User's Manual

Models SR10001/SR10002/SR10003/SR10004/ SR10006

SR10000 Recorder

vigilantplant.™

YOKOGAWA
Yokogawa Electric Corporation

IM 04P03B01-01E
2nd Edition

Foreword

Thank you for purchasing the YOKOGAWA SR10000 Recorder.
This user's manual explains how to use the SR10000 recorder excluding the communication functions. To ensure correct use, please read this manual thoroughly before operation.
The following three manuals including this manual are available for the SR10000 Recorder.

- **Paper Manual**

Manual Title	Manual No.	Description
SR10000 Recorder Operation Guide	IM 04P03B01-02E	Explains concisely the operations of the SR10000 Recorder. It is also provided in the CD-ROM.

- **Electronic Manuals Provided on the Accompanying CD-ROM**

Manual Title	Manual No.	Description
SR10000 Recorder Operation Guide	IM 04P03B01-02E	Explains concisely the operations of the SR10000 Recorder. This is the electronic version of the paper manual.
SR10000 Recorder User's Manual	IM 04P03B01-01E	This manual.
SR10000 Communication Interface User's Manual	IM 04P03B01-17E	Explains the communication functions of the SR10000 Recorder using Ethernet interface and the RS-422A/485 communication interface.

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer as listed on the back cover of this manual.
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How to Use This Manual

Structure of the Manual

Read the Operation Guide first to familiarize yourself with the basic operation, and then read this manual. For a description of the communication function, see the *SR10000 Communication Interface User's Manual (IM 04P03B01-17E)*.
This user's manual consists of the following sections.

Chapter	Title and Description
1	**Functional Explanation and Setup Guide** Describes the functions of the SR10000 Recorder and provides a function setup guide. Refer to this chapter when you are unsure of the details of the function that you are operating.
2	**Frequently Used Setup Operations (Setting Mode)** Describes how to change the input range, alarms, chart speed, etc.
3	**Setup Operations for Convenient Functions (Setting Mode)** Describes the setup operations for convenient functions such as how to assign tags to channels and how to set message strings that are to be printed.
4	**Setup Operations for Changing/Adding Functions (Basic Setting Mode)** Describes the setup operations for changing or adding functions such as setting the recorder to detect sensor burnouts and changing the contents that are printed on the chart paper.
5	**Troubleshooting** Describes error message and troubleshooting measures of the SR10000 Recorder.
6	**Maintenance** Describes periodic inspection, calibration, and pen adjustment/printer carriage adjustment.
7	**Specifications** Gives the specifications of the SR10000 Recorder.
Appendix	Describes the printout contents.
Index	

Note

- This user's manual covers information regarding the recorders with English as the printout font (suffix code "2").

Recorder's Version and Functions Described in This Manual

The contents of this manual corresponds to the recorder with version 1.31.

SR10000 Versions and Functions

Version	Suffix Code	Added or Modified Functions	Reference
1.21 or earlier	–	–	–
1.31	/BT1	(Added) Header printout	Section 1.3

- Checking the Version Number
  Press the FUNC key, △ key, or ▽ key to select **VER** (VER), then press the ↵ key.
  Hold down the FUNC key to return to Operation mode.

Software (Sold Separately)

The table below shows the relationship between the RXA10 Configuration Software revisions and the SR10000 recorder versions.

		Recorder version		
		1.21 or earlier	1.31	
RXA10 Configuration Software revision	R3.01	Yes	Yes	

Yes: Compatible

Conventions Used in This Manual

Unit

K ..... Denotes 1024. Example: 768 KB (file size)
k ..... Denotes 1000.

Safety Markings

The following markings are used in this manual.

Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

WARNING Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

CAUTION Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

Note Calls attention to information that is important for proper operation of the instrument.

Subheadings

On pages that describe the operating procedures in Chapter 2 through 4 and 6, the following symbols are used to distinguish the procedures from their explanations.

Procedure Follow the numbered steps. All procedures are written with inexperienced users in mind; depending on the operation, not all steps need to be taken.

Explanation This subsection describes the setting parameters and the limitations on the procedures. It does not give a detailed explanation of the function. For details on the function, see chapter 1.

Contents

1.1 Measuring Input Section

Input Section

Number of Measurement Channels and Scan Interval

The recorder samples the input signals on the measurement channels at the scan interval to obtain the measured values.

Model	Number of Channels	Scan Interval
1-pen model	1	125 ms
2-pen model	2	125 ms
3-pen model	3	125 ms
4-pen model	4	125 ms
Dot model	6	1 s (However, the scan interval is 2.5 s when the integration time of the A/D converter is 100 ms.)

Input Type, Measurable Range, and Computation

The recorder can measure the following types of inputs.

Input Type	Measurable Range
DC voltage	DC voltage in the range of ±20 mV to ± 50 V
1-5V	See “1-5V” below.
Thermocouple	Temperature range corresponding to each type: R, S, B, K, E, J, T, N, W, L, U, and WRe
RTD	Temperature range corresponding to each type: Pt100Ω and JPt100Ω
ON/OFF input	Contact input: Open contact is OFF (0). Closed contact is ON (1). Voltage input: Less than 2.4 V is OFF (0). Greater than or equal to 2.4 V is ON (1). Within ±6 V.

- **1-5V**

  1-5V is scaled to values in the appropriate unit to be used as measured values. Also, the low-cut function (input less than 0% is fixed to 0% (scale left value)) can be used.
- **Current Input**

  A shunt resistor is attached to the input terminal. The current signal is converted to a voltage signal and measured. The measurable range is the range equivalent to the “DC voltage” range indicated above after converting the current to the voltage signal.

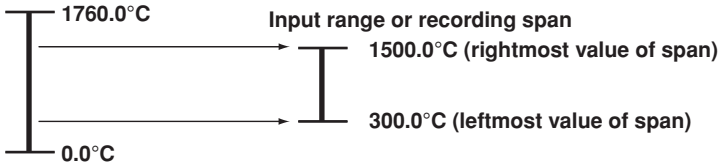
Note

Three types of shunt resistors (250 Ω, 100 Ω, and 10 Ω) are available for current input (See “Optional Accessories (Sold Separately)” in the *Operation Guide*). For example, a 250-Ω shunt resistor is used to convert the signal to the range of 1 to 5 V for 4 to 20 mA input.

- **Range Type, Measurable Range, and Recording Span**

  Various “range type” are available for the different types of inputs (for example thermocouple type R). Each range type has a preset measurable range (0.0 to 1760.0°C for thermocouple type R). Measurement can be made by specifying an arbitrary range within the measurable range as the *input range*. The measured values in the input range are recorded on the chart paper. The range of measured values that are recorded is called the *recording span*.

  Measurable range (Thermocouple Type R example)

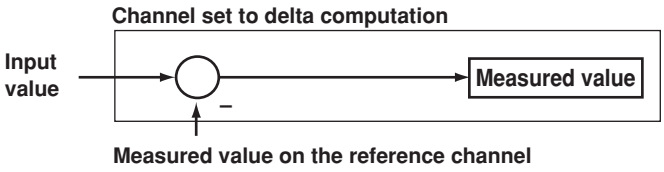


<Related Topics> Setting the input range: Section 5.1

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

- **Delta Computation**

  The value obtained by subtracting the measured value of another channel (called the *reference channel*) from the input value of the channel set to delta computation is used as the measured value of that channel. The reference channel must be assigned to a channel whose channel number is less than that of the channel on which delta computation is specified. The channel on which delta computation is specified is automatically set to the same range type as the reference channel.

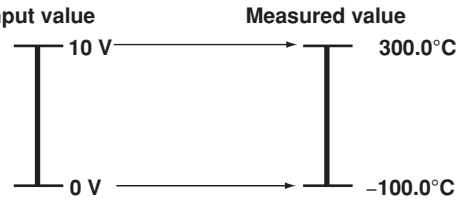


Note

A channel whose input type is set to DC voltage, TC, or RTD can be designated as a reference channel. However, channels set to scaling or square root computation cannot be designated.

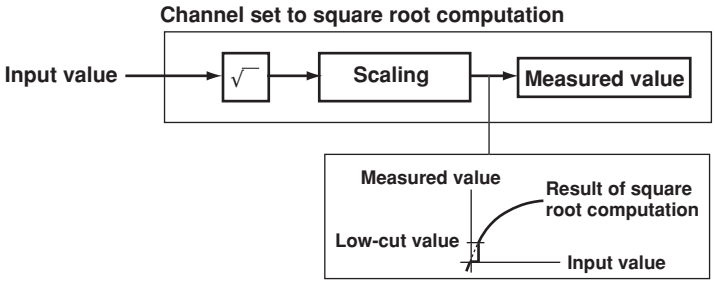
- **Scaling**

  The input values are scaled to values in the appropriate unit to be used as measured values.



- **Square Root Computation**

  When the input type is DC voltage, the square root of the input value is calculated, the result is scaled to a value in the appropriate unit, and used as the measured value of the channel. Also, the low-cut function (input less than a given measured value is fixed to 0% (scale left value)) can be used.



Note

The square root computation on the recorder uses the following formula.

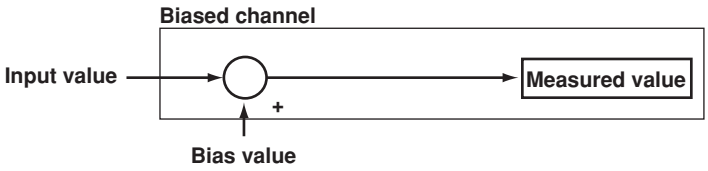
$$F_x = (F_{max} - F_{min}) \sqrt{\frac{V_x - V_{min}}{V_{max} - V_{min}}} + F_{min}$$

where V*min* (leftmost value of span) < V*max* (rightmost value of span)
F*min* (leftmost value of scale after scaling) < F*max* (rightmost value of scale after scaling)
V*x* is the input voltage and F*x* is the scaled value

<Related Topics> Setting the input range: Section 5.1

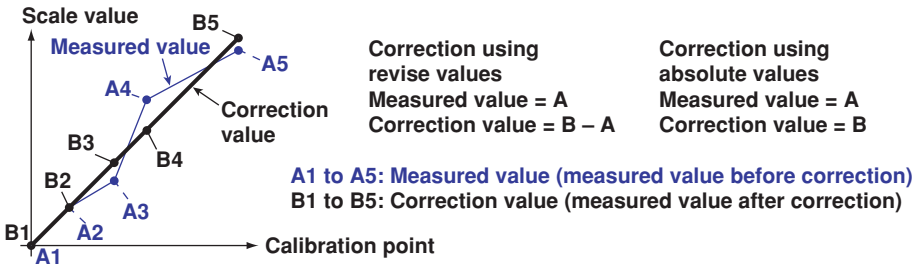
For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

- **Bias**
  A given value (bias value) is added to the input value and used as the measured value of that channel.



<Related Topics> Setting the bias: Sections 4.15 and 3.10

- **Calibration Correction (/CC1 Option)**
  Corrects the measured value of each channel using segment linearizer approximation and makes the resultant value the measured value of the channel. You can set arbitrary correction values for 2 to 16 points of arbitrary measured values. Linear approximation is used between two segment points. Correction values can be assigned using revise values or absolute values.



<Related Topics> Setting the calibration correction function: Sections 4.15, 4.22, and 3.11

Burnout Detection of Thermocouples

This function makes the recording go off the scale to the right or left when the thermocouple burns out while measuring temperature with a thermocouple. This function can also be used on 1-5V. The burnout detection function can be set for each channel. By default, this function is disabled.

Note

For 1-5V, a burnout occurs when the input value is less than or equal to 0.2 V.

<Related Topics> Setting the burnout detection function: Section 4.3

Reference Junction Compensation of Thermocouple Input

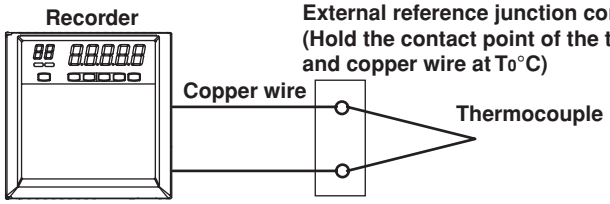
When measuring the temperature using a thermocouple, the reference junction compensation on the recorder can be used. When using external reference junction compensation, you can set the reference voltage. The reference junction compensation can be set for each channel.
By default, the recorder is configured to use the internal reference junction compensation function.

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

Note

When using external reference junction compensation, set an appropriate reference junction compensation voltage. For example, if the reference junction temperature of the external reference compensation is T_0 °C, set the reference compensation junction voltage to the thermoelectromotive force of the 0°C reference of T_0 °C.

Example when using external reference junction compensation



<Related Topics> Setting the reference junction compensation function: Section 4.4

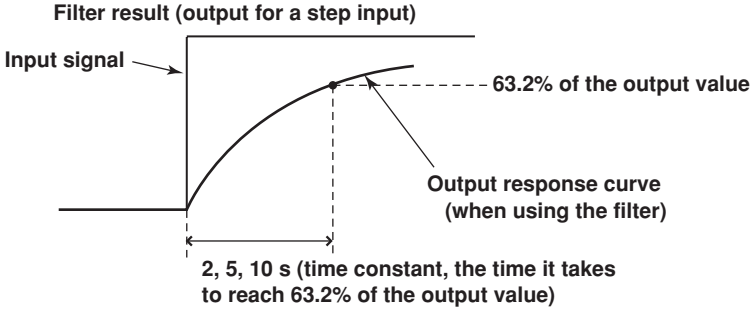
Noise Elimination from Input Signals

Filter and Moving Average

This function used to suppress the effects of noise that is riding on the signal. The pen model and dot model are equipped with a filter function and a moving average function, respectively. The function can be set for each measurement channel. However, it does not operate on channels set to ON/OFF input.

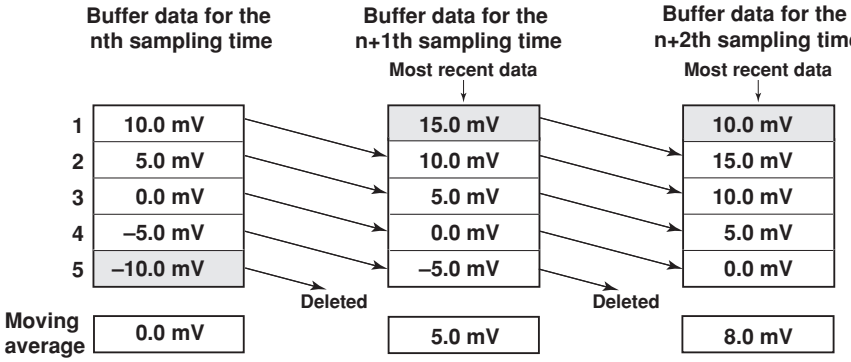
- **Filter (Pen Model)**

  The filter is a low-pass filter. The time constant can be set to 2 s, 5 s, or 10 s.



- **Moving Average (Dot Model)**

  The average value of the m most recent values acquired at the scan interval is used as the measured value of the channel. The number of moving-averaged data points (m) can be set in the range 2 to 16. The figure below shows an example indicating the operation of the buffer for the moving average computation when the number of moving averaged data points is set to 5.



<Related Topics> Setting the filter: Sections 4.11 and 3.2
Setting the moving average: Sections 4.10 and 3.3

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

Integration Time of the A/D Converter

The recorder uses an A/D converter to convert the sampled analog signal to a digital signal. By setting the integration time of the A/D converter to match the time period corresponding to one cycle of the power supply or an integer multiple of one cycle, the power supply frequency noise can be effectively suppressed.
The integration time of the A/D converter is selected according to the model from the table below.

Model	Integration Time of the A/D Converter
Pen model	Select 16.7 ms (60 Hz), 20 ms (50 Hz), or Auto
Dot model	Select 16.7 ms (60 Hz), 20 ms (50 Hz), 100 ms or Auto

- If Auto is selected, the recorder detects the power supply frequency and automatically selects 16.7 ms or 20 ms.
- If Auto is specified when using the 24-VDC power supply on a recorder with the 24-VDC/AC power supply (/P1 option), the integration time is fixed to 20 ms (50 Hz).
- Because 100 ms is an integer multiple of 16.7 ms and 20 ms, this setting can be used to suppress the power frequency noise for either frequency, 50 Hz or 60 Hz.
- The scan interval on the dot model is 1 s when the integration time is set to 16.7 ms or 20 ms and 2.5 s when the integration time is set to 100 ms.

<Related Topics> Setting the A/D integration time: Section 4.2

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

1.2 Alarms

This function generates an alarm when the measured data meets a certain condition. The alarm status is displayed on the screen while recording the alarm occurrence/ release on the chart paper.
Also, alarm output relays can be used to output contact signals when alarms occur (/A1, /A2, and /A3 options).

Alarm Types

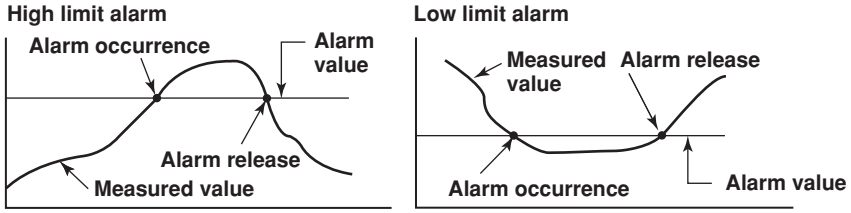
Number of Alarm Point Marks

Up to four alarms can be set for each channel.

Alarm Conditions

The following four conditions are available: The alphanumeric character or symbol inside the parentheses is used on the recorder to denote each alarm.

- **High Limit Alarm (H/ꟾ)**
  An alarm occurs when the input value exceeds the alarm value.
- **Low Limit Alarm (L/ꟾ)**
  An alarm occurs when the input value falls below the alarm value.

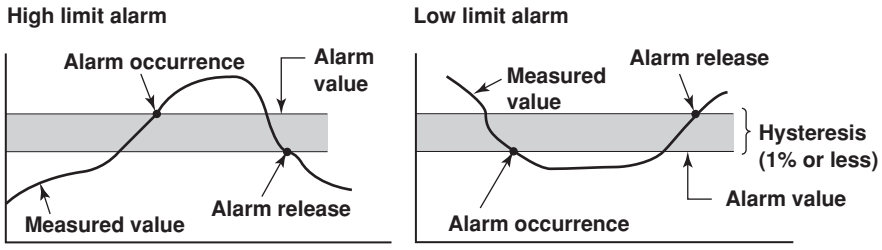


- **Difference High Limit Alarm (h/ꟾ)***
  An alarm occurs when the difference in the input values of two channels is greater than or equal to the specified value.
- **Difference Low Limit Alarm (l/ꟾ)***
  An alarm occurs when the difference in the input values of two channels is less than or equal to the specified value.

* Can be specified on channels set to delta computation.

Alarm Hysteresis

Hysteresis can be specified to the values for activating and releasing the alarm. The hysteresis applies only to high limit alarm (H) and low limit alarm (L). The hysteresis width can be set in the range of 0.0% (OFF) to 1.0% of the recording span in 0.1 steps. The setting applies to all high limit alarms and low limit alarms. By default, the hysteresis width is set to 0.5%.



<Related Topics> Setting alarms: Section 2.2
Setting the alarm hysteresis: Section 4.1

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

Alarm Indication

When an alarm occurs, the ALM indicator in the status display section illuminates, and the 2nd digit of the LED shows the alarm status for each channel. When the alarm clears, the indicator and the LED turn OFF.

Alarm Recording

The alarm occurrence/release can be recorded on the chart paper. See section 1.3.

Alarm Output Relay (/A1, /A2, and /A3 Options)

Contact signals can be generated from alarm output relays when alarms occur. The number of output relays is 2 (/A1), 4 (/A2), or 6 (/A3). The alarm output relays are denoted as I01 to I06 on the recorder.
The following functions can be assigned to the alarm output relay.

Diagnosis Output

The diagnosis output can be assigned to alarm output relay I01.
The relay is activated when there is an error in the plotter operation on the pen model, when a burnout is detected, or when there is an error in the A/D converter. Output relay I01 is normally energized and de-energizes when an error is detected (de-energized operation).

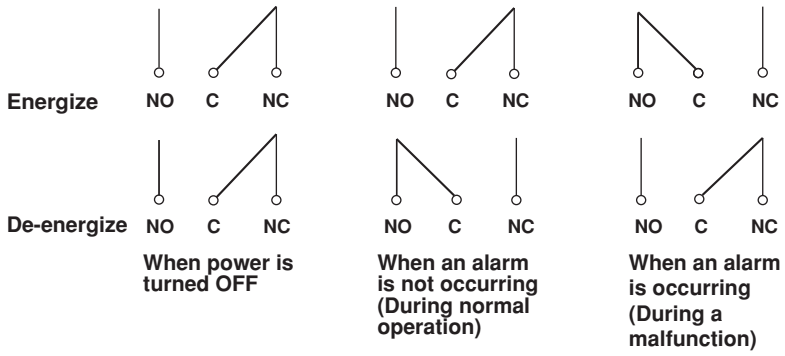
Note

If diagnosis output is enabled, I01 becomes a relay dedicated to diagnosis output.

<Related Topics> Setting the diagnosis output: Section 4.1

Energized/De-energized Operation of Alarm Output Relays

You can select whether the alarm output relay is energized or de-energized when an alarm occurs. If de-energized is selected, the status of the alarm output relay when an alarm occurs is the same as the status that results when the recorder is turned OFF (including power failures). The setting applies to all alarm output relays.
The default setting is energized.



NO : Normally Opened, **C** : Common, **NC** : Normally Closed

Note

If diagnosis output is enabled, I01 is fixed to de-energized operation.

<Related Topics> Setting the energized/de-energized operation of alarm output relays: Section 4.1

Alarm Output Relay Operation

When the output destination of multiple alarms is assigned to a single alarm output relay, the relay is activated when any of the assigned alarms is occurring (OR operation).

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

1.3 Recording

The recorder is capable of recording the measured values with pens or dots (trend recording) as well as various other types of information.

Trend Recording

The measured values are printed within a width of 100 mm.

Recording Method (Pen Model)

- The measured value is updated every scan interval and continuously recorded.
- The recording colors in order from channel 1 are red, green, blue, and violet.

Recording Method (Dot Model)

- The most recent measured value is recorded with a dot every dot printing interval. The dot printing interval is in the range of 10 s to 90 s. There are two recording methods from which you can select. One method automatically adjusts the dot printing interval according to the chart speed so that the dots do not overlap. The other method records at the fastest dot printing interval at all times.
- The recording colors in order from channel 1 are purple, red, green, blue, brown, and black. The recording color of each channel can be changed among these six colors.
- For each channel, trend recording can be enabled or disabled.

<Related Topics> Setting the trend recording interval: Section 3.1
Changing the recording color: Section 4.5
Enabling/Disabling trend recording for each channel: Section 3.6

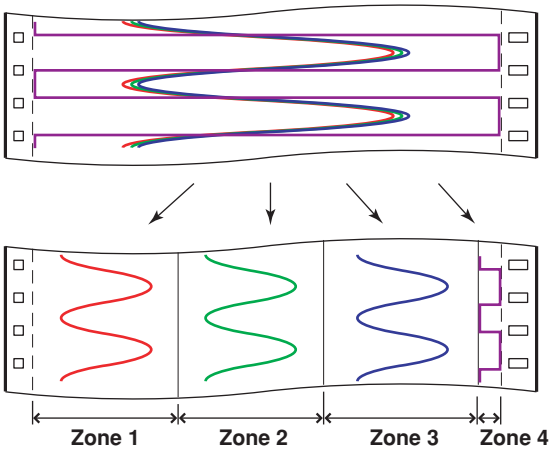
Chart Speed

On the pen model, the chart speed can be selected from 40 settings in the range of 10 to 12000 mm/h.
On the dot model, the chart speed can be selected from 28 settings in the range of 10 to 1500 mm/h.
The default setting is 20 mm/h.

<Related Topics> Setting the chart speed: Section 2.4

Zone Recording

A recording zone is assigned to each channel. This function is useful such when the recording results overlap making them difficult to be viewed.

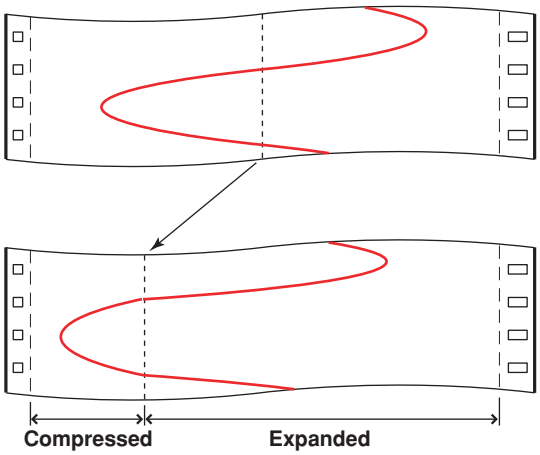


<Related Topics> Setting the zone recording: Section 3.4

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

Partial Expanded Recording

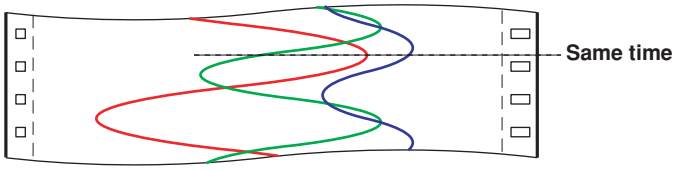
This function expands a section of the recording range. By default, partial expanded recording is disabled.



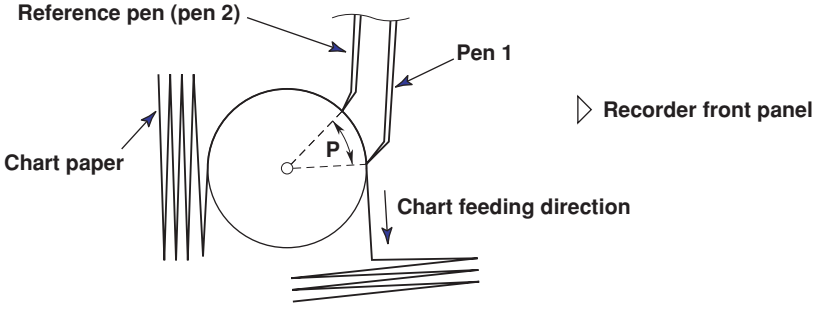
<Related Topics> Setting the partial expanded recording: Sections 4.12 and 3.5

Pen Offset Compensation (Pen Model)

This function compensates for the pen offset (phase difference) along the time axis. On 2-pen, 3-pen, and 4-pen recorders, there are offsets along the time axis (phase difference) between the pens. This offset is corrected when pen offset compensation is used.



Below is an explanation for the 2-pen model.
The recording of these two pens are offset by an amount of phase P. If pen offset compensation is enabled, the measured values of pen 1 are stored in the memory, and recorded when the chart paper is fed by an amount corresponding to P.



By default, this function is disabled.

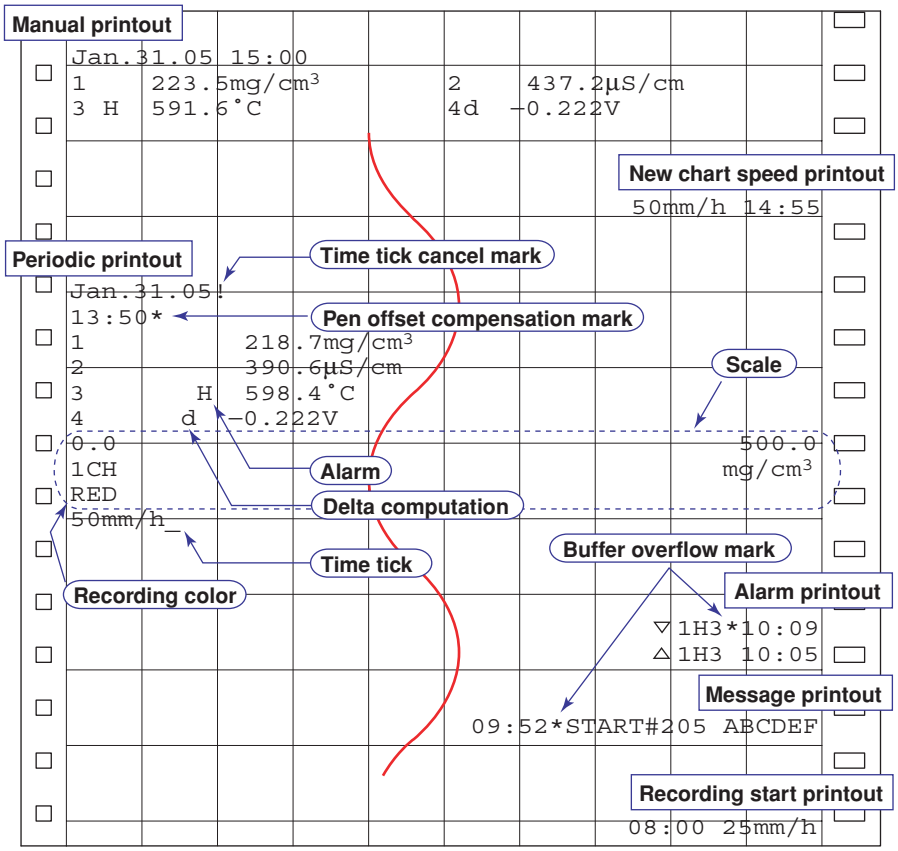
<Related Topics> Setting the pen offset compensation: Section 4.6

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

Printout

The figure below is used to explain the printout contents. The actual printout and font are different from those illustrated in the figure. The printout positions are also slightly different.

Printout Example on the Pen Model



Time tick

The time ticks are marks that indicate the positions of the date/time on the chart paper.

Time tick cancel mark

An exclamation point (!) is printed when the periodic printout time tick was not printed at the correct position.

Channel number or tag printout

Channel numbers or tags can be printed.

<Related Topics>

Switching between channel number printout and tag printout: Section 4.7

Setting the periodic printout (interval, reference time, and periodic printout ON/OFF): Section 4.8

Turning printout ON/OFF (alarm printout, recording start printout, new chart speed printout, scale printout for periodic printout, and recording color printout for periodic printout): Section 4.7

Setting the time format (alarm printout, message printout, recording start printout, and new chart speed printout): Section 4.16

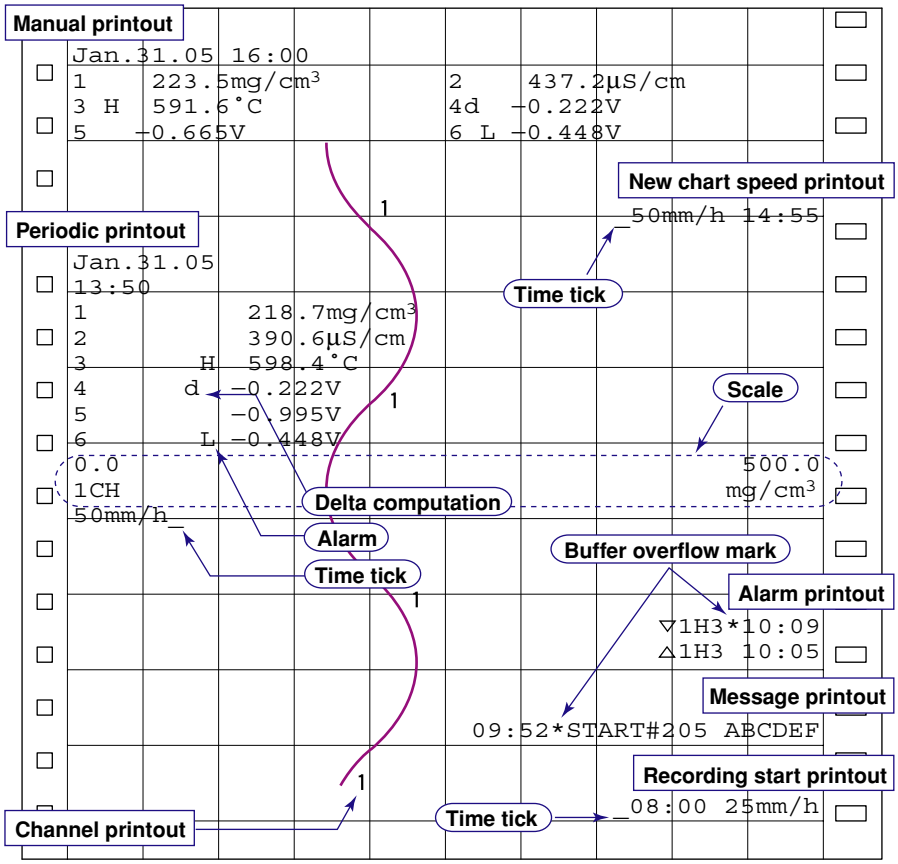
Turning periodic printout ON/OFF for each channel: Section 3.6

Setting the message string: Section 3.8

Executing manual printouts, executing message printouts, clearing the alarm printout buffer, and printing out settings: see the *Operation Guide*)

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

Printout Example on the Dot Model



Channel Printout (Dot Model Only)

Prints the channel No. or tag by the trend recording. The channel No. or tag is printed every approximately 25 mm on the chart paper. The channel printout can be enabled or disabled. By default, the channel printout is enabled.

<Related Topics>

Switching between channel number printout and tag printout: Section 4.7

Setting the periodic printout (interval, reference time, and periodic printout ON/OFF): Section 4.8

Turning printout ON/OFF (channel printout, alarm printout, recording start printout, new chart speed printout, and scale printout for periodic printout): Section 4.7

Setting the time format (alarm printout, message printout, recording start printout, and new chart speed printout): Section 4.16

Turning recording and printout ON/OFF for each channel (trend recording and periodic printout): Section 3.6

Setting the message string: Sections 3.8

Executing manual printouts, executing message printouts, clearing the alarm printout buffer, and printing out settings: see the *Operation Guide*)

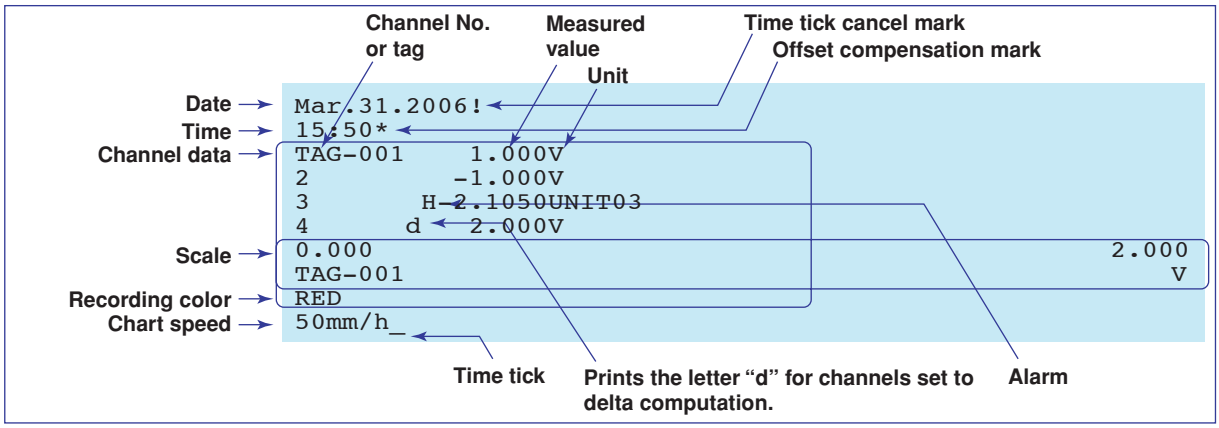
For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

Periodic Printout

Values such as the measured values are printed at a determined interval. The contents of the printout vary between the pen model and dot model.

Printout cannot be performed at the following chart speeds.

Pen model: 1800 mm/h or higher; Dot model: 120 mm/h or higher



The font used in the figure differs from that of the actual printout. The printout positions may also differ from those of the actual printout.

- **Printout Contents**
  - Date/Time: The date/time when the periodic printout was executed.
  - Time ticks: Marks that indicate the first pen position of the date/time on the chart paper. If the time tick is not printed in the correct position, the pen model prints a time tick cancel mark (!), and the dot model does not print the time tick.
  - Offset compensation mark: When pen offset is being executed on the pen model, asterisks (*) are printed.
  - Channel data: Prints the channel numbers or tags, measured values (instantaneous values), and units.
  - Alarm status: Prints the alarm that is occurring. Prints the letter "d" on channels set to delta computation. If multiple alarms are occurring, the alarm with the highest precedence is printed.
    Alarm printout precedence: (Higher) H, L, h, and l (lower)
  - Scale: Prints the leftmost and rightmost values of the recording span and the channel number or tag for channels that have scale printout specified. The scale is printed for one channel at each periodic printout. The channel whose scale is printed changes in ascending order. The scale of channels that are being zone recorded is printed within the recording range of the zone for 40 mm or greater.
  - Recording color (pen model): Prints the recording colors of channels that have scale printout and recording color printout specified.
  - Chart speed: The chart speed can be printed.
  - For the measured values and alarm status, you can select whether to print them for each channel. For the scale and recording color (pen model), you can select whether to print them.

- **Interval (for details, see appendix 1)**
  The printout interval can be set by specifying the value or set automatically in sync with the chart speed.

- **Turning ON/OFF the Periodic Printout**
  Periodic printout can be turn ON/OFF. By default, periodic printout is enabled with the interval synchronized to the chart speed.

For the procedure to set the functions, see section 1.6, "Function Setup Guide."

Alarm Printout

Alarm information is printed when an alarm occurs or releases.
Printout cannot be performed at the following chart speeds.
Pen model: 1800 mm/h or higher; Dot model: 120 mm/h or higher

△1H2∗10:00
- 10:00 — Time of alarm occurrence/release
- ∗ — Indicates that there are alarms that are not printed because the alarm printout buffer is full.
- 2 — Level number
- H — Alarm type (H: high limit, L: low limit, h: difference high limit, and l: difference low limit)
- 1 — Channel No. or tag
- △: Alarm occurrence, ▽: Alarm release

- The print condition can be set to (1) print when alarms occur and release, (2) print only when alarms occur, or (3) do not print.
- Alarms that occur while an alarm printout is in progress are temporarily saved to the buffer memory in a printout-wait condition. Alarms are cleared from the buffer memory when they are printed.
- The number alarms that can be stored in the buffer is 8 and 12 on the pen model and dot model, respectively. Alarms that occur while the buffer is full are not printed. A buffer overflow mark is printed when there are alarms that cannot be printed because the buffer is full.
- The time printout format can be selected.

Manual Printout

Measured values and alarm status can be printed manually using the keys. When manual printout is executed, trend recording stops and restarts when manual printout is complete.
<For the operation procedure, see the *Operation Guide*.>

Message Printout

Printout cannot be performed at the following chart speeds.
Pen model: 1800 mm/h or higher; Dot model: 120 mm/h or higher
Preset messages can be printed on the chart paper using the keys. Five messages, each within 16 characters, can be registered in advance.

- If message printout is executed while another message is being printed, the most recent message is temporarily stored to the buffer memory in a printout-wait condition. Messages are cleared from the buffer memory when they are printed.
- The number of messages that can be stored in the buffer is 5. If message printout is executed when the buffer is full, the message is not printed. A buffer overflow mark is printed when there are messages that cannot be printed because the buffer is full.
- The time printout format can be selected.

New Chart Speed Printout

Printout cannot be performed at the following chart speeds.
Pen model: 1800 mm/h or higher; Dot model: 120 mm/h or higher

- When the chart speed is changed, the time tick (dot model), the date/time of change, and the new chart speed are printed. An asterisk (∗) shows there are messages that cannot be printed.
- The time printout format can be selected.

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

Recording Start Printout

Printout cannot be performed at the following chart speeds.

Pen model: 1800 mm/h or higher; Dot model: 120 mm/h or higher

When recording is started, the time tick (dot model), the time, and the chart speed can be printed. An asterisk (∗) shows there are messages that cannot be printed.

- The recording start printout can be enabled or disabled. By default, the recording start printout is disabled.
- The time printout format can be selected.

Printout/Display Format of the Date.

The printout/display format of the date can be selected from the list below.

Selectable Settings	Type	Printout Format Example	Display Format Example	Notes
y-n-d	Year/Month/Day	2006/03/31	06 03 31	Default value
n-d-y_1	Month/Day/Year	03/31/2006	03 31 06	
d-n-y_1	Day/Month/Year	31/03/2006	31 03 06	
d.n.y_2	Day.Month.Year	31.03.2006	31 03 06	
n.d.y_2	Month.Day.Year	Mar.31.2006	03 31 06	

*1 These do not apply for the date printout format for message printouts that include measured values (/BT1 option). Specify that in the message format.

Printout Format of the Time

The printout format of the time can be selected from the list below.

Selectable Settings	Type	Printout Format Example	Notes
H:n	Hour:Minute	10:00	Default value
H:n:S	Hour:Minute:Second	10:00:00	
n-d H:n	Month/Day Hour:Minute	03/31 10:00	
n-d H:n:S	Month/Day Hour:Minute:Second	03/31 10:00:00	
y-n-d H:n:S	Year/Month/Day Hour:Minute:Second	2006/03/31 10:00:00	

*1: The year/month/day format varies depending on the printout/display format of the date.

*2: Can be set to the alarm printout, message printout, recording start printout, and new chart speed printout.

*3 These do not apply for the date printout format for message printouts that include measured values (/BT1 option). Specify that in the message format.

<Related Topics> Setting the printout/display format of the date: Section 4.14
Setting the printout format of the time: Section 4.16

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

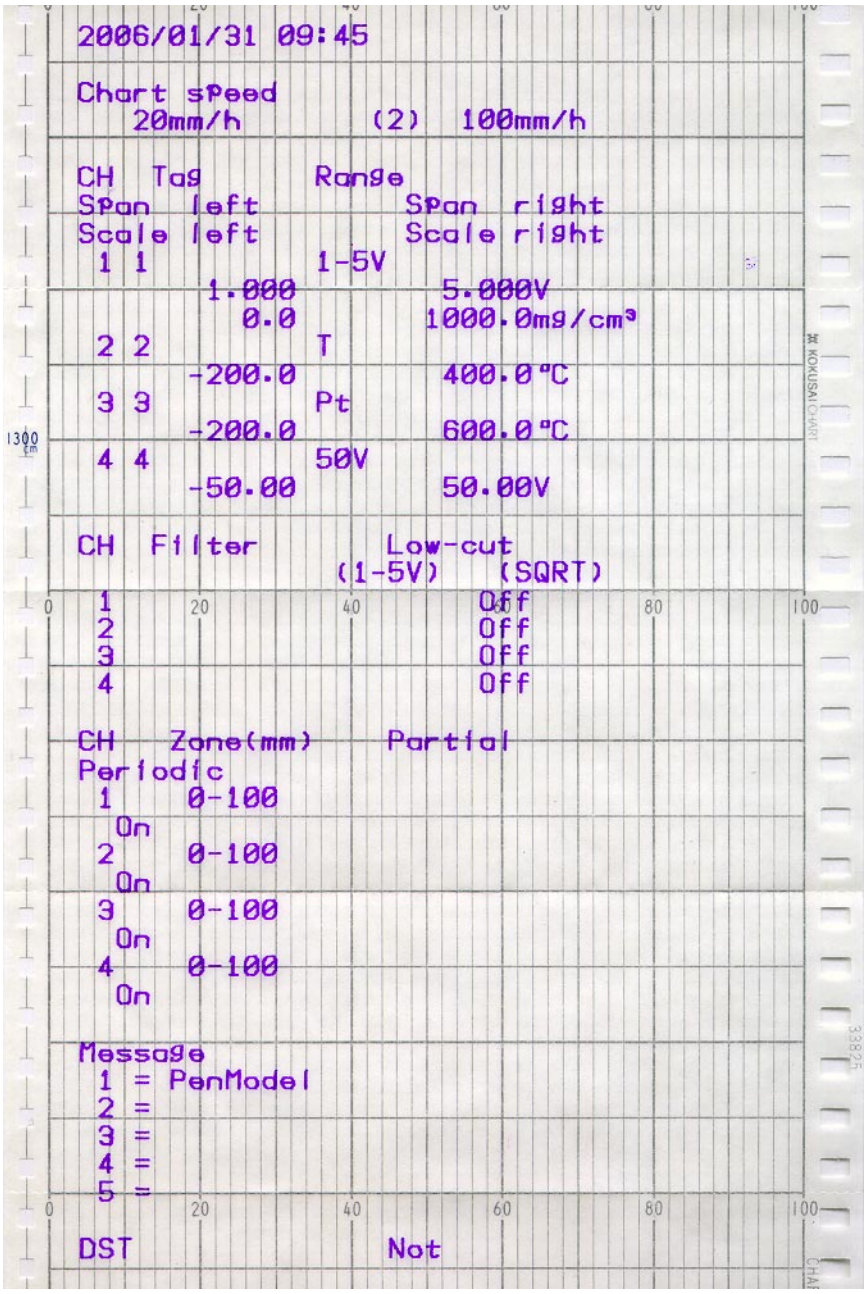
Setting Printout

List or setup list can be printed. When setting printout is executed, trend recording stops and restarts when the printout is complete.

List printout contains Setting Mode settings such as the input range and alarm for each channel.

Setup List contains Basic Setting Mode settings such as the alarm output relay operation and printout method.

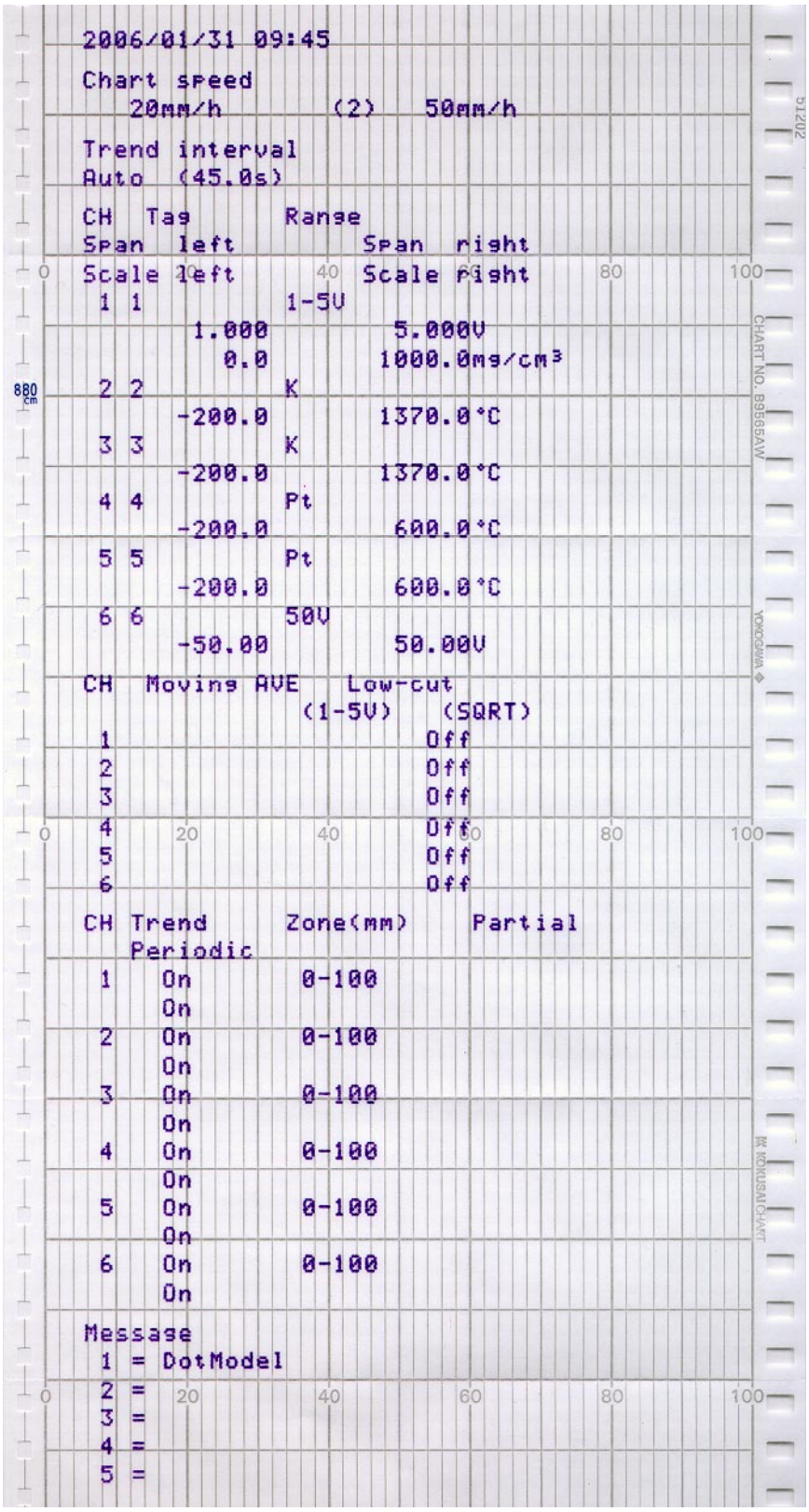
- **Printout Example of List on the Pen Model**



The printout examples may appear differently from the actual printout as a result of functional improvements made on the recorder after this manual was written.

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

- **Printout Example of List on the Dot Model**



The printout examples may appear differently from the actual printout as a result of functional improvements made on the recorder after this manual was written.

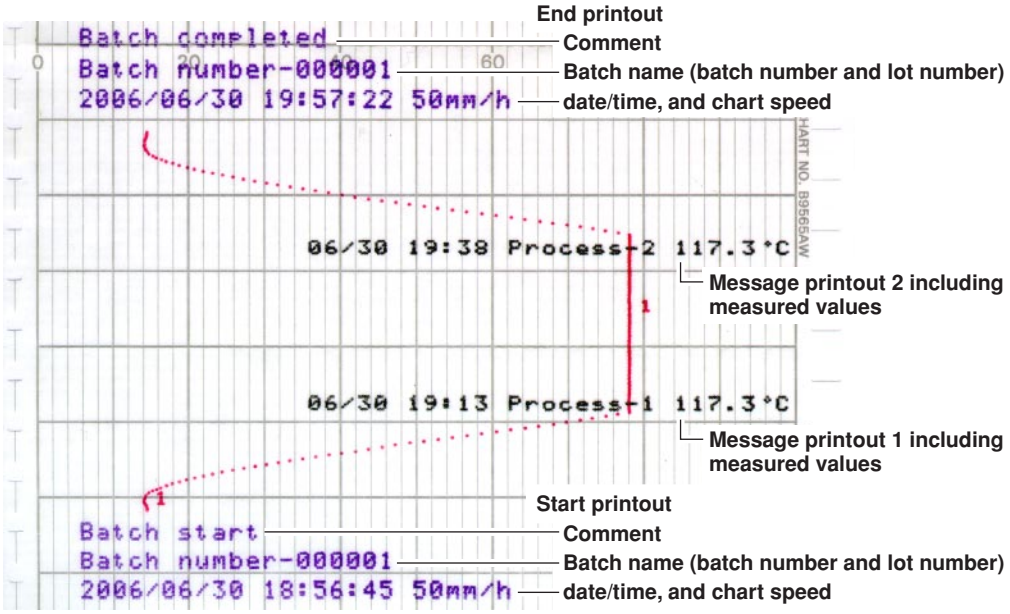
For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

Header Printout (/BT1 Option)

When recording is started, the Start printout is performed, and recording starts. During trend recording, you can print out messages (up to 5) that include measured values. When recording is stopped, End printout is performed.

Operation	1. Chart paper feed 2. Start printout 3. Recording start	Message printout 1 including measured values	Message printout 2 including measured values	1. Recording stop 2. End printout 3. Chart paper feed
(Operation instruction)	(Record start)	(Message printout 1)	(Message printout 2)	(Recording stop)

- **Example Printout (Dot Model)**



The printout examples may appear differently from the actual printout as a result of functional improvements made on the recorder after this manual was written.

Start Printout and End printout

You can set “Start printout” and “Start printout 2” for the printout when recording starts. Also, you can set “End printout” and “End printout 2” for the printout when recording stops.

Printout/Operation	Description	Notes
Comment	Prints 32 characters x 5 lines or less.	
Batch name		
Batch number	Prints up to 26 characters.	
Lot number	Prints a number from 4-digits or 6-digits.	You can automatically increment by 1 when recording stops.
Date/time	The date format prints out according to the date printout/display format.	Date and time cannot be turned On/Off independently.
Chart speed	Prints the current chart paper feed speed.	
Chart paper feed	Feeds the chart paper 50 mm or less before Start printout. Feeds the chart paper 50 mm or less after End printout.	Steps of 1 mm Steps of 1 mm
Ejection of pen offset compensating data	You can record the portion of the data that remains after recording stops. Also, when recording the remaining portion of the data, you can change the chart speed to 450 mm/h (fixed).	When pen offset compensating is On (pen model).

You can select whether to print out the batch name, date/time, and chart speed. By default, the printout is enabled.

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

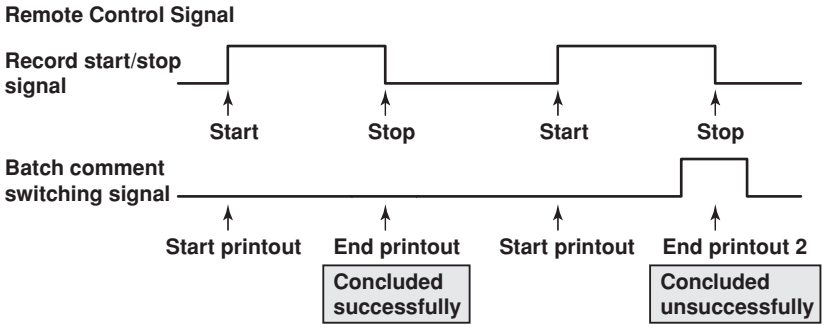
- **Switching between Start Printout and Start printout 2, and between End printout and End printout 2**

  With the remote control function (/R1 option), you can change the items that are printed out.

  For example, when a process ends successfully, End printout is performed and the lot number is updated. If the process fails, you can have End printout 2 be carried out and the lot number remain not updated.

  Depending on the status of the "batch comment switching signal," the following switches occur when the "record start/stop signal" switches:

Record start/Stop Signal Status		Batch Comment Switching Signal Status	
		Level: 0 (Open)	Level: 1 (Closed)
Upon start	Edge (rising)	Start printout	Start printout 2
Upon stop	Edge (falling)	End printout	End printout 2

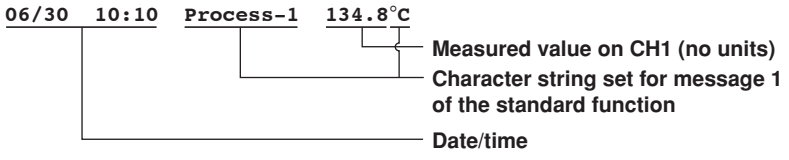


Message Printout Including Measured Values

Following the specified message format, the date/time, message strings of the standard function (5 strings of up to 16 characters), and measured instantaneous values are printed out together.

- Up to 5 messages of 35 characters can be entered.
- Messages are printed out in the order in which they are set.
- The specified number of characters specified for standard function messages is used, then if a subsequent character string has been set, it is used next. Also, it can only be used once for the message format.

Message Example

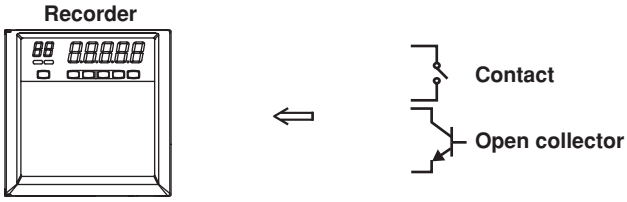


<Related Topics> Setting start printout and stop printout: Sections 4.23 and 3.12
Assigning functions to the remote control input terminals: Section 4.18
Setting the message string: Section 3.8
Enabling the message format: Section 4.23
Regarding the message format: Section 3.13

For the procedure to set the functions, see section 1.6, "Function Setup Guide."

1.4 Remote Control Function (/R1 Option)

Specified operations can be carried out by applying remote signals (contact or open collector signals) to the remote control input terminals.
There are five remote control input terminals. An action can be assigned to each terminal.



Assignable Functions

- **Recording start/stop**
  - Remote input signal: Rising edge signifies start; falling edge signifies stop
  - Starts/stops recording.
  - Applying a rising edge signal when recording is already in progress produces no effect. Applying a falling edge signal when recording is stopped produces no effect.
- **Chart Speed Switch**
  - Remote input signal: Level
  - The chart paper is fed at the secondary chart speed while a level signal is applied to the terminal. The secondary chart speed is set in advance.
- **Internal Clock Adjustment**
  - Remote input signal: Trigger
  - The internal clock of the recorder is adjusted to the nearest hour depending on the time when the remote signal is applied.

Time When Signal Is Input	Adjustment
00 min 00 s to 01 min 59 s	Truncates the minutes and seconds. Example: 10 hours 01 min 50 s becomes 10 hours 00 min 00 s.
02 min 00 s to 57 min 59 s	The time is not changed.
58 min 00 s to 59 min 59 s	Rounds up the minutes and seconds. Example: 10 hours 59 min 50 s becomes 11 hours 00 min 00 s.

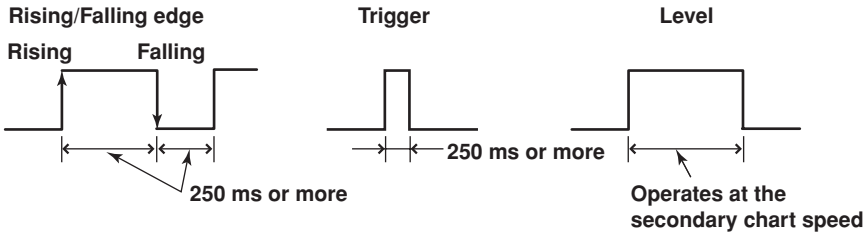
- **Message 1 Printout to Message 5 Printout**
  - Remote input signal: Trigger
- **Manual Printout**
  - Remote input signal: Trigger
- **Priority to Remote Recording (/BT1 Option)**
  - Remote input signal: Edge (rising/start or falling/stop)
  - Starts/stops recording.
  - When started with a remote signal (on a remote signal rise), stop per key operation or communication is disabled.

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

- **Switching Batch Comment (/BT1 Option)**
  - Remote input signal: Level
  - Switches between Start printout and Start printout 2, and between End printout and End printout 2 depending on the status of the batch comment switching signal when recording is started/stopped remotely.
  - When starting/stopping by key operation, performs Start printout and End printout.

Remote Signal (Edge, Trigger, and Level)

The above actions are carried out on the rising or falling edge of the remote signal (edge), the ON signal lasting at least 250 ms (trigger), or the ON/OFF signal (level).



For contact inputs, the remote signal rises when the contact switches from open to closed and falls when the contact switches from closed to open. For open collector signals, the remote signal rises when the collector signal (voltage level of the remote control terminal) goes from high to low and falls when the collector signal goes low to high.

<Related Topics> Assigning functions to the remote control input terminals: Section 4.18
Setting the secondary chart speed: Section 3.9

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

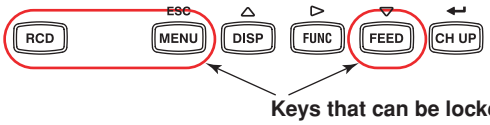
1.5 Other Functions

Key Lock

Key lock is a function that prohibits key operations. When key lock is enabled, pressing keys produces no effect. To release the key lock, a password is entered.

Key Lock Items

Each of the following keys can be included or excluded from the key lock function.



In the case of the FUNC key, each function of the FUNC key can be included or excluded from the key lock function.

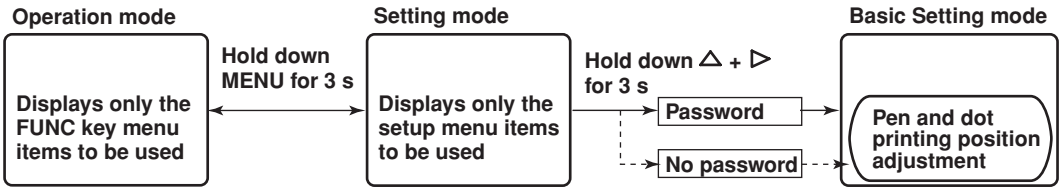
FUNC key functions: Manual printout, list printout, setup list printout, message printout, printout buffer clear, pen exchange (pen model), and ribbon cassette exchange (dot model)

<Related Topics> Setting the key lock function: Section 4.9
Using the key lock function: see the *Operation Guide*)

Customize Menu

The menu can be customized to display only the menus that you use.

- Display only the items that you use on the FUNC key menu.
- Display only the items that you use on the Setting mode menu.
- Lock Basic Setting mode (use a password to enter the mode).
  The pen position adjustment (pen model) and dot printing position adjustment (dot model) can be set so that they can be used without the password.



<Related Topics> Setting the FUNC key menu: Section 4.19
Setting the Setting mode menu: Section 4.20
Enabling/Disabling the customized menu: Section 4.21

Font

The characters used in the printout can be set to English, Japanese, German, or French. The characters that are available vary depending on the selected font.

English: Alphabet, numbers, and symbols
Japanese: Alphabet, numbers, Katakana, and symbols
German: Alphabet (German), numbers, and symbols
French: Alphabet (French), numbers, and symbols

<Related Topics> Changing the language: Section 4.13

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

DST

If the recorder is used in a region that has DST, time can be switched automatically between DST and standard time by setting the date/time when switching from the standard time to DST and the date/time when switching back from DST to standard time. When switching from standard time to DST, the clock is set ahead by 1 hour. When switching back from DST to standard time, the clock is set back by 1 hour.

<Related Topics> Using the DST: Section 3.14

Temperature Unit

The temperature unit can be set to Celsius or Fahrenheit. The setting applies to all channels.

<Related Topics> Changing the temperature unit: Section 4.24

For the procedure to set the functions, see section 1.6, “Function Setup Guide.”

1.6 Function Setup Guide

This section explains the settings necessary to use various functions of the recorder. Read the section corresponding to the function you wish to use.

Note

This section contains all the settings related to each item. If the desired setting is the same as the default value, you do not have to set it.

Item	Description	Reference Section
Date/Time setting	Use **CLOCK** in Setting mode	2.5
DST	Sets the date/time for switching between DST and standard time using **AUX > DST** in Setting mode.	3.14
Setting initialization	Use **INIT** in Basic Setting mode to initialize the settings of Setting mode and Basic Setting mode to their default values.	4.17

Measuring input functions

Item	Description	Reference Section
Range and span of the TC, RTD, or DC voltage	Use **RANGE** in Setting mode.	2.1
1-5V	• Range, span, and scale Use **RANGE** in Setting mode. • Unit Use **UNIT** in setting mode to set the unit after scaling. • Low-cut Use **PERS. > 1-5V** low-cut in Basic Setting mode and select Use or Not. If Use is selected, turn ON/OFF the low-cut function using **RANGE** in Setting mode. If Not is selected, the Low-cut item does not appear in the **RANGE** setting.	2.1 2.3 4.15 2.1
Scaling	• Range, span, and scale Use **RANGE** in Setting mode. • Unit Use **UNIT** in setting mode to set the unit after scaling.	2.1 2.3
Square Root Computation	• Range, span, and scale Use **RANGE** in Setting mode. • Unit Use **UNIT** in setting mode to set the unit after scaling. • Low-cut Use **PERS. > SQRT** low-cut in Basic Setting mode and select Use or Not. If Use is selected, set the low-cut value using **RANGE** in Setting mode. If Not is selected, the Low-cut item does not appear in the **RANGE** setting.	2.1 2.3 4.15 2.1
Unused channels	Use **RANGE > SKIP** in Setting mode to disabling the trend recording (dot model) and periodic printout of the target channel.	2.1
Bias	Use **PERS. > BIAS** in Basic Setting mode and select Use or Not. If Use is selected, set the bias value that is added to the input using **BIAS** in Setting mode. If Not is selected, the **BIAS** item does not appear.	4.15 3.10
Calibration Correction (/CC1 option)	Use **PERS. > CALIB** in Basic Setting mode and select Use or Not If Use is selected, • Use **CALIB** in Basic Setting mode to set the correction mode and the number of calibration points. • Use **CALIB** in Setting mode to set the measured value and correction value for each channel. If Not is selected, the **CALIB** item does not appear.	4.15 4.22 3.11
Burnout detection function (TC input and 1-5V input)	Use **B_OUT** in Basic Setting mode to set the burnout detection function for each channel.	4.3

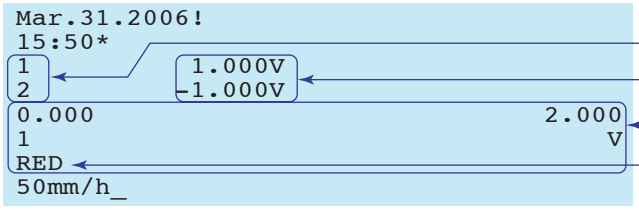
Item	Description	Reference Section
RJC of TC input	Use **RJC** in Basic Setting mode to select whether to use the internal RJC function or an external RJC function.	4.4
Filter (pen model)	Use **FILTR** in Basic Setting mode and select Use or Not. If Use is selected, set the filter time constant using **AUX > FILTR** in Setting mode. If Not is selected, the **AUX > FILTR** item does not appear.	4.11 3.2
Moving average (dot model)	Use **M_AVE** in Basic Setting mode and select Use or Not. If Use is selected, set the number of samples of moving average using **AUX > M_AVE** in Setting mode. If Not is selected, the **AUX > M_AVE** item does not appear.	4.10 3.3
Integration time of the A/D converter	Use **INTG** in Basic Setting mode to set the integration time of the A/D converter.	4.2
Temperature Unit	Select the temperature unit using **TEMP** in Basic Setting mode.	4.24

Alarm functions

Item	Description	Reference Section
Alarms for each channel	Use **ALARM** in Setting mode.	2.2
Set a hysteresis on the alarm occurrence/release value of high limit alarm and low limit alarm	Use **ALARM > HYS** in Basic Setting mode to set the hysteresis to be applied to the high limit alarm and low limit alarm of measurement channels.	4.1
Diagnosis output	Use **ALARM > DIAG** in Basic Setting mode to set the function.	4.1
Change the alarm output relay operation	If **ALARM > RELAY** in Basic Setting mode set to **"DE_EN"**, alarm output relay is energized during normal operation and de-energized when an alarm occurs.	4.1

Recording functions

Item	Description	Reference Section
Recording interval (dot model)	Use **AUX > TREND** in Setting mode to set the recording interval to AUTO or FIX.	3.1
Change the recording color of measurement channels (dot model).	Use **COLOR** in Basic Setting mode to set the recording color of measurement channels.	4.5
Turn trend recording ON/OFF (dot model)	Use **AUX > PRINT** in Setting mode to turn ON/OFF the trend recording for each measurement channel.	3.6
Chart speed	Use **CHART** in Setting mode to set the chart speed.	2.4
Record by setting recording zone	Use **AUX > ZONE** in Setting mode to set the recording zone for each channel.	3.4
Partial expanded recording	Use **PART** in Basic Setting mode and select Use or Not. If Use is selected, set the display mode using **AUX > PART** in Setting mode. If Not is selected, the **AUX > PART** item does not appear.	4.12 3.5
Record by compensating for the pen offset along the time axis (pen model)	Use **POC** in Setting mode to turn ON/OFF offset compensation.	4.6
Date format	Use **DATE** in Basic Setting mode to set the printout/display format of the date.	4.14
Time format	Use **T_PRN** in Basic Setting mode to set the printout format of the time.	4.16

Item	Description	Reference Section
Periodic printout		
	• Enable/Disable the periodic printout Use **PER.** in Basic Setting mode to turn ON/OFF the periodic printout.	4.8
	• Printout interval Use **PER.** in Basic Setting mode to set the periodic printout interval.	4.8
	• Turn ON/OFF periodic printout for each channel Use **AUX > PRINT** in Setting mode to turn ON/OFF the periodic printout for each measurement channel.	3.6
	• Scale printout and recording color printout (pen model) Use **PRINT > SCALE** in Basic Setting mode to turn scale printout ON/OFF. Use **PRINT > PEN** color in Basic Setting mode to turn pen color printout ON/OFF (pen model).	4.7
Tag printout	• Select channel printout or tag printout Use **PRINT > TAG.CH** in Basic Setting mode to select whether to use channel numbers or tags in printouts.	4.7
	• Set the tag Use **AUX > TAG** in Setting mode to set the tag name.	3.7
Alarm occurrence/release printout		
	• Turn printout ON/OFF Use **PRINT > ALARM** in Basic Setting mode to select whether to print the alarm occurrence and release, print only the alarm occurrence, or not print.	4.7
	• Time printout format Use **T_PRN > ALARM** in Basic Setting mode to set the time printout format when printing alarm occurrence/release.	4.16
Message printout	• Set the message string Use **AUX > MSG** to set the message string to be printed.	3.8
	• Time printout format Use **T_PRN > MSG** in Basic Setting mode to set the time printout format.	4.16
	• Execute the message printout Use **FUNC** key **> MSG** in Operation mode to execute the message printout.	Operation Guide Printing a Message
New chart speed printout	• Turn printout ON/OFF Use **PRINT > SPEED** in Basic Setting mode to set whether to print the new chart speed when the chart speed is changed.	4.7
	• Time printout format Use **T_PRN > SPEED** in Basic Setting mode to set the time printout format.	4.16
Recording Start Printout	• Turn printout ON/OFF Use **PRINT > RCD** in Basic Setting mode to enable/disable the recording start printout.	4.7
	• Time printout format Use **T_PRN > RCD** in Basic Setting mode to set the time printout format.	4.16
Setting Start printout/End printout (/BT1 option)		
	Use **BATCH > DUAL** (Dual comment) in Basic Setting mode, and select a **LOT** from 4 or 6 digits.	4.23
	Use **BATCH > B.NUM** in Setting mode to set the batch number.	3.12
	Use **BATCH > LOT** in Setting mode to set the lot number.	3.12
	Use **BATCH > DETAI > START**, **END**, **STAT2**, and END2 in Setting mode to set the various comments, printout ON/OFF, and chart paper feed amount for each. Also, in **END** and **END2**, enter the settings for lot number update and ejection of pen offset compensating data (Pen model).	3.12

Item	Description	Reference Section
Switching between Start printout and Start printout 2, and between End printout and End printout 2 (/BT1, /R1 option)		
	• Switching settings	
	Assign **DUAL** (Batch comment switching) to the remote control input terminal.	4.18
	Use **BATCH > DUAL** (Dual comment) in Basic Setting mode and select Use.	4.23
	Set **BATCH > DETAI > STAT2**, and **END2** in Setting mode.	3.12
	• Executing the switch	
	The switch occurs according to the status of the **DUAL** (Batch comment switching) signal when **RCD** or **PR.RCD** signal assigned to the remote control input terminal rises or falls.	1.3
Printout of messages including measured values (/BT1 option)		
	• Setting message strings	3.8
	Use **AUX > MSG** in Setting mode to enter the message to print out.	
	• Setting the message format	4.23
	Use **BATCH > MSG_F** in Basic Setting mode and select Use.	
	Set the message format using the PC software (sold separately) or a communication command.	
	• Executing the message printout	
	Execute the message printout by choosing **FUNC key > MSG** in Operation mode.	Operation Guide Printing a Message

Display functions

Item	Description	Reference Section
Date format	Same as the Date format in “Recording functions.”	4.14

Other functions

Item	Description	Reference Section
Key lock	• Target keys and password	4.9
	Use **LOCK** in Basic Setting mode to set the keys to be key-locked and the password.	
	• Enable the key lock	Operation Guide
	Use **FUNC** key > **LOCK** in Operation mode to turn key lock ON/OFF.	Activating/Releasing the Key Lock
Customize menu	• FUNC key target menu selection	4.19
	Use **S.MENU > FUNC** in Basic Setting mode to select the menus to be displayd.	
	• Setting mode target menu selection	4.20
	Use **S.MENU > SET** in Basic Setting mode to select the menus to be displayd.	
	• Customize menu execution	4.21
	Use **CUST.M** in Basic Setting mode to select whether to use the customized menu.	
Font	Use **FONT** in Basic Setting mode to set the characters used in the recording.	4.13
Remote control function (/R1 option)	• Assign functions to the remote control input terminals	4.18
	Use **REM** in Basic Setting mode to set the function to be assigned to the remote control input terminal.	
	• Secondary chart speed	3.9
	If “chart speed switching” is assigned, use **AUX > SPD_2** in Setting mode to set the secondary chart speed.	
	• Switching between Start printout and Start printout 2, and between End printout and End printout 2 (/BT1 option)	
	If **DUAL** (Batch comment switching) is assigned,	4.23
	Use **BATCH > DUAL** (Dual comment) in Basic Setting mode. Set **BATCH > DETAI > STAT2**, and **END2** in Setting mode.	3.12

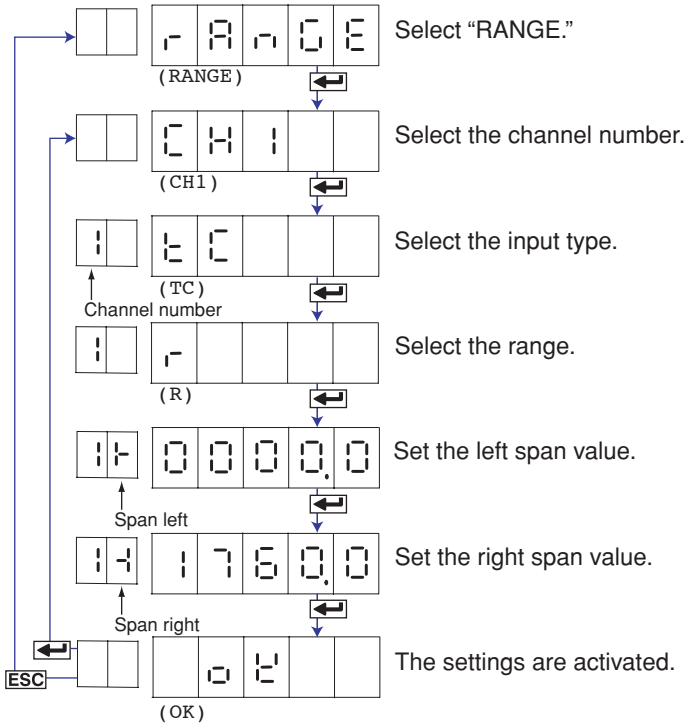
2.1 Setting the Input Range

Input range can be set for each measurement channel. Set unused channels to Skip. If you change the input range, set the bias, alarm, partial expanded recording, and calibration correction again.

Procedure

TC, RTD, and DC Voltage

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   To change the polarity, press the △ or ▽ key when the leftmost digit of the value is blinking.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Description

- **Selectable Range of Input Range, Span Left, and Span Right**
  The input range, span left, and span right can be set in the range shown below. Span left and span right cannot be set to the same value.

DC voltage (volt)

Range Type	Selectable Span Range
20 mV(20mV)	–20.00 to 20.00 mV
60 mV(60mV)	–60.00 to 60.00 mV
200 mV(200mV)	–200.0 to 200.0 mV
2 V(2V)	–2.000 to 2.000 V
6 V(6V)	–6.000 to 6.000 V
20 V(20V)	–20.00 to 20.00 V
50 V(50V)	–50.00 to 50.00 V

Thermocouple (tC)

Range Type	Selectable Span Range (°C)	Selectable Span Range (°F)
R (r)	0.0 to 1760.0°C	32 to 3200°F
S (S)	0.0 to 1760.0°C	32 to 3200°F
B (b)	0.0 to 1820.0°C	32 to 3308°F
K (K)	–200.0 to 1370.0°C	–328 to 2498°F
E (E)	–200.0 to 800.0°C	–328.0 to 1472.0°F
J (J)	–200.0 to 1100.0°C	–328.0 to 2012.0°F
T (t)	–200.0 to 400.0°C	–328.0 to 752.0°F
N (n)	0.0 to 1300.0°C	32 to 2372°F
W (W)	0.0 to 2315.0°C	32 to 4199°F
L (L)	–200.0 to 900.0°C	–328.0 to 1652.0°F
U (U)	–200.0 to 400.0°C	–328.0 to 752.0°F
WRe (WrE)	0.0 to 2400.0°C	32 to 4352°F

RTD (rtd)

Range Type	Selectable Span Range (°C)	Selectable Span Range (°F)
PT (Pt100) (Pt)	–200.0 to 600.0°C	–328.0 to 1112.0°F
JPT(JPt100) (JPt)	–200.0 to 550.0°C	–328.0 to 1022.0°F

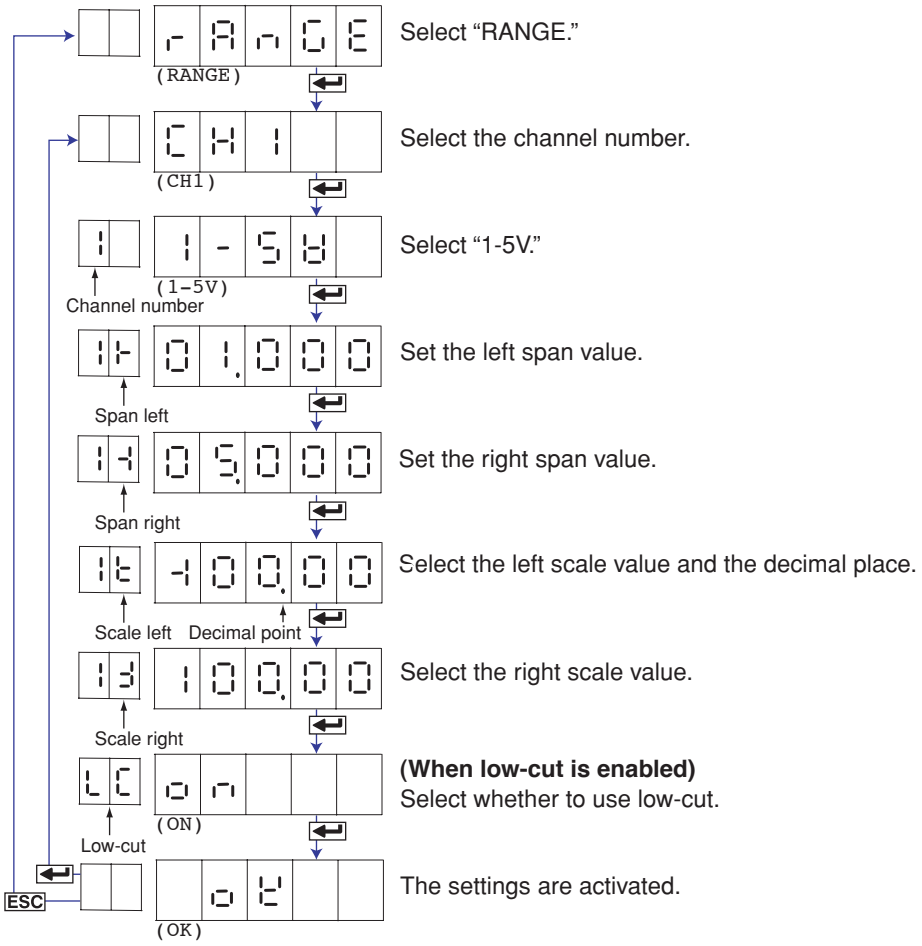
/N1 option

Selectable Settings	Input Type
Cu1 CU1	Cu10 (GE)
Cu2 CU2	Cu10 (L&N)
Cu3 CU3	Cu10 (WEED)
Cu4 CU4	Cu10 (BAILEY)
Cu5 CU5	Cu10: a = 0.00392 at 20°C
Cu6 CU6	Cu10: a = 0.00393 at 20°C
Cu25 CU25	Cu25*: a = 0.00425 at 0°C

/N3 option

Selectable Setting		Input Type	Notes
PR	Pr	PR40-20	Thermocouple
PLATI	PLAtI	PLATINEL	
NiMo	n iMo	NiNiMo	
W/WRe	W WrE	W/WRe26	
N2	n2	Type N (AWG14)	
Kp	KP	Kp vs Au7Fe	
Pt4	Pt4	Pt25	RTD
Pt3	Pt3	Pt50	
Ni1	n i1	Ni100 (SAMA)	
Ni2	n i2	Ni100 (DIN)	
Ni3	n i3	Ni120	
J263	J263	J263*B	
Cu8	CU8	Cu53	
Cu9	CU9	Cu100: a = 0.00425 at 0°C	

1-5V Input



Description

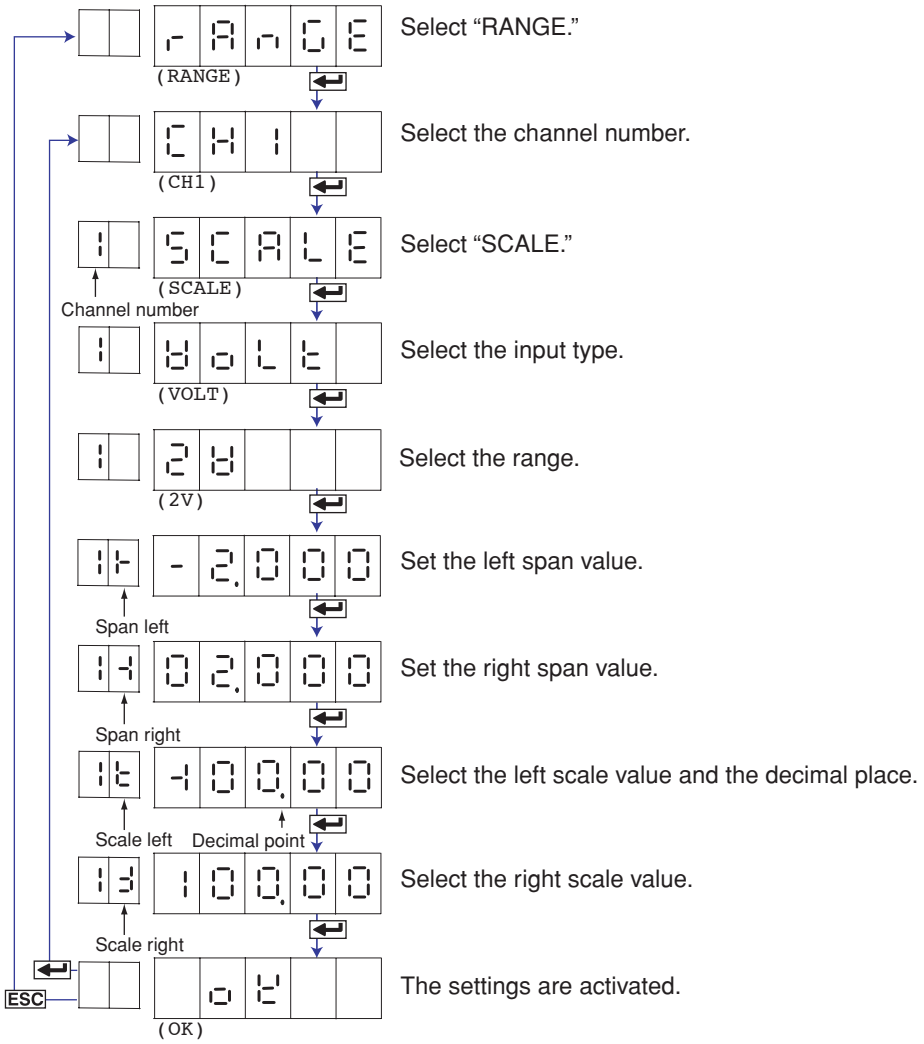
- **Span Left and Span Right**
  Selectable span left range: 0.8 to 1.2 V
  Selectable span right range: 4.8 to 5.2 V

- **Scale Left, Scale Right, and Decimal Place**
  Selectable range (mantissa): –19999 to 30000
  Example: The value in the range of –100.00 to 350.00 cannot be specified. The mantissa of scale right is 35000, which exceeds the upper limit to 30000. Set in the range of –100.0 to 350.0.
  Decimal place: XXXXX, XXXX.X, XXX.XX, XX.XXX, X.XXXX
  To set the decimal place for the left scale setup item, press the ▷ key to make it blink, then press the △ or ▽ key.
  The decimal position is the position specified by scale left.
  Make sure that left scale is less than scale right.

- **Low-Cut**
  ON (on): Cuts values less than or equal to 0% of the recording span (sets such values to 0% (scale left value)).
  OFF (oFF): Does not apply the low-cut function.

<Related Topics> Setting the unit: Section 2.3
Enabling the low-cut function: Section 4.15

Linear Scaling

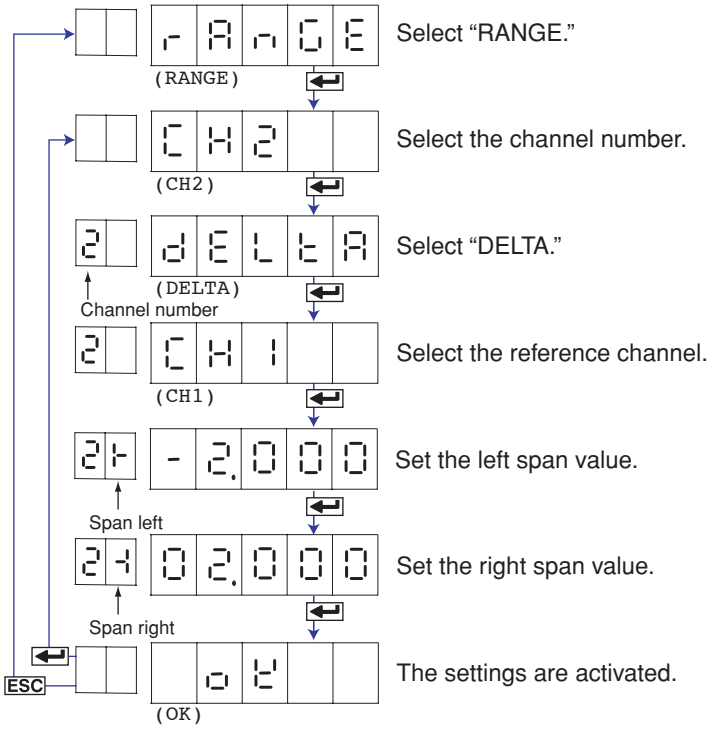


Description

- **Span Left and Span Right**
  Same as the selectable span range of the DC voltage, Thermocouple, and RTD range.
- **Scale Left, Scale Right, and Decimal Place**
  Selectable range (mantissa): –19999 to 30000
  Example: The value in the range of –100.00 to 350.00 cannot be specified. The mantissa of scale right is 35000, which exceeds the upper limit to 30000. Set in the range of –100.0 to 350.0.
  Decimal place: XXXXX, XXXX.X, XXX.XX, XX.XXX, X.XXXX
  To set the decimal place for the left scale setup item, press the ▷ key to make the decimal point blink, then press the △ or ▽ key.
  The decimal position is the position specified by scale left.

<Related Topics> Setting the unit: Section 2.3

Delta Computation

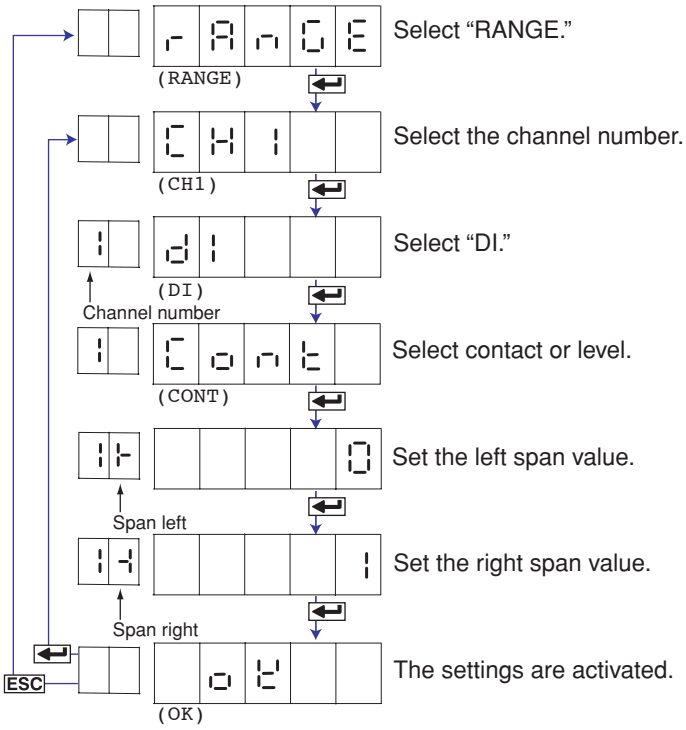


Description

- **Reference Channel**
  The reference channel must be a channel that is smaller in channel number than the channel being set.
- **Span Left and Span Right**
  The range type is the same as the reference channel. The span left and span right can be set in the range shown below. Span left and span right cannot be set to the same value.

Input Type	Range Type	Selectable Span Range (°C)	Selectable Span Range (°F)
DC voltage (volt)	20 mV (20mV)	–20.00 to 20.00 mV	
	60 mV (60mV)	–60.00 to 60.00 mV	
	200 mV (200mV)	–200.0 to 200.0 mV	
	2 V (2V)	–2.000 to 2.000 V	
	6 V (6V)	–6.000 to 6.000 V	
	20 V (20V)	–20.00 to 20.00 V	
	50 V (50V)	–50.00 to 50.00 V	
Thermocouple (tC)	R (r)	–1760.0 to 1760.0°C	–3168 to 3168°F
	S (S)	–1760.0 to 1760.0°C	–3168 to 3168°F
	B (b)	–1820.0 to 1820.0°C	–3276 to 3276°F
	K (K)	–1570.0 to 1570.0°C	–2826 to 2826°F
	E (E)	–1000.0 to 1000.0°C	–1800 to 1800°F
	J (J)	–1300.0 to 1300.0°C	–1999.9 to 2340.0°F
	T (t)	–600.0 to 600.0°C	–1080.0 to 1080.0°F
	N (n)	–1300.0 to 1300.0°C	–2340 to 2340°F
	W (W)	–1999.9 to 2315.0°C	–4167 to 4167°F
	L (L)	–1100.0 to 1100.0°C	–1980 to 1980°F
	U (U)	–600.0 to 600.0°C	–1080.0 to 1080.0°F
	WRe (WrE)	–1999.9 to 2400.0°C	–4320 to 4320°F
RTD (rtd)	PT(Pt100) (Pt)	–800.0 to 800.0°C	–1440.0 to 1440.0°F
	JPT(JPt100) (JPt)	–750.0 to 750.0°C	–1350.0 to 1350.0°F

ON/OFF Input

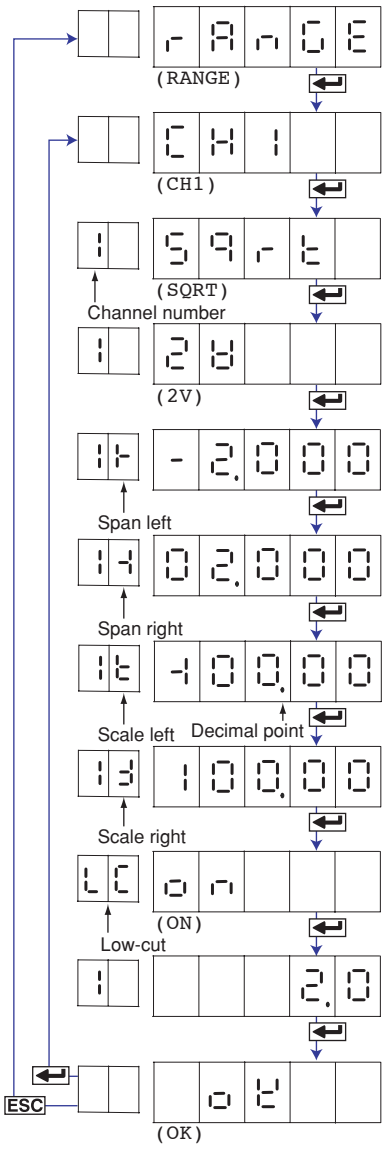


Description

- **Selectable Range of Input Range, Span Left, and Span Right**
  The input range, span left, and span right can be set in the range shown below. Span left and span right cannot be set to the same value.

Range Type	Selectable Span Values
Level (LEVEL)	0: Less than 2.4 V, 1: 2.4 V or higher, within ±6 V
Contact (Cont)	0: Open, 1: Closed

Square Root Computation



Select "RANGE."

Select the channel number.

Select "SQRT."

Select from the range types of DC voltage.
20 mV, 60 mV, 200 mV, 2 V, 6 V, 20 V, or 50 V

Set the left span value.

Set the right span value.

Select the left scale value and the decimal place.

Select the right scale value.

(Displays the following when the low-cut is enabled)
Turn ON or OFF the low-cut function.

Set the low-cut point.
0.0 to 5.0% of the recording span, 0.1 steps.

The settings are activated.

Description

- **Input Type on Which Square Root Computation Can Be Performed**
  Square root computation can be performed when set to DC voltage input.

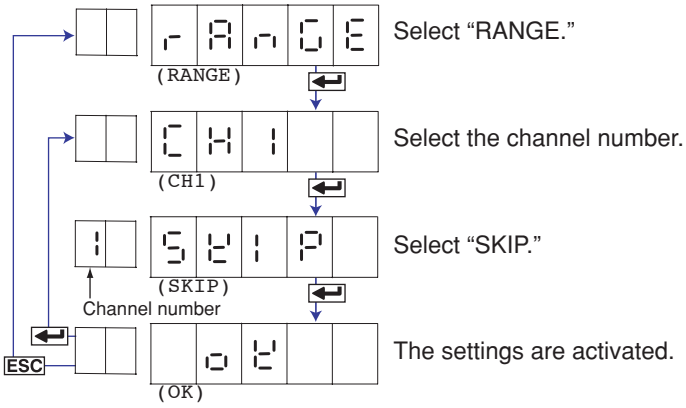
- **Span Left and Span Right**
  Same as the selectable span range of the DC voltage range.
  Make sure that span left is less than span right.

- **Scale Left, Scale Right, and Decimal Place**
  Selectable range (mantissa): –19999 to 30000
  Example: The value in the range of –100.00 to 350.00 cannot be specified. The mantissa of scale right is 35000, which exceeds the upper limit to 30000. Set in the range of –100.0 to 350.0.
  Decimal place: XXXXX, XXXX.X, XXX.XX, XX.XXX, X.XXXX
  To set the decimal place for the left scale setup item, press the ▷ key to make it blink, then press the △ or ▽ key.
  The decimal position is the position specified by scale left.
  Make sure that scale left is less than scale right.

- **Low-Cut and Low-Cut Point**
  If low-cut is set to ON, set the low-cut point.
  Selectable range of the low-cut point: 0.0 to 5.0% of the recording span
  Values below the low-cut point is set to 0% of the recording span (scale left value).

<Related Topics> Setting the unit: Section 2.3
Enabling the low-cut function: Section 4.15

Skip (Unused Channels)



Note

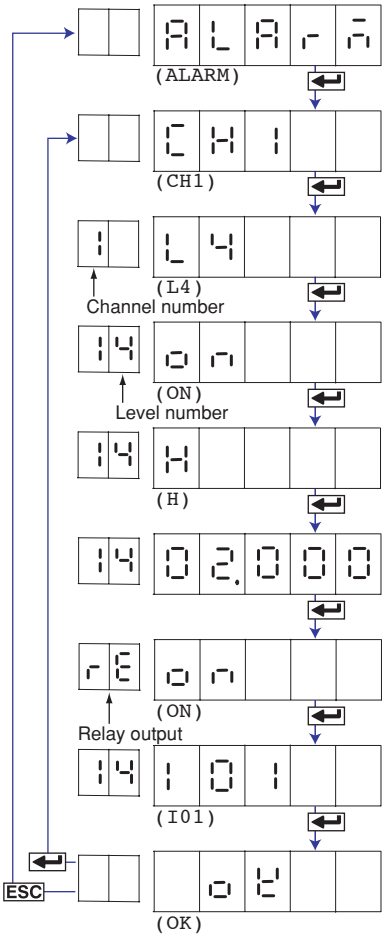
Do not use channels set to skip as a reference channel of delta computations.

2.2 Setting the Alarm

An alarm can be set for each channel.
If you change the input range, set the alarm again.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   To change the polarity, press the △ or ▽ key when the leftmost digit of the value is blinking.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



Select the "ALARM."

Select the channel number.

Select the level number between 1 and 4.

Select ON to set the alarm.

(Displays the following when the alarm is ON)
Select the alarm type.

Set the value used to turn ON the alarm.

Select ON to set the alarm relay output. This setting is valid only on models with the /A1, /A2, or /A3 option.

(When the alarm output is ON)
Specify the alarm output relay number.

The settings are activated.

3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

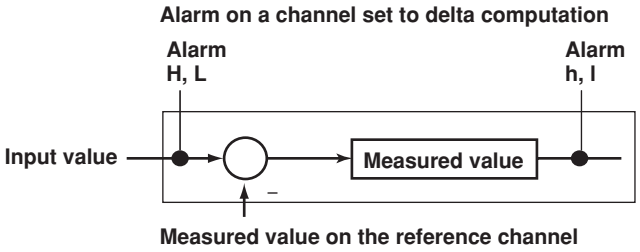
Explanation

Alarm Type

Symbol	Name	Notes
H ( )	High limit alarm	
L ( )	Low limit alarm	
h ( )	Difference high limit alarm	Can be specified on channels set to delta computation.
l ( )	Difference low limit alarm	Can be specified on channels set to delta computation.

Note

On channels set to delta computation, alarms can be detected on the values illustrated in the figure below.



Alarm Value

- **High Limit Alarm/Low Limit Alarm**
  The following values can be specified.
  - For DC voltage, thermocouple, or RTD:
    Values within the measurable range in the input range (example: –2.000 to 2.000 V for the 2 V input range).
  - For ON/OFF input (DI): 0 or 1.
  - For linear scaling (1-5V, scaling, and square root):
    A value within –5 to 105% of the scaling span and within the range of –19999 to 30000 (excluding the decimal point).

- **Difference High Limit Alarm/Difference Low Limit Alarm**
  Values in the measurable range can be specified.Measurable range refers to “Selectable Span Range” in the table on page 2-5.

Relay No.

The selectable relay numbers are listed below.
I01 and I02 on the /A1 option
I01, I02, I03, and I04 on the /A2 option
I01, I02, I03, I04, I05, and I06 on the /A3 option

<Related Topics> Setting the auxiliary alarm function: Section 4.1

2.3 Setting the Unit on Linearly Scaled Channels

Units can be assigned on channels whose input range is set to Scale, 1-5V, or SQRT.The assigned unit is added when printing to the chart paper or during data transmission.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.

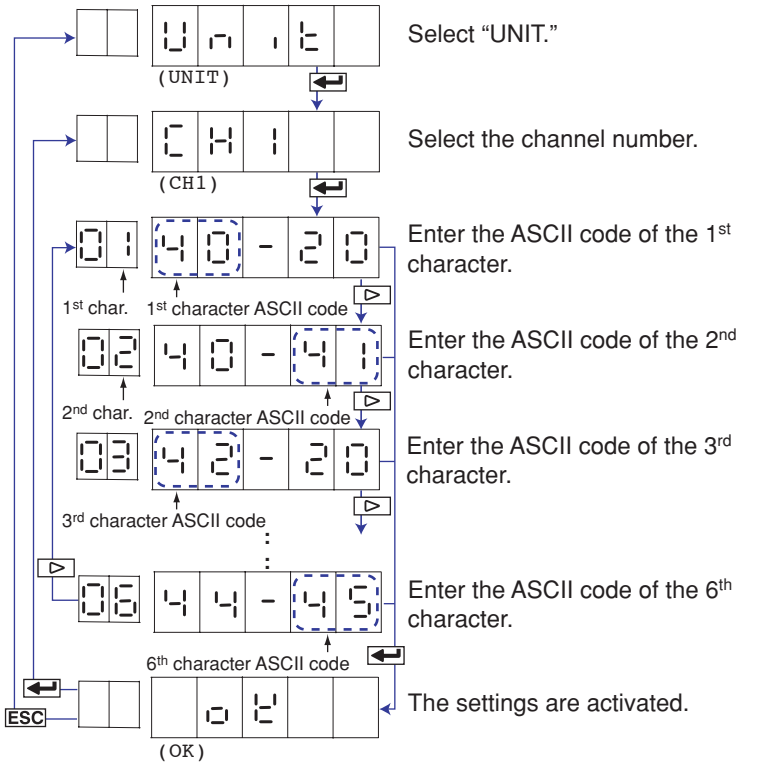
For English

Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	SP			#		%			(	)	*	+		-	.	/
30	0	1	2	3	4	5	6	7	8	9						
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z				°	
60		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	µ	Ω	²	³	

For German or French

Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	SP			#		%			(	)	*	+		-	.	/
30	0	1	2	3	4	5	6	7	8	9						
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z				\	
60		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z		Ω			
A0																
B0	°		²	³		µ										
C0					Ä			Ç				Ë				Ï
D0							Ö						Ü			ß
E0	à		â		ä			ç	è	é	ê	ë			î	ï
F0					ô		ö			ù		û	ü			

Only German
Only French
SP = Space
Example: To register A, enter 41.



3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Characters That Can Be Used for Units

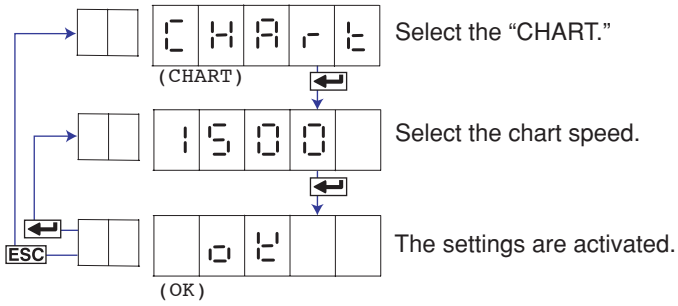
A unit is set using up to six characters.

2.4 Changing the Chart Speed

The chart speed can be changed.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Chart Speed

- Pen model: Select from the 40 settings shown below.
- Dot model: Select from the 28 settings in the thick frame shown below.

Chart speed (the chart speed of the dot model is inside the thick frame) (Unit: mm/h)

10	15	20	25	30	40	50	60	75	80
90	100	120	150	160	180	200	240	300	360
375	450	600	720	750	900	1200	1500	1800	2400
3000	3600	4500	4800	5400	6000	7200	9000	10800	12000

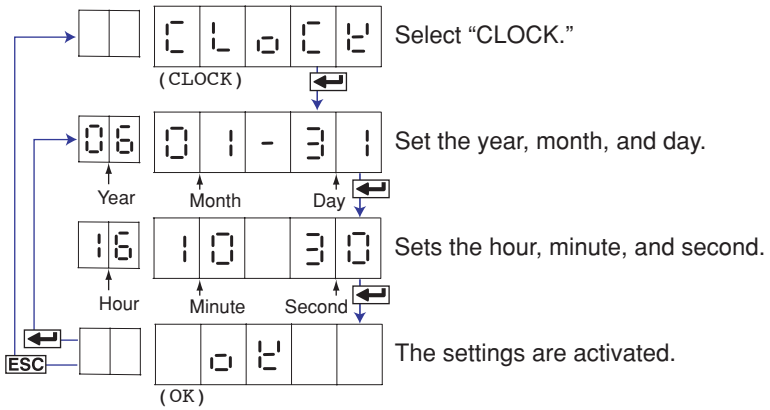
<Related Topics> Setting the secondary chart speed: Section 3.9
Turning the new chart speed printout ON and OFF: Section 4.7

2.5 Setting the Date/Time

The date/time can be set.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Date/Time

Set the lower two digits of the year.
Values in the range 80 and 99 correspond to 1980 to 1999.

Note

When setting the date/time, the year, month, day, hour, minute, and second are displayed in the order shown above regardless of the printout/display format of the date (see section 4.14).

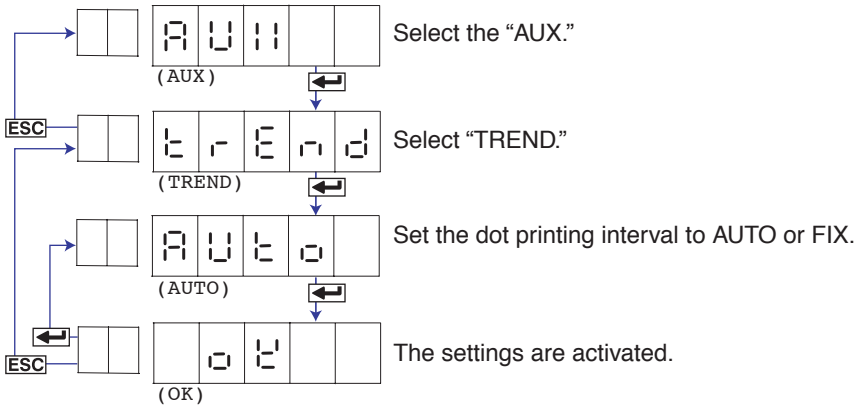
<Related Topics> Changing the printout/display format of the date: Section 4.14
Changing the printout format of the time: Section 4.16

3.1 Setting the Trend Recording Interval (Dot Model)

The trend recording interval (dot printing interval) on the dot model can be set.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

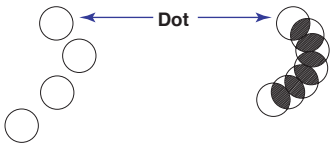
Explanation

Trend Recording Interval

AUTO (AUTo): The trend recording interval is set according to the chart speed so that the dots do not overlap.

FIX (FIX): The trend recording interval is fixed to 10 s/6 dots.

When set to AUTO **When set to FIX**



Recording Intervals When AUTO Is Selected

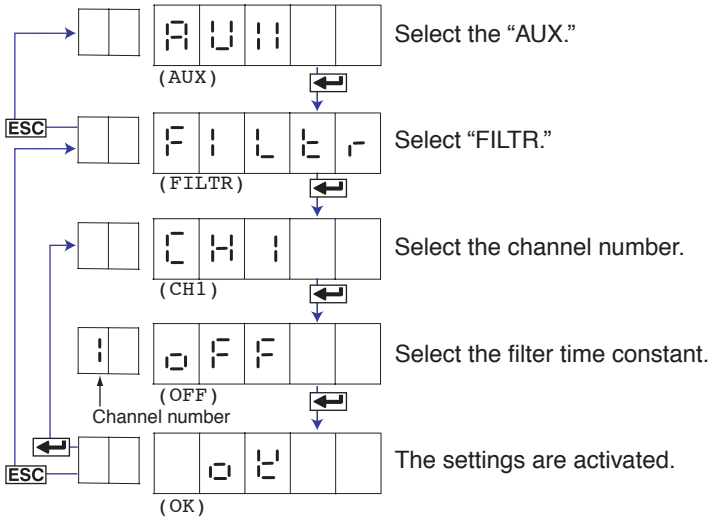
Chart speed	Integration Time Set to 50Hz/60Hz/AUTO	Integration Time Set to 100 ms
10 mm/h	90 s	90 s
15 mm/h	60 s	60 s
20 mm/h	45 s	45 s
25 mm/h	36 s	35 s
30 mm/h	30 s	30 s
40 mm/h	22 s	22.5 s
50 mm/h	18 s	17.5 s
60 mm/h	15 s	15 s
75 mm/h	12 s	10 s
80 mm/h	11 s	10 s
90 mm/h or higher	10 s	10 s

3.2 Setting the Filter (Pen Model)

A filter can be set on the measurement channels on the pen model.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Filter Time Constant

The time constant is selectable from 2 s, 5 s, and 10 s. Select OFF when not using the filter.

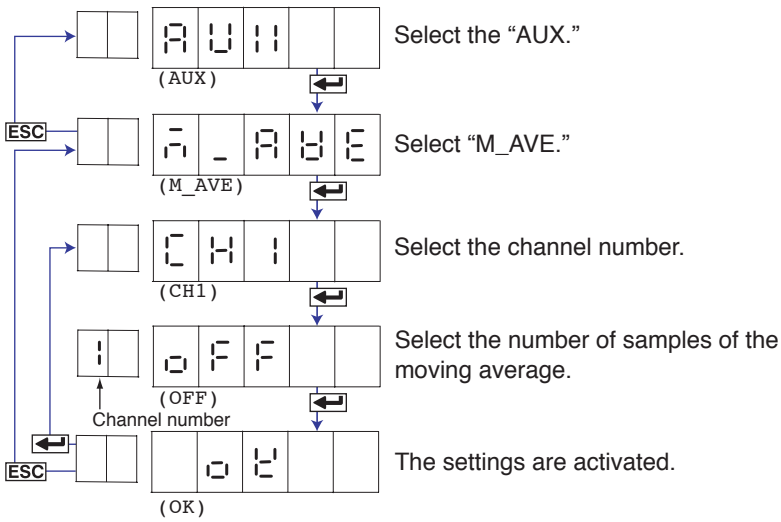
<Related Topics> Enabling the filter function: Section 4.11

3.3 Setting the Moving Average (Dot Model)

The moving average function can be set on the measurement channels on the dot model.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Number of Samples of Moving Average

The number of samples can be set to an integer between 2 and 16. Select OFF when not using the moving average function.

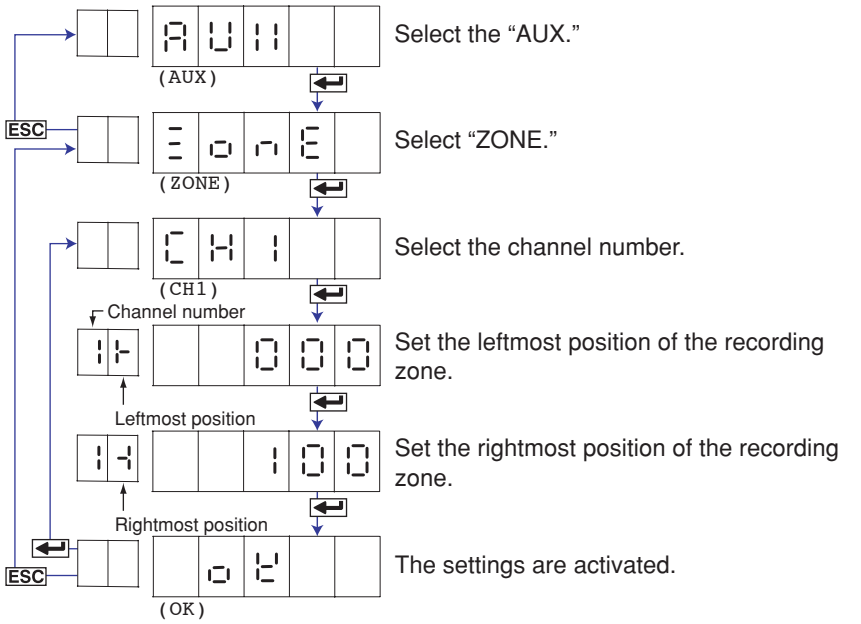
<Related Topics> Enabling the moving average: Section 4.10

3.4 Setting Recording Zones for Each Channel (Zone Recording)

A recording zone can be set for each measurement channel.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Recording Zone

The recording zone can be set in the following range.
Leftmost position: 0 mm to 95 mm
Rightmost position: 5 mm to 100 mm
Set a larger value for the rightmost position than the leftmost position.
Set at least 5 mm for the recording zone width.

Note

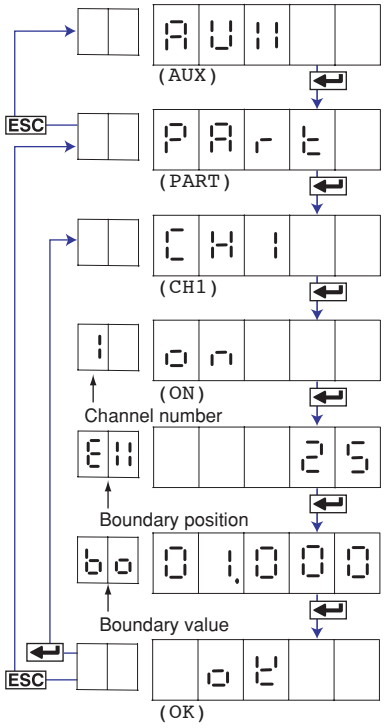
If the recording zone is set to a value less than 40 mm, scale printout of periodic printout cannot be executed.

3.5 Setting the Partial Expanded Recording

A section of the recording range can be expanded.
If you change the input range, set the partial expanded recording again.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   To change the polarity, press the △ or ▽ key when the leftmost digit of the value is blinking.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



Select the "AUX."
Select the "PART."
Select the channel number.
Select ON to set the partial expanded recording function.
(When partial expanded recording is ON)
Set the boundary position. (A value when the record span is assumed to be 100%)
Set the boundary value within the recording span.
The settings are activated.

3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Boundary Position

Set a value between 1 and 99%. One percent corresponds to 1 mm, because the record width is 100 mm.

Example: To record 0 to 8 V in the 0 to 50% position and 8 to 10 V in the 50% to 100% position with a span of 0 to 10 V, set the boundary position to 50% and the boundary value to 8.00 V.

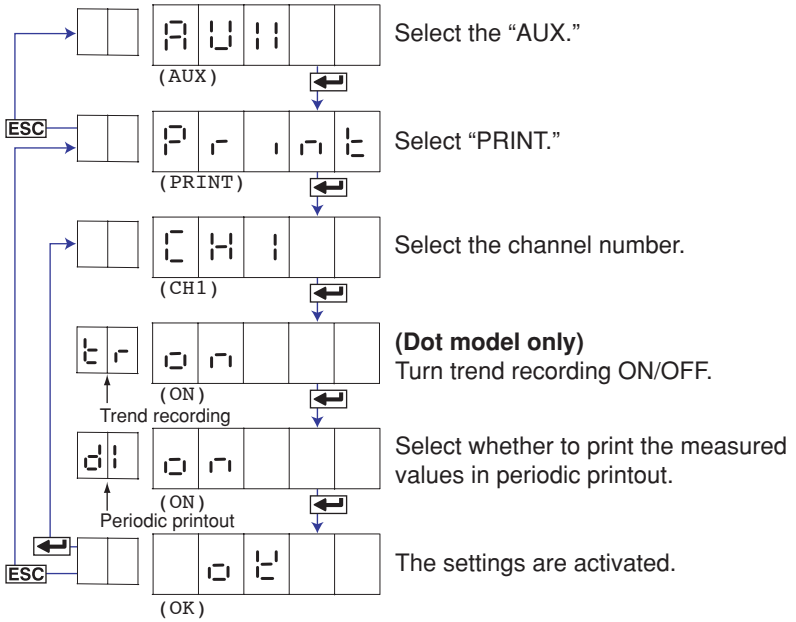
<Related Topics> Enabling the partial expanded recording function: Section 4.12

3.6 Turning Trend Recording (Dot Model) and Periodic Printout ON/OFF for Each Channel

This section explains the details of setting the trend recording and periodic printout for each measurement channel.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

The following settings can be entered for each channel.

- Turn trend recording ON/OFF (dot model only).
- Yurn the printing of measured values/alarm statuses ON/OFF during periodic printout.

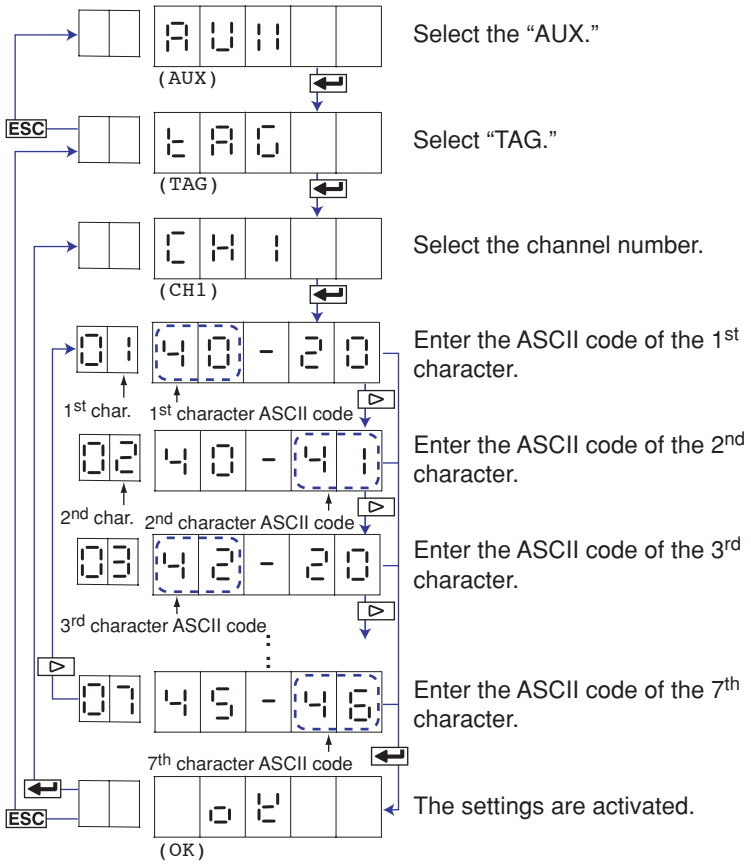
<Related Topics> Turning Periodic Printout ON and OFF and Setting the Interval: Section 4.8

3.7 Setting Tags on Channels

Tags can be assigned to measurement channels.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



For English

Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	SP			#		%			(	)	*	+		-	.	/
30	0	1	2	3	4	5	6	7	8	9						
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z				°	
60		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	µ	Ω	²	³	

For German or French

Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	SP			#		%			(	)	*	+		-	.	/
30	0	1	2	3	4	5	6	7	8	9						
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z				\	
60		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z		Ω			
A0																
B0	°		²	³		µ										
C0					Ä			Ç				Ë				Ï
D0							Ö						Ü			ß
E0	à		â		ä			ç	è	é	ê	ë			î	ï
F0					ô		ö			ù		û	ü			

Only German
Only French
SP = Space
Example: To register A, enter 41.

3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Characters That Can Be Used for Tags

Set a tag using up to seven characters.

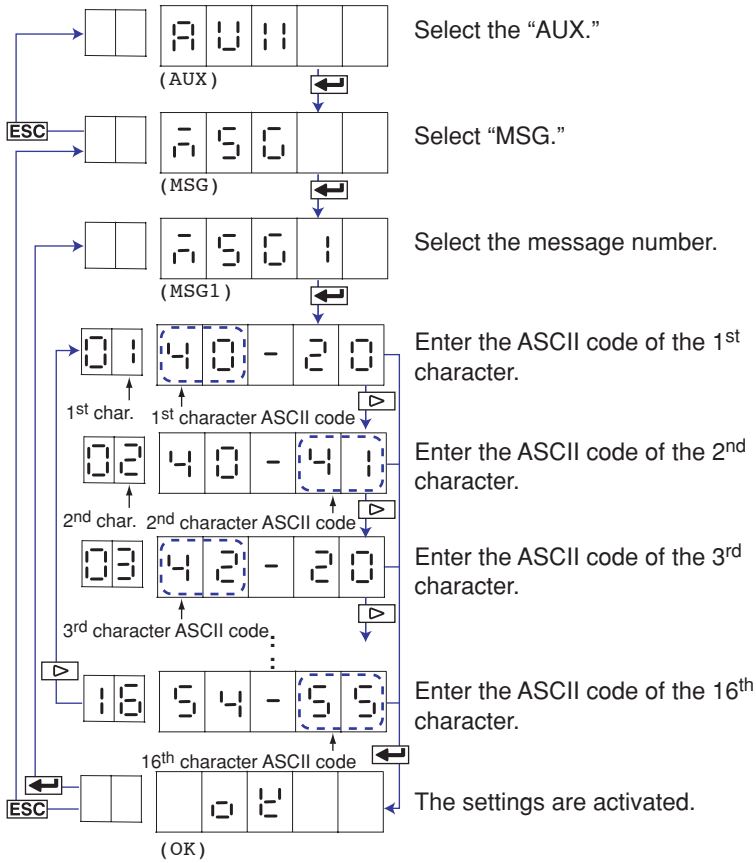
<Related Topics> Printing tags in place of channel numbers: Section 4.7

3.8 Setting the Message String

Message strings to be printed on the chart paper can be set. Up to five message strings can be registered.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



For English

Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	SP			#		%			(	)	*	+		-	.	/
30	0	1	2	3	4	5	6	7	8	9						
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z				°	
60		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	μ	Ω	²	³	

For German or French

Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	SP			#		%			(	)	*	+		-	.	/
30	0	1	2	3	4	5	6	7	8	9						
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z				\	
60		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z		Ω			
A0																
B0	°		²	³		μ										
C0					Ä			Ç				Ë				Ï
D0							Ö						Ü			ß
E0	à		â		ä			ç	è	é	ê	ë			î	ï
F0					ô		ö			ù		û	ü			

Only German
Only French
SP = Space
Example: To register A, enter 41.

3. Press the ↵ key to set other message numbers.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Characters That Can Be Used for Messages

Set a message using up to 16 characters.

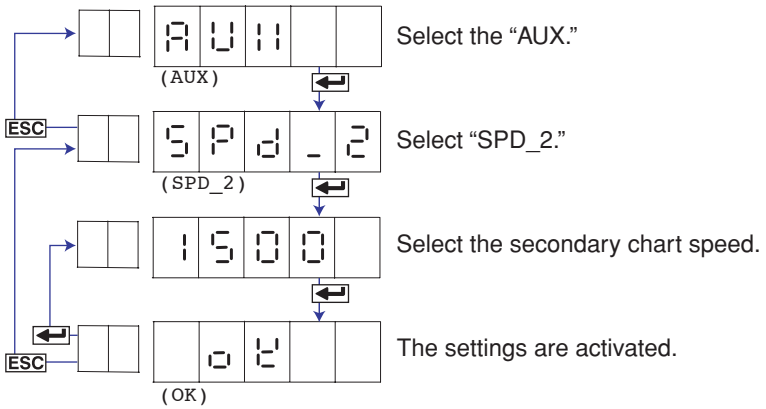
<Related Topics> Printing a message: "Printing a Message" in the *Operation Guide*

3.9 Setting the Secondary Chart Speed (Remote Control Function, /R1)

The secondary chart speed when the chart speed is to be switched using the remote control function (/R1 option) can be set.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Chart Speed

See section 2.4.

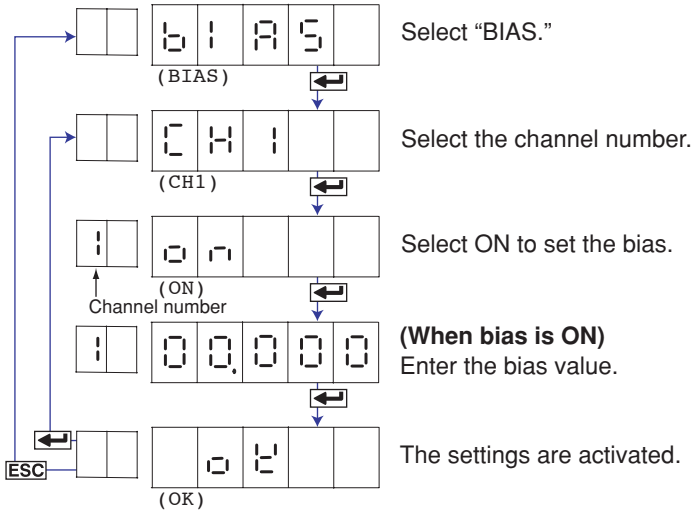
<Related Topics> Setting the remote control function: Section 4.18

3.10 Applying a Bias on the Measuring Input Signal

A bias can be applied to the scaled value of the measuring input signal.
If you change the input range, set the bias again.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   To change the polarity, press the △ or ▽ key when the leftmost digit of the value is blinking.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Bias

The range of bias that can be specified is approximately ±10% of the measurable range of the input range. For example, the range is –0.4 V to 0.4 V for the 2 V input range.
For channels on which scaling is set, the range is approximately ±10% of the scaling width.

Note

A bias cannot be set on channels set to ON/OFF input (DI). In addition, the bias function cannot be used on all channels if calibration correction (/CC1 option) is used.

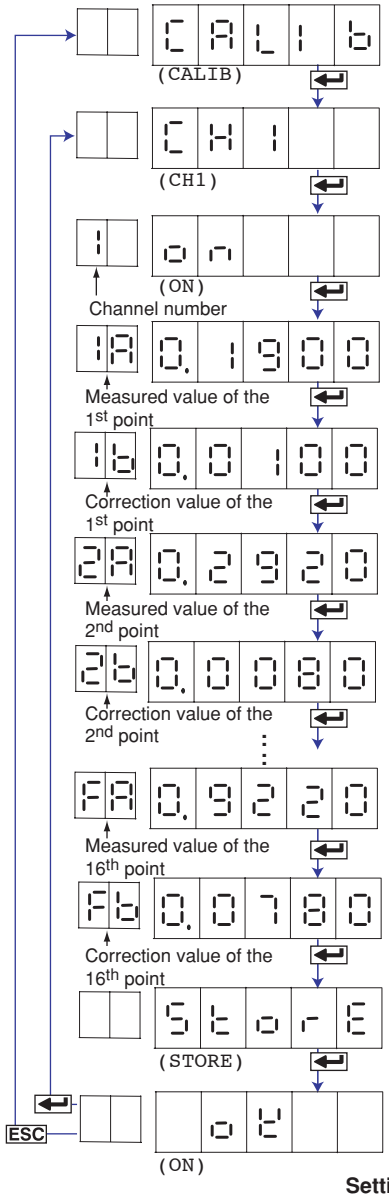
<Related Topics> Enabling the bias function: Section 4.15

3.11 Performing Calibration Correction (/CC1 Option)

The scaled values of the measuring input signal are corrected using specified segments, and the results are used as measured values.
If you change the input range, set the measured and correction values again.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   To change the polarity, press the △ or ▽ key when the leftmost digit of the value is blinking.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



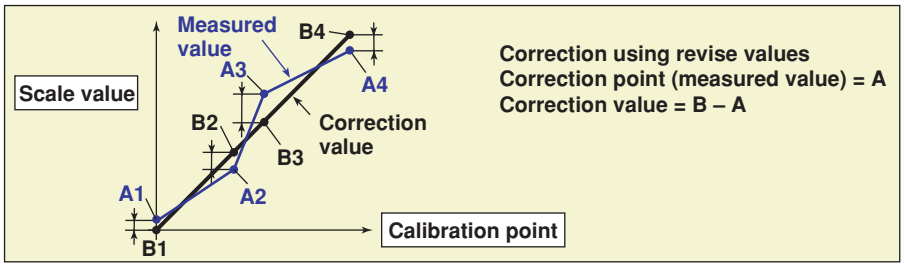
Setting example when the calibration correction method is set to revise value and the number of calibration points is set to 16

3. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

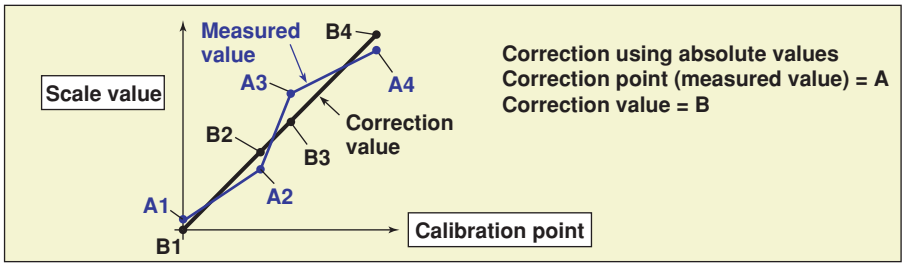
Explanation

Setting Measured and Corrected Values

- Using revise values



- Using absolute values



Example of a two-point correction

Calibration Point	Corrected Value	Measured value (A)	Correction Value	
			Revise Value (B – A)	Absolute Value (B)
1	10.0°C	9.8°C	0.2°C	10.0°C
2	90.0°C	90.5°C	– 0.5°C	90.0°C

Setup Conditions of Measured and Correction Values

- Setting range of measured and correction values when using revise values
  $A1 < A2 \leq A3 \leq \ldots \leq A16$
  $(A1 + B1) < (A2 + B2) < (A3 + B3) < \ldots < (A16 + B16)$
  A and B are within the measurable range or scaling range of the range type*
  * Within the scaling range: –5% to 105% of the scale value or –19999 to 30000 (the decimal place is the same as the setting for the scale value)

- Setting range of measured and correction values when using absolute values
  $A1 < A2 \leq A3 \leq \ldots \leq A16$
  $B1 < B2 < B3 < \ldots < B16$
  A and B are within the measurable range or scaling range of the range type*
  * Within the scaling range: –5% to 105% of the scale value or –19999 to 30000 (the decimal place is the same as the setting for the scale value)

Note

- Make sure that the leftmost value is less than the rightmost value for span and scale.
- Calibration correction cannot be set on ON/OFF input (DI), delta computation, and square root computation channels. In addition, calibration correction cannot be used on all channels if the bias function is enabled.

<Related Topics> Enabling the calibration correction function: Section 4.15
Setting the calibration correction method and number of calibration points: Section 4.22

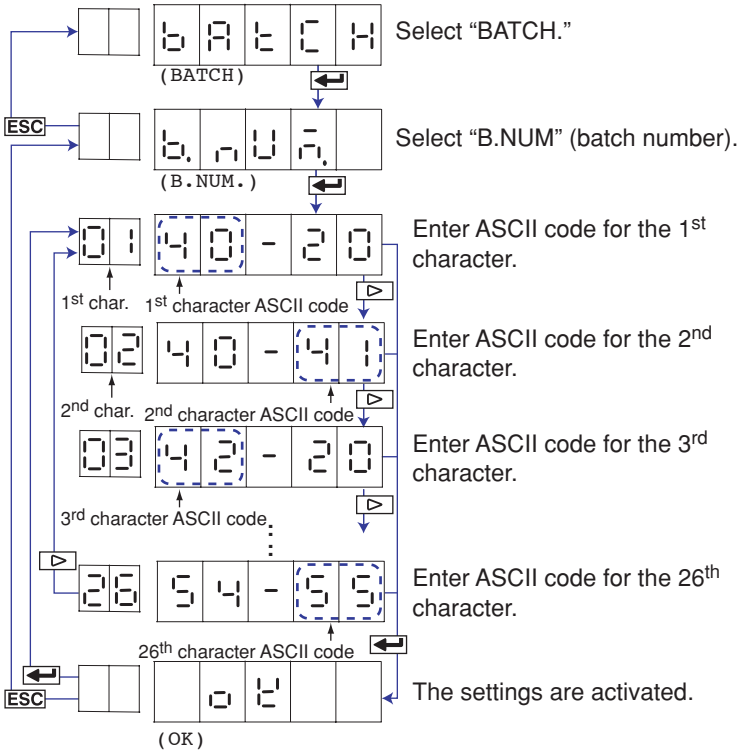
3.12 Setting Up Start Printout and End printout (/BT1 Option)

Enter settings for Start printout/Start printout 2 when starting recording, and for End printout/End printout 2 when stopping recording.
Before entering settings, enable “Start printout and End printout” in Basic Setting mode.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.

Setting the Batch Number



For English

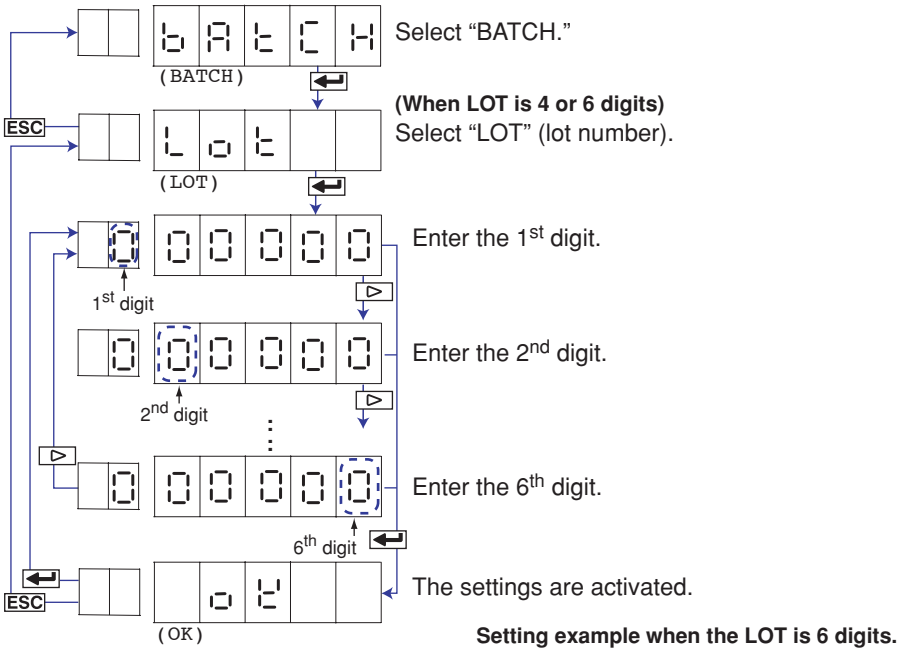
Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	SP			#		%			(	)	*	+		-	.	/
30	0	1	2	3	4	5	6	7	8	9						
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z				°	
60		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	μ	Ω	²	³	

For German or French

Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	SP			#		%			(	)	*	+		-	.	/
30	0	1	2	3	4	5	6	7	8	9						
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z				\	
60		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z		Ω			
A0																
B0	°		²	³		μ										
C0					Ä			Ç				Ë				Î
D0							Ö						Ü			ß
E0	à		â		ä			ç	è	é	ê	ë			î	ï
F0					ô		ö			ù		û	ü			

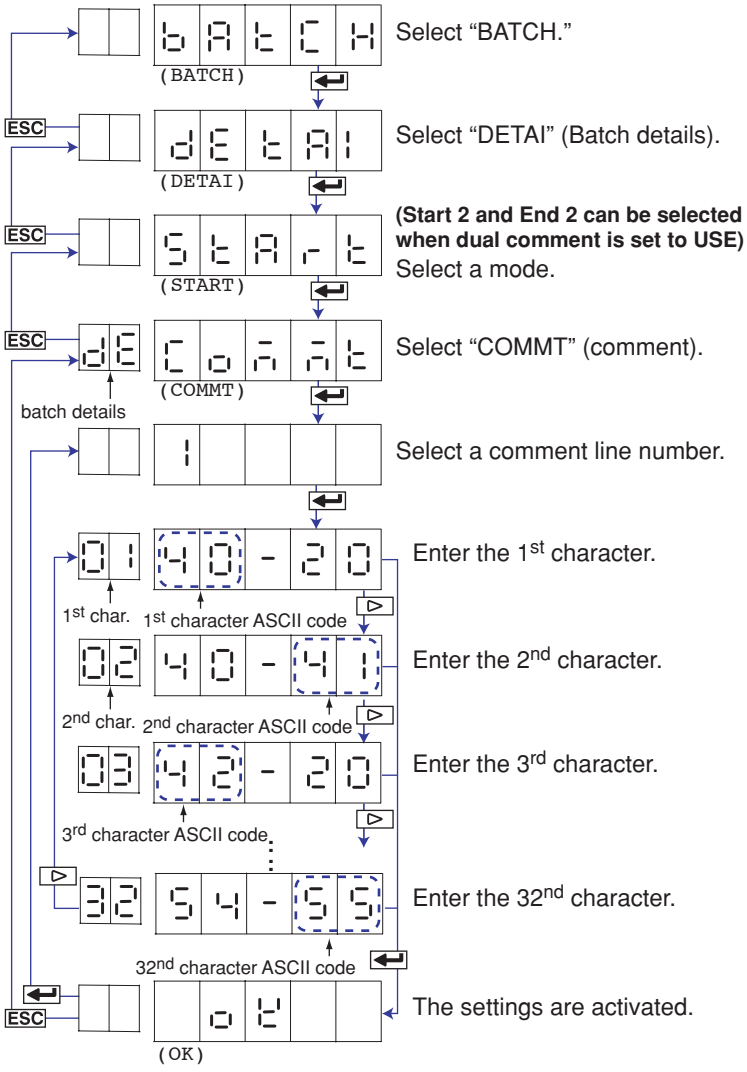
Only German
Only French
SP = Space
Example: To register A, enter 41.

Setting the Lot Number



Setting example when the LOT is 6 digits.

Setting Comments



For English

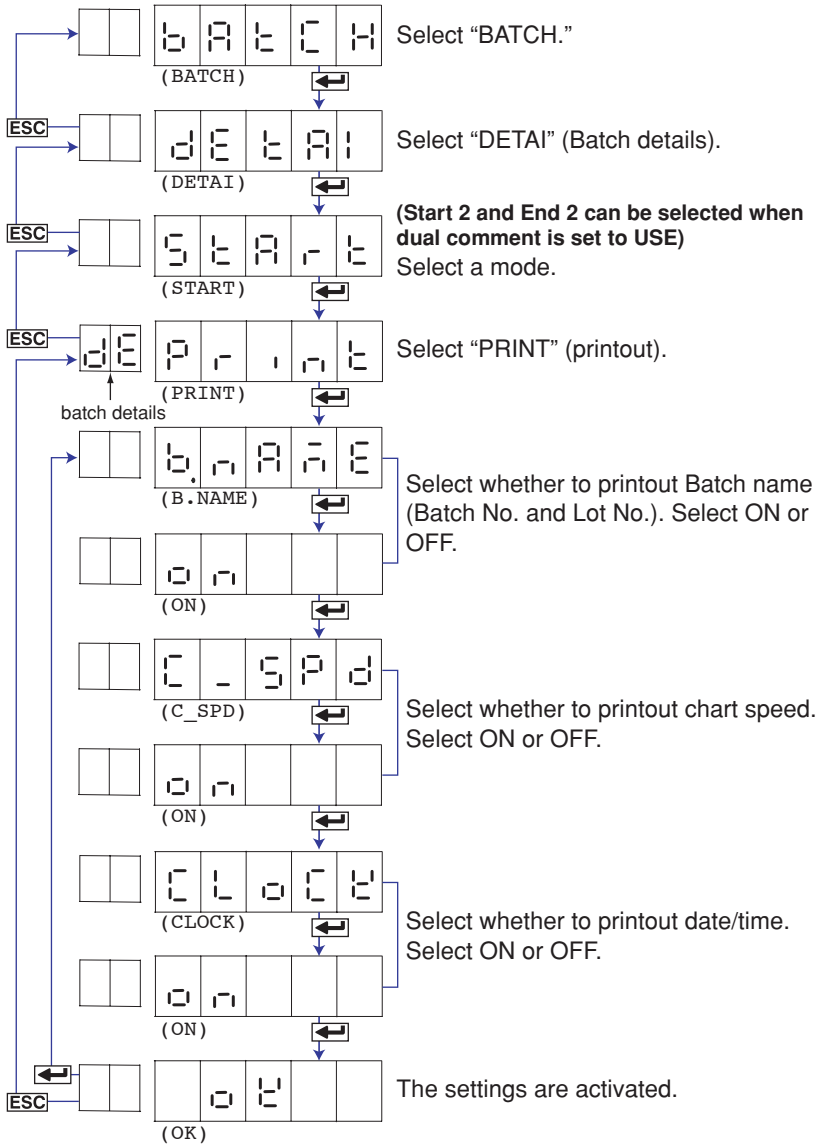
Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	SP			#		%			(	)	*	+		-	.	/
30	0	1	2	3	4	5	6	7	8	9						
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z				°	
60		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	µ	Ω	²	³	

For German or French

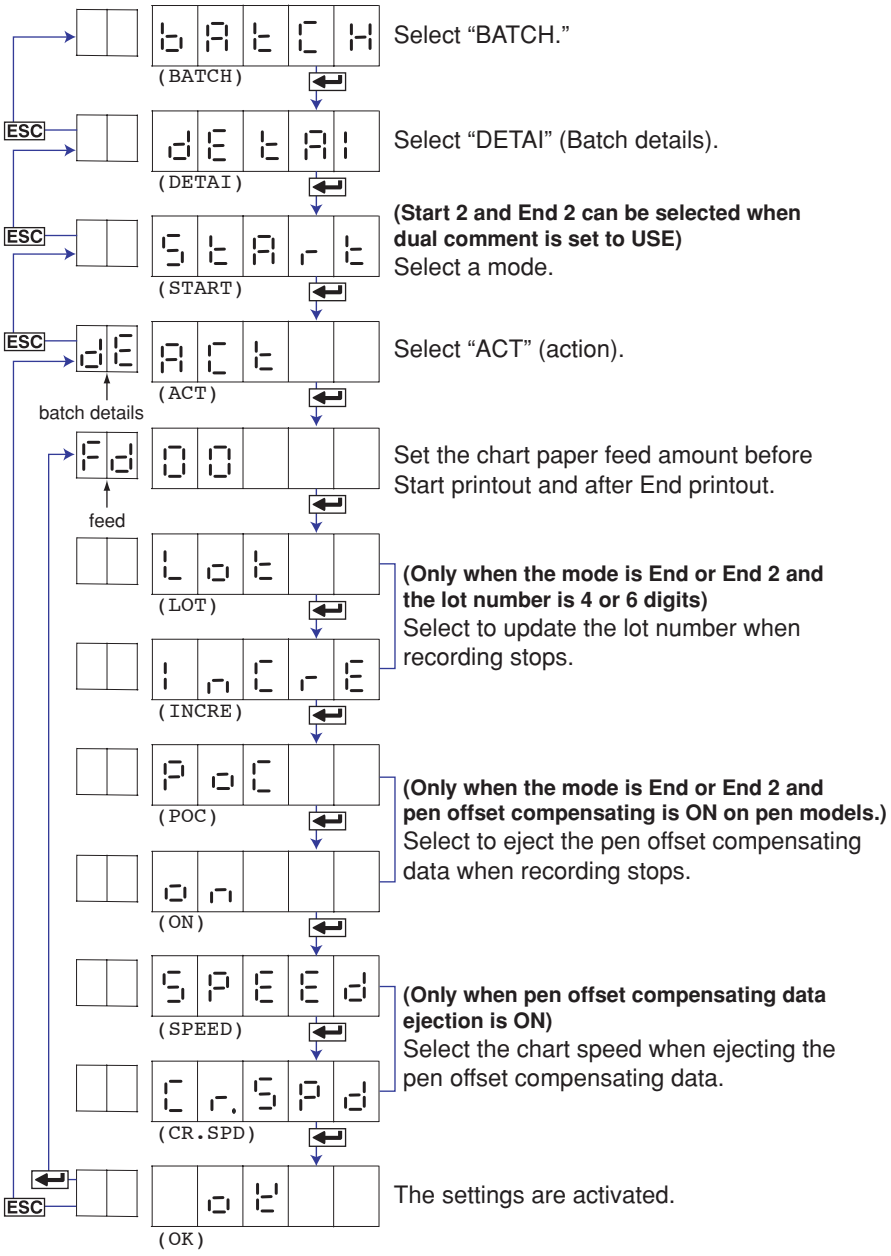
Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	SP			#		%			(	)	*	+		-	.	/
30	0	1	2	3	4	5	6	7	8	9						
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z				\	
60		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z		Ω			
A0																
B0	◦		²	³		µ										
C0					Ä			Ç				Ë				Ï
D0							Ö						Ü			ß
E0	à		â		ä			ç	è	é	ê	ë			î	ï
F0					ô		ö			ù		û	ü			

Only German
Only French
SP = Space
Example: To register A, enter 41.

Selecting Printout ON/OFF for the Batch Name, Chart Speed, and Date/Time.



Setting the Feed Amount, Lot Number Update, and Ejection of Pen Offset Compensating Data



3. Press the ↵ key to set other items.
   If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Batch Number
You can enter up to 26 characters.

Lot Number
Enter using a 4 or 6 digit number. Select which number of digits to use (4 or 6) under "Lot No." in Basic Setting mode.

Mode
Select Start (StArt), End (End), Start 2 (StAt2), or End 2 (End2). Start 2 and End 2 become available when you enable "Dual comment" in Basic Setting mode.

Comment
You can enter up to 32 characters.

Comment Line Number
1 to 5 lines can be printed out.

Chart Paper Feed Amount
The available setting range is 0 to 50 mm.

Lot Number Update
Update (InCrE): Increments the lot number when recording stops.
Do not update (UnCHG): Do not update the lot number.

Ejection of Pen Offset Compensating Data (pen model)
You can eject the portion that is not recorded when recording stops.
ON (on): Eject
OFF (oFF): Do not eject

Chart Speed When Ejecting Pen Offset Compensating Data (pen model)
Select the chart speed when ejecting the portion that was not recorded.
Current chart speed (Cr.SPd): Feeds at the specified chart speed.
450 (450): Fixed to feed at 450 mm/h.

Note

The following operations are performed when using the header printout function (/BT1 option).

- **When the power is interrupted and is reintroduced, recording always stops. End printout/End printout 2 is not performed.**
- Until Start printout/Start printout 2 and End printout/End printout 2 finishes, the instrument cannot transition to the next operation.
- When recording is started, the alarm and message printout information stored in the buffer prior to recording stop is cleared.

<Related Topics> Enabling start printout and stop printout: Section 4.23
Setting the number of lot number digits and enabling start 2 printout and stop 2 printout: Section 4.23

3.13 Regarding the Message Format (/BT1 Option)

In the 5 message printouts, up to 35 characters can be printed out including the date/time and measured values. Messages including measured values can be printed out even when start printout or stop printout is disabled.

Procedure

The message format cannot be set by key operation. Set the format using the communication command or a RXA10-03 or RXA10-04 Configuration software (sold separately).

Explanation

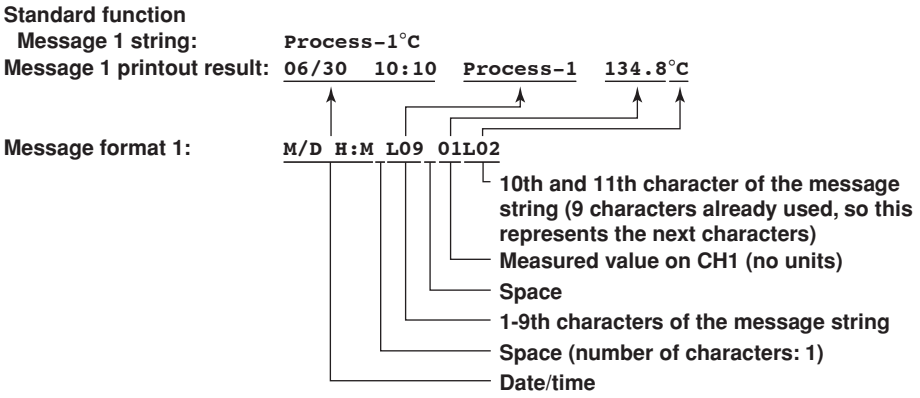
Message Number

Select from 1 to 5.

Message Format

Choose a message format. Measured values, message strings, and date/time can be set arbitrarily.

Example: Based on the message 1 string of the standard function, you can set a combination with message format 1 and print it out as message 1 including measured values.



- **Date/Time Format and Number of Characters Used**

H:M	(Hour:Minute)	5 characters
H:M:S	(Hour:Minute:Second)	8 characters
M/D H:M	(Month/Day Hour:Minute)	11 characters
M/D H:M:S	(Month/Day Hour:Minute:Second)	14 characters
D/M H:M	(Day/Month Hour:Minute)	11 characters
D/M H:M:S	(Day/Month Hour:Minute:Second)	14 characters
D.M H:M	(Day.Month Hour:Minute)	11 characters
D.M H:M:S	(Day.Month Hour:Minute:Second)	14 characters
M.D H:M	(Month.Day Hour:Minute)	12 characters
M.D H:M:S	(Month.Day Hour:Minute:Second)	15 characters
Y/M/D H:M:S	(Year/Month/Day Hour:Minute:Second)	19 characters
M/D/Y H:M:S	(Month/Day/Year Hour:Minute:Second)	19 characters
D/M/Y H:M:S	(Day/Month/Year Hour:Minute:Second)	19 characters
D.M.Y H:M:S	(Day.Month.Year Hour:Minute:Second)	19 characters
M.D.Y H:M:S	(Month.Day.Year Hour:Minute:Second)	20 characters

- **Measured Value Format and Number of Characters Used**

  The format for measured values is 01, 02, ...06. No units are added. 7 characters are used.

- **Character String Format**
  The format for message strings is L01 (1 character), L02 (2 characters), ... L16 (16 characters).
  In the example on the previous page, L09 indicates “Process-1” and L02 indicates “°C .”

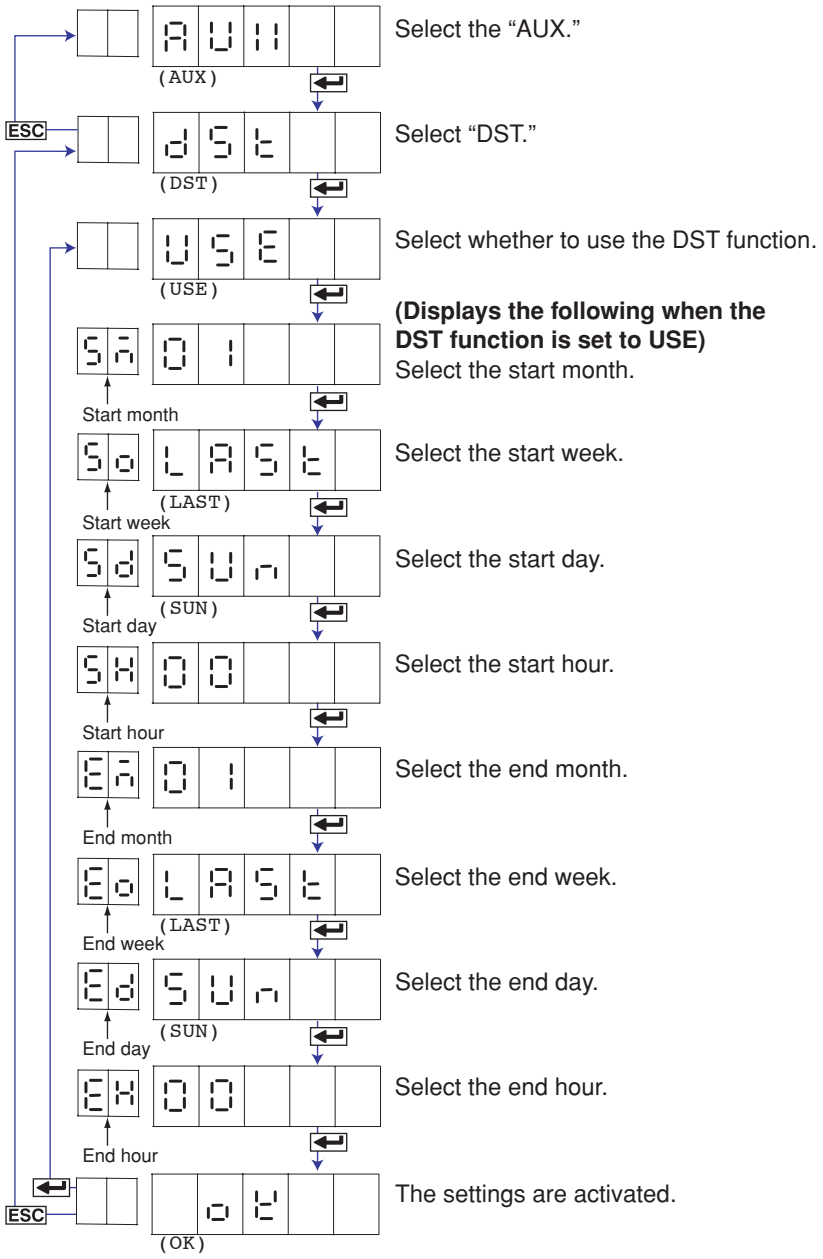
<Related Topics> Enabling the message format: Section 4.23
Setting message strings: Section 3.8

3.14 Setting the Date/Time for Switching between Standard Time and DST

The date/time for switching from the standard time to DST and the date/time for switching back from DST to standard time can be set, if the recorder is used in a region that has DST. When the preset date/time arrives, the recorder internal clock automatically switches.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



3. If you are done, press the **ESC** key.
4. Hold down the MENU key for 3 seconds to return to Operation mode.

Explanation

Start Month, Start Day, and Start Time
Set the date/time for switching from standard time to DST. Specify the day as the n^{th} day of the week of the month.

End Month, End Day, and End Time
Set the date/time for switching from DST to standard time. Specify the day as the n^{th} day of the week of the month.

Start Month and End Month
01 to 12: January to December

Start Week and End Week
1: 1st week
2: 2nd week
3: 3rd week
4: 4th week
LASt: Last week

Start Day and End Day
SUn: Sunday
Mon: Monday
tUE: Tuesday
WEd: Wednesday
tHU: Thursday
Fri : Friday
SAt: Saturday

Start Time and End Time
00 to 23: Hour 00 to hour 23

4.1 Changing the Auxiliary Alarm Function

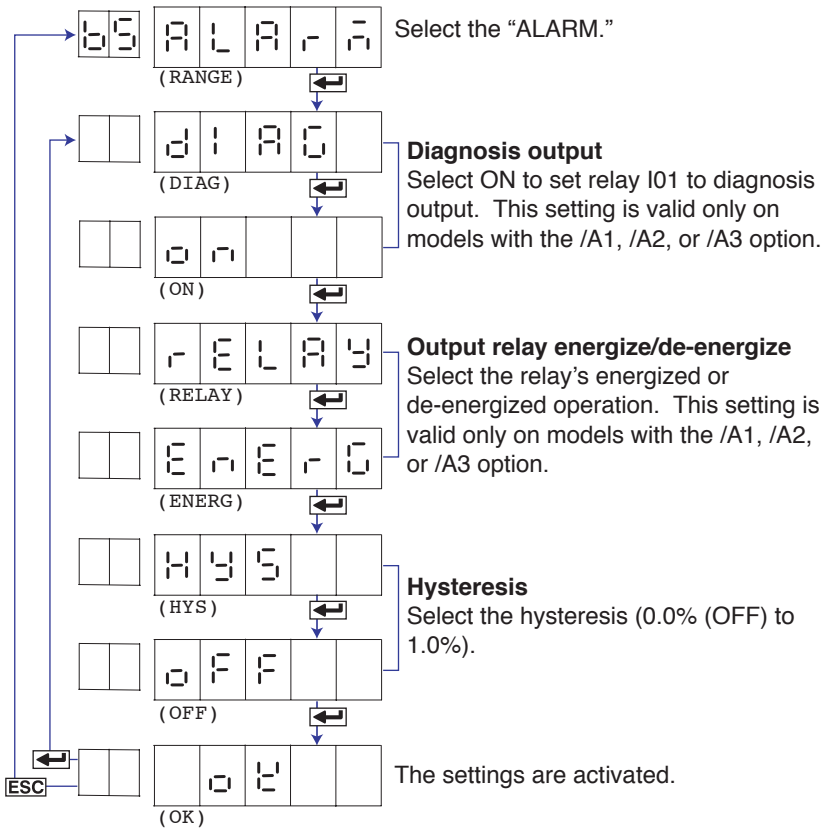
This section explains the details of setting the alarm system items listed below.

- Diagnosis output using the alarm output relay (I01)
- Energized/De-energized operation of alarm output relays when alarms occur
- Alarm hysteresis

Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Diagnosis Output

When set to ON, alarm output relay I01 becomes a dedicated diagnosis output relay, and the operation is fixed to de-energized. Diagnosis output is a function which outputs a relay signal when an error is detected in the recording section, burnout detection function, or the A/D converter.

Output Relay Energize/De-Energize Operation

Sets whether the output relay is energized or de-energized when an alarm occurs.

Energize (EnEr G): Energizes the relay when an alarm occurs. The relay is de-energized during normal operation.

De-energize (dE_En): De-energizes the relay when an alarm occurs. The relay is energized during normal operation.

Hysteresis

Sets the alarm hysteresis of the measurement channels.

The hysteresis width can be set in the range of 0.0% (OFF) to 1.0% of the recording span in 0.1 steps.

The hysteresis applies to all high limit and low limit alarms of measurement channels.

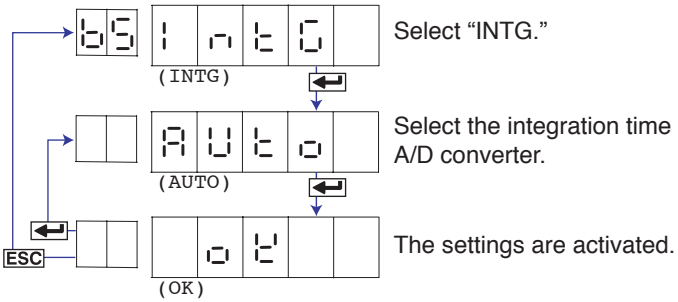
<Related Topics> Setting the alarm: Section 2.2

4.2 Changing the Integration Time of the A/D Converter

The integration time of the A/D converter can be set. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Integration Time

Selects the integration time of the A/D converter.

Selectable Settings	Integration Time	Scan Interval (Pen Model)	Recording Interval (Dot Model)
50 Hz (50Hz)	20 ms	125 ms	1 s
60 Hz (60Hz)	16.7 ms	125 ms	1 s
Auto (Auto)	20 ms or 16.7 ms*2*3	125 ms	1 s
100 ms (100ms)*1	100 ms	–	2.5 s

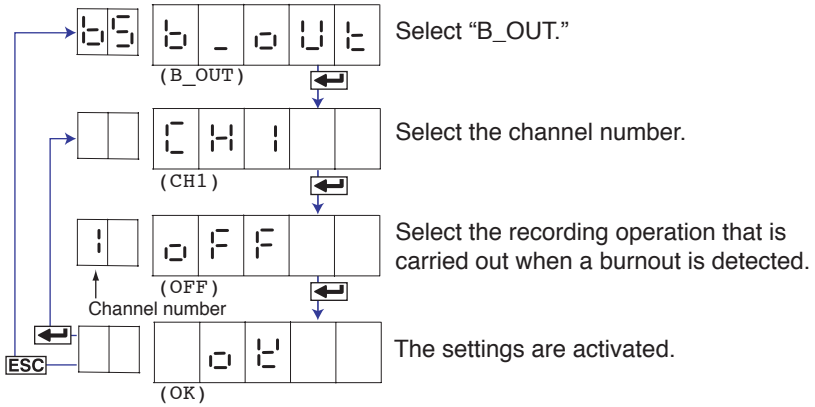
*1 Selectable only on the dot model.
*2 Automatically switch by detecting the power supply frequency.
*3 The integration time is fixed to 20 ms if "Auto" is selected when using the DC power supply on a model with the /P1 option.

4.3 Setting the Burnout Detection Function

The burnout detection function of thermocouples can be set on 1-5V or TC input channels. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Burnout

Selects the action taken when a burnout is detected at the 1-5V input or the thermocouple input.

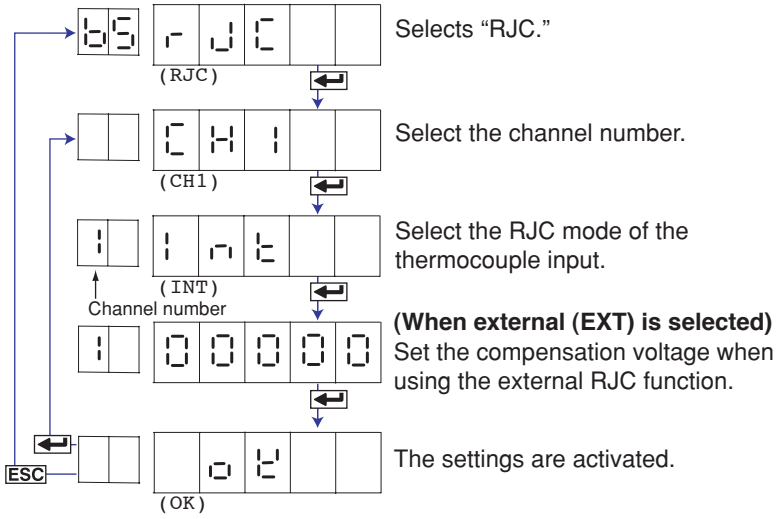
Upscale (UP): Records off the scale on the 100% side.
Downscale (doWn): Records off the scale on the 0% side.
OFF (oFF): Disables the burnout detection function.

4.4 Setting the RJC Function on TC Input Channels

The RJC mode can be set on TC input channels. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   To change the polarity, press the △ or ▽ key when the leftmost digit of the value is blinking.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

RJC

Sets the RJC mode.

Internal (Int): Uses the RJC function of the recorder.

External (EXTr): Uses an external RJC function. If external is selected, set the compensation voltage.

Compensation Voltage

Sets the compensation voltage when using an external RJC function.

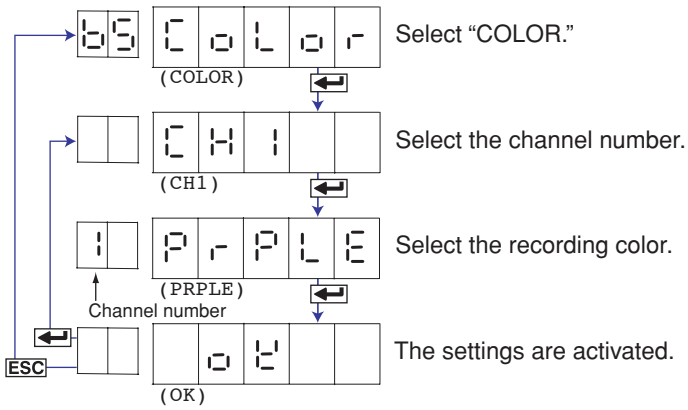
The compensation voltage can be set in the range of –19999 μV to 20000 μV.

4.5 Changing the Channel Recording Color (Dot Model)

The trend recording color on the dot model can be changed. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Color

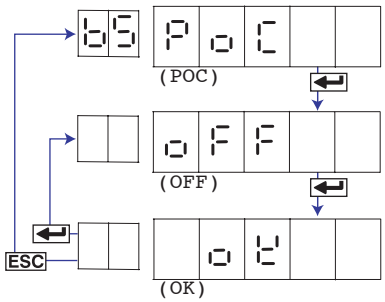
Sets the recording color of measurement channels.
By default, the recording colors are set as follows:
Channel 1: Purple (PrPLE)
Channel 2: Red (rEd)
Channel 3: Green (GrEEn)
Channel 4: Blue (bLUE)
Channel 5: Brown (broWn)
Channel 6: Black (bLACK)

4.6 Recording by Compensating for the Pen Offset along the Time Axis (Pen Model)

The pen offset along the time axis (pen model) can be compensated. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

When pen offset compensation is turned ON, an asterisk is printed by the time on the periodic printout.

Note

When pen offset compensation is enabled, all pens are aligned with the reference pen (pen that is furthest to the back: pen 2 on the 2-pen model, pen 3 on the 3-pen model, and pen 4 on the 4-pen model) for recording. When recording is started, only the reference pen moves until the offset is compensated. This is not a malfunction.

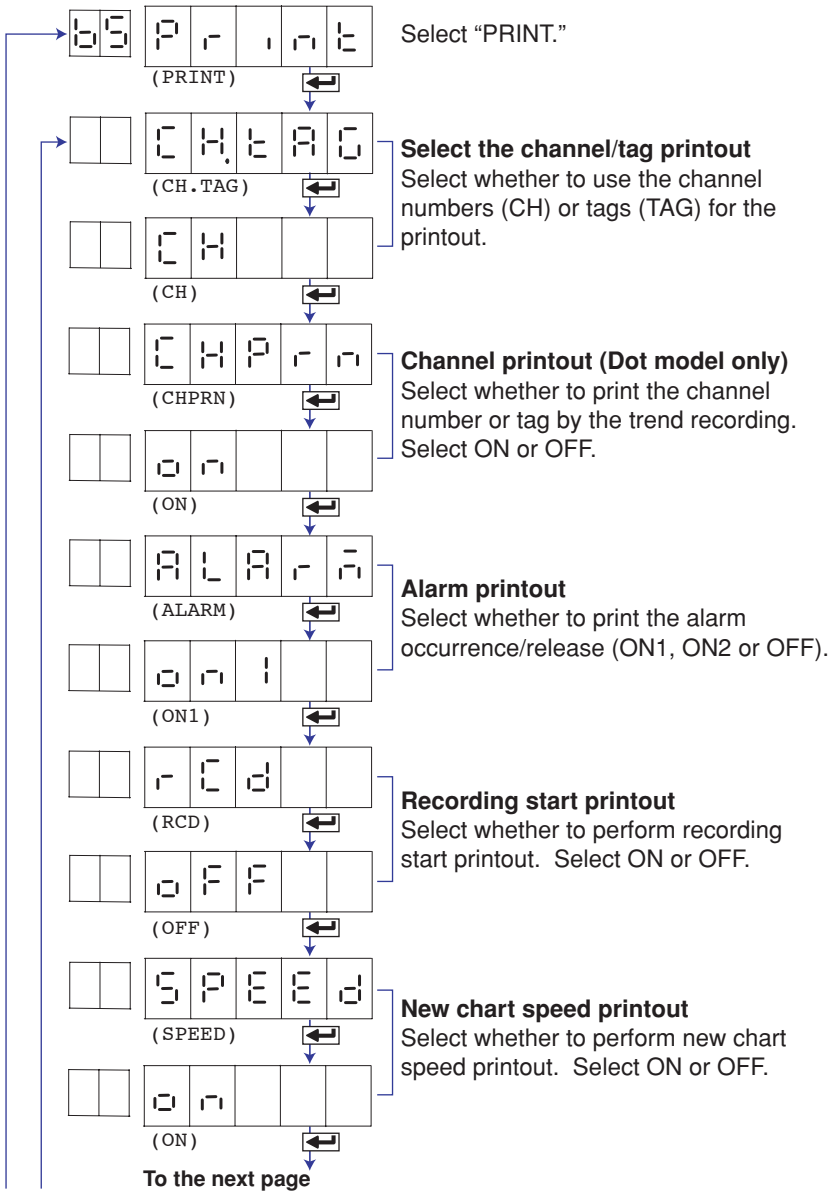
4.7 Turning Printouts ON/OFF

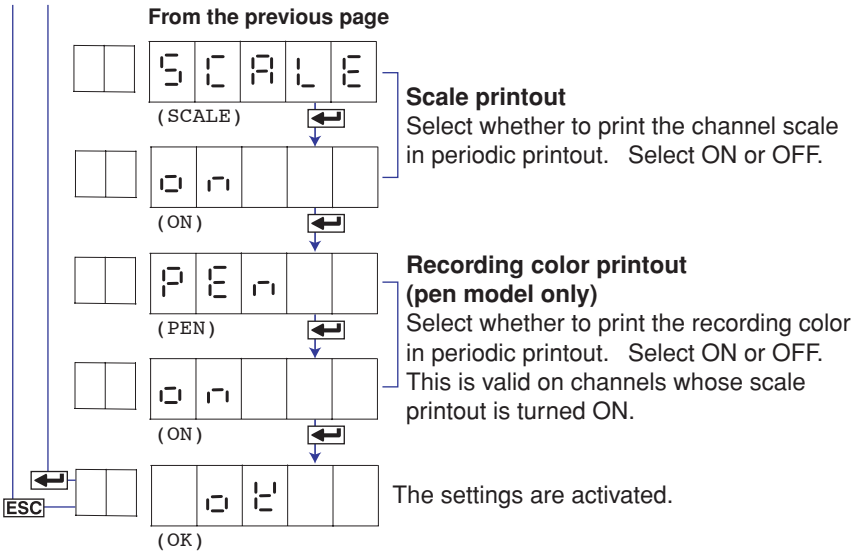
(Selecting the Channel/Tag Printout and Turning ON/OFF the Channel, Alarm, Recording Start, New Chart Speed, Scale, and Pen Color Printouts)

Select whether to print using channel numbers or tags and set whether to print the various printout items. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.





4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Channel/Tag Printout

Channel (CH): Prints the channel number.
Tag (tAG): Prints the tag.

Alarm Printout

ON1 (on 1): Prints the alarm information when an alarm occurs or releases.
ON2 (on2): Prints the alarm information only when an alarm occurs.
OFF (oFF): Does not print alarm information.

Note

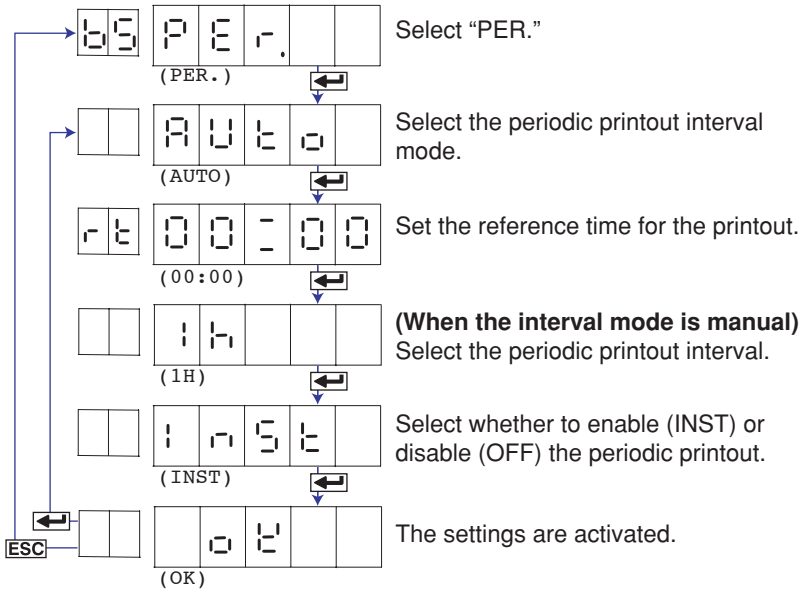
Channel, alarm, recording start, and new chart speed printouts are not performed when the chart speed is higher than or equal to 1800 mm/h and 120 mm/h on the pen model and dot model, respectively.

4.8 Turning Periodic Printout ON and OFF and Setting the Interval

The periodic printout settings can be specified. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1 . Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Periodic Printout

Selects the periodic printout interval mode.
Auto (AUto): Automatically sets the printout interval in sync with the chart speed.
Manual (MAn.): Set the printout interval manually.

Reference Time

Sets the reference time for determining the times for executing the periodic printout. The reference time is set in the range of 00 to 23 in 1 hour steps. Minutes cannot be specified.

Interval

Select the interval from 10, 12, 15, 20, 30 minutes, 1, 2, 3, 4, 6, 8, 12, and 24 hours (10 min to 24H). However, printout might not take place at the specified interval depending on the chart speed and items printed (for details, see appendix 1).

Turning ON/OFF the Periodic Printout

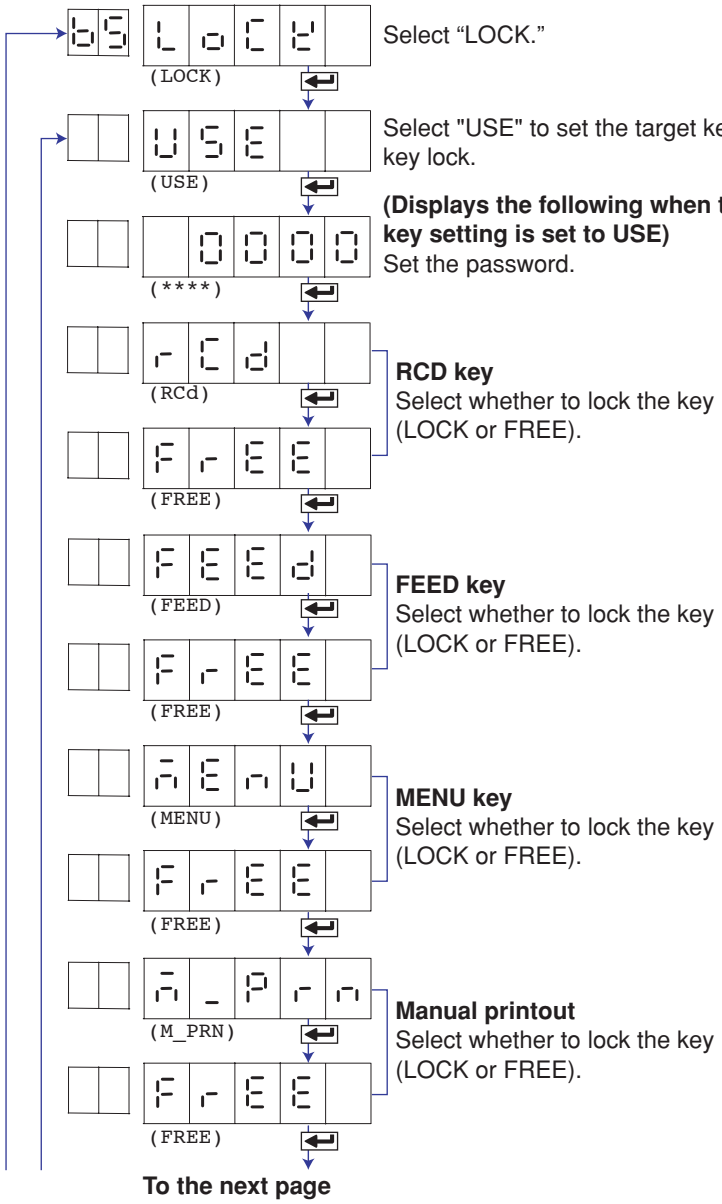
ON (instantaneous value) (inst): Prints the measured value at that point.
OFF (oFF): Disables periodic printout.

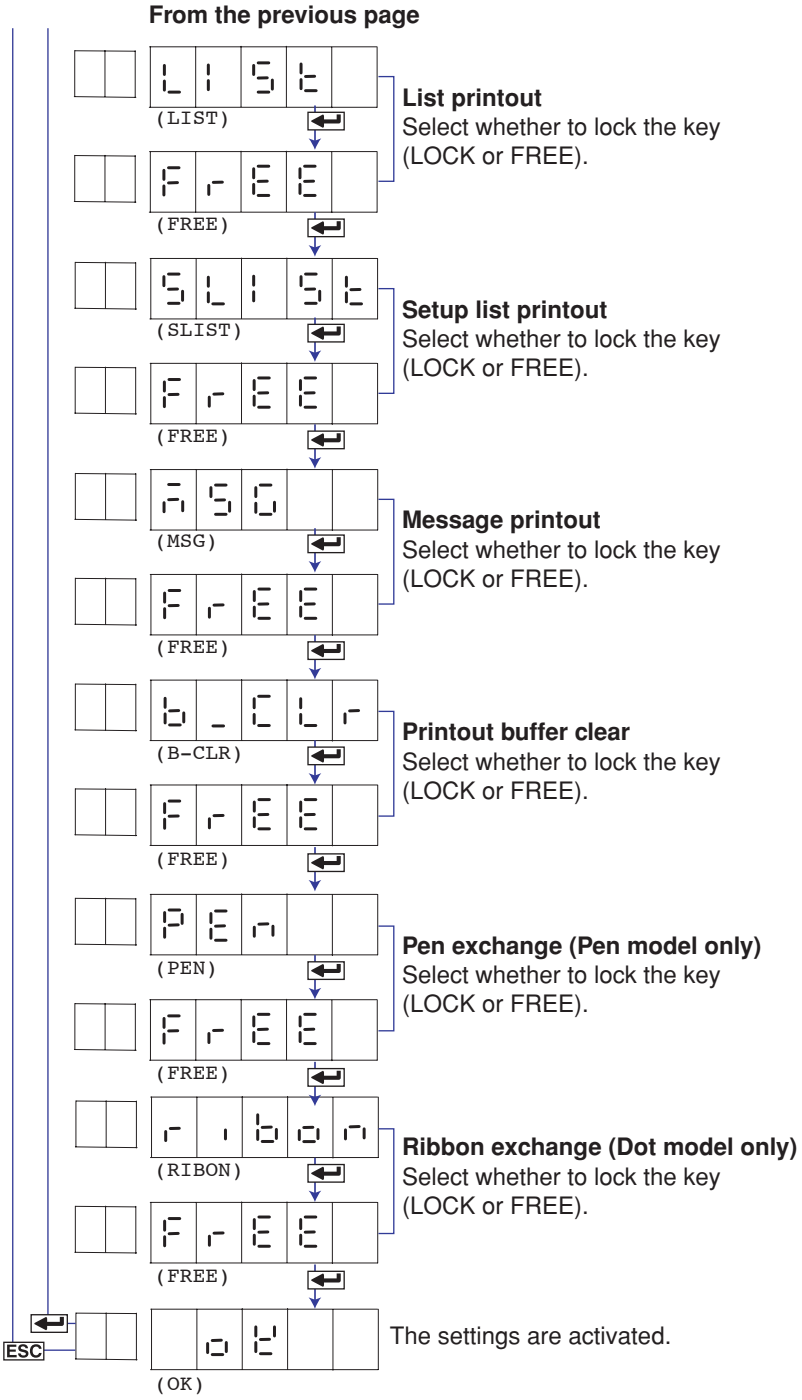
4.9 Setting the Key Lock

The keys that can be locked and the password for releasing the key lock can be set. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.





4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Key Lock

Select the target keys (USE)
Not use the key lock (not)

Password

Sets the password for releasing the key lock. Set the password using a four-digit number.

Operation of Keys to Be Key-Locked

Sets the operation of the keys to be key-locked. Select Lock (LOCK) or Free (FREE) for each key operation.

RCD: RCD key
FEED: FEED key
MENU: MENU key
M_PRN: FUNC key + manual printout operation
LIST: FUNC key + list printout operation
SLIST: FUNC key + setup list printout operation
MSG: FUNC key + message printout operation
B_CLR: FUNC key + clear operation of the printout buffer memory
PEN: FUNC key + the operation of moving the pen to an easily accessible position of replacement (pen model)
RIBON: FUNC key + the operation carried out when replacing the ribbon cassette with the power turned ON (dot model)

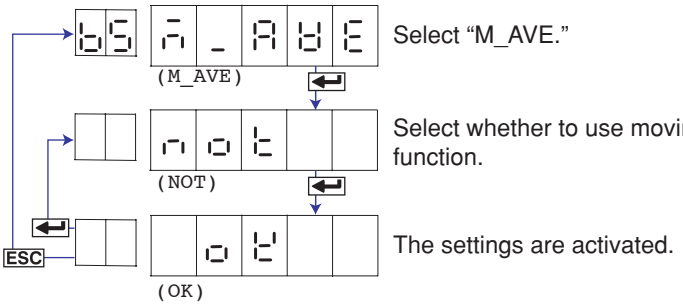
<Related Topics> Activating/Releasing the Key Lock: “Activating/Releasing the Key Lock” in the *Operation Guide*

4.10 Enabling the Moving Average Function (Dot Model)

The moving average function can be enabled/disabled on the dot model. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Moving Average

Enable (USE): Enables the setting of the number of samples of the moving average in Setting mode.

Disable (not): The "M_AVE" item does not appear in Setting mode.

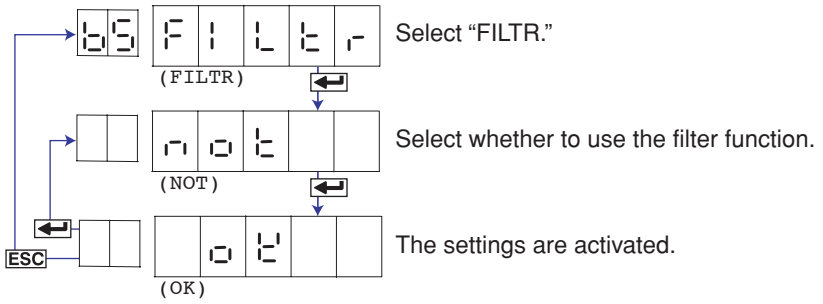
<Related Topics> Setting the moving average: section 3.3

4.11 Enabling the Filter Function (Pen Model)

The input filter function on the pen model can be enabled/disabled. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Filter

Enable (USE): Enables the setting of the filter and the time constant in Setting mode.
Disable (not): The "FILTR" item does not appear in Setting mode.

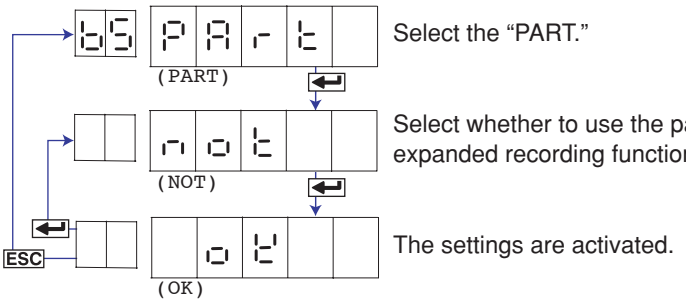
<Related Topics> Setting the filter: Section 3.2

4.12 Enabling the Partial Expanded Recording Function

The partial expanded recording function can be enabled/disabled. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Partial Expanded Recording
Enable (USE): Enables the setting of the boundary position and boundary value of the partial expanded recording function in Setting mode.
Disable (not): The “PART” item does not appear in Setting mode.

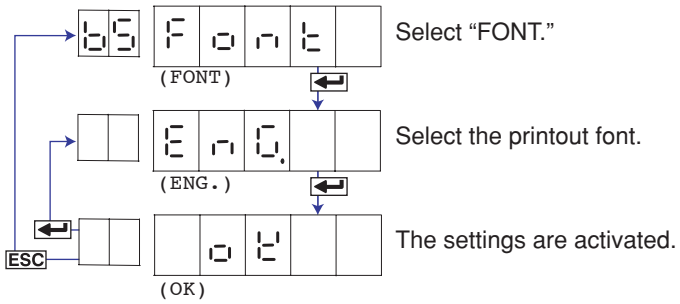
<Related Topics> Setting the partial expanded recording: Section 3.5

4.13 Changing the Printout Font

The printout font can be changed. Changing the font changes the characters that can be used for message printouts, tags, and header printouts (/BT1 option). Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Font

English (EnG.): Uses the alphabet, numbers, and symbols for printout.
Japanese (JPn.): Uses the alphabet, Katakana, numbers, and symbols for printout.
German (GEr.): Uses the German alphabet, numbers, and symbols for printout.
French (Fr E.): Uses the French alphabet, numbers, and symbols for printout.

For English or Japanese

Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	SP			#		%			(	)	*	+		-	.	/
3	0	1	2	3	4	5	6	7	8	9						
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z				°	
6		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	μ	Ω	²	³	
A							ヲ	ァ	ィ	ゥ	ェ	ォ	ャ	ュ	ョ	ッ
B	ー	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	サ	シ	ス	セ	ソ
C	タ	チ	ツ	テ	ト	ナ	ニ	ヌ	ネ	ノ	ハ	ヒ	フ	ヘ	ホ	マ
D	ミ	ム	メ	モ	ヤ	ユ	ヨ	ラ	リ	ル	レ	ロ	ワ	ン	゛	°

Only Japanese

For German or French

Lower / Upper	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	SP			#		%			(	)	*	+		-	.	/
3	0	1	2	3	4	5	6	7	8	9						
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z				\	
6		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z		Ω			
A																
B	°		²	³		μ										
C					Ä			Ç				Ë				Ï
D							Ö						Ü			ß
E	à		â		ä			ç	è	é	ê	ë			î	ï
F					ô		ö			ù		û	ü			

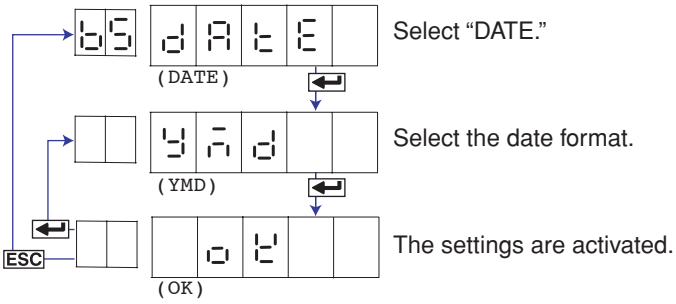
Only German
Only French

4.14 Changing the Print/Display Format of the Date

The format of the printout and display of the year, month, and day can be changed.
Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Type

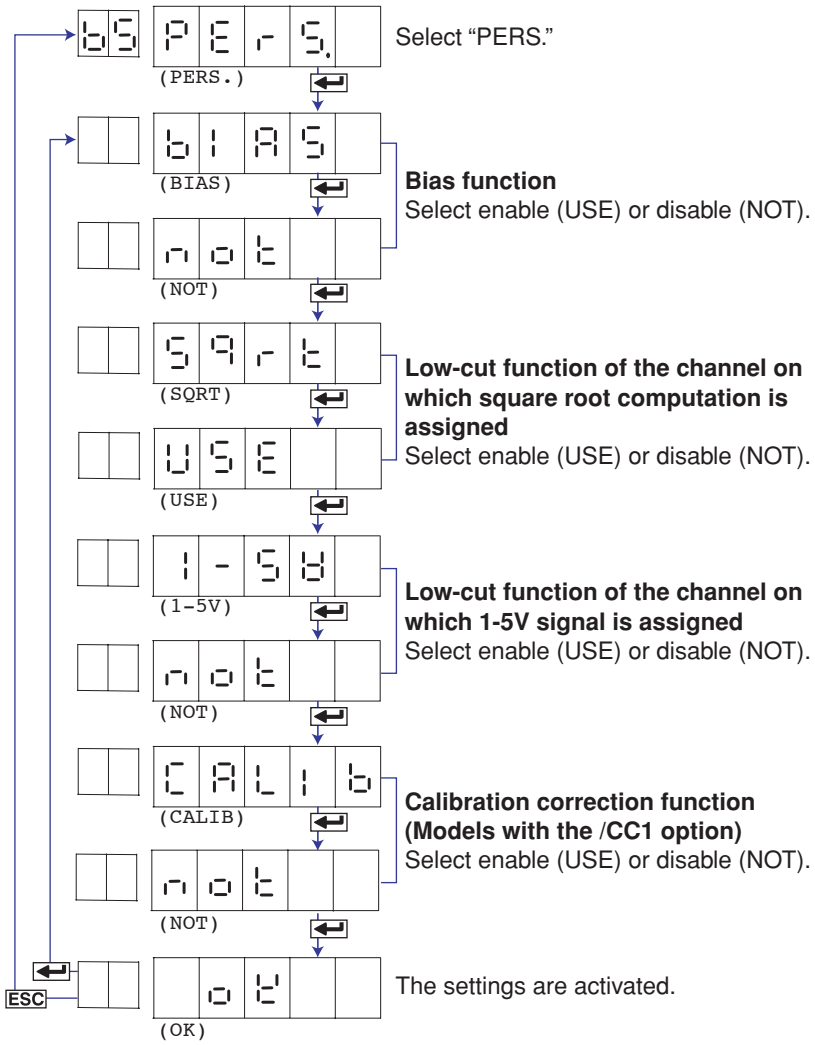
Selectable Settings	Type	Printout Format Example	Display Format Example	Notes
YMd	Y/M/D	2006/03/31	06 03 31	Default value
MdY_1	M/D/Y	03/31/2006	03 31 06	
dMY_1	D/M/Y	31/03/2006	31 03 06	
dMY_2	D.M.Y	31.03.2006	31 03 06	
MdY_2	M.D.Y	Mar.31.2006	03 31 06	

4.15 Enabling the Bias, Low-Cut, and Calibration Correction (/CC1 Option) Functions

The bias, low-cut, and calibration correction functions can be enabled/disabled. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Bias

Enable (USE): Enables the setting of the bias value in Setting mode.
Disable (not): The “BIAS” item does not appear in Setting mode.

SQRT Low-Cut

Sets the low-cut function for the square root computation.
Enable (USE): Enables the setting of the low-cut function when a channel is set to square root computation in Setting mode.
Disable (not): The “SQRT” item does not appear in Setting mode.

1-5V Low-Cut

Sets the low-cut function for the 1-5V input.
Enable (USE): Enables the setting of the low-cut function when a channel is set to 1-5V in Setting mode.
Disable (not): The “1-5V” item does not appear in Setting mode.

Calibration Correction (/CC1 Option)

Enable (USE): Enables the setting of the calibration correction function in Basic Setting and Setting modes.
Disable (not): The “CALIB” item does not appear in Basic Setting or Setting mode.

Note

The bias and calibration correction functions (/CC1 option) cannot be enabled simultaneously.

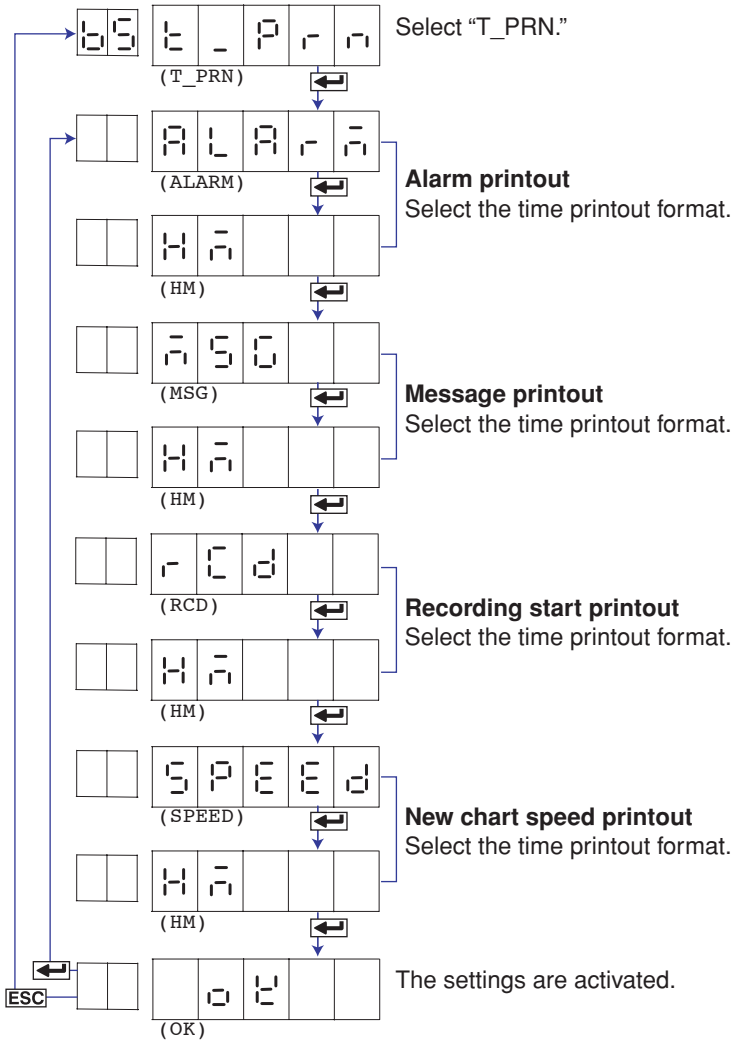
<Related Topics> Setting the bias value: Section 3.10
Setting the low-cut function: Section 2.1
Setting the calibration correction method and number of calibration points: Section 4.22
Performing calibration correction: Section 3.11

4.16 Changing the Time Printout Format

The time printout format can be changed on the alarm printout, message printout, recording start printout, and new chart speed printout. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Selecting the Printout Format

Select the time format of the alarm printout, message printout, recording start printout, and new chart speed printout.

- **Alarm Printout, Recording Start Printout, and New Chart Speed Printout**

  H:M (H:M): Hour:Minute
  H:M:S (H:M:S): Hour:Minute:Second
  M/D H:M (M/D H:M): Month/Day Hour:Minute
  M/D H:M:S (M/D H:M:S): Month/Day Hour:Minute:Second
  Y/M/D H:M:S (Y-M-S): Year/Month/Day Hour:Minute:Second

- **Message Printout**

  H:M (H:M): Hour:Minute
  H:M:S (H:M:S): Hour:Minute:Second
  M/D H:M (M/D H:M): Month/Day Hour:Minute
  M/D H:M:S (M/D H:M:S): Month/Day Hour:Minute:Second
  Y/M/D H:M:S (Y-M-S): Year/Month/Day Hour:Minute:Second
  NONE (none): Does not print the date/time.

Note

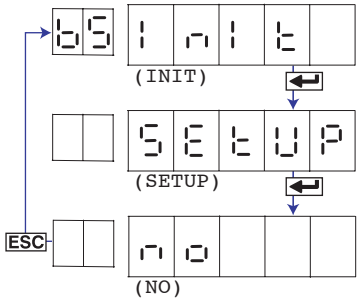
The printout format of the year, month, and day varies depending on the print/display format of the date (see section 4.14).

4.17 Initializing the Settings

This section explains the details of initializing the recorder settings to their factory default.
Be careful, because all settings except the date/time and the adjustment values of the pen position and printer carriage position will be initialized. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



Select "INIT."

Select the range to be initialized.

Select "YES" and press ↵ to execute the initialization and return to Operation mode.

Explanation

Initialization

Set (SET): Initializes the settings in Setting mode.
Setup (SETUP): Initializes the settings in Basic Setting mode and Setting mode.

Items That Are Not Initialized

The following items are not initialized.

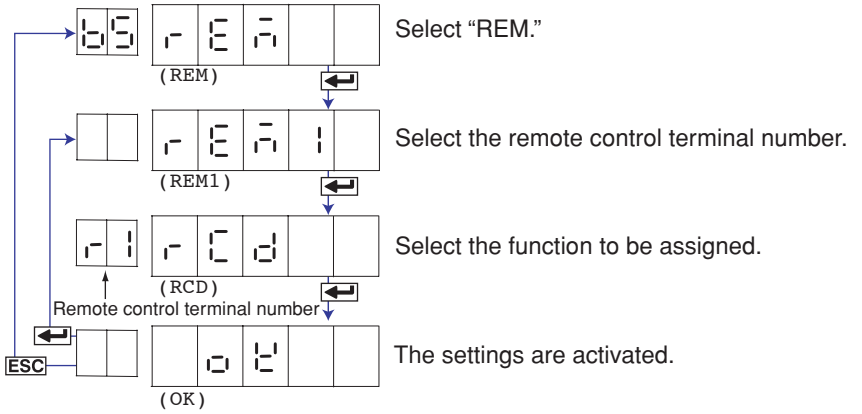
- Adjustment value of the pen position and the adjustment value of the printer carriage position (Basic Setting mode)
- Date/Time (Setting mode)

4.18 Assigning Functions to the Remote Control Input Terminals (/R1 Option)

Functions can be assigned to the remote control input terminals. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. Press the ↵ key to set other remote numbers.
   If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Remote Numbers

The remote control input terminal numbers are from 1 to 5.

Functions to Be Assigned

RCD (rCd):	Starts/stops recording.
C_SPD (C_SPd):	Changes the chart speed.
T_ADJ (t_AdJ):	Adjusts the internal clock to the nearest hour.
M_PRN (M_Prn):	Executes a manual printout.
MSG1 (MSG 1):	Prints message 1.
MSG2 (MSG2):	Prints message 2.
MSG3 (MSG3):	Prints message 3.
MSG4 (MSG4):	Prints message 4.
MSG5 (MSG5):	Prints message 5.
PR.RCD (Pr.rCd):	Starts/stops recording (/BT1 option).
DUAL (dUAL):	Start printout and Start printout 2, End printout and End printout 2 switches according to the status of the “PR.RCD” signal during the rising or falling of the “RCD” or “PR.RCD” signal (/BT1 option).
NONE (nonE):	No function is assigned.

Note

When you select “PR.RCD” and start recording remotely, you cannot stop recording using key operation or communications.

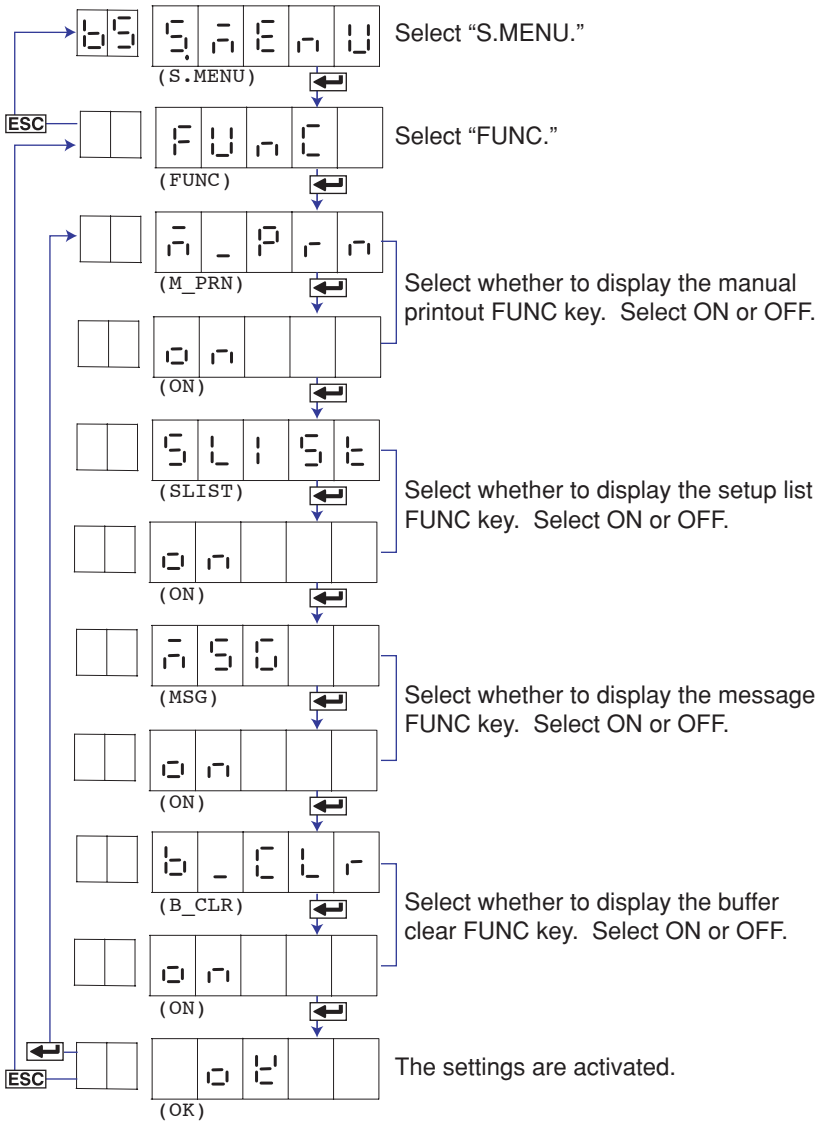
<Related Topics> Setting the secondary chart speed: Section 3.9

4.19 Selecting to Show/Hide the FUNC Key Menus

Select the menu for showing/hiding the FUNC key menus.
Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

ON(on): Shows the FUNC key menu.
OFF(oFF): Hides the FUNC key menu when customized menu is enabled.

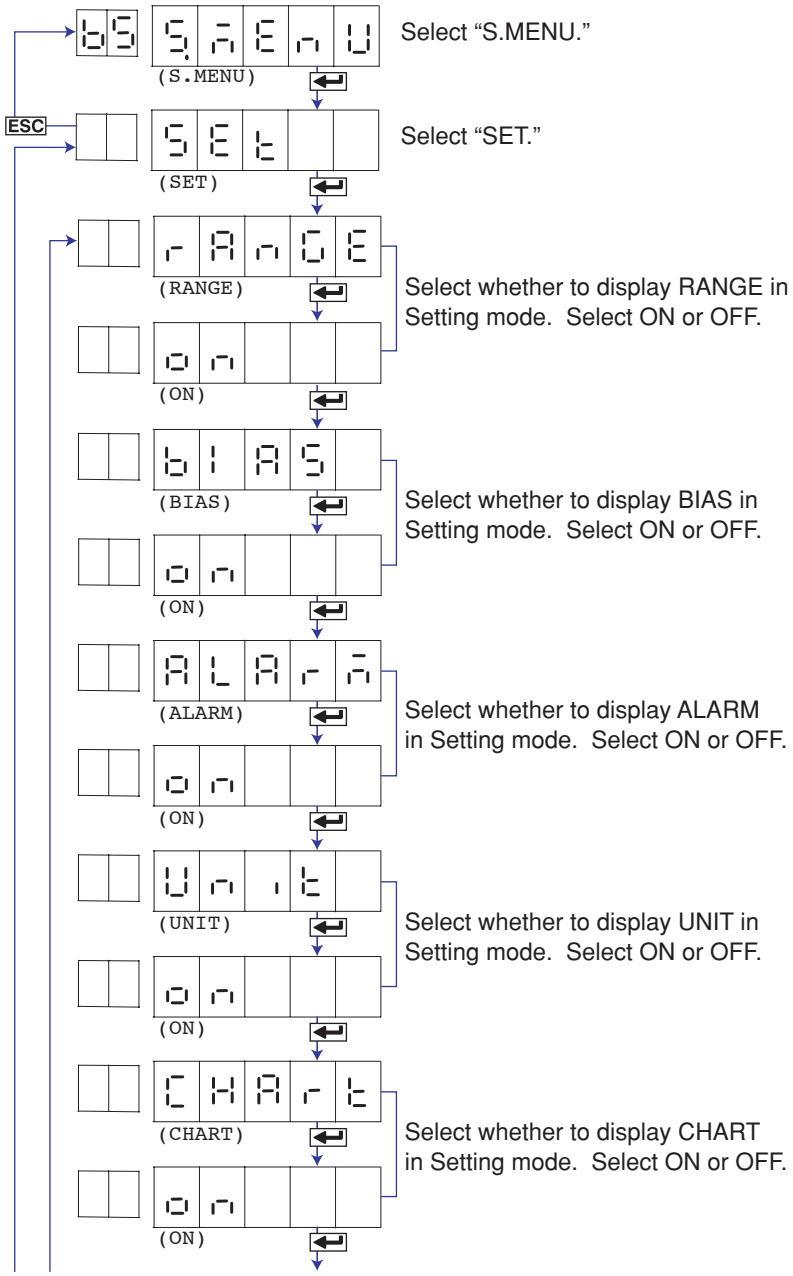
<Related Topics> Enabling the customized menu: Section 4.21

4.20 Selecting to Show/Hide Setting Mode Menus

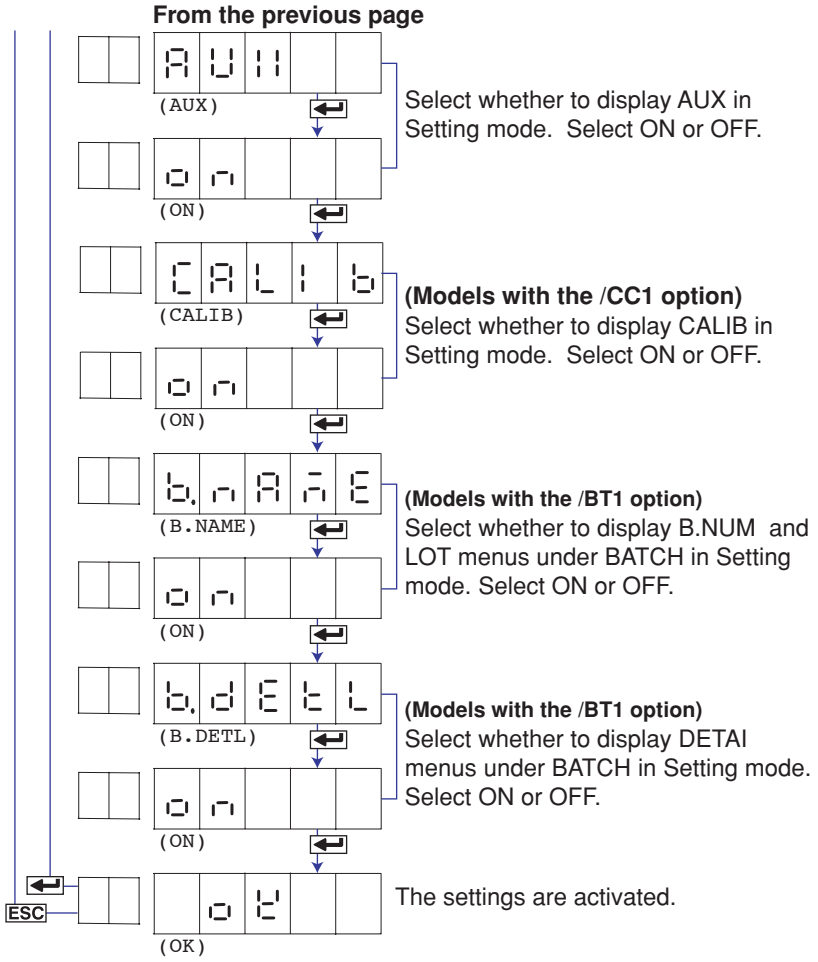
Select the menu for showing/hiding the Setting mode menus.
Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



To the next page



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

ON (on): Shows the menu in Setting mode.
OFF (oFF): Hides the menu in Setting mode when customized menu is enabled.

<Related Topics> Enabling the customized menu: Section 4.21

4.21 Enabling/Disabling the Customized Menu

When the Customized menu is enabled, the following changes can be made.

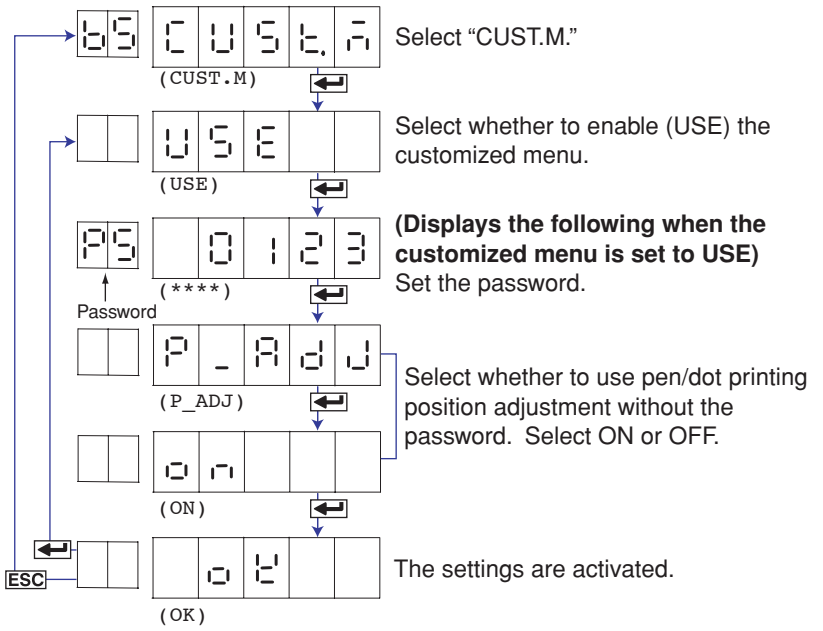
- Hide specified menu items from the FUNC key menu.
- Hide specified Setting mode menu items.
- Lock Basic Setting mode.

Basic Setting mode cannot be entered when recording is in progress.

Procedure

Enabling the Customized Menu

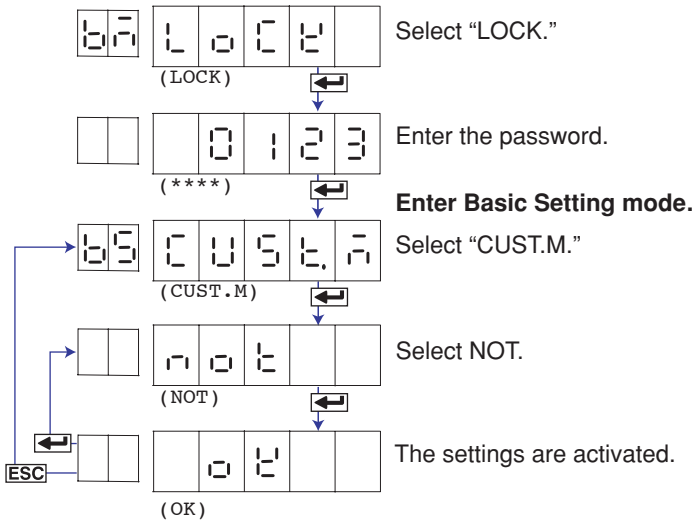
1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Disabling the Customized Menu

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Enable (USE): Locks Basic Setting mode and hides the specified menu items in Setting mode and FUNC key menu items.

Disable (not): Releases Basic Setting mode and shows the all menu items in Setting mode and all FUNC key menu items.

Password

This is the password used to release the customized menu or to enter Basic Setting mode. Set the password using a four-digit number.

Note

Changing the Settings without Releasing the Basic Setting Mode Lock

The settings in Basic Setting mode can be changed without releasing the customized menu.

Procedure

1. Enter the password in the same manner as described in "Releasing the Customized Menu," and press the ↵ key. Enter Basic Setting mode.
2. Change the settings in the same manner as the normal procedure.
3. Return to Operation mode with the customized menu enabled.

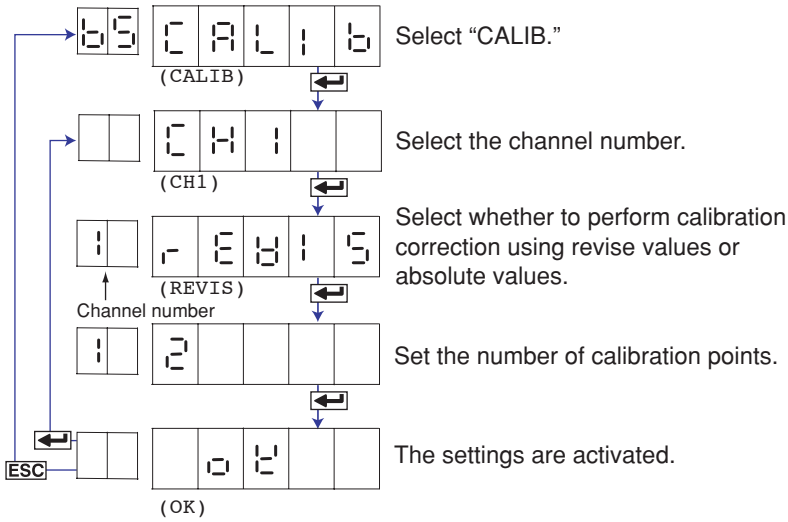
<Related Topics> Selecting to show/hide the FUNC key menus: Section 4.19
Selecting to show/hide setting mode menus: Section 4.20
Adjusting the pen/dot position: Sections 6.4 and 6.5

4.22 Setting the Calibration Correction Function (/CC1 Option)

The calibration correction method and the number of correction points can be set. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Calibration Correction Method

Revise value (rEV1 S): Specifies the difference between the correction values and input values.

Absolute value (AbSoL): Specifies the correction values.

Number of Calibration Points

Selects the number of points that make up the segments (including the start and end points) in the range of 2 to 16.

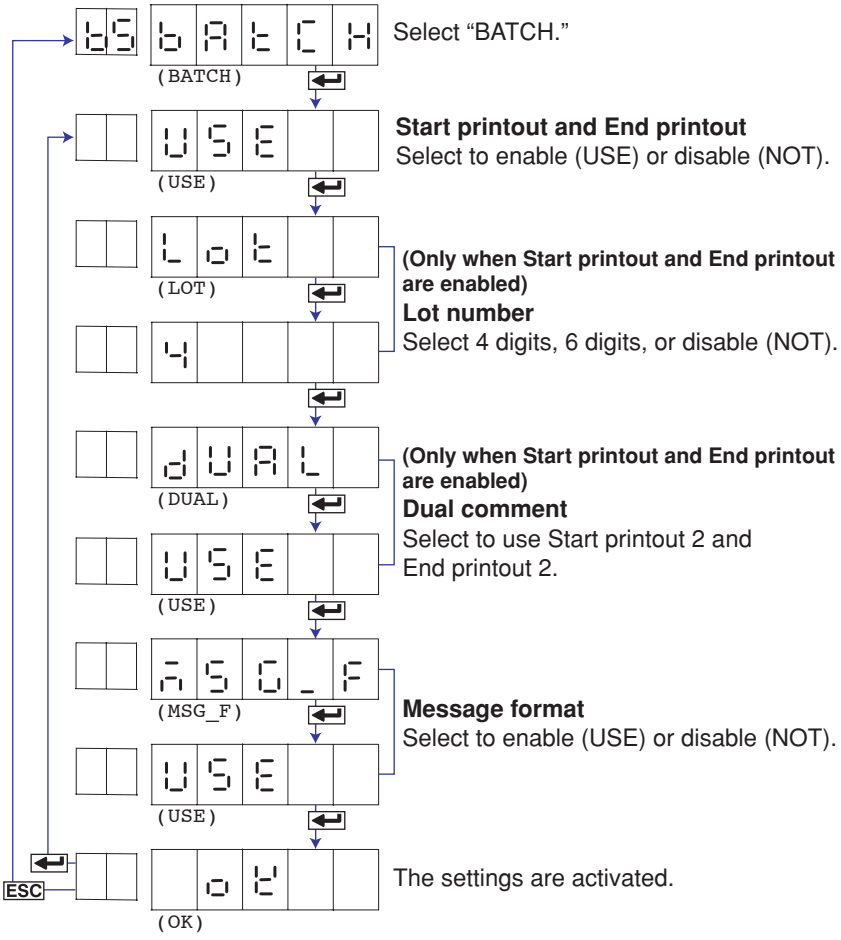
<Related Topics> Enabling the calibration correction function: Section 4.15
Performing calibration correction: Section 3.11

4.23 Enabling Start Printout, End printout, and Message Format (/BT1 Option)

This section explains the details of enabling/disabling the Start printout, End printout, and Message format.
Basic Setting mode cannot be entered when recording is in progress .

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. Press the ↵ key to set other channels.
   If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Start printout and End printout

USE (USE): When starting/stopping recording, performs Start printout and End printout. You can now set “Start printout and End printout” under “Lot number,” “Dual comment” and in Setting mode.

NOT (not): Do not perform Start printout/End printout.

Lot number

Batch name : Batch No. (character string) and Lot No. (number)

4 (4): Prints out a 4-digit lot number. You can now set this under “LOT” in Setting mode.

6 (6): Prints out a 6-digit lot number. You can now set this under “LOT” in Setting mode.

NOT (not): Does not print out the lot number.

Dual comment

USE (USE): You can now select Start printout 2 and End printout 2 in Setting mode’s Mode.

NOT (not): There are no Start printout 2 and End printout 2 choices in Setting mode’s Mode.

Message Format

USE (USE): You can now set the message format using the RXA10-03 or RXA10-04 software (sold separately) or a communication command.

NOT (not): Message format settings cannot be entered.

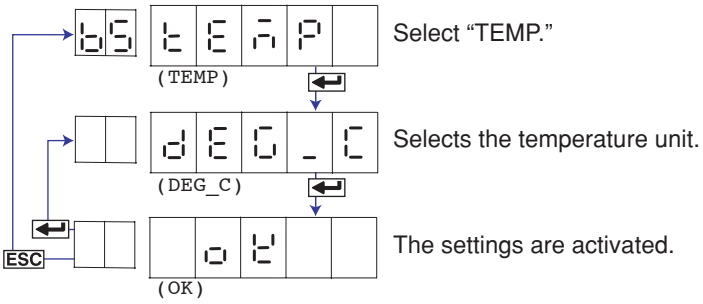
<Related Topics> Setting start printout and stop printout: Section 3.12
Setting batch comment switching: Section 4.18
Regarding the message format: Section 3.13

4.24 Changing the Temperature Unit

The unit of the temperature measured using the TC or RTD can be changed. Basic Setting mode cannot be entered when recording is in progress.

Procedure

1. Hold down the MENU key for 3 seconds to enter Setting mode.
2. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
3. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.



4. If you are done, press the **ESC** key.
5. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Temperature Unit

°C (dEG_C): Uses Celsius.
°F (dEG_F): Uses Fahrenheit.

5.1 A List of Error Messages

There are cases in which the LED displays an error code during operation. The error messages and their description are listed below.

Setting Errors

Code	Message Sent via Communication	Explanation/Countermeasures
001	System error.	Contact your nearest YOKOGAWA dealer.
002	Incorrect date or time setting.	Check the setting.
003	A disabled channel is selected.	The channel does not exist.
004	Incorrect function parameter.	Incorrect communication parameter.
005	The input numerical value exceeds the set range.	–
006	Incorrect input character string.	The entered character cannot be used.
007	Too many characters.	–
008	Incorrect input mode.	Incorrect range mode (Volt, TC, Scale, etc.) setting.
009	Incorrect input range code.	Incorrect range type (2 V, R, PT100, etc.) setting.
010	Format error.	Incorrect character string format.
011	Range settings are not same within the selected channels.	Channels whose range differs cannot be set simultaneously.
012	An invalid characters.	Contains an invalid character.
013	Ref. CH error.	Specify a channel whose range is set to voltage, TC, or RTD for the reference channel.
015	Too many characters for printout.	Too many characters in the message printout including measured values.
016	Too many characters for message.	Cannot enter a setting that exceeds the message string (16 characters).
021	Cannot set an alarm for a SKIPPED channel.	–
022	The upper and lower span limits are equal.	This is not allowed.
023	The upper and lower scale limits are equal.	This is not allowed.
024	The lower span limit is greater than the upper span limit.	–
025	The lower scale limit is greater than the upper scale limit.	–
026	Bias cannot be set to the SKIPPED channel.	–
027	Bias cannot be set to the DI channel.	–
030	The partial boundary value exceeds the range of the span.	–
031	Partial is invalid on the SKIPPED channel.	–
035	The upper and lower limits of the printing zone are equal.	Set the rightmost value of the zone – the leftmost value ≥ 5 mm.
036	The lower limit of the printing zone is greater than the upper limit.	Set the rightmost value of the zone – the leftmost value ≥ 5 mm.
037	The printing zone is narrower than the minimum width (5 mm).	Set the rightmost value of the zone – the leftmost value ≥ 5 mm.
038	Partial is invalid on the DI channel.	–
039	The bias and the calibration cannot be used simultaneously.	–
040	Datume value (1 >= 2)	Set the measured value of the first point less than that of the second point in the calibration correction.
041	Datume value (n-1 > n)	Set the measured value of the $n-1^{th}$ point less than or equal to that of the n^{th} point in the calibration correction.
042	Revise value (n-1 >= n)	Set the correction value of the $n-1^{th}$ point less than that of the n^{th} point in the calibration correction.

Code	Message Sent via Communication	Explanation/Countermeasures
048	Start = Finish.	The DST start time and end time cannot be set to the same time.
049	Invalid or missing DST time settings.	Since the time gains one hour when the DST starts, the set-up time does not exist.
081	All space or 'quit' string cannot be specified.	–
086	The key-lock release password is incorrect.	Enter the correct password.
087	This key is locked.	–
091	Password is incorrect.	Enter the correct password.
100	IP address doesn't belong to class A, B, or C.	–
101	The result of the masked IP address is all 0s or 1s.	–
102	SUBNET mask is incorrect.	Set a correct subnet mask.
103	The net part of default gateway is not equal to that of IP address.	Set the correct default gateway.
161	This action is invalid during pen hold.	–
163	This action is invalid during record.	–
164	This action is invalid during manual printing.	–
165	This action is invalid during list printing.	–
166	This action is invalid during setup list printing.	–
167	This action is invalid during chart feed.	–
169	This action is invalid during ribbon hold.	–
170	This action is invalid during priority remote record.	Recording stop via communications or key operation cannot be accepted under the current settings. Perform the Stop using the remote control function.
171	This action is invalid during batch.	Cannot enter Basic Setting mode during header printout (until End printout is finished).

Operation Errors

Code	Message Sent via Communication	Explanation/Countermeasures
232	There is no available data.	There is no data for periodic printout or data for calculating TLOG when the timer expired.

Communication Errors

Code	Message Sent via Communication	Explanation/Countermeasures
300	Command is too long.	–
301	Too many number of commands delimited with ';'.	Keep the number of commands separated by sub delimiters under 10.
302	This command has not been defined.	–
303	Data request command can not be enumerated with sub-delimiter.	–
350	Command is not permitted to the current user level.	–
351	This command cannot be specified in the current mode.	–
352	The option is not installed.	–
353	This command cannot be specified in the current setting.	–
390	Command error.	–
391	Delimiter error.	–
392	Parameter error.	–
393	No permission.	–
394	No such connection.	–
395	Use "quit" to close this connection.	Attempted to disconnect its own connection.

Code	Message Sent via Communication	Explanation/Countermeasures
396	Failed to disconnect.	–
397	No TCP control block.	The control block of the specified connection cannot be found.
400	Input username.	–
401	Input password.	–
402	Select username from ‘admin’ or ‘user’.	If the recorder is configured not to use the user name and password, use user names ‘admin’ or ‘user’.
403	Login incorrect, try again!	–
404	No more login at the specified level is acceptable.	–
420	Connection has been lost.	–
421	The number of simultaneous connection has been exceeded.	–
422	Communication has timed-out.	–

Warning Messages

Code	Message Sent via Communication	Explanation/Countermeasures
600	Initialized.	Settings and measured data have been initialized.

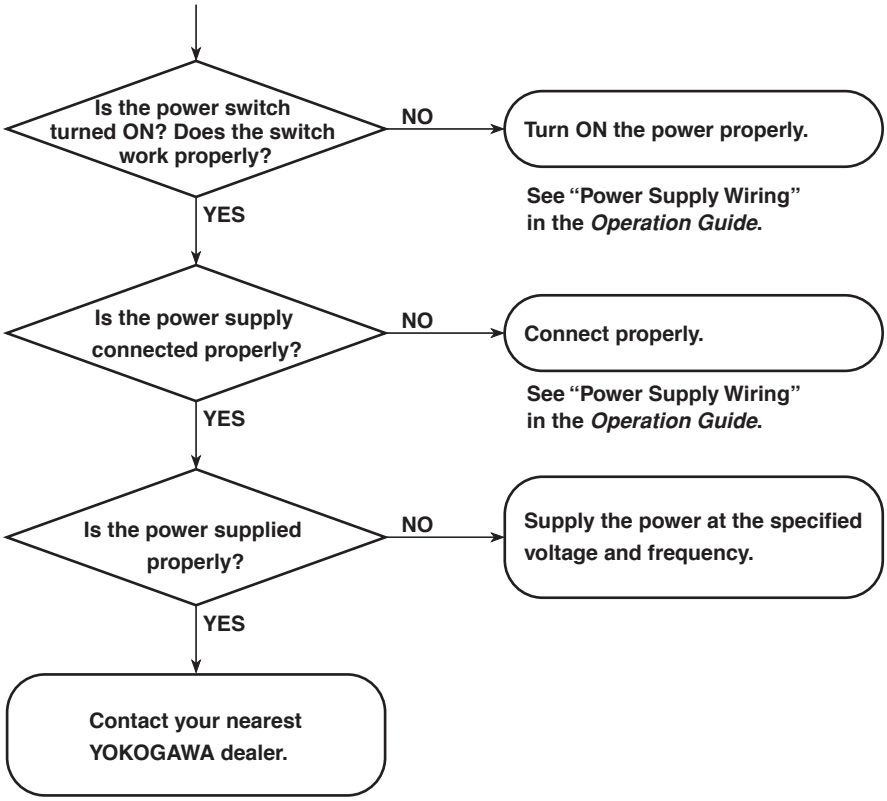
System Errors

Code	Message Sent via Communication	Explanation/Countermeasures
902	RAM failure.	Contact your nearest YOKOGAWA dealer.
910	A/D error.	Contact your nearest YOKOGAWA dealer.
921	A/D calibration value error.	Contact your nearest YOKOGAWA dealer.
922	A/D calibration is in the wrong order.	Contact your nearest YOKOGAWA dealer.
930	Memory acquisition failure.	Contact your nearest YOKOGAWA dealer.
940	The ethernet module is down.	Contact your nearest YOKOGAWA dealer.
950	A/D number error.	Contact your nearest YOKOGAWA dealer.
951	EEPROM write error.	Contact your nearest YOKOGAWA dealer.
960	Ribbon error	Contact your nearest YOKOGAWA dealer.
961	Printer error	Contact your nearest YOKOGAWA dealer.
962	Plotter error	Contact your nearest YOKOGAWA dealer.
963	Pen 1 error	Contact your nearest YOKOGAWA dealer.
964	Pen 2 error	Contact your nearest YOKOGAWA dealer.
965	Pen 3 error	Contact your nearest YOKOGAWA dealer.
966	Pen 4 error	Contact your nearest YOKOGAWA dealer.

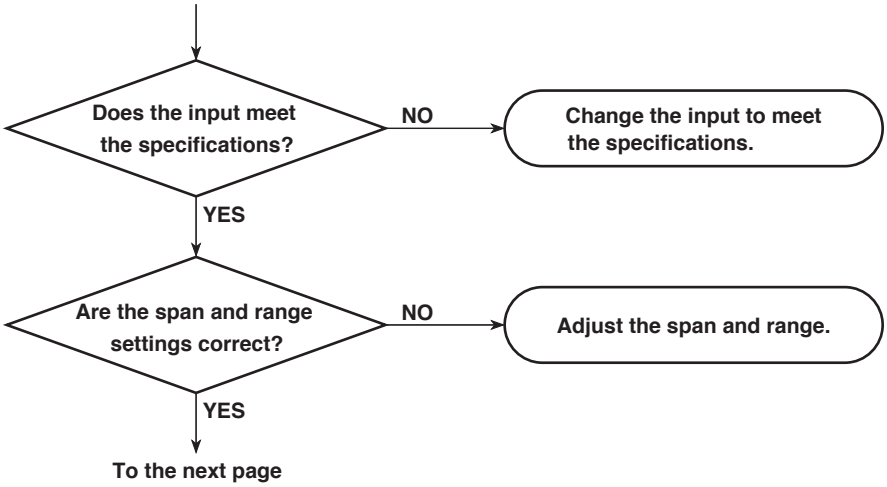
5.2 Troubleshooting Flow Charts

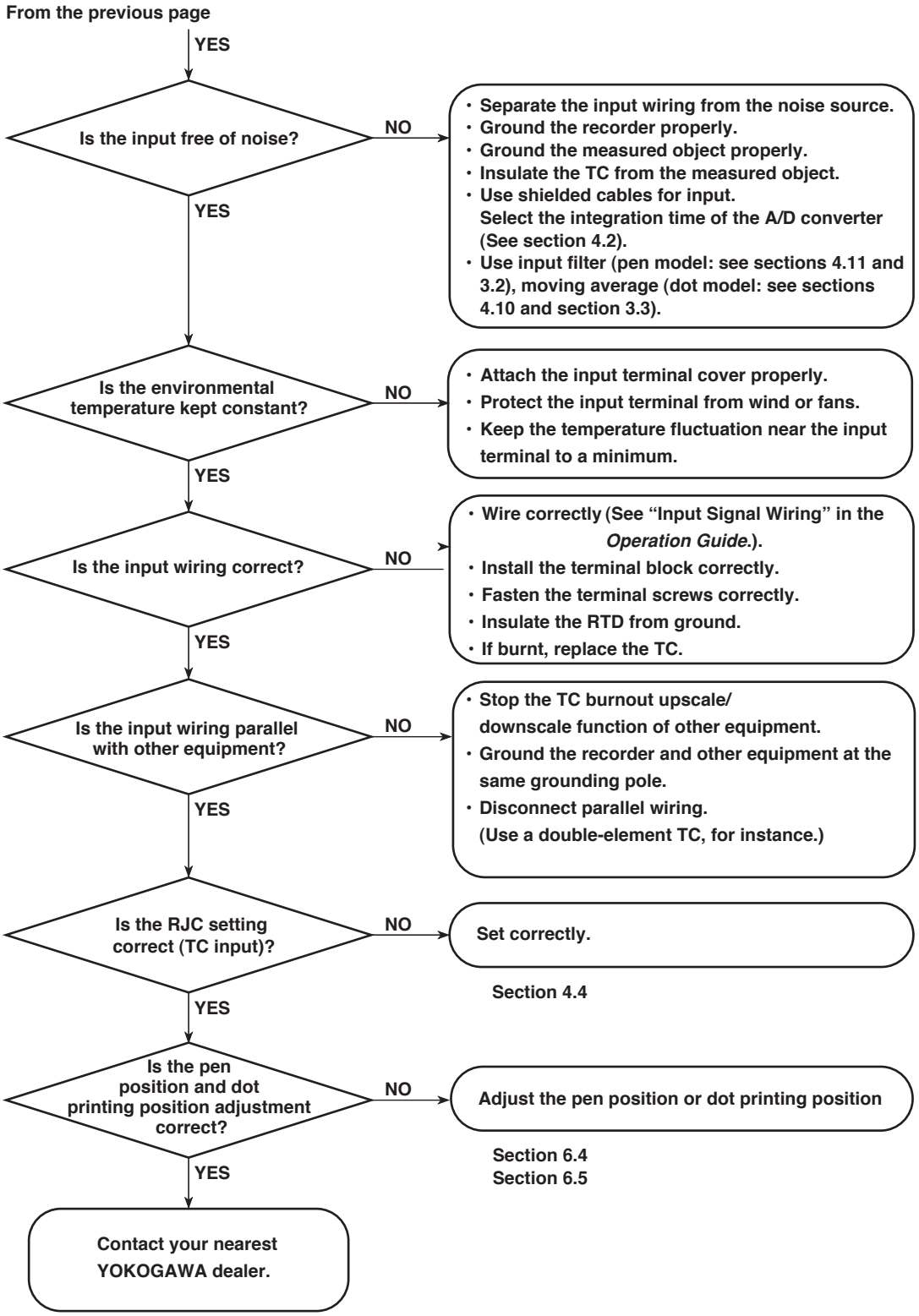
Follow the flow charts to correct the problem.

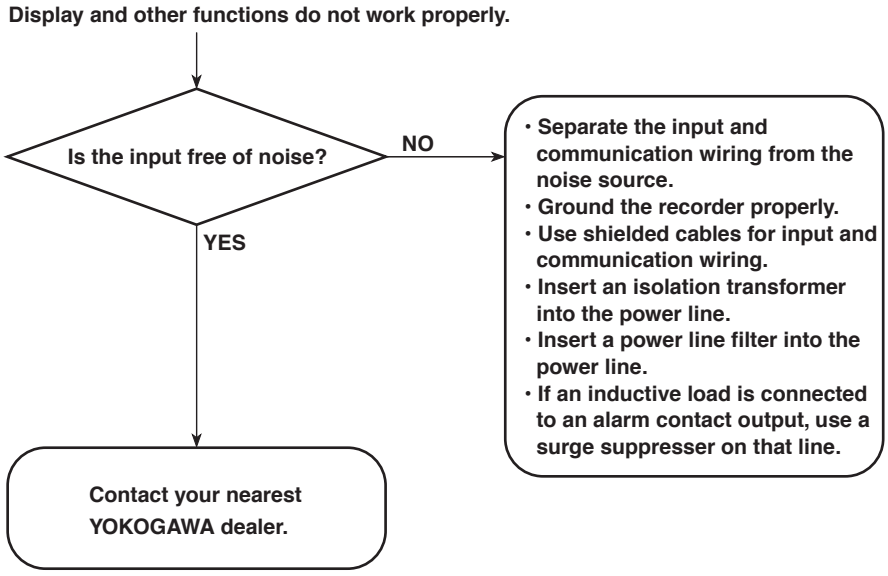
Nothing works (pen and chart paper do not move).

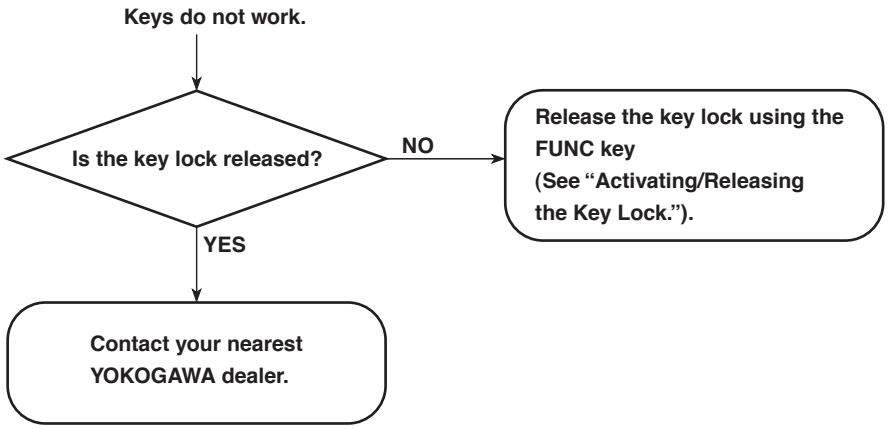


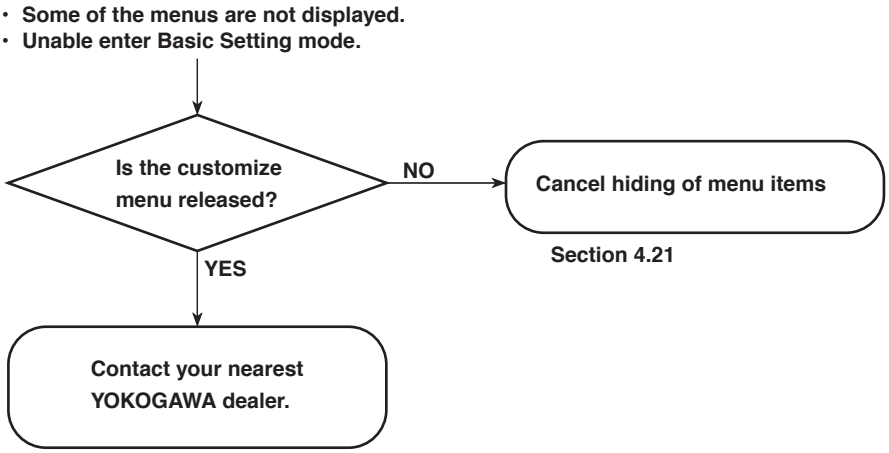
- **The reading error is large.**
- **The indication is unstable.**
- **The pen is off the scale on either the 0% or 100% side.**




From the previous page
YES
Is the input free of noise?
NO
・Separate the input wiring from the noise source.
・Ground the recorder properly.
・Ground the measured object properly.
・Insulate the TC from the measured object.
・Use shielded cables for input.
Select the integration time of the A/D converter (See section 4.2).
・Use input filter (pen model: see sections 4.11 and 3.2), moving average (dot model: see sections 4.10 and section 3.3).
YES
Is the environmental temperature kept constant?
NO
・Attach the input terminal cover properly.
・Protect the input terminal from wind or fans.
・Keep the temperature fluctuation near the input terminal to a minimum.
YES
Is the input wiring correct?
NO
・Wire correctly (See "Input Signal Wiring" in the *Operation Guide*.).
・Install the terminal block correctly.
・Fasten the terminal screws correctly.
・Insulate the RTD from ground.
・If burnt, replace the TC.
YES
Is the input wiring parallel with other equipment?
NO
・Stop the TC burnout upscale/ downscale function of other equipment.
・Ground the recorder and other equipment at the same grounding pole.
・Disconnect parallel wiring.
(Use a double-element TC, for instance.)
YES
Is the RJC setting correct (TC input)?
NO
Set correctly.
Section 4.4
YES
Is the pen position and dot printing position adjustment correct?
NO
Adjust the pen position or dot printing position
Section 6.4
Section 6.5
YES
Contact your nearest YOKOGAWA dealer.


Display and other functions do not work properly.
Is the input free of noise?
NO
YES
• Separate the input and communication wiring from the noise source.
• Ground the recorder properly.
• Use shielded cables for input and communication wiring.
• Insert an isolation transformer into the power line.
• Insert a power line filter into the power line.
• If an inductive load is connected to an alarm contact output, use a surge suppresser on that line.
Contact your nearest YOKOGAWA dealer.

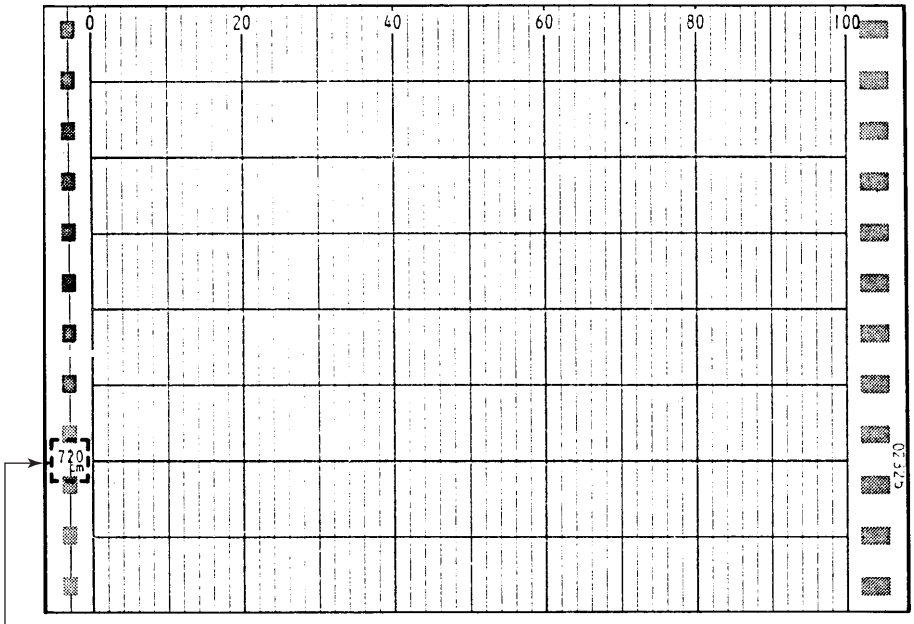

Keys do not work.
Is the key lock released?
NO
YES
Release the key lock using the FUNC key (See "Activating/Releasing the Key Lock.").
Contact your nearest YOKOGAWA dealer.


• Some of the menus are not displayed.
• Unable enter Basic Setting mode.
Is the customize menu released?
NO
YES
Cancel hiding of menu items
Section 4.21
Contact your nearest YOKOGAWA dealer.

6.1 Periodic Inspection

Check the operation periodically to keep the recorder in good working order.
Perform the following checks and replace worn parts as needed.

- Is the indication and recording functioning properly? If not, see chapter 5.
- Are recorded lines or printed characters clear (not blurred)?
  On the pen model, replace the felt pens and plotter pens. On the dot model, replace the ribbon cassette. For the procedure, see “Preparing to Record” in the *Operation Guide.*
- Is the chart paper feeding properly (no paper jams)? If not, see chapter 5.
- Is there enough chart paper remaining?
  Remaining chart length is printed on the left margin of the chart at intervals of 20 cm. For the replacement procedure of the chart paper, see “Preparing to Record” in the *Operation Guide*.



Remaining amount of chart paper

6.2 Cleaning the Recorder

CAUTION

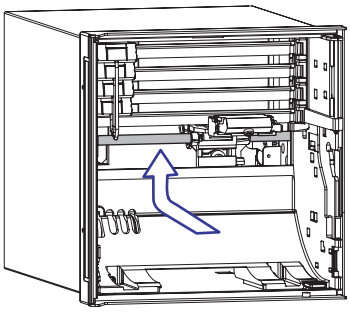
- When cleaning, be sure not to scratch the flexible printed circuit board of the plotter carriage.
- Do not apply lubricating oil to the shaft.

Pen Model

To maintain smooth operation, it is recommended that the plotter carriage shaft be cleaned once a year.

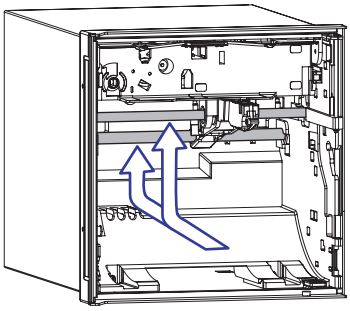
Cleaning Procedure

Wipe the dust off the plotter carriage shaft using a soft lint-free cloth or paper.
If the dirt does not come off easily, apply ethyl alcohol to the cloth or paper.



Dot Model

To maintain smooth operation, wipe the dust off the two shafts of the printer carriage using a soft lint-free cloth or paper. It is recommended that these shafts be cleaned once a year.



6.3 Calibrating the Recorder

Calibrate the measured value against the input.
It is recommended that the recorder be calibrated once a year to assure its measurement accuracy.
For details regarding calibration, contact your nearest YOKOGAWA dealer.

Required Instruments

A calibration instrument with appropriate resolution is required for calibrating the recorder.

Recommended Instrument

- DC voltage standard: Model 5520A by FLUKE or equivalent
  Main Specifications
  Output accuracy: ±(0.005% + 1 μV)
- Decade resistance box: Yokogawa Meters & Intruments Model 2793-01 or equivalent
  Main Specifications
  Accuracy of output range 0.1 to 500 Ω: ±(0.01% + 2 mΩ)
  Resolution: 0.001 Ω
- 0°C standard temperature device: ZC-114/ZA-10 by Coper Electronics or equivalent
  Main Specifications
  Standard temperature stability accuracy: ±0.05°C

For information on purchasing the calibration instruments, contact your nearest YOKOGAWA dealer.

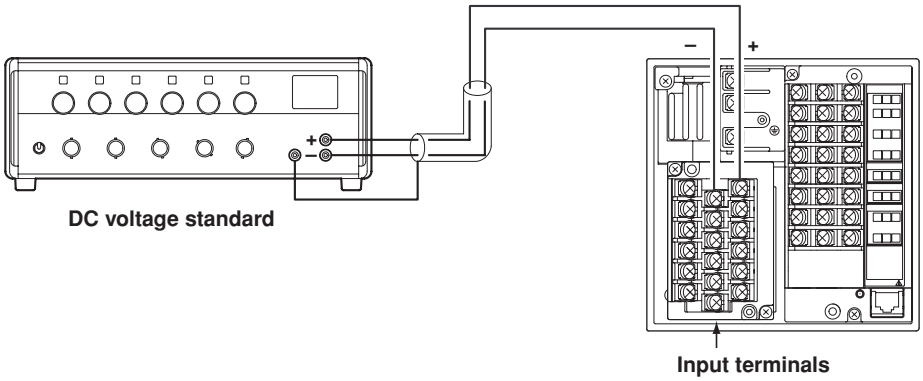
Calibration Procedure

1. Wire the recorder and the calibration instrument as shown in the following figure, and adequately warm up the instruments (the warm-up time of the recorder is at least 30 minutes).
2. Check that the operating environment such as ambient temperature and humidity is within the normal operating conditions (see section 7.6).
3. Apply appropriate input signals corresponding to 0%, 50%, and 100% of the input range and calculate the errors from the readings.
   If the error is outside the accuracy specifications, contact your nearest YOKOGAWA dealer.

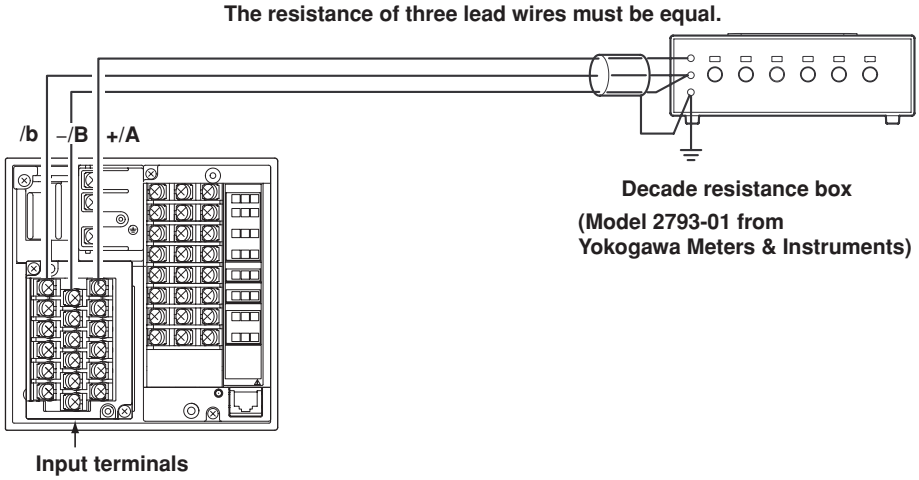
Note

For thermocouple inputs, you must measure the temperature of the input terminal and apply a voltage taking into account the reference junction temperature.

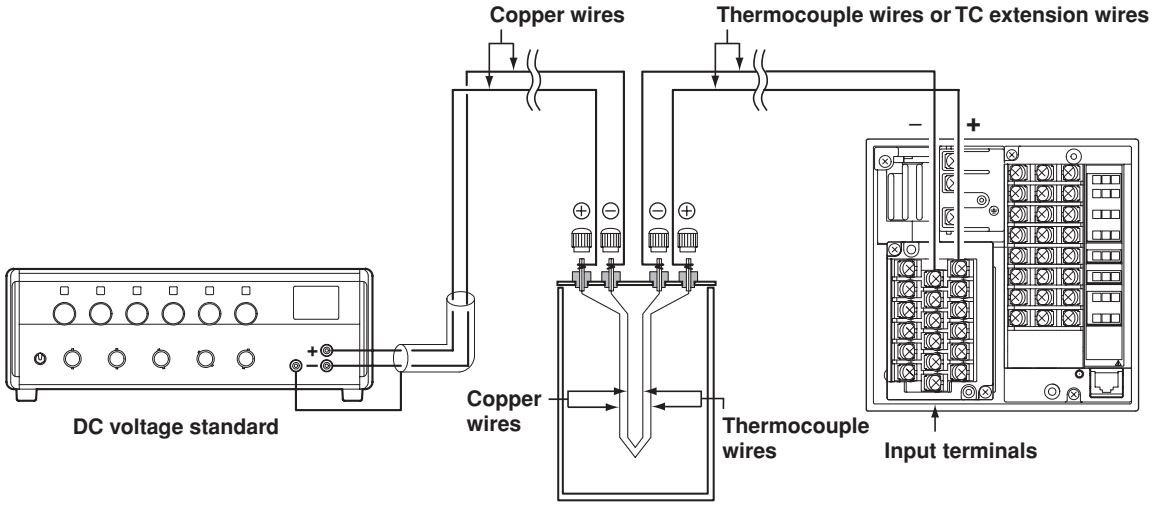
DC Voltage Measurement



Temperature Measurement When Using an RTD



Temperature Measurement When Using a Thermocouple



(0°C standard temperature device ZC-114/ZA-10 by Coper Electronics)

RJC of TC input

As the measurement terminal of the recorder is generally at room temperature, the actual output of the thermocouple is different from the values given on the thermoelectromotive force table based on 0°C. The recorder performs compensation by measuring the temperature at the input terminal and adding the corresponding thermoelectromotive force to the actual output of the thermocouple. Therefore, when the measurement terminal is shorted (equivalent to the case when the detector tip is 0°C), the measured value indicates the temperature of the input terminal.

When calibrating the recorder, this compensation voltage (thermoelectromotive force of 0°C reference corresponding to the input terminal temperature) must be subtracted from the output of the DC voltage standard before application. As shown in the figure, by using the 0°C standard temperature device to compensate the reference junction at 0 °C, you can input the thermoelectromotive force of 0 °C reference from the DC voltage standard and perform the calibration.

6.4 Adjusting the Pen Position (Pen Model)

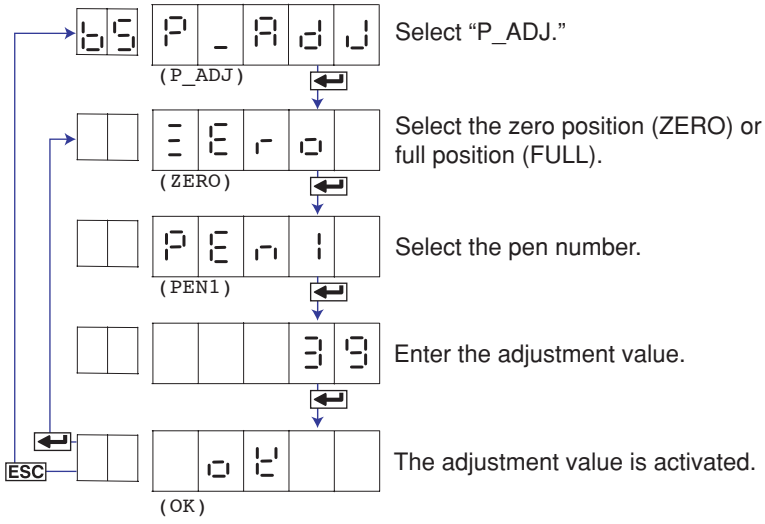
The pen position on the chart paper can be adjusted.
It is recommended that the position be adjusted once a year to assure its recording accuracy.

Note

Pen position is adjusted under standard operating conditions when the recorder is shipped from the factory. Because the chart paper may expand or contract depending on the environment in which the recorder is used, it is recommended that the position be readjusted before use.

Procedure

1. Warm up the recorder for at least 30 minutes.
2. Check that the operating environment such as ambient temperature and humidity is within the standard operating conditions (see section 7.6).
3. Hold down the MENU key for 3 seconds to enter Setting mode.
4. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
5. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   To change the polarity, press the △ or ▽ key when the leftmost digit of the value is blinking.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.
6. Adjust the zero position first and then the full position.
   Increase or decrease the setting to align pen position with the scale line on the chart paper.



7. To repeat the setup, press the ↵ key.
   If you are done, press the **ESC** key.
8. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Zero position (ZERO): Left edge of the chart paper
Full position (FULL): Right edge of the chart paper

PEN 1 to PEN4: Pen number 1 to 4

Adjustment

Zero position: 00 to 70, full position: –45 to 15
A value change of 1 corresponds to 0.033 mm change in the pen position. Decreasing the value moves the pen to the left and increasing the value moves the pen to the right.

Note

The procedure is different when the customized menu is enabled.

- **When "P-ADJ" of the customized menu is ON**
  Carry out steps 1 to 4 in "Adjusting the Pen Position."
  Select "FREE" and press the ↵ key to display "P-ADJ."
  Carry out the steps beginning with 5 in "Adjusting the Pen Position."
- **When "P-ADJ" of the customized menu is OFF**
  See "Releasing the Customized Menu" or "Changing the Settings without Releasing the Basic Setting Mode Lock."

<Related Topics> Releasing the customized menu: Section 4.21
Changing the settings without releasing the basic setting mode lock: Section 4.21

6.5 Adjusting the Dot Printing Position (Dot Model)

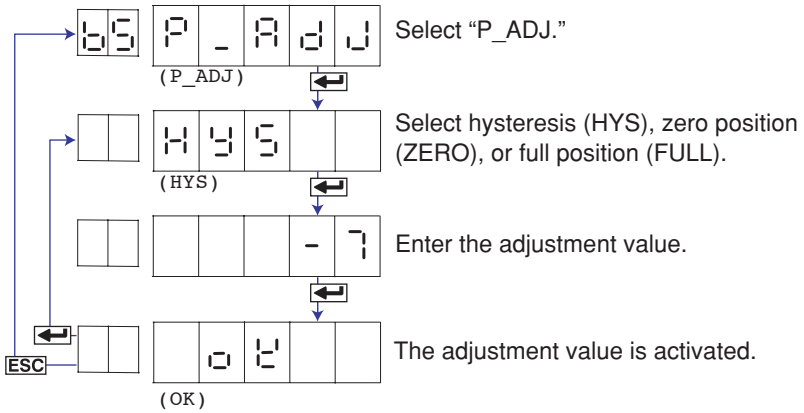
The dot printing position on the chart paper can be adjusted. Adjust the hysteresis, the zero position, and then the full position.
It is recommended that the position be adjusted once a year to assure its recording accuracy.

Note

Dot printing position is adjusted under standard operating conditions when the recorder is shipped from the factory. Because the chart paper may expand or contract depending on the environment in which the recorder is used, it is recommended that the position be readjusted before use.

Procedure

1. Warm up the recorder for at least 30 minutes.
2. Check that the operating environment such as ambient temperature and humidity is within the standard operating conditions (see section 7.6).
3. Hold down the MENU key for 3 seconds to enter Setting mode.
4. Hold down the △ and ▷ keys simultaneously for 3 seconds to display the Basic Setting mode screen.
5. Carry out the procedure shown in the figure below.
   Press the △ or ▽ key to select the value.
   For the procedure on how to enter values or characters, see page 19 in the *Operation Guide*.
   To change the polarity, press the △ or ▽ key when the leftmost digit of the value is blinking.
   If you press the **ESC** key, the operation is cancelled, and the display returns to a higher level menu.
6. Hysteresis: Increase or decrease the setting so that the dots printed out on the chart paper form a single straight line.
   Zero and full positions: Increase or decrease the setting to align the line with the scale line on the chart paper.



7. If you are done, press the **ESC** key.
8. To return to the Operation mode,
   1. Press the **ESC** key, use the △ or ▽ key to select End, and press the ↵ key.
   2. Press the △ or ▽ key to select StorE or Abort, and press the ↵ key.

Explanation

Hysteresis (HYS): Center of the chart paper
Zero position (ZERo): Left edge of the chart paper
Full position (FULL): Right edge of the chart paper

Hysteresis Adjustment

Adjustment: –7 to 7

A single line is drawn on the chart paper. If the line appears as shown in Figure a, increase the displayed setting. If the line appears as shown in Figure b, decrease the displayed setting.

Repeat this procedure until the line becomes straight.

A value change of 1 corresponds to 0.1 mm change in the dot printing position.

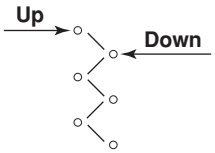


Figure a

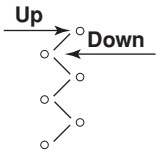


Figure b

Zero Position and Span Adjustment

Adjustment

Zero position: 00 to 15, full position: –45 to 15

A value change of 1 corresponds to 0.1mm change in the dot printing position.

Decreasing the value moves the line to the left and increasing the value moves the line to the right.

Note

The procedure is different when the customized menu is enabled.

- **When "P-ADJ" of the customized menu is ON**
  Carry out steps 1 to 4 in "Adjusting the Dot Printing Position."
  Select "FREE" and press the ↵ key to display "P-ADJ."
  Carry out the steps beginning with 5 in "Adjusting the Dot Printing Position."
- **When "P-ADJ" of the customized menu is OFF**
  See "Releasing the Customized Menu" or "Changing the Settings without Releasing the Basic Setting Mode Lock."

<Related Topics> Releasing the customized menu: Section 4.21
Changing the settings without releasing the basic setting mode lock: Section 4.21

7.1 Input Specifications

Number of Inputs and Scan Interval on the Pen Model

Item	Specifications
Number of inputs	1, 2, 3, or 4
Scan interval	125 ms

Number of Inputs and Scan Interval on the Dot Model

Item	Specifications
Number of inputs	6
Scan interval	1 s (when the integration time of the A/D converter is 20 ms or 16.7 ms) 2.5 s (when the integration time of the A/D converter is 100 ms)

Input Type

Item	Specifications
Input type	DC voltage, 1-5V, TC, RTD, DI (ON/OFF input), DC current (by adding an external shunt resistor)

Input Range and Measurable Range

Input	Range Type	Measurable Range	
Volt	20 mV	–20.00 to 20.00 mV	
	60 mV	–60.00 to 60.00 mV	
	200 mV	–200.0 to 200.0 mV	
	2 V	–2.000 to 2.000 V	
	6 V	–6.000 to 6.000 V	
	20 V	–20.00 to 20.00 V	
	50 V	–50.00 to 50.00 V	
	1-5V	(0.800 to 1.200 V range) to (4.800 to 5.200 V range)	
TC	R[1]	0.0 to 1760.0°C	32 to 3200°F
	S[1]	0.0 to 1760.0°C	32 to 3200°F
	B[1]	0.0 to 1820.0°C	32 to 3308°F
	K[1]	–200.0 to 1370.0°C	–328 to 2498°F
	E[1]	–200.0 to 800.0°C	–328.0 to 1472.0°F
	J[1]	–200.0 to 1100.0°C	–328.0 to 2012.0°F
	T[1]	–200.0 to 400.0°C	–328.0 to 752.0°F
	N[1]	0.0 to 1300.0°C	32 to 2372°F
	W[2]	0.0 to 2315.0°C	32 to 4199°F
	L[3]	–200.0 to 900.0°C	–328.0 to 1652.0°F
	U[3]	–200.0 to 400.0°C	–328.0 to 752.0°F
	WRe[4]	0.0 to 2400.0°C	32 to 4352°F
RTD	PT (Pt100)[5]	–200.0 to 600.0°C	–328.0 to 1112.0°F
	JPT (JPt100)[5]	–200.0 to 550.0°C	–328.0 to 1022.0°F
DI	Level	0: Less than 2.4 V, 1: Greater than or equal to 2.4 V Within ±6 V	
	Contact	0: Open, 1: Closed	

1 R, S, B, K, E, J, T, N: IEC584-1 (1995), DIN IEC584, JIS C1602-1995
2 W: W-5% Re/W-26% Re (Hoskins Mfg. Co.), ASTM E988
3 L: Fe-CuNi, DIN43710, U: Cu-CuNi, DIN43710
4 WRe: W-3%Re/W-25%Re (Hoskins Mfg. Co.)
5 Pt100: JIS C1604-1997, IEC751-1995, DIN IEC751-1996
JPt100: JIS C1604-1989, JIS C1606-1989
Measurement current: i = 1 mA (Pt100, JPt100)

Item	Specifications
Input type	Floating unbalanced input. Isolation between channels (except, b terminal is shared for RTD input).
Burnout Detection of TC	Can be set for each channel. Upscale/Downscale switchable.

Input Type	Operating Conditions
TC input	2 kΩ or less: normal, 10 MΩ or more: burnout, detection current: approx. 10 μA
1-5V input	0.2 V or less: burnout

RJC of TC input	Set whether to use the recorder RJC function or an external RJC function for each channel. Set the compensation voltage when using an external RJC function. Compensation voltage range: –19999 μV to 20000 μV.
A/D converter	
Resolution	16 bits
Integration time	Pen model: Selectable from 20 ms (50 Hz), 16.7 ms (60 Hz), and Auto (auto switch between 20 ms and 16.7 ms according to the power supply frequency). Dot model: Selectable from 20 ms (50 Hz), 16.7 ms (60 Hz), 100 ms and Auto (auto switch between 20 ms and 16.7 ms according to the power supply frequency).
Filter function (pen model)	Filter ON/OFF switchable for each channel. Time constant selectable from 2, 5, and 10 s.
Moving average function (dot model)	Moving average ON/OFF switchable for each channel. The number of samples of the moving average is selectable between 2 and 16.

Input Computation

Item	Specifications
Delta computation	Calculates the difference between two channel inputs using the following equation. Delta = (the input value of the channel set to delta computation) – (the input value of the reference channel) where (reference channel NO.) < (channel No. set to delta computation). Computable input type: DC voltage, TC, and RTD. The channel set to delta computation and the reference channel is set to the same range type.
Linear scaling	Scales the input value to a value with a unit suitable for the application. Computable input type: DC voltage, TC, RTD, DI Value after scaling Mantissa: –19999 to 30000 Decimal position: Can be set arbitrarily Unit: Can be set arbitrarily (up to 6 characters) Displayable and printable range –19999 to 31500
Computation on the 1-5V input	
Linear scaling	Linearly scales the 1-5V signal. Value after scaling: Same as linear scaling. Displayable and printable range: Same as linear scaling.
Low-cut function	Sets values below 0% of the recording span to the leftmost value of the scale. The leftmost value of scale must be less than the rightmost value of scale.
Square root computation	Takes the square root of the input value and linearly scales the result. Computable input type: DC voltage
Linear scaling	Value after scaling: Same as linear scaling. Displayable and printable range: Same as linear scaling.
Low-cut function	Sets values below the low-cut point to the leftmost value of scale. The leftmost value of scale must be less than the rightmost value of scale. Low-cut point range: 0.0 to 5.0% of the recording span (0.1% steps)
Bias	Adds a bias to the measuring input value. Bias value range: ±10% of the span of the measurable range at the specified range type. ±10% of the scaling span if linear scaling is used.

7.2 Alarm Function Specifications

Item	Specifications
Number of alarms	Up to four alarms (level) for each measurement channels.
Alarm type	High limit (H), low limit (L), difference high limit (h), and difference low limit (l). The symbol indicating the alarm is given in parentheses.
Hysteresis	Set a width to the value for detecting alarm occurrence/release (common to all channels and all levels) Applied to high limit alarm and low limit alarm. Hysteresis range: Approx. 0.0% to 1.0% of the recording span (0.1% steps)
Display	Indicates the alarm occurrence status on the display. Display for each channel: Displays the alarm type (display precedence: H, L, h, and l). Alarm summary display: The ALM indicator illuminates.
Alarm relay contact output (optional specifications)	See section 7.5

7.3 Recording Function Specifications

Trend Recording (Pen Model)

Item	Specifications
Recording pen	Disposable felt pen
Step response time	Approx. 1 s (using the IEC61143 measurement method)
Number of pens	Up to 4
Recording color	Pen 1: Red, pen 2: Green, pen 3: Blue, pen 4: Violet
Trend recording	Updates the data at the scan interval. Continuous recording.
Pen offset compensation	Records by compensating for the offset of each pen along the time axis.
Chart speed	10 to 12000 mm/h (40 steps).
Zone recording	Recording zone can be specified for each channel. Recording width: 5 mm or more (1 mm steps)
Partial expanded recording	Records by expanding the right or left side of the boundary position (the other section is reduced). Boundary position: 1 to 99% Boundary value: Within the recording span range

Trend Recording (Dot Model)

Item	Specifications
Recording method	Trend recording by a 6-color wire dot printer
Recording color	Channel 1: Purple, channel 2: Red, channel 3: Green, channel 4: Blue, channel 5: Brown, channel 6: Black
Trend recording interval	Records at the following interval through a raster scan system. AUTO: Synchronizes to the chart speed and automatically sets to the interval FIX: 10 s/6 channels
Chart speed	10 to 1500 mm/h (28 steps)
Recording ON/OFF	Recording can be turned ON/OFF for each channel.
Zone recording	Same as the pen model.
Partial expanded recording	Same as the pen model.

Chart Paper

Item	Specifications
Printing width	100 mm
Type/Length	Z-fold type. Approx. 16 m.
Chart paper feeding accuracy	Within ±0.1% After feeding 1000 mm and with respect to the print scale on the chart paper.

Printouts (Pen Model)

Item	Specifications
Recording pen (color)	Plotter pen (purple)
Alarm printout	Prints alarm occurrence/release.
Printout contents	Occurrence (△)/release (▽) marks, channel No. or tag, alarm type, alarm level, time, printout buffer overflow mark.
Time printout format	Selectable from hour:minute, hour:minute:second, month:day:hour:minute, month:day:hour:minute:second, and year:month:day:hour:minute:second.
Alarm printout buffer	Stores 8 occurrences of alarm information waiting to be printed.
Periodic printout	Prints at specified time intervals from the reference time.
Interval (see appendix 1)	Reference time: 00 hour 00 minute to 23 hour 00 minute (1 hour steps, minute fixed) Auto: Automatically determined from the chart speed. Manual: Select 10 min, 12 min, 15 min, 20 min, 30 min, 1 hour, 2 hours, 3 hours, 4 hours, 6 hours, 8 hours, 12 hours, or 24 hours.
Mode	Select no periodic printout or print instantaneous values.
Printout contents	Date/Time, offset compensation ON/OFF, channel information (measured value, alarm status, unit, delta computation ON/OFF, scale, channel number or tag, recording color), chart speed (with time ticks)
Message printout	Prints preset message strings.
Number of messages	5
Printout contents	Time, message (up to 16 characters), printout buffer overflow mark.
Time printout format	Selectable from hour:minute, hour:minute:second, month:day:hour:minute, month:day:hour:minute:second, year:month:day:hour:minute:second, and not print.
Message printout buffer	Stores 5 messages waiting to be printed.
Recording start printout	Prints at the start of recording.
Printout contents	Time and chart speed, printout buffer overflow mark.
Time printout format	Selectable from hour:minute, hour:minute:second, month:day:hour:minute, month:day:hour:minute:second, and year:month:day:hour:minute:second.
New chart speed printout	Prints when the chart speed is changed.
Printout contents	Chart speed and time, printout buffer overflow mark.
Time printout format	Selectable from hour:minute, hour:minute:second, month:day:hour:minute, month:day:hour:minute:second, and year:month:day:hour:minute:second.
Manual printout	Prints the measured values of all channels.
Printout contents	Measured values of all channels at that point. Trend recording is temporarily suspended.
Setting printout (List)	Prints the settings of items in Setting mode.
Printout contents	Range setting, alarm setting, etc. Trend recording is temporarily suspended.
Setting printout (setup list)	Prints the settings of items in Basic Setting mode.
Printout contents	Basic alarm specifications, basic recording specifications, etc. Trend recording is temporarily suspended.
Items dependent on the chart speed	

Chart speed	Periodic printout Alarm printout Message printout Recording start printout New chart speed printout
10 to 1500 mm/h	Printed
1800 mm/h or higher	Not printed

Chart speed	Periodic printout interval
10 to 15 mm/h	8 hours
20 to 30 mm/h	4 hours
40 to 60 mm/h	2 hours
75 to 120 mm/h	1 hour
150 to 180 mm/h	30 minutes
200 to 300 mm/h	20 minutes
360 to 1500 mm/h	10 minutes

Date printout format	Select the printout format of the date from Y/M/D, M/D/Y, D/M/Y, D.M.Y, and M.D.Y. The format applies to the date printout of all printout items .

Printout (Dot Model)

Item	Specifications
Recording	Dot printing.
Channel printout	Prints the channel number beside the trend recording every approx. 25 mm of chart paper. Channel printout ON/OFF selectable.
Alarm printout	Prints alarm occurrence/release.
Printout contents	Occurrence (△, red)/release (▽, blue) marks, channel No. or tag, alarm type, alarm level, time, printout buffer overflow mark.
Time printout format	Selectable from hour:minute, hour:minute:second, month day hour:minute, month day hour:minute:second, and month day year hour:minute:second.
Alarm printout buffer	Stores 12 occurrences of alarm information waiting to be printed.
Periodic printout	Prints at specified time intervals from the reference time.
Interval (see appendix 1)	Same as the pen model.
Measured value	Same as the pen model.
Printout contents	Same as the pen model except offset compensation ON/OFF and recording color are not printed.
Message printout	Same as the pen model.
Recording start printout	Same as the pen model. With time ticks.
New chart speed printout	Same as the pen model. With time ticks.
Manual printout	Same as the pen model.
Setting printout (List)	Same as the pen model.
Setting printout (Setup)	Same as the pen model.

Items dependent on the chart speed

Chart speed	Channel printout	Periodic printout Alarm printout Message printout Recording start printout New chart speed printout
10 to 100 mm/h	Printed	Printed
120 mm/h or higher	Not printed	Not printed

Chart speed	Periodic printout interval
10 to 15 mm/h	8 hours
20 to 30 mm/h	4 hours
40 to 75 mm/h	2 hours
80 to 100 mm/h	1 hour

Date printout format	Same as the pen model.

Values for Special Measured Values
Same as “Special values” for the digital display on page 7-7.

7.4 Display Function Specifications

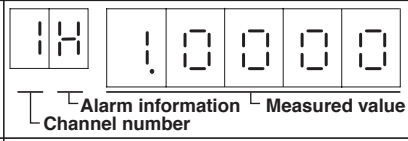
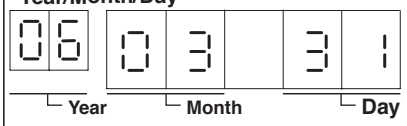
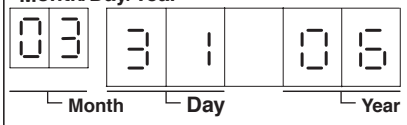
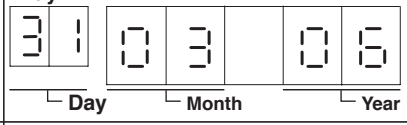
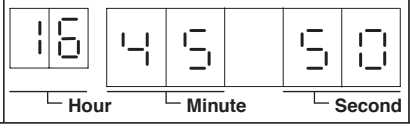
Display and Displayed Contents

This section explains the specifications of the display functions of measurement channels. Display examples are illustrations used to explain the displayed contents and differ in appearance from the actual displays.

Item	Specifications
Display	7-segment LED (orange)
Number of screens	5 (switched using keys)
Displayed contents	
Display type	Digital display and channel ID alarm status display (automatically/manually switch the displayed channel) Date display Time display OFF
Display update of measured values / computed values	
When displayed channels are fixed	
	Dot model: Updated at the scan interval Pen model: Updated every 1 s
When displayed channels are automatically switched	
	Switches the channel/alarm status and measured value at 2-s intervals.
Status display	
RCD	This indicator turns ON when recording is started and turns OFF when stopped.
ALM	The indicator turns ON when an alarm occurs and turns OFF when the alarm is released.
Display type specifications	
Digital display	
Channel number (1st digit)	Displayed with 1 character as follows: Measurement channels: 1, 2, 3, 4, 5, 6
Alarm (2nd digit)	Displayed with the symbols below. If multiple alarms are occurring simultaneously, the alarm with higher precedence is shown. (Higher order of precedence) H, L, Hh, LL (lower order of precedence)
Measured value (3rd to 7th digits)	• DC voltage input: Displays values between “the min. measurable value – 5% of the span of the measurable range” and “the max. measurable value + 5% of the span of the measurable range” of the range (example: –2.200 to 2.200 V for the 2 V range). • TC and RTD input: Displays values for input values between “the min. measurable value – 10°C” and “the max. measurable value + 10°C” (example: –10.0°C to 1770.0°C for TC R) • ON/OFF input (DI): Displays the input value 0 or 1. • Linear scaling (1-5V, scaling, and square root): Displays value for input values between “the leftmost value of scale – 5% of scaling span” and “the rightmost value of scale + 5% of scaling span” (example: –5.0 to 105.0 when scaled to 0.000 to 100.0). However, the displayable range during scaling is from –19999 to 31500 (excluding the decimal). Values below –19999 and values above 31500 are displayed as –Over and +Over, respectively.

7.4 Display Function Specifications

Item	Specifications		
Special values	Measurement channel		
	Status	**Display**	**Description**
	+Over	OVER	See below.
	–Over	–OVER	See below.
	Skip	SKIP	A value for channels set to skip.
	Error	ERROR	Values such as when both the reference channel and measurement channel are +Over or –Over in delta computation.
	+Burnout	B.OUT	A value displayed when a burnout is detected on a channel set to burnout up scale.
	–Burnout	B.OUT	A value displayed when a burnout is detected on a channel set to burnout down scale.
	+Over and –Over of measurement channels A condition in which the value is outside the display range indicated in “Measured value or computed value” above. For example, • For 2 V range, values below –2.200 V are –Over and values over 2.200 V are +Over. • For TC R, values below –10.0°C are –Over and values over 1770.0°C are +Over. • If scaled to 0.0 to 100.0, values below –5.0 are –Over and values above 105.0 are +Over. However, the displayable range during scaling is from –19999 to 31500 (excluding the decimal). Values below –19999 and values above 31500 are displayed as –Over and +Over, respectively.		
Date/Time display	Displays the date or the time. The date display format can be selected. The format is common with the date printout format.		
Lights off	Displays nothing.		

Name	Display Example	Description
Digital Display		**Channel number. (1 digit), alarm (1 digit), and measured value (5 digits)**
Date display	**Year/Month/Day**  **Month/Day/Year**  **Day/Month/Year** 	**Displays the lower two digits for the year.**
Time display		

7.5 Specifications of Optional Functions

Alarm Output Relay (/A1, /A2, and /A3)

Item	Specifications
Operation	Outputs relay contact signals from the dedicated terminals on the rear panel when alarms occur.
Number of outputs	2 outputs (/A1), 4 outputs (/A2), 6 outputs (/A3)
Relay contact rating	250 VDC/0.1 A (for resistance load) 250 VAC (50/60 Hz)/3 A
Output format	NO-C-NC
Auxiliary functions	Energized/De-energized operation selectable (common to all relays) Reflash operation (Fixed to relay I01, I02, and I03. Relay release time is approx. 500 ms.)
Diagnosis output	Relay I01 can be used for diagnosis output. Diagnosis output: Outputs a relay signal when an error in the recording section (plotter on the pen model), a burnout, or an error in the A/D converter is detected. Relay operation is fixed to de-energized.

RS-422A/485 Communication Interface (/C3)

Item	Specifications
Connection	Complies with EIA RS-422A/485
Connection type	Multi-drop connection 1:32 (four-wire system), 1:31 (two-wire system)
Transmission mode	Half-duplex
Synchronization	Start-stop synchronization
Baud rate	1200, 2400, 4800, 9600, 19200, or 38400 bps
Start bit	Fixed to 1 bit
Data length	7 bits or 8 bits
Stop bit	Fixed to 1 bit
Parity	Odd, even, or none (no parity)
Received buffer length	2047 bytes
Escape sequence	Open and close
Protocol	Dedicated protocol, Modbus slave protocol
Communication mode	ASCII for input/output for control and setting ASCII or binary for input/output of measured data
Communication distance	1.2 km

Ethernet Communication Interface (/C7)

Item	Specifications
Function	
Setting/Measurement server	Uses a dedicated protocol Measured/computed data, setup data, status byte
Maintenance/Test server	Connection information, network statistics, etc.
Instrument information server	Model, serial number, etc.
Electrical and mechanical specifications	
	Conforms to IEEE 802.3.
Interface	Basic specifications Connection: Ethernet (10BASE-T) Protocol: TCP, IP, UDP, ICMP, and ARP The maximum number of simultaneous connections and the number of simultaneous use

Function Administrators	Maximum Number of Connections Users	Number of Simultaneous Users	Port Number
Setting/Measurement server	3	1	2 34260/tcp
Maintenance/Test server	1	1	1 34261/tcp
Instrument information server	-	-	- 34264/udp

Miscellaneous	
User authentication	Administrator: 1, users: 6 (limitations placed on users)
Keepalive	Drops the connection if there is no response to an inspection packet. Use or not use is selectable.

Green Display (/D6)

Item	Specifications
Color	1st digit (channel display) and 3rd to 7th digits (data display) of the 7- segment LED: Green 2nd digit (alarm display): Orange

Cu10, Cu25 RTD Input (/N1)

Item	Specifications
Cu10, Cu25 RTD	This option allows Cu10 and Cu25 inputs to be added to the standard input types.

Input type and measurable range

Input Type		Measurable Range
RTD (Measurement current i: 2 mA)	Cu10 (GE) Cu10 (L&N) Cu10 (WEED) Cu10 (BAILEY) Cu10: α = 0.00392 at 20°C Cu10: α = 0.00393 at 20°C Cu25*: α = 0.00425 at 0°C	–200 to 300°C –328.0 to 572.0°F

*** Measurement current i = 1 mA**

Measurement and recording accuracy

Input Type	Measurement Accuracy	Recording Accuracy
Cu10 (GE) Cu10 (L&N) Cu10 (WEED) Cu10 (BAILEY) Cu10: α = 0.00392 at 20°C Cu10: α = 0.00393 at 20°C	±(0.4% of rdg + 1.0°C)	Measurement accuracy ± (0.3% of recording span)
Cu25: α = 0.00425 at 0°C	±(0.3% of rdg + 0.8°C)	

Expansion Inputs (/N3)

Item	Specifications
Input type	Adds the input types shown in the table below.

Input Type		Measurement Range	
Thermocouple	PR40-20	0.0 to 1900.0°C	32 to 3452°F
	PLATINEL	0.0 to 1400.0°C	32 to 2552°F
	NiNiMo	0.0 to 1310.0°C	32 to 2390°F
	W/WRe26	0.0 to 2400.0°C	32 to 4352°F
	Type N (AWG14)	0.0 to 1300.0°C	32 to 2372°F
	Kp vs Au7Fe	0.0 to 300.0 K	
RTD (Measuring current i = 1 mA)	Pt25	–200.0 to 550.0°C	–328.0 to 1022.0°F
	Pt50	–200.0 to 600.0°C	–328.0 to 1112.0°F
	Ni100 (SAMA)	–200.0 to 250.0°C	–328.0 to 482.0°F
	Ni100 (DIN)	–60.0 to 180.0°C	–76.0 to 356.0°F
	Ni120	–70.0 to 200.0°C	–94.0 to 392.0°F
	J263*B	0.0 to 300.0 K	
	Cu53	–50.0 to 150.0°C	–58.0 to 302.0°F
	Cu100: α = 0.00425 at 0°C	–50.0 to 150.0°C	–58.0 to 302.0°F

Item	Specifications

Measurement and recording accuracy

Input Type		Measurement Accuracy	Recording Accuracy
PR40-20	0 to 450°C	Not warranted	Measurement accuracy ±(0.3% of recording span)
	450 to 750°C	±(0.9% of rdg + 3.2°C)	
	750 to 1100°C	±(0.9% of rdg + 1.3°C)	
	1100 to 1900°C	±(0.9% of rdg + 0.4°C)	
PLATINEL		±(0.25% of rdg + 2.3°C)	
NiNiMo		±(0.25% of rdg + 0.7°C)	
W/WRe26	0 to 400°C	±15.0°C or less	
	400 to 2400°C	±(0.2% of rdg + 2.0°C)	
Type N(AWG14)		±(0.2% of rdg + 1.3°C)	
Kp vs Au7Fe	0 to 20 K	±4.5 K	
	20 to 300 K	±2.5 K	
Pt25		±(0.15% of rdg + 0.6°C)	
Pt50		±(0.3% of rdg + 0.6°C)	
Ni100(SAMA)		±(0.15% of rdg + 0.4°C)	
Ni100(DIN)			
Ni120			
J263*B	0 to 40 K	±3.0 K	
	40 to 300 K	±1.0 K	
Cu53		±(0.15% of rdg + 0.8°C)	
Cu100		±(0.2% of rdg + 1.0°C)	

Note) No RJC for PR40-20 (fixed to 0°C)

Remote Control 5 Points (/R1)

Item	Specifications
Number of input terminals	5
Input type	Isolated from the main circuitry through a photocoupler, built-in isolated power supply for the input terminals, and shared common
Input type and signal level	
Voltage-free contact	Contact closed at 200 Ω or less and contact open at 100 kΩ or greater
Open collector	ON voltage: 0.5 V or less (sink current 30 mA or more), leakage current when OFF: 0.25 mA or less
Signal type	Edge, level, or trigger (250 ms or more)
Operation	Perform the following control operations by applying a given signal to the remote signal input terminal. • Start/stop recording (edge) • Set the clock (adjust the clock to the nearest hour with the contact input, trigger)

Time When Signal Is Input	Procedure
00 min 00 s to 01 min 59 s	Truncates the minutes and seconds. Example: 10:00:50 → 10:00:00
58 min 00 s to 59 min 59 s	Rounds up the minutes and seconds. Example: 10:59:50 → 11:00:00
02 min 00 s to 57 min to 59 s	No operation

- Manual printout (trigger)
- Message 1 to 5 printout (trigger)
- Switch the chart speed (level)
- Priority to remote Recording (/BT1 option) (edge)
- Batch comment switching (/BT1 option) (level)

24-VDC/AC Power Supply Operation (/P1)

Item	Specifications
Rated supply voltage	24 VDC/AC
Allowable power supply voltage range	21.6 to 26.4 VDC/AC
Withstand voltage	1000 VAC at 50/60 Hz for one minute (between the power terminal and the ground terminal)
Rated power supply frequency	50/60 Hz (for AC operation)
Allowable power supply frequency range	50 Hz ± 2% or 60 Hz ± 2% (for AC operation)
Effects of power supply voltage fluctuation	The fluctuation in the measured values is within ±1 digit and that in the recording is within ±0.1% in the recording span for the 21.6 to 26.4 VAC/DC range.
Effects of power supply frequency fluctuation	The fluctuation in the measured values and recording is ±(0.1% of rdg + 1 digit) at the rated frequency ±2 Hz.
Rated power	25 VA (for DC operation) or 35 VA (for AC operation)

Power consumption

Model	24 VDC	24 VAC	Maximum
1 to 4 pen models	Approx. 7 VA*	Approx. 13 VA*	Approx. 35 VA
6 dot model	Approx. 8 VA*	Approx. 13 VA*	Approx. 35 VA

* When balanced

Calibration Correction (/CC1)

Item	Specifications
Number of calibration points	2 to 16 (can be specified for each channel)
Correction mode	Revise or absolute value (can be specified for each channel)
Correctable range	DC input (DC voltage, TC, and RTD) and linear scaling (DC voltage, TC, RTD, and 1-5V) (Not allowed on ON/OFF input (including linear scaling), delta computation, square root computation, and computation channels)
Correction range	• (1^{st} correction point + 1^{st} correction value) < (2^{nd} correction point + 2^{nd} correction value) < ... • Corrected value (revise value: correction point + correction value, absolute value: correction value) within the measurable range and scaling range (–5% to 105% or –19999 to 30000) of each input range • Setting limits Left span (0%) < Right span (100%) Left scale (0%) < Right scale (100%)
Others	Calibration correction and bias functions cannot be used simultaneously (common to all channels)

Header Printout (/BT1)

Item	Specifications
Printout function	When recording starts or stops, prints out the batch name, comment, date/time, and chart speed. Also, messages can be printed out including measured values.
Printed items	
Recording start/recording end printouts	Batch name: Batch number (up to 26 characters) and lot number (4 or 6 digit number, or OFF), Comment (up to 32 characters x 5 lines) Chart speed Date/time: Year, month, date, time, minute, second (date format depends on the date printout/display format) Printout ON/OFF selection: Batch name, chart speed, and date/time
Message printouts	In the 5 message formats, measured values, strings (up to 16 characters), and date/time can be arbitrarily combined and printed out (up to 35 characters total). However, message format settings cannot be entered using the keys.

7.6 General Specifications

Construction

Item	Specifications
Mounting	Flush panel mounting (on a vertical plane)
Mounting angle	Inclined backward up to 30 degrees from a horizontal plane.
Allowable panel thickness	2 to 26 mm
Material	Case: drawn steel
	Front door: Aluminum die-cast
Color	Case: Charcoal gray light (Munsell 10B3.6/0.3 or equivalent)
	Front door: Charcoal gray light (Munsell 10B3.6/0.3 or equivalent)
Front panel	Water and dust-proof (complies with DIN40050-IP54)
Dimensions	144(W) × 144(H) × 220(D) mm (D: depth from the panel mounting plane)
Weight	1-pen: approx. 2.1 kg, 2-pen: approx. 2.2 kg, 3-pen: approx. 2.3 kg, 4-pen: approx. 2.4 kg
	6-dot: approx. 2.5 kg

Normal Operating Conditions

Item	Specifications
Ambient temperature	0 to 50°C
Ambient humidity	20 to 80%RH (at 5 to 40°C)
Allowable power supply voltage range	
	90 to 132, 180 to 264 VAC
Power supply frequency	50 Hz ±2%, 60 Hz ±2%
Vibration	10 to 60 Hz 0.2 m/s^2 or less
Shock	Not acceptable.
Magnetic field	400 A/m or less (DC and 50/60 Hz)
Noise	Normal mode (50/60 Hz)
	Volt: The peak value including the signal must be less than 1.2 times the rated value of the range (Example: 2 V for 2 V range).
	TC: The peak value including the signal must be less than 1.2 times the rated value of the range.
	RTD: 50 mV or less
	Common mode noise (50/60 Hz): 250 VACrms or less for all ranges
	Maximum noise voltage between channels (50/60 Hz): 250 VACrms or less.
Mounting position	Up to 30° of backward tilt angle allowed, no tilt to the left or right
Warm-up time	At least 30 minutes after power on
Altitude	2000 m or less above sea level

Power Supply

Item	Specifications
Rated supply voltage	100 to 240 VAC
Allowable power supply voltage range	
	90 to 132, 180 to 264 VAC
Rated power supply frequency	
	50 Hz, 60 Hz
Rated power	40 VA
Power consumption	

Model	100 VAC	240 VAC	Maximum
1- to 4-pen model	Approx. 12 VA*	Approx. 17 VA*	Approx. 40 VA
6-dot model	Approx. 13 VA*	Approx. 18 VA*	Approx. 40 VA

* When balanced

Isolation

Item	Specifications
Insulation resistance	Each terminal to ground terminal: 20 MΩ or more (at 500 VDC)
Dielectric strength	Power supply to ground terminal: 1500 VAC (50/60 Hz), 1 minute
	Contact output terminal to ground terminal: 1500 VAC (50/60 Hz), 1 minute
	Measuring input terminal to ground terminal: 1000 VAC (50/60 Hz), 1 minute
	Between measuring input terminals: 1000 VAC (50/60 Hz), 1 minute (except for RTD input terminal)
	Remote input terminal to ground terminal: 500 VDC, 1 minute
Grounding	Grounding resistance: 100 Ω or less

Transport and Storage Conditions

Item	Specifications
Ambient temperature	–25 to 60°C
Ambient humidity	5 to 95%RH (no condensation)
Vibration	10 to 60 Hz, 4.9 m/s^2 maximum
Shock	392 m/s^2 maximum (in packaged condition)

Supported Standards

Item	Specifications
CSA	Certified by CSA22.2 No. 61010-1 (certified by NRTL/C), Installation category II[1], Measurement category II[2], Pollution degree 2[3] * "US" (USA) and "C" (Canada) are indicated to the right and left of the CSA mark, respectively, to show that NRTL is included.
CE	
EMC	EN61326(Emission: Class A, Immunity: Annex A) EN61000-3-2 EN61000-3-3 EN55011 compliance Class A Group 1
Low voltage directive	EN61010-1 compliance, Installation category II, Measurement category II, Pollution degree 2
C-Tick	AS/NZS CISPR 11 compliance Class A Group 1

1 Installation category (overvoltage category) describes a number which defines a transient overvoltage condition. It implies the regulation for impulse withstand voltage. "II" applies to electrical equipment which is supplied from the fixed installation like a distribution board.

2 Applies to measuring circuits connected to low voltage installation, and electrical instruments supplied with power from fixed equipment such as electric switchboards.

3 "Pollution degree" describes the degree to which a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. "2" applies to normal indoor atmosphere. Normally, only non-conductive pollution occurs.

Standard Performance

Item **Specifications**

Measurement and recording accuracy

The following specifications apply to operation of the recorder under standard operation conditions:
Temperature: 23 ± 2°C
Humidity: 55% ± 10%RH
Power supply voltage: 90 to 132 or 180 to 264 VAC
Power supply frequency: 50/60 Hz ± 1%
Warm-up time: At least 30 minutes.
Other ambient conditions such as vibration should not adversely affect the operation

Input Type	Range Type	Measurement (Digital Display)		Recording (Trend)	
		Measurement Accuracy	Highest Res.	Recording Accuracy	Resolution
DC voltage	20 mV	±(0.1% of rdg + 2 digits)	10 μV	Measurement accuracy ± (0.3% of recording span)	Pen model: Dead band 0.2% of recording span Dot model: Resolution 0.1 mm
	60 mV		10 μV		
	200 mV		100 μV		
	2 V		1 mV		
	6 V		1 mV		
	20 V		10 mV		
	50 V	±(0.1% of rdg + 3 digits)	10 mV		
DC voltage	1-5 V	±(0.1% of rdg + 2 digits)	1 mV		
TC **(excludes RJC accuracy)**	R S B	±(0.15% of rdg + 1°C) except R,S: 0 to 100°C, ±3.7°C 100 to 300°C, ±1.5°C B: 400 to 600°C, ±2°C Accuracy not warranted for values less than 400°C	0.1°C		
	K	±(0.15% of rdg + 0.7°C) except ±(0.15% of rdg + 1°C) for –200 to –100°C			
	E J T	±(0.15% of rdg + 0.5°C) except ±(0.15% of rdg + 0.7°C) for: –200 to –100°C			
	N	±(0.15% of rdg + 0.7°C)			
	W	±(0.15% of rdg + 1°C)			
	L U	±(0.15% of rdg + 0.5°C) except ±(0.15% of rdg + 0.7°C) for: –200 to –100°C			
	WRe	±(0.2% of rdg + 1°C)			
RTD	Pt100 JPt100	±(0.15% of rdg + 0.3°C)			
ON/OFF input	Level Contact	Threshold level (2.4 V) accuracy ± 0.1 V ≤ 1 kΩ: ON, ≥ 100 kΩ: OFF (Parallel capacitance 0.01 μF or less)	–	–	

Measuring accuracy in case of linear scaling

Accuracy during scaling (digits) = measuring accuracy (digits) × multiplier + 2 digits (rounded up)
where the multiplier = scaling span (digits)/measuring span (digits).
Example: Assuming that
• range type: 1-5 V
• measuring span: 1.000 to 5.000 V
• scaling span: 0.000 to 2.000 Then,
The measuring accuracy for 5 V input value is as follows.
Measuring accuracy = ±(0.1% × 5 V + 2 digits)
= ±(0.005 V [5 digits] + 2 digits)
= ±7 digits
Multiplier = {2000 digits (0.000 to 2.000)}/{4000 digits (1.000 to 5.000)} = 0.5
Accuracy during scaling = ±(7 × 0.5 + 2) digits = 6 digits (rounded up)

Reference junction compensation

Internal/External selectable for each channel

Item	Specifications
Reference junction compensation accuracy	
	Above 0°C with input terminal temperature balanced (60 minutes after power on)
	Type R, S, B, W, WRe: ±1.0°C
	Type K, J, E, T, N, L, U: ±0.5°C
Maximum input voltage	±10 VDC (continuous) for ranges of 200 mV or less, TC, RTD, and DI ranges
	±60 VDC (continuous) for 2 VDC or higher ranges
Input resistance	Approximately 10 MΩ or more for ranges of 200 mV or less and TC
	Approximately 1 MΩ for 2 VDC or higher ranges
Input source resistance	Volt, TC: 2 kΩ or less
	RTD input: 10 Ω or less per wire (The resistance of all three wires must be equal).
Bias current	10 nA or less (except when burnout detection function is enabled)
Common mode rejection ratio	120 dB (50/60 Hz ± 0.1%, 500 Ω unbalanced, between the minus terminal and ground)
Normal mode rejection ratio	40 dB or more (50/60 Hz ± 0.1%)
Noise rejection	By the integrating A/D converter: The integration time is 16.7 ms, 20 ms, or 100 ms (dot model)
	Low-pass filtering (pen model): Filter time constant is 2 s, 5 s, or 10 s
	Moving average (dot model): The number of samples is 2 to 16.

Effects of Operating Conditions

Item	Specifications
Ambient temperature	With temperature variation of 10°C:
	Measurement: ±(0.1% of rdg + 1 digit) or less
	Recording: Measurement fluctuation + ±0.2% of the recording span or less
	* Excluding the error of reference junction compensation
Power supply fluctuation	With variation within 90 to 132 V and 180 to 264 VAC (50/60 Hz):
	Measurement: ±1 digit or less
	Recording: ±0.1% of the recording span or less
	With variation of ±2 Hz from rated power frequency (power supply voltage 90 to 132, 180 to 264 VAC):
	Measurement: ±(0.1% of rdg + 1 digit) or less
	Recording: Same as the measurement fluctuation
Magnetic field	AC (50/60 Hz) and DC 400 A/m fields:
	Measurement: ±(0.1% of rdg 10 digits) or less
	Recording: ±0.5% of the recording span or less
Input source resistance	
DC voltage range	With variation of +1 kΩ:
	Ranges of 200 mV or less: Within ±10 μV
	Ranges of 2V or more: ±0.1% of rdg
TC range	With variation of +1 kΩ: ±10 μV or less
RTD range	With variation of 10 Ω per wire (resistance of all three wires must be equal):
	Measurement: ±(0.1% of rdg + 1 digit) or less
	Recording: Measurement fluctuation + ±0.1% of the recording span or less
	With maximum difference of 40 mΩ between wires: Approx. 0.1°C (for Pt100)
Mounting position	With a backward tilt of 30° or less
	Measurement: ±(0.1% of rdg + 1 digit) or less
	Recording: Indication fluctuation + ±0.1% of the recording span or less
Vibration	When a sinusoidal vibration along all three axis at a frequency between 10 to 60 Hz and an acceleration of 0.2 m/s^2 is applied for 2 hours
	Measurement: ±(0.1% of rdg + 1 digit) or less
	Recording: Indication fluctuation + ±0.1% of the recording span or less

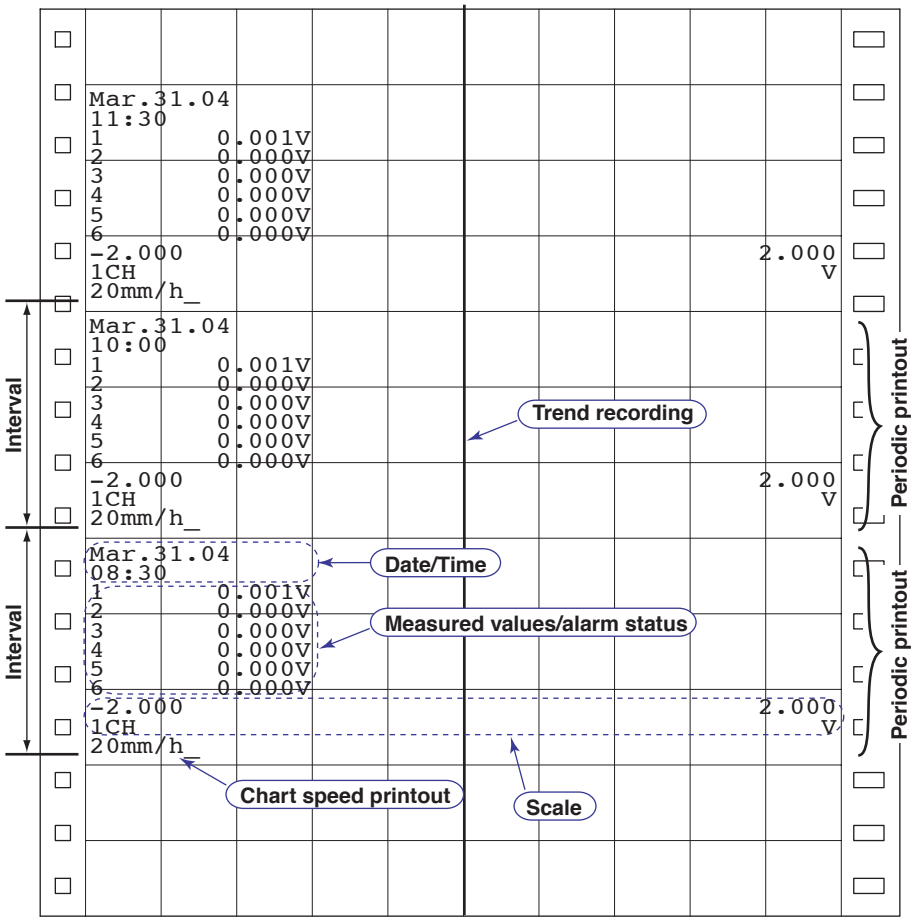
Other Specifications

Item	Specifications
Clock	With a calendar function
Accuracy of clock	±100 ppm, excluding a delay (of 1 second, maximum) caused each time the power is turned on.
DST	The date/time for switching between standard time and DST can be specified.
Memory backup	A built-in lithium battery backs up the setup parameters and runs the clock (battery life: approximately ten years at room temperature).
Key Lock Function	Password for releasing the key lock can be set.
Key Lock Items	RCD key, MENU key, FEED key, and function under the FUNC key (manual printout, list printout, setup list printout, message printout, printout buffer clear, and pen/ribbon cassette exchange)
Noise	Machine Noise Information Ordinance 3.GSGV, Jan 18, 1991
	Maximum noise level: 60 dB (A) or less (complies with ISO7779)

Appendix 1 Periodic Printout Interval

The periodic printout function prints measured values and other data numerically at the left side of the chart paper while performing trend recording.
The periodic printout interval varies depending on the chart speed and setup conditions.

Periodic Printout Example of the Dot Model



The figure above is used to explain the printout contents. The actual printout and font are different from those illustrated in the figure. The printout positions are also slightly different.

When the Interval Is Set to Auto

Printout is performed at the interval corresponding to the chart speed.

Pen Model Chart Speed	Periodic Printout Interval	Dot Model Chart Speed	Periodic Printout Interval
10 to 15 mm/h	8 hours	10 to 15 mm/h	8 hours
20 to 30 mm/h	4 hours	20 to 30 mm/h	4 hours
40 to 60 mm/h	2 hours	40 to 75 mm/h	2 hours
75 to 120 mm/h	1 hours	80 to 100 mm/h	1 hours
150 to 180 mm/h	30 minutes	120 mm/h or higher	Not printed
200 to 300 mm/h	20 minutes		
360 to 1500 mm/h	10 minutes		
1800 mm/h or higher	Not printed		

When the Interval Is Set to Manual

If you select Manual, you can set the interval.

- **Chart Speeds That Allows Periodic Printout**

Pen Model Chart Speed	Printout Availability	Dot Model Chart Speed	Printout Availability
10 to 1500 mm/h	Yes	10 to 100 mm/h	Yes
1800 mm/h or higher	No	120 mm/h or higher	No

- **Interval Settings**

  Select from 10, 12, 15, 20, 30 minutes, 1, 2, 3, 4, 6, 8, 12, and 24 hours (see section: 4.8).

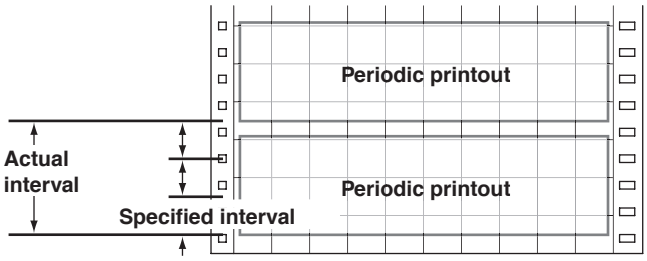
- **Printout Items**

Item	Number of Lines	Initial Setting	Notes (Ref. Section)
Date/Time	2	-	Always printed.
Measured value and alarm status	1 line/channel	Printed	Print or not print selectable for each channel (section 3.6).
Scale	2	Printed	Print or not print selectable (section 4.7).
Pen color (Pen model only)	1	Printed	Print or not print selectable (section 4.7).
Chart speed	1	-	Always printed.

- **Relationship between the Printout Items and Interval**

  The next periodic printout does not start until all items of the previous periodic printout are printed.

  If all items cannot be printed in the specified interval, the printout interval increases by an integer multiple of the specified interval.



Example: Dot model, chart speed: 20 mm/h, interval: 30 minutes, all other settings at default.

- This setting requires 11 lines to be printed which is equivalent to approximately 28 mm* of chart paper.
- The length of chart paper that is fed within the interval is 10 mm.

  * The length of chart paper needed in the printout varies depending on the chart speed and dot printing interval.

Not all items can be printed in the specified interval of 30 minutes.
The actual interval is 1 hour and 30 minutes.

If you want to print at a shorter interval, change the settings as follows:

- Reduce the number of printed items.
- Increase the chart speed within the printable range.

Note

Measurement, display, periodic printout, and trend recording (dot model) are not performed by setting unused channels to SKIP (see section 2.1).

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