen. When the base position is 0, the bar is displayed based on leftmost (or bottommost). When the base position is 100, the bar is displayed based on rightmost (or uppermost).




When standard position is 0




When standard position is 50




When standard position is 100

■ Setting the zone usage*1

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.

KR2S……1, 2, 3, 4, 6, 8, 9, 10, 12, 24, 44

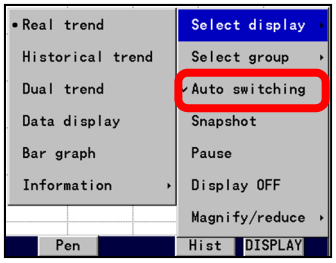
KR3S……1, 2, 3, 4, 6, 8, 9, 10, 12, 24, 36, 48, 56

■ 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 (second)

Set the switching period if the [Auto switching] has been set to ON with the DISPLAY menu.




■ Data value updating period (second)

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.

*When choosing the previous file from the list in [DISPLAY] - [Information], dual trend synchronizes.

■ Setting the separator line of data

Select [ON] or [OFF]. When select [ON], display the separator line of data on the trends.
(Refer to '5-4 Recording separator)

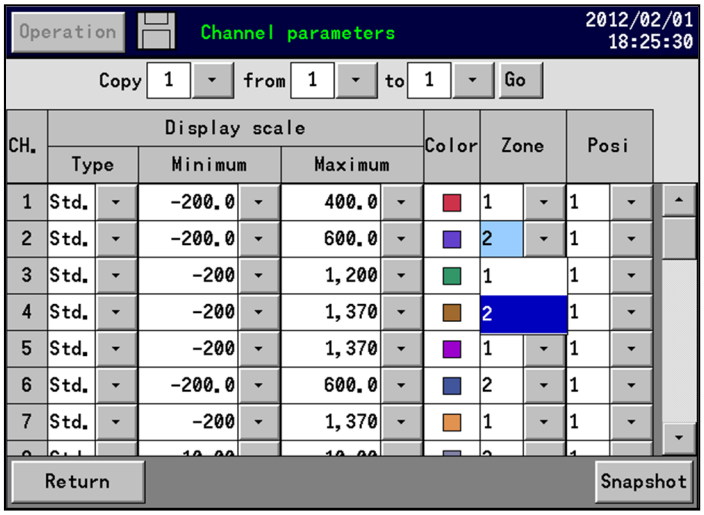
*1 Zone

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.

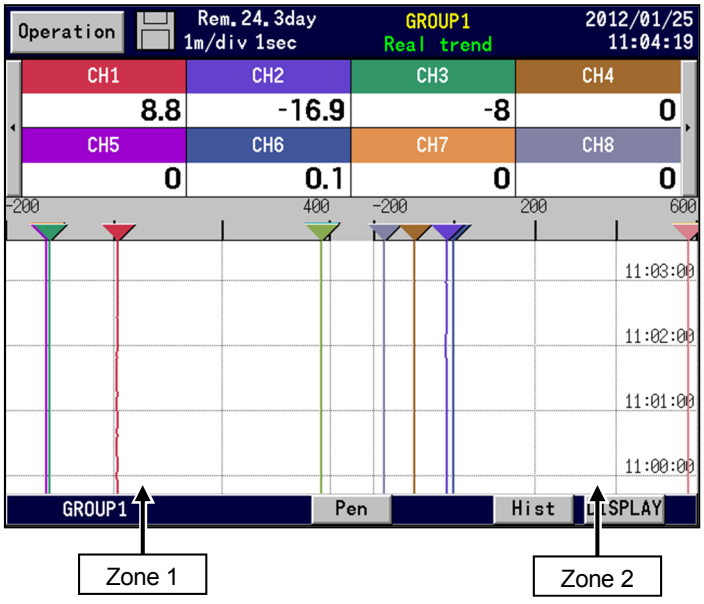
<Setting method>

Tap [MENU settings] - [Display settings] - [Common parameters] and then select [ON] of the [Zone usage].

Then next, tap [MENU settings] - [Display settings] - [Channel parameters], the following screen with the zone items 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.



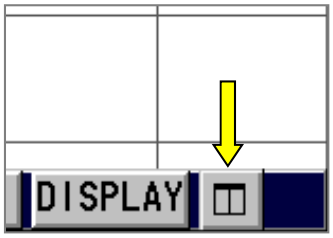
■ Setting the division * Only KR3S

Select from [OFF], [2], or [4].

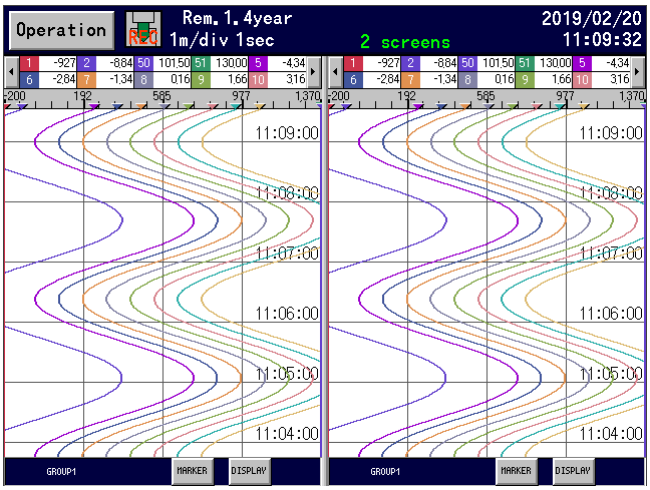
Set division of the operation screen.

If setting other than [OFF] is selected, division button is displayed on the bottom right.

(e.g.: bisection button)




When this button is tapped, a screen is divided.




Display type and group can be set individually in each frame on the divided screen.

By tapping each divided screen, it switched to one screen display.

Displays which can be displayed as division display are as follow.

・Real trend display

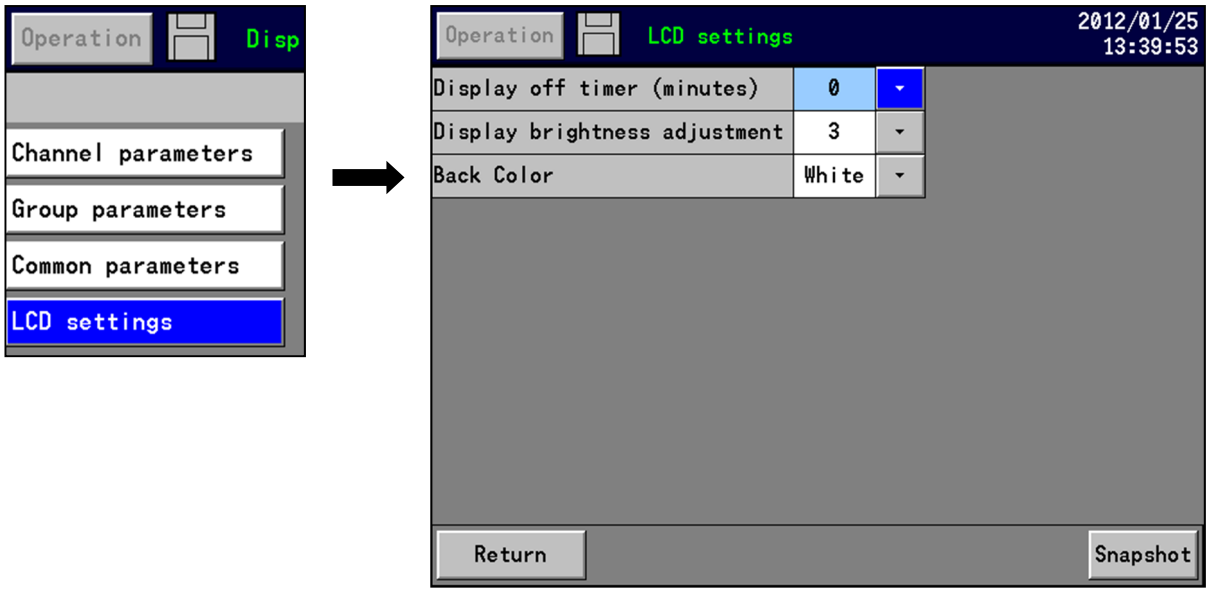
・Data display

・Bar graph display

Switch the screen to 1 screen display for displaying other display.

## 9-3-6 LCD settings

Tap the [Operation] button and then tap [MENU settings] - [Display settings] - [LCD settings], the following screen is displayed.
On this screen, display off timer and saturation, etc. can be set.




■ Setting the display off timer (minute)

The display-off timer for the LCD can be set from 1 to 60 minutes.
For cancellation of the display off, tap the screen.
*0 minute does not display off.
*Even the display is off, if the alarm is activated, LCD lights up. LCD becomes display off when the set time past from the point of alarm cancellation.

■ Setting the display brightness

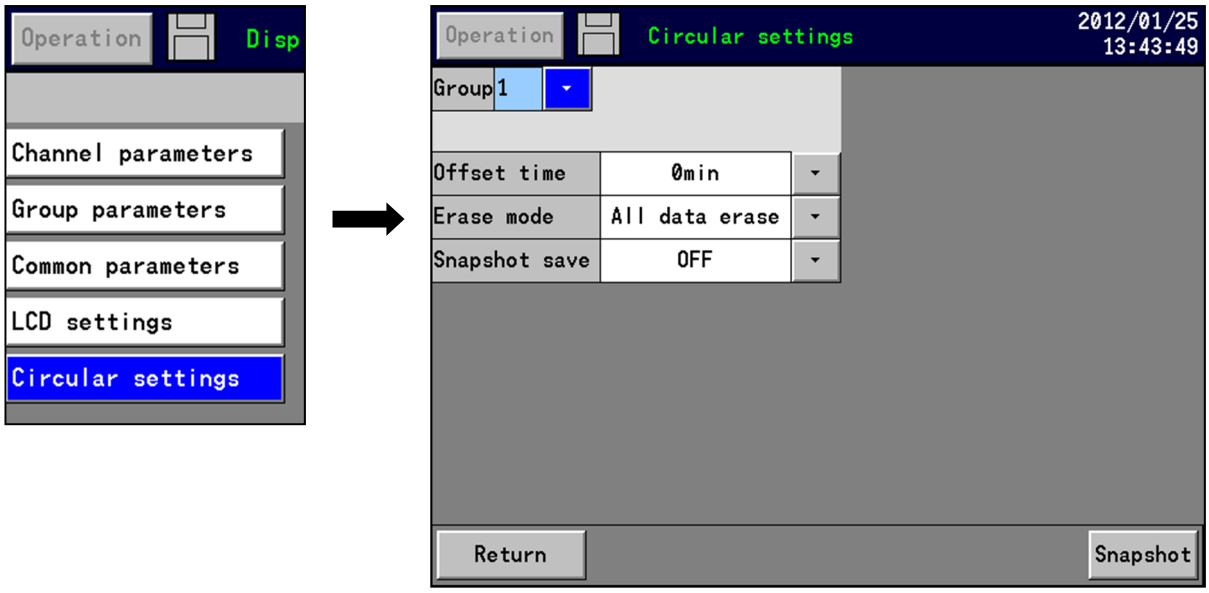
Select the brightness of the LCD backlight from 4 steps. 4 is the brightest and 1 is the darkest.

■ Setting the back color

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

## 9-3-7 Circular settings

Tap the [Operation] button and then tap [MENU settings] - [Display settings] - [Common parameters]. At the [Common parameters] set [Trend direction] [Circle] the item is displayed.
The setting items on this screen are managed by each group.
Set group number.




■ Setting the offset time

Time reference position of the circular can be changed.
Offset value to be set is depended on the time of one full circle.
*Time of one full circle is depended on the size of the file.

| Time of one full circle | Offset value to be set |
|---|---|
| 10 minutes | 0, 1, 2, ···, 9min |
| 15 minutes | 0, 1, 2, ···, 14min |
| 20 minutes | 0, 2, 4, ···, 18min |
| 30 minutes | 0, 2, 4, ···, 28min |
| 60 minutes | 0, 10, 20, ···, 50min |
| 2 hours | 0, 10, 20, ···, 110min |
| 3 hours | 0, 1, 2h |
| 4 hours | 0, 1, 2, 3h |
| 6 hours | 0, 1, 2, ···, 5h |
| 8 hours | 0, 1, 2, ···, 7h |
| 12 hours | 0, 1, 2, ···, 11h |
| 24 hours | 0, 1, 2, ···, 23h |
| 1 week | |
| 1 month | |

■ Setting the erase mode

| Item | Contents |
|---|---|
| All data erase | After one full circle of the waveform is recorded, erase all the waveform on the chart and start drawing the next waveform. |
| Partial erase | When there is one division left to record the waveform on the scale, erase one old division and continue drawing the waveform. |

■ Setting the snapshot save

Save snapshot of one full circle.

*File name: group name + date (year/month/date/hour, minute, second)

*Storing destination of the snapshot is same as data.

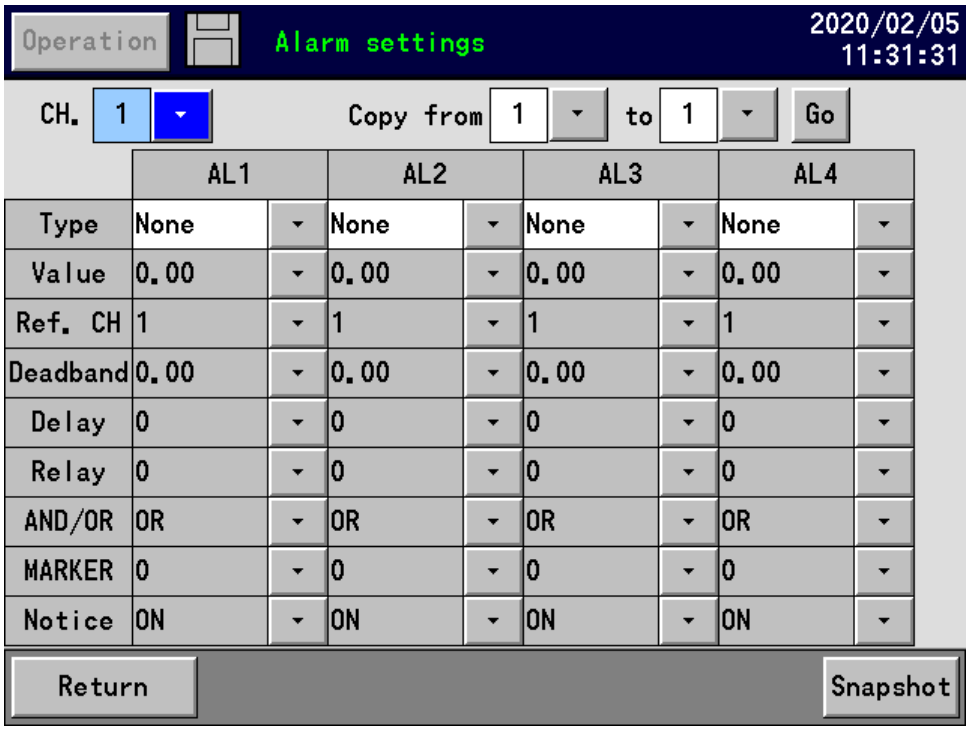
| Remarks | Set 'Recording cycle' and 'File size' according to following table when selecting circular trend.(Refer to '9-5 file settings')<br>*The setting is automatically changed to vertical trend display when it is unable to be displayed as circular trend.<br>*Recorded file which is set as unable to display can not reply by circular trend.<br>*When the amount of data is less than 2 points in one full circle, the file can not be displayed as circular trend. |
|---|---|

| | | | File size | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Auto | Minute | | | | | Hour | | | | | | | 1 week | 1 month |
| | | | | 10 | 15 | 20 | 30 | 60 | 2 | 3 | 4 | 6 | 8 | 12 | 24 | | |
| Recording cycle | Second | 0.1* | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| | | 0.2* | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × |
| | | 0.5* | ○ | ○ | ○ | × | × | × | × | × | × | × | × | × | × | × | × |
| | | 1 | ○ | ○ | ○ | ○ | ○ | × | × | × | × | × | × | × | × | × | × |
| | | 2 | ○ | ○ | ○ | ○ | ○ | ○ | × | × | × | × | × | × | × | × | × |
| | | 3 | ○ | ○ | ○ | ○ | ○ | ○ | × | × | × | × | × | × | × | × | × |
| | | 5 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × | × | × | × | × | × | × |
| | | 10 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × | × | × | × | × |
| | | 15 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × | × | × | × |
| | | 20 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × | × | × |
| | | 30 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × | × |
| | Minute | 1 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × |
| | | 2 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × |
| | | 3 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × |
| | | 5 | ○ | × | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × | × |
| | | 10 | ○ | × | × | × | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × |
| | | 15 | ○ | × | × | × | × | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × |
| | | 20 | ○ | × | × | × | × | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | × |
| | | 30 | ○ | × | × | × | × | × | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | | 60 | ○ | × | × | × | × | × | × | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

*Only KR2S

# 9-4 Alarm settings

Tap the [Operation] button and then tap [MENU settings] - [Alarm settings], the following screen is displayed.
On this screen, alarm activation condition can be set by each channel.




■ 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.

| Type | Contents |
|---|---|
| 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*1 | 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*1 | 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*2

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

■ Setting the delay*3

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 to 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.

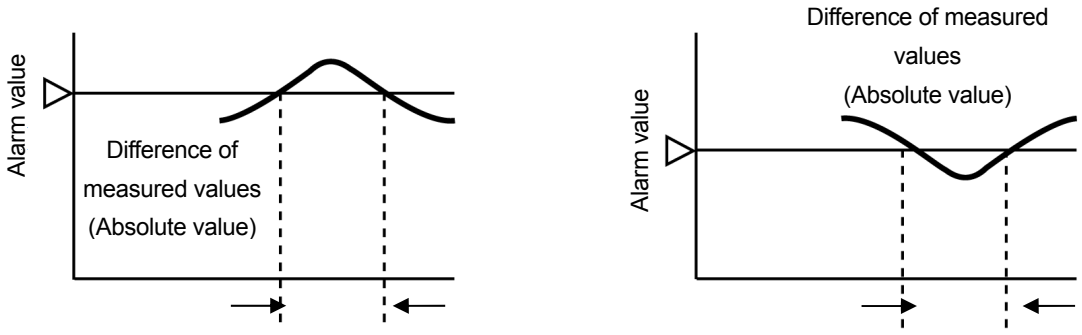
| | |
|---|---|
| Remarks | ・ Upper limit of processible alarms in 0.1sec. (sampling cycle) are 128. If the alarm exceeds the upper limit, it will not be processed.<br>・ Alarm recovery is processed 1sec. after alarm condition is cancelled.<br>・ When in CF Card Overwrite Mode, if more than 200 alarm activation occurred in 1 sec. for more than 2min. continuously, recorded data may be defected.<br>・ When the recording cycle is set to less than 1 second, the alarm data cannot be recorded with the CSV format. |

■ Setting the notice

Set the notification action when an alarm occurs. Some notification operations are not performed when "None" is selected. Set this when using alarms as triggers for relays and markers.

| The notification action when selected Notice 'ON'. | |
|---|---|
| ON | ・ Relay(DO)<br>・ Marker<br>・ Alarm release judgment (if an alarm has already occurred during setting) |
| OFF | ・ Icon display on status bar<br>・ Display data color change<br>・ Alarm recording to recorded data<br>・ Change of alarm status of high order communication<br>・ Addition to the alarm display screen<br>・ Email function |

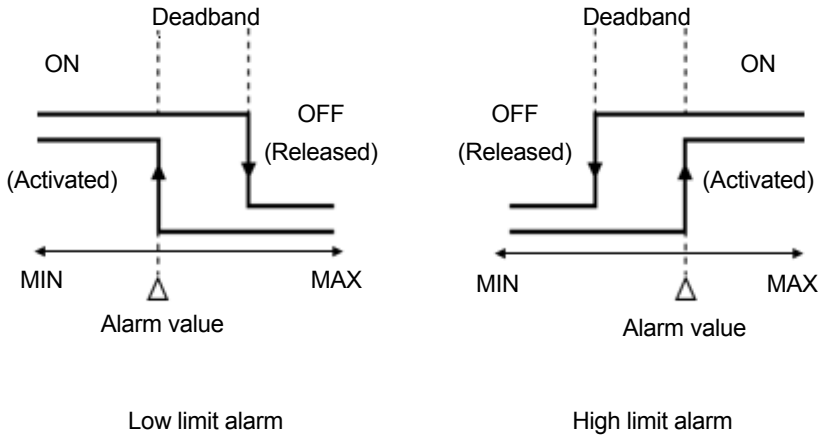
## *1 Differential alarm



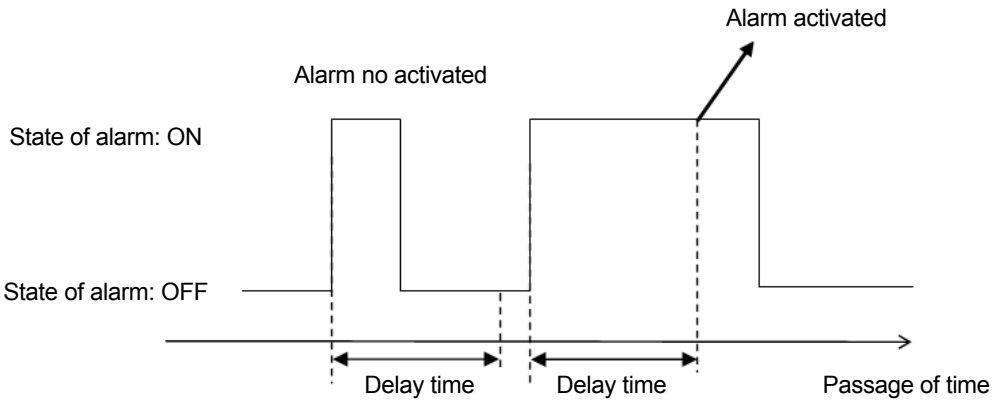

At Difference of measured values≧Alarm value : Differential high limit alarm activated

At Difference of measured values≦Alarm value : Differential low limit alarm activated

## *2 Alarm deadband



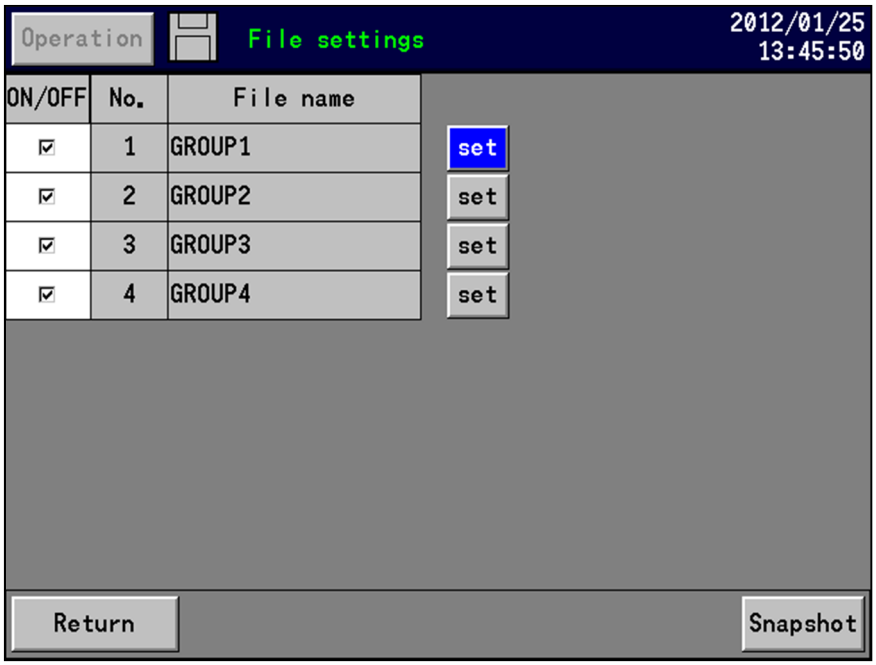

## *3 About alarm Delay



# 9-5 File settings

## 9-5-1 File settings

Tap the [Operation] button and then tap [MENU settings] - [File settings], the following screen is displayed.

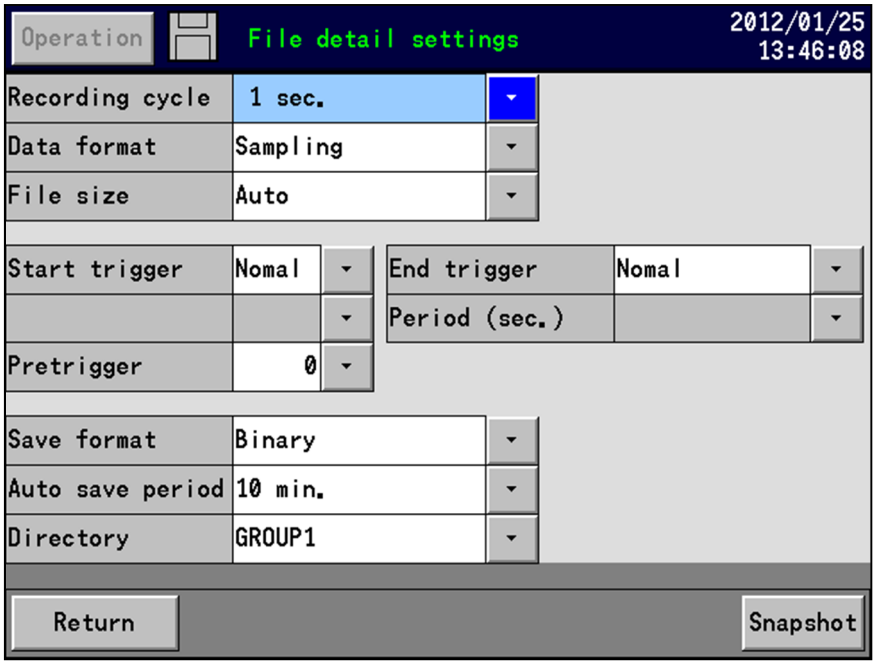



■ Setting the ON/OFF

Record when checked and does not record when un-checked.

Tap the [Set] button, file detail settings screen of the group is displayed.

On this screen, recording cycle, start trigger and end trigger and recording data storing folder name can be set.



■ Setting the recording cycle

| | |
|---|---|
| Seconds | 0.1 sec*, 0.2 sec*, 0.5 sec*,<br>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 |

*Only KR2S. If the recording cycle is set to 0.5 seconds or less on the KR2S, the number of input channels will automatically be 4 points.
In the case of the past profile replay specification, you cannot select a recording cycle of less than 1 second.

■ Setting the data format

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. *1

| | |
|---|---|
| Sampling | Record measured data's instantaneous values on the recording period. |
| Average | Record measured data's average values on the recording period. |
| Maximum | Record measured data's maximum values on the recording period. |
| Minimum | Record measured data's minimum values on the recording period. |
| Maximum/Minimum | Record measured data's maximum and minimum values on the recording period.*2 |

*1 When the recording cycle is 0.1 second, the sampling is only selectable.
*2 When the maximum/minimum is selected, the data size becomes 1.5 times larger.

■ Setting the file size

Set the file size. File is completed when the file reaches the size (time period) and from them, data is saved in the other file. When recording is stopped before reaching the file size, or the data reaches maximum file size (refer to '7-8 Internal memory screen'), file is completed.

| | |
|---|---|
| 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 | Auto, 1 week 1 month |

*'Auto' records maximum file size.
*Recording period interval is specified as,
[minute] [hour] is calculated based on 'Time 0:00'
[1 week] is calculated based on 'Sunday. 0:00'
[1 month] is calculated based on 'first day 0:00'

■ Setting the start trigger

The recording starts by the following trigger. (normal, alarm and DI option)

| Trigger type | Contents |
|---|---|
| Normal | The recording starts without any conditions. |
| Alarm | The recording starts when the alarm relay becomes ON.<br>The trigger standby state when the alarm relay becomes OFF.<br>When this item is selected, the relay terminal number can be selected.<br>*During the writing the data to the internal memory, the next recording cannot be started. |
| Digital input(Option) | The recording starts when the digital input terminal becomes ON.<br>The trigger standby state when the digital input terminal becomes OFF.<br>When this item is selected, the input terminal number can be selected.<br>*During the writing the data to the internal memory, the recording cannot be started. |

*When selecting the [Alarm] and [Digital input] in start trigger, please the trigger the standby state by tapping the [START] of the [Operation] menu, or the disk icon.

■ Setting the pretrigger (0 to 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

The recording stops by the following trigger. (normal, alarm and DI option)

| Trigger type | Contents |
|---|---|
| Normal/Alarm/ Digital input(Option) | The recording starts/stops by selecting [START/STOP] of the [Operation] menu. |
| Period (seconds) | Record data of specified period (seconds) and stops. At this time, if the start trigger condition is established, restart the recording when writing to an external memory of the recording file is finished*.<br><br>Setting example<br>Ex) recording period/end trigger period/number of the group/marker text<br>in 100ms to 1s/period: 10sec./number of the group: 1/marker text: none<br>1s/period: 60sec./number of the group: 3/ marker text: none |

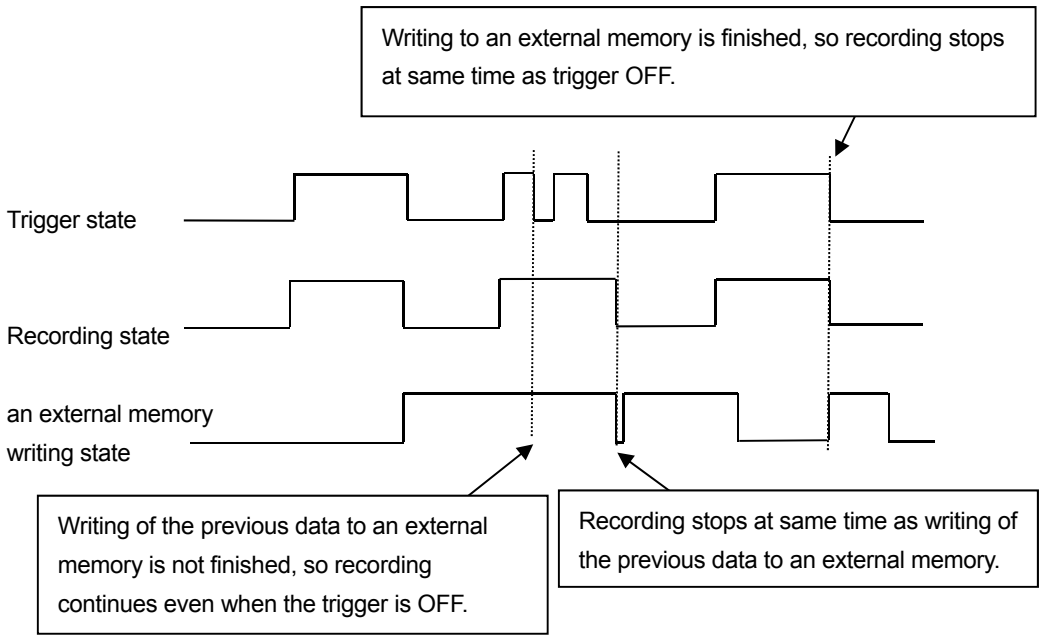
*When the recording period is short (in 10sec.), short end trigger period (in 1 min.) is set and start trigger is activated continuously after the end of the end period, depending on the combination of the other settings, tap operation, recording operation, display of renewal and USB copy operation may take some time.
When performing trend operation such as marker text, decrease the number of the group and lengthen the recording period and end trigger period.

| Remarks | If the writing to an external memory takes more than update of the internal memory, it may lead to the data defect, so be sure to revise settings and operation method. |
|---|---|

■ Setting the period (seconds) (10 to 30000)

After starting record by start trigger, if trigger becomes OFF, the data is recorded for set period and then stopped. However, [STOP] of the [Operation] menu or disc icon is tapped, recording is stopped despite of this setting.

| | |
|---|---|
| Remarks | ・ If the alarm activation/recovery is set in 1sec., recording that is triggered by alarm may not start.<br>・ If the [period (seconds)] is set in the end trigger, recording data file is created at every set period until the trigger condition is cancelled. However, if the start trigger is [normal], recording data file is created at every set period until tapping on the [STOP].<br>・ If the start trigger is set to [Alarm] or the [DI], recording is not stared immediately after the trigger activation. Therefore, if the writing of the marker text is set under the trigger condition, recording is not performed so the marker text is not displayed and saved.<br>・ When start/stop of the recording is triggered by alarm or the DI signal and if there is a file not written to an external memory in the same group at the trigger OFF, the recoding continues during that period. When the writing to an external memory is completed, the recording is also stops. Similarly, recording continues when the case such as trigger changes to ON right after OFF. |




■ Setting the save format

Select the file format for recording the data into an external memory.

| 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. When the decimal marker is set to ',', the data becomes the tab-delimited text file with the extension of 'txt'. |
| CSV (continue) | The format is same as the above, however when recording is stopped by trigger, the data is recorded same file continuously after restarting.<br>In above case, when recording is stopped, the file is completed, and the data is recorded by new file after restarting. |

| Remarks | When the recording cycle is less than 1 second, the alarm data cannot be recorded with the CSV format. |
|---|---|

■ Setting the interval for copying to an external memory

This is the interval for copying the file in the internal memory to an external memory.
The interval is calculated from the time of starting the record of each file.
In addition to this interval, each file is copied to an external memory at its completion. (Refer to '7-8 Internal memory screen')

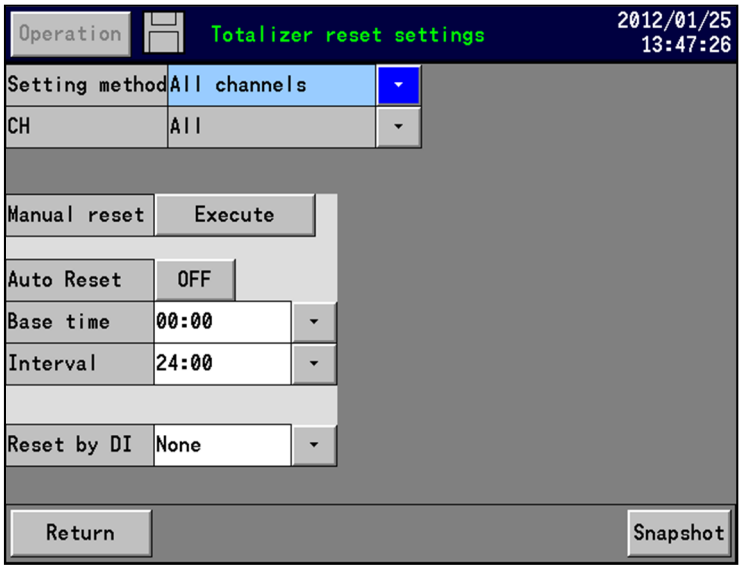
| Minutes | No settings, 1 min, 2 min, 3 min, 5 min, 10 min, 20 min, 30 min, 60 min |
|---|---|

■ Setting the directory (Maximum length 16 characters)

For copying the data to an external memory, the directory name for copying can be set.
The hierarchy can also be specified. The delimiting symbol is '¥' (backslash).
Refer to '5-2 Character entering method'.

# 9-6 Totalizer reset settings

Tap the [Operation] button and then tap [MENU settings] - [Totalizer reset settings], the following screen is displayed.
On this screen, if the set formula set by the [Input operation settings] were totalizer, the procedure for resetting the totalized data to 0 can be set (Refer to '9-2-1Setting method of formula'). Only the 'ITG' is reset in this setting.




■ Setting method
Select 'all channels' or 'individual channel'.

| Setting method | Contents |
|---|---|
| All channels | Setting contents are accommodated all channels. |
| 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.

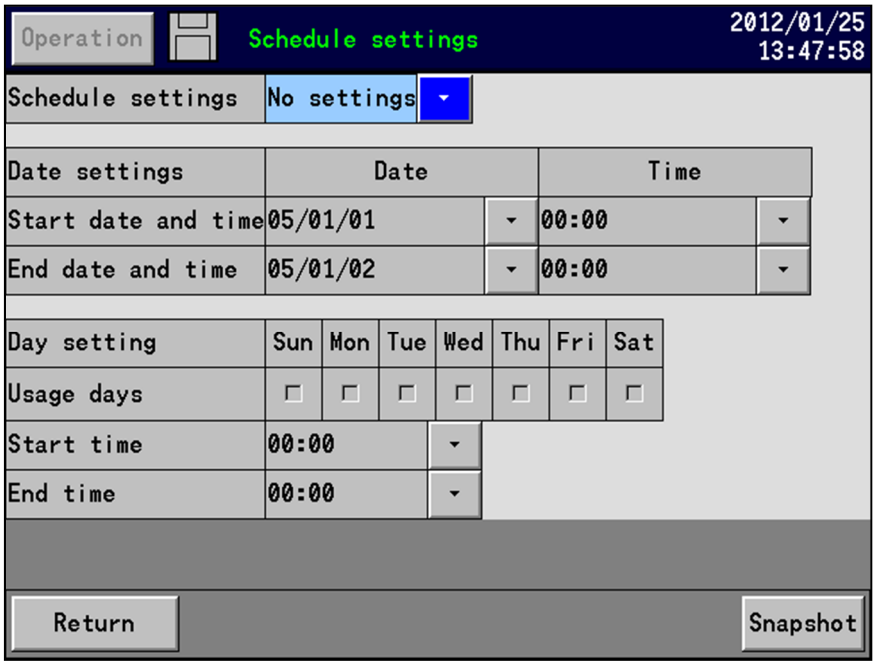
■ Base time and interval
The totalizer reset is executed at the following time.
Base time + (Interval x n) n = 0, 1, 2, 3, …

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 dose not have 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.

# 9-7 Schedule settings

Tap the [Operation] button and then tap [MENU settings] - [Schedule settings], the following screen is displayed.
On this screen, the recording period can be set. 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.



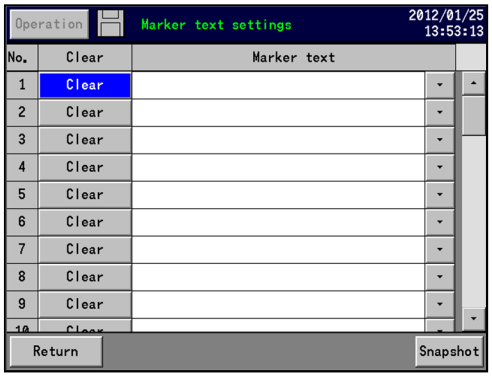

■ Setting the schedule
Select it from No settings, date or day.
By these settings, the following settings become enabled.

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

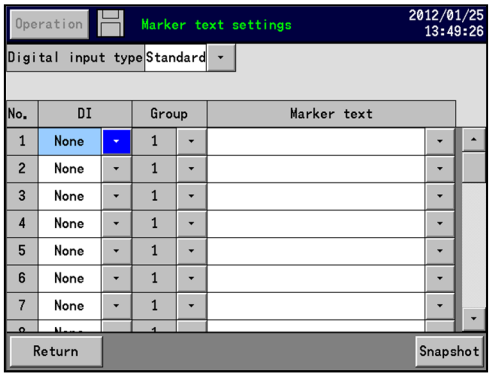
■ Setting the parameters for the day settings
Check the day for using.
Set the start time and the end time.

# 9-8 Marker text settings

Tap the [Operation] button and then tap [MENU settings] - [Marker text settings], the following screen is displayed.
Displayed screen differs from 'with or without' DI (Option).
On this screen, marker text (maximum of 50 characters) to be written on the trends can be registered.
Up to 50 marker texts are able to be registered. Even when marker texts are not registered on this screen, texts can be created at the writing of markers.
For writing the marker text, refer to '5-3-1. Tapping on the operation screen.'




Without optional digital input (Option)




With optional digital input (Option)

Marker text settings screen

■ Clear

Tapping the [Clear], the marker text is erased.

■ Setting the marker text

Tapping the [▼] of the marker text column, the character entering screen is displayed. Enter the characters.

■ Maker writing with the DI (Option)

The maker can be written on the trends of the specified group with ON from the DI 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.

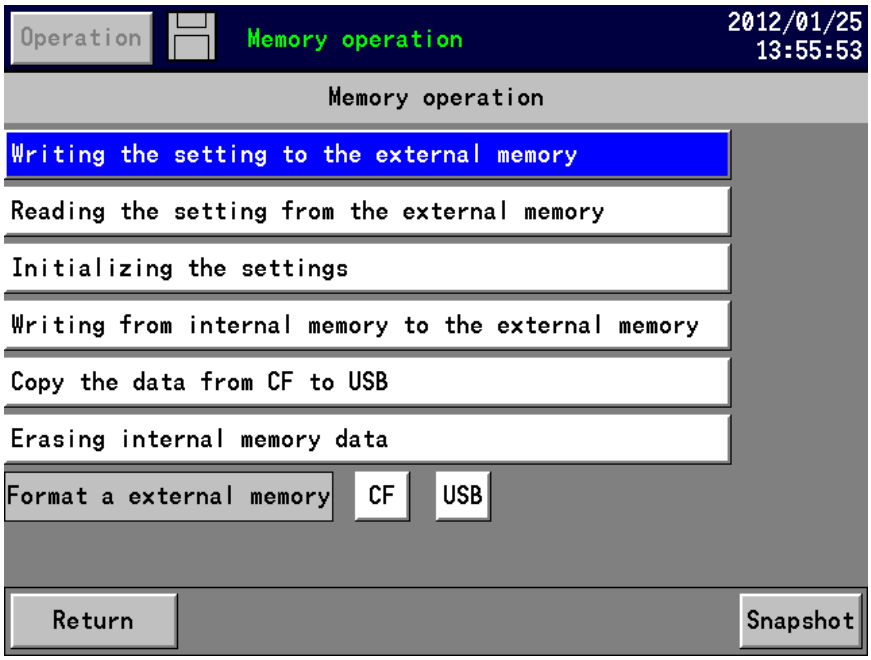
<Digital input --- Binary>

Set the maker text number 1 to 7 by using the digital input terminal 1 to 3 (Binary expression of low bit at terminal 1 side and high bit at terminal 3 side).
When terminal 4 is turned on under condition of the contact status of 1 to 3 at the terminal change to 1 to 7, the markers corresponding to the marker text numbers are written on the trends of the specified group.

| Remarks | ・ Upper limit of the marker text that can be written (saved) in 1sec. is two marker texts. If writing of more than two marker text is performed, display and saving cannot be done.<br>・ Upper limit of the marker text that can be displayed on the real trend is thirty marker texts. If writing of the marker is occurred while displaying the other screen, latest thirty marker texts is displayed when re-drawing is done on the real trend display. |
|---|---|

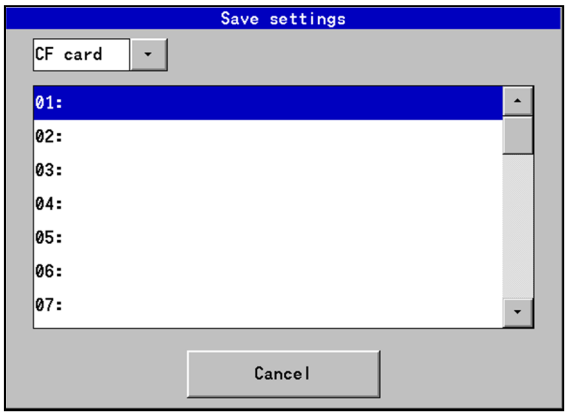
# 9-9 Memory operation

Tap the [Operation] button and then tap [MENU settings] - [Memory operation], the following screen is displayed.
On this screen, saving and reading of the setting files and copying recorded data to the USB memory are available.




■ Writing the settings to the external memory

Up to 100 current setting contents can be saved in an external memory (CF card or USB memory).
List of the saved setting files in alphabetical order is displayed.
File name entering screen is displayed when tapping the file desired to be saved. Current setting contents are saved by entering a file name and tap [Set].
*The file with the extension of '.krs' is saved in the 'SETUP' folder.

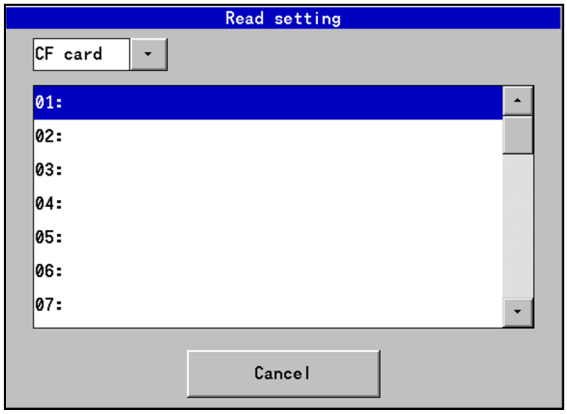


■ Reading the setting from the eternal memory

The setting file saved in the external memory (CF card or USB memory) is read and the current settings are overwritten.

List of the saved setting files in alphabetical order is displayed.

Settings are read when tapping the file desired to be read.




■ Initializing the settings

Initialize the settings.

■ 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

Inserting the USB flash memory (up to 8G byte) to USB port of this recorder allows copying of recorded data file of CF card to USB memory. Does not copy setting files and snapshots.

*Operation of all USB flash memories is not guaranteed.

*External media, such as a hard disk, ZIP, MO, an optical disc, cannot be used. Please note that connecting those media to the recorder may damage those media. Please be noted.

■ Erasing internal memory data

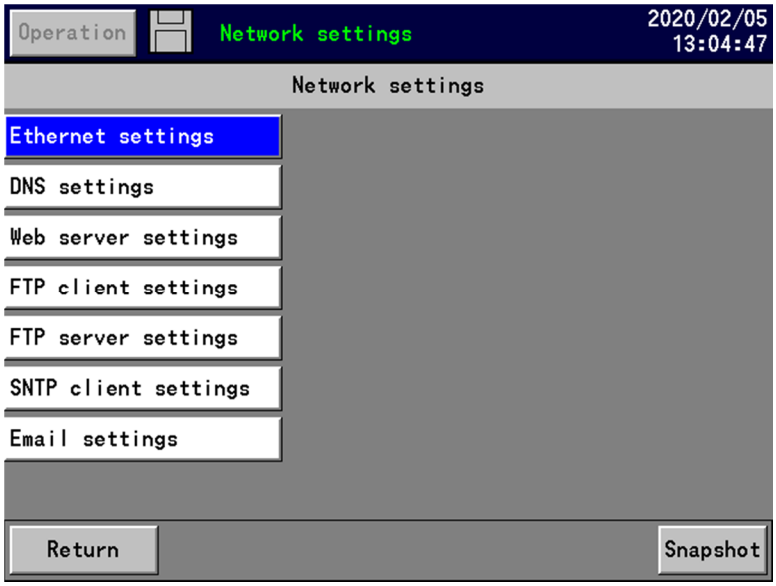
Recorded data in the internal memory are erased.

■ Format the external memory

Format CF card/USB memory.

# 9-10 Network settings

Tap the [Operation] button and then tap [MENU settings] - [Network settings], the following screen is displayed.
On this screen, network settings of this recorder can be set.

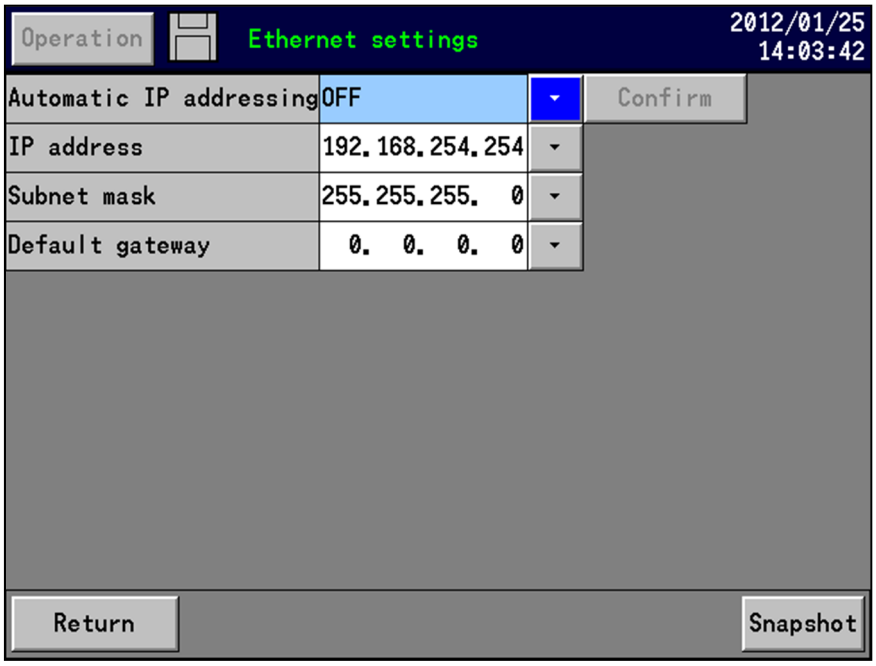



A list of network settings

| | |
|---|---|
| Ethernet settings | Refer to '9-10-1 Ethernet settings'. |
| DNS settings | Refer to '9-10-2 DNS settings'. |
| Web server settings | Refer to '9-10-3 Web server settings'. |
| FTP client settings | Refer to '9-10-4 FTP client settings'. |
| FTP server settings | Refer to '9-10-5 FTP server settings'. |
| SNTP client settings | Refer to '9-10-6 SNTP client settings'. |
| E-MAIL settings | Refer to '9-10-7 E-MAIL settings'. |

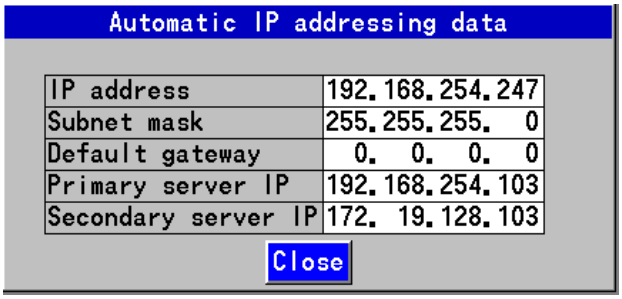
## 9-10-1 Ethernet settings

Tap the [Operation] button and then tap [MENU settings] - [Network settings] - [Ethernet settings], the following screen is displayed.
On this screen, set address settings to use this recorder on the Ethernet.




■ Automatic IP addressing

Set automatic IP addressing acquisition of this recorder. If automatic IP addressing is 'ON', items below the automatic IP addressing become greyed out and setting change is disabled.
When the automatic IP addressing is 'ON', tapping the [Confirm] button allows checking acquired IP address, etc.




Tap [Close] to close the window.

| | |
|---|---|
| Remarks | ■ About DNS settings<br>Same as automatic IP address settings, DNS settings acquires IP address automatically from DHCP server. However, IP address can not use separately as automatically acquired value and fixed value for DNS.<br>If IP address is set at DHCP server and DNS is not set, DNS server address is managed as 0.0.0.0.<br>If using the automatically acquired DNS address, DNS settings is needed to be 'ON'. |

■ IP address
Set IP address of this recorder. 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.

Reference

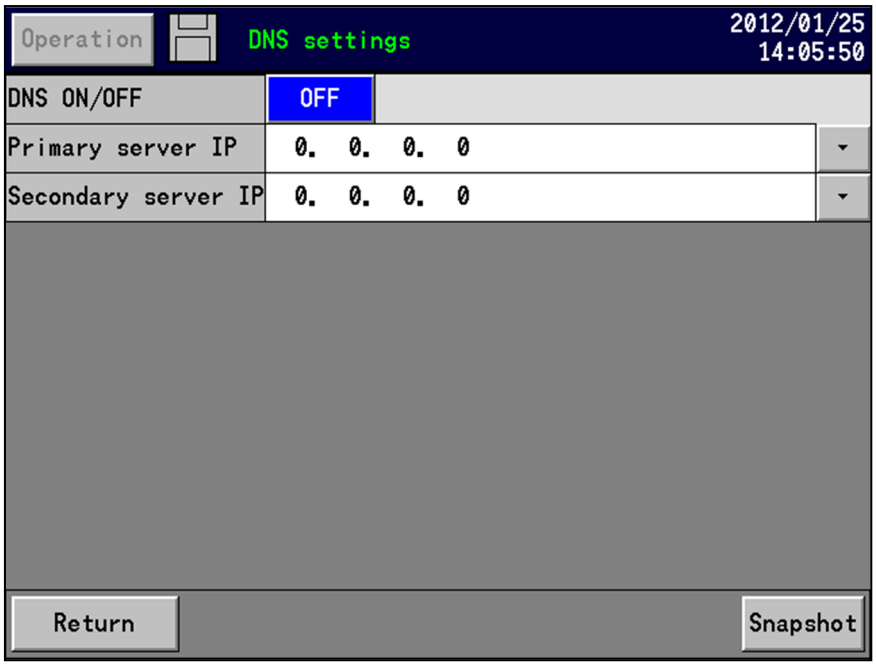
■ Example of usage in a small network
When this recorder is used in a small network without connecting to an interoffice LAN or Internet via a router, set the IP address as follows.

| Instrument | IP address | Subnet mask |
|---|---|---|
| KR A | 192.168.254.254 | 255.255.255.0 |
| KR 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 |
| ... | ... | ... |

## 9-10-2 DNS settings

Tap the [Operation] button and then tap [MENU settings] - [Network settings] - [DNS settings], the following screen is displayed.
On this screen, DNS server for this recorder can be set.

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.



■ DNS ON/OFF

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

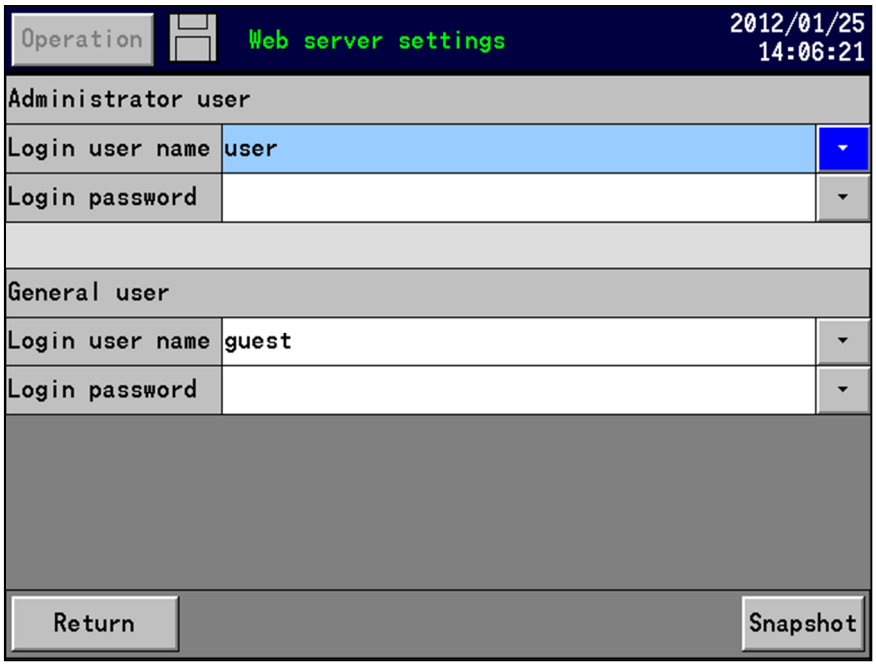
■ Primary server IP, Secondary server IP

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.

## 9-10-3 Web server settings

Tap the [Operation] button and then tap [MENU settings] - [Network settings] - [Web server settings], the following screen is displayed.

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




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

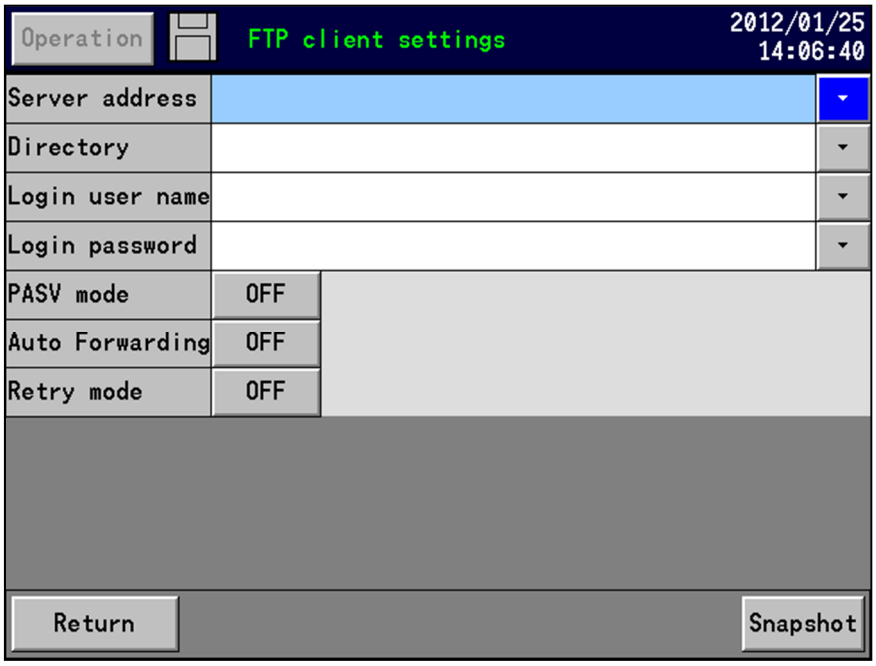
Set the login user name of administrator user/general user.

■ Login password

Set the login password of administrator user/general user.

## 9-10-4 FTP client settings

Tap the [Operation] button and then tap [MENU settings] - [Network settings] - [FTP client settings], the following screen is displayed.
On this screen, FTP settings of this recorder can be set.




■ 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 (9-10-2).

■ 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.

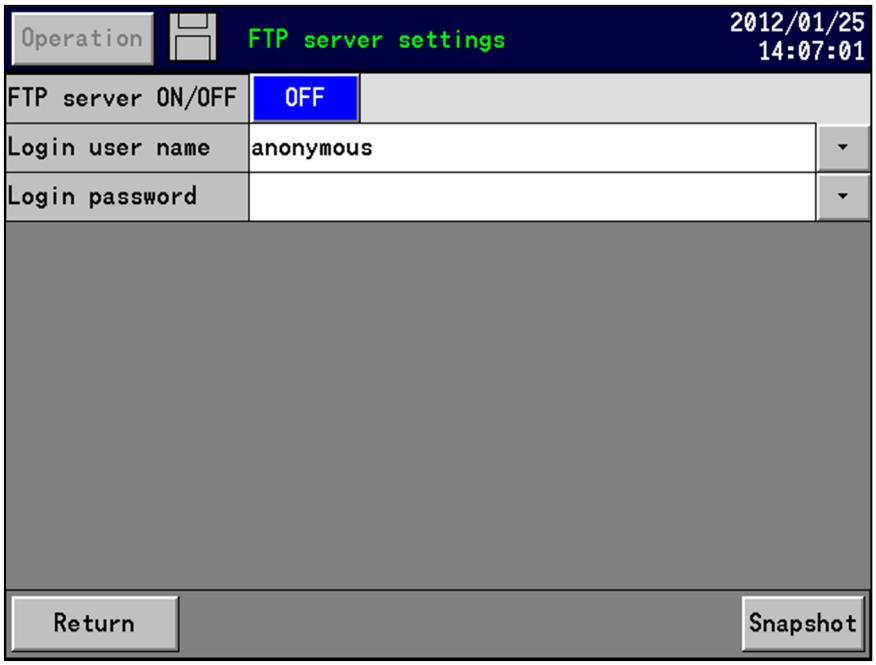
■ Auto Forwarding
Set to ON for transferring the file created automatically at the switching of the file for recording.

■ 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.

| | |
|---|---|
| Remarks | ・ 'FTP transfer error' message is displayed every 30sec. after displaying of the first message, during the error condition is established.<br>・ If high load settings such as many calculations are set or below 1sec is set for recording intervals in multiple groups, and times of writing to the CF card is comparatively high, FTP transmission and/or sending a mail may not be performed (condition differs depending on the setting contents and/or the network environment).<br>In this case, countermeasures such as changing the recording condition or not performing unnecessary calculation lower the load and recover to the normal state. |

## 9-10-5 FTP server settings

Tap the [Operation] button and then tap [MENU settings] - [Network settings] - [FTP server settings], the following screen is displayed.
On this screen, the settings for using the FTP server function of this recorder can be set.




■ 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.

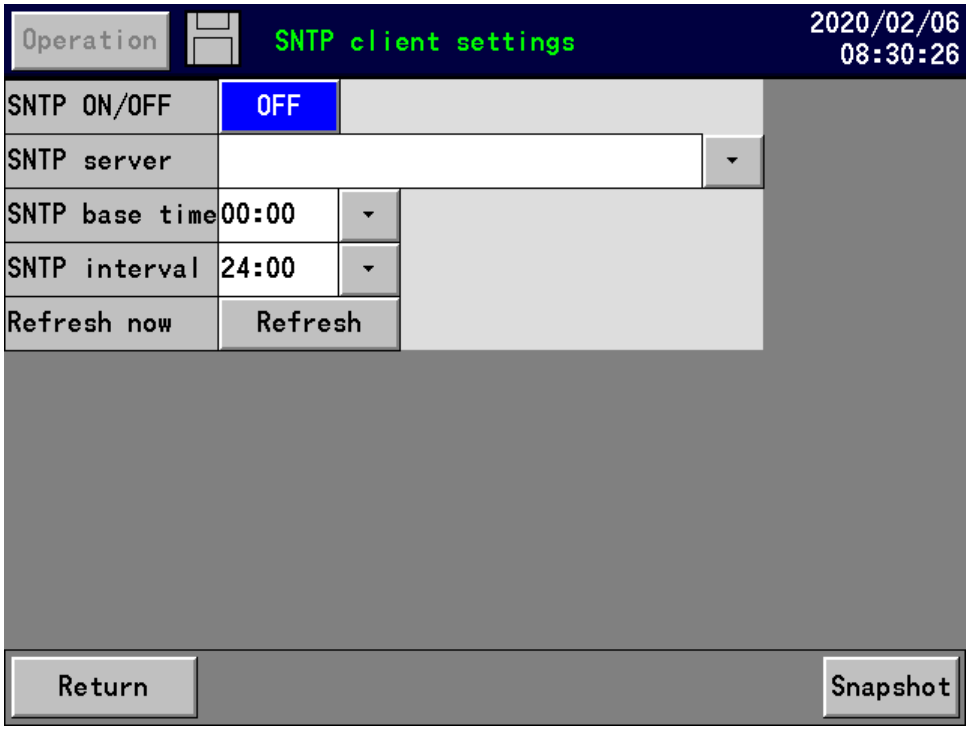
| | |
|---|---|
| Reference | ■ Using method of FTP server<br>By using the function of the FTP server, the file in the CF card of this recorder can be read from a PC on the network. The followings are the connection method for using a Web browser (Internet Explorer, Netscape, Opera) *.<br>(1) Enter 'ftp://(IP address of this instrument)/ ' into the address bar in the browser and press the ENTER key of the PC.<br>(2) The list of files and folders is displayed in the browser.<br>(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.<br><br>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. |

*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.

## 9-10-6 SNTP client settings

Tap the [Operation] button and then tap [MENU settings] - [Network settings] - [SNTP client settings], the following screen is displayed.

On this screen, the settings for using the SNTP function of this recorder can be set.




■ 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 (9-10-2).

■ SNTP base time/ SNTP interval

The time synchronization is executed at the following time.
Base time + (interval x n)　n = 0, 1, 2, 3, …

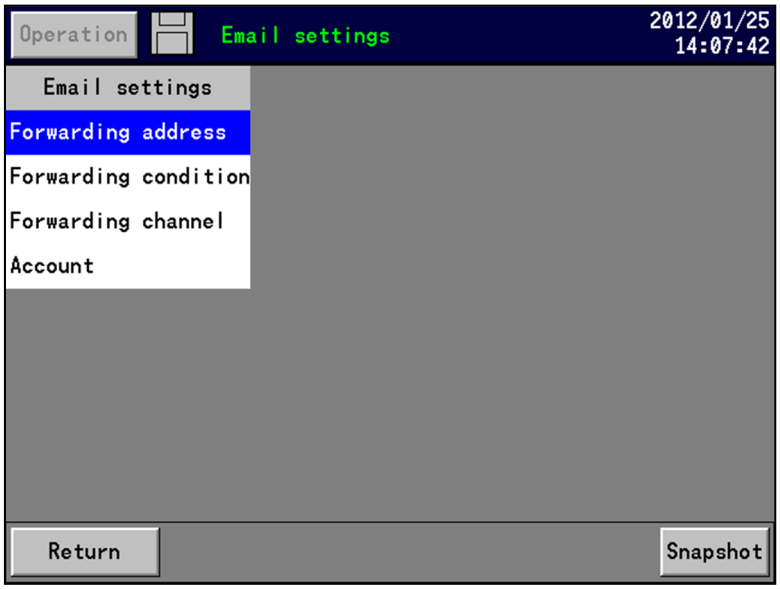
Example: In case that the 'SNTP base time' is 0:00 and the 'SNTP interval' is 04:00, the time synchronization by the SNTP is executed at 0 o'clock, 4 o'clock, 8 o'clock, 12 o'clock, 16 o'clock and 20 o'clock.

■ Refresh now

When the [Refresh] button is tapped, the time synchronization with the SNTP server is executed.

## 9-10-7 Email settings

Tap the [Operation] button and then tap [MENU settings] - [Network settings] - [Email settings], the following screen is displayed.
On this screen, the settings for using Email function of this recorder can be set.
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.

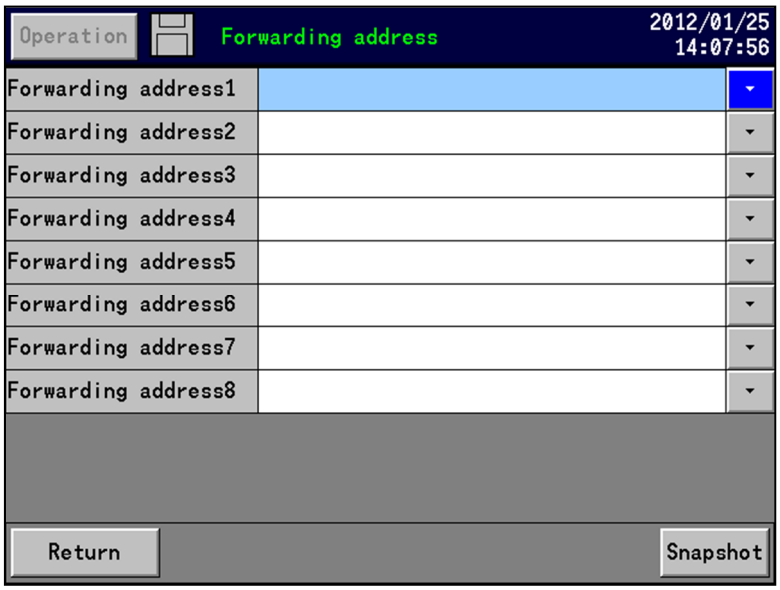



A list of Email settings

| | |
|---|---|
| Forwarding address | Refer to 'Forwarding address' as follows. |
| Forwarding condition | Refer to 'Forwarding condition' as follows. |
| Forwarding channel | Refer to 'Forwarding channel' as follows. |
| Account | Refer to 'Account' as follows. |

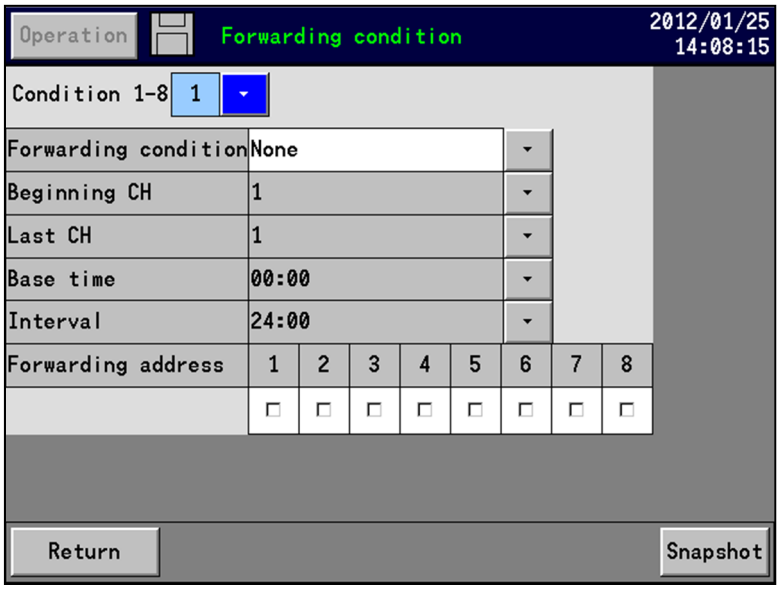
● Forwarding address

By selecting, the following screen is displayed. On this screen, up to 8 forwarding address can be set.




● Forwarding condition

By selecting, the following screen is displayed. On this screen, up to 8 forwarding conditions can be set.




■ 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, …

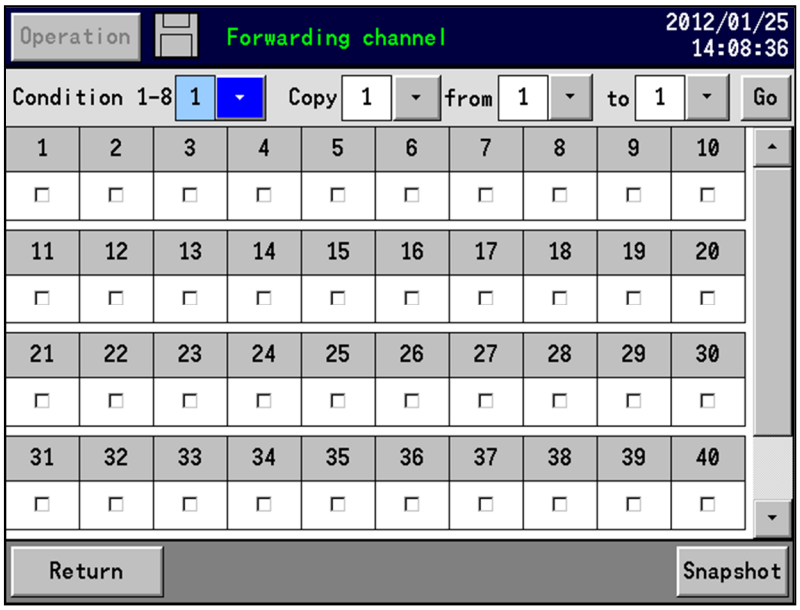
Example: In case that the 'Base time' is 0:00 and the 'Interval' is 04:00, the e-mail is forwarded at 0 O'clock, 4 O'clock, 8 O'clock, 12 O'clock, 16 O'clock and 20 O'clock.

■ 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

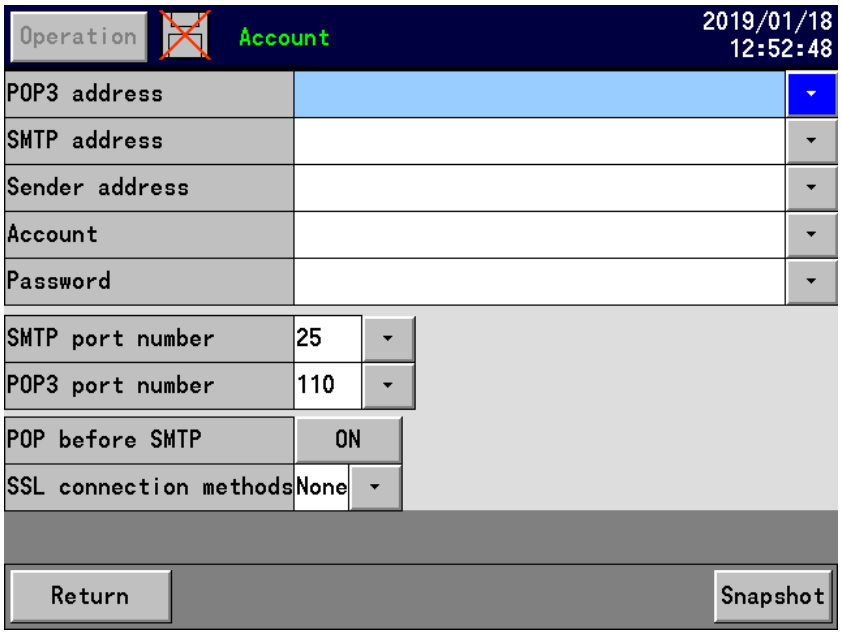
Check the channel numbers for attaching the data.

■ 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.

● Account

On this screen, SMTP (Simple Mail Transfer Protocol) can be set.




■ 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.

■ POP before SMTP

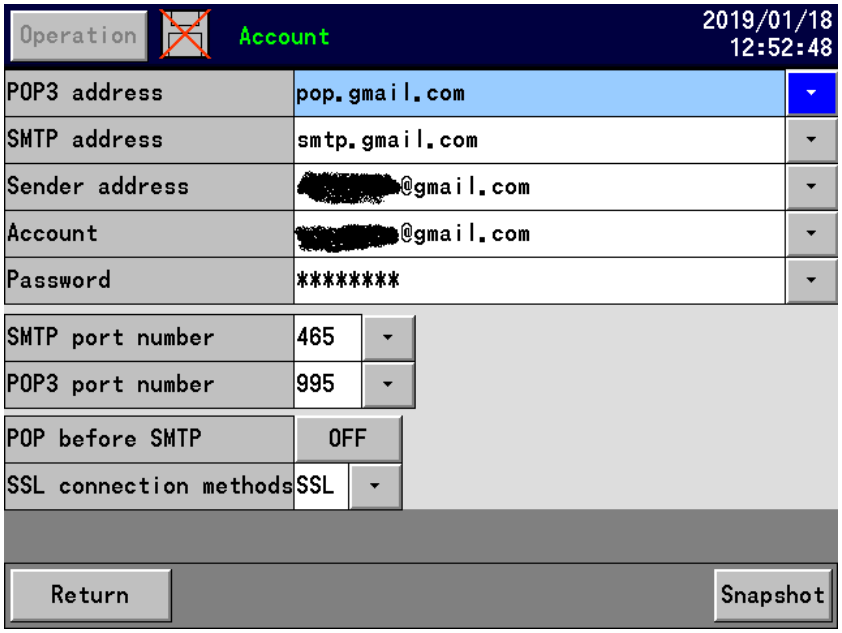
Turn this ON if authentication done by POP before SMTP is preferred.

■ SSL connection method

Select SSL connection method from below.

| Item | Contents |
|---|---|
| None | Do not perform SSL connection |
| SSL | Use SMTP over SSL or POP3 over SSL |
| TLS | Use STARTTLS or STLS |

(Setting example)

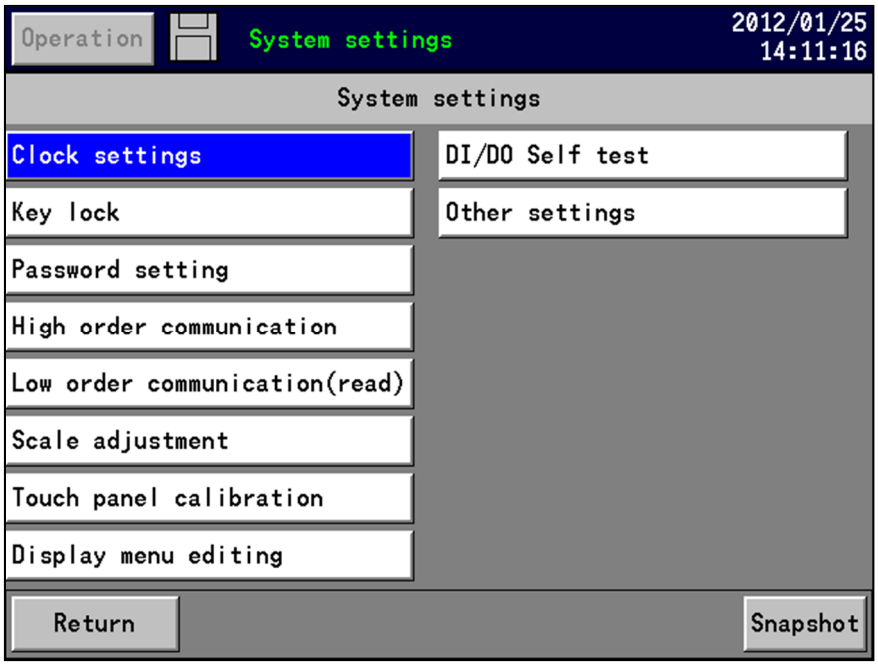



Setting method differs depending on mail server in use.
Set according to the mail server's instruction.

| Reference | ・Numbers of storable unsent e-mail in this recorder is 53 e-mails. If new e-mail sending operation is occurred exceeding storable numbers, 'Mail sending error' message is displayed. At this time, the e-mail that is failed to send is not stored as send object (will not be sent).<br>It takes approximately 5sec. to send an e-mail (however, this is depending on network environment).<br>・'Mail sending error' message is displayed every 30sec. after displaying of the first message, during the error condition is established.<br>・If high load settings such as many calculations are set or below 1sec is set for recording intervals in multiple groups, and times of writing to the CF card is comparatively high, FTP transmission and/or sending a mail may not be performed (condition differs depending on the setting contents and/or the network environment).<br>In this case, countermeasures such as changing the recording condition or not performing unnecessary calculation lower the load and recover to the normal state. |
|---|---|

# 9-11 System settings

Tap the [Operation] button and then tap [MENU settings] - [System settings], the following screen is displayed.
On this screen, clock, communication, adjustment (calibration) and user registration of this recorder can be set.



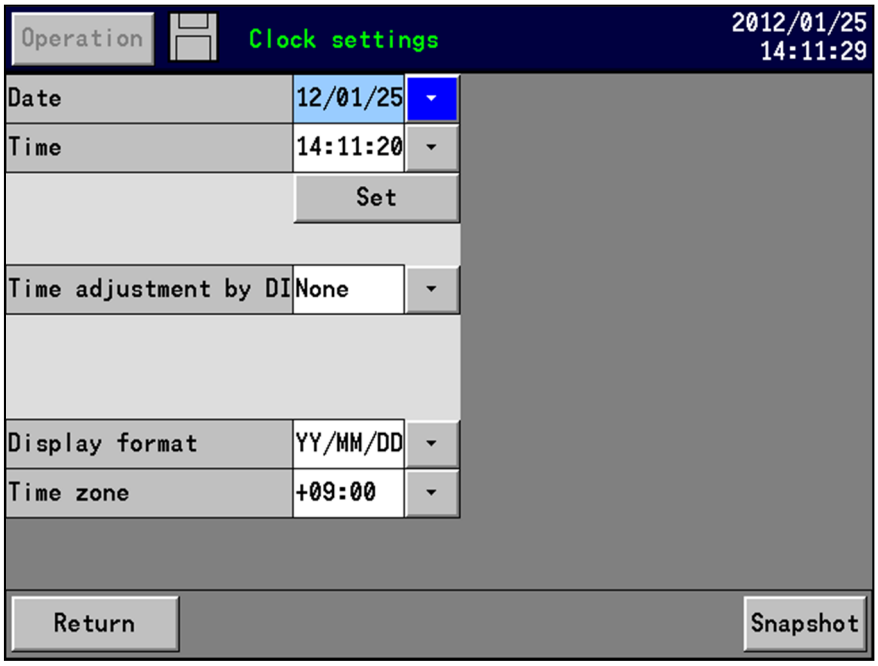

A list of System settings

| | |
|---|---|
| Clock settings | Refer to '9-11-1 Clock settings'. |
| Key lock | Refer to '9-11-2 Key lock'. |
| Password setting | Refer to '9-11-3 Password setting'. |
| High order communication | Refer to '9-11-4 high order communication settings'. |
| Low order communication | Refer to '12 Communication function settings (Option)'*. |
| Scale adjustment | Refer to '9-11-5 Scale adjustment'. |
| Touch panel calibration | Refer to '9-11-6 Touch panel calibration'. |
| Display menu editing | Refer to '9-11-7 Display menu editing'. |
| DI/DO Self test | Refer to '9-11-8 DI/DO Self test (Option)'. |
| Other settings | Refer to '9-11-9 Other settings'. |

*Not displayed without the communication option.

## 9-11-1 Clock settings

Tap the [Operation] button and then tap [MENU settings] - [System settings] - [Clock settings], the following screen is displayed.
On this screen, internal clock settings of this recorder can be set.




■ Date / Time

Enter the date in the same way as the character entering.
Writing to the internal clock executed when tapping the [Set] button. Tap [Set] synchronized with official time of the region, etc.

■ Time adjustment by DI

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'.
*Not displayed if the recorder is without DI option.

■ Display format

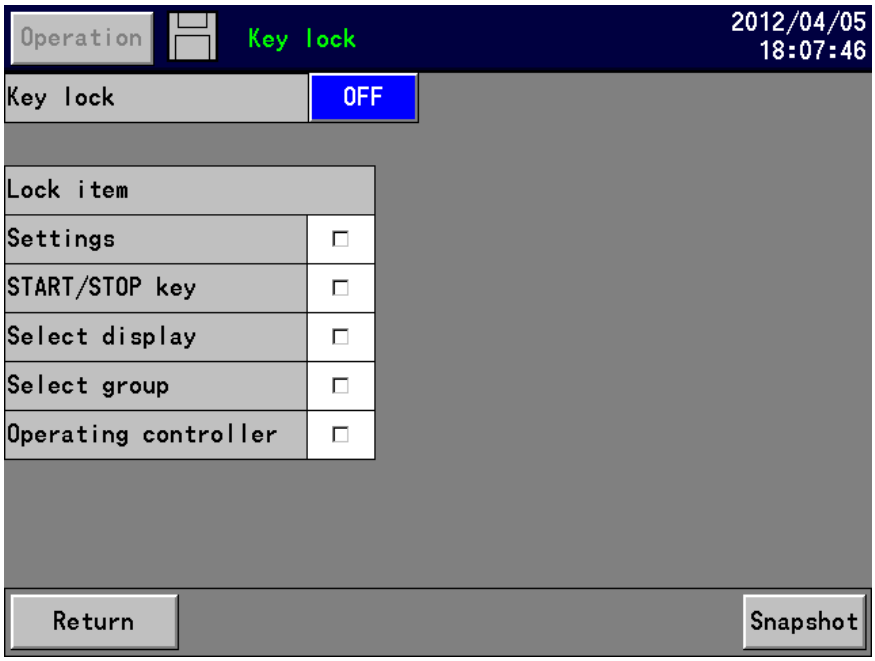
Select the display format of the date.
YY/MM/DD : Year/month/day
MM/DD/YY : Month/day/year
DD/MM/YY : Day/month/year

■ Time Zone

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

## 9-11-2 Key lock

Tap the [Operation] button and then tap [MENU settings] - [System settings] - [Key lock], the following screen is displayed.
On this screen, key lock operation can be carried out. If the key lock is 'ON' and lock item 'Settings' is checked then selecting the MENU settings, entering the password is necessary to be in the settings screen.




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

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

| 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 DISPLAY menu. |
| Select group | Lock for group selection of DISPLAY menu. |
| Operating controller | Lock for Controller selection of DISPLAY menu*. |

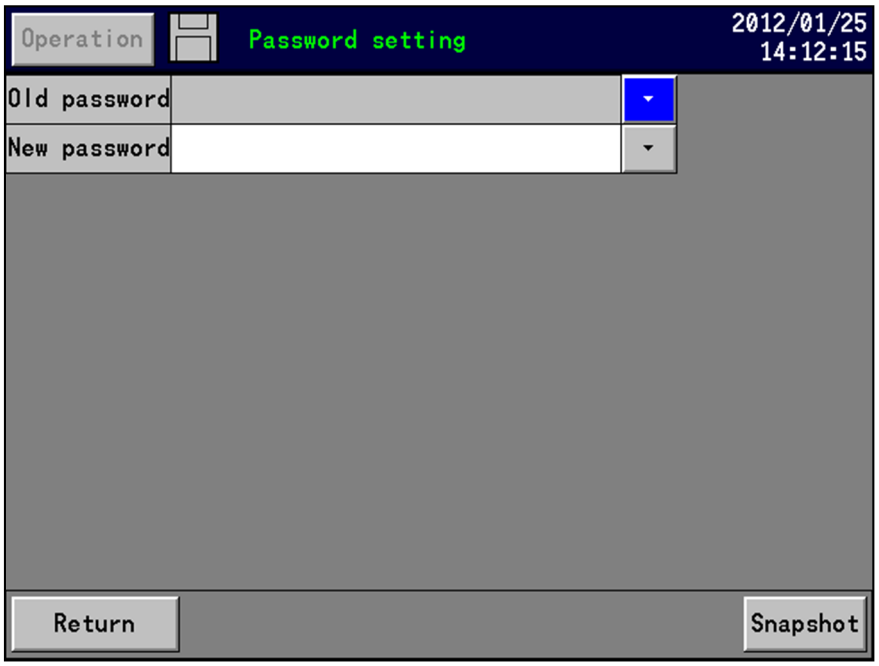
*Operating controller is displayed when the controller's PV parameter is connected with low order communications and registered in a channel.
(Refer to '12 Communication function settings (Option)')

## 9-11-3 Password setting

Tap the [Operation] button and then tap [MENU settings] - [System settings] - [Password setting], the following screen is displayed.

This password is used for the followings.

・For releasing the key lock




■ Setting the password (For entering the password, refer to '5-2 Character entering method'.)

Set the password for the key lock.

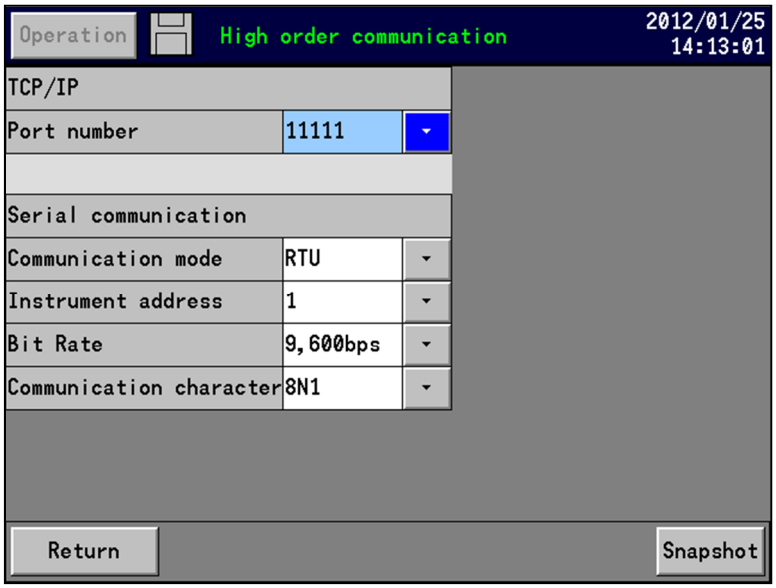
■ For changing the password

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.

## 9-11-4 High order communication settings (Option)

Tap the [Operation] button and then tap [MENU settings] – [System settings] - [High order communication], the following screen is displayed.
On this screen, high order communication for this recorder can be set.

*This screen is not displayed without communication interface option.




■ TCP/IP Port number (Option)

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 s for high order application, set the number except 502. When use the PC software corresponding commercial Modbus-TCP, set 502.
* If port number is set to 11111 on high order communications by TCP/IP, communication mode is RTU and the instrument address is fixed at "01".

■ Serial communication

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

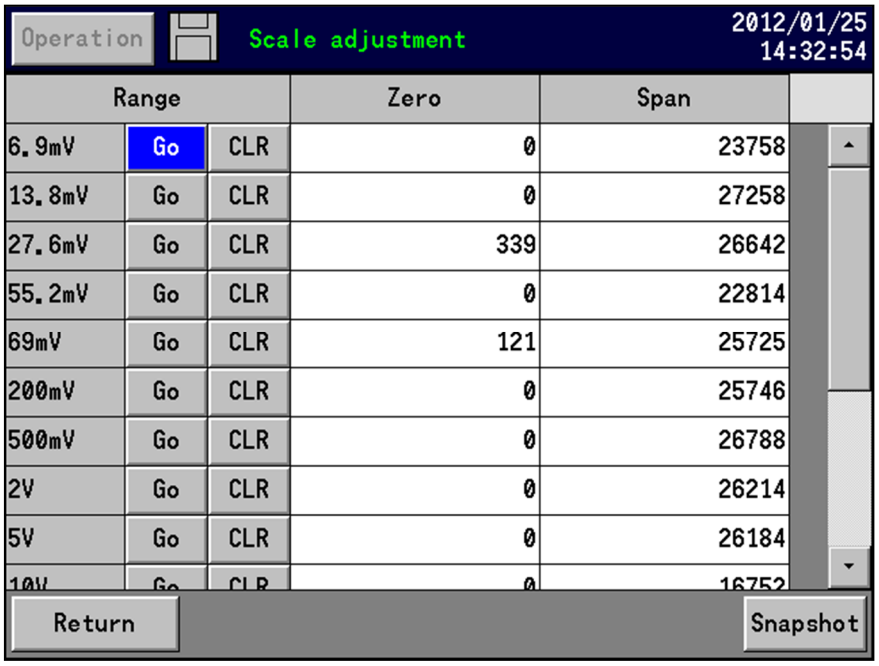
| | |
|---|---|
| Communication mode | Select the communication mode from [RTU] or [ASCII]. |
| Instrument address | Set a value from 1 to 31. |
| Bit rate | Select the bit rate from [9600bps] or [19200bps]. |
| Communication character | Select a combination of the data bit, parity and stop bit. |

| Code | Character length | Parity | Stop bit |
|---|---|---|---|
| 7E1 | 7 bits | Even | 1 |
| 7E2 | | | 2 |
| 7O1 | | Odd | 1 |
| 7O2 | | | 2 |
| 8N1 | 8 bits | None | 1 |
| 8N2 | | | 2 |
| 8E1 | | Even | 1 |
| 8E2 | | | 2 |
| 8O1 | | Odd | 1 |
| 8O2 | | | 2 |

*Codes are used to represent characters. MODBUS RTU mode can set only 8-bit characters (see Section 7-1).

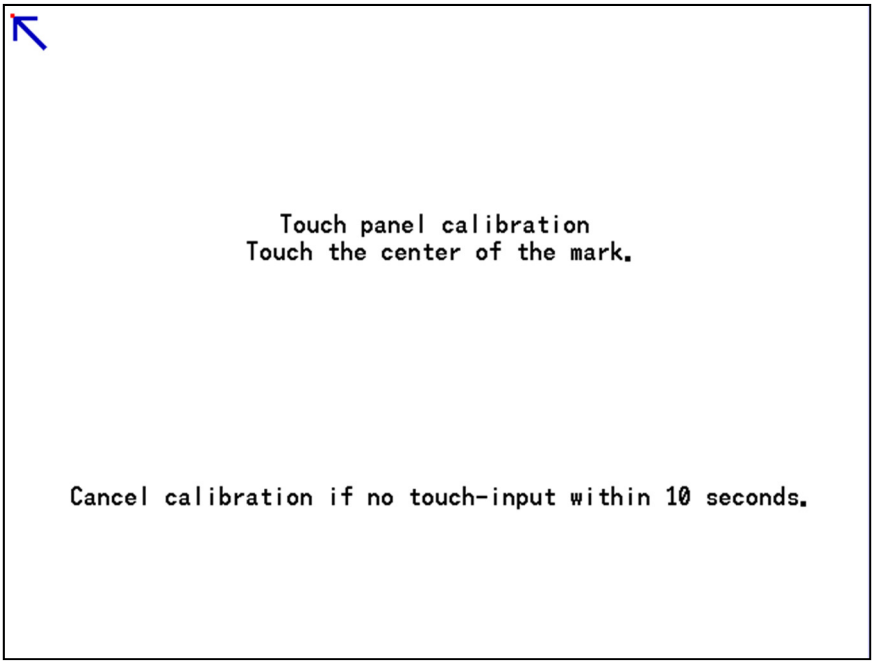
## 9-11-5 Scale adjustment

Tap the [Operation] button and then tap [MENU settings] - [System settings] - [Scale adjustment], the following screen is displayed.
On this screen, adjustment of the scale for this recorder can be set (Refer to '17 Scale adjustment').



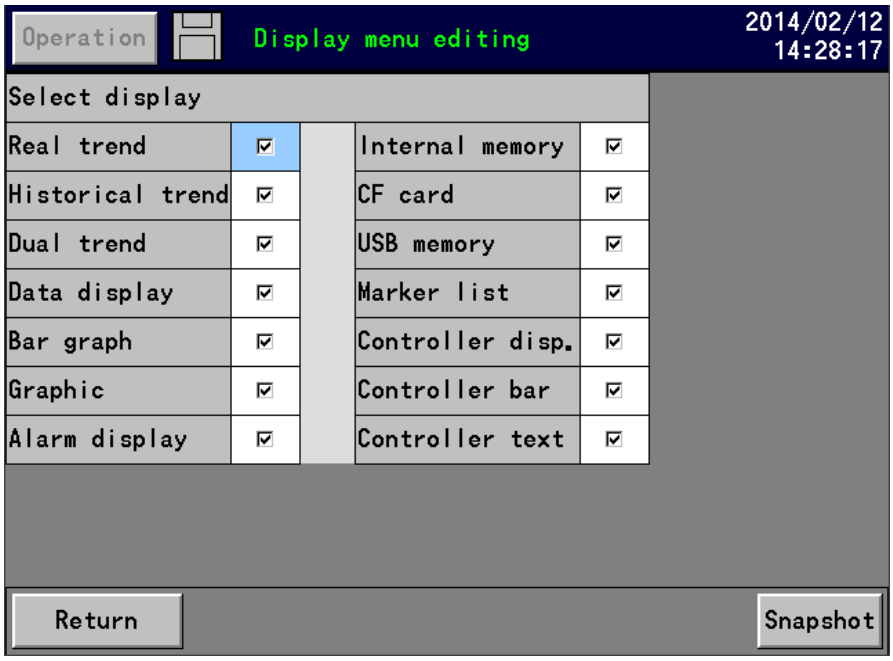
## 9-11-6 Touch panel calibration

Tap the [Operation] button and then tap [MENU settings] - [System settings] - [Touch panel calibration], the following screen is displayed.
On this screen, calibration of touch panel for this recorder can be set. 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 touch pen. 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.



## 9-11-7 Display menu editing

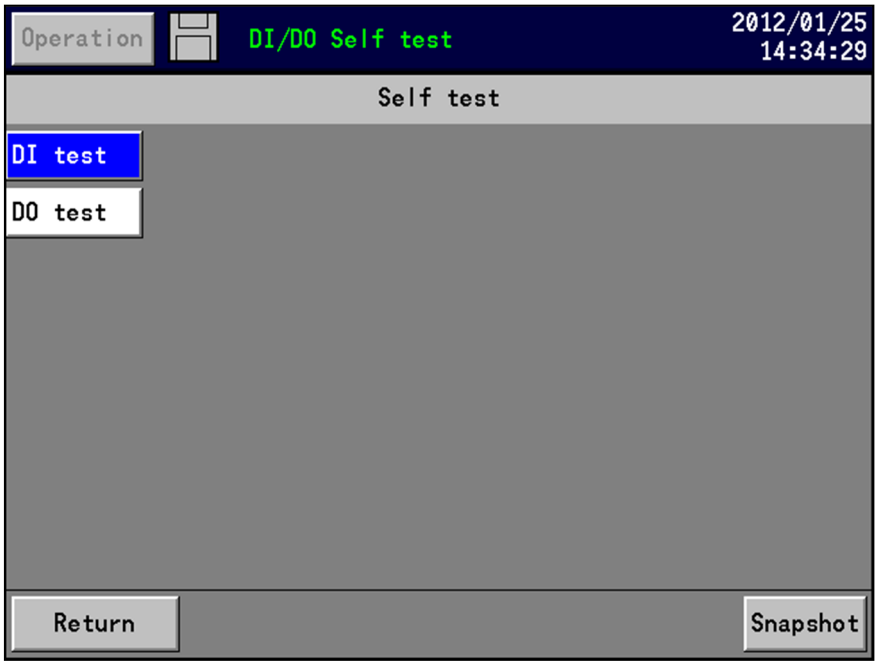
Tap the [Operation] button and then tap [MENU settings] - [System settings] - [Display menu editing], the following screen is displayed.
On this screen, items to be displayed on the [Select display] of the [DISPLAY] menu on the trend screen can be set.



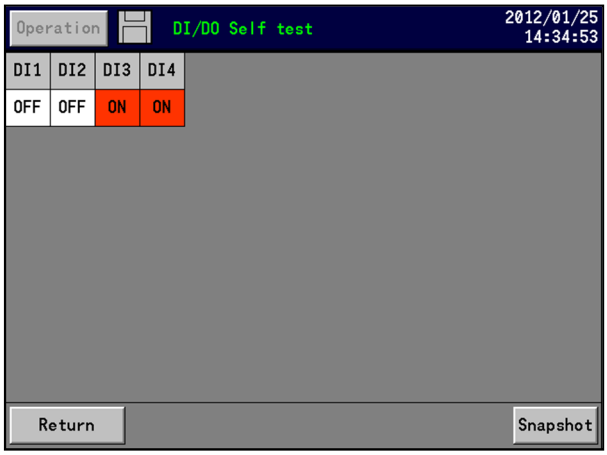

*[Controller disp.], [Controller bar], [Controller text] are displayed when controllers are connected with low order communications and registered in a channel (Refer to '12 Communication function settings (Option)').

## 9-11-8 DI/DO Self test (Option)

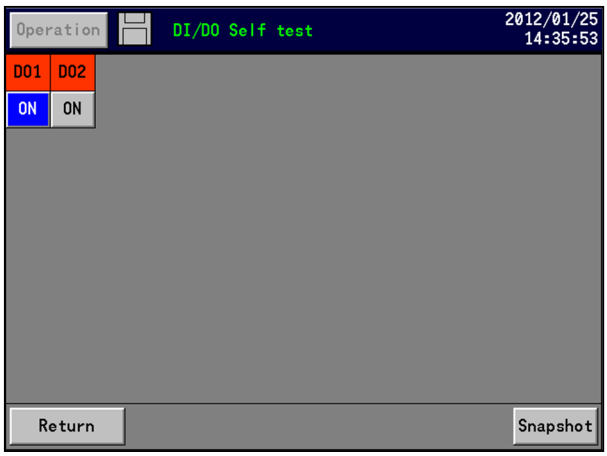
Tap the [Operation] button and then tap [MENU settings] - [System settings] - [DI/DO Self test], the following screen is displayed.
On this screen, alarm output/digital input operation confirmation can be done.




DI test

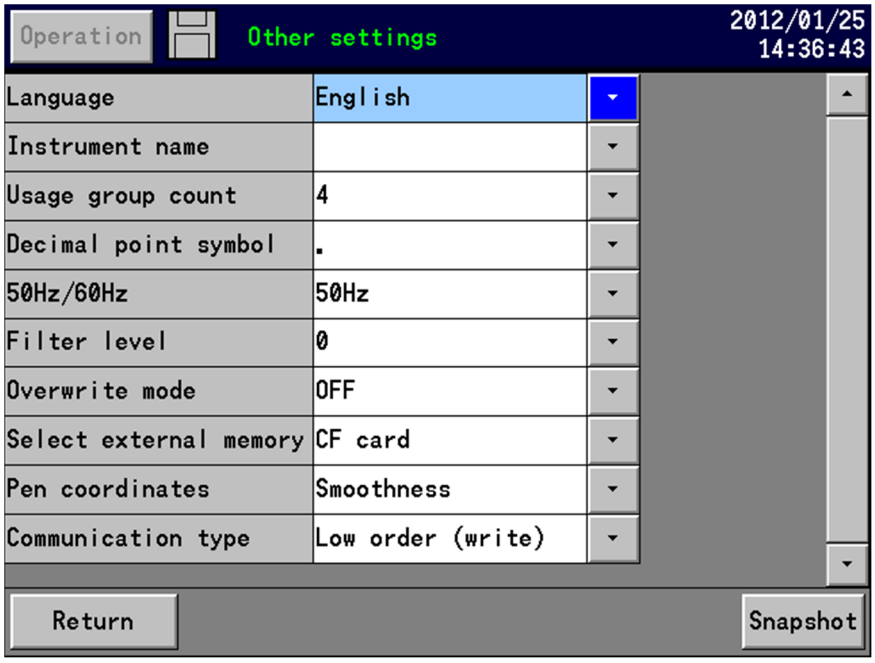



DO test



## 9-11-9 Other settings

Tap the [Operation] button and then tap [MENU settings] - [System settings] - [Other settings], the following screen is displayed.
On this screen, language, filter level and selecting communication type, etc. for this recorder can be set.




■ 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 (KR2S:1 to 5, KR3S:1 to 6). The smaller the usage group count, the longer the period for recording it in internal memory (Refer to '7-8 Internal memory screen').

■ Setting the decimal point symbol

Select [. (dot)], or [, (comma)] for the decimal point.

■ 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.

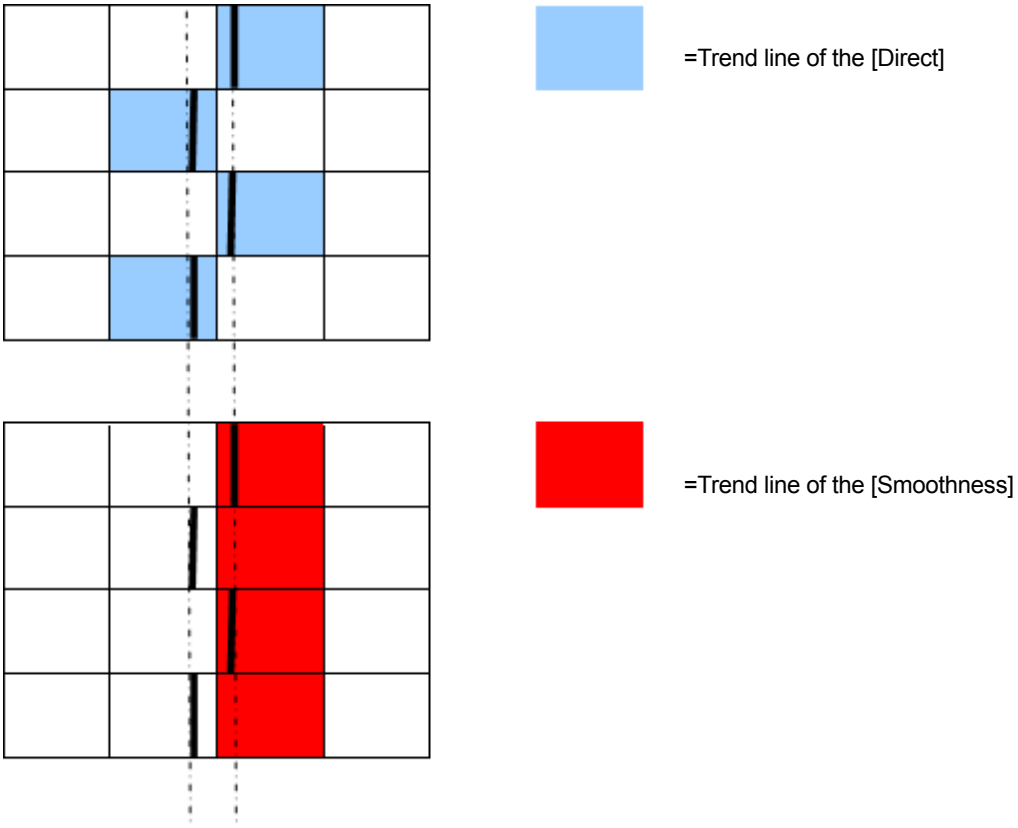
■ Setting the pen coordinate

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])




Range of the changing is less than range of 1 dot.

■ Setting the communication type (Option)

Select the communication type from [Low order], [Low order (Modbus RTU)], [Low order (read)], or [Low order (write)].

Contents of each communication types are following.

| | |
|---|---|
| High order | Use for the data acquisition by an instrument or a computer that is connected as high order. |
| Low order (Modbus RTU) | Use for the data read and write by the instrument which supports Modbus RTU that is connected as low order. |
| Compatible Low (read) | Used for reading input data of a CHINO instrument and data in PLC that is connected as low order. |
| Compatible Low (write) | Used for writing data of KR to PLC that is connected as low order. |

Refer to '12 Communication function setting' for use of each low order communication.

# 10 Setting/displaying on Web screen (Option)

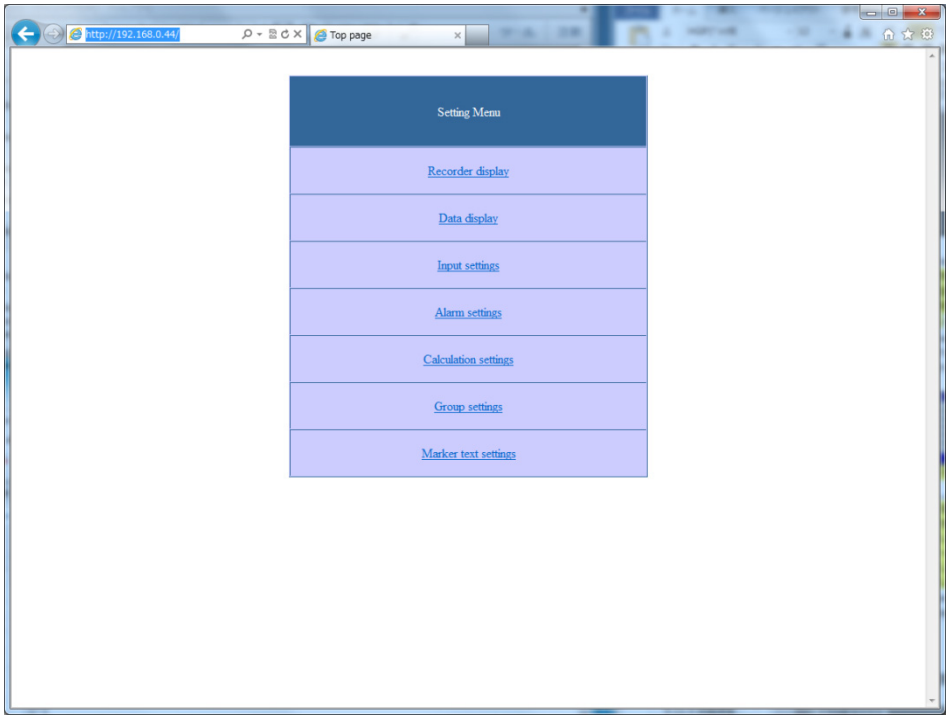
## 10-1 Display and settings using the Web screen

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

| Remarks | Please see '8 HOME settings' and '9 MENU settings' also. |
|---|---|

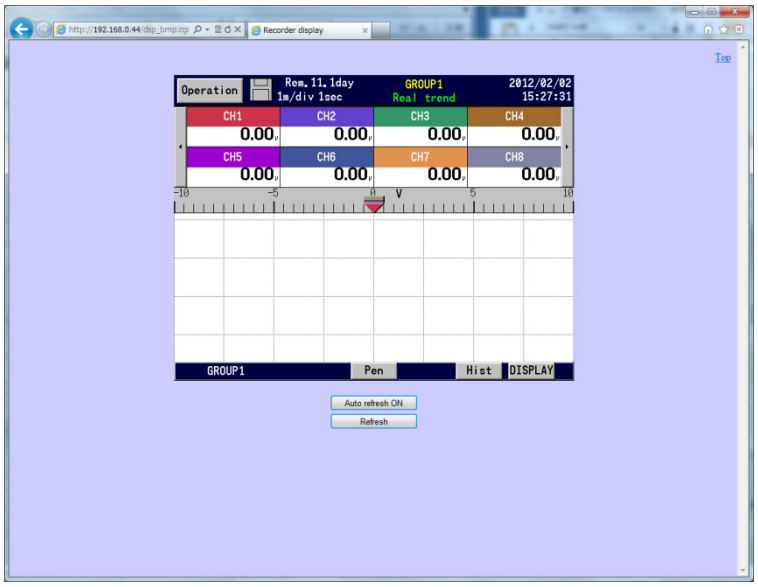
### 10-1-1 Top page

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 default user name used for the password authentication is 'user'. However, user name and 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.



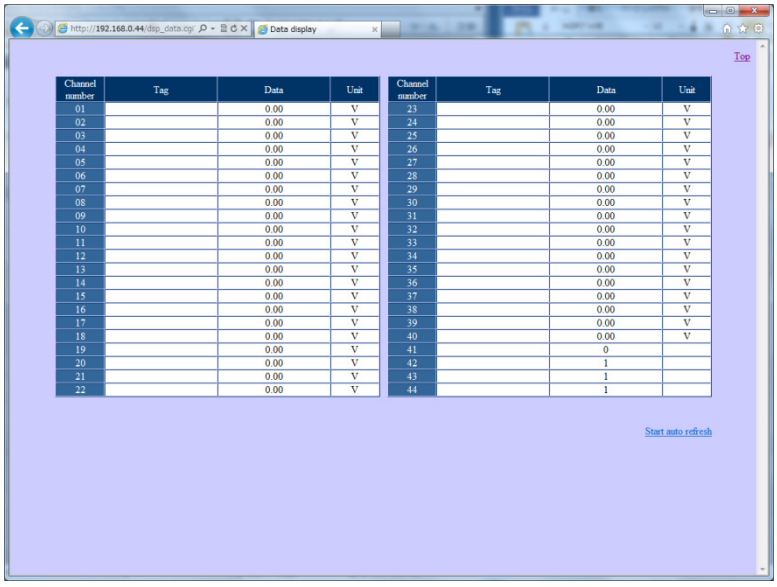
## 10-1-2 Recorder display

The same contents as this recorder are displayed. 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 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].



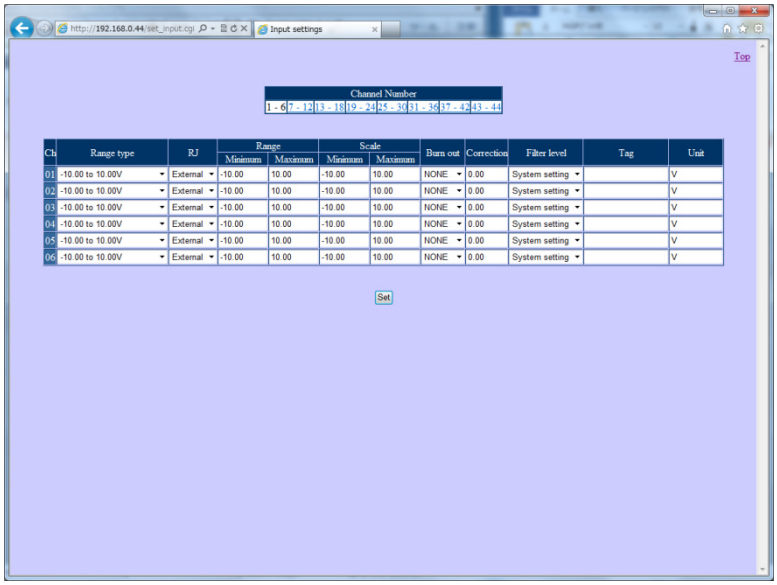

## 10-1-3 Data display

The data 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.



## 10-1-4 Input settings

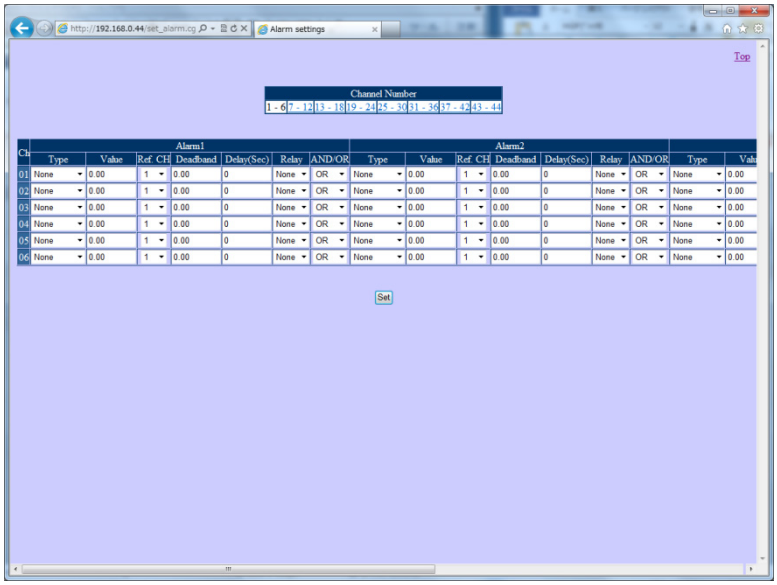
This is for changing the settings of the input parameters of this recorder. By clicking the [Set] button after entering each item, the setting contents are written in this recorder. The displaying channel block can be switched by selecting the link from the [Channel number] table at the upper part of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




| 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.<br>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. |

## 10-1-5 Alarm settings

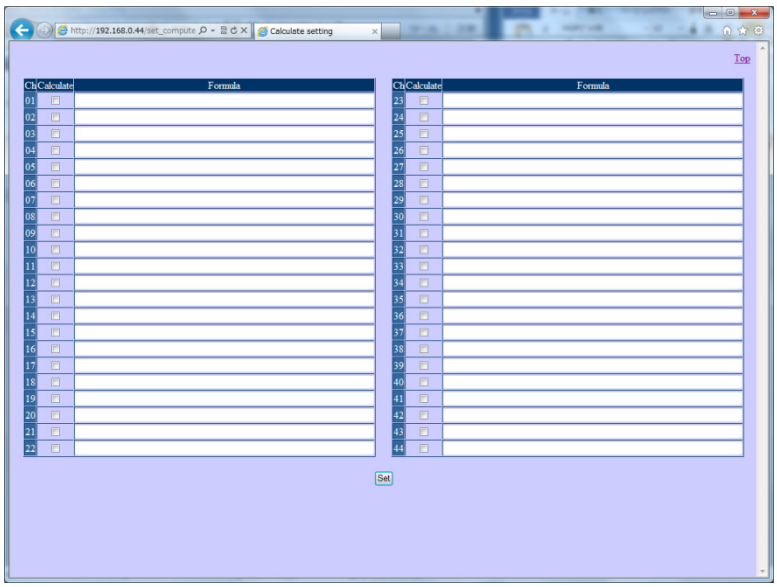
This is for changing the settings of the alarm parameters of this recorder. By clicking the [Set] button after entering each item, the setting contents are written in this recorder. The displaying channel block can be switched by selecting the link from the [Channel number] table at the upper part of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




| 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. |

## 10-1-6 Calculation settings

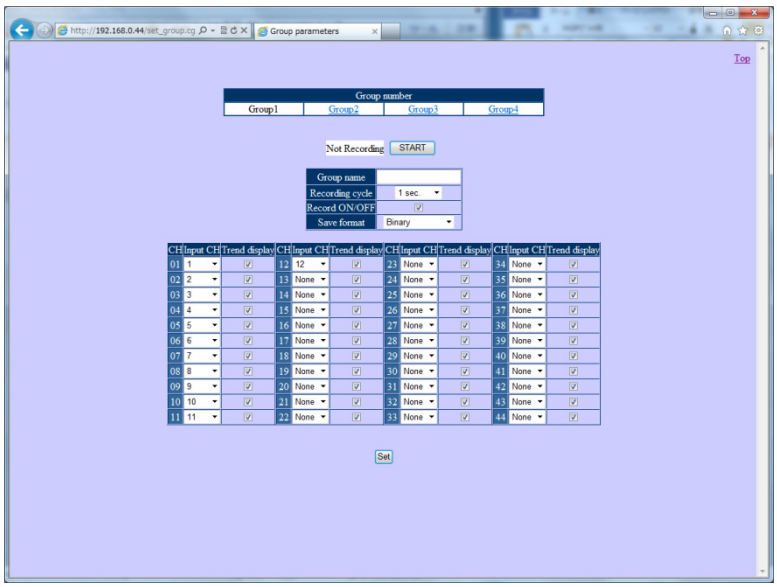
This is for selecting whether the calculation for each channel of this recorder is used or not, and for setting the formula. When the [Set] button is clicked after entering each item, the setting contents are written in this recorder. The settings cannot be changed during recording.




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

## 10-1-7 Group settings

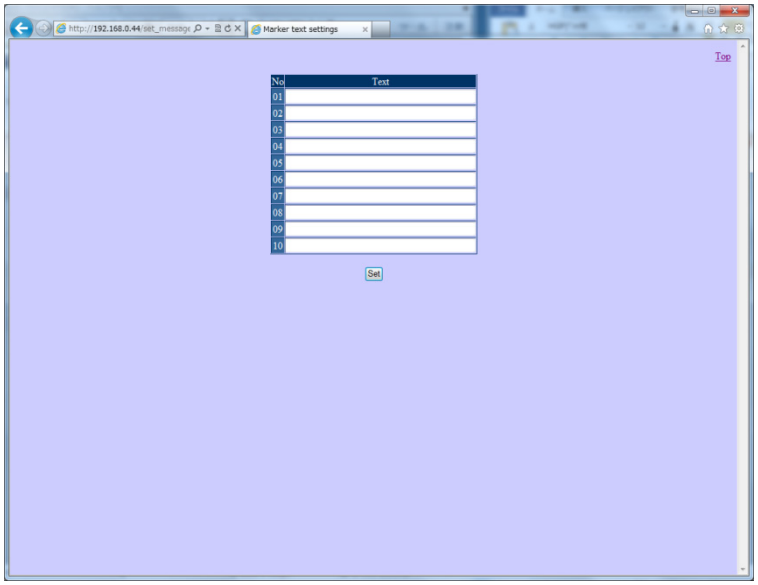
This is for changing the settings of the record-related-parameters of this recorder. When the [Set] button is clicked after entering each item, the setting contents are written in this recorder. The settings of one group are displayed on one screen. The group to be displayed can be switched by selecting 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/OFF checked cannot be changed during recording.




| 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 '9-5 File settings') |
| 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. |

## 10-1-8 Marker 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 '5-3-1 Tapping on the operation screen'.




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

# 11 Recording in a USB memory

## 11-1 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.

## 11-2 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.

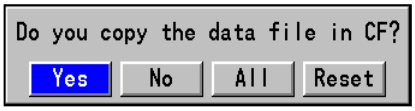
## 11-3 Usage

The USB memory has the following usage in this recorder.

(1) Used as an external media for storing the data (Refer to '9-11-9 Other settings' - [Selecting an external memory])

(2) The recorded data is copied when the USB memory is inserted.
Does not copy setting files and snapshots.

When the USB memory is inserted, the following message is displayed.




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

(3) Copying all data stored in the CF card together (Refer to '9-9 Memory operation')
Does not copy setting files and snapshots.

(4) Reading/writing the setting file (Refer to '9-9 Memory operation')

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

| Remarks | 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. |
|---|---|

# 12 Communication function settings (Option)

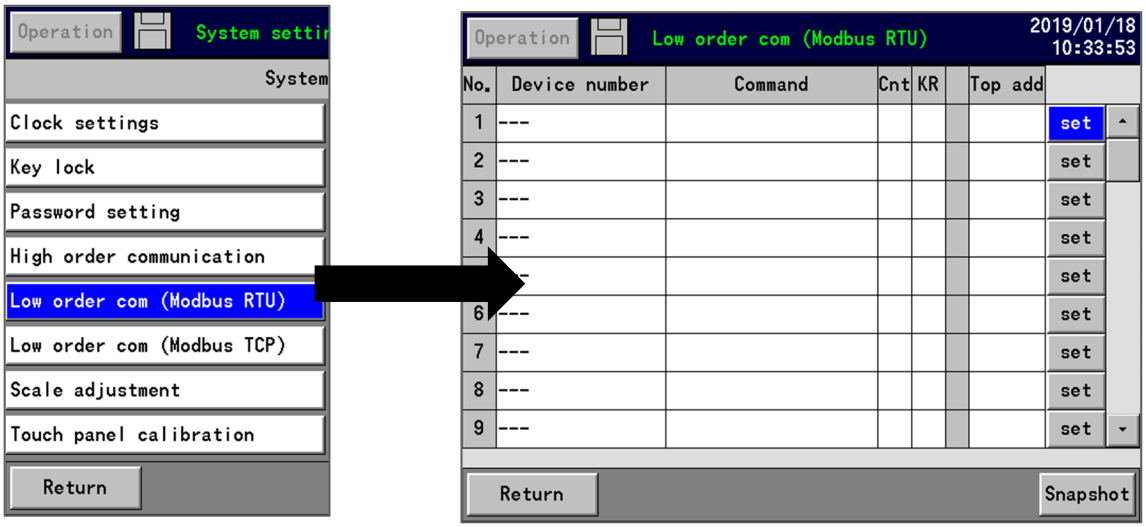
## 12-1 Low order (Modbus RTU)

### 12-1-1 Outline

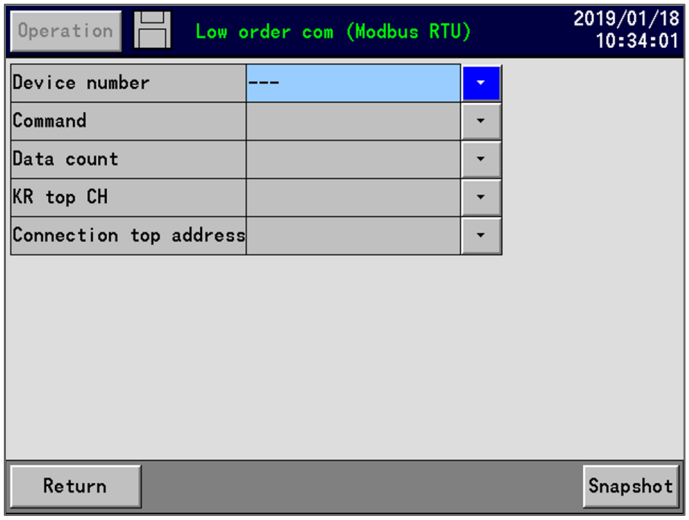
By using low order (Modbus RTU), data of instrument which supports Modbus RTU can be read and write.
Maximum 31 instruments can be registered.

### 12-1-2 Setting method

Tap the [Operation] button and then tap [MENU settings] - [System settings] - [Low order com (Modbus RTU)], the following screen is displayed.
On this screen, instruments to register to KR2S/KR3S can be set.




When [set] is tapped, detail setting screen of corresponding No. is displayed.




■ Device number

Set device number (COM number) of an instrument to communicate as low order communication.
Setting range: COM1 to COM31

■ Command

Set communication command (function code).

Commands to be able to set from KR2S/KR3S are following.

| | |
|---|---|
| Read | ReadBitSet(01) |
| | ReadBitData(02) |
| | ReadWordSet(03) |
| | ReadWordData(04) |
| | ExReadWordSet(60) |
| | ReadFloatData(04) |
| Write | WriteBitSet(05) |
| | WriteWordSet(06) |
| | WriteWordSet(16) |
| | ExWriteWordSet(61) |

■ Data count

Set number of data to perform communication (write/ read).

Number of data available to be set is depending on the model code of the device.

■ KR top CH

Set top CH of KR side which starts communication (write/ read).

Numbers of the channels available to be set are depending on the model code of the device.

Multiple data can not be read by same channel.

■ Connection top address

Set top address (reference number) of the device which performs communication (write/ read).

Setting range: 0 to 65535

# 12-2 Compatible low order (read)

## 12-2-1 Outline

*To use low order communications (write), on [System settings] – [Other settings] of communication type, set 'Low order' (write). (Refer to '9-11-9 Other settings')

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).*2
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 for 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 (Only 1C frame is supported.)
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 4-7-2). When communicate with RS-422A, need communication unit that is corresponded high order link C mode command.

—Instrument can be connected to low order side—
1. BR
2. AL3000
3. AH3000
4. SE3000
5. KE3000
6. LE5000
7. KR2000/3000/KR2S/KR3S/ KR2D/KR3D
8. LT230
9. LT350/370
10. LT450/470
11. LT830
12. DB1000/2000/DB600
13. DP-G
14. KP1000/2000
15. JU
16. JW
17. MELSEC series *4
18. SYSMAC series *5

■ Lower-order communication (read) outline

| | |
|---|---|
| Model | KR2S***R******, KR2S***G******<br>KR3S**-R**-***, KR3S**-G**-*** |
| Connection quantity | Maximum 16 |
| Data renewal period | approximately 1 second per 1 instrument.*1 |
| Communication time out | approximately 1 second for each instrument (no retry) *2.<br>Retain the data of last value. |

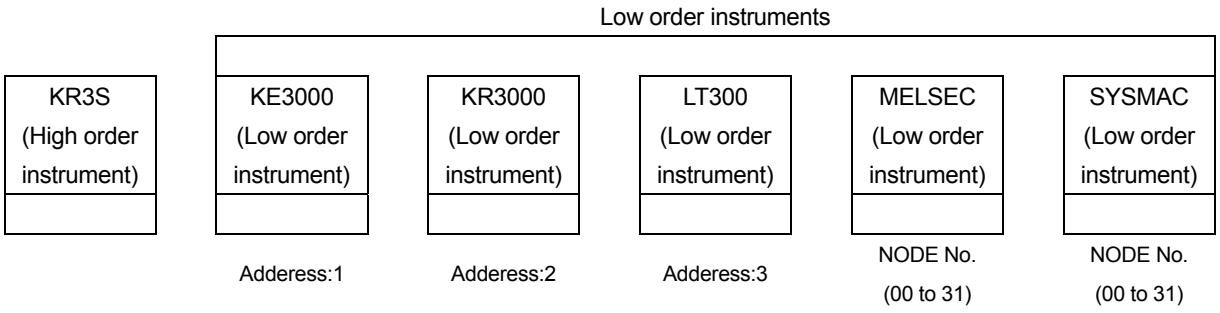
*1 Display of renewal may delay in this instrument depending on the condition of data renewal or communication response delay of low order side instrument.

*2 When communication time out is occur for the 60th times in a row, display and record 'UNDER'.

## 12-2-2 Procedure of connection setting to low order instrument

After connecting 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 '4-7 Connection of communication I/F terminal (Option)', 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>




## 12-2-3 Setting of low order instrument

(1) Set communication address (instrument number) of low order instrument from 1 to 31 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.

| | |
|---|---|
| Bit rate | 9600 bps |
| Length of data | 8 bit |
| Stop bit | 1 bit |
| Parity | None |

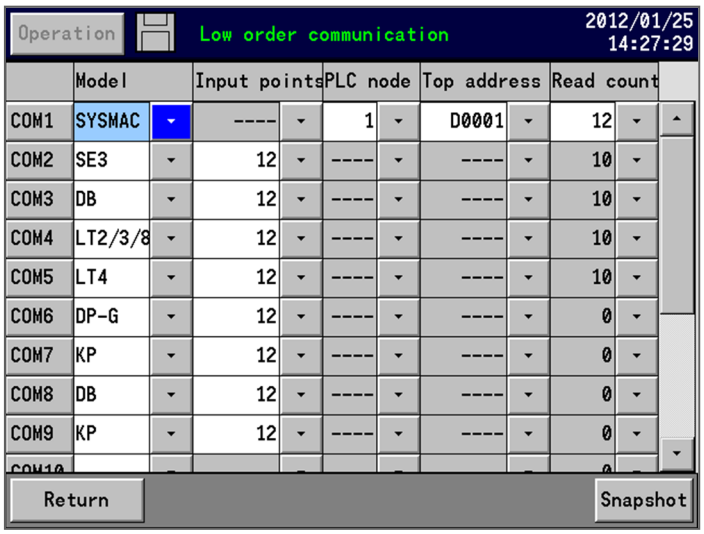
## 12-2-4 Register the instrument to this recorder

(1) On the setting menu screen of this recorder, tap [System settings] - [Low order communication (read)].

('Low order communication' is displayed only with the instrument that have optional low order communication.)

(2) Select appropriate name of the model from a list of 'model'.*1 Register low order instrument corresponding each communication address (instrument number) 1 - 31 to COM1-COM31.

(3) Register points to 'input points'.*2 *3




■ Example of setting

COM1: SYSMAC
COM2: SE3
COM3: DB
COM4: LT2/3/8
COM5: LT4
・
・
・

*1 Names of the instruments displayed on the list are abbreviated.

| On the list | Model of our company |
|---|---|
| SE3 | SE3000 |
| AL/AH | AL3000/AH3000 |
| KR2/3 | KR2000/KR3000/KR2S/KR3S/KR2D/KR3D |
| LE5 | LE5000 |
| LT2/3/8 | LT230/LT350・370/LT830 |
| LT4 | LT450・470 |
| DB | DB1000/2000/DB600 |
| DP-G | DP1000G |
| KP | KP1000/2000 |

*2 On KR data of JU and JW is assigned as below for CH data.

| JW | |
|---|---|
| CH01 | Voltage level (average) |
| CH02 | Current value (average) |
| CH03 | Electric power 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 power value |
| CH04 | Load resistance value |

*3 The data of LT, DB, DP-G and KP is allocated in KR as CH data.

| CH / Parameter | | Model name | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | LT8 | LT2 | LT3 | LT4 | DB | DP-G | KP |
| CH01 | PV | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| CH02 | SV | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| CH03 | MV1 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| CH04 | MV2 | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| CH05 | Execution SV | × | ○ | ○ | ○ | ○ | ○ | ○ |
| CH06 | EV1 | × | ○ | ○ | ○ | ○ | ○ | ○ |
| CH07 | EV2 | × | ○ | ○ | ○ | ○ | ○ | ○ |
| CH08 | EV3 | × | × | ○ | ○ | ○ | ○ | ○ |
| CH09 | EV4 | × | × | × | ○ | ○ | ○ | ○ |
| CH10 | P | × | ○ | ○ | ○ | ○ | ○ | ○ |
| CH11 | I | × | ○ | ○ | ○ | ○ | ○ | ○ |
| CH12 | D | × | ○ | ○ | ○ | ○ | ○ | ○ |
| CH13 | Execution No. | × | ○ | ○ | ○ | ○ | × | × |

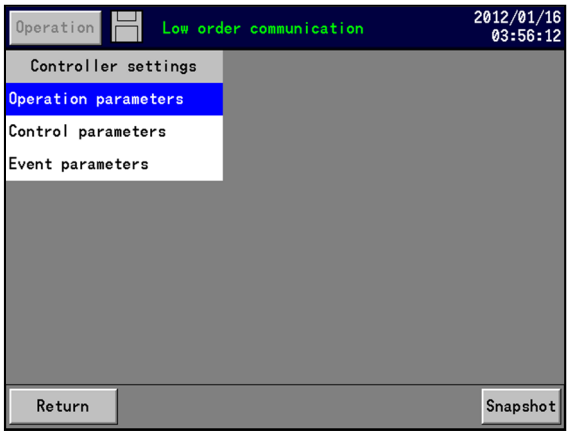
○ : The display is possible. × : UNDER display

## 12-2-5 Settings to controllers

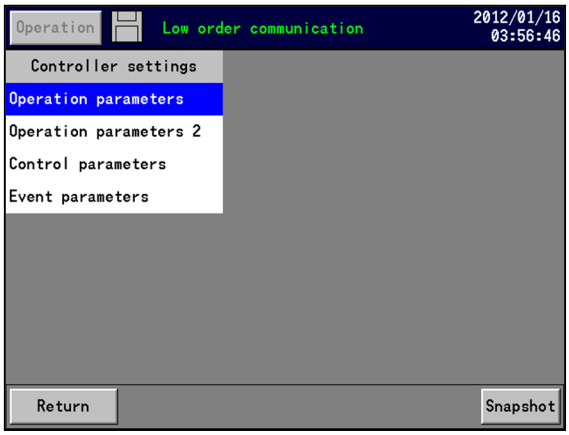
On the registration screen of instruments (refer to '12-2-4 Register the instrument to this recorder), by pressing the [COM] button of the row, that a controller (LT series, DB) is registered, a portion of parameters for a controller can be set.
The menu of the following figure is displayed first and, by selecting each menu, the corresponding parameter can be set.
If connecting device is added or reduced, tap [COM] once and check that the communication is done normally.
(DP-G series and KP series doesn't change to controllers menu even if the 'COM' button is tapped, since only reading is available.)

● Controller setting

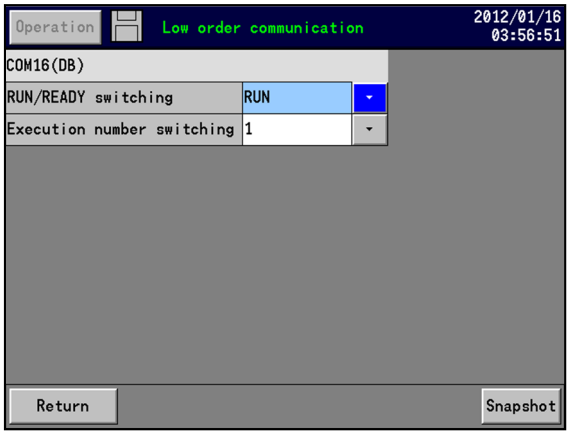
[LT2/3/8] Display




[LT4] [DB] Display




● Operation parameters

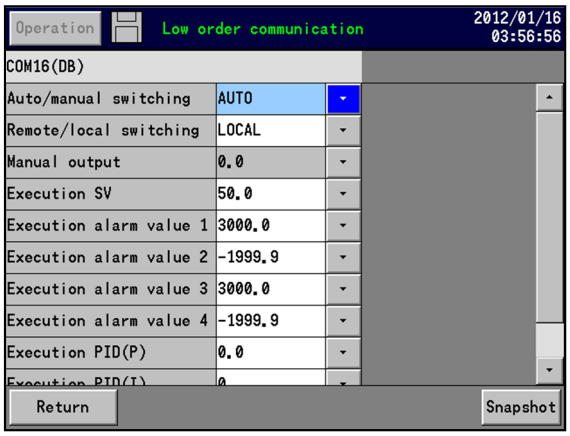



For the controllers connected, the following operations can be executed.

- ・RUN/READY selection
- ・Execution number selection

  Execution No. 1, No. 2 (Execution SV1, Execution SV2) only: Switching of the LT800 series is disabled.

● Operation parameters 2

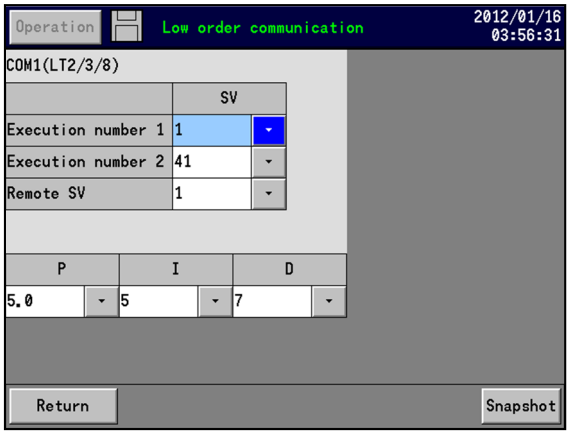



It can be used for LT400 series and DB/KP series controllers.
For the controllers connected, the following operations can be executed.

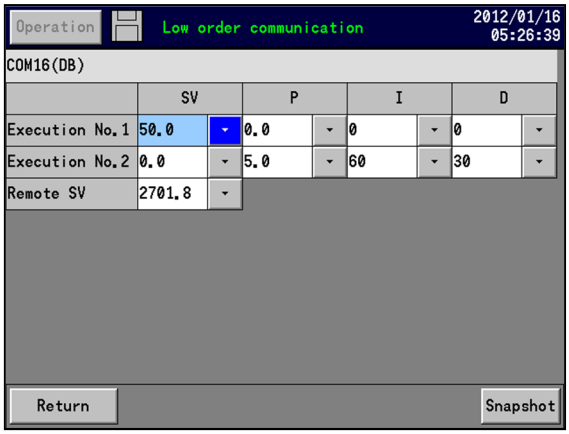
・AUTO/MANUAL selection
・Manual output (auto/manual, valid only when the manual is selected)
・REMOTE/LOCAL selection
・Execution number selection (No.1 and No.2 only)
・Execution alarm value, Executing PID (DB series controllers only)

● Control parameters

[LT2/3/8] Display




[LT4] [DB] Display



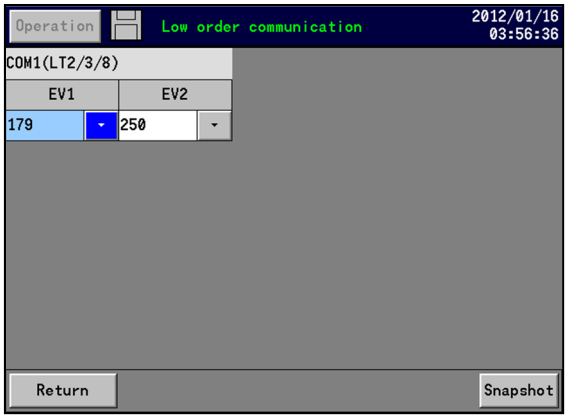

For the controllers connected, the following operations can be executed.

・Setting of a SV and PID values of execution No. 1 and 2
(For LT8 series, it becomes gray display since changing execution No.2 is not available.)
・Setting a remote SV value

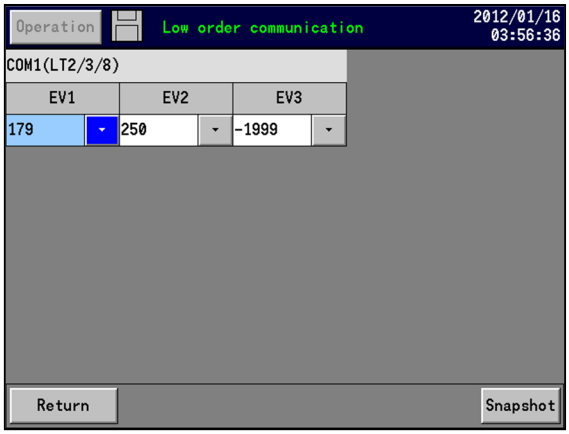
| Remarks | ■ About SV limit<br>Set SV and remote SV values within SV limit minimum to SV limit maximum of each controller.<br>When the value is set outside the range, it is not reflected. DB and LT4 are displays with 'Sending failed'. LT2/3/8 displays 'Sending complete' but the setting is not reflected to the controller. |
|---|---|

● Event parameter

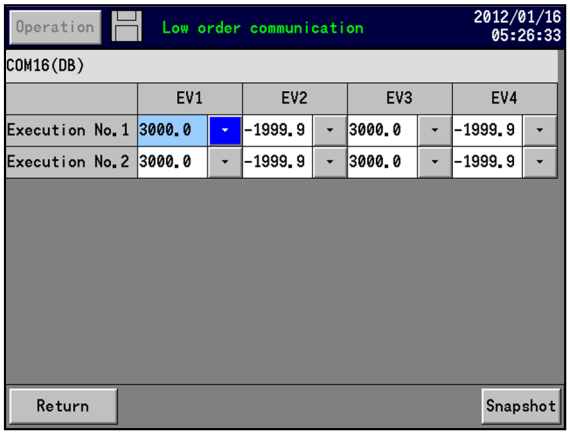
[LT2/8] Display




[LT3] Display




[LT4] [DB] Display




For the controllers connected, the following operations can be executed.

・Setting of event parameters 1 to 4 of execution No. 1 and 2.

(*When the setting that exceeds the maximum and the minimum value of the EVENT value of each device is done, the error message is displayed.)

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

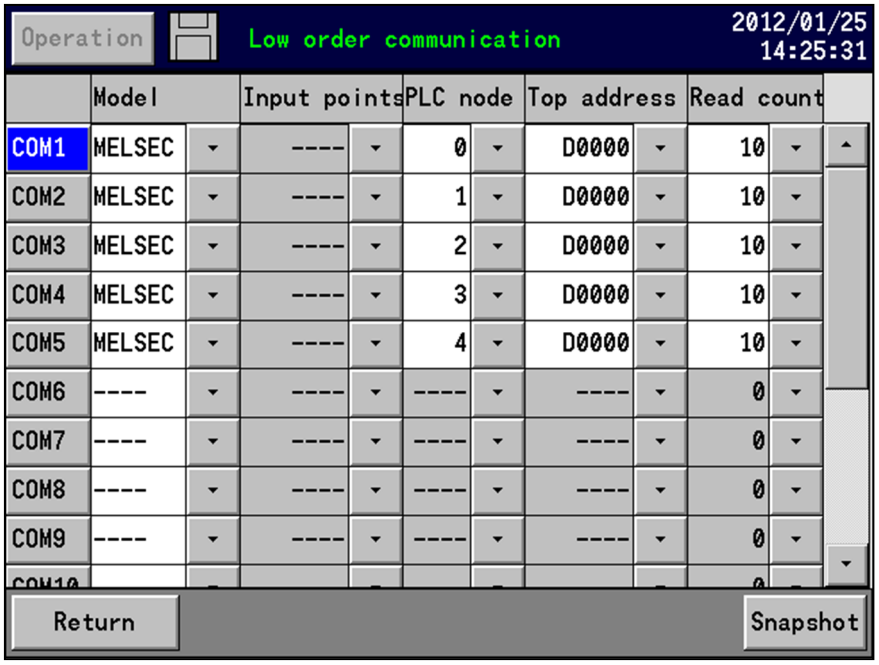
| | | Model name | | | | |
|---|---|---|---|---|---|---|
| Controller menu | Parameters name | LT8 | LT2 | LT3 | LT4 | DB |
| Operation parameters | RUN/READY switching | R/W | | | | |
| | Execution number switching | × | R/W | | | |
| Operation parameters 2 | Auto/manual switching | × | × | × | R/W | |
| | 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 |

## 12-2-6 Register PLC to this recorder

(1) On the setting menu screen of this recorder, tap [System settings] - [Low order communication (read)].
('Low order communication' is displayed only with the instrument that have optional low order communication.)

(2) Select the name of the model from the list of [Model]. Then register PLC on each COM1 to COM31.

(3) Register administrates address of the recorder on [PLC node], [Top address], and [Read count].

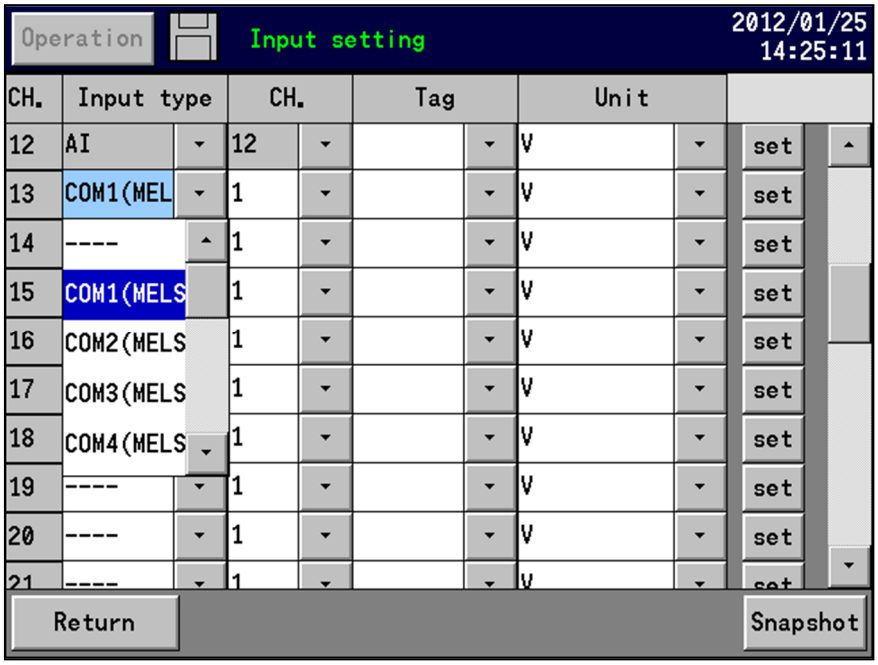


## 12-2-7 Register CH number of low order instrument

(1)On the setting menu screen of this recorder, tap [Input operation settings] - [Input setting].

(2) Tap the ▼ of [Input type] of CH which is registered low order instrument. From the displayed list, select the model that is registered at '12-1-4 Register the instrument to this recorder' and '12-2-6 Register PLC to this recorder'.

(3) Set CH number of low order instrument which is resisted to 'CH' column of third row. For PLC, let [Top address] be channel 1.

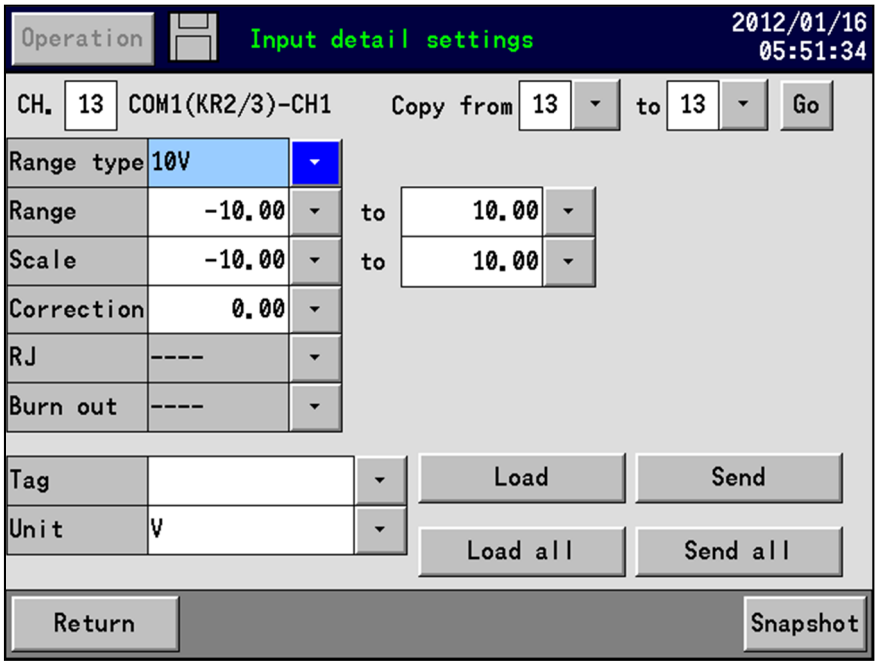



| Remarks | ■ About input setting of low order instrument<br>When a model that registers by the low order communication setting and an actual connected model have the difference, the selection item of the input type might not be displayed normally. Make sure that there is no difference between actual connected model and the registration. |
|---|---|

## 12-2-8 Input setting of low order instrument

(1) On the setting menu screen of this recorder, tap [Input operation settings] - [Input setting].

(2) Tap the [Set] button of the column that displays low order unit. Input setting screen as follows is displayed.




(3) Tap [Load] button for getting setting contents of relevant CH of low order instrument. Tap [Load all] 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 [Load] button again. When message of 'Loading Completed' is not shown, communication is not normal. Check the setting and connection of this instrument and low order instruments again.

(4) When changing the setting from this recorder for appropriate CH of low order instrument, perform following procedure. (For the instrument which is not capable of changing the setting, [Send] and [Send all] button are not displayed.)
When change the setting of only displayed CH, tap [Send] button. In case of changing all needed CH and setting at once, tap [Send all] 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 sending is failed, the following message is displayed.


Tap [OK] button for returning and tap [Send] button again. When message of 'Sending Completed' is not shown, communication is not normal. Check the setting and connection of this instrument and low order instruments again.

(5) After finish the setting of CH, tap [Return] button and save the setting.

(6) After setting of the above procedure, start data acquisition from slave device.

# 12-3 Compatible low order (write)

## 12-3-1 Outline

*To use Low order communications (write), on [System settings] - [Other settings] of communication type, set 'Low order' (write). (Refer to '9-11-9 Other settings')

Low order communications (write) has the function that this recorder communicates as 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-485 communication standard compliance.

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

*1 Data of following PLC manufactured by Mitsubishi Electric can be read.
・MELSEC AnACPU series
・MELSEC QnACPU series
・MELSEC QnASCPU series
・MELSEC QCPU series
・MELSEC FX series (Only 1C frame is supported.)
Need the communication unit, etc. that is corresponded communication control procedure model 4.
Following devices can be loaded.
・D0000 to D1023
・M0000 to M2047.

*2 Data of following PLC manufactured by Omron can be read.
・The instrument which support SYSMAC C mode command communication.
Following channels can be loaded.
・Data memory (DM) area : D0000 to D9999
・CIO (input and output relay, etc.) area : 0 to 6143
For communication of Omron PLC and RS-485, line convertors (SC8-10) as many as number of PLC are necessary. (Refer to '4-7-2 Connection of low order communication RS-485').

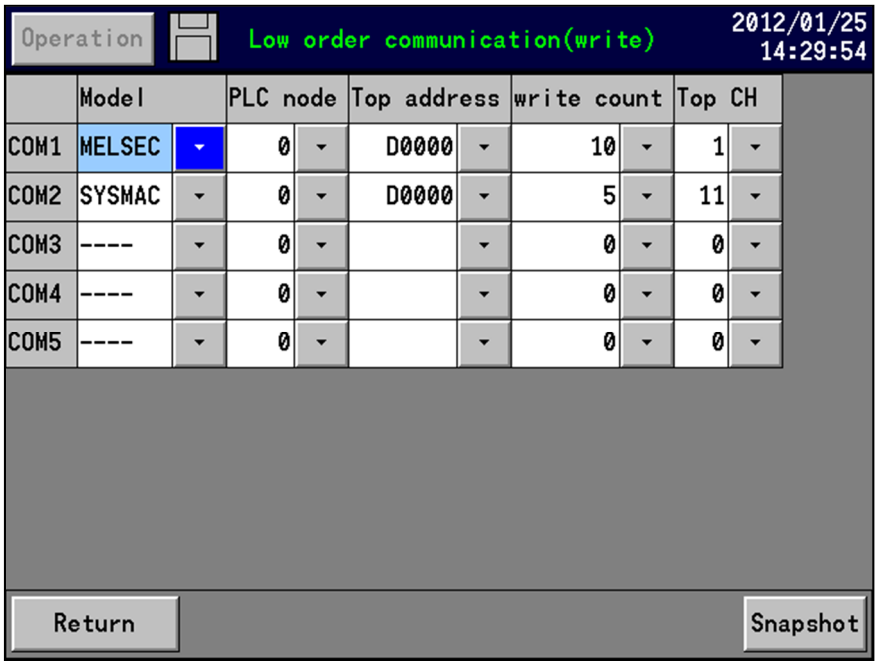
■ Low order communications (write) specification outline

| Model | KR2S***R******, KR2S***G******<br>KR3S**-R**-***, KR3S**-G**-*** |
|---|---|
| Connection quantity | Maximum 5 |
| Data renewal period | Approximately 1 second per 1 instrument*1 |
| Communication time out | Approximately 1 second for each instrument *2 (no retry) |

*1 Display of renewal may delay in this instrument depending on condition of data renewal or communication response delay of low order side instrument.
*2 When the instrument includes communication time out and has communication error for 60th times, it displays error message.

## 12-3-2 Register the instrument to this recorder

(1) On the setting menu screen of this recorder, tap [System settings] - [Low order communication (write)].
('Low order communication' is displayed only with the instrument that have optional low order communication.)
(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 [PLC node], [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 MELSEC of PLC node '0'.
COM2: Write the data of CH11 to 15 of KR to 'D0000 to D0004' of SYSMAC of PLC node '0'.

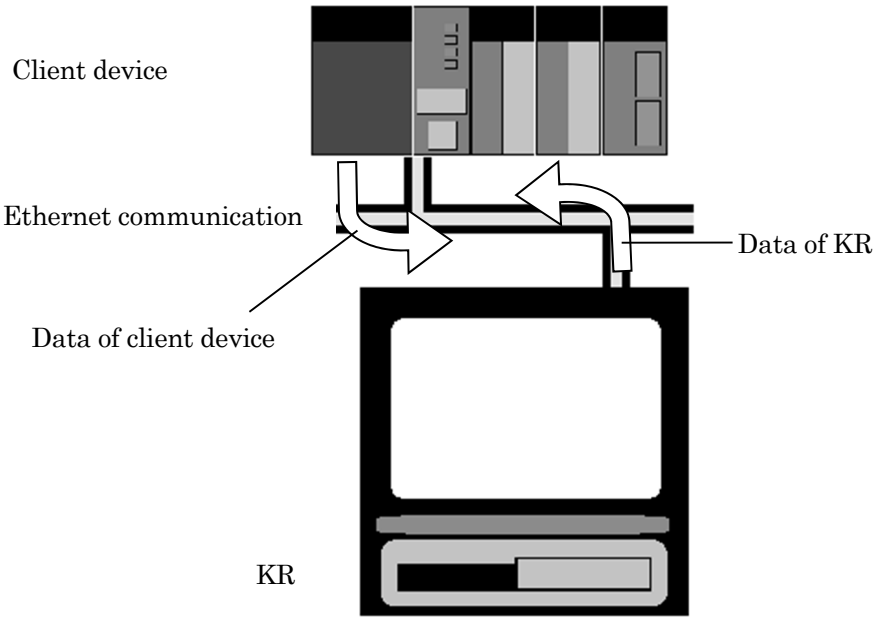
# 12-4 Low order (Modbus TCP)

## 12-4-1 Outline

*Please note that this function can not be used with '12-2 Compatible low order (read)' or '12-3 Compatible low order (write)'.

Low order communication (Modbus TCP) is that KR functions as a master unit of the communication and assigns read data from a slave device as input channel of KR, as well as writes measured and calculated data of KR to the slave device. Communication between KR and the slave device is Modbus TCP standard compliant.

■ Figure of data communication




■ Communication specifications

| Item | Contents |
|---|---|
| Communication method | Modbus TCP |
| Connection quantity | Maximum 16 |
| Maximum read point | KR3S: 120 - Analog input point<br>KR2S: 44 - Analog input point |
| Maximum write point | KR3S: 128<br>KR2S: 44 |
| Data renewal period | 50mm/sec. × number of connected device<br>Due to status of data update interval and communication response delay of slave unit, display update of KR2S/KR3S may delay. |
| Communication time out | 4.2sec.<br>If communication time out occurs, display of KR2S/KR3S becomes COM_ERR. |

■ Procedure to prepare communication

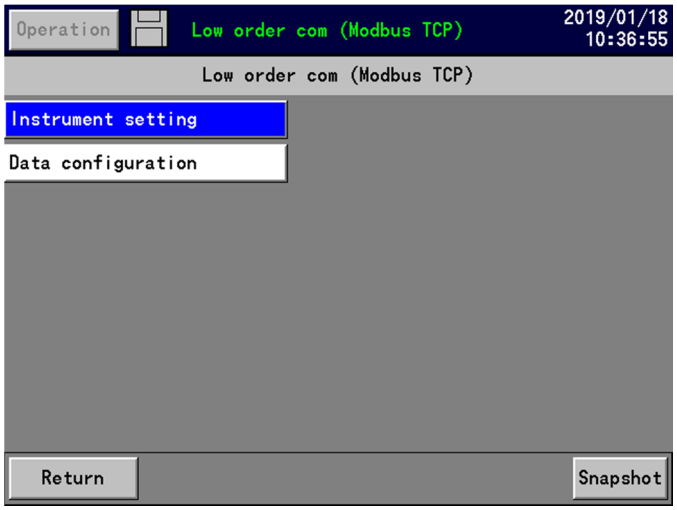
(1) Change setting of KR.

□ [MENU settings] - [Network settings] - [Ethernet settings]

Set IP address etc. according to usage environment.

□ [MENU settings] - [System settings] - [Low order com (Modbus TCP)]

On the setting menu screen of MENU settings, select System settings then Low order communication to display following screen.




[Low order com (Modbus TCP)] - [Instrument setting] (12-4-2)

Sets network setting of a device to connect to KR.

[Low order com (Modbus TCP)] - [Data configuration] (12-4-3)

Configures communication contents of a device to connect to KR.

For details, refer to a paragraph of corresponding item.

□ [MENU settings] - [Display settings] - [Group settings]

Turns ON the channel which is set in [Data configuration].

□ DISP menu

Selects one of [Real trend], [Data screen], or [Bar graph screen] to monitor acquired data.

(2) Change setting of connecting device.

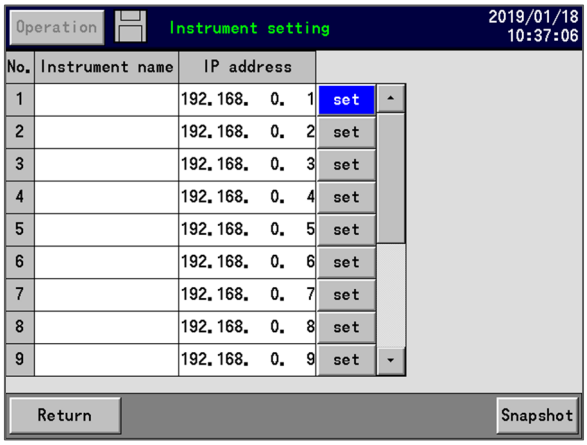
Sets network setting according to usage environment.

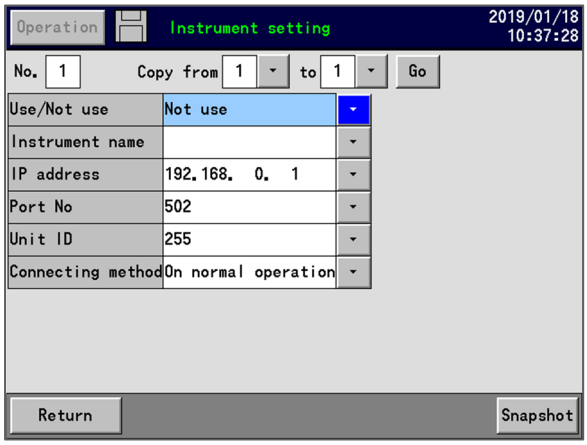
If the data is written from KR, data can be monitored by the connecting device.

## 12-4-2 Instrument registration

Operates on MENU settings.
It moves to the input screen when [set] button is tapped.

From MENU settings, select low order communication and then instrument setting to display following screen on the left.
Registration information of an instrument to be connected to KR is displayed. Screen on the right is displayed when [set] is tapped.
Set network setting of an instrument to be connected to KR.

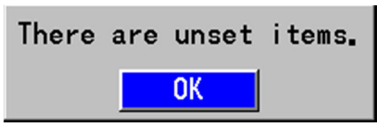



■ Set Use/ Not use

| | |
|---|---|
| Use | Setting items of current No. becomes valid and communication starts after the setting is saved. |
| Not use | Setting items of current No. becomes invalid. |

・Following warning is displayed if exiting the screen when there is unset item at use.




■ Set Instrument name
・Set individual name for the connecting instrument.
・The name set in here is used in data configuration to set communication setting.

■ Set IP address
・Set IP address of connecting instrument.

■ Set Port No.
・Set port number used in communication with KR.

■ Set Unit ID

・Set unit number (instrument number, slave) of connecting instrument.

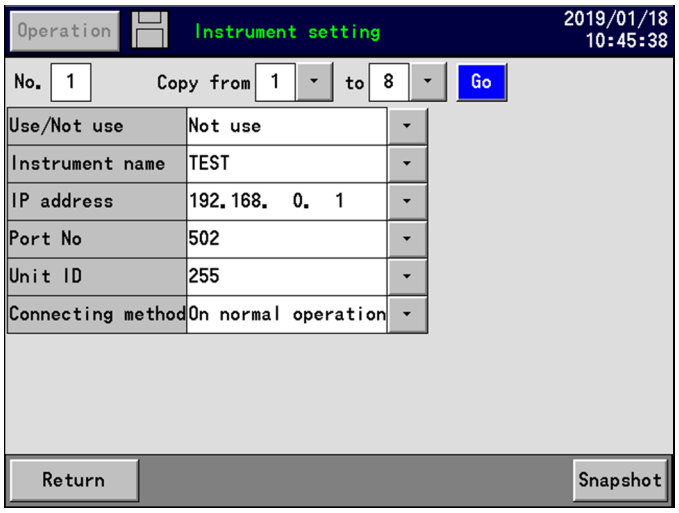
・Depending on the model, some instrument can only be connected by specific unit number, so refer to the instruction manual of corresponding device.

■ Set connecting method

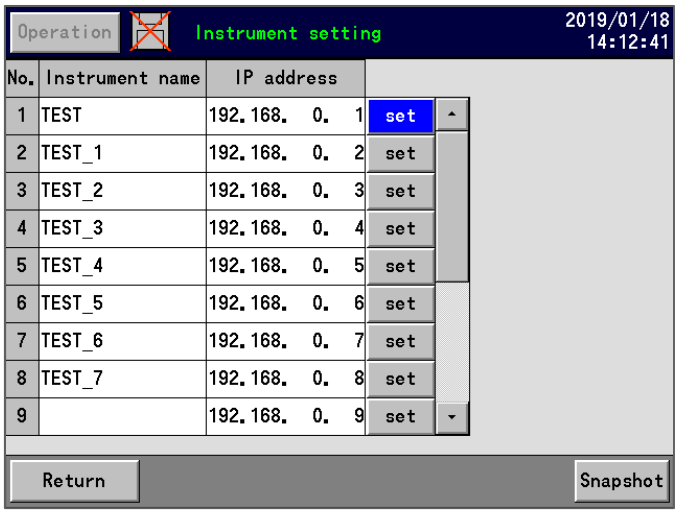
| | |
|---|---|
| On normal operation | Continue connecting by TCP. |
| When required | Connect by TCP only while acquiring data and disconnect it after the data acquisition.<br><br>Note: If data is acquired from 1 client instrument by multiple KR, load of the client instrument becomes high and so communication error may occur depends on specifications and ability of the client instrument. If connecting by 'When required', test connection with the client instrument first to make sure no error occurs then use it. |

■ Copy parameter using copy function

・Example of copy




Setting of screen above shows copying contents of No.1 to No.1 to 8.
When the copy is done, setting is changed as shown below.




Usage status of copy source, port number, and unit ID is copied at same status.
IP address is continuous number from copy source and the instrument name is the name of the copy source plus '_' and number added.
When [Go] is selected and the copy is completed, following message is displayed.

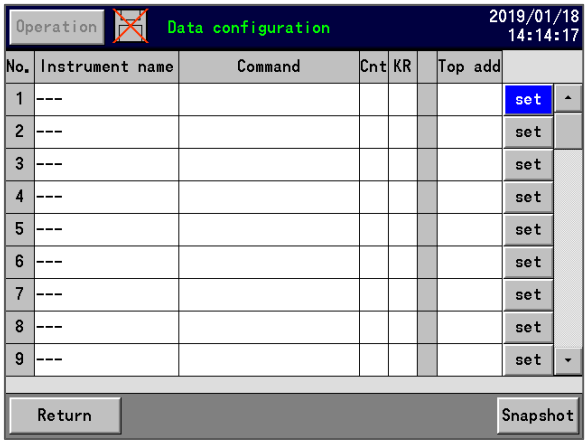

■ Others

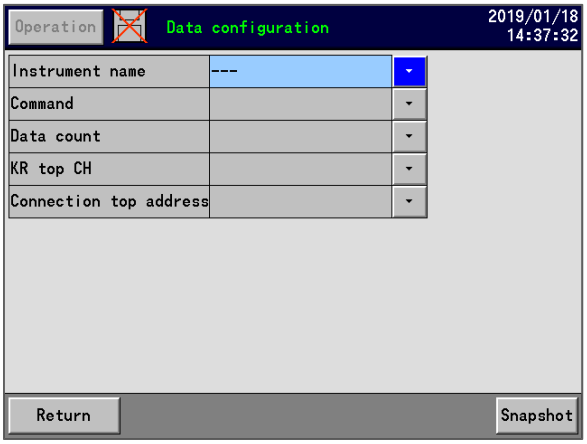
・'Instrument name' and 'IP address' can not be duplicated.

## 12-4-3 Data configuration

Operates on MENU settings.
It moves to the input screen when [set] button is tapped.

From MENU settings, select low order communication and then data configuration to display following screen on the left.
Data connection information of an instrument to be connected to KR is displayed. Screen on the right is displayed when [set] is tapped.
Set network setting of an instrument to be connected to KR.




■ Set Instrument name
・Set instrument name to perform data transmission. Select an instrument from registered instrument.
・If clears the set instrument name, items on and after the instrument name becomes all unset.

■ Set Command
・Set communication command. Refer to the following table below for the detail.

| Read command (function code) |
|---|
| ReadBitSet(01) |
| ReadBitData(02) |
| ReadWordSet(03) |
| ReadWordData(04) |
| ExReadWordSet(60) |
| ReadFloatData(04) |
| **Write command (function code)** |
| WriteBitSet(05) |
| WriteWordSet(06) |
| WriteWordSet(16) |
| ExWriteWordSet(61) |

■ Set Data count

・Set data count which performs communication (write/ read).

・The value that exceeds number of the corresponding channel can not be set.

■ Set KR top CH

・Set the top of the channels of which KR performs write and read.

・Channel to be able to read are as follows.

KR3S: 'Analog input point + 1' to 120.

KR2S: 'Analog input point + 1' to 40.

・Writing of 'KR - Slave device' is available to all channels.

・Multiple data can not be read by a same channel.

Following warning is displayed if the setting overlaps.


■ Set Connection top address

・Set top of an address (reference number) of a connecting instrument which performs writing and reading.

■ Others

・Following warning is displayed if numeric value out of range is set to 'Data count', 'KR top CH', or 'Connection top address'.

# 12-5 KT-M input

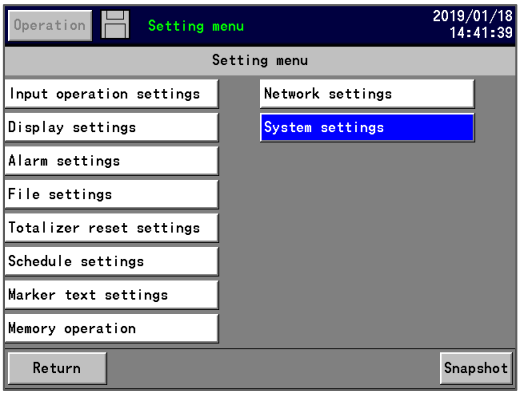
## 12-5-1 Outline

By using low order communication function, KR and KT-M can be connected.
KR and KT-M communicate through RS-485 communication standard compliant serial communication. Data update interval is about 3 seconds.

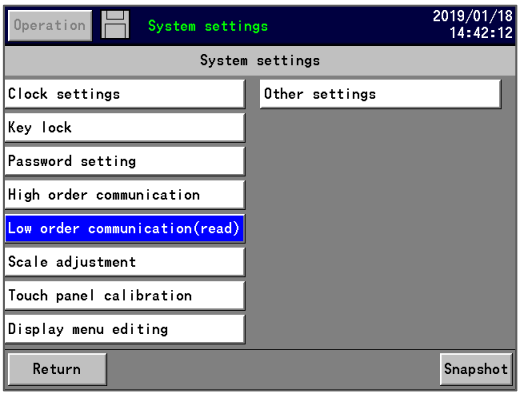
| | |
|---|---|
| Remarks | ・ Serial communication is used by KT-M, so both high order and low order can not be used by other applications.<br>・ Serial communication of KR and KT-M is 1:1, so multiple instruments can not be connected.<br>・ KT-M has instrument address for every CH, so it takes time to update the measured values.<br>(About 3 seconds for 24 points at stable communication) |

## 12-5-2 Setting method

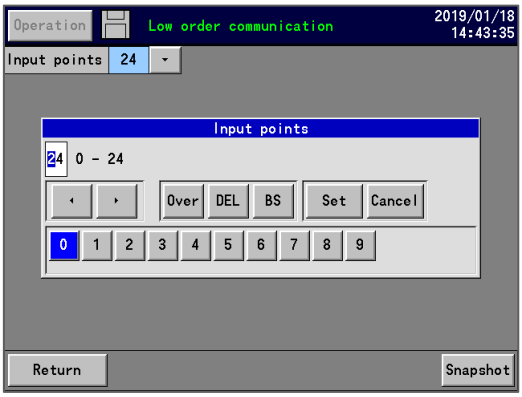
(1) From MENU settings, select System settings.



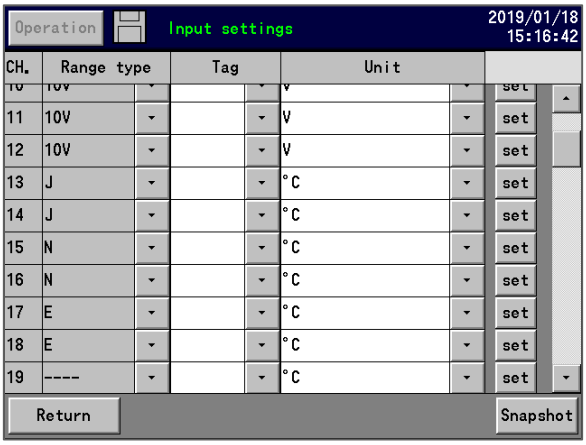

(2) Select Low order communication (read).

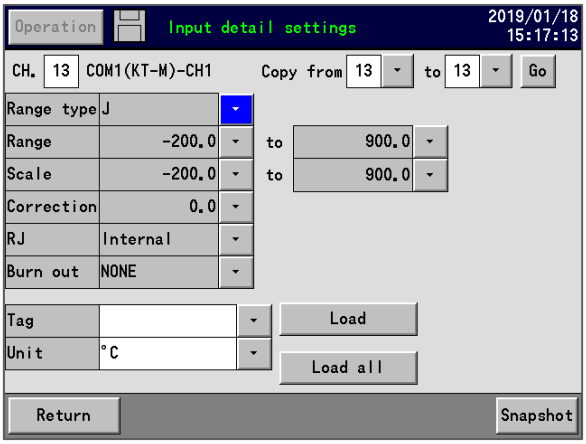


(3) Check input point by Low order communication [Input points].
KT-M maximum CH number 24 can be input. Save the setting by tapping [Return].




(4) Check that KT-M is set properly from MENU settings - input operation settings - input settings.
Change tag and unit from [set] if necessary.



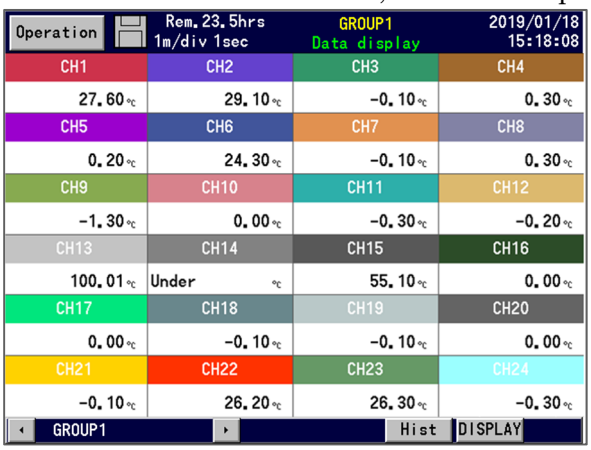
Reference

■ KT-M input channel

Channel of KT-M changes depending on the number of input channel of KR
If it is analog input 12 points, CH13 of KR becomes 1CH of KT-M.
(CH1 of KT-M is placed at position of KR input point + CH1)
Arrangement of KT-M input channel can not be changed.

■ At using Pt100 and Pt-Co unit

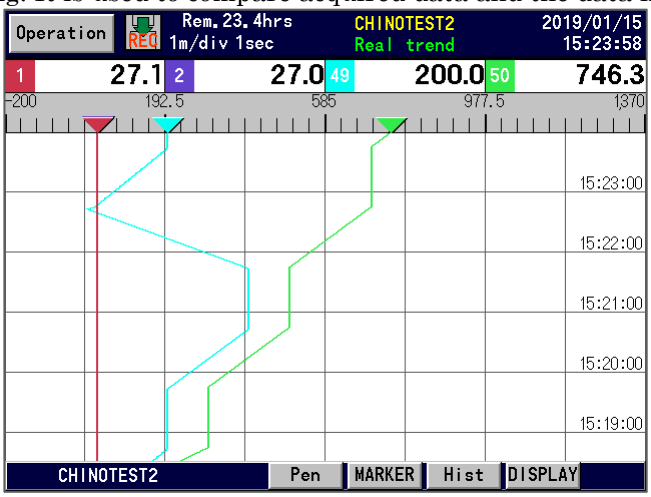
Pt100 and Pt-Co unit is used on KT-M, it occupies 4 terminals and 2CH.
For that reason, latter CH of occupied 2CH during Pt unit in use displays 'Under' on KR.
(e.g.) If Pt unit is used on CH13 and 14 of KT-M, 'Under' is displayed on CH14.



# 13 Past profile replay (Option)

## 13-1 Past profile replay

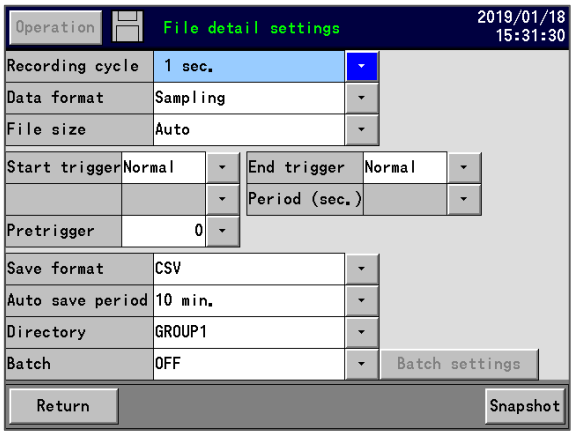
Past profile replay is a recording function that replays and records CSV file (=reference file) created in advance during data recording. It is used to compare acquired data and the data in the reference file.




(e.g.) CH1 and CH2: actual input channels, and CH49 and CH50: standard file data replay channels.

### 13-1-1 Creating reference file (for replay)

Generally, CSV file created by KR is eligible. To create CSV file, go to [Operation] - [MENU settings] - [File settings] - [set] and set Save format to CSV.

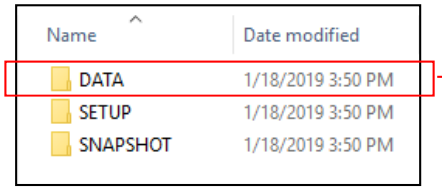



CSV file is created by recording data in this status.

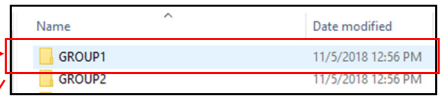
In the case of the past profile replay specification, you cannot select a recording cycle of less than 1 second.

◆ Unload record file

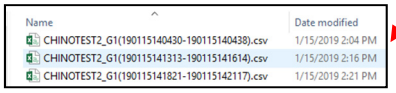
Record file created by KR is saved in [DATA] folder directly under the CF card (root folder) by folder of every group. Select a file to replay and copy to PC.




Configuration example of a folder in CF card




Configuration example of inside [DATA] folder




Configuration example of inside [GROUP1] folder

◆ File format

Following is CSV format data file created by KR loaded on Excel.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | Date | Time | CH1 [C] | CH2 [C] | CH3 [C] |
| 2 | 2017/10/19 | 11:28:27 | 20.1 | 25.4 | 25.3 |
| 3 | 2017/10/19 | 11:28:28 | 20.1 | 25.4 | 25.3 |
| 4 | 2017/10/19 | 11:28:29 | 20.1 | 25.3 | 25.3 |
| 5 | 2017/10/19 | 11:28:30 | 20.1 | 25.4 | 25.3 |
| 6 | 2017/10/19 | 11:28:31 | 20.1 | 25.5 | 25.3 |
| 7 | 2017/10/19 | 11:28:32 | 20.1 | 25.5 | 25.2 |
| 8 | 2017/10/19 | 11:28:33 | 20.1 | 25.5 | 25.2 |
| 9 | 2017/10/19 | 11:28:34 | 21.1 | 25.7 | 25.5 |
| 10 | 2017/10/19 | 11:28:35 | 23.1 | 26.1 | 25.8 |
| 11 | 2017/10/19 | 11:28:36 | 26.6 | 26.9 | 26.7 |
| 12 | 2017/10/19 | 11:28:37 | 30.1 | 27.9 | 27.5 |
| 13 | 2017/10/19 | 11:28:38 | 34.4 | 29.1 | 28.7 |
| 14 | 2017/10/19 | 11:28:39 | 39.1 | 30.4 | 30.1 |
| 15 | 2017/10/19 | 11:28:40 | 43 | 31.5 | 31.1 |

Row 1 indicates each column's item name: column A is date, B is time, and C and after are data.
Column number on later mentioned calculation counts column C as the first one.

◆ Reference file expansion function (set at your will)

By adding information to data part in the reference file, the function is added.
(Data part is [Row 2, Column C] and after of the Excel spread sheet above.)
Adding information can not be edited on the instrument. To edit, add functions listed below to the measured value on the PC.
Timing to read added information is below.

- ・At power ON
- ・At CF card insertion
- ・At setting change of the related information (Select reference file): only recording stop can be changed

● Position alignment function: [PO (rise)] [PU (fall)]

By adding [PO CH□] (or [PU CH□]) to data part, target data can be registered as check point.
When value of specified CH reaches a check point, it forwards data replay position to the check point.
If the data replay reaches the check point faster than the specified CH value, it waits the specified CH value reaching the point by stopping the replay.
Adding information at temperature rise: 'Data' PO CH□
('Data'+[PO]+[Signle byte one space]+[CH□])
Adding information at temperature fall: 'Data' PU CH□
('Data+[PU]+[space for 2 letters]+[CH□]) □: Target CH No.
e.g.: At CH2 temperature rise, check point at 130.0°C
[130.0PO CH2]

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 31 | 2019/1/15 | 11:48:13 | 24.4 | 24.4 | 95.8 | 119 |
| 32 | 2019/1/15 | 11:48:14 | 24.4 | 24.4 | 98.2 | 124.5 |
| 33 | 2019/1/15 | 11:48:15 | 24.4 | 24.4 | 101.5 | 130.0PO CH2 |
| 34 | 2019/1/15 | 11:48:16 | 24.4 | 24.4 | 104.6 | 134 |
| 35 | 2019/1/15 | 11:48:17 | 24.4 | 24.4 | 107.9 | 139 |

In this case, after data recording starts, temperature of the CH2 rises and when it reaches 130.0°C, data replay position forwards to yellow arrow (above figure: Column F, Row 33). By doing this, base points of data of CH2 and replay data match so checking slope state on and after becomes easier.

| Remarks | ■ To add information, input by single-byte characters.<br>■ Evaluation range is current replay position to next check point.<br>■ Check point available for 1 file is max. 30. |
|---|---|

● Alarm set value update function: [AO (rise)] [AU (fall)]

By adding [AO CH□ AL△=▲] (or [AU CH□ AL△=▲]) to the end of the data, it can change alarm valule of the specified CH, if measured value of the specified CH becomes target data or more (or less).

Adding information at temperature rise: 'Data'AO CH□ AL△=▲

('Data'+[AO]+[ Single byte one space]+[CH□]+[Single byte one space]+[AL△=▲])

Adding information at temperature fall: 'Data' AU CH□ AL△=▲

('Data'+[AU]+[Single byte one space]+[CH□]+[Single byte one space]+[AL△=▲])

□: Target CH No. △: Alarm level (1 to4) ▲: Alarm set value

e.g.: When measured value of CH1 becomes 25.4°C or more, change alarm set value of CH1 alarm level 1 to 120.0

[25.4AO CH1 AL1=120.0]

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | Date | Time | CH1 [℃] | CH2 [℃] | KP1SV [℃] | KP2SV [℃] |
| 2 | 2019/1/15 | 11:47:44 | 24.4 | 24.4 | 0 | 0 |
| 3 | 2019/1/15 | 11:47:45 | 24.4 | 24.4 | 0 | 0 |
| 4 | 2019/1/15 | 11:47:46 | 24.4 | 24.4 | 0 | 0 |
| 5 | 2019/1/15 | 11:47:47 | 24.4 | 24.4 | 0 | 0 |
| 6 | 2019/1/15 | 11:47:48 | 24.4 | 24.4 | 19 | 0 |
| 7 | 2019/1/15 | 11:47:49 | 24.4 | 24.4 | 22.3 | 0 |
| 8 | 2019/1/15 | 11:47:50 | 24.4 | 24.4 | 25.4AO CH1 AL1=120.0 | 4 |
| 9 | 2019/1/15 | 11:47:51 | 24.4 | 24.4 | 28.7 | 9 |
| 10 | 2019/1/15 | 11:47:52 | 24.4 | 24.4 | 31.2 | 14.5 |

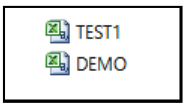
| Remarks | ■ To add information, input by single-byte characters.<br>■ Align decimal point position of alarm set value to decimal point position of target data.<br>■ Alarm set value change available for 1 file is max. 30.<br>■ Multiple alarm set value changes can not be set to 1 data part (one cell).<br>■ If multiple data satisfy judgment condition of the same alarm set value, the latest set value of the replay data is employed.<br>■ Only alarm set value can be changed. The other alarm parameter can not be changed. |
|---|---|

◆ Reference file storing place

Create [REF] folder directly under the CF card (root folder).

Save CSV file created in the previous paragraph in the [REF] folder.


Example of folder configuration inside the CF



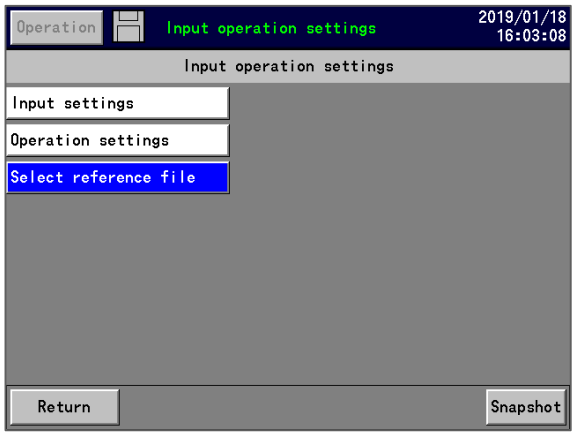

Example of folder configuration inside [REF] folder

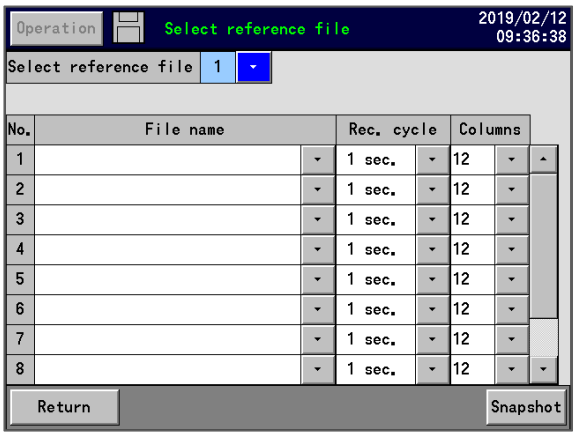
| | |
|---|---|
| Remarks | ■ File name shall be single-byte alphanumeric characters. It is necessary to enter the name at reference file selection screen (will be mentioned later), so a simple name is recommended.<br>■ Date information, time information, and data part shall be single-byte.<br>■ 0 to 30000 data (excluding decimal point) is available. If using a number to third decimal place, it is 30.000. Exponent data is not supported.<br>■ Decimal point position is 0 to 3.<br>■ Data count to be used shall comply with record count for 1 file created by KR.<br>Refer to '7-8 Internal memory screen' ■ Internal memory for record count for 1 file. |

## 13-1-2 KR settings

### ◆ Reference file selection

[Operation] - [MENU settings] - [Input operation settings] - [Select reference file]
Register reference file to be used.



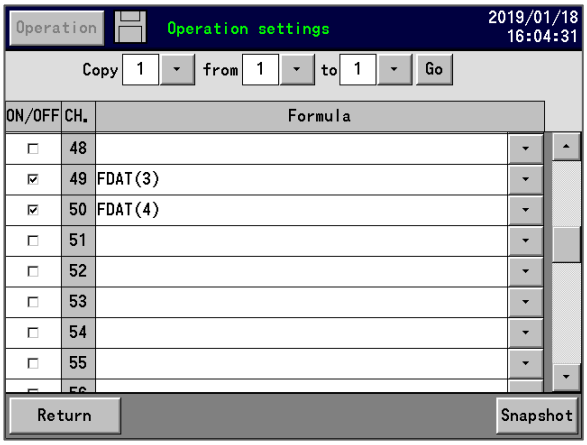




Up to 10 reference files can be registered. Select file No. to be used at [Select reference file].
(In the case of screen above, No.2 DEMO.csv becomes reference file.)
When registering reference file, set recording cycle and recording point of the target file as well.

- File name: reference file name (no extension needed) saved in REF folder inside.
- Recording cycle: 1 sec. to 60 min.
  Sets reference file update interval.
- Columns (recording point)　KR2S: 1 to 44, KR3S: 1 to 56
  Sets reference file intake point.

### ◆ Operation settings

[Operation] - [MENU settings] - [Input operation settings] - [Operation settings]




For CH to refer the refernce file, mark [ON/OFF] check box and set following firmula.

**Operation formula: FDAT(X)**
X: Column number of the reference file
(Count columns without date column)

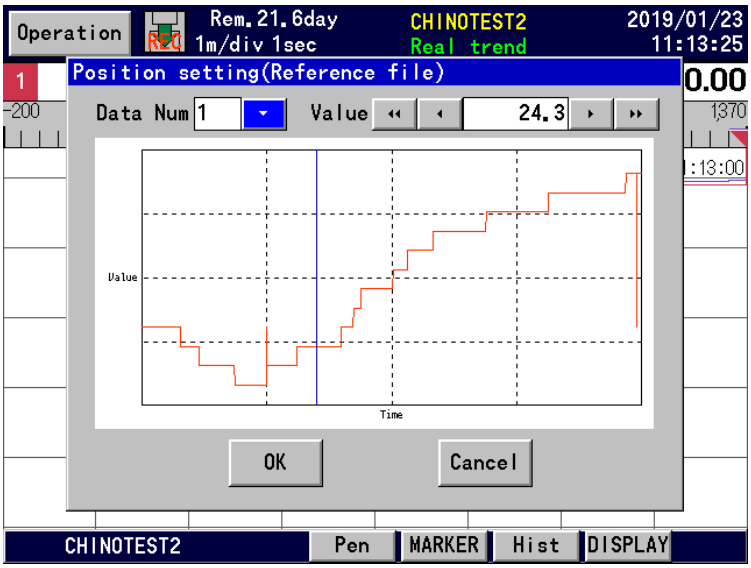
e.g.: If refering column KP1SV [°C] of the table below
[FDAT(3)]
Note) If refering to blank cell, value is all 0.

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | Date | Time | CH1 [℃] | CH2 [℃] | KP1SV [℃] | P2SV [℃] |
| 2 | 2019/1/15 | 11:47:44 | 24.4 | 24.4 | 0 | 0 |
| 3 | 2019/1/15 | 11:47:45 | 24.4 | 24.4 | 0 | 0 |
| 4 | 2019/1/15 | 11:47:46 | 24.4 | 24.4 | 0 | 0 |
| 5 | 2019/1/15 | 11:47:47 | 24.4 | 24.4 | 0 | 0 |
| 6 | 2019/1/15 | 11:47:48 | 24.4 | 24.4 | 19 | 0 |
| 7 | 2019/1/15 | 11:47:49 | 24.4 | 24.4 | 22.3 | 0 |
| 8 | 2019/1/15 | 11:47:50 | 24.4 | 24.4 | 25.4AO CH | 4 |
| 9 | 2019/1/15 | 11:47:51 | 24.4 | 24.4 | 28.7 | 9 |
| 10 | 2019/1/15 | 11:47:52 | 24.4 | 24.4 | 31.2 | 14.5 |
| 11 | 2019/1/15 | 11:47:53 | 24.4 | 24.4 | 34.5 | 20 |
| 12 | 2019/1/15 | 11:47:54 | 24.4 | 24.4 | 37.9 | 24 |

## 13-1-3 Reference file replay operation

When the recording starts, reference file is read and the data replay starts.
If position alignment function is written to the reference file, the operation follows the written contents.

To adjust replay position manually, perform adjustment on [Position setting (Reference file)] screen during recording.
Select [Position setting (Reference file)] from [Operation] menu.
Select data number to refer at [Data Num].
Decide rough position by tap operation and perform fine adjustment using right/left keys of [Value]. (Blue line is displayed)
1 data moves by [◂] and [▸] right/left key, and 10 data moves by [◂◂] and [▸▸] right/left key.
After changing the position, by tapping [OK] button, it performs data replay from the specified place.




Retruning replay position to starting position(top) can be done at [Totalizer reset]. When totalizer reset is done, contents of reference file is cleared and it returns to the top of the file then starts the replay. To set totalizer reset, go to [Operation] - [MENU settings].

| | |
|---|---|
| Remarks | ■ CF card is being accessed on recording to refer to the reference file.<br>Stop recording to insert/ remove CF card. If CF card is removed while it is being referred, previous value (data replayed previous to removal of the card) is retained, yet it does not recover even though the CF card is inserted again. Stop the recording once and then start the recording again.<br>■ Recording start as reference file reading condition is for recording started from the front panel.<br>If [Alarm] and [Contact input] is used as start trigger, data replay starts at the point of recording start from the front panel regardless of alarm/ contact status. |

# 14 Barcode scan function (Option)

According to scanned barcode data, it performs marker writing, display group switch, and batch operation.
With this option, barcode hand-held scanner [HC76TR] manufactured by DENSO CORPORATION can be connected to KR.

## 14-1 Outline

According to scanned barcode data, it performs marker writing, display group switch, and batch operation.
Supported barcode format is following. Prepare the barcode separately.

・UPC-A/ UPC-E
・EAN-13/ EAN-8/ EAN-128
・Codabar (NW-7)
・Code39/ Code128

| Reference | It is necessary that recording is started to use barcode function to write marker, delete marker text, or switch display group. |
|---|---|

### 14-1-1 Marker writing

Scanned information is written as marker text to the displayed group.
However, if scanned information is 'Special data', or at the 'batch function in use', marker writing does not function.

(e.g.) 

(Code 39)

'123' is written by scanning this barcode.

### 14-1-2 Special data

◆ DEL MSG (Space between DEL and MSG)

Delete marker text written at last operation on the displayed group
If there is no marker text on the group, it becomes error at data receive.

(e.g.) 

(Code 39)

◆ GROUP□ (□ is group No.)

Switch screen to screen of received group No.
If mentioned number exceeds number of group in use, it becomes error.

(e.g.) 




(All Code 39)

◆ At 'Batch function' in use

It is according to batch settings written in next chapter. Refer to the next chapter about the detail.

# 14-2 Setting

## 14-2-1 Common settings

Set communication setting of KR/ HC76TR as follow to use this function.

| | |
|---|---|
| Communication interface | RS-232C |
| Communication method | Half-duplex communication start-stop synchronous communication |
| Communication speed | 9600bps |
| Data bit | 8-bit |
| Parity bit | Non (None) |
| Stop bit | 1-bit |

| | |
|---|---|
| Reference | To connect barcode hand-held scanner [HC76TR] and KR through ethernet (Modbus RTU), refer to '16 Barcode recipe maintenance function16-2 and 16-3'. |

## 14-2-2 HC76TR settings

Communication procedure: ACK/NAK mode

Communication format: Data transfer format of this specifications is following

| Header | Code mark | Bar code data | No. of digit | | Terminator |
|---|---|---|---|---|---|
| | | | n1 | n2 | |

Header (None) ··· used as initial value
Terminator (CR) ··· used as initial value
Code mark (Transfer forbidden) ··· used as initial value
Code mark add position (After the header) ··· used as initial value
Number of digit (Transfer forbidden ) ··· used as initial value
Barcode data as follows

Set to transfer only data part of each barcode data format.
(e.g.) For the case of UPC-A

| 0 | Data (11-digit) | C/D |
|---|---|---|

C/D: Check Digit

Transfer '0' for UPC-A digit adjustment (Transfer forbidden)
Transfer UPC-A check digit (Transfer forbidden)

(e.g.) For the case of Code 39

| Start code (*) | Data | C/D | Stop code (*) |
|---|---|---|---|

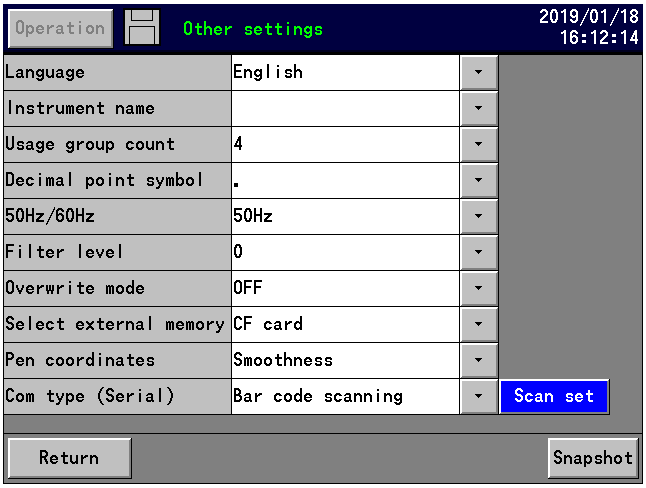
C/D: Check Digit

Transfer Code 39 start code (Transfer forbidden)
Transfer Code 39 check digit (Transfer forbidden)
Transfer Code 39 stop code (Transfer forbidden)
Change to Code 39 FULL ASCII (Change for bidden)

## 14-2-3 KR settings

◆ Communication type selection

[MENU settings] - [System settings] - [Other settings]
At the [Com type (Serial)], select 'Bar code scanning'.




When communication type 'barcode scanning' is selected, [Scan set] becomes available to select.

Items in [Scan set]

・Scan content confirmation:

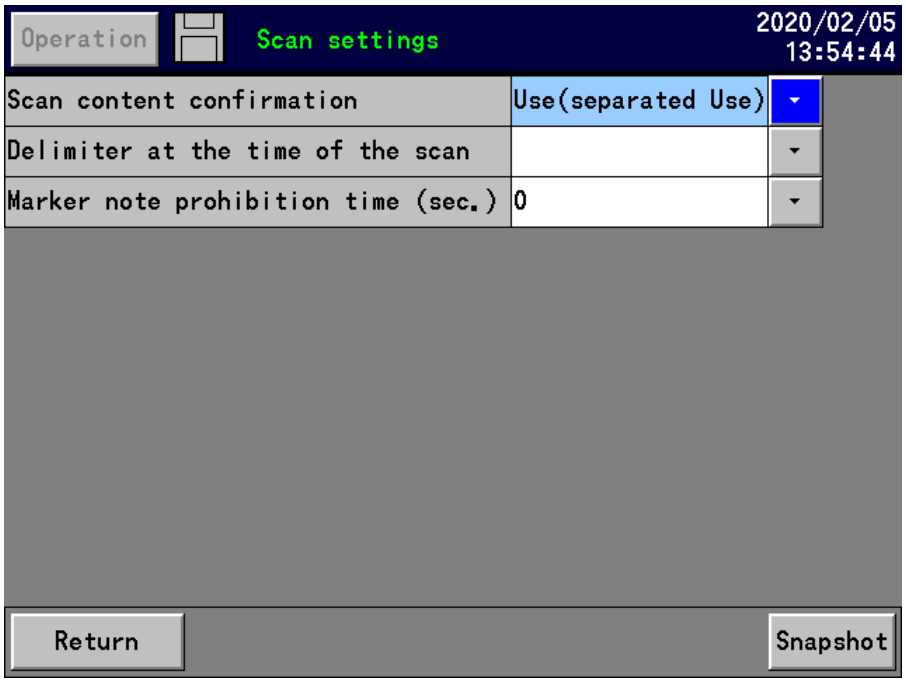
Write the scan contents directly to the displayed group as marker text.
Displays the marker text input screen containing the scan contents, and writes it to the displayed group when "OK" is selected. If the barcode was scanned before "OK", it will be added after the previous scan. If "Use (no delimited)", each scan content will not be separated when added. In the case of "Use (separated Use)", enter the character specified in the next section "Delimiter at the time of the scan" between each scan content.

・Delimiter at the time of the scan:

This can be entered when "Scan content confirmation: Use(separated use)" is selected.

・Marker note prohibition time (sec.): 0 to 60 sec.

If same barcode is scanned repeatedly, this function prevents marker writing by setting prohibition time. When it passes the prohibition time, same barcode data can be written again.



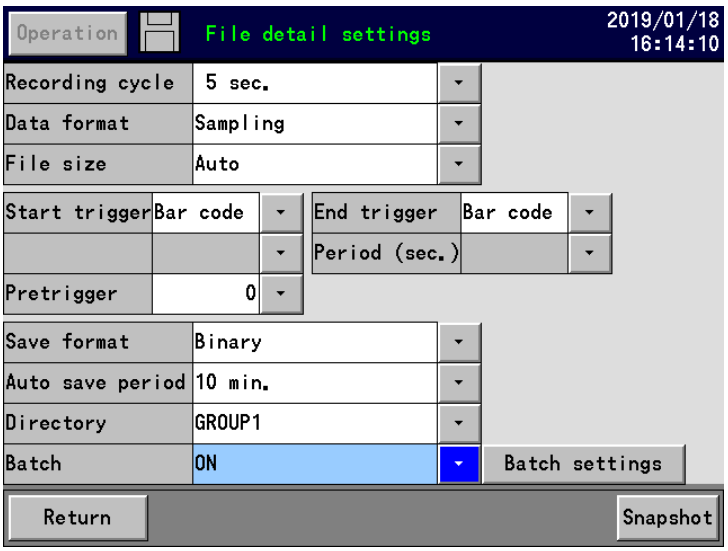
# 15 Batch function

Batch information can be added to the recording file by this function. Add information can be checked on CF card, USB memory screen 'File information', or on PC software TRAMS etc.

## 15-1 Batch settings

### 15-1-1 Batch ON/OFF

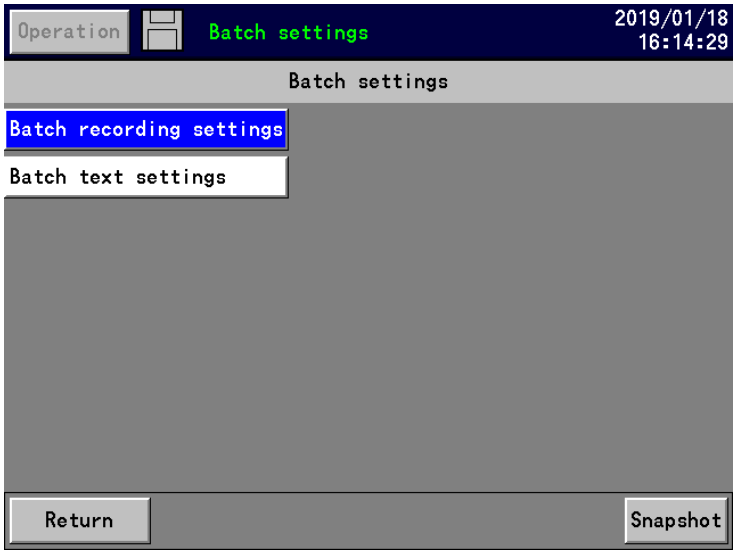
[MENU settings] - [File settings] - each group [set].



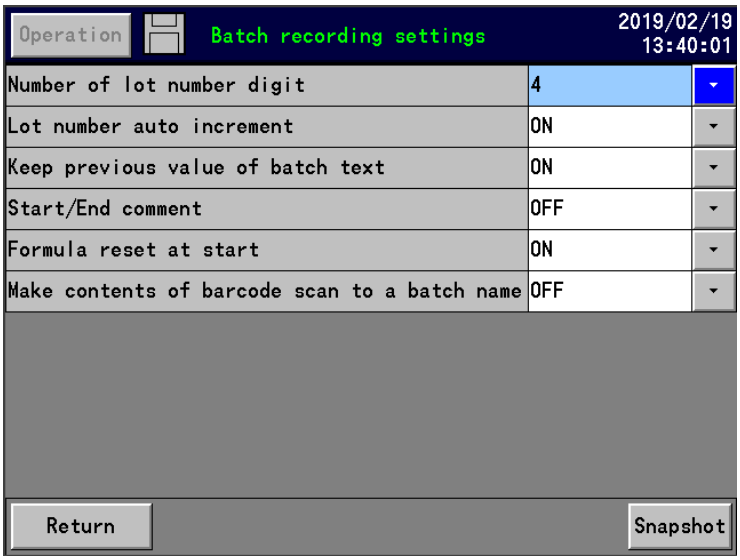

・[Batch]: Select from [ON] or [OFF].
Whether to use or not to use the batch recording function is selected.
When [ON] is selected, detail of batch operation can be set at items in [Batch settings].

### 15-1-2 Batch settings

◆ [Batch settings] screen display item:
[Batch recording settings], [Batch text settings]



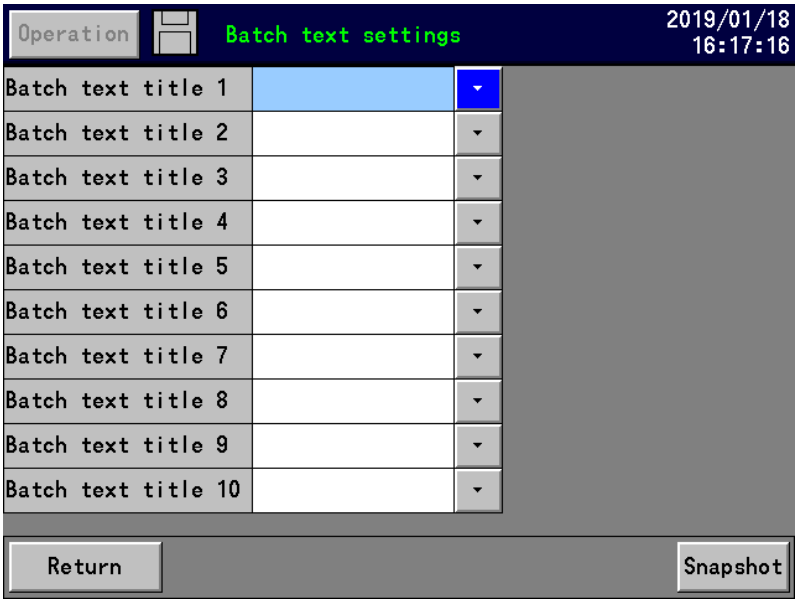
◆ [Batch recording setting] screen:




・Number of lot number digit: 0 to 8
Set number of lot number digit used in recording.
・Lot number auto increment: Select from [ON] or [OFF].
If 'ON' is selected, lot number is automatically added at every start.
・Keep previous value of batch text: Select from [ON] or [OFF].
If [ON] is selected, previous input value is displayed on batch text input screen.
・Start/End comment: Select from [OFF], [Start comment], or [End comment].
Batch name and lot number is written as marker text when [Start comment], or [End comment] is selected and each condition is satisfied.
・Formula reset at start: Select from [ON] or [OFF].
If [ON] is selected, it reset totalizer of all the channels at recording start.
・Make contents of barcode scan to a batch name: Select from [ON] or [OFF].
If [ON] is selected, contents of barcode scan is used as batch name. *To use this function, it is necessary to set start trigger to [barcode].

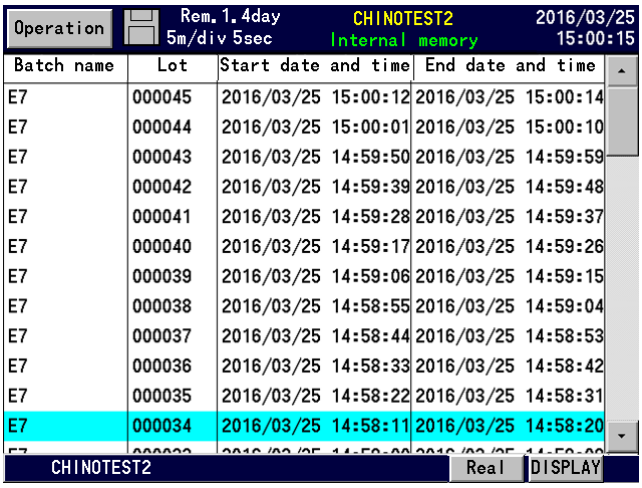
◆ [Batch text settings] screen

Set batch text recorded on batch recording.

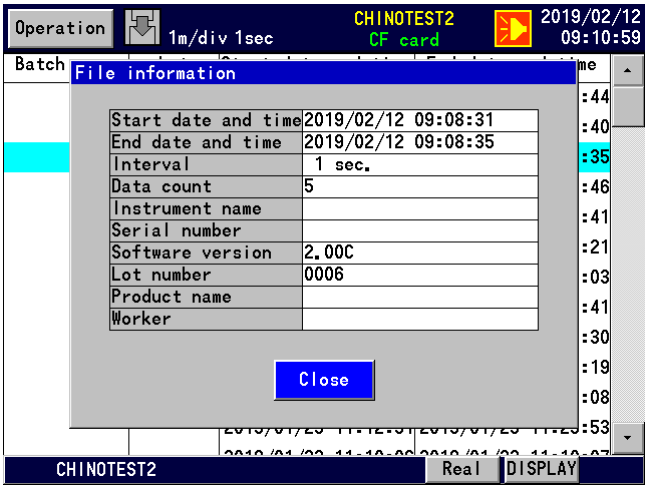


# 15-2 File list display screen(Internal memory/ CF card/ USB memory)

[DISPLAY] - [Select display] - [Information] - each recording media (internal memory, CF card, or USB memory)
Displays batch name, lot number, and start/ end date and time of each file saved in the file.



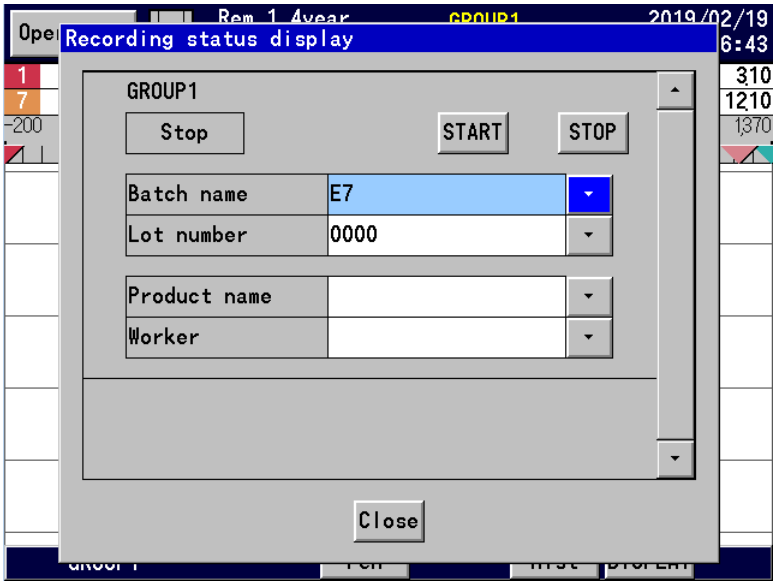

When saving format is 'binary', file information screen of each file is displayed on CF card and USB memory screen.




Displayed item:
・Start date and time/ end date and time
・Interval (Recording cycle)
・Data count
・Instrument name
・Serial number
・Software version
・Batch name *1
・Lot number *1
・Batch text 1 to 10 *1 (On above scree, [Product name] and [Worker] correspond)
*1: It is displayed when [ON] is selected at [Batch].

# 15-3 Recording status display screen

[Operation] - [Recording status] - [Recording status display].
Displays recording status of each group, and perform recording START/STOP.




Displayed item:

・Recording status display

Display each group status by 3 types: [Recording], [Waiting], or [STOP].

Recording start and stop is available from status display right START/ STOP buttons.

・Batch name:

Sets and displays batch name to record on the file. Up to 15 letters can be input.

It is not displayed if the number of lot number digit is 0.

・Lot number:

Sets and display slot number to record on the file.

Setting range is according to the setting of lot number digit.

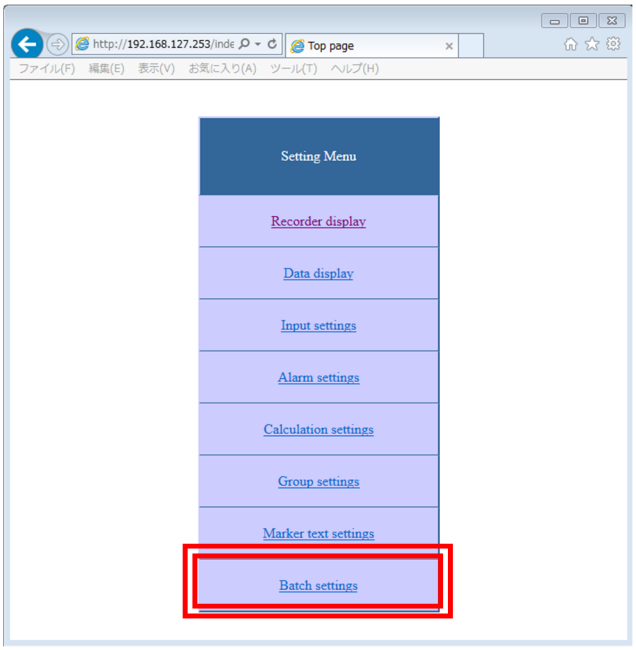
・Batch text:

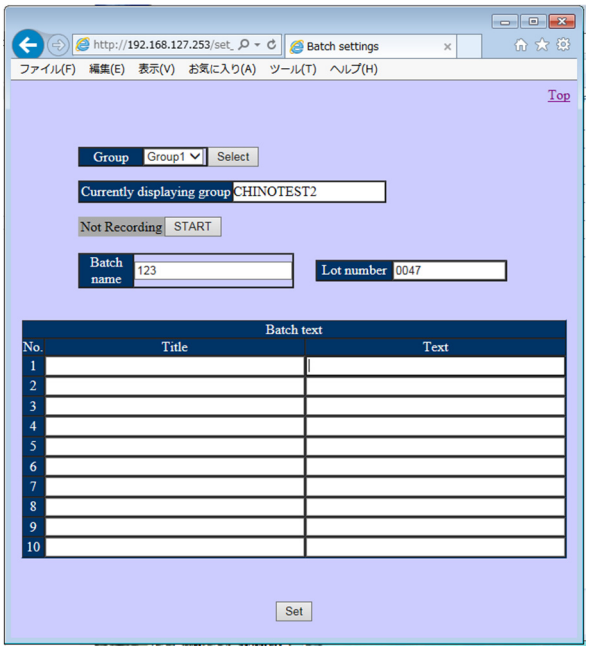
Sets and displays batch text. Up to 10 secs, 15 letters can be input.

| Remarks | ■ The group of which channels are not registered is not displayed.<br>■ When file settings 'batch' item is OFF, [batch name], [Lot number], and [Batch text] is not displayed.<br>■ If number of lot number digit is 0, [lot number] is not displayed. |
|---|---|

# 15-4 Batch settings window (Web server function)

[Batch settings] is added to the setting window accessed through a web browser.




・Display item:

・Group selection:

Display group name of which batch information you want to display or set and click [Select] button.

Select from [Group 1] to [Usage group count (number of used group)].

・Recording status display:

Display each group status by 3 types: [Recording], [Record waiting], or [Not Recording].

START/STOP button on the right of status display behaves as below.

・When recording is stop, the button displays [START] and it starts recording by the click of the button.

・When it is recording, the button displays [STOP] and it stops recording by the click of the button.

・Batch name:

Sets and displays batch name to record in the file. Up to 15 letters can be input.

Batch recording settings [Keep previous value of batch text]: If 'ON' is selected, it displays previous set value.

・Lot number:

Sets and displays lot number to record in the file. Setting range is according to the lot number digit setting.

・Batch text/ Title, Text:

Sets and displays each item. Max.10 cases, up to 15 letters can be input.

| | |
|---|---|
| Remarks | It becomes setting error in the following conditions.<br>■ When KR is on recording or on setting (during displaying setting screen).<br>■ Invalid letter is included in the batch name.<br>Invalid letters: [ : ] [ ; ] [ / ] [ ¥ ] [ \| ] [ , ] [ * ] [ ? ] [ ' ] [ < ] [ > ] [ _ ]<br>■ In file settings [Batch] item is ON and batch name is blank.<br>■ In file settings [Batch] item is OFF.<br><br>When number of lot number digit is 0, [Lot number] is not displayed. |

# 15-5 Supplement

## 15-5-1 Recording file

When file settings [Batch] item is ON, add batch information to the file name and recording data.

◆ File name

Example of the name is expected to be following set value.
Setting: group name: test, Batch name: ABC, Lot number: 10, Number of lot number digit: 4,
Group number: 2, Start date and tiem: 2016/03/31 13:56:00,
End date and time: 2016/04/07 08:29:59, Registersd CH number: 12, Recorinf cycle: 1 sec.,
Data format: sample, Number of marker : 96, Hand writing point: 1234

・File format: binary
Example of the name: Test_ABC_0010_G2B(20160331135600-012030)M096P1234.krf

[group name]_[batch name]_[lot number]_[group number]B([start date and time]-[registered CH number][recording cycle][data format)M[number of marker]P[handwriting point].krf

・Recording cycle:
00: 0.1s, 01: 0.2s, 02: 0.5s, 03: 1s, 04: 2s, 05: 3s, 06: 5s, 07: 10s, 08: 15s, 09: 20s, 10:30s,
11: 1min, 12: 2min, 13: 3min, 14: 5min, 15: 10min, 16: 15min, 17: 20min, 18: 30min, 19: 60min

・Data format: 0: sample, 1: average, 2: max. 3: mini., 4: max./ mini.

・File format: CSV
Example of the name: Test_ABC_0010_G2B(160331135600-160407082959).csv

[group name]_[batch name]_[lot number]_[group number]B([start date and time]-[end date and time]).csv

◆ Recording information (CSV format)

If saving a file in CSV format, following contents are added to standard 'recording data' and 'marker information'.

・Add contents

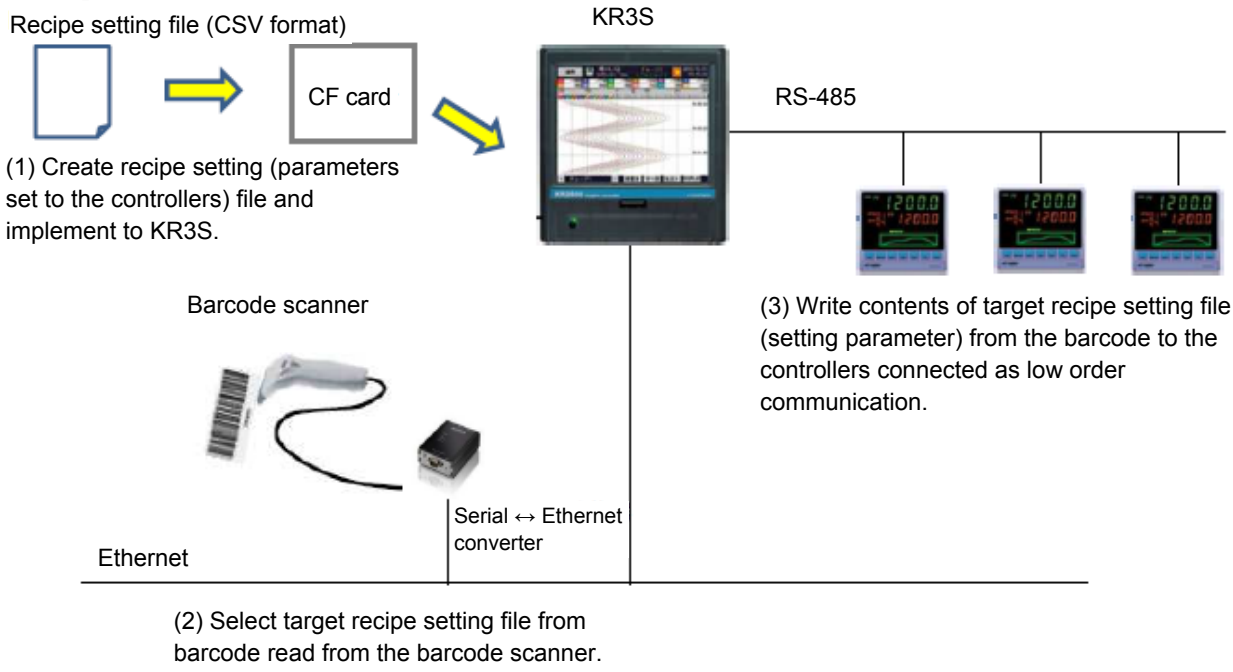
Batch information, [line feed]
Batch name, (batch name), [line feed]
Lot number, (lot number), [line feed]
(Batch text style 1), (Batch text character string 1), [line feed]
(Batch text style 2), (Batch text character string 2), [line feed]
:
(Batch text style 10), (Batch text character string 10), [line feed]

Each value at the end of the recording is written inside ( ).

# 16 Barcode recipe maintenance function (Option)

## 16-1 Outline

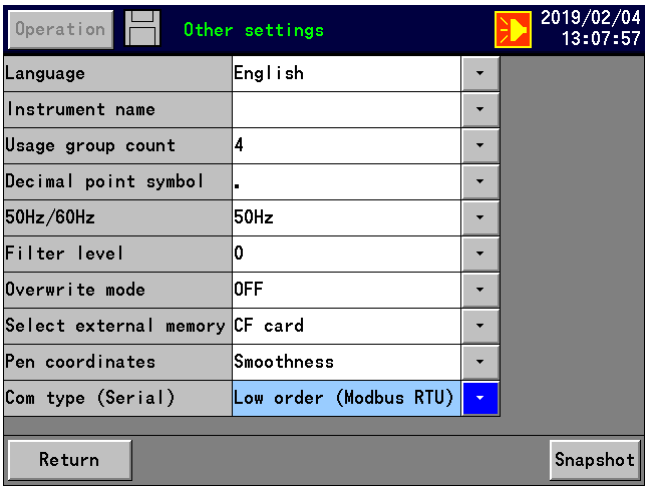
Write contents (setting parameter) of target recipe setting file (CSV format) to controllers through code data read from barcode.
(Example)




## 16-2 KR setting

### 16-2-1 System settings (Other settings)

Tap the [Operation] button and then tap [MENU settings] - [System settings] - [Other settings]. To enable barcode recipe function, set [Com type (Serial)] (communication type selection (Serial)) to 'Low order (Modbus RTU)'.



### 16-2-2 Low order communication (Modbus RTU) settings

To display altered contents of controller parameter by the recipe file, register the instrument at low order communication (Modbus RTU) settings. (Refer to '12-1 Low order (Modbus RTU)')

## 16-3 Serial/ Ethernet converter (N Port Express) settings

N Port Express DE-311 (1 port RS-232/422/485 serial device servers) manufactured by Moxa Inc. is used for connection of the barcode scanner and KR.

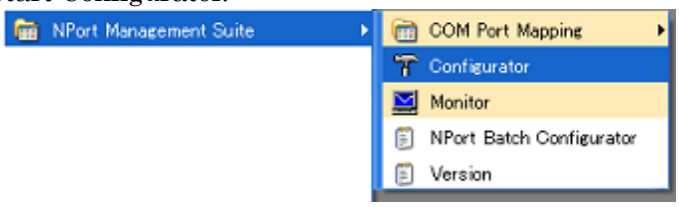
### 16-3-1 Software install

Install software from N Port Express DE-311 attached CD. For how to install the software, refer to the instruction manual of DE-311.

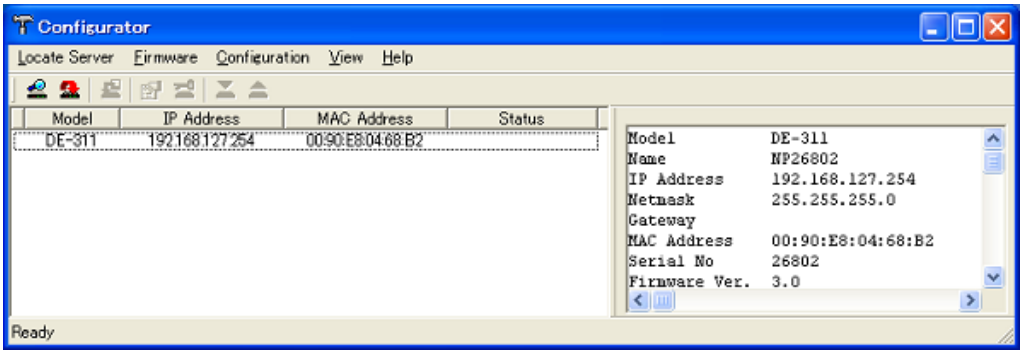
### 16-3-2 Connection and setting

(1) Connect N Port Express DE-311 and PC by LAN cable.

(2) Start Configurator.




(3) Information in the following window is displayed when search button  is clicked.




Default IP address of N Port Express DE-311 is 192. 168. 127. 254.
(This is written on the back of the device.)

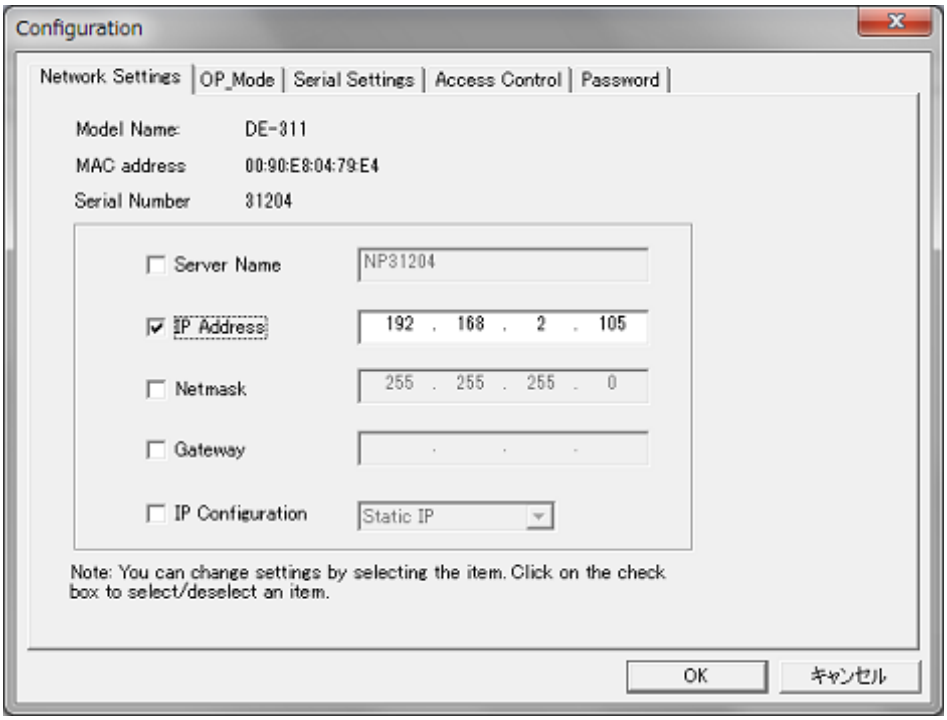
**Reference**

If nothing is displayed, check following contents.

- Link lamp of N Port Express DE-311 is lit.
- IP address of the PC is set to 192.168.127.*** (*** is 1 to 253).
  Carry out setting of IP address as follows
  From [Control panel] - [Network and Sharing Center] - [Local area connection] - [Property] - [Internet protocol Ver4] - [Property] IP address of the PC
- From application of Monitor, click Configurator button  and information is displayed.

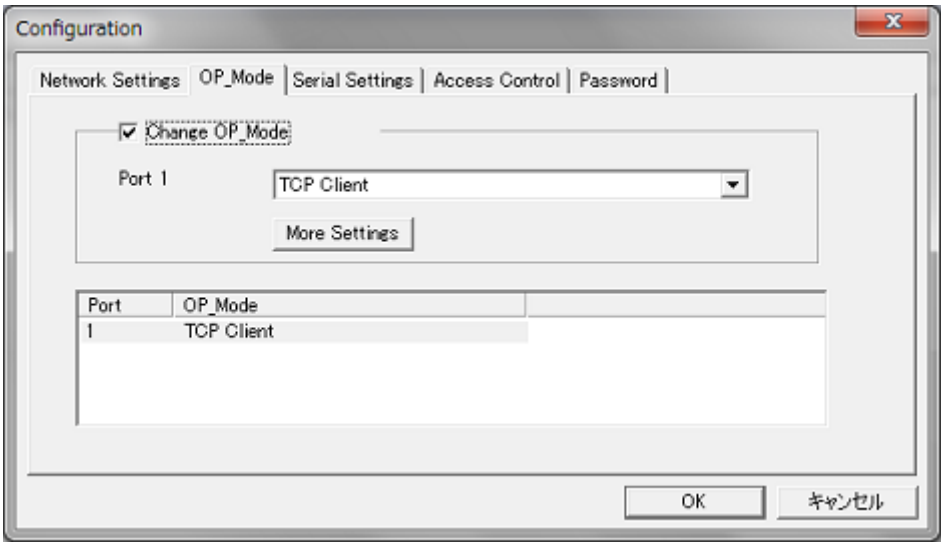
(4) Network Setting

To change IP address of the Nport, mark check box of IP Address and change the set value. When OK is clicked, an altered content of checked item is reflected. Change other values if necessary.



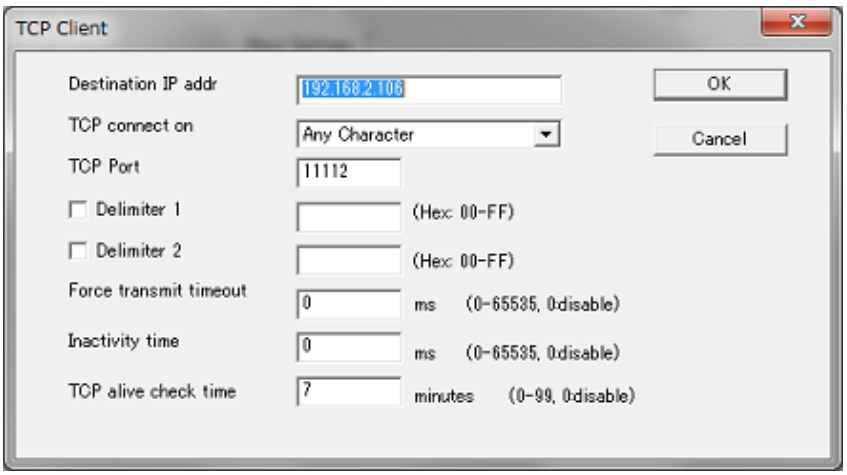

(5) OP Mode

Mark check box of Chang OP Mode and select TCP Client for Port 1 and click More Setting.



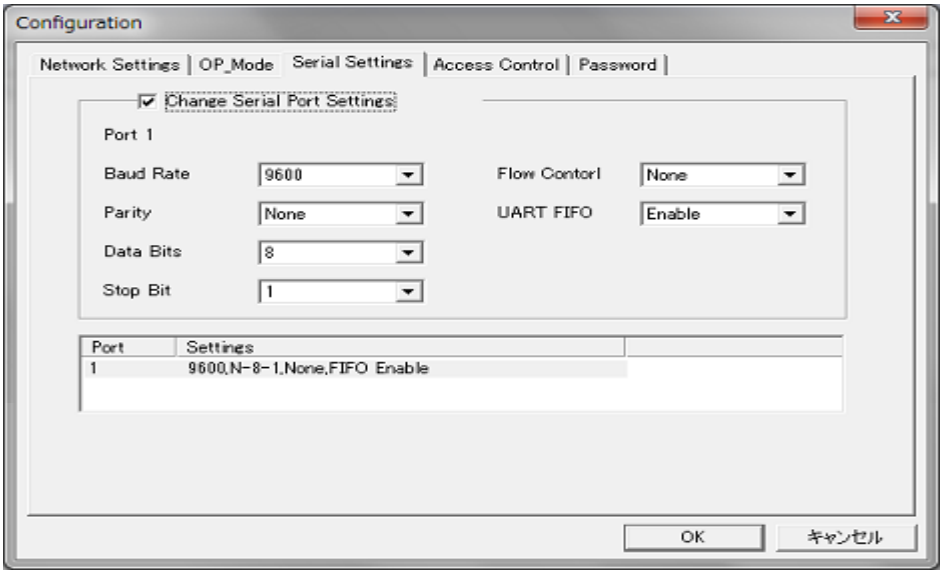
(6) TCP Client (More setting)

Input IP address of KR to Destination IP Address. For other settings, input as shown in the window below.
Connection of IP address set at Destination IP Address becomes valid.
When the setting is finished, click OK.

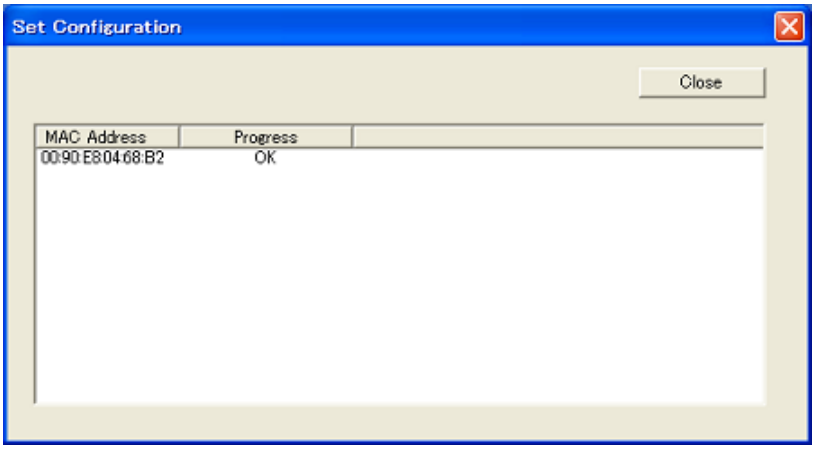



(7) Serial Settings

Mark check box of Change Serial Port Setting and set as below.




(8) When all the items are set, click OK in the bottom of the window. Window informingsetting completion is displayed. Click Close.



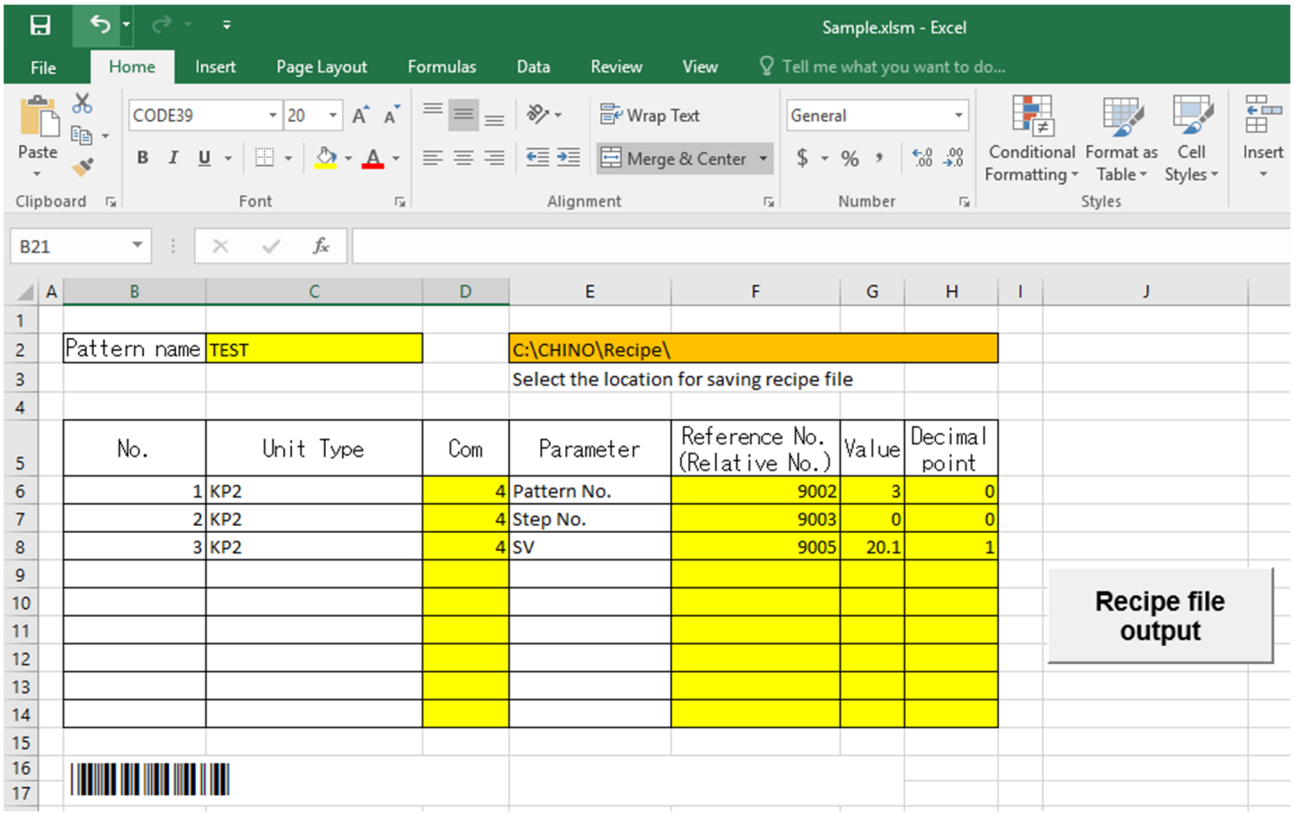
## 16-4 HC76TR setting

For setting of barcode hand-held scanner [HC76TR] manufactured by DENSO CORPORATION, refer to '14 Barcode scan function (Option) 14-2-2 HC76TR settings'.

## 16-5 About recipe file

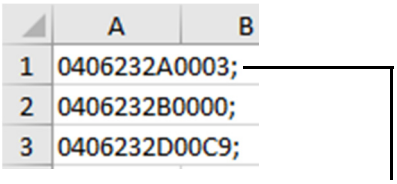
Recipe creating software sample (xlsm) is saved in instruction manual CD. Sample file is divided to 'Setting screen' sheet and 'CSV' sheet. Input parameter contents referring the sample. At the input also refer to the communication instruction manual of the controllers.

< Recipe creating software: Setting screen sheet>

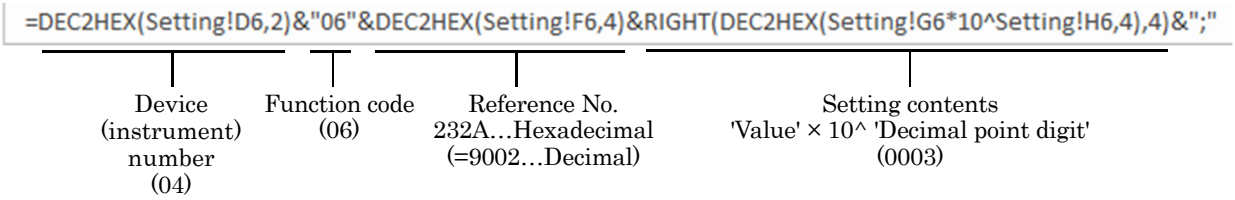



| Item | Contents |
|---|---|
| Pattern name | Set contents of the barcode and name describing the recipe file. (Mandatory)<br>*If pattern name is too long, barcode becomes long as well and the scanner may not be able to read the information. |
| Unit type | Model name of the connecting device. (Blank is fine) |
| Com | Device (instrument) number of the connecting device. (Mandatory) |
| Parameter | Parameter name of the connecting device. (Blank is fine) |
| Reference No. (Relative No.) | Reference number of the connecting device. (Relative No.) (Mandatory) |
| Value | Value to write to the target reference number. (Mandatory) |
| Recipe file output (button) | Create 'CSV' sheet as pattern name.csv file to 'Output destination'. Before clicking this button, make sure that parameter contents are in row A of the 'CSV' sheet.Store csv file to Recipe folder in the CF card. |
| Output destination | Change output destination to drive name of CF card which is connected to the PC. If it can not be saved, save in the existing directory of C drive once and copy it to the recipe folder on the CF card. |
| Barcode | Pattern name is displayed as barcode. Install font of corresponding barcode to the PC beforehand. If there is no proper font, barcode is not displayed. Example above uses CODE39. |

< Recipe creating software: CSV sheet>
(Setting example)




*In this example controller KP2000 is connected as device (instrument) number 04.




On 'CSV' sheet, setting contents set in 'setting screen' sheet is converted to Modbus-RTU format

Contents of the above Excel sheet column A, row 1; 0406232A0003 means that for device (instrument) number 4, set contents 0003 is written to reference number 49003 (=9002+40001) 'Pattern No. for program pattern R/W' by function code 06 (Writing of analog setting values). Function code, reference No., and available contents to set differ depending on the device (instrument). For details, refer to the instruction manual of communication interface of respective device and change formula of column A on the 'CSV' sheet if necessary.

Also, if parameter row is added on the 'Setting screen' sheet, copy and paste function of column A on the 'CSV' sheet. When 'Recipe file output' button is clicked, contents of column A is output to the 'CSV' file as it is.

## 16-6 Barcode recipe writing procedure

1. Insert CF card with recipe file (.csv) to KR.
   Save CSV file in Recipe folder in the CF card.
2. Read pattern name barcode by the scanner.
   When the barcode is read, KR writes the parameter which is in the CF card inside the Recipe folder corresponding CSV file to the controller through communication interface.

| Reference | Copy recipe folder beforehand to use new CF card. |
|---|---|

| Remarks | If denial response (NAK) or communication error is found on the communication, 'Failed to write recipe setting file.' message appears on the screen. Reconsider the parameter. |
|---|---|

# 17 Scale calibration

## 17-1 Scale calibration

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

| Calibration name | Descriptions |
|---|---|
| Zero/Span adjustment | Execute the adjustment by inputting the zero and span of each measurement range.<br>*This recorder executes 12 channels of input process with one AD converter. Therefore, input zero and span of each range once to adjust. |

* The sensor correction (shift of value) for each channel can also be performed. (Refer to '9-1 Input operation settings')

## 17-2 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% |

## 17-3 Preparation

### 17-3-1 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 |

### 17-3-2 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<br>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. |
|---|---|

## 17-4 Connections

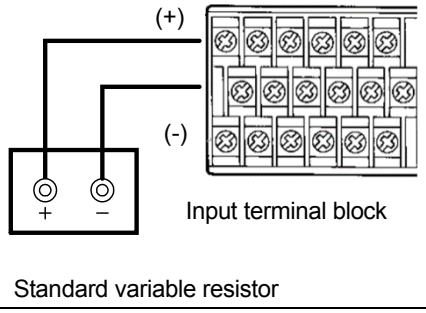
Connections depend upon the input types. Connect tools such as standard tools to the measuring input terminals to be adjusted.

**Caution**

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

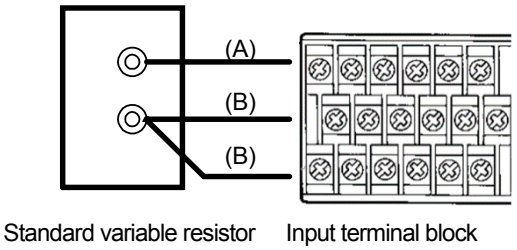
(1) In case of the DC voltage input
The 2nd terminal of each input terminal unit is for the terminal for adjustment.
For the adjustment, connect to the 2nd terminal as shown in the right figure.

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

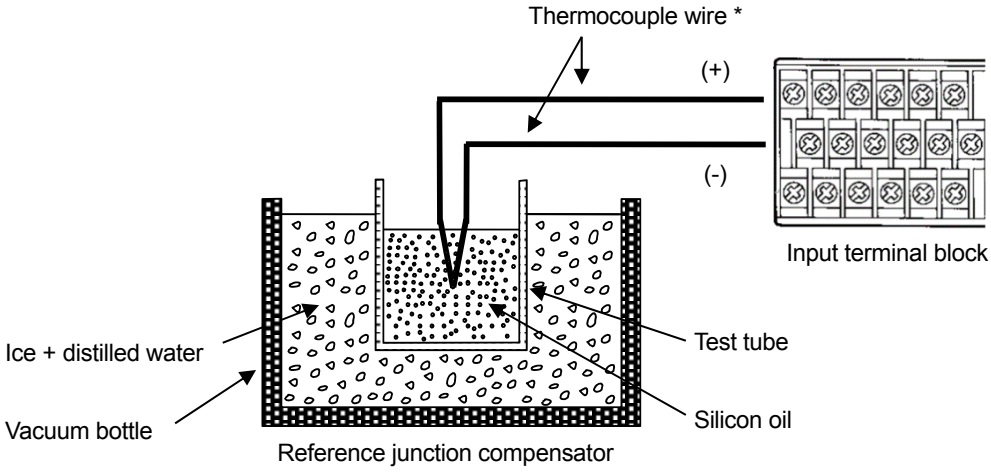



(2) In case of the resistance thermometer input
The 2nd terminal of each input terminal unit is for the terminal for adjustment.
For the adjustment, connect to the 2nd terminal as shown in the right figure.

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



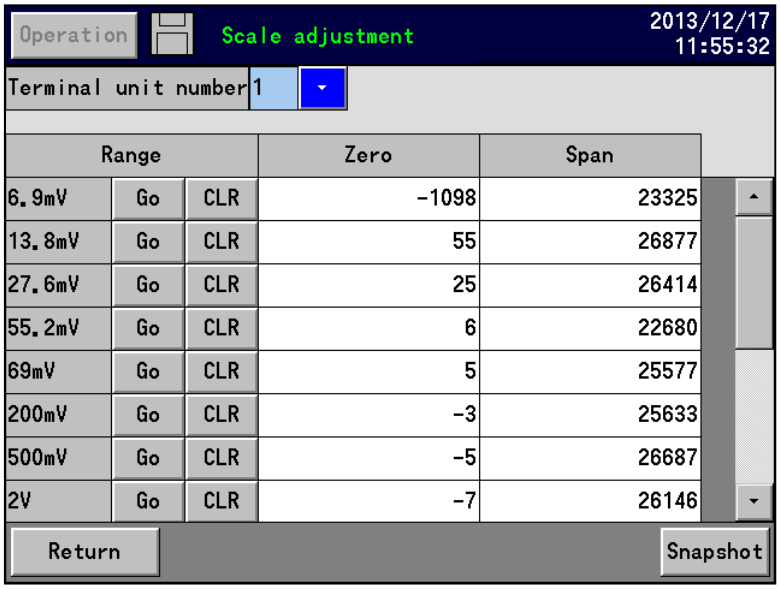

(3) In case of the thermocouple input
The 1st, 6th and 12th terminals of each input terminal unit are the terminals for adjustment. For the adjustment of thermocouples, connect to the 1st, 6th and 12th terminals independently as shown in the figure below.
*The 1st, 6th and 12th terminals are used for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

# 17-5 Zero and span adjustment

Tap the [Operation] button and then tap [MENU settings] - [System settings] - [Scale adjustment], the following scale adjustment screen is displayed.
On this screen, scale adjustment of each input channel can be set. Execute the range adjustment by inputting the zero and span values of the input range to each input terminal for adjustment. Tap the [Go] button at the range to be adjusted to move to the adjustment mode.
The data displayed show the AD account values after adjustment.
Terminal unit number 1*: CH 1 to 12, 2: CH 13 to 24, 3: CH 25 to 36, 4: CH 37 to 48
*Only for KR3S

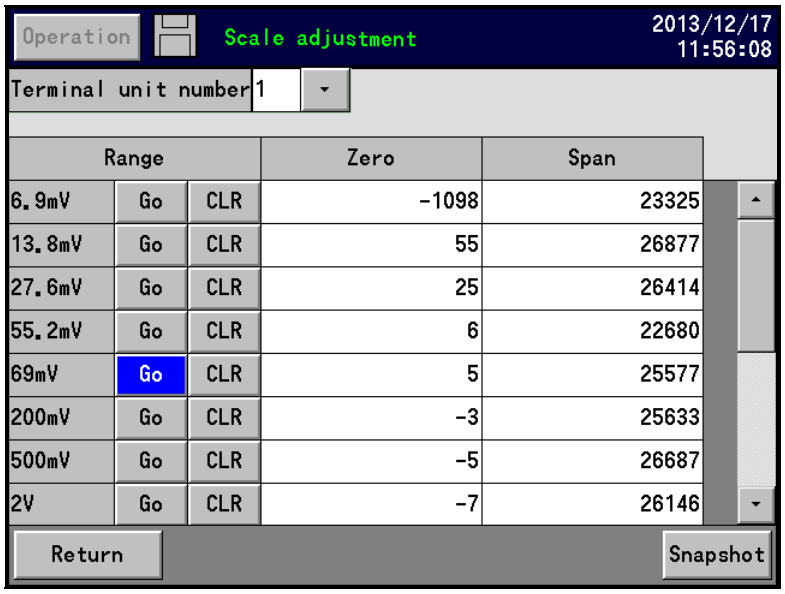



## 17-5-1 Adjustment of the DC voltage input range

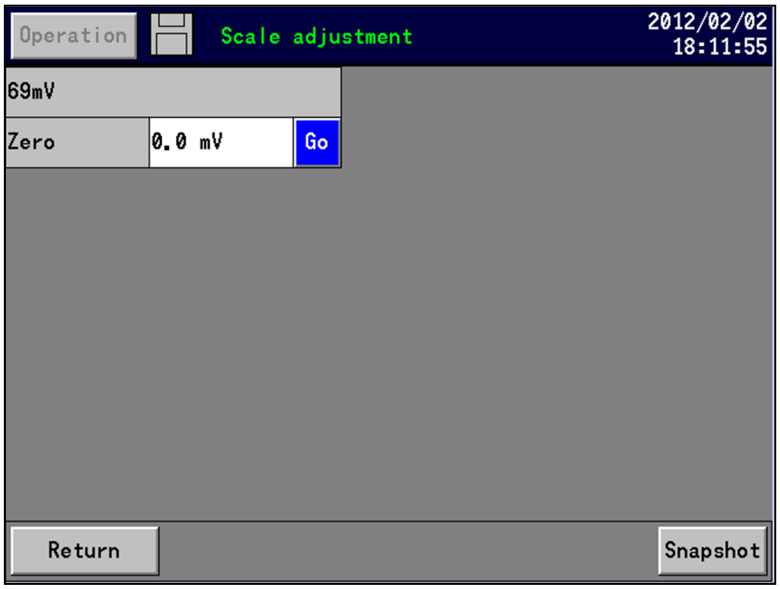
Connect as shown in '17-4 Connection (1) In case of the DC voltage input'. Execute the adjustment by inputting the voltage for the adjustment range.

< Setting method >

(1) Tap the [Go] button at the range to be adjusted.



(2) When 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 ± 69mV range
・Input the voltage of 0V with the DC standard voltage generator.
(4) After inputting the zero point for about 5 seconds, tap the [Go] button.
(5) Adjust the span point.
(Example) For the adjustment of the ± 69mV range
・Input the voltage of +69mV with the DC standard voltage generator.

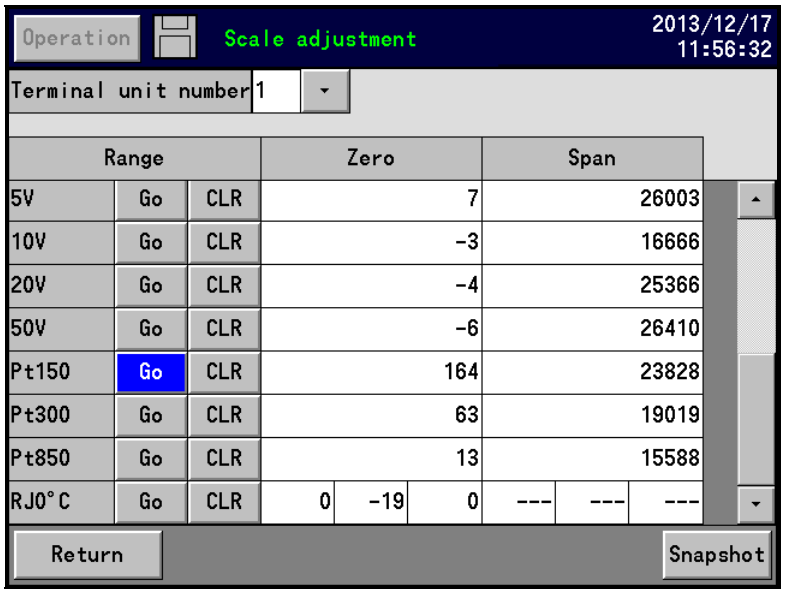

(6) After inputting the span point for about 5 seconds, tap the [Go] button.
(7) After the adjustment of the span point, the screen is returned to the calibration screen for all ranges.
(8) Repeat from (1) to (6) for the adjustment of other ranges.
(9) When the adjustments are completed, tap the [Return] button twice to return to the setting menu screen.

## 17-5-2 Adjustment of the resistance thermometer input range

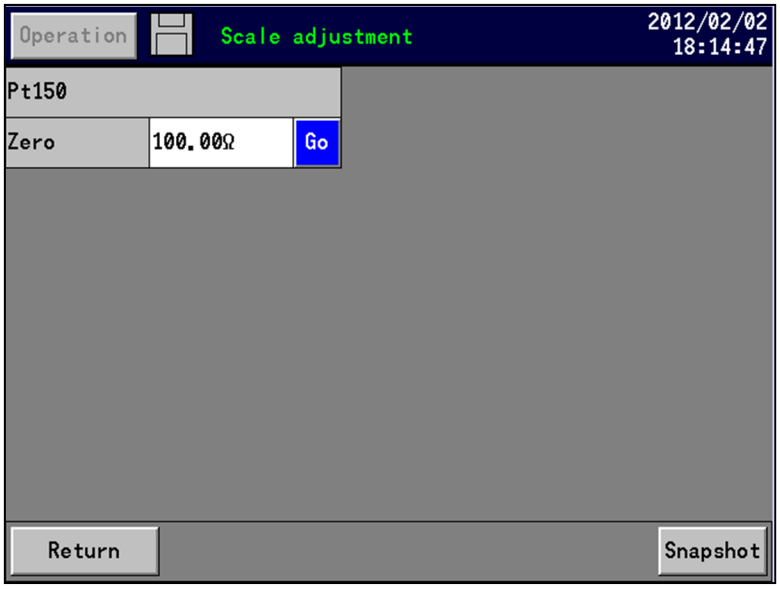
Connect as shown in '17-4 Connection (2) In case of the resistance thermometer input'. Execute the adjustment by inputting the resistance value for the adjustment range.

< Setting method >

(1) Tap the [Go] button at the range to be adjusted.




(2) When 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

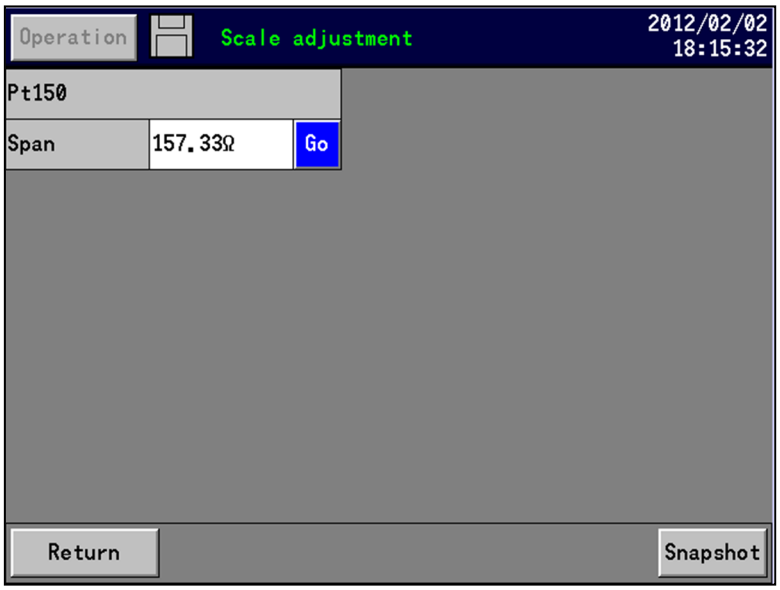
・Input the resistance of 100Ω with the standard variable resistor.

(4) After inputting the zero point for about 5 seconds, tap 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, tap 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.

(9) When the adjustments are completed, tap the [Return] button twice to return to the setting menu screen.

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

## 17-5-3 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 result of the adjustment would be influenced. |
|---|---|

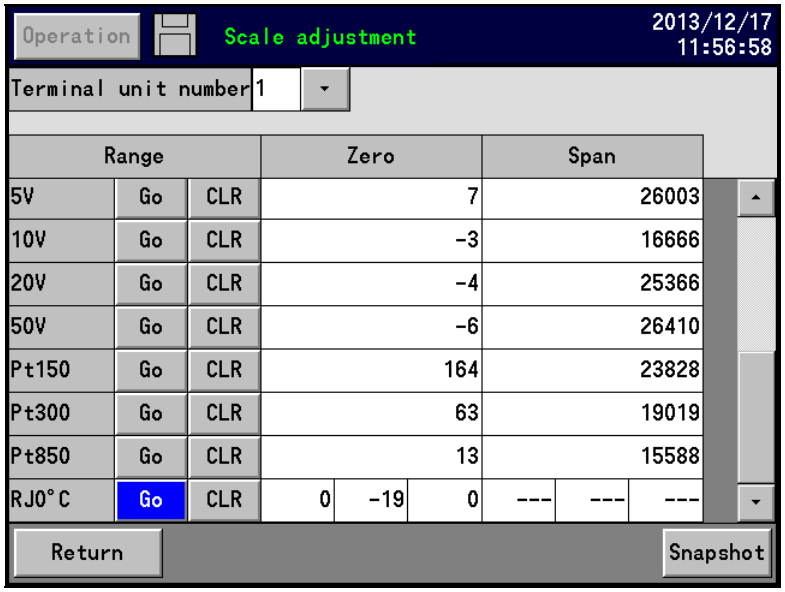
Connect as shown in '17-4Connection (3) In case of the thermocouple input'. Execute the adjustment by connecting the thermocouple for adjusting to each of the 1st, 6th and 12th terminals.

< Setting method >

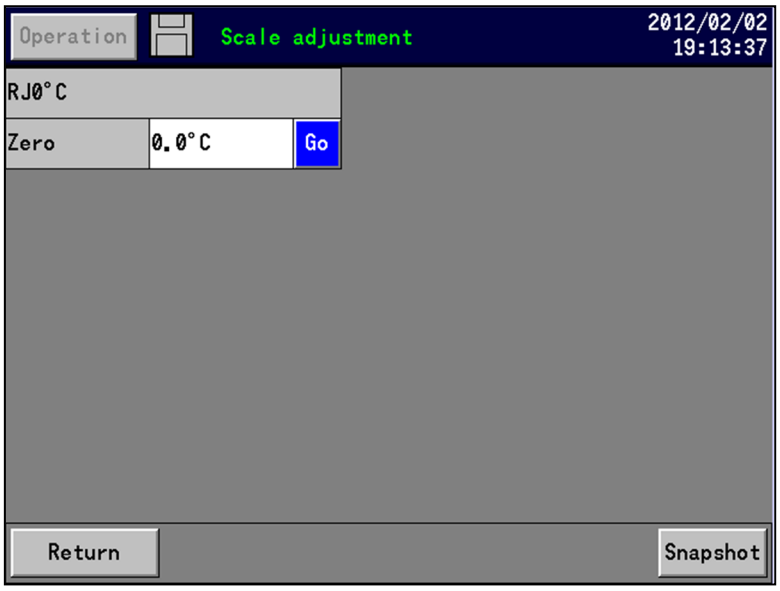
(1) Before moving to the calibration screen, set the input of the 1st, 6th and 12th terminals to the followings.
(Refer to '9-1 Input settings'.)

| Range type | Thermocouple connected |
|---|---|
| Range | Set the decimal point position of the range setting value to 1. Recommendation: Measuring range of which the reference range is ±13.8mV and the display resolution becomes 0.1°C (Refer to '20 Specifications ○Measuring Range, Accuracy Rating and Display Resolution'.) |
| RJ | Internal |
| Burn out | None |

(2) Tap the [Go] button at the range of RJ0°C on the calibration screen.



(3) After about 30 seconds passed, tap the [Go] button.




(4) After the adjustment, the screen is returned to the calibration screen for all ranges.
(5) When the adjustments are completed, tap the [Return] button twice 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.<br>When the [CLR] button is tapped on the calibration screen, the adjustment data are cleared and returned to the default data set at the factory. |
|---|---|

# 18 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.<br>Contact your local CHINO's sales agent to perform parts replacement. |
|---|---|

◆ Operating conditions

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

| Items | Conditions |
|---|---|
| Temperature | 20 to 25°C |
| Humidity | 20 to 80%RH |
| Operation time | 8 hours/day |
| Corrosive gas | Not existed |
| Others | A place without dust, moisture or oily smoke<br>A place without vibrations or shocks<br>A place where the operation is not adversely affected |

◆ 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 | * |
| Relay (For mechanical alarm output) | 70,000 times | Resistance load<br>(Less than the rated contact rating) |
| | 20,000 times | Inductive load<br>(Less than the rated contact rating) |
| Lithium battery | 5 years, | |

*When the LCD reduces its brightness to half, replace it. The reduction of brightness differs depending on the usage conditions.
The replacement interval can be extended by using the screen saver function (display off timer) or by setting the brightness control small.
(Refer to '9-3-6 LCD settings')

# 19 Troubleshooting

## 19-1 Trouble

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

◆ 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) Try turning OFF and ON the external source power supply. | |

◆ Abnormal measurement

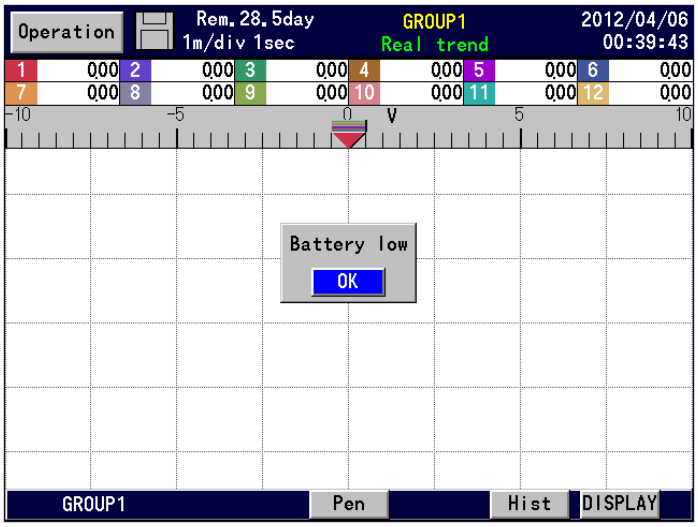
| Symptoms | Causes and remedial measures |
|---|---|
| 1) Measured values unstable | ●Check measuring terminals for looseness.<br>●Check if the input signal is unstable. |
| 2) An error occurs | ●Check if the input signal is correct.<br>●Check if extension wire is connected to input terminals. (Thermocouple input only)<br>●Check input value, if error found, perform calibration with reference to Adjustment (Refer to '17 Scale calibration'). |
| 3) Influences by ambient temperature (Thermocouple input only) | ●Check if the terminal cover is mounted. |

# 19-2 Battery voltage reduction

| Caution | If the power failure occurs at following state, data have not been saved to the CF card and/or operation starting indication (refer below), etc. may be lost. To avoid this occurrence of event, stop acquiring data and execute 'writing from internal memory to the external memory'. Please contact us promptly to replace the battery. If the data is lost, the data can not be guaranteed in any case. |
|---|---|

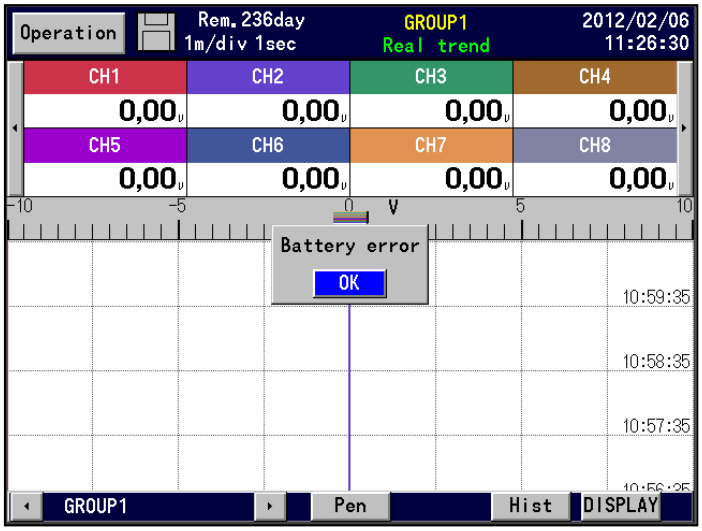
## 19-2-1 Detecting Voltage reduction

When the reduction in internal battery voltage occurs, following voltage reduction message is displayed every one hour during operation and when turns on the power supply.
Battery effective time is approximately tens of hours to a hundred hours after warning message 'Battery low' started appearing.




## 19-2-2 Dead battery

Alarm message 'Battery error' is displayed every one hour during operation and when turns on the power supply.
At this state, phenomenon as follow occurs.



| Caution | We are not responsible for the lost or damaged data in any case. |
|---|---|

◆ Phenomenon that occurs when the power supply is cut off at the state of battery voltage reduction and dead battery

- Data loss before writing to CF card.
  *Data saved in the CF card will not to be lost.

- Totalizing data become default value.
  Totalizing data become default value when the battery is dead.

- Disappearance of alarm display screen and marker list screen.
  *Only the screen displays disappear, the data saved in the CF card will not be lost.

- Power failure protection during the operation state becomes invalid and initialized.
  Types of display screen, display group number, trend magnification ratio, auto switching checked/unchecked and record start, etc. are normally protected from power failure as a state before the event, however the protection become invalid and the state before the power failure will not be saved under the circumstance.
  *The status above will be lost, but settings will not be erased.

- A possibility of internal clock losing time.
  The internal clock may lose time when the power is off for a long period of time under the state of dead battery.

- Setting may be initialized when change the settings during the warning message of voltage reduction is displayed.

- If the power supply cut out occurs a few second after the setting change, setting may be initialized.
  *If not changing the settings, it is saved in the internal memory therefore the settings will not be erased. We recommend saving the settings that have frequent usage to the CF card.
  *If the settings are initialized, warnings message 'Do the initial settings.' is displayed.

◆ When problem cannot be solved

If the problem cannot be solved by performing the troubleshooting above, contact your sales agent or CHINO with information of:
1. Model, 2. Serial No., 3. Description of the problem, 4. Other notes.

When repair of the instrument is needed, understand the following before having it to repair.
The data of internal memory may be deleted during the repair by unexpected trouble.
Backup the data to the USB memory before having the instrument to be repaired.

# 20 Specifications

## ◆ General specifications

Rated power voltage: 100-240 VAC, 50/60 Hz
(Universal power supply)
Power consumption:
KR2S……35VA MAX
KR3S……60VA 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
(100 to 240VAC±10%)
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
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……Fire-retardant polycarbonate resin
Case…… Steel
Color:
Door frame…… Black (Equivalent to Munsell N3.0)
Case……Gray (Equivalent to Munsell N7.0)
Weight: Approx.
KR2S……2.1kg (12 points input with full options)
KR3S……5.6kg (48 points input with full options)
Dimensions:
KR2S……144H × 144W× 204.7D
KR3S……288H × 288W× 209.6D
Panel cutout size:
KR2S……138mm × 138mm
KR3S……281mm × 281mm
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……M3.0

## ◆ Supported standards

EMC directive: EN61326-1 conformity (CE) ClassA
*During the test, the reading corresponding to ± 1mV may fluctuate.
Low voltage directive: EN61010-1,
EN61010-2-030 conformity (CE)
Overvoltage category: Ⅱ
Pollution degree: 2
Environmental regulations: RoHS(CE)
Environmental regulations standards:
EN50581 conformity
(Monitoring and control instruments including industrial monitoring and control instruments.)
Dust/splash-proof:
IEC60529 IP54 (front part) compliance

## ◆ Input specifications

Measuring points:
KR2S……6 points, 12 points
KR3S……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 tap operation
The measuring range is selected automatically according to the setting range.

Scale setup: Setting of minimum values, maximum values and engineering units by tap 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.).]

Measuring period:
KR2S……About 1 second/12 points
(About 0.1 second/4 points)
KR3S……About 1 second/48points

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 on 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)
Thermocouple inputs (burnout enabled),
Resistance thermometer inputs Maximum ±6VDC

Measuring current:
Resistance thermometer inputs 1mA±20%

Maximum common mode voltage:
30VAC, 60VDC

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 (standard specification)

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
* : Only KR2S. If the recording cycle is set to 0.5 seconds or less on the KR2S, the number of input channels will automatically be 4 points.
In the case of the past profile replay specification, you cannot select a recording cycle of less than 1 second.

Recordable time(Estimate):

| CF card volume | Recording points | Recording cycle | | |
|---|---|---|---|---|
| | | 1sec | 10sec | 1min |
| 256MB (attachments) | 12 points | Approx. 2 months | Approx. 20 months | Approx 10yrs |
| 8GB | 12 points | Approx. 5 yrs | Over 10 yrs | Over 10 yrs |

Recording data:
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),
CSV format

Recoding into internal memory:

* The following conditions can be selected by settings.
- Tap operations
- Trigger signals (alarm activation, digital input(Option) )
- 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
USB flash memory: Operation of all USB flash memories is not guaranteed.

## ◆ Display specifications

Display:
KR2S…5.7-inchi TFT color LCD
(118.2mm × 89.4mm)
VGA(640 × 480 dots)
KR3S…10.4-inchi TFT color LCD
(217.4mm × 163.8mm)
VGA(640 × 480 dots)

Trend display colors:
KR2S…12 colors (selectable)
KR3S…48 colors (selectable)

Operation screens: Screens are switched with tapping

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 or circle 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 tap 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 50 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

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, Error

Alarm memory: Alarm activation/cancellation time and alarm types are stored.
*storage of latest 1000 data for all channels

Alarm output (Option): 2/4 points ('c' contact)

## ○ 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.

Note) The indication equivalent to 1mV may vary under the test environment by EMC directives.

* Only the CE corresponding model applies.

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

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 | | Measurement 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 ℃ | 160 Ω | ±0.15% ±1digit | 0.1 ℃ |
| | | -200.0 to 300.0 ℃ | 220 Ω | ±0.1% ±1digit | 0.1 ℃ |
| | | -200.0 to 850.0 ℃ | 400 Ω | | 0.1 ℃ |
| | JPt100 | -140.0 to 150.0 ℃ | 160 Ω | ±0.15% ±1digit | 0.1 ℃ |
| | | -200.0 to 300.0 ℃ | 220 Ω | ±0.1% ±1digit | 0.1 ℃ |
| | | -200.0 to 649.0 ℃ | 400 Ω | | 0.1 ℃ |
| | Pt50 | -200.0 to 649.0 ℃ | 220 Ω | ±0.1% ±1digit | 0.1 ℃ |
| | Pt-Co | 4.0 to 374.0 K | 220 Ω | ±0.15% ±1digit | 0.1 K |

Pt100: IEC751 (1995), JIS C1604-2013

JPt100: JIS C1604-1981, JIS C1606-1989

Pt50: JIS C1604-1981

## ○Exception of accuracy rating

| Input type | Measurement range | Accuracy rating |
|---|---|---|
| K、E、J、T、L | -200 to 0 ℃ | ±0.2%±1digit |
| R、S | 0 to 400 ℃ | ±0.2%±1digit |
| B | 0 to 400 ℃ | Not specified |
| | 400 to 800 ℃ | ±0.15%±1digit |
| N、U | -200 to 0 ℃ | ±0.3%±1digit |
| W-WRe26 | 0 to 100 ℃ | ±4%±1digit |
| | 100 to 400 ℃ | ±0.5%±1digit |
| PtRh40-PtRh20 | 0 to 300 ℃ | ±1.5%±1digit |
| | 300 to 800 ℃ | ±0.8%±1digit |
| CR-AuFe | 0 to 20 K | ±0.5%±1digit |
| | 20 to 50 K | ±0.3%±1digit |
| Pt100 | 700 to 850 ℃ | ±0.15%±1digit |
| Pt-Co | 4 to 50 K | ±0.3%±1digit |

# CHINO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