User's Manual

Model FX103/FX106/FX112

FX100

YOKOGAWA
Yokogawa Electric Corporation

IM 04L20A01-01E
4th Edition

Foreword

Thank you for purchasing the FX100. This manual describes the functions (excluding the communications functions), installation and wiring procedures, operating procedures, and handling precautions of the FX100. To ensure correct use, please read this manual thoroughly before beginning operation. The following manuals are also provided in addition to this manual. Read them along with this manual.

Electronic Manuals Provided on the Accompanying CD-ROM

Manual Title	Manual No.	Description
FX100 Communication Interface User's Manual	IM 04L20A01-17E	Describes the communication functions of the FX100 using the Ethernet/serial interface.
DAQSTANDARD User's Manual	IM 04L20A01-61E	Describes the functions and operating procedure of the software "DAQSTANDARD" that comes with the package.

Paper Manuals

Manual Title	Manual No.	Description
FX100 Operation Guide	IM 04L20A01-02E	A guide providing simple explanations of operations for the FX100.
Support for the FX100 on DAQLOGGER and DAQEXPLORER	IM 04L20A01-03E	Describes the operation for scanning and recording data from the FX100 using DAQLOGGER and DAQEXPLORER.

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.
- Copying or reproducing all or any part of the contents of this manual without the permission of Yokogawa Electric Corporation is strictly prohibited.
- The TCP/IP software of this product and the document concerning the TCP/IP software have been developed/created by YOKOGAWA based on the BSD Networking Software, Release 1 that has been licensed from the Regents of the University of California.

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Revisions

1st Edition	October 2003	4th Edition	May 2005
2nd Edition	December 2003		
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Safety Precautions

The FX100 conforms to IEC safety class I (provided with terminal for protective grounding), Installation Category II, and EN61326-1 (EMC standard), class A (use in a commercial, industrial, or business environment).
This product is a measurement category II (CAT II) instrument.

* Measurement category II (CAT II)
Applies to measuring circuits connected to low voltage installation, and electrical instruments supplied with power from fixed equipment such as electric switchboards.

The following general safety precautions must be observed during all phases of operation. If the FX100 is used in a manner not specified in this manual, the protection provided by the FX100 may be impaired. YOKOGAWA Electric Corporation assumes no liability for the customer's failure to comply with these requirements.
Please use this instrument as a measurement category II (CAT II) instrument.
This instrument is for indoor use only.

About This Manual

- This manual should be read by the end user.
- Read this manual thoroughly and have a clear understanding of the product before operation.
- This manual explains the functions of the product. YOKOGAWA does not guarantee that the product will suit a particular purpose of the user.
- Under absolutely no circumstances may the contents of this manual be transcribed or copied, in part or in whole, without permission.
- The contents of this manual are subject to change without prior notice.
- 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 or omissions, please contact your nearest YOKOGAWA dealer.

Precautions Related to the Protection, Safety, and Alteration of the Product

- The following safety symbols are used on the product and in this manual.


"Handle with care." (To avoid injury, death of personnel or damage to the instrument, the operator must refer to the explanation in the manual.)


Protective grounding terminal


Alternating current

- For the protection and safe use of the product and the system that integrates the product, be sure to follow the instructions and precautions on safety that are stated in this manual whenever you handle the product. Take special note that if you handle the product in a manner that violate these instructions, the protection functionality of the product may be damaged or impaired. In such cases, YOKOGAWA does not guarantee the quality, performance, function, and safety of the product.
- If you are replacing parts or consumable items of the product, make sure to use parts specified by YOKOGAWA.
- Do not modify this product.

WARNING

Power Supply

Ensure that the source voltage matches the voltage of the power supply before turning ON the power.

Protective Grounding

Make sure to connect the protective grounding to prevent electric shock before turning ON the power.

Necessity of Protective Grounding

Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so invalidates the protective functions of the instrument and poses a potential shock hazard.

Defect of Protective Grounding

Do not operate the instrument if the protective earth might be defective. Make sure to check them before operation.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable liquids or vapors. Operation in such environments constitutes a safety hazard.

Do Not Remove Covers

The cover should be removed by YOKOGAWA's qualified personnel only. Opening the cover is dangerous, because some areas inside the instrument have high voltages.

External Connection

Connect the protective grounding before connecting to the item under measurement or to an external control unit.

Damage to the Protective Structure

Operating the FX100 in a manner not described in this manual may damage its protective structure.

Exemption from Responsibility

- YOKOGAWA makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
- YOKOGAWA assumes no liability to any party for any loss or damage, direct or indirect, caused by the user or any unpredictable defect of the product.

Handling Precautions of the Software

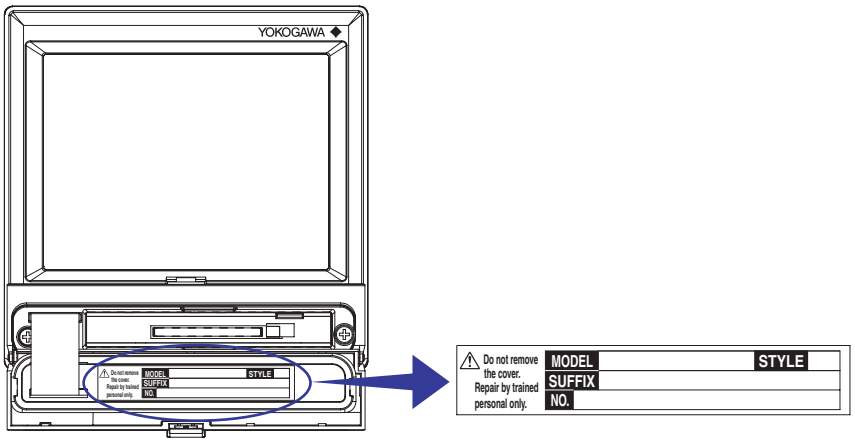
- YOKOGAWA makes no warranties regarding the software accompanying this product except those stated in the WARRANTY that is provided separately.
- Use the software on a single PC.
- You must purchase another copy of the software, if you are to use the software on another PC.
- Copying the software for any purposes other than backup is strictly prohibited.
- Please store the original media containing the software in a safe place.
- Reverse engineering, such as decompiling of the software, is strictly prohibited.
- No portion of the software supplied by YOKOGAWA may be transferred, exchanged, sublet, or leased for use by any third party without prior permission by YOKOGAWA.

Checking the Contents of the Package

Unpack the box and check the contents before operating the instrument. If some of the contents are not correct or missing or if there is physical damage, contact the dealer from which you purchased them.

FX100

When you open the operation key panel on the front panel, a name plate is located on the back side of the cover. Check that the model name and suffix code given on the name plate on the rear panel match those on the order.



MODEL and SUFFIX

Model	Suffix Code	Optional Code	Description
FX103			Number of inputs for measurement: 3ch
FX106			Number of inputs for measurement: 6 ch
FX112			Number of inputs for measurement: 12 ch
External storage medium	–0		No external memory
	–1		FDD
	–4		Compact flash memory card (with medium)
Displayed language	–1		Japnese
	–2		English
	–3		Chinese
Options		/A1	Alarm output relays 2 points*1
		/A2	Alarm output relays 4 points*1
		/A3	Alarm output relays 6 points*1
		/C2	RS-232 interface (including Modbus protocol)*2
		/C3	RS-422-A/485 interface (including Modbus protocol)*2
		/C7	Ethernet (10BASE-T) interface
		/F1	Fail/memory end detection and output*3
		/M1	Mathematical function (report fuction included)
		/N2	Three-terminal isolated RTD (input for measurement)
		/N3	Pt1000 Ω RTD input
		/P1	24 VDC/AC power supply
		/PM1	Pulse measurement input 3 points, Remote control 5 points*4
		/R1	Remote control 8 points

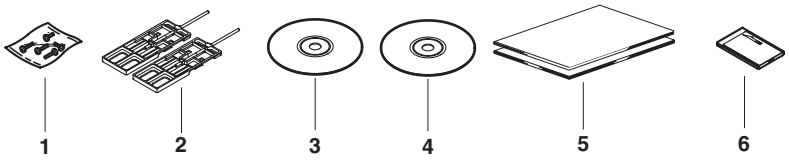
*1 Only one can be specified at once.
*2 Either one can be specified.
*3 If /F1 is specified, /A3 cannot be specified.
*4 If /PM1 is specified, /A3, /M1, or /R1 cannot be specified.
If /PM1 is specified, /A2/F1 cannot be specified.

NO. (Instrument Number)

When contacting the dealer from which you purchased the instrument, please give them the instrument number.

Standard Accessories

The standard accessories below are supplied with the instrument. Check that all contents are present and that they are undamaged.



No.	Name	Part Number/Model	Q'ty	Note
1	Terminal screws		3	M4
2	Mounting bracket	B9900BX	2	For panel mounting
3	DAQSTANDARD	FXA100	1	CD-ROM used to install "DAQSTANDARD," software for setting the FX100 and displaying data.
4	FX100 electronic manual	B8703KA	1	CD-ROM containing the PDF files of this manual, the FX100 Communication Interface User's Manual, DAQSTANDARD User's Manual, and other files.
5	FX100 Operation Guide	IM 04L20A01-02E	1	A guide providing simple explanations of operations for the FX100.
	Support for the FX100 on DAQLOGGER and DAQEXPLORER	IM 04L20A01-03E	1	Describes the operation for scanning and recording data from the FX100 using DAQLOGGER and DAQEXPLORER.
6	CF memory card	B9968NM	1	Compact flash memory card (32 MB, capacity and model of CF memory card may vary) provided only when the external storage medium suffix code is "-4"

Optional Accessories (Sold Separately)

The following optional accessories are available for purchase separately. When you receive the order, check that all contents are present and that they are undamaged.

For information and ordering, contact your nearest YOKOGAWA dealer.

Part Name	Part Number/Model	Q'ty	Note
CF memory card	B9968NM	1	32 MB
	B9968NP	1	64 MB
	B9968NQ	1	128 MB
	B9968NR	1	256 MB
	B9968NS	1	512 MB
Shunt resistor	4389 20	1	250 Ω±0.1%
	4389 21	1	100 Ω±0.1%
	4389 22	1	10 Ω±0.1%
Mounting bracket	B9900BX	1	

How to Use This Manual

Structure of the Manual

This user's manual consists of the following sections. For details on the communications functions and the software "DAQSTANDARD" provided with the package, see the respective manuals (IM 04L20A01-17E and IM 04L20A01-61E).

Chapter	Title and Description
1	**Explanation of Functions** Describes in detail the functions of the instrument. The chapters that explain the operation of the FX100 only describe the operating procedures. For more detailed information about the functions, see this chapter.
2	**Installation and Wiring** Describes the installation and wiring procedures of the FX100.
3	**Names of Parts, Display Modes, and Common Operations** Describes the names of the parts of the FX100, the basic key operations, the basic operations carried out initially, and how to use the external storage medium drive.
4	**Measurement Input and Alarm Related Setup Operations** Describes how to set the input for the measurement and alarms.
5	**Operations on the Operation Screens** Describes how to use the operation screens.
6	**Operations for Changing the Displayed Contents** Describes how to change the display format and write user defined messages.
7	**Data Save/Load Operations** Describes how to write various data to the internal memory, how to save and load from the external storage medium, and the file operations on the external storage medium.
8	**Computation and Report Function Related Operations** (/M1 or /PM1 Option) Describes how to set and execute operations related to the computation function and report function of the computation function option.
9	**Operations of Other Functions** Describes the USER key, key lock, login/logout of key operation, log display, alarm on internal memory remaining space, and remote input setting.
10	**Troubleshooting** Describes the error messages and the troubleshooting measures of the FX100.
11	**Maintenance** Describes periodic inspection, calibration, and recommended replacement period for worn parts.
12	**Specifications** Describes the specifications of the FX100.
Appendix	Describes how to estimate the time for acquiring measured data to the internal memory, meaning and syntax of computation equations, data types the FX100 creates, the ASCII file format, and a list of the setup items.
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Note

- This user's manual covers information regarding FX100s that have a suffix code for language "-2" (English).
- For details on setting the displayed language, see section 3.6.

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.

Danger. Refer to corresponding location on the instrument.
This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.

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

CAUTION Calls attentions to actions or conditions that could cause 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.

Symbols Used on Pages Describing Operating Procedures

On pages that describe the operating procedures in Chapter 3 through 11, the following symbols are used to distinguish the procedures from their explanations.

[ ] ..... Indicates character strings that appear on the screen.
Example: [Space] soft key, [Volt]

Procedure This subsection contains the operating procedure used to carry out the function described in the current section. All procedures are written with inexperienced users in mind; experienced users may not need to carry out all the steps.

Explanation
Setup Items Describes the details of the settings and the restrictions that exist with the operating procedure. It does not give a detailed explanation of the function. For details on the function, see chapter 1.

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1.1 Overview of the FX100

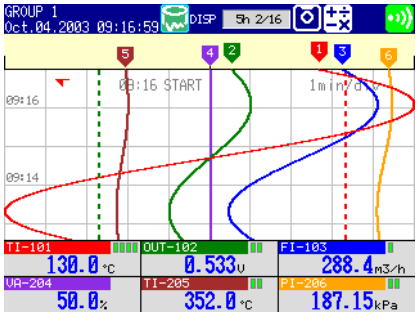
Measurement Input

DC voltage, thermocouple, resistance temperature detector, or ON/OFF signal (contact signal or voltage signal) can be measured. The input signal is A/D-converted at a scan interval and becomes a measured value of the channel. In addition, difference computation, square-root computation, and scaling can be carried out on the measured data to be a measured value of the channel. With the pulse measurement function (/PM1 option), you can measure the number of pulses per unit time and pulse sum value.

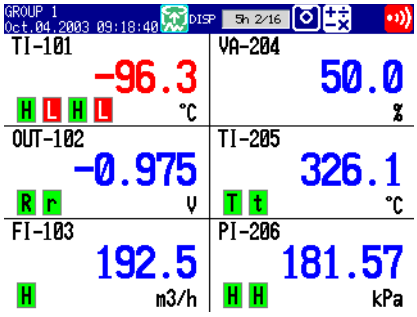
Displaying the Measured Data

The measured data acquired to the internal memory can be displayed on the operation display using trend waveforms, numeric values (digital values), or bar graphs.

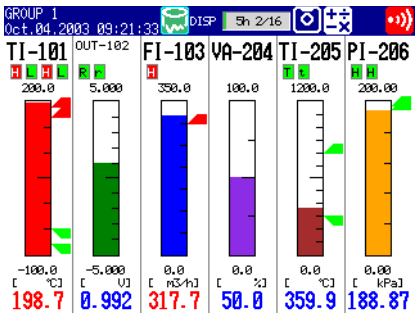
Trend Display



Digital Display



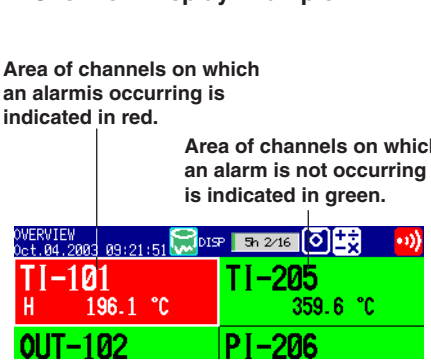
Bar Graph Display



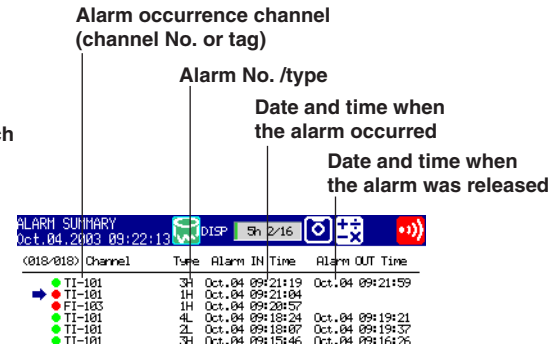
Alarms

Alarms can be generated when the measured data meets a certain condition. When an alarm occurs, you can have the information about the alarm displayed on the operation screens. Also, you can output relay signals from the alarm output terminal on the option terminal block (/A1, /A2, /A3 options). The overview display allows you to check the alarm status on all channels. Also, the alarm summary shows detailed information about the alarms in the order that they occurred.

Overview Display Example

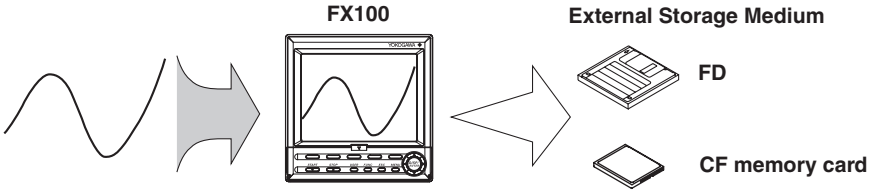


Alarm Summary Display Example



Saving Data

The measured data is acquired to the internal memory. The data in the internal memory can also be saved to external storage media such as floppy disks (2HD) and compact flash memory cards on models with a drive.



The data that has been saved to an external storage medium can be displayed on a PC using the DAQSTANDARD software that comes with the package. The data can also be loaded into the FX100 to be displayed.

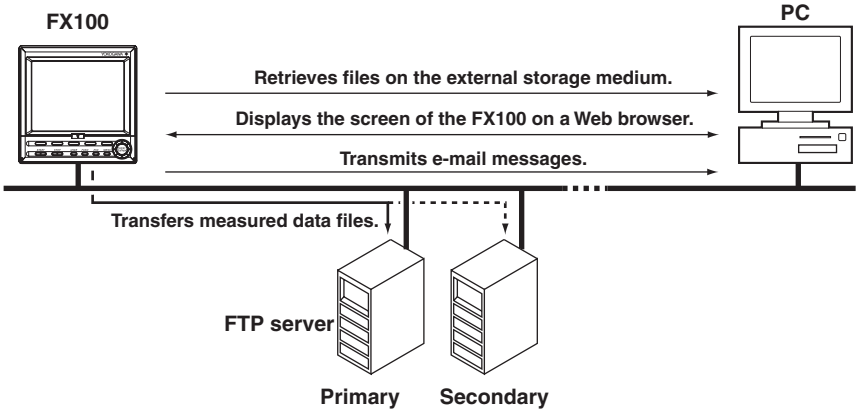
Communication Function

You can carry out the following types of operations by using the optional communication functions (/C7, /C2, /C3).

- Operate the FX100.
- Configure the FX100.
- Monitor the measured data.
- Read the setup data or measured data from the FX100.
- Read files on the storage medium of the FX100.

You can also carry out the following types of operations by using the Ethernet communication interface (/C7).

- Transmit the measured data in units of files to the FTP server on the network.
- Retrieve the files on the storage medium of the FX100 from a PC on the network.
- Display the screen of the FX100 on a Web browser on a PC.
- Transmit e-mail messages to preset recipients when events such as alarm generations occur.



The communication functions using the Ethernet or serial interface are not covered in this manual. See the "*FX100 Communication Interface User's Manual*" (IM 04L20A01-17E).

DAQSTANDARD

By using the DAQSTANDARD that comes standard with the FX100, the following operations are possible.

- Displaying the measured data
- Converting the measured data to ASCII, Lotus, or Excel formats
- Configuring the setup file for the FX100

See the "*DAQSTANDARD User's Manual*" (IM 04L20A01-61E).

1.2 Functions of the Input Section

Number of Measurement Channels/Scan Interval

The number of measurement channels and scan intervals for different models are listed in the table below.

Model	Number of Measurement Channels	Scan Interval
FX103	3 channels	250 ms
FX106	6 channels	1 s or 2 s
FX112	12 channels	1 s or 2 s

Input Type and Computation

You can select the input type of a measurement channel from the table below. In addition, difference computation, square-root computation, and scaling can be performed on the measured data and display or save the computed result as measured data.

Input type	Description
DC voltage	Measures a DC voltage in the range of ±20 mV to ±50 V.
DC current	The current signal is converted to a voltage signal by a shunt resistor attached to the input terminal and measured. The measurable range is the range equivalent to the "DC voltage" range indicated above after converting the current to the voltage signal.
Thermocouple	Measures temperatures corresponding to the temperature range of each thermocouple type such as R, S, B, K, E, J, T, N, W, L, U, and WRe3-25.
Resistance temperature detector	Measures temperatures corresponding to the appropriate range for Pt100, JPt100, or Pt1000.*1
ON/OFF input	Displays the contact input or voltage input signals by correlating them to 0% or 100% of the display range. Contact input: Closed contact is ON (1). Open contact is OFF (0). Voltage input: Less than 2.4 V is OFF (0). Greater than or equal to 2.4 V is ON (1)
Pulse input	For the description, see page 1-7.

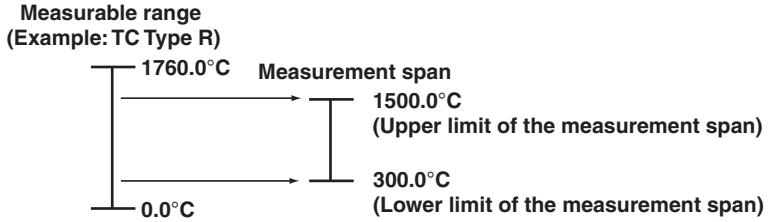
*1 Pt1000 is optional (/N3 option).

Note

For converting a current signal to a voltage signal, three shunt resistors are provided (see "*Optional Accessories (Sold Separately)*" on *page v*. A 250 W shunt resistor, for example, is used to convert a 4 to 20 mA to a 1 to 5 V.

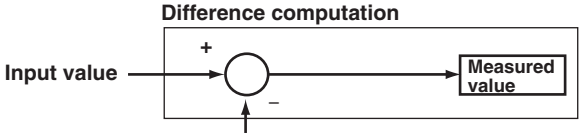
Measurable Range and Measurement Span

You can specify an arbitrary range for a measurement span within the measurable range and display the measured data.



Difference Computation

The value obtained by subtracting the measured value of another channel (this channel is called a “reference channel”) from the input value becomes a measured value of the channel.



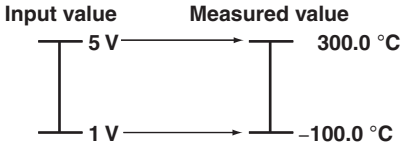
Note

Even if the input type or the measurement range of the difference computation channel and the reference channel is not the same, the difference computation is performed according to the following rules.

- When the decimal position between the reference channel and the difference computation channel is different, the measured value of the reference channel is adjusted to the decimal position of the measured value of the difference computation channel to make the computation.
  Example: When the measured value of the difference computation channel is 10.00 and the measured value of the reference channel is 100.0, the computation result becomes 10.00 – 100.0 = –90.00.
- When the units for the reference channel and the difference computation channel are different, the measured value is not adjusted.
  Example: When the measured value of the difference computation channel is 10.00 V and the measured value of the reference channel is 5.00 mV, the computation result becomes 10.00 V – 5.00 mV = 5.00 V.
- When the reference channel is set to [Scale] or [Sqrt], the computation uses the scaled values.

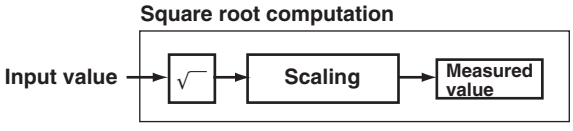
Scaling

The input value is converted to a value in the appropriate unit and the converted value becomes a measured value of the channel.



Square Root

When the input type is set to “DC voltage,” the square root of the input value is computed. The computed result is scaled to a value in the appropriate unit and the scaled value becomes a measured value of the channel.



Note

- The FX100 uses the following square-root computation:

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

  - Vmin: Lower limit of span
  - Fmin: Lower limit of scale
  - Vx: Input voltage
  - Vmax: Upper limit of span
  - Fmax: Upper limit of scale
  - Fx: Scaling value
- When the value inside the square root is negative, the measured value is indicated as when Fmin < Fmax: “–Over,” or when Fmin > Fmax: “+Over”.

Burnout Detection

When measuring temperature using a thermocouple and the thermocouple burns out, you can specify the measurement result to be set to positive over range* or negative over range.* Burnout can be set on each measurement channel.

* Positive over range is a condition in which the input signal is over the upper limit of the measurable range. Negative over range is a condition in which the input signal is below the lower limit of the measurable range. The measured value is indicated as “Burnout” for both cases.

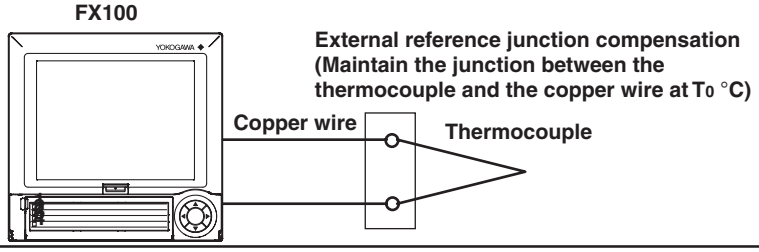
Reference Junction Compensation (RJC)

When measuring the temperature using a thermocouple, the reference junction compensation can be used. You can select whether to use the reference junction compensation provided by the FX100 or external reference junction compensation. If you are using external reference junction compensation, you will also set the reference voltage.

Note

When using the external reference junction compensation, set an appropriate reference junction compensation voltage. As in the example in the following figure, if the reference junction temperature for the external reference junction compensation is T0 °C, set the thermoelectromotive force of the 0 °C reference for T0 °C as the reference junction compensation voltage.

An example of External reference junction compensation



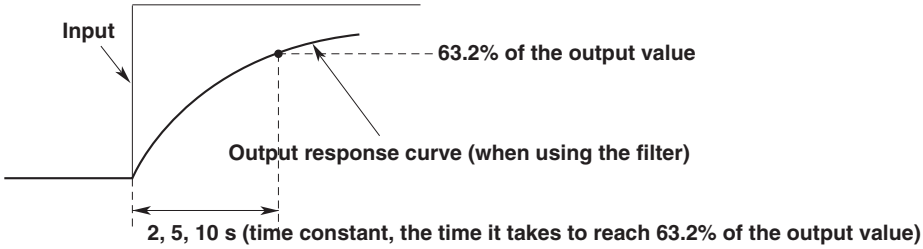
Filter/Moving Average

The filter and moving average are used to suppress the effects of noise that is riding on the signal. Filtering is provided on the FX103. Moving average is provided on the FX106 and FX112. The filter or moving average can be set on each channel.

Filter Function (FX103)

Suppresses the effects of noise above the frequency determined by the specified time constant. The time constant can be set to 2 s, 5 s, or 10 s.

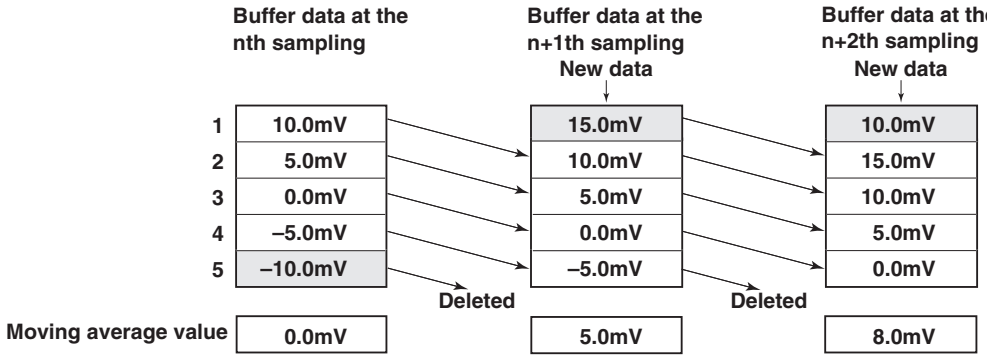
Effects of using filter (Output response for a step input)



Moving Average

The input signal of the measurement channel is set to the averaged value of the m most current data points (the number of moving-averaged data points) acquired at the scan interval. The number of moving-averaged data points 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.”



Integration Time of the A/D Converter

The FX100 uses an A/D converter to convert the sampled analog signal to a digital signal. By setting the integration time 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 eliminated.

The integration time of the A/D converter is selected from the table below.

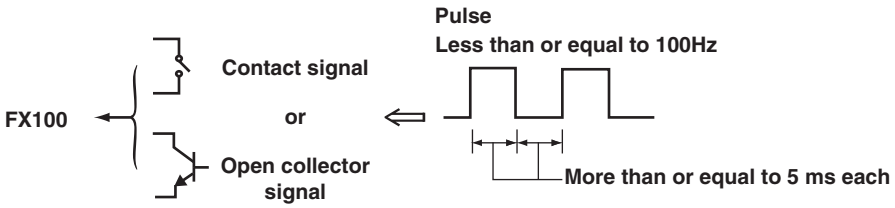
Model	Integration Time of the A/D Converter
FX103	Select 16.7 ms (60 Hz), 20 ms (50 Hz), or Auto
FX106/FX112	Select 16.7 ms (60 Hz), 20 ms (50 Hz), 100 ms, or Auto

- If “Auto” is selected, the FX100 will automatically detect the power supply frequency and select 16.7 ms or 20 ms. Fixed to 20 ms on /P1 models that use the 24 VDC power supply.
- Because 100 ms is an integer multiple of 16.7 ms and 20 ms, this setting can be used to eliminate the power frequency noise for either frequency, 50 Hz or 60 Hz. However, when the integration time is 100 ms, the scan interval is fixed to 2 s.

Pulse Input (/PM1 Option)

Contact or open collector signal pulses are input to the dedicated input terminals.

- Three inputs are available. However, the instrument can be expanded for up to 8 inputs.
- Pulses of 100 Hz or less whose Low (closed) and High (open) pulse widths are both 5 ms or more can be counted.
- The FX100 counts the following changes.
  Contact signal pulse input: contact changes from open to closed
  Open collector signal: input terminal level changes from High to Low



Counting Input Pulses

You can count and display the number of pulses input at each scan interval using computation channels.

Sum Value

To display the pulse sum value, an equation is entered on the computation channels to be displayed.

Number of Pulses per Unit Time

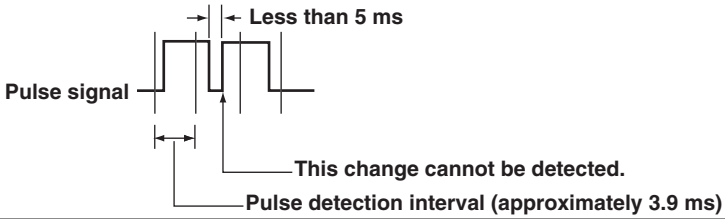
To display the number of pulses per unit time (1 s, 1 min, and 1hour), an equation is entered on the computation channels to be displayed.

Using computation channels, sum of pulses are calculated and displayed.

For information about the computation function, see section 1.6, "*Computation Function and Report Function (/M1, /PM1 Option)*".

Note

The pulse detection interval is approximately 3.9 ms. If the pulse width is not 5 ms or greater, the FX100 may not be able to detect it.



1.3 Alarm Function

This function generates an alarm when the measured/computed data meets a certain condition. When an alarm occurs, information notifying the alarm occurrence is displayed on the screen. In addition, a signal can be output from the relay output terminals (/A1, /A2, or /A3 option) on the rear panel of the FX100.

Alarm Type

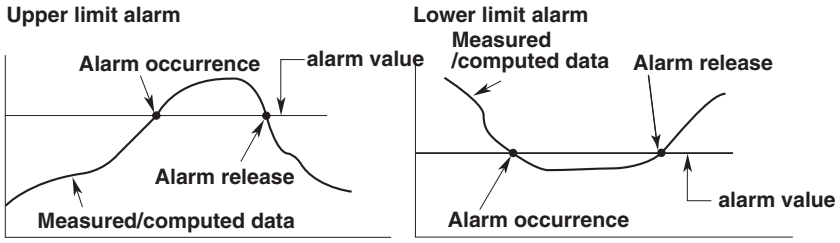
Number of Alarms

You can set up to four alarms for each channel.

Alarm Conditions

The following eight conditions are available. Letters in the parentheses are the symbols used for each alarm.

- **Upper limit alarm (H)**
  An alarm occurs when the measured value exceeds the alarm value.
- **Lower limit alarm (L)**
  An alarm occurs when the measured value falls below the alarm value.

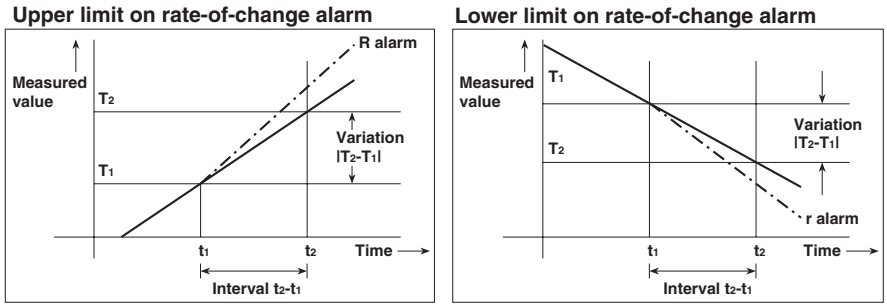


- **Difference upper limit alarm (h)[*1]**
  An alarm occurs when the difference between the measured values of two channels becomes greater than or equal to the alarm value.
- **Difference lower limit alarm (l)[*1]**
  An alarm occurs when the difference between the measured values of two channels becomes smaller than or equal to the alarm value.

*1 Can be specified only on difference computation channels.

- **Upper limit on rate-of-change alarm (R)[*2]**
  The amount of change of the measured values over a certain time interval is checked. An alarm occurs when the amount of increase becomes greater than or equal to the specified value.
- **Lower limit on rate-of-change alarm (r)[*2]**
  The amount of change of the measured values over a certain time interval is checked. An alarm occurs when the amount of decrease becomes greater than or equal to the specified value.

*2 Can be specified only on measurement channels.

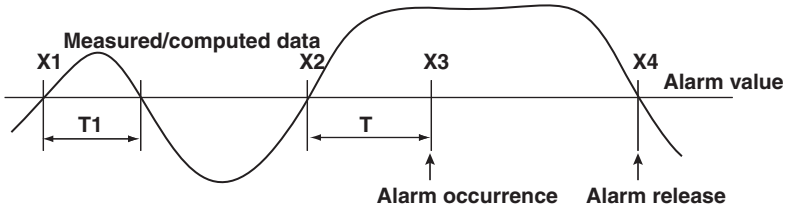


The interval is defined by the following equation and is set in terms of the number of measured data points.

Interval = scan interval × number of measurements

- **Delay upper limit alarm (T)**
  An alarm occurs when the measured value remains above the alarm value for the specified time period (delay period).
- **Delay lower limit alarm (t)**
  An alarm occurs when the measured value remains below the alarm value for the specified time period (delay period).

Delay upper limit alarm example ("T" is the specified delay period)

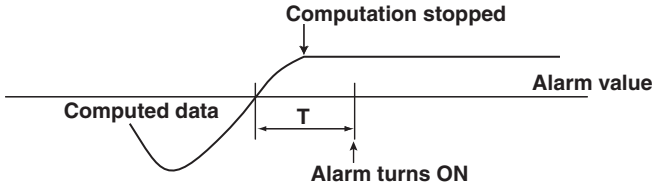


- Alarm does not occur at T1, because the time period is shorter than the specified delay period (T).
- The input exceeds the alarm value at X2, but the alarm occurs at X3 at which the specified delay period elapses (the time when the alarm occurs is the time at X3).
- The input falls below the alarm value at X4 and the alarm is released.

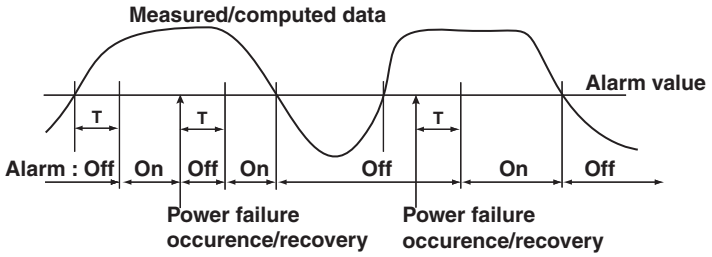
Note

The following special operations are available for the delay upper/lower limit alarm.

- **When a delay alarm is set on a computation channel (/M1, /PM1 option) and the computation is stopped**
  If the computation is stopped in a condition in which the computed value is exceeding the alarm setting, the alarm is turned ON after the specified period (delay period) elapses.



- **Delay alarm when a power failure occurs**
  Alarm detection is reset upon a power failure. It restarts the operation after the power recovers.

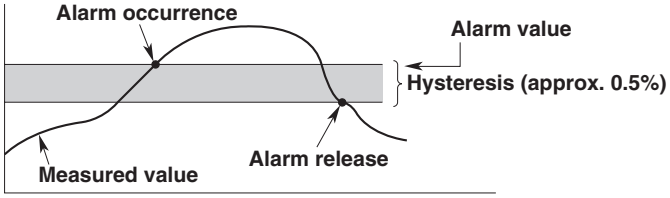


- **Operation when the alarm setting is changed**
  - When a new delay alarm is set
    The alarm detection starts at the time the alarm is set. It is unaffected by the conditions existing before the alarm is set.
  - If the alarm setting of a preexisting delay alarm is changed
    - If an alarm is not occurring at the time of the change, alarm detection starts at the new setting.
    - If an alarm is occurring at the time of the change and the alarm type is set to delay upper limit alarm, the alarm continues as long as the input is above or equal to the new setting. If the input is below the new setting, the alarm turns OFF. If the alarm type is set to delay lower limit alarm, the alarm continues as long as the input is below or equal to the new setting. If the input is greater than the new setting, the alarm turns OFF.

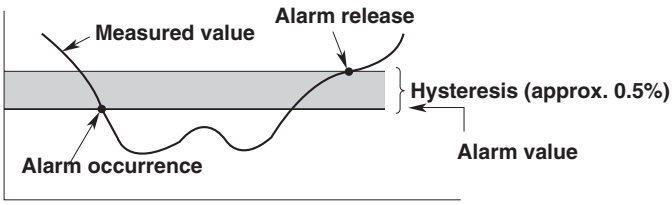
Alarm Hysteresis

You can set a width (hysteresis) to the values used to activate and release alarms. Alarm hysteresis prevents frequent activation and release of alarms when the measured value is unstable around the alarm value. The hysteresis is fixed to 0.5% of the measurement span (display scale width if the range is set to scale).
It is applied only on alarms set to upper/lower limit alarm on measurement channels.
The function can be turned ON/OFF. The initial value is set to [On] (use hysteresis).
The setting applies to all measurement channels.

Upper Limit Alarm (H)



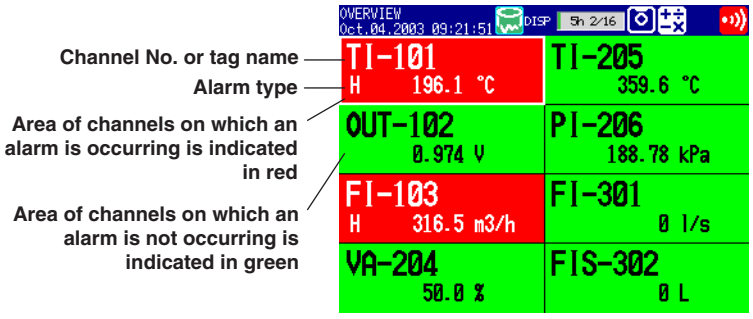
Lower Limidt Alarm (L)



Alarm Indication

The alarm conditions are displayed as alarm icons in the status display section and through the trend, digital, bar graph, overview and other screens. The detailed information about the alarms is displayed in the alarm summary.

Alarm Indication Example (Overview screen)



Hold/Non-Hold of the Alarm Indicator

There are two methods in displaying alarms. The initial value is non hold.

- Clears the alarm display when the cause of the alarm is no longer met (non-hold).
- Holds the alarm display until the alarm ACK operation is executed (hold).

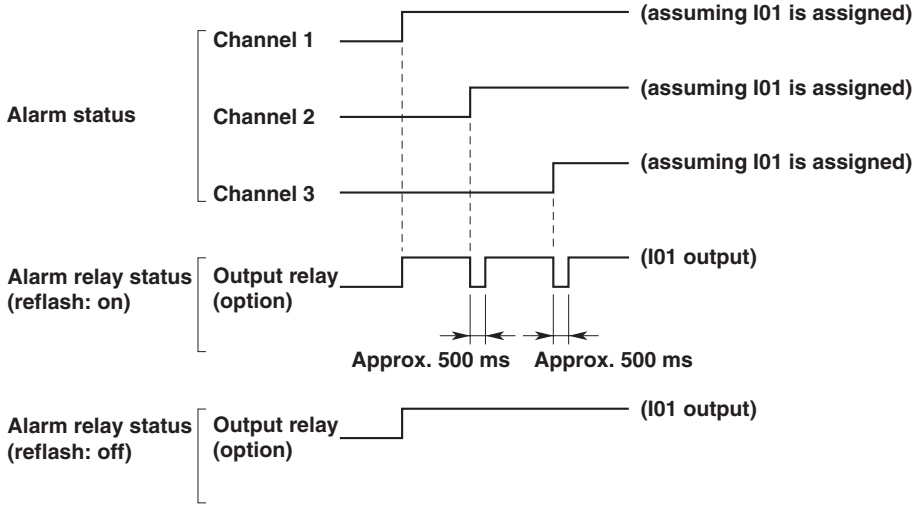
The initial value is set to non-hold.

Alarm Output Relay (/A1, /A2, or /A3 option)

If you are using a model with the optional alarm output relay, a contact signal can be generated according to the alarm conditions. The number of contact outputs for a/A1 to /A3 are 2, 4, and 6 respectively. The alarm output relays are indicated using [I01] to [I06] in the alarm output settings. The following functions can be specified on the alarm output relay.

Reflash

When multiple alarms are set to one alarm output relay, this function notifies the succeeding alarms after the first alarm that causes the relay activation. When a succeeding alarm occurs, the output relay temporarily turns OFF (approximately 500 ms). The initial value is set to Off (do not use). The reflash alarm function is set only to output relays I01, I02, and I03 (I01 and I02 for /A1 option).



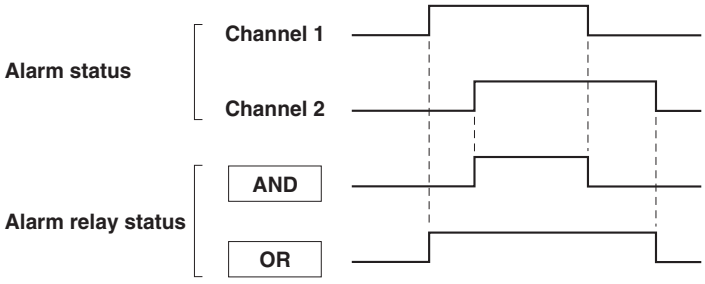
Note

If you set the reflash alarm, relays I01 to I03 become dedicated to reflash alarms regardless of the number of alarm output relay points. Therefore, I01 to I03 operate as OR logic and non-hold regardless of the settings made in “AND/OR of alarm output relays” and “Hold/Non-hold operation of the alarm output relay” on the next page.

AND/OR of Alarm Output Relay

When sharing an alarm output relay among multiple alarms, you can select from the following conditions that cause the alarm output relay to be activated.

- AND: Activated when all alarms are being generated simultaneously.
- OR: Activated when at least one of the alarms is being generated.



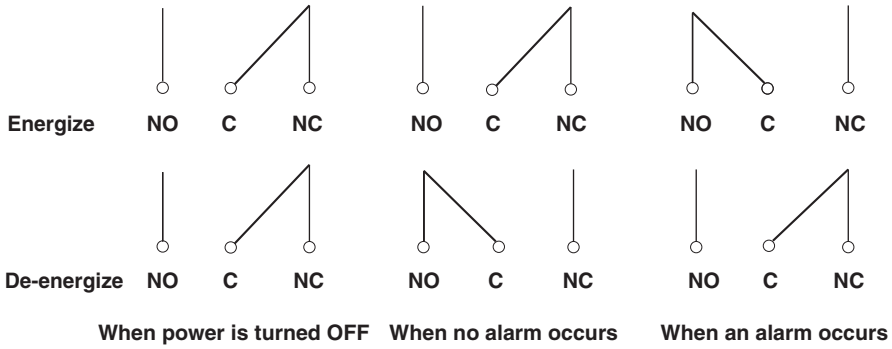
Specify the alarm output relay to operate under the AND condition as in [I01 (first relay) to Ixx (where xx is the relay number)].

Note

If the reflash alarm is turned ON, I01 to I03 are set to OR logic operation. Specifying AND produces no effect.

Energize or De-energize Operation of the Alarm Output Relay

You can select whether to energize or de-energize the alarm output relay when the alarm occurs. By selecting de-energize, the alarm output relay will operate in the same manner as when the alarm occurs when the power supply is disrupted. Energize or de-energize applies to all alarm output relays. The initial value is set to Energize.

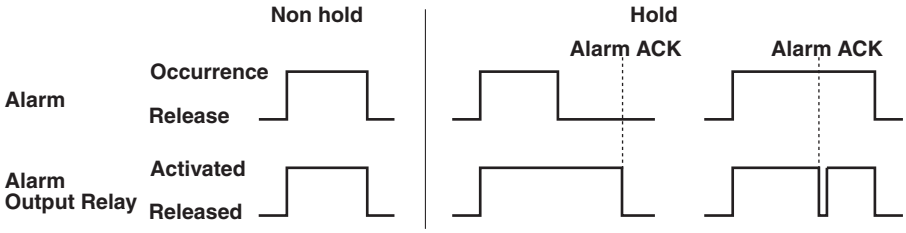


NO: Normally opened, C: common, NC: normally closed

Hold/Non-Hold Operation of the Alarm Output Relay

There are two methods in operating the alarm output relay.

- Turns OFF the output relay when the cause of the alarm is no longer met (non-hold).
- Holds the output relay ON until the alarm acknowledge operation is executed (hold).



Note

If the reflash alarm is turned ON, I01 to I03 are set to non-hold. Specifying hold produces no effect.

Alarm Output Release (Alarm ACK) Operation

When you perform the alarm ACK procedure, all alarm displays and relay outputs (/A1, /A2, /A3 option) are released. However, this procedure is not valid if the alarm display/output relay operation is set to non-hold. This cancellation procedure can be performed using FUNC key or USER key, or via remote control (/R1, /PM1 option).

Note

When the basic setting mode is entered, the activated/released condition of the previous alarm output relay is held. Alarm detection is not carried out in the basic setting mode, and you cannot release the alarm output relay.

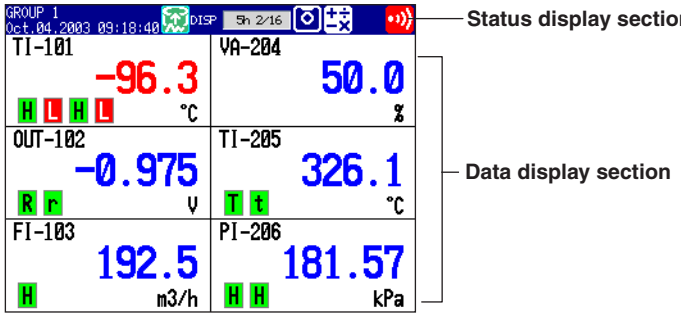
1.4 Display Function

Describes screens in the operation mode.

Common Items Related to the Display

5.5” TFT Color

The FX100 has a 5.5” TFT color LCD (240-by-320 dot resolution). The screen consists of the status display section and the data display section.



- **Status Display Section**
  Displays the displayed screen name, date and time, internal memory/external storage medium usage condition, alarm condition, user name (when using the key login function), computation condition (/M1, /PM1 option), status of key lock function and e-mail transmission function (/C7 option).
- **Data Display Section**
  Displays measured data using numerical values, waveforms, bar graphs, and so on. Shows the setup screen when setting functions.

Group Display

The data displayed on the trend, digital, and bar graph screens are the data of measurement or computation channels that are assigned to the group. Up to 6 channels can be assigned to a single group. Up to 4 groups can be registered. The groups are common to the trend, digital, and bar graph screens.
On the trend, digital, and bar graph screens, the displayed groups can be automatically switched at 5 s, 10 s, 20 s, 30 s, or 1 min intervals.

Channel Number or Tag Name Display

The channels can be displayed as channel number or tags. The setting applies to all channels.

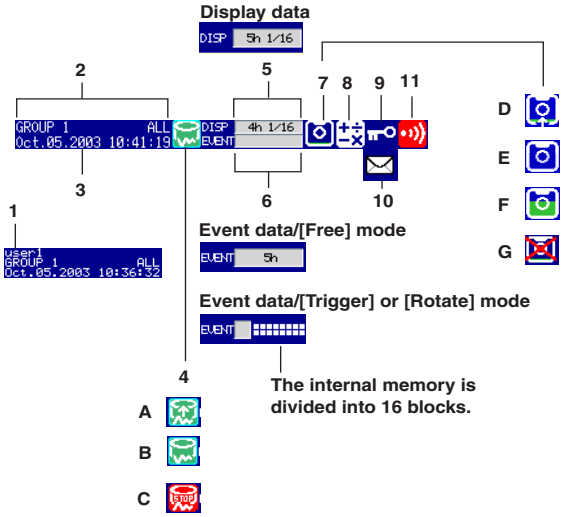
Alarm Indication

Alarms are checked at all times and displayed on the relevant screens using alarm type symbols.

Name	Symbol
Upper limit alarm	H
Lower limit alarm	L
Difference upper limit alarm	h
Difference lower limit alarm	l
Upper limit on rate-of-change alarm	R
Lower limit on rate-of-change alarm	r
Delay upper limit alarm	T
Delay lower limit alarm	t

Status Indication Section

The following information is displayed in the status display section during operation mode and setting mode. (The information is not displayed during basic setting mode. [Setup Mode] is displayed instead.)



1. **User name**
   The user name is displayed when the key login function is used and the user is logged in.
2. **Group name or display name**
   The display name or group name corresponding to the display shown on the data display section. [ALL] is displayed only when all channels are displayed on the trend display (see page 1-17).
3. **Current date and time**
   The current date and time are displayed.
4. **Data acquisition to the internal memory ON/OFF**
   A and B is alternately displayed: Data being acquired or waiting for a trigger for event data.
   C: Data acquisition stopped

Note

For event data that starts sampling when the trigger condition is met, the display indicates that sampling is in progress even in the trigger wait state. The trigger wait state can be determined on the bar graph.

5. **Memory usage of the display data acquisition area in the internal memory**
   Displayed when acquisition of display data is enabled.
   For models with a storage medium drive
   - The box indicates the amount of display data acquisition area in the internal memory. The green bar shows the used space of the area.
   - Time display indicates the remaining space of the display data acquisition area in the internal memory.
   - n/16
     The maximum number of display data files that can be written to the internal memory is 16. “16” represents this value. The value n is the number of display data files in the internal memory.

Note

In the following cases, the display data is overwritten from the oldest file. Use caution because the overwritten data is lost forever.

- When there is no more remaining space of the display data acquisition area in the internal memory.
  At this point, the status display section shows [Overwrite].
- When the number of display data files in the internal memory has exceeded 16.

For models without storage medium drive

Only the items below differ from "For models with a storage medium drive."

- When "auto save" is specified
  The box indicates a display data file. The green bar shows the progress of the data acquisition. Time display shows the remaining time a display data file is created.
  For the description of "display data" and "auto save," see section 1.5, "*Data Storage Function*."

6. **Memory usage of the event data acquisition area in the internal memory**
   Displayed when acquisition of event data is enabled.
   For models with a storage medium drive
   - When the acquisition mode is [Free]
     - The box indicates the amount of event data acquisition area in the internal memory. The green bar shows the used space of the area.
     - Time display indicates the remaining time of the event data acquisition area in the internal memory.
     - n/16
       The maximum number of event data files that can be written to the internal memory is 16. "16" represents this value. The value n is the number of event data files in the internal memory.
       For the description of "free mode," see "1.5 Data Storage Function."

Note

In the following cases, the event data is overwritten from the oldest file. Use caution because the overwritten data is lost forever.

- When there is no more remaining time of the event data acquisition area in the internal memory
  The status display section shows [Overwrite].
- When the number of event data files in the internal memory has exceeded 16

- When the mode is [Trigger] or [Rotate]
  - Bar graph
    Displays the acquisition time (amount of memory used with respect to the data length) of the specified event data.
    When pretrigger is specified and START is pressed causing the FX100 to enter the trigger wait state, data of size equal to the pretrigger amount is acquired to the internal memory. At this point the bar is displayed in orange. After acquiring the data of size equal to the pretrigger, the length of the bar stays fixed. However, the relevant data is updated until the trigger condition is met. When the trigger condition is met, the bar turns green. Data is acquired to the internal memory after the pretrigger data.
    If data acquisition to all blocks is finished in [Trigger] mode, [Full] (or [F]) is displayed in the bar. When [Full] (or [F]) is displayed, event data is not acquired to the internal memory even if the trigger condition is met.
    For the description of "trigger mode" and "rotate mode," see section 1.5, "*Data Storage Function*."
  - Block display
    When the event data acquisition area is divided into multiple blocks, the block usage is displayed.
    White blocks: Blocks with no data.
    Green blocks: Block containing data that was acquired to the internal memory after starting the current acquisition of event data.
    Gray blocks: Blocks containing previous data.

For models without storage medium drive

Only the items below differ from “For models with a storage medium drive.”

- When the acquisition mode is [Free] and “auto save” is specified
  The box indicates a event data file. The green bar shows the progress of the data acquisition. Time display shows the remaining time a event data file is created.
  For the description of “event data” and “auto save,” see section 1.5, “*Data Storage Function*.”

7. Icon indicating the external storage medium status

No icon is displayed: A storage medium is not inserted in the drive or the FX100 is not equipped with a storage medium drive.

Note

If you use a floppy disk, press “FUNC key > [Media] soft key” to have the disk in the drive detected.

D and E are displayed alternately: The storage medium is being accessed.
E: External storage medium waiting (not being accessed).
F: The green level inside the icon indicates the amount of used space of the storage medium. If the remaining amount falls to 10% or less, the color changes to red. However, the color does not change when the FIFO action of the CF memory card is specified.
For the FIFO action of the CF memory card, see section 1.5, “*Data Storage Function*.”

8. Computation icon (only on models with the computation option)

No computation icon is displayed: No computation option (/M1, /PM1) or computation is stopped.
White computation icon: Computation in progress.
Yellow computation icon: Computation dropout occurred.

Note

Computation dropout occurs when the computation process cannot be completed within the scan interval. Press the FUNC key, then the [Math ACK] soft key to set the icon back to a white computation icon. If computation dropouts occur, increase the scan interval or reduce the number of computation channels that are turned on.

9. Key lock icon

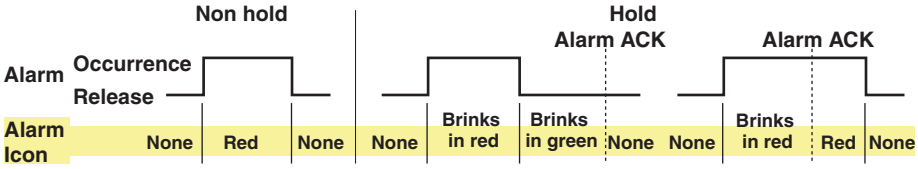
Key icon: Key lock is enabled.
No indication: Key lock is disabled.
For the key lock function, see section 1.9, “*Other Functions*.”

10. E-mail transmission function icon

Displayed when the e-mail transmission function is enabled.
See the ”*FX100 Communication Interface User’s Manual* ” (IM 04L20A01-17E).

11. Alarm icon

Displayed when any one of the alarms is occurring. The indication varies depending on hold/non-hold settings of alarm display.

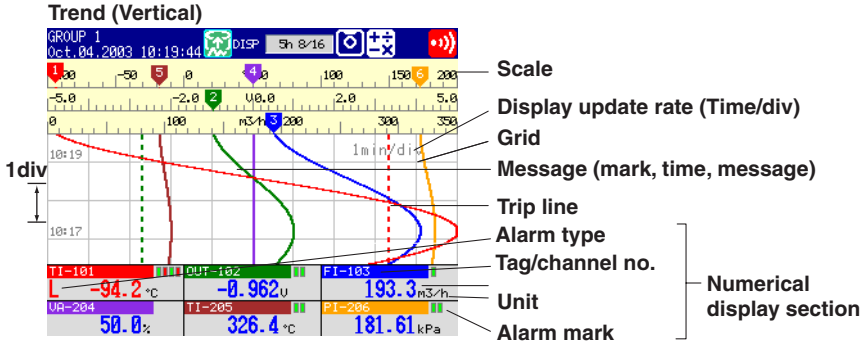


For a description on the hold/non-hold setting of alarm indication, see section 1.3, “ *Alarm Function*.”

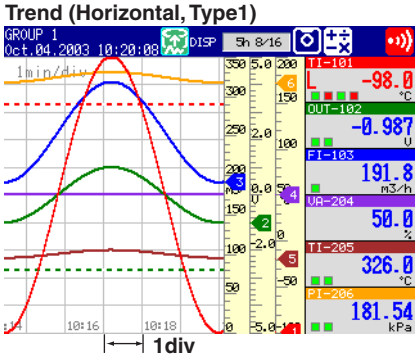
Trend Display

Displays the waveform of the measured and computed data. The direction of the waveform display can be set to horizontal or vertical.

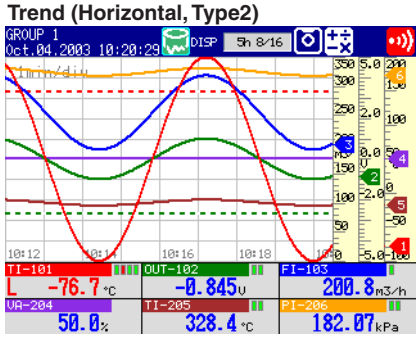
Trend (Vertical)



Trend (Horizontal, Type1)



Trend (Horizontal, Type2)



Displayed Information

The following Information can be displayed.

Information	Description
All channel display	Waveforms of all channels that were set to display the trend are displayed on one trend screen.
Displayed color of waveforms	The displayed color of waveforms can be specified for each channel. The color also applies to the bar graph.
Thickness of waveform lines	You can select from 1, 2, or 3 dots. The specified thickness of waveform lines applies to all channels.
Trip line display	Displays a line to indicate a particular value of interest (trip line) for each group. You can select the thickness of the displayed line from 1, 2, or 3 dots. Up to four trip lines can be displayed on a single group.
Scale display	A scale appropriate for the measured item can be displayed for each channel. You can select whether or not to display the scale for each channel.
Grid	The specified number of lines are displayed on the waveform display area.
Turn ON/OFF the numerical display section	The numerical display section can be turned ON or OFF. If the numerical display section is turned OFF, the display shows only the waveform and the scale.

Updating the Waveform

One division along the time axis consists of 30 dots on the LCD. The displayed waveform is updated at an interval corresponding to one dot. This interval is determined by the time period corresponding to one division (referred to as the display update rate). The relationship between the display update rate and the sampling interval of displayed data is as follows:

Display Update Rate (/div)	15 s*	30 s*	1 min	2 min	5 min	10 min	15 min	20 min	30 min	1 h	2 h	4 h	10 h
Speed of movement of waveform (approximate value, mm/h)	2500	1250	625	312	156	78	42	31	21	10	5.2	2.6	1.0

* for the FX103 only

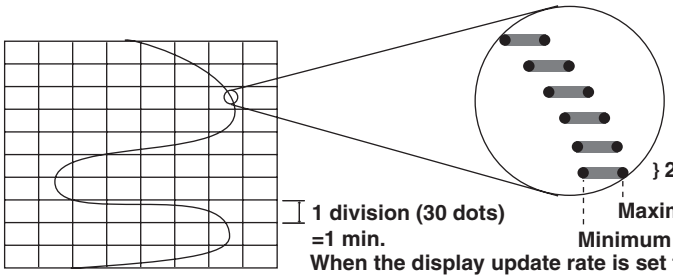
Updating the Numerical Display

Numerical display is updated every second. However, when the scan interval on the FX106/FX112 is 2 s, the update rate is also 2 s.

Note

The data displayed on the screen are a maximum and minimum values of the data that are sampled at the scan interval, within the time period corresponding to one dot.

Displayed data of the waveform (when the display update rate is set to one minute)



When the display update rate is set to one minute, the time period corresponding to one dot (the sampling interval of displayed data) is 2 s.

Writing Messages

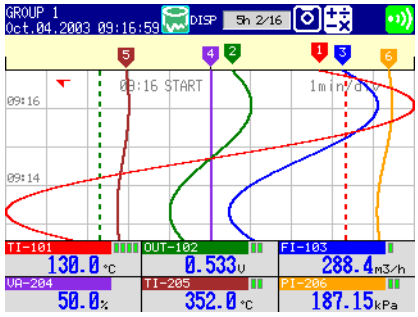
Messages specified by the user can be displayed at arbitrary points in time. For example, by displaying a message when a certain operation is carried out, the point at which the operation is carried out can be seen visually. Displayed messages are saved.

Number of Messages: 8

Messages

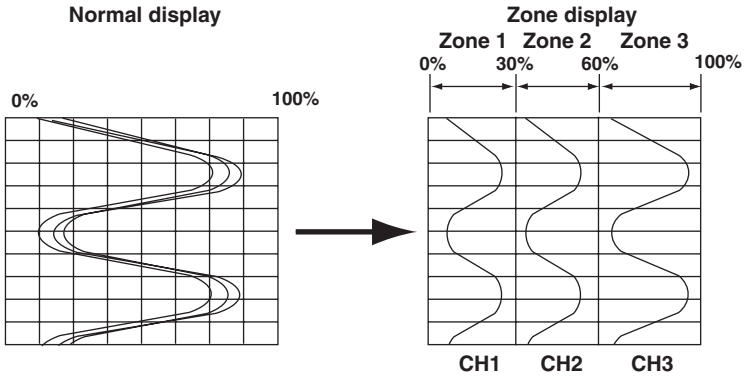
1	START
2	PROCESS 2
3	
4	
5	
6	
7	
8	

Trend Screen



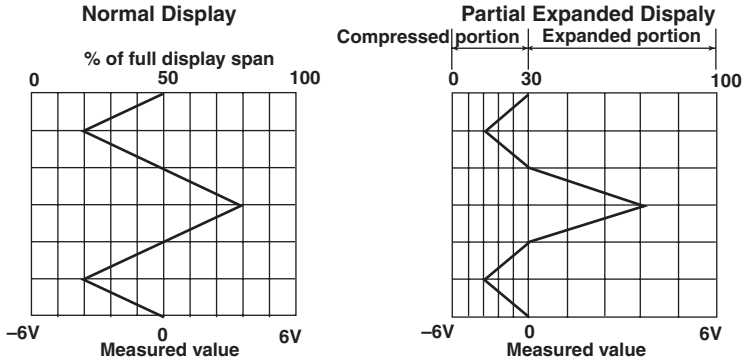
Zone Display

The display range (zone) can be set for each channel. In the example shown in the figure below, channel 1 is displayed in the zone 0 to 30%, channel 2 in the zone 30 to 60%, and channel 3 in the zone 60 to 100%.



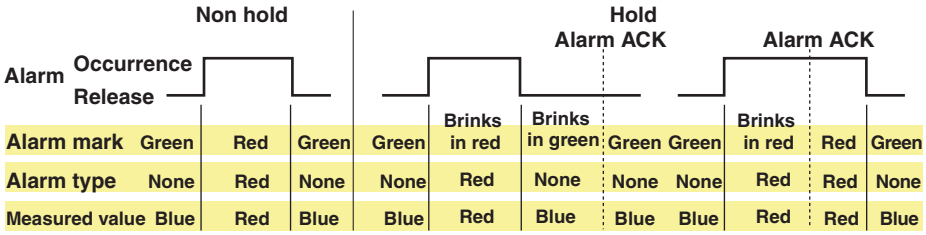
Partial Expanded Display

By compressing a section of the display scale of the waveform, the remaining section of is expanded. You specify a value on the display scale (boundary value) to be moved to another position on the display scale (boundary value displacement position). In the example shown below, 0 V (boundary value) is moved to the 30% position of the display scale (boundary value displacement position). The section below the boundary represents –6 V to 0 V and the section above the boundary represents 0 V to 6 V.



Alarm Indication

The indications of preset alarm marks vary depending on the hold/non-hold setting of alarm indication as follows.

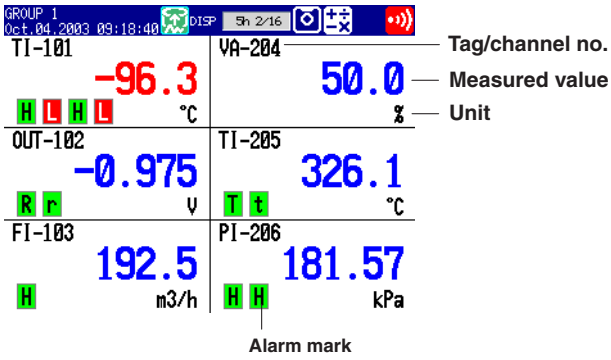


Alarm mark	Green	Red	Green	Green	Brinks in red	Brinks in green	Green	Green	Brinks in red	Red	Green
Alarm type	None	Red	None	None	Red	None	None	None	Red	Red	None
Measured value	Blue	Red	Blue	Blue	Red	Blue	Blue	Blue	Red	Red	Blue

For a description on the hold/non-hold setting of alarm indication, see section 1.3, "*Alarm Function*."

Digital Display

The measured data are displayed using numerical values in large size.



Updating of the Numerical Display

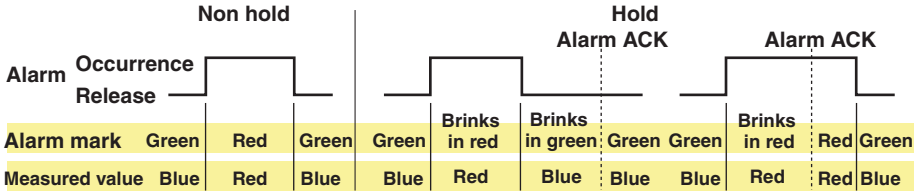
Numerical display is updated every second. However, when the scan interval on the FX106/FX112 is 2 s, the update rate is also 2 s.

Note

- **Numerical Display of Measurement Channels (Common to Trend, Digital, and Bar Graph Displays)**
  When the measured values of measurement channels are over range (see below), the measured values are indicated as “+Over” or “–Over.” If a burnout is detected on a channel assigned to the burnout detection function, "Burnout" is displayed for the measured value. Otherwise, a numerical value is displayed.
  Over Range of Measurement Channels
  - For DC voltage input, over range occurs when the measured value of the measurement channel exceeds ±5% of the measurable range. For example, the measurable range when the measurement range is 2 V is –2.000 to 2.000 V. If the measured value exceeds 2.200 V, + over range occurs; if the measured value falls below –2.200 V, – over range occurs.
  - For thermocouple or RTD input, over range occurs when the measured value exceeds approximately ±10°C of the measurable range. For example, the measurable range when the measurement range is R is 0.0 to 1760.0°C. If the measured value exceeds approximately 1770.0°C, + over range occurs; if the measured value falls below approximately –10.0°C, - over range occurs.
- **Numerical display of computation channels (common to trend, digital, and bar graph displays)**
  See section 1.6, “*Computation Function and Report Function (/M1, /PM1 Option)*.”

Alarm Indication

The indications of preset alarm marks vary depending on the hold/non-hold setting of alarm indication as follows.

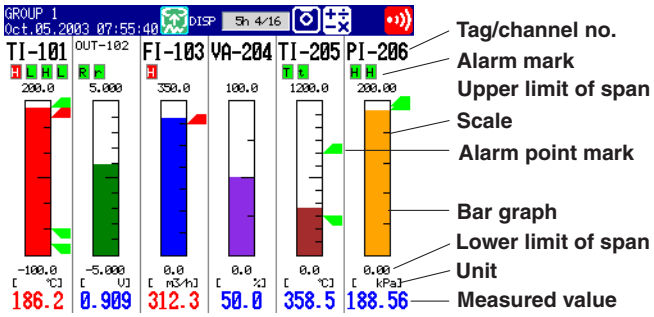


For a description on the hold/non-hold setting of alarm indication, see section 1.3, “ *Alarm Function*.”

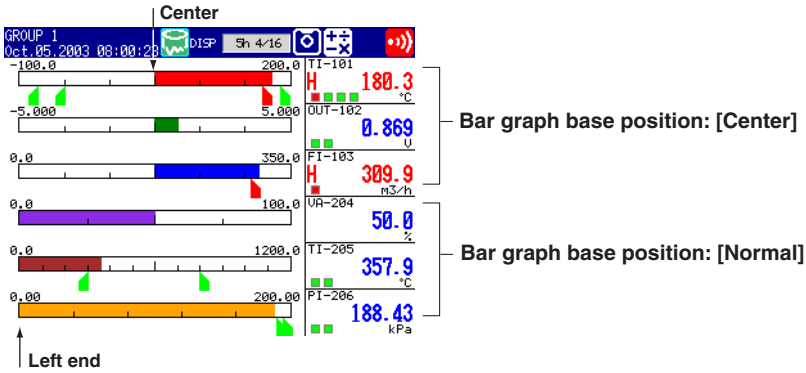
Bar Graph Display

The measured/computed data are displayed using bar graphs.

Bar Graph (Horizontal)



Bar Graph (Vertical)



Updating of the Numerical Display

Numerical display is updated every second. However, when the scan interval on the FX106/FX112 is 2 s, the update rate is also 2 s.

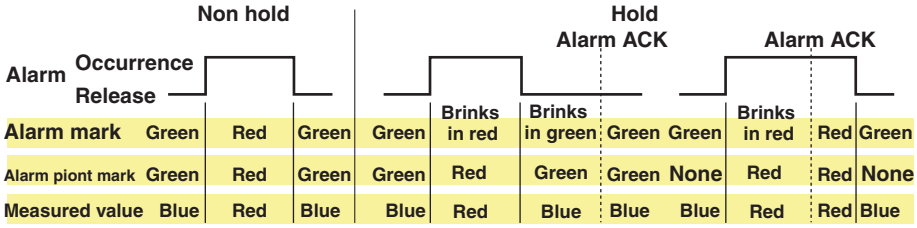
Displayed Information

The following Information can be displayed.

Information	Description
Display direction	The bar graph can be displayed vertically or horizontally.
Reference position	When the bar graph is displayed horizontally, the starting point of the bar (reference position) can be set to standard (Left or right end of the scale, whichever the value is smaller) or the center.
Display color	The displayed color of bar graphs can be specified for each channel. The display color is common to the trend display color.
Scale display	Main scale marks are displayed for each channel. This is common with the number of scale divisions of the trend display.

Alarm Indication

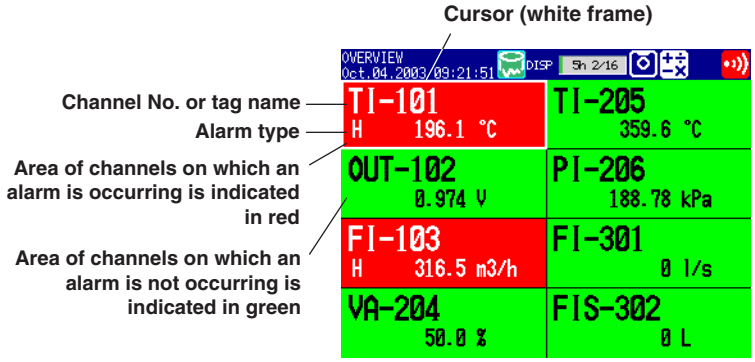
The indications of preset alarm marks vary depending on the hold/non-hold setting of alarm indication as follows.



For a description on the hold/non-hold setting of alarm indication, see section 1.3, "*Alarm Function*."

Overview Display

Displays alarm conditions of all channels.
You can move the cursor to select a channel and display the trend or bar graph of the group containing the selected channel.

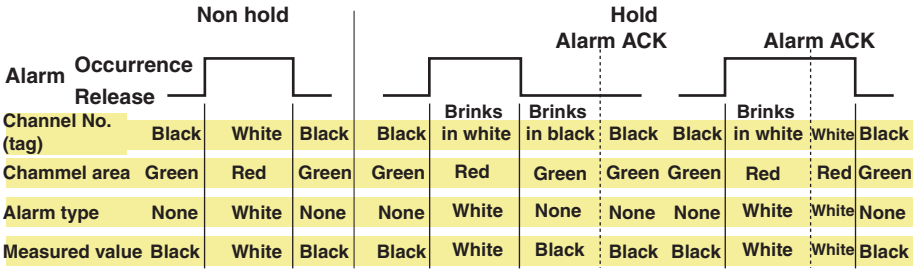


Updating the Numerical Display

Numerical display is updated every second. However, when the scan interval on the FX106/FX112 is 2 s, the update rate is also 2 s.

Alarm Indication

The display in the channel display area and channel no./tag name when an alarm occurs on any of the channels varies depending on the hold/non-hold setting of alarm indication as follows.



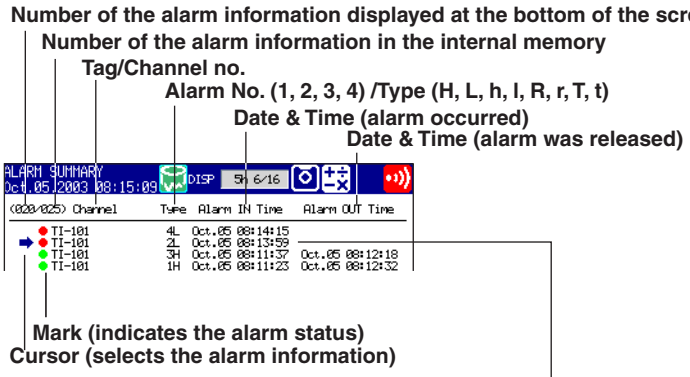
Channel No. (tag)	Black	White	Black	Black	Brinks in white	Brinks in black	Black	Black	Brinks in white	White	Black
Chammel area	Green	Red	Green	Green	Red	Green	Green	Green	Red	Red	Green
Alarm type	None	White	None	None	White	None	None	None	White	White	None
Measured value	Black	White	Black	Black	White	Black	Black	Black	White	White	Black

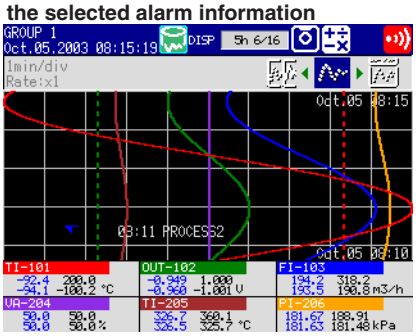
For a description on the hold/non-hold setting of alarm indication, see section 1.3, “ *Alarm Function*.”

Alarm Summary

A list of the most recent alarms can be displayed.

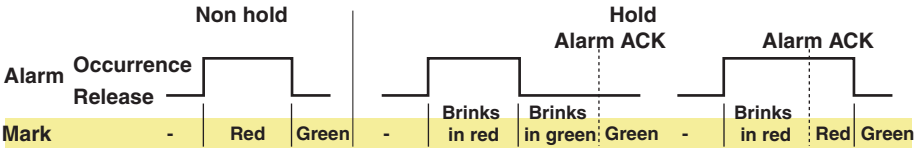
- Up to 120 incidents can be displayed.
- By selecting an alarm from the list using arrow keys, the historical trend of the display data or event data containing the alarm can be recalled.





Alarm Mark Indication

The mark indication varies depending on the hold/non-hold setting of alarm indication as follows.



-: Alarm information is not displayed.

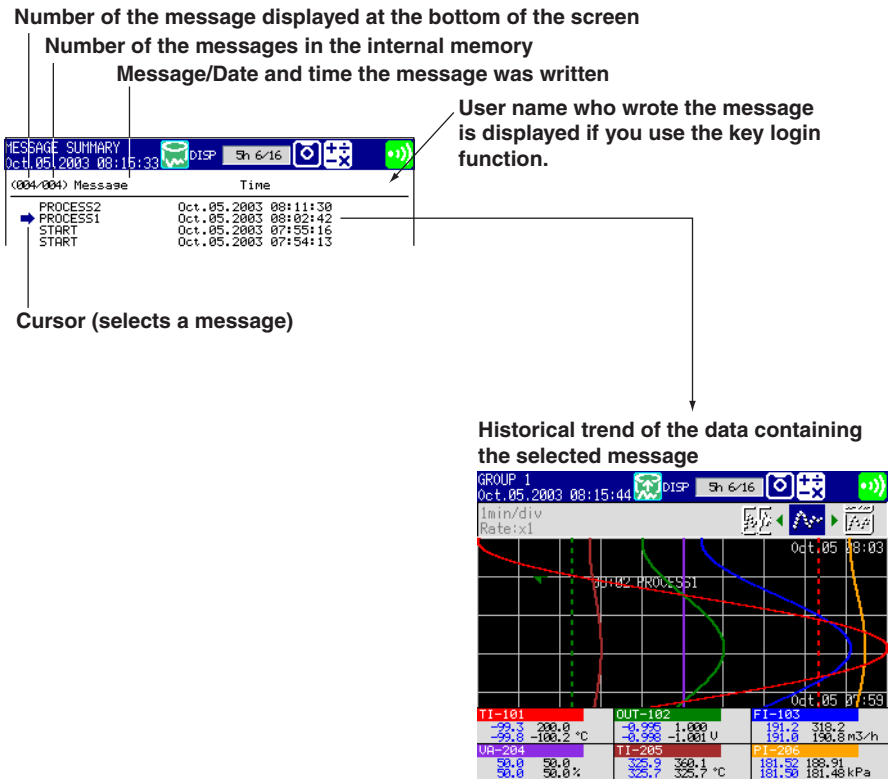
For a description on the historical trend display, see page 1-26.

For a description on the hold/non-hold setting of alarm indication, see section 1.3, “ *Alarm Function*.”

Message Summary

The messages and the times when they were entered are displayed in a list.

- Up to 100 messages can be displayed.
- By selecting a message from the list using arrow keys, the historical trend of the display data or event data containing the message can be recalled.

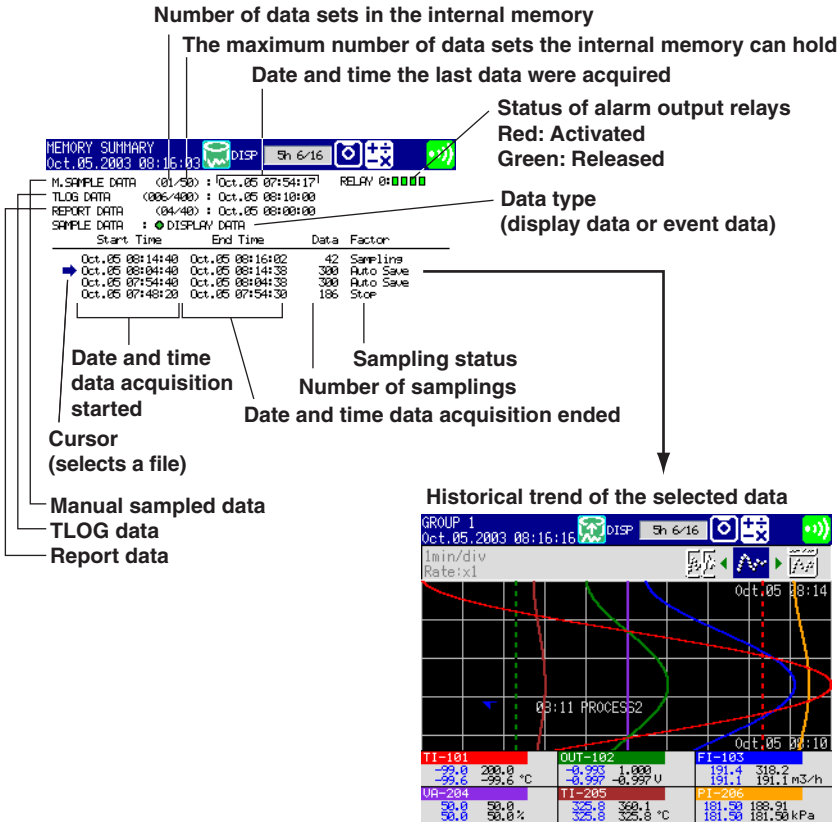


For a description on the historical trend display, see page 1-26.

Memory Summary

The information pertaining to the display data and event data in the internal memory is displayed.

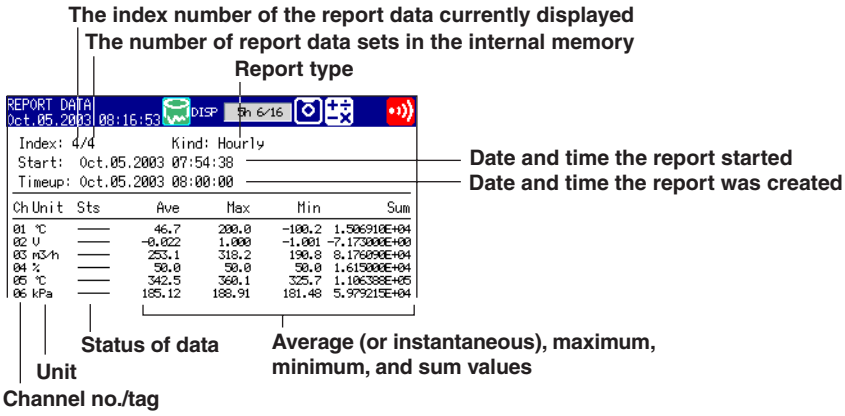
- By selecting the display data or event data using the arrow keys, the historical trend display can be recalled.
- The number of manual sampled data, TLOG data (/M1, /PM1 option), and report data (/M1, /PM1 option) residing in the internal memory are displayed.
- For models that have the alarm output relays (/A1, /A2, /A3 option), the ON/OFF state of the relays are also listed.



For a description on display data and event data, see section 1.5.
For a description on the historical trend display, see page 1-26.

Report Data (/M1, /PM1 Option)

Report data residing in the internal memory can be displayed.



For a description on report function, see section 1.6.

Historical Trend

The waveform of the measured data in the internal memory or the external storage medium can be displayed. This function is called “Historical trend.”

Methods Used to Display the Historical Trend

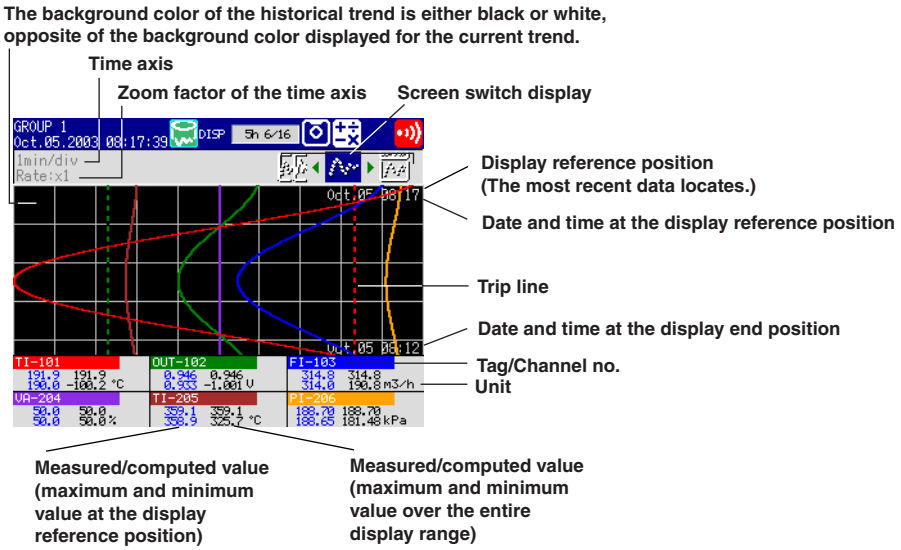
The following four methods are available in displaying the historical trend of the display data or event data in the internal memory:

- Display from the alarm summary. For the operating procedure, see section 5.3.
- Display from the message summary. For the operating procedure, see section 5.3.
- Display from the memory summary. For the operating procedure, see section 5.3.
- Recall from the screen menu. For the operating procedure, see section 5.4.

You can display the historical trend of the display data or event data on the external storage medium. For the operating procedure, see section 7.6.

Information Displayed on the Historical Trend

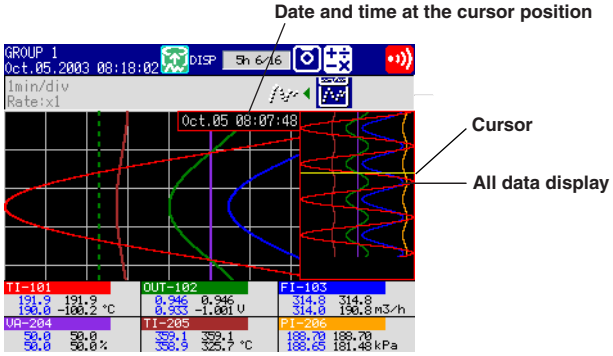
Alarms and scales are not displayed on the historical trend display.



Operation on the Historical Trend

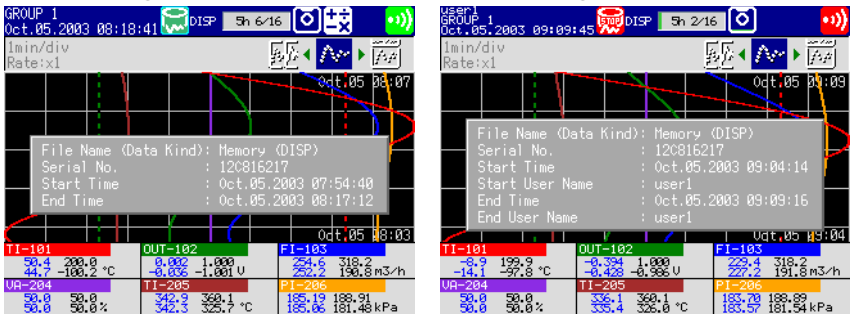
The following operations can be carried out.

- The waveform can be scrolled along the time axis using the the arrow keys.
- The time axis can be expanded or reduced.
- You can display all the data points of the file displayed on the historical trend display in a section of the screen (all data display) and specify the data that positions to the reference position using a cursor.



- The information of the data being displayed on the historical trend can be displayed.

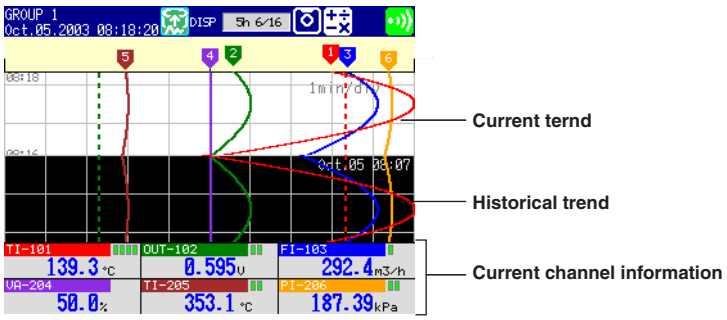
When the login function is disabled **When the login function is enabled**



File Name (Data Kind): File name and data type (display data or event data)
Serial No.: Serial number of the FX100 that acquired the data
Start Time, End Time: Time at which data acquisition is started/stopped
Start User Name, Stop User Name: Name of the user who carried out the operation (user name is displayed only when the key login function is used).

Half Screen Display (Only When Displaying the Historical Trend of the Display Data)

Using up and down arrow keys, you can have a half of the display show the historical data of the display data and the other half show the display data currently being measured.



Setting the Display Condition of the LCD

The following display conditions of the LCD can be configured.

Display Attribute	Setting
Background color of the operation display	The background color of the display can be set to white or black. The initial setting of the control operation display is [Black]; the initial setting of the measurement operation display is [White].
LCD brightness	The brightness of the LCD can be set between eight levels. The initial setting is [2].
Backlight saver	The lifetime of the LCD backlight can be extended by automatically dimming the light when there is no key operation for a certain amount of time. The display returns to the original brightness with a key operation or an alarm occurrence. The initial setting is set so that the backlight saver is disabled.

1.5 Data Storage Function

This section describes the types of data that can be created and how to save them.

Data Type and Data File

Data types and corresponding files are as follows:

Type	Content
Display data	• Waveform data that have been sampled at a specified sampling interval and displayed on the trend display. • The maximum and minimum values from measured/computed data within the sampling intervals are held. • A header string can be written into the display data file (a character string that is common to all data files). • Alarm and message information is held. • Data format: Binary format (undisclosed) • File name: Mddhhmma.DDS
Event data	• The measured/computed data are acquired at the specified sampling interval. There is a mode in which the data acquisition is started when a trigger occurs or another mode in which the data is acquired continuously. • The header string can be written into the event data file (a character string that is common to all data files). • Alarm and message information is held. • Data format: Binary format (undisclosed) • File name: Mddhhmma.DEV
Manual sampled data	• Every time a key that executes manual sampling is pressed, the measured/computed data of all channels at that point are acquired. • Up to 50 samples of data can be stored in the internal memory. • The header string can be written into the manual sampled data file (a character string that is common to all data files). • Data format: ASCII format • File name: Mddhhmma.DMN
TLOG data (option)	• The measured/computed data of all channels is acquired to the internal memory at the end of every interval period a timer specifies. • Up to 400 data sets can be stored in the internal memory. • The header string can be written into the TLOG data file (a character string that is common to all data files). • Data format: Binary format (undisclosed) • File name: Mddhhmma.DTG
Report data (option)	• Consists of hourly, daily, weekly, and monthly reports. Data are computed at intervals depending on the report type (one hour for hourly report, one day for daily report, etc.). Data are added to the internal memory at the end of every interval period. • Up to 40 reports can be stored in the internal memory. • Each report file can contain up to 12 measured/computed channels of report data. • The header string can be written into the report data file (a character string that is common to all data files). • Data format: ASCII format • File name: Hourly report: Mddhhmma.DHR, Daily report: Mddhhmma.DDR, Weekly report: Mddhhmma.DWR, Monthly report: Mddhhmma.DMR
Setup data	• The setup data of the FX100 • File name: Up to eight alphanumeric characters, Extension: .PNL
Screen image data	• The screen image displayed on the FX100. • File name: Mddhhmma.PNG

For information on using each type of data, see appendix 4, "*Types of Data Created on the FX100 and Their Uses*."

File Name

- **Mddhhmm denotes the date and time.**
  Mddhhmm of setup data and screen image data is the date and time the file was created.
  Mddhhmm of other data is the date and time the first data was sampled.

  M: Month (1 to 9, X (October), Y (November), Z (December), dd: day, hh: hour, mm: minute

- **"a" denotes the last digit of the year (0 to 9).**
  However, "a" becomes a sequence number for the following case. It takes a value between A and Z.
  For example, if the acquisition of the display data is started and stopped, and started again within 1 minute by pressing the START key, the two file names are the same up to Mddhhmm (month, day, hour, and minute). In this case, the second file is assigned the sequence number A.
  Example:
  70112563.DDS
  7011256A.DDS
  Two display data files which sampling started on July 1st, 2003 at 12:56.

File Creation

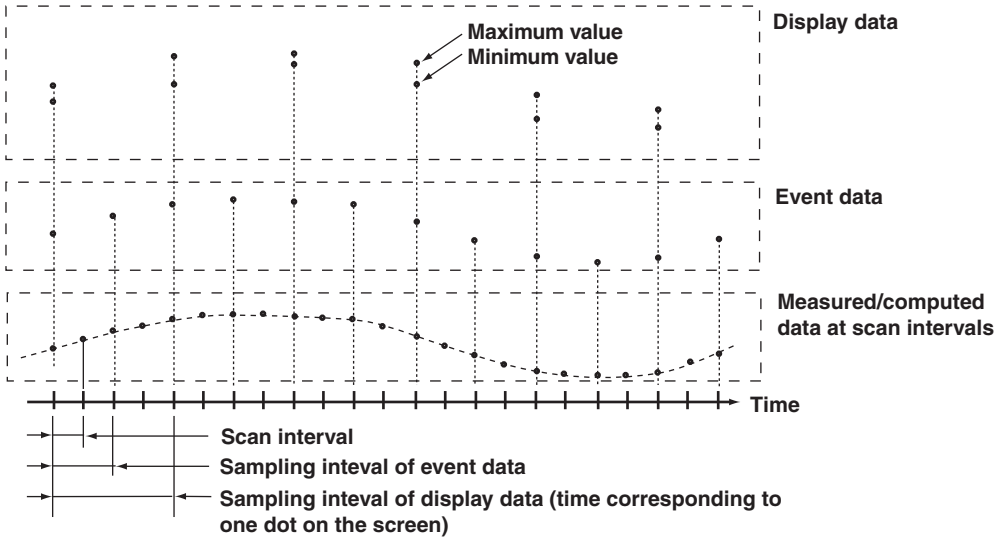
The display data, event data, manual sampled data, TLOG data (/M, /PM1 option), and report data (/M, /PM1 option) are temporarily written to the internal memory. Data files are created when the data in the internal memory is saved to the external storage medium.

Note

A backup should be made of the data on the external storage medium.

Display Data and Event Data

The measured/computed data are first acquired to the FX100's internal memory as two types of data, display data and event data.



- **Display Data**

  Display data are used to display waveforms on the FX100's screen. The sampling interval of display data is the time period corresponding to one dot on the screen. This interval is determined by the display update rate. The relationship between the display update rate and the sampling interval of display data is as follows:

Display Update Rate (/div)	15 s*	30 s*	1 min	2 min	5 min	10 min	15 min	20 min	30 min	1 h	2 h	4 h	10 h
Sampling interval of display data (s)	0.5	1	2	4	10	20	30	40	60	120	240	480	1200

* for the FX103 only

Display data consists of maximum and minimum values of the measured or computed data sampled at the scan interval within the time period corresponding to one dot on the time axis on the screen. Display data can be likened to the conventional recording on the chart sheet and are useful for long-term observations.

See page 1-18 for the display update rate.

- **Event Data**

  Event data is the measured/computed data at specified sampling intervals. The sampling interval can be selected from the selections below. You cannot specify a sampling interval that is faster than the scan interval.

  FX103: 250 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 30 s, 60 s, 120 s, 300 s, and 600 s
  FX106/FX112:1 s, 2 s, 5 s, 10 s, 30 s, 60 s, 120 s, 300 s, and 600 s

  By setting the sampling interval equal to the scan interval, all measured or computed data sampled at the scan interval can be saved. In addition, the event data generated when an event occurs (an alarm, for example) can also be saved. This is useful when you wish to observe the measured/computed data in detail.

Specifying the Data to Be Acquired

Specify the type of data to be acquired depending on the application. Several examples are shown below. Please use them as references.

Example 1: Continuously record the waveform data as in the conventional chart-type recorders.

Select "display data only."

Example 2: Continuously record the waveform data and when an alarm occurs, record detailed data around the alarm incident.

Select "display data and event data." For the event data, select "Trigger" or "Rotate" for the mode. Specify the trigger used to start the event data acquisition and the time period during which to acquire the data (event data file size).

Example 3: Continuously record detailed data.

Select "even data only." Select "Free" for the mode.

Example 4: Recording is not necessary under normal circumstances. Only record detailed data around the alarm incident.

Select "event data only." Select "Trigger" or "Rotate" for the mode. Specify the trigger used to start the event data acquisition and the time period during which to acquire the data.

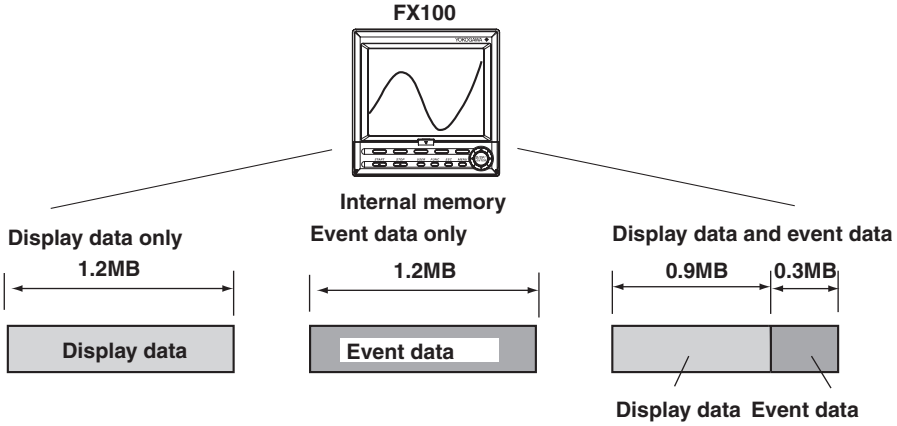
Acquiring Data to the Internal Memory (Display Data and Event Data)

Combination of Data Types to Be Acquired

Select "display data only," "display data and event data," or "event data only."

Internal Memory Capacity

The capacity of the internal memory for acquiring display data and event data is 1.2 MB. When the measured/computed data are saved as both display data and event data, 0.9 MB is used to save display data and 0.3 MB is used to save event data.



Channels for Saving the Display Data / Event Data

You can specify the channels to save the display data or event data from the measurement and computation channels (/M1, /PM1 option). By default, the data of all measurement/computation channels is set to be saved.

Data Acquisition (Display Data)

Data acquisition starts when the START key is pressed and stops when the STOP key is pressed. The display data are overwritten when the display data storage area in the internal memory becomes full, or the number of files* exceeds 16.

* The number of display data files
During manual save, a file is created for each data write operation (a set of start and stop operations). During auto save, a file is created every auto save interval and at every specified date/time.

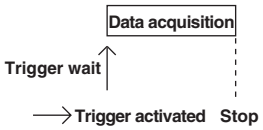
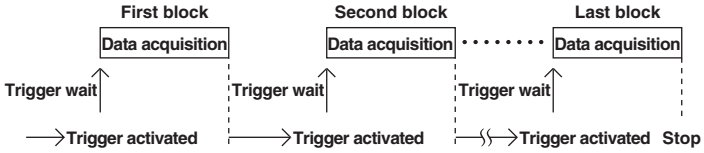
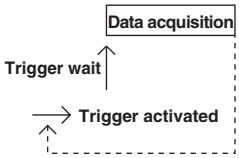
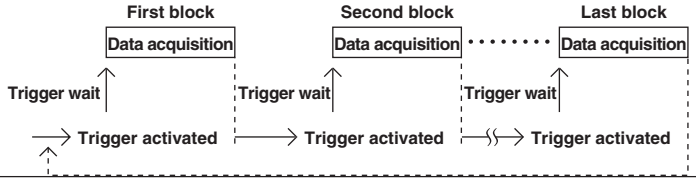
Note

- The display data in the internal memory can be confirmed with the memory summary. See *section 5.3.*
- When a power disruption occurs the file is closed.

Data Acquisition (Event Data)

The operation differs from the mode you specified. There are three modes in data acquisition, [Free], [Trigger], and [Rotate]. [Free] mode can be set when acquiring the event data only.

Mode	Description
Free	Data acquisition is started by pressing the START key. The operation is stopped by pressing the STOP key. When the storage area of the internal memory becomes full, or the number of files* in the internal memory exceeds 16, it is overwritten. * The number of event data files During manual save, a file is created for each data write operation (start and stop operations). During auto save, a file is created every specified interval (data length) and at every specified date/time.

Mode	Description
Trigger	**When the internal memory is not divided into blocks:** One event data file is created in the internal memory. Press the START key to enter the trigger wait state. After the trigger is activated, data are acquired for the specified time (data length) and the operation is stopped. At this point, the acquisition does not start even if the trigger is activated.  **When the internal memory is divided into blocks:** An event data file each in the block is created. Press the START key to enter the trigger wait state. After the trigger is activated, data are acquired for the specified time (data length) and the operation is stopped. When the trigger is activated again, data are acquired and stored to the next block. When all blocks are full, no more acquisition takes place. 
Rotate	**When the internal memory is not divided into blocks:** One event data file is created in the internal memory. Press the START key to enter the trigger wait state. After the trigger is activated, data are acquired for the specified time (data length, see section 8.11) and the operation is stopped. Data are overwritten when the trigger is activated again. Every time the trigger is activated during the trigger wait state, data are overwritten. Press the STOP key to terminate data acquisition.  **When the internal memory is divided into blocks:** An event data file each in the blocks is created. Press the START key to enter the trigger wait state. After the trigger is activated, data are acquired for the specified time (data length, see section 8.11) and the operation is stopped. When the trigger is activated again, data are acquired and stored to the next block. When all blocks are full and the trigger is activated, data are overwritten to the first block. Every time the trigger is activated during the trigger wait state, data are overwritten to the next block. Press the STOP key to terminate data acquisition. 

Note

- The event data in the internal memory can be confirmed with the memory summary. See section 1.4 .
- When a power failure occurs, the event data file in the internal memory is closed as one file.

Pretrigger for the Event Data

Pretrigger is applied to the event data with [Trigger] or [Rotate] modes.
You can have event data before the trigger point be stored.
It is specified in terms of a percentage of the data length (0, 5, 25, 50, 75, 95, 100%).
If 0% is selected, all data are after the trigger point. The initial setting is 0%.

Trigger Type for the Event Data

When [Trigger] or [Rotate] is selected, the trigger type is selected by turning each type of trigger ON/OFF. The triggers operate in an OR fashion: the trigger is activated when any of the conditions that are turned ON are satisfied.

Type	Description
Key trigger	The trigger condition is satisfied when the FUNC key > [Trigger] soft key or the USER key (only when the "trigger" function is assigned to the USER key) is pressed.
External trigger	The trigger condition is satisfied when the external contact specified by remote control function is turned ON.
Alarm trigger	The trigger condition is satisfied when any of the alarms occur.

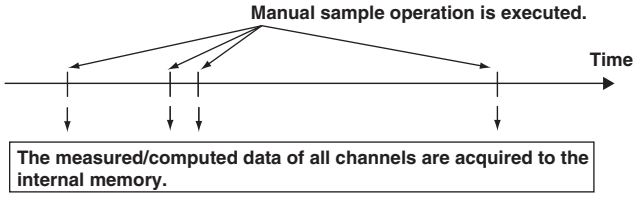
Estimate of the Number of Data That Can Be Written to the Internal Memory, and the Time Required to Do So

See appendix 1, " *Time Estimate for Writing Display/Event Data to the Internal Memory*."

Acquiring Data to the Internal Memory (Other Data)

Manual Sampled Data

Every time a given key operation is carried out, all measured/computed data at that point is acquired to the internal memory except for measurement channels that are skipped and computation channels that are turned OFF.



- Up to 50 data sets can be stored in the internal memory. When this number is exceeded, data are overwritten from the oldest data.

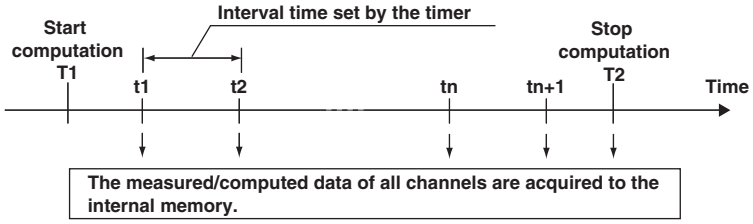
Note

The number of manual sampled data in the internal memory can be confirmed with the memory summary. See section 1.4 .

TLOG Data (/M1, /PM1 Option)

All the measured/computed data of all channels can be acquired to the internal memory at the preset interval. However, this excludes measurement channels that are skipped and computation channels that are turned OFF.

- TLOG data is acquired from the time the computation is started till the computation is stopped.
- TLOG data is acquired at each time interval set by timers and when the computation is stopped.



- Up to 400 data sets can be stored in the internal memory. When this number is exceeded, data are overwritten from the oldest data.

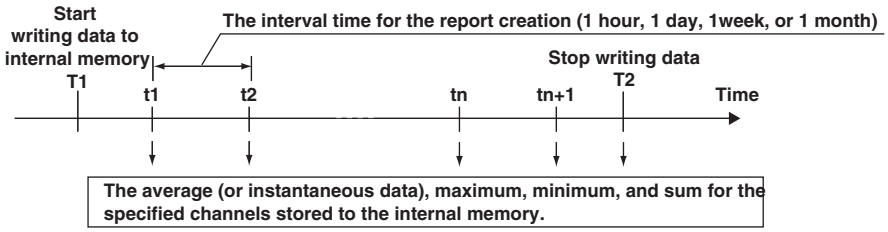
Note

- Up to 16 blocks (number of computation start-and-stop operations) can be created in the internal memory. When the number of blocks in the internal memory exceeds 16, TLOG data is overwritten even if the number of data sets is less than 400.
- The number of TLOG data sets in the internal memory can be confirmed with the memory summary. See section 1.4 .

Report Data (/M1, /PM1 Option)

The average or instantaneous value, and maximum, minimum, and sum can be computed for the specified channels at the preset interval, and the result can be acquired to the internal memory.

- Reports are created from the time the data acquisition is started till the data acquisition is stopped.
- Reports are created at each time interval (one hour for hourly report, one day for daily report, etc) and when the data acquisition is stopped.
- You can select report type from hourly, daily, hourly and daily, daily and weekly, or daily and monthly.



- Up to 40 data sets can be stored in the internal memory. When this number is exceeded, data are overwritten from the oldest data.
  For "hourly only", this constitutes 40 minutes of report data. For "daily+monthly", this constitutes 39 daily reports and one monthly report or 38 daily reports and two monthly reports.

Note

The number of report data sets in the internal memory can be confirmed with the memory summary. See section 1.4 .

Saving Data to the External Storage Medium (for Models with External Storage Drive)

Type of Storage Medium

The measured/computed data in the internal memory can be saved to the following external storage media.

- Floppy disk (1.44 MB)
- CF memory card (32 MB to 512 MB)

Note

- Use an external storage medium formatted to "FDISK 1 partition (hard disk format)."
- If a memory card larger than 32 MB is formatted using Windows XP, FAT32 is selected by default. The FX100 cannot use memory cards formatted to FAT32. When formatting a memory card on Windows XP, select FAT for the file system.

Two Saving Methods

There are two methods in which the data are saved to the external storage medium, manual save and auto save.

Manual Save

When saving the data residing in the internal memory to the external storage medium, insert the storage medium into the drive and carry out a given key operation. You can specify whether to save the entire data in the memory or only the data that have not been saved to the storage medium beforehand.

Be sure to save data to a storage medium before it is overwritten. Check the remaining space in the internal memory and save data.

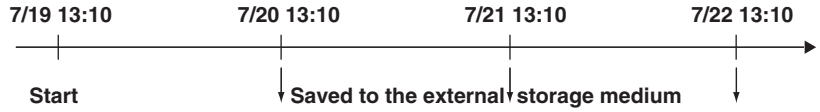
Auto Save

The external storage medium is placed in the drive at all times. Data saving to the external storage medium is done automatically.

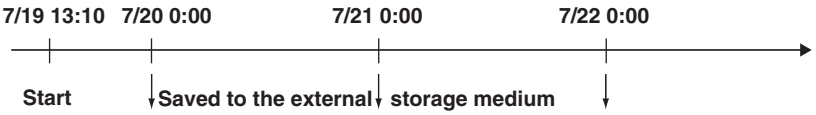
- **Display data**
  The display data in the internal memory is saved automatically to the external storage medium according to the timing shown below.
  - At specified intervals
    You ca select an interval (auto save interval) form 10 minutes to 31 days. *
    * The selections vary depending on the number of channels of data that is saved and the sampling interval.
  - Specified time
    You can specify a time to save the data as follows. This operation is called "data saving through memory timeup ."
    - Every hour on the hour
    - Specified hour on the hour every day
    - Specified hour on the hour on the specified day every week
    - Specified hour on the hour on the specified day every month
  - When the acquisition to the memory is stopped
  - When a given key operation is carried out to save data (see page 1-39.)
    You can save data using a key operation when necessary.

Examples of Data Save Operation to the External Storage Medium (During Auto Save)

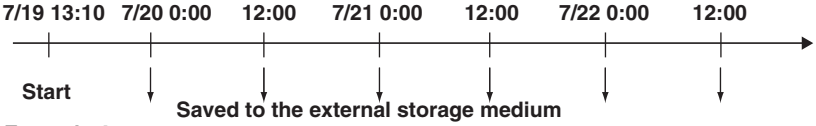
Example 1
Auto save interval or data length: 1 day
Date and time when data is saved to the external storage medium: Not used
After starting at 13:10, data is saved every 24 hours after (at 13:10 everyday).



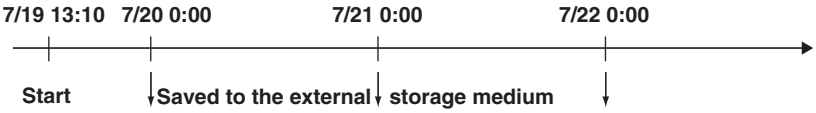
Example 2
Auto save interval or data length: 1 day
Date and time when data is saved to the external storage medium: 0 hour every day.
After starting at 13:10 on July 19th, data is saved at 0 hour on July 20th and then every day after and at 0 hour every day (the same time for both in this example).



Example 3
Auto save interval or data length: 12 hours
Date and time when data is saved to the external storage medium: 0 hour every day.
After starting at 13:10 on July 19th, data is saved at 0 hour on July 20th and then every 12 hours after and at 0 hour every day (0 hour occurs at the same time as the 12 hour timing).



Example 4
Auto save interval or data length: 2 day
Date and time when data is saved to the external storage medium: 0 hour every day.
After starting at 13:10 on July 19th, data is saved at 0 hour on July 20th and then every 2 days after and at 0 hour every day (the 2-day timing occurs at the same time as 0 hour).



Note

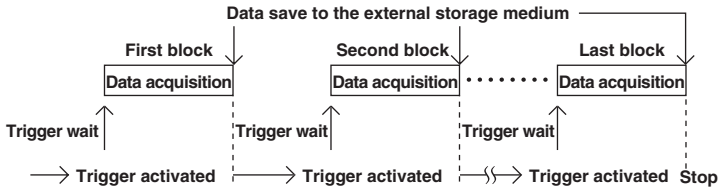
If the saving of the data to the external storage medium is not complete due to reasons such as insufficient free space, the next time data is saved to the external storage medium, unsaved data is also saved.

- **Event data (during [Free] mode)**
  The event data in the internal memory is saved automatically to the external storage medium according to the timing shown below. For the saving operations, see examples of data save operation for display data.
  - At specified intervals
    You ca select an interval (data length) from 3 minutes to 31 days. *
    * The selections vary depending on the number of channels of data that is saved and the sampling interval.
  - Specified time
    You can specify a time to save the data as follows. This operation is called "data saving through memory timeup."
    - Every hour on the hour
    - Specified hour on the hour every day
    - Specified hour on the hour on the specified day every week
    - Specified hour on the hour on the specified day every month

- When the acquisition to the memory is stopped
- When a given key operation is carried out to save data (see below.)

- **Event data (during [Trigger] mode or [Rotate] mode)**
  - After acquiring the data to the internal memory over the specified period (data length)
  - When the acquisition to the memory is stopped

  The following figure shows the operation when the acquisition area in the internal memory is divided using the trigger mode.



Saving Data Using FUNC Key Operation (During Auto Save)

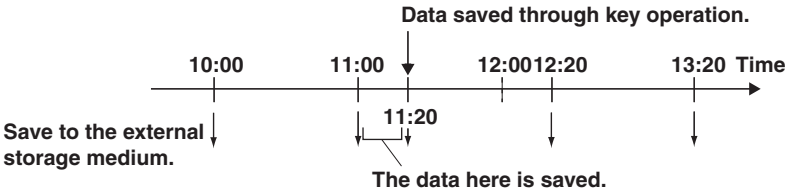
Through FUNC key operation, display data/event data can be saved to the external storage medium at an arbitrary time during data acquisition. For the operating procedure, see section 7.3 .

Below is the behavior of the FX100 when this operation is executed.

- **When saving data at auto save intervals (display data) or data length (event data)**

  Saving of the data is repeated at auto save intervals or every data length from the point when data is saved through key operation.

  Example: When auto save interval or data length is set to 1 hour



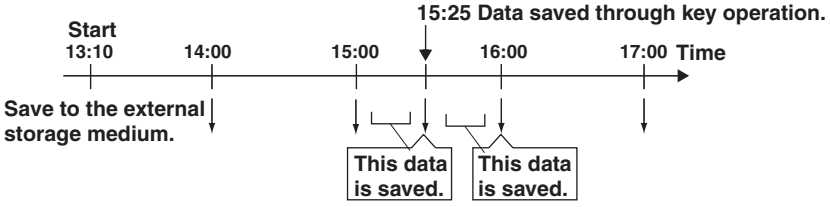
Note

The save operation using the auto save interval or data length is executed by counting the auto save interval or data length from the last time the data was saved.

- **When saving data at specified times**

  The operation continues without change after saving the data through key operation.

  Example: When data is saved every hour on the hour



- **Manual sampled data**
  The first time manual sample is executed, a manual sampled data file is created on the external storage medium. The data are appended to this file for each successive manual sample operation.

Note

When auto save is selected and there is no medium in the drive at the time when manual sample is executed, all unsaved data are saved the first time when manual sample is executed, after the storage medium is reinserted into the drive.

- **TLOG data (/M1, /PM1 option)**
  The first time TLOG data is acquired, a TLOG data file is created on the external storage medium. The data are appended to this file at each time interval. When the number of TLOG data sets exceeds 400, a new file is created.

Note

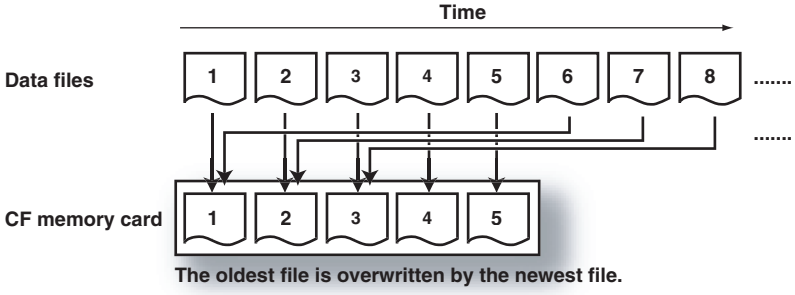
When auto save is selected and there is no medium in the drive at the time when data are supposed to be saved, all unsaved data are saved the first time when the interval time expires after the storage medium is reinserted into the drive.

- **Report data (/M1, /PM1 option)**
  The first time report data is created, a report data file is created on the external storage medium. A file is created for each type of report such as hourly, daily, weekly, and monthly reports. The data are appended to this file at each time interval.
  Dividing report files
  The report files are divided at the following times.
  - When data acquisition is stopped.
  - For hourly reports
    - When the 0:00 report is created every day.
    - When the number of data sets in the file reaches 25.
  - For daily reports
    - When the report for the first day of the month is created every month
    - When the number of data sets in the file reaches 32.

Note

When auto save is selected and there is no medium in the drive at the time when data are supposed to be saved, all unsaved data are saved the first time when the interval time expires after the storage medium is reinserted into the drive.

- **FIFO (first in first out) method for the CF memory card**
  FIFO refers to a processing method in which the oldest files are deleted to make room for new files when the external storage medium becomes full. FIFO can be specified only if the external storage medium is a compact flash memory card (CF memory card), and autos save mode is selected. The default is OFF.



- FIFO can be specified for files in the specified directory. FIFO cannot be specified for read-only, system, or hidden files.
- In the following cases, the oldest files are deleted.
  - When the amount of free space on the CF card after saving a data file falls below 1 MB.
  - When the number of files in the directory is 1000 or more.

Note

The dates and times of manual sample files and report files are updated whenever new data is added, meaning that they are less likely to be eligible for deletion. To release this condition (only when the FIFO method is specified), manual sample files and report files are split when they exceed 100 KB in size.

- If an error occurs with the CF memory card, the error indicator appears on the icon for the external storage medium, and the memory end output relay (with the /F1 option) becomes energized. To release this condition, replace or reformat the memory medium.

Other Data that Can Be Saved

- **Setup data**
  Setup data of the FX100 can be saved to the root directory of the external storage medium.
- **Screen image data**
  You can save the screen image currently displayed on the FX100's screen as a .png format file.

Destination Directory Name

You can specify the name of the save destination directory on the external storage medium (up to 8 alphanumeric characters. Initial value is [DATA0]) (see section 7.1).

* Display data, event data, manual sample data, TLOG data (/M1, /PM1 option), report data (/M1, /PM1 option), and screen image data files are saved to this directory.

File Header

You can write a header comment (up to 32 alphanumeric characters) to display data, event data, manual sampled data, TLOG data (/M1, /PM1 option) and report data (/M1, /PM1 option) files.

Saving Data via Ethernet

The display data, event data, report data, and screen image data can be automatically transferred to an FTP server via Ethernet for storage. Conversely, the FX100 can operate as an FTP server. In this case, the FX100 is accessed from a PC and the files on the external storage medium can be retrieved for storage. For details on these functions, see the " *FX100 Communication Interface User's Manual* " (IM 04L20A01-17E).

1.6 Computation Function and Report Function (/M1, /PM1 Option)

Computation Function

Equations can be written to computation channels by using the measured data or computed data as variables. The result of the computation can be displayed or stored. Computation is performed at the scan interval.

Computation Channels

You can use 12 computation channels, channel 31 to channel 42.

Types of Computations

In the table below, y represents the computed result. X and n generally represent the measured data and a constant.

Type	Description
Four arithmetical operations	Addition (+), subtraction (–), multiplication (×), and division (/)
**	Determines the power. $y = X^n$
SQR	Determines the square root.
ABS	Determines the absolute value.
LOG	Determines the common logarithm. $y = \log_{10} x$
EXP	Determines the exponent. $y = e^x$
Relational computation	Determines <, ≤, >, ≥, =, ≠ of two elements and outputs "0" or "1."
Logical computation	Determines the AND (logical product), OR (logical sum), XOR (exclusive logical sum) of two elements, NOT (negation) of an element and outputs "0" or "1."
TLOG computation	Determines the sum, maximum, minimum, average, and maximum – minimum (P–P) values at specified time intervals over the time interval. There are three timers used to set the time interval. For detail, see page 1-45.

Data That Can Be Used in Equations

For TLOG computation, only measured and computed data can be used. For all other computations, all types of data can be used.

- **Measured data**
  The data are specified using channel numbers in computing equations. If scaling is in effect, the scaled values are used in the computation.
- **Computed data**
  The data are specified using channel numbers in computing equations.
- **Constants (K01 to K30)**
  The values assigned to K01 to K30 can be used as constants. Enter the values as K01 to K30 in the equations.
  Range of constants (Maximum number of significant digits is 5):
  –9.9999E + 29 to –1.0000E – 30, 0, 1.0000E – 30 to 9.9999E + 29
- **Communication input data (C01 to C12)**
  Data that have been specified through the communication interface (/C2, /C3, or /C7 option) can be used. Enter the data as C01 to C12 in the equations.
  Range of numerical values (Maximum number of significant digits is 5):
  –9.9999E + 29 to –1.0000E – 30, 0, 1.0000E – 30 to 9.9999E + 29
  For the procedure used to set the data, see the " *FX100 Communication Interface User's Manual* " (IM 04L20A01-17E).

- **Conditions of the remote control terminals (D01 to D08, /R1 or /PM1 option)**
  The conditions of the remote input signal can be assigned to "1" and "0," and used in the equations. Enter the data as D01 to D08 (the number following the letter D is the remote terminal number) in the equations.
  The correlation between the conditions of the remote input signal and the value "1" and "0" are shown below.

Type of the remote input signal	Status	"1" or "0"
Contact	close	1
	open	0
Open collector	Voltage level is Lo at the remote terminal	1
	Voltage level is Hi at the remote terminal	0

- **Pulse input (D06 to D08, /PM1 option)**
  You can count pulses using pulse input terminals. Enter the data as D06 to D08 (the number following the letter D is the pulse input terminal number) in the equations.
  You can use D01 to D05 for pulse inputs as well as D06 to D08.

Unit Handling

The unit corresponding to the measured/computed data in the equation is not compensated. In computations, measured and computed data are handled as values without units. For example, if the measured data from channel 01 is 20 mV and the measured data from channel 02 is 20 V, the computed result of 01 + 02 is 40.

How to Write Equations/Order of Precedence of the Operators

See appendix 2 " *Meaning and Syntax of Equations*."

Displaying the Computed Result

The computed result of computation channels can be displayed on each operation screen.

- **Numerical display**
  The range of displayed values of computed data is from –9999999 to 99999999 excluding the decimal point. The decimal point position corresponds to the position of the decimal point of the upper and lower limit span of the computation channel.
  However, special displays are used for cases given in the table below.

Data Condition	Computation	Display
The computed result exceeds 99999999.	positive over display range	+Over
The computed result is below –9999999.	negative over display range	–Over
The value exceeds 3.4E + 38, or is below –3.4E + 38 in the middle of computation.	overflow	+Over or –Over
An error is detected. When the following computation is specified, a computation error occurs. • X/0 • SQR (–X) • LOG (–X) • When a skipped channel No. is entered in the equation.	error	+Over
The number of stacks * in the equation exceeds 17.	error	+Over

* Channel, constants (K), communication input data (C), remote/pulse input (D)

- **Computation data dropout**
  Computation data dropout occurs when the computation is not completed within the scan interval.
  - The computation icon displayed in the status display section turns yellow.
  - When computation data are acquired to the internal memory, the data immediately before a computation drop out are substituted for the computation data at the time of the dropout.
  - When this occurs frequently, lower the CPU load by reducing the number of computation channels or making the scan interval longer.

Alarm

You can set up to 4 alarms on each computation channel. The alarm types are upper limit alarm (H), lower limit alarm (L), delay upper limit alarm (T), and delay lower limit alarm (t). The hysteresis is fixed to 0.

Acquiring and Saving the Computed Data

Similar to measured data, computed data can be acquired to the internal memory as display data or event data and saved to the external storage medium.
For a description on data saving, see section 1.5, " *Data Storage Function*."

Other Functions

- **Rolling average**
  The moving average of the computed result of the equation specified for the computation channel is determined, and the result is displayed as computed data for that channel. The sampling interval and the number of samples can be specified for each channel. The maximum sampling interval is 1 hour ; the maximum number of samples is 250. The initial setting is [Off] (do not perform moving average).

Note

- While the number of samples acquired is less than the specified number of samples, the average of acquired data is computed.
- The computation error data are not included in the rolling average computation.
- If the computed data exceeds the upper or lower limit, the data is clipped at the upper or lower limit, and the moving average is computed. The upper and lower limit is ±100000000 excluding the decimal point. The decimal point position is the same as that of the specified value for the span lower limit.

- **TLOG data**
  The instantaneous values of all channels (excluding measurement channels set to Skip and computation channels set to Off) can be saved at intervals specified by a timer.

Note

TLOG computed data and TLOG data are not the same. TLOG computed data refers to the result of the TLOG computation. TLOG data refers to the measured/computed data of all channels acquired at specified intervals.

TLOG Computation

Determines the sum, maximum, minimum, average, and maximum – minimum (P–P) values of the specified channel at specified time intervals. The interval is set by timers.

- **Timer mode**

  There are two timer modes: absolute mode and relative mode.

  - **Absolute mode**

    Timer expires at times determined from the reference time and the interval. The reference time is specified by the hour (00 to 23).

    Example 1: Reference time: 14:00
    Interval: 12 h
    The expiration time is set to 2:00 (2:00 AM) and 14:00 (2:00 PM).

    Example 2: Reference time: 00:00
    Interval: 10 min
    The expiration time is set to 0:00, 0:10, 0:20, ..., 23:40, and 23:50.
    For example, if the computation is started at 9:36, the time expiration will occur at 09:40, 09:50, 10:00, and so on.

  - **Relative mode**

    The timer is started when the computation is started. The timer is repeated at each interval. The timer is suspended while the power is lost.

    Example: Interval: 00:15
    The timer expires every 15 minutes after the computation is started.

- **Timer to be used**

  Three timers are available. You can specify the timer to be used for each channel.

- **Sum scale of the TLOG.SUM**

  In the sum computation (TLOG.SUM) of time series, data are summed over the scan interval. However, for flow values that have units /s, /min, or /h, a simple summation results in the actual value not matching the computed result, because the scan interval and the unit of the input values are different. In these cases, the unit of the data measured over the scan interval is converted to match the unit of the input values and the computation is performed.

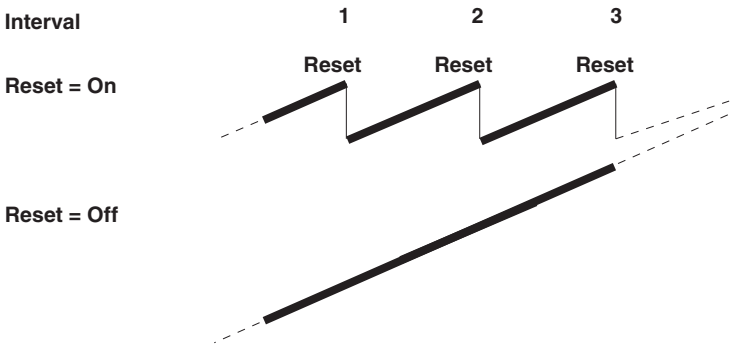
  For example, if the scan interval is 2 s, and the input value is 100 m^3/min, a simple summation would add 100 every 2 s resulting in 3000 after one minute. However, if the computing unit is set to /min, then 2 s/60 s is multiplied every scan interval before the value is added giving a result that has a m^3/min unit. The following equations are applied. The scan interval unit is in seconds.

  Off $\sum$(measured value)
  /s $\sum$(measured value) x scan interval
  /min $\sum$(measured value) x scan interval/60
  /h $\sum$(measured value) x scan interval/3600

- **Reset action**

  Whether or not to reset the computed result at every timeout is selectable. The figure below shows the action of TLOG.SUM computation.

  Example: Result of the TLOG.SUM computation



  The summed value is reset to "0" at every interval when "Reset" is "On," or the summed value from the start of computation is derived when "Reset" is "Off."

- **If power is lost while the TLOG computation was in progress**

  The TLOG computation is resumed when the power is restored. The operation varies depending on whether power is restored before or after the scheduled time to create the TLOG data.

Time of Recovery	TLOG Computation Operation
After the time to create the TLOG data	TLOG data are created immediately when power is restored. The measured/computed data up to the time of the power disruption are used. At the next scheduled TLOG computation time, data will be used from the point in time after the power was restored.
Before the time to create the TLOG data	After power is restored, TLOG data are created at the normally scheduled time to perform the TLOG computation. All measured/computed data excluding the power disruption period are used.

- **How the measured/computed data are handled when there is an abnormality in the data**

Type of Abnormal Data	TLOG Computation		
	AVE	MAX/MIN/P-P	SUM
Positive over*	not used	used	not used
Negative over*	not used	used	not used
Error	not used	not used	not used
Burnout: Positive (+) over range	not used	used	not used
Burnout: Negative (–) over range	not used	used	not used

* "over range" for measurement channels or "computation overflow" for computation channels

Report Function

This function is used to create hourly, daily, weekly, and monthly reports. The report data can be displayed on the screen.

Types of Reports

- **Hourly report**
  On every hour on the hour, the average, maximum, minimum, and sum values of the specified channels are determined from an hour of data up to the current hour and stored to the internal memory.
- **Daily report**
  At the specified time everyday, the average, maximum, minimum, and sum values of the specified channels are determined from a day of data up to the specified time and stored to the internal memory.
- **Weekly report**
  At the specified time of the specified day every week, the average, maximum, minimum, and sum values of the specified channels are determined from a week of data up to the specified time and stored to the internal memory.
- **Monthly report**
  At the specified time of the specified date every month, the average, maximum, minimum, and sum values of the specified channels are determined from a month of data up to the specified time and stored to the internal memory.

Report Data Display

For a display example of report data, see page 1-25.

Combinations of Reports That Can be Created

The reports created by the FX100 can be set to “hourly only,” “daily only,” “hourly and daily,” “daily and weekly,” or “daily and monthly.”

Number of Measurement and Computation Channels That Can Be Assigned to the Report

Up to 12 channels can be assigned to one report.
The report data are not created for channels that are set to Skip or those that have the computation turned Off.

About the Sum Scale

In the sum computation, data are summed over the scan interval. However, for flow values that have units /s, /min, /h, or /day a simple summation results in the actual value not matching the computed result, because the scan interval and the unit of the input values are different. In these cases, the unit of the data measured over the scan interval is converted to match the unit of the input values and the computation is performed.

For example, if the scan interval is 2 s, and the input value is 100 m^3/min, a simple summation would add 100 every 2 s resulting in 3000 after one minute. However, if the sum unit is set to /min, then 2 s/60 s is multiplied every scan interval before the value is added giving a result that has a m^3/min unit. The following equations are applied. The scan interval unit is in seconds.

Off $\sum$(measured value)
/s $\sum$(measured value) x scan interval
/min $\sum$(measured value) x scan interval/60
/h $\sum$(measured value) x scan interval/3600
/day $\sum$(measured value) x scan interval/86400

If Power is Lost While the Report Function is in Progress

If a power disruption occurred while the report function was in progress, the report function will resume after the power is restored. The exact operation will vary depending on whether the power is restored before or after the scheduled time to create a report.

Time of Recovery	Report Operation
After the time to create the report	Report data are created immediately after power is restored. The measured/computed data up to the time of the power disruption are used. For the next scheduled report, data after the power recovery are used.
Before the time to create the report	After power is restored, report data are created at the time of the next normally scheduled report. All measured/computed data excluding the power disruption period are used.

How the Measured/Computed Data Are Handled When There is an Abnormality in the Data

Type of Abnormal Data	Report Data		
	Average value	Max/Min value	Sum value
Positive over*	not used	used	not used
Negative over*	not used	used	not used
Error	not used	not used	not used
Burnout: Positive (+) over range	not used	used	not used
Burnout: Negative (–) over range	not used	used	not used

* "over range" for measurement channels or "computation overflow" for computation channels

Displaying the Report

The reports can be displayed using the key operations. For a displayed example, see page 1-25.

- **Status Display**

  If the data of a measurement or a computation channel enter any of the conditions listed below within the relevant time period (one hour for hourly reports for example), a symbol that indicates the condition is output to the report.

Data Condition	Symbol
Common to measurement and computation channels	
Measurement error or computation error	E
For measurement channels	
Positive (+) over range *	O
Negative (–) over range *	O
Burnout: Positive (+) over range *	B
Burnout: Negative (–) over range *	B
For computation channels	
Positive (+) computation overflow (when the value exceeds 3.4E + 38)	O
Negative (–) computation overflow (when the value falls below –3.4E + 38)	O

* For a description on positive/negative over range, see page 1-20.

Power failure/Time change	Symbol
Power failure	P
Time change	C

Numerical Display

The range of displayed values of report data is from –9999999 to 99999999 excluding the decimal point. The decimal point position corresponds to the position of the decimal point of the lower limit span of the computation channel.
However, special displays are used for cases given in the table below.

- **Measurement channel**

Item	Data Condition of Measurement Channels	Displayed value
AVE (Average value)	When all data are measurement errors or over range	(Blank)
MAX, MIN, INST (Maximum value, minimum value, instantaneous value)	• When all data are measurement errors • Positive (+) over range (including "Burnout") • Negative (–) over range (including "Burnout")	(Blank) 99999 –99999
SUM (Sum value)	• When all data are measurement errors or over range • When the sum value exceeds 3.4E + 38 • When the sum value is below –3.4E + 38	(Blank) 9.999999E + 99 –9.999999E + 99

- **Computation channel**

Item	Data Condition of Computation Channels	Displayed value
AVE (Average value)	When all data are computation errors or over range	(Blank)
MAX,* MIN,* INST* (Maximum value, minimum value, instantaneous value)	• When all data are computation errors • When the maximum value exceeds 99999999 • When the minimum value is below –9999999	(Blank) 999999999 –99999999
SUM (Sum value)	• When all data are computation errors or computation overflow • When the sum value exceeds 3.4E + 38 • When the sum value is below –3.4E + 38	(Blank) 9.999999E + 99 –9.999999E + 99

* The decimal position that was specified when the span for the channel was specified is reflected in the maximum and minimum values. For example, if the span setting of the channel is "200.0," then "99999999" is output when the value exceeds "99999999.9" and "–99999999" is output when the value is below "–999999.9."

Storing to the Internal Memory and Saving to the External Storage Medium

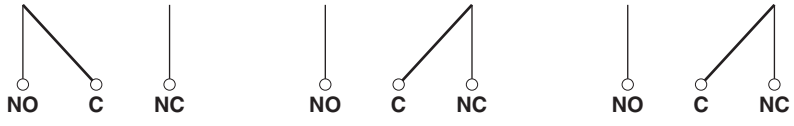
For a description on data storage function, see section 1.5 .

1.7 FAIL/Memory End Output Function (/F1 option)

FAIL Output

When a failure occurs in the CPU of the FX100, the relay contact signal (1 signal) is output. The relay is energized when the CPU is normal; it is de-energized when a CPU failure occurs (de-energized on failure). Therefore, relay output is carried out even when the power is turned OFF (even during a power failure) (see figure below). You cannot change this behavior.

- **Relay Behavior (De-energized on failure)**



Normal **Failure** **Power-off**

NO: normally opened, C: common, NC: normally closed

Memory End Output

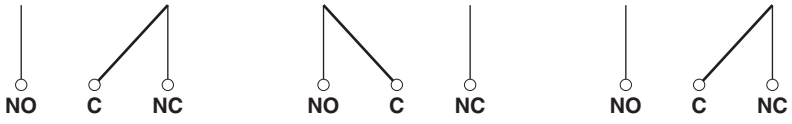
If little free space remains in the internal memory or external medium and the following conditions apply, a single relay output signal is output. This relay signal is energized. The operation cannot be changed.

For Models with an External Storage Drive

- **For both manual save and auto save**
  - When saving displayed data
    When the remaining time * for saving the displayed data to the internal memory is less than a specified time (the memory alarm time), the relay is energized. The memory alarm time can be set from [1] to [100] hours or [Off].
  - When saving event data
    When in the mode in which data is always saved to the internal memory (Free mode), and the remaining time * for saving the event data is less than the specified time (the memory alarm time), the relay is energized.
    When in a mode in which data starts being written to the internal memory upon an event such as an activation of an alarm (Trigger or Rotate mode), the relay is not energized (and memory end is not output).
    * The area of data saved on the external storage medium is considered to be available space.
  - To release this condition, save unsaved data to the storage medium. For the operating procedure, see section 7.3.

- **For auto save only**
  - The relay becomes energized when the remaining space on the external medium falls to 10% or less. In this case, the external storage medium icon in the status display section turns from green to red. However, this does not occur if FIFO is specified for the CF memory card. When the FIFO method is specified for the compact flash memory card, the relay is energized if a storage medium error is detected.
  - To release this condition, replace the storage medium.
    See section 1.5, "*Data Storage Function*" for information on auto save and manual save modes.

- **Relay operation**



NO: normally opened, C: common, NC: normally closed

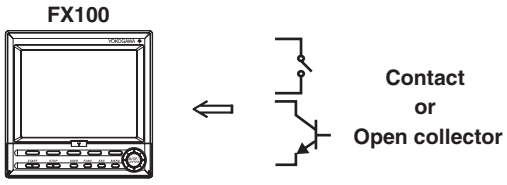
For Models with No External Storage Drive

When the memory alarm time is set to something other than OFF (the default setting), the relay operates in the same manner as described in "For Both Manual Save and Auto Save" under "For models with an external storage drive." Also, to deenergize the relay, clear the internal memory.

See section 7.8 for the operating procedure to clear the internal memory.

1.8 Remote Control Function (/R1, /PM1 Option)

When a contact or open collector signal is applied to the remote control terminal, a predetermined action is carried out.
Arbitrary actions can be assigned to the eight remote control terminals.



Actions That Can Be Assigned

Enclosed in parentheses are soft key expressions.

- **None: [None]**
  No action is assigned.

- **Starts/stops data acquisition: [Memory]**
  - Remote input: Edge (Rising/start, falling/stop)
  - Starts/stops writing display data and/or event data to the internal memory and the report function (/M1, /PM1 option)
  - While data acquisition is in progress, applying a rising signal produces no effect. While data acquisition is suspended, applying a falling signal produces no effect.

- **External trigger for event data acquisition: [Trigger]**
  - Remote input: Trigger, 250 ms or more
  - This becomes the external trigger that starts the acquisition of the event data to the internal memory. This is valid only when acquiring the event data to the internal memory using the trigger or rotate mode, the acquisition start trigger is set to external trigger, and the FX100 is in the trigger wait state. For all other cases, applying the remote signal produces no effect.

- **Releasing the alarm indication and output relay: [AlarmACK]**
  - Remote input: Trigger, 250 ms or more
  - Releases the alarm indication and relay output (option) of all alarms. This is the same function as when the [AlarmACK] soft key is pressed. This procedure is not valid if the alarm display/output relay operation is set to non-hold.

- **Adjusting the internal clock: [Time adj]**
  - Remote input: Trigger, 250 ms or more
  - Adjusts the internal clock of the FX100 to the nearest hour depending on the time when the remote signal is applied.

Time of signal input	New time
00 min. 00 s to 01 min. 59 s	Adjusts the internal clock down to the nearest hour. Example: 10 hr. 01 min. 50 s becomes 10 hr. 00 min. 00 s.
02 min. 00 s to 57 min. 59 s	Time is unchanged.
58 min. 00 s to 59 min. 59 s	Adjusts the internal clock down to the nearest hour. Example: 10 hr. 59 min. 50 s becomes 11 hr. 00 min. 00 s.

- **Starts/stops computation: [Math] (/M1, /PM1 option)**
  - Remote input: Edge (Rising/start, falling/stop)
  - Starts/stops the computation. This is valid only on models with the computation function.
  - If the computation is started, applying a rising signal produces no effect. If the computation is stopped, applying a falling signal produces no effect.

- **Clears computed results: [Math rst] (/M1, /PM1 option)**
  - Remote input: Trigger, 250 ms or more
  - Resets the data on all computation channels. This is valid only on models with the computation function and while the computation is stopped. For all other cases, applying the remote signal produces no effect.
- **Manual sampling: [M.sample]**
  - Remote input: Trigger, 250 ms or more
  - The instantaneous values of all measurement and computation channels (excluding the measurement channels that are set to [Skip] and the computation channels that are turned Off) can be stored to the internal memory.
- **Loads the setup data: [Pnl1 load] [Pnl2 load] [Pnl3 load]**
  - Remote input: Trigger, 250 ms or more
  - The setup data of the file "LOAD 1.PNL," "LOAD 2.PNL," or "LOAD 3.PNL" that is saved in the external storage medium are loaded for use. The file, "LOAD 1.PNL," "LOAD 2.PNL," or "LOAD 3.PNL" must be created and saved to the external storage medium beforehand.

Note

This item can be set on models with a external storage drive.

- **Writing messages: [Message1] to [Message8]**
  - Remote input: Trigger, 250 ms or more
  - Displays a message at the position corresponding to the time when the signal was applied on the trend screen. The displayed message is also written to the internal memory. When the data acquisition to the internal memory is stopped, messages cannot be displayed or written. Applying a remote signal produces no effect.
- **Snapshot: [Snapshot]**
  - Remote input signal: Trigger, 250 ms or more
  - Saves the current screen image data to the external storage medium. The snapshot function operates in all modes (operation mode, setting mode, and basic setting mode). Error messages, even if they are displayed, are not saved.

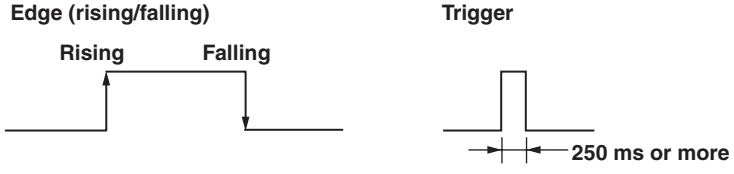
Note

This function is available on models with an external storage drive, or models with the Ethernet communication interface (option /C7) that are set up for snapshot FTP transfer.

- **Pulse input: [Pulse]**
  You can use the remote input terminals as pulse input terminals.
  For a description on pulse input, see page 1-7.

Remote Input Signal

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



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 terminal) goes from high to low and falls when the collector signal goes low to high.

1.9 Other Functions

USER key

One of the following actions can be assigned to the USER key. “Alarm ACK” is initially assigned.

Action That Can Be Assigned

Name of Action	Action
None	None
Trigger	Provides a key trigger for starting acquiring the event data. (when [Key Trigger] is set as a trigger to start acquiring event data)
AlarmACK	Release alarm indication and relay output (when alarm display and alarm output relay action is set to “hold.”)
Math	Starts/stops computation (when the computation function (/M1, /PM1) is equipped).
Math rst	Clears computed results (when the computation function (/M1, /PM1) is equipped and the computation is suspended).
M.sample	Stores instantaneous values of all channels to the internal memory.
Message 1 to Message 8	Displays messages and stores them to the internal memory.
Snapshot	Saves an image of the displayed screen to the storage medium (This setting is only available for models with external storage medium drives. However, this function can be performed even on models with no drives by using the Ethernet communication interface (/C7 option) that are set up for snapshot FTP transfer).
Media	Detects the external storage medium in the drive.

Key Lock

Key lock is a function that locks key operations and the saving of data to the external storage medium during manual save mode.

A password needs to be entered to release the key lock.

Items and Behaviors of the Key Lock (Can be set individually)

Item	Behavior during Key Lock
START key	Disabled
STOP key	Disabled
MENU key	Disabled
USER key	Disabled
DISP/ENTER key	Switching operation screens is disabled.
[Alarm ACK] soft key	Disabled
Math (soft keys below)	
• [Math START] soft key	Disabled (option)
• [Math STOP] soft key	Disabled (option)
• [Math reset] soft key	Disabled (option)
Write memory (soft keys below)	
• [Message] soft key	Disabled
• [Manual sample] soft key	Disabled
• [Trigger] soft key	Disabled
• [Save Display] soft key	Disabled
• [Save Event] soft key	Disabled
• [E-Mail START] soft key	Disabled
• [E-Mail STOP] soft key	Disabled
• [E-Mail test] soft key	Disabled
Media	Saving data to the external storage medium is prohibited during manual save mode.

Note

To prohibit further setting operations, lock the MENU key.

Key Login/Logout

This function allows only certain users to access the FX100. The users are distinguished by their name, user IDs, and passwords. Up to 7 users can be registered.

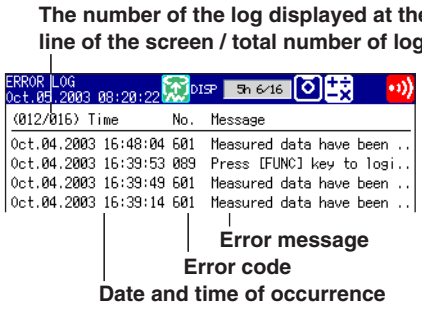
Log Display

A list of phenomena that occurred can be displayed in the order of occurrence for the following items:

- Error messages (50 most recent messages)
- A log of key login and logout (50 most recent logins)
- A log of communication commands (200 most recent commands)
- A log of file transfers using the FTP client function (50 most recent transfers)
- A log of e-mail transmissions (the 50 most recent transmissions)
- A log of Web operations (the 50 most recent operations)

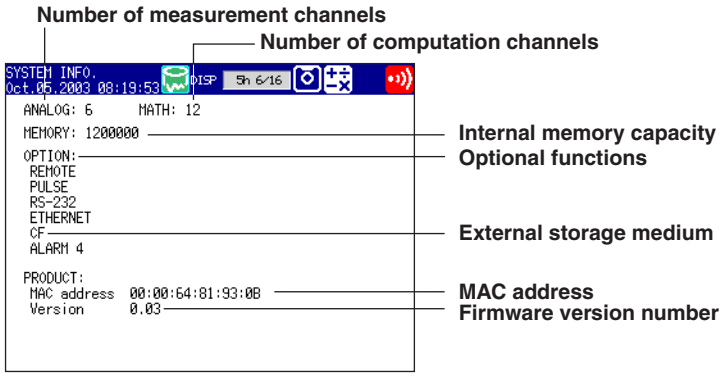
Error Log Example

Displays the date and time of the error occurrence, error code number, and the message.



System Screen

The total number of inputs on the FX100, capacity of the internal memory, communication functions, external storage drive, options, MAC address, and the firmware version number can be displayed.



Displayed Language

The displayed language can be set to English, Japanese, German, or French.

Snapshot

The image data displayed on the screen can be saved to the external storage medium through key operation. The data is in PNG format and can be pasted to commercially sold software programs such as document creation software.

Note

This function is available on the following models.

- Models with an external storage drive, or;
- Models with the Ethernet communication interface (/C7 option) that are set up for snapshot FTP transfer.

Daylight Savings Time

- When the specified time is reached at which the daylight savings time adjustment is to be enabled, the FX100 automatically sets the clock ahead by one hour.
  Example: If the time is set to 9 o'clock on June 1, the time is set ahead to 10 o'clock June 1.
- When the specified time is reached at which the daylight savings time adjustment is to be disabled, the FX100 automatically sets the clock back by one hour.
  Example: If the time is set to 9 o'clock on December 1, the time is set back to 8 o'clock December 1.

Temperature Unit

The temperature unit can be set to Celsius (°C) or Fahrenheit (°F). This applies to all channels.

2.1 Handling Precautions

This section describes the precautions to be taken when using the FX100 and the external storage medium. Make sure to read this section before using the FX100.

Handling Precautions for the FX100

- This instrument uses many plastic parts. When cleaning, wipe using a dry soft cloth. Do not use volatile chemicals since this might cause discoloring and deformation.
- Do not bring charged objects near the signal terminals. Doing so can lead to malfunction.
- Do not pour volatile agents on the LCD, panel keys, or other parts of the instrument nor leave them in contact with rubber or PVC products for an extended time. Doing so can lead to malfunction.
- Do not apply shock to the instrument.
- When not in use, make sure to turn OFF the power.
- If there are any symptoms of trouble such as smoke, strange odors, or strange sounds coming from the instrument, immediately turn OFF the power and disconnect power supply. Then, contact your nearest YOKOGAWA dealer or representative.

Handling Precautions for the External Storage Medium

- Use caution in the handling of the external storage medium as it is delicate.
- Write operations to floppy disks may fail in high-temperature or low-temperature environments. If you are using the FX100 in a low-temperature environment (around 10 °C or less), use the FX100 after the warm-up time (at least 30 minutes) has elapsed.
  If you are using the FX100 in a high-temperature environment (around 40 °C or more), it is recommended that the external storage medium be inserted into the drive when saving the data and be removed after the data storage operation is finished.
- For the general handling precautions of the external storage medium, see the instruction manual that came with that medium.

CAUTION

- Do not eject the external storage medium while the access lamp is illuminated. This can damage the data.
- Do not operate the floppy disk drive in a place with vibrations or shock. The disk or drive may malfunction.

2.2 Installation

Installation Location

Install the instrument indoors, in a location that meets the following conditions. The environment of the installation location is described in *section 12.6, "General Specifications."*

- **Instrumentation panel**
  The FX100 is designed to be installed in an instrumentation panel (panel mount type).
- **Well-ventilated location**
  Install the instrument in a well-ventilated location to prevent the temperature inside the instrument from rising. For the panel cut dimensions when arranging multiple FX100, see the next page. Also, when other instruments are arranged on the panel, allow adequate space between them.
- **Location where mechanical vibration is small**
  Select a location with low mechanical vibration for installation.
- **Horizontal location**
  When installing the FX100, make sure it does not tilt to the left or right (0 to 30 degrees of backward tilt angle is allowed).

Note

- Condensation may occur if the instrument is moved to another place where the ambient temperature is higher, or if the temperature changes rapidly. In addition, measurement errors will occur when using thermocouple input. In this case, let the instrument adjust to the new environment for at least an hour before using it.
- The life of the LCD may shorten (degradation of the image quality) if the FX100 is used in a high-temperature environment. It is recommended that the backlight brightness of the LCD be set low if the FX100 is installed in a hot environment (around 40∞C or higher). For a description on the LCD brightness setting, see section 3.4, "*Setting the Brightness of the LCD and the Backlight Saver Function*."

Do not install the FX100 in the following places.

- **Outdoors**
- **In direct sunlight or near heat appliances**
  Select a location with the smallest temperature fluctuation as possible near room temperature (23 °C). Placing the FX100 in direct sunlight or near heat appliances can cause adverse effects.
- **Where an excessive amount of soot, steam, dust, or corrosive gases are present**
  Soot, steam, humidity, dust, and corrosive gas can cause adverse effects on the FX100. Avoid installing the FX100 in an environment with a high level of such elements.
- **Near magnetic field sources**
  Avoid bringing magnets or instruments that produce magnetic fields near the FX100. Using the FX100 near a strong magnetic field source can cause measurement errors.
- **Where the view of the display is poor**
  The FX100 uses a LCD for the display. Therefore, viewing of the display from an extreme angle is difficult. Install the FX100 so that the user can easily view the display.

Installation Procedure

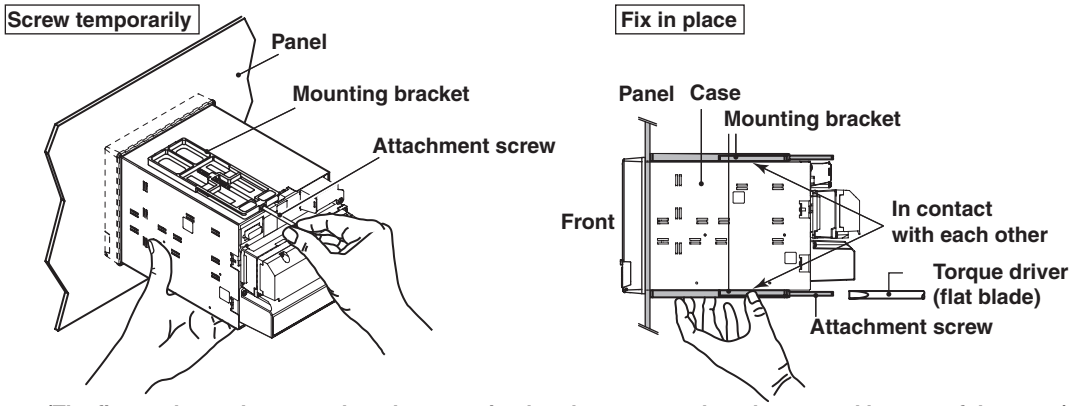
Use a 2 mm to 26 mm thick steel plate for the panel on which the FX100 is to be mounted.

1. Insert FX100 from the front of the panel.
2. Using the mounting brackets that came with the package, secure the FX100 to the panel as shown in the following figure.
   - Two mounting brackets are used at the top and bottom or left and right of the case (remove the seal covering the holes of the mounting brackets on the case beforehand).
   - The adequate tightening torque of the screws for the panel mounting brackets is 0.7 to 0.9 N·m.
   - Mount the FX100 to the panel according to the procedure below.
     - First, attach the two mounting brackets and temporarily fasten the attachment screws.
     - Next, fix the FX100 in place by tightening the attachment screws with the appropriate torque. When the FX100 is approximately perpendicular to the panel as you fasten the screws, press the mounting bracket against the case so that they are in contact with each other.

CAUTION

Tightening the screws with a torque greater than the adequate tightening torque can cause deformation of the case or damage to the bracket.

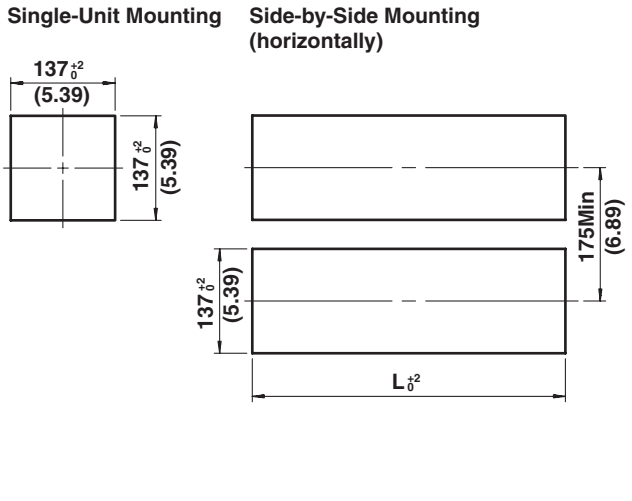
Panel Mounting Diagram



(The figure shows the case when the mounting brackets are used on the top and bottom of the case.)

Panel Cut Diagram

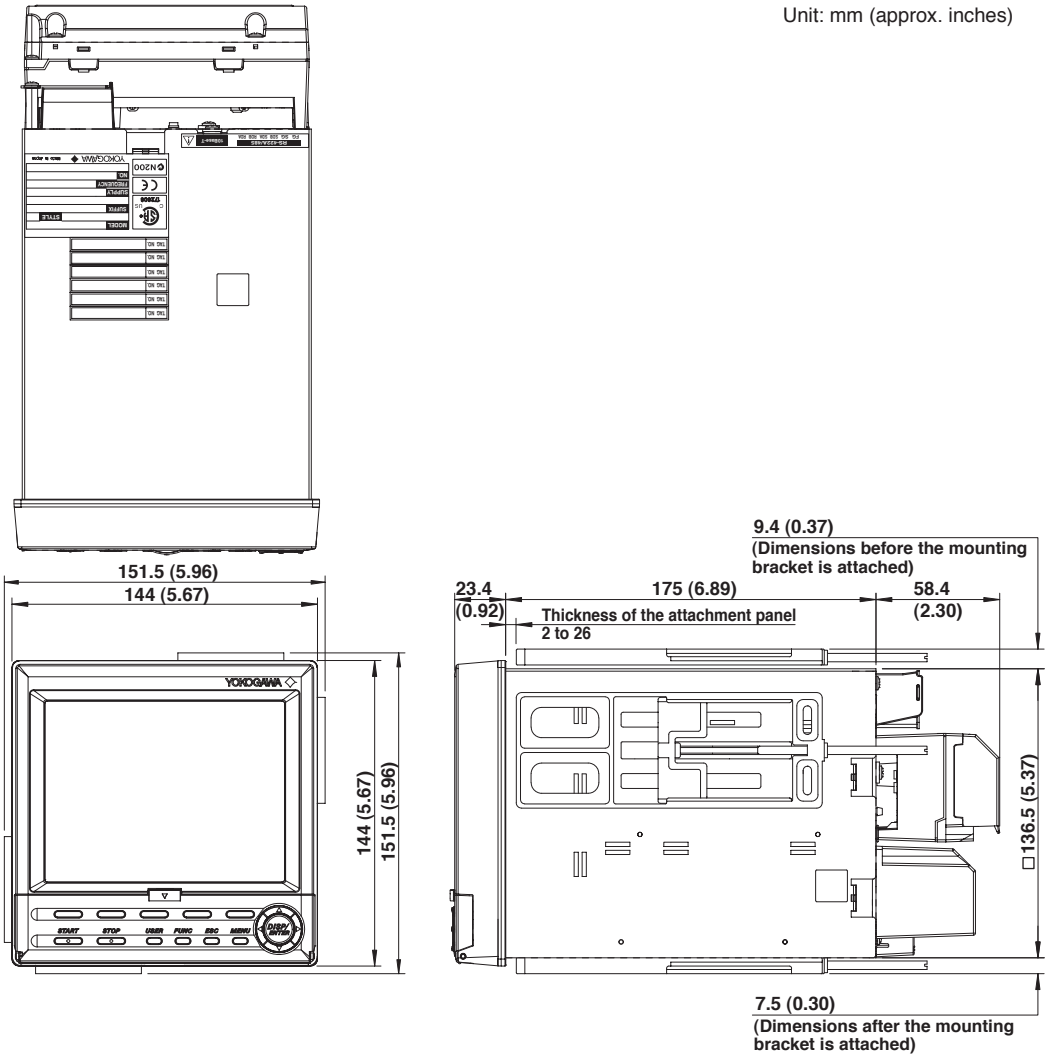
Unit: mm (approx. inches)



Units	L^{+2}_{0} (mm)
2	282
3	426
4	570
5	714
6	858
7	1002
8	1146
9	1290
10	1434
n	(144xn)–6

External Dimensions of the FX100

Unit: mm (approx. inches)



The dimensional tolerance is ±3% unless otherwise specified (However, the tolerance for dimensions less than 10 mm is ±0.3 mm).

Note

For FX100s which are side-by-side mounted vertically, when a front panel is opened the down arrow key may interfere the upper front panel.

2.3 Measurement Input Terminal Wiring

General Precautions When Wiring the Measurement Input Signal Wires

WARNING

- To prevent the possibility of electric shock when wiring, confirm that the power supply source is turned OFF.

CAUTION

- If a large pulling force is applied to the input/output signal wires connected to the FX100, the terminal or signal wire may become damaged. To prevent this from happening, fix all the wiring cords to the rear of the installation panel.
- Do not apply a voltage exceeding the following value to the input terminals. Otherwise, damage to the unit may result.
  - Maximum input voltage
    Voltage range less than or equal to 200 mVDC, TC, RTD, and DI: ±10 VDC
    Other DC voltage ranges: ±60 VDC
  - Maximum common mode voltage
    ±60 VDC (under the measurement category II)
- The FX100 is an installation category II product.

Ensure that noise does not enter the measurement circuit.

- Keep the measurement circuit away from the power supply cable (power supply circuit) and ground circuit.
- It is desirable that the object under measurement is not a noise source. However, if this is not avoidable, insulate the object under measurement and the measurement circuit. In addition, ground the object under measurement.
- Shielded wires are effective against noise caused by electrostatic induction. As necessary, connect the shield to the ground terminal of the FX100 (make sure this does not lead to grounding at two points).
- Twisting the measurement circuit wires at short intervals is relatively effective against noise caused by electromagnetic induction.
- Make sure to ground the protective ground terminal through a small grounding resistance (less than or equal to 100 Ω).

When using the reference junction compensation of the FX100 through thermocouple input, take measures to stabilize the temperature at the terminal section.

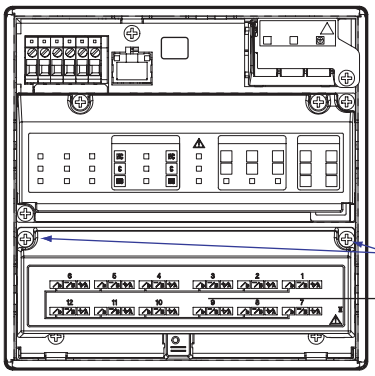
- Always attach the terminal cover.
- Do not use thick wires with high heat radiations effects (cross-sectional area of 0.5 mm^2 or smaller recommended).
- Keep the ambient temperature consistent. Large temperature fluctuations can occur as a result of such things as turning ON/OFF a nearby fan.

Connecting the input wires in parallel with other instruments may mutually affect the measured values. If you need to make a parallel connection:

- Turn OFF burnout.
- Ground each instrument at a single common point.
- Do not turn ON/OFF the instrument during operation. It may cause adverse affects on other instruments.
- Resistance temperature detectors cannot be connected in parallel.

Arrangement of the Measurement Input Terminal Blocks

The measurement input terminal blocks are arranged on the rear panel of the FX100 as shown in the figure below.



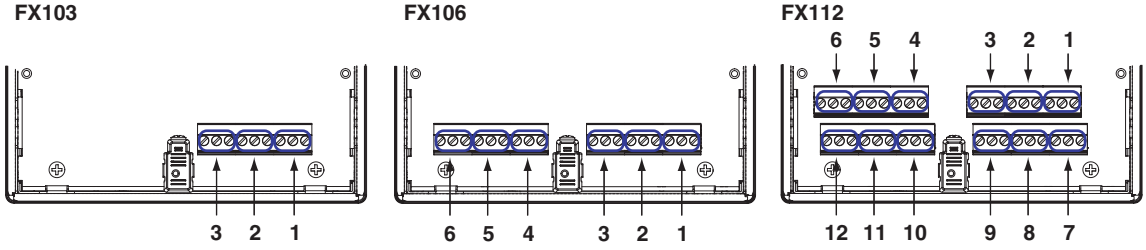
A terminal cover is screwed over the measurement input terminal blocks. A label showing the arrangement of the terminals is affixed to the cover.

Note

- The installation position of each terminal block is fixed and cannot be changed.
- For a description on the connection of communication interfaces such as the serial or Ethernet interface, see the "*FX100 Communication Interface User's Manual "* (IM04L20A01-17E).

Measurement Input Assignments on the Measurement Input Terminal Block

Measurement inputs are assigned on the FX103, FX106, and FX112 as shown in the figure below. One measurement input uses three terminals.

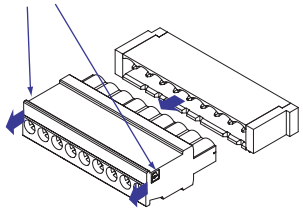


1 to 12: Measurement input channel numbers

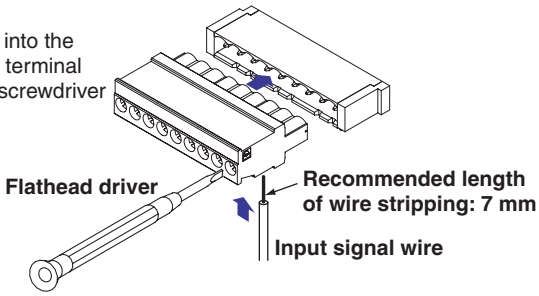
Wiring Procedure

1. Turn OFF the power to the FX100, then remove the terminal cover.
2. Wire the signal wire to the terminal.
   Remove the measurement input terminal block to perform the wiring.
   Wire gauge: 0.2–2.5 mm^2 (AWG24–AWG17)

Removing the terminal block
Hold both sides of the terminal block, then pull straight out.

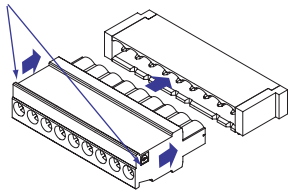


Connecting Wires
Insert the input signal wire into the slit on the underside of the terminal block, then use a flathead screwdriver to tighten the front screw.



Reattaching the Terminal Block

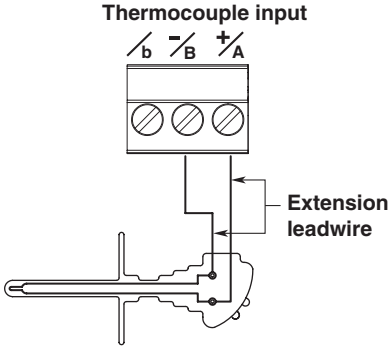
Align the terminal block with the connectors on the main unit, then push in. Push completely in until it stops.



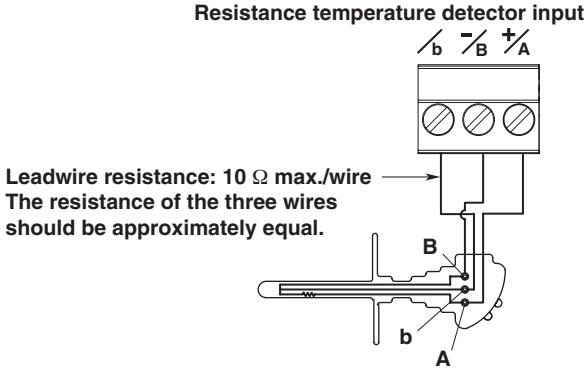
3. Attach the terminal cover, then fasten with screws.

Measurement Input Wiring

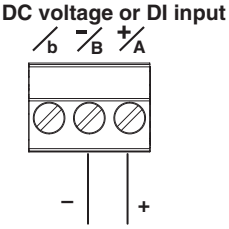
Thermocouple input



Resistance temperature detector input

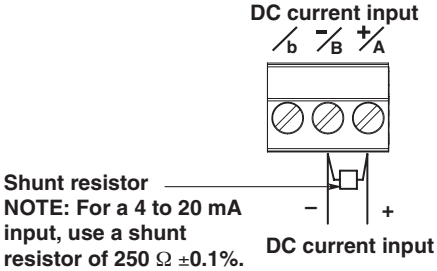


DC voltage or DI input



DC voltage or DI input

DC current input



DC current input

Note

On the standard measurement input block, RTD input terminals A and B are isolated on each channel. Terminal b is shorted internally across all channels. If you specified the three-wire isolated RTD (/N2) option, b terminals are isolated with each other.

2.4 Optional Input/Output Terminal Wiring

General Precautions When Wiring the Input/Output Signal Wires

WARNING

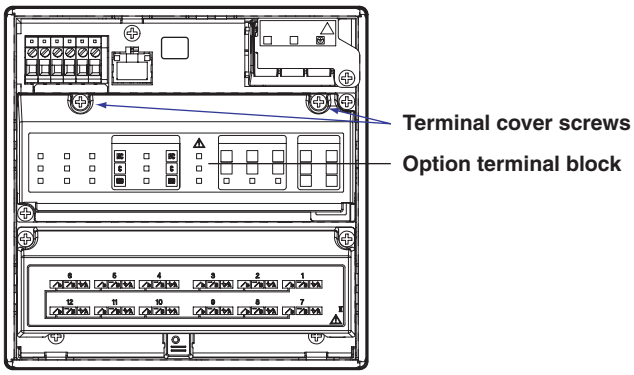
- To prevent the possibility of electric shock when wiring, confirm that the power supply source is turned OFF.
- If a voltage greater than or equal to 30 VAC/60 VDC is going to be applied to the output terminals, use round crimp-on lugs with insulation covers (to prevent the wires from coming loose) for connecting the signal wires on all output terminals. In addition, use double insulated wires (withstand voltage of 2300 VAC or more) for signal wires to which a voltage greater than or equal to 30 VAC/60 VDC is to be applied and basic insulation wires (withstand voltage of 1350 VAC or more) for all other signal wires. To prevent the possibility of electric shock, attach the terminal cover after connecting the wires and keep your hands away from the terminals.

CAUTION

If a large pulling force is applied to the input/output signal wires connected to the FX100, the terminal or signal wire may become damaged. To prevent this from happening, fix all the wiring cords to the rear of the installation panel.

Arrangement of the Option Terminal Block

The option terminal block is arranged on the rear panel of the FX100 as shown in the figure below.



The option terminal block is included when the following option codes are specified.
Alarm output relay (option code: /A1, /A2, /A3), FAIL/memory end output relay (option code: /F1), remote control (option code: /R1), pulse measurement input (option code: /PM1)

A terminal cover is screwed on the option terminal block. A label showing the arrangement of the terminals is affixed to the cover.

Note

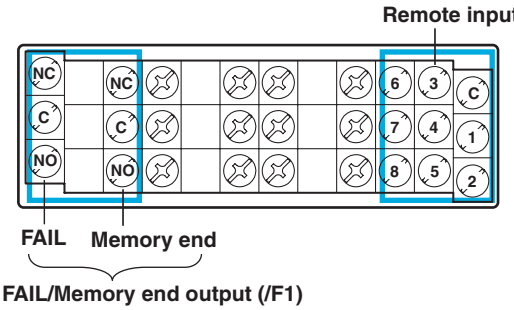
- The installation position of each terminal block is fixed and cannot be changed.
- For a description on the connection of communication interfaces such as the serial or Ethernet interface, see the "*FX100 Communication Interface User's Manual*" (IM04L20A01-17E).

Terminal Arrangement on the Option Terminal Block

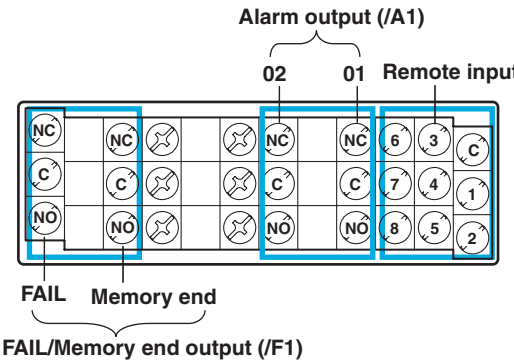
Terminals are arranged as shown in the figure below according to the options installed. You can use only the terminals that correspond to the options you purchased.

- **When pulse input (/PM1) is not installed**

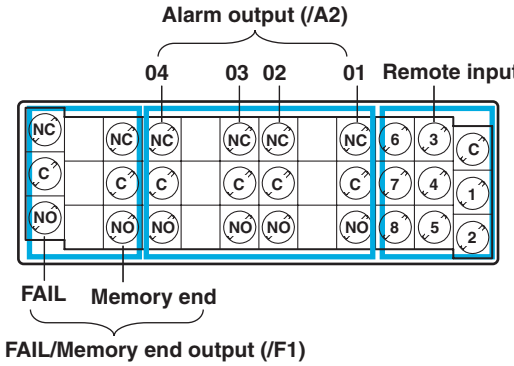
Without alarm output terminals



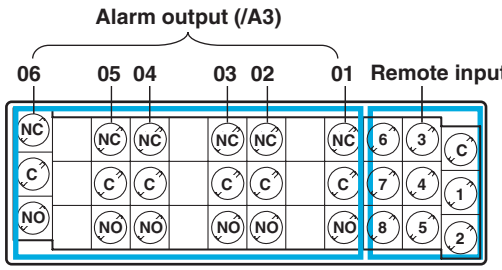
With /A1



With /A2



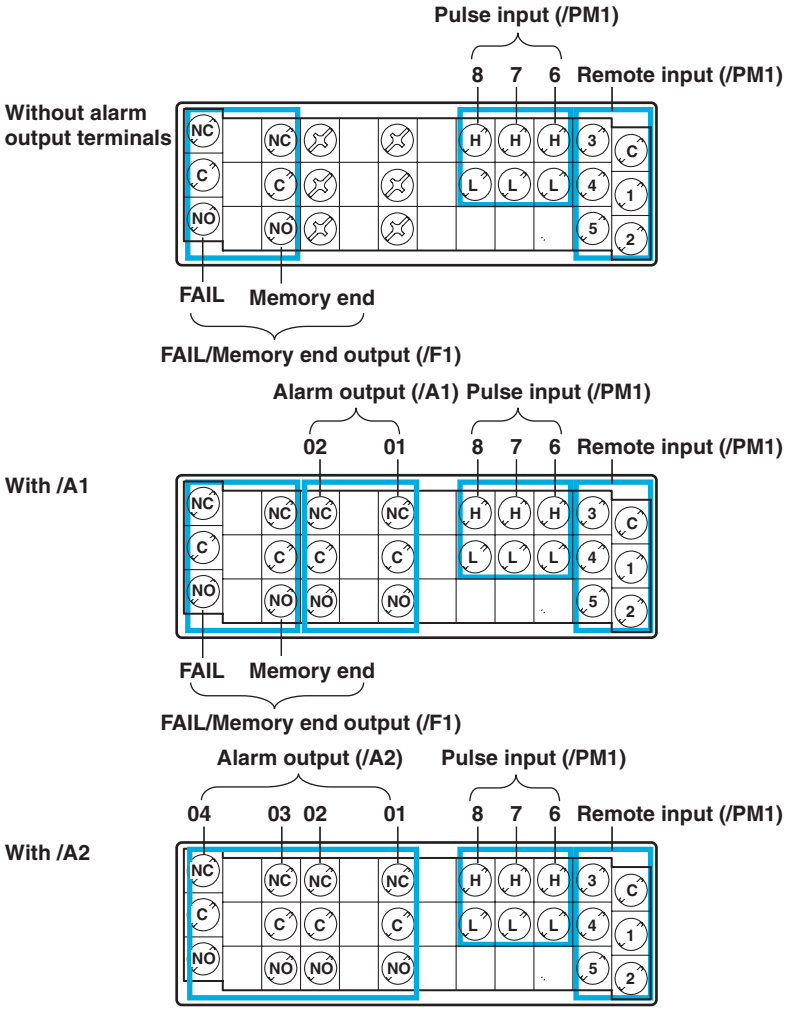
With /A3



NC (normally closed), C (common), NO (normally opened): Relay contact output terminal
1 to 8, C (common): Remote input terminal

The alarm output terminals 01 to 06 are indicated using [I01] to [I06] in the alarm output settings.
The remote input terminals 1 to 8 are indicated using numbers 1 to 8 in the remote output settings.

- **When pulse input (/PM1) is installed**

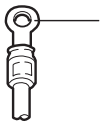


NC (normally closed), C (common), NO (normally opened): Relay contact output terminal
1 to 8, C (common): Remote input terminal
H, L: Pulse input terminals

The alarm output terminals 01 to 06 are indicated using [I01] to [I06] in the alarm output settings.
The remote input terminals 1 to 8 are indicated using numbers 1 to 8 in the remote output settings.
The pulse input terminals 6 to 8 are indicated using numbers 6 to 8 in the pulse input settings.

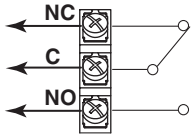
Alarm Output, FAIL/Memory End Output Wiring

Use crimp-on lugs with isolation sleeves (for 4-mm screws) when connecting the input/output signal wires to the terminals.



Crimp-on lug with isolation sleeve (for 4-mm screw)

Relay contact output



Relay Output Specifications

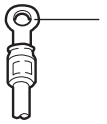
Output format: Relay contact

Contact rating: 250 VAC (50/60 Hz)/3 A or 250 VDC/0.1 A (resistive load)

Dielectric strength: 1600 VAC (50/60 Hz) for 1 minute (between the input terminal and earth)

Remote Input, Pulse Input Wiring

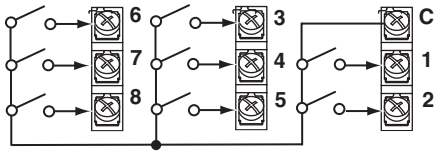
Use crimp-on lugs with isolation sleeves (for 4-mm screws) when connecting the input/output signal wires to the terminals.



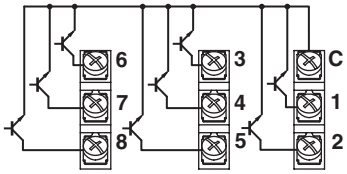
Crimp-on lug with isolation sleeve (for 4-mm screw)

Remote input

• Relay contact input (non-voltage contact)

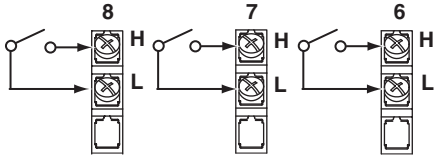


• Transistor input (open collector)

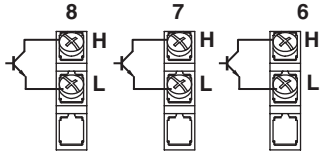


Pulse input

• Relay contact input (non-voltage contact)



• Transistor input (open collector)



Relay Contact Input and Transistor Input Specifications

Input signal:

- Non-voltage contact:
  Close: 200 Ω or less, Open: 100 kΩ or more
- Open collector
  0.5 V or less (30 mADC) when turned ON, leakage current of 0.25 mA or less when turned OFF

Input format: Photocoupler isolation (shared common)

Dielectric strength: 1000 VDC for 1 minute (between the input terminal and earth)

2.5 Wiring the Power Supply

Precautions to Be Taken When Wiring the Power Supply

Make sure to follow the warnings below when wiring the power supply. Otherwise, electric shock or damage to the FX100 may result.

WARNING

- To prevent the possibility of electric shock when wiring, confirm that the power supply source is turned OFF.
- To prevent the possibility of fire, use a power line or cord that is equivalent to 600 V PVC insulated wire (AWG 18) or better.
- Make sure to ground the protective ground terminal through a grounding resistance of less than or equal to 100 Ω before turning ON the power.
- Use crimp-on lugs with isolation sleeves (for 4-mm screws) for power supply wires and protective grounding wires.
- To prevent the possibility of electric shock, make sure to close the cover (transparent) for the power supply wires.
- Furnish a switch (double-pole type) to separate the FX100 from the main power supply in the power supply line. In addition, make sure to indicate that the switch is a power control for the FX100 on the switch and the ON/OFF positions of the switch.

  Switch Specifications

  Steady-state current rating: 1 A or more, inrush current rating: 60 A or more
  Use a switch complied with IEC60947-1 and 3.
- Connect a fuse between 2 A and 15 A in the power supply line. Use a fuse approved by CSA (for the use in North America) or VDE (for the use in Europe).
- Do not add a switch or fuse to the ground line.

Use a power supply that meets the following conditions:
Except for /P1 model

Item	Specification
Rated supply voltage:	100 to 240 VAC
Supply voltage range used:	90 to 132, 180 to 264 VAC
Rated supply voltage frequency:	50/60 Hz
Permitted supply voltage frequency range:	50/60 Hz ± 2%
Maximum power consumption:	25 VA (100 V), 35 VA (240 V)

/P1 model

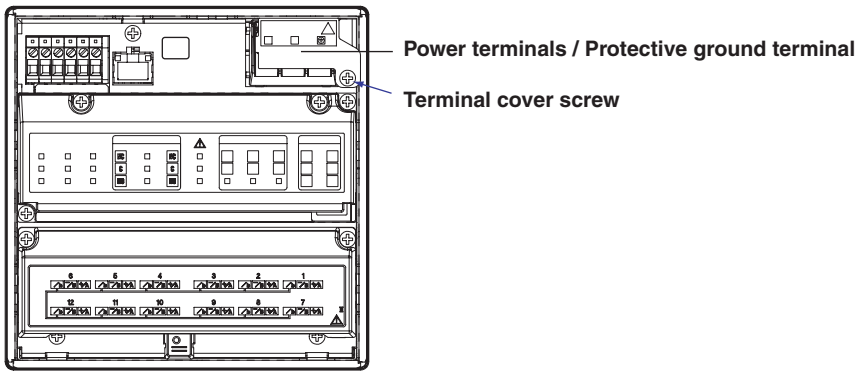
Item	Specification
Rated supply voltage:	24 VDC/AC
Supply voltage range used:	21.6 to 26.4 VDC/AC
Rated supply voltage frequency:	50/60 Hz (for AC)
Permitted supply voltage frequency range:	50/60 Hz ± 2% (for AC)
Maximum power consumption:	17 VA (for DC), 30 VA (for AC)

Note

- Do not use a supply voltage in the range 132 to 180 VAC, as this may have adverse effects on the measurement accuracy (applies to all models except for the ones with /P1 option).
- The FX100 has no power switch. Use an external switch to turn the power ON and OFF.

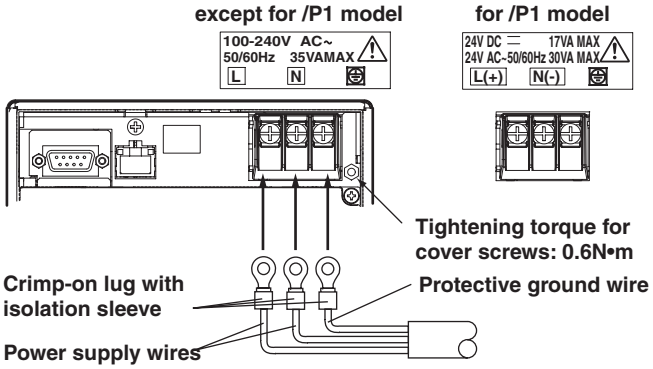
Power Terminal and Protective Ground Terminal Arrangement

Power terminals and protective ground terminal are arranged as shown in the figure below.



Wiring Procedure

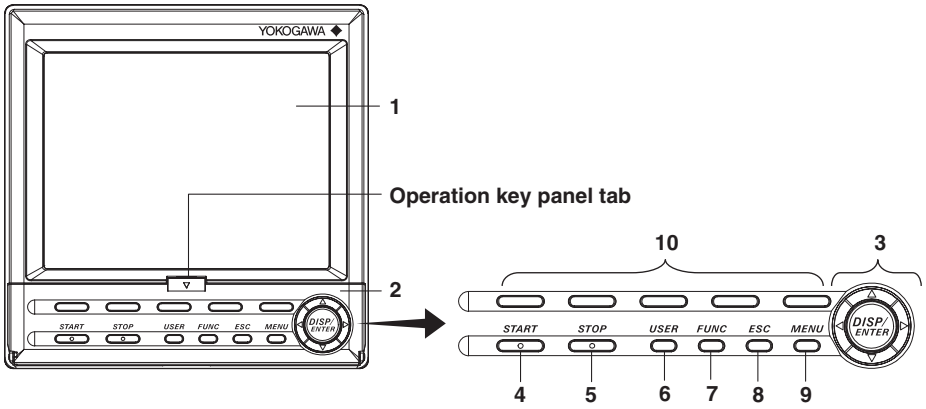
1. Turn OFF the power to the FX100, and open the cover (transparent) for the power supply wires.
2. Connect the power cord and the protective ground cord to the power supply terminals. Use crimp-on lugs with isolation sleeves (for 4-mm screws).



3. Close the cover (transparent) for the power supply wires and secure it in place with screws.

3.1 Names of Parts and Functions

Front Panel



1. LCD screen

Displays various operation screens such as the trend display and the setup screen to configure the FX100.

2. Operation key panel

Operation keys are arranged. Open the panel by pushing down on the tab located at the center of the top edge of the cover and pulling it forward when inserting or removing the external storage medium such as floppy disks and CF memory cards.

Operation Key

3. DISP/ENTER key and four Arrow keys

The keys are used to switch the operation screen in the operation mode. In the setup screens, the keys are used to select parameters and to confirm the new settings.

4. START key

Used to start the data acquisition to the internal memory and display the waveform on the trend screen.

5. STOP key

Used to stop the data acquisition to the internal memory. It also stops the updating of the waveform on the trend screen.

6. USER key

Executes the action assigned to this key.

7. FUNC key

If the key is pressed in operation mode, a soft key menu is displayed at the bottom section of the display enabling the execution of various functions. The key is also used when switching from setting mode to operation mode.

8. ESC key

Used to cancel an operation. Also used to return to the operation mode from the setting mode or return to the menu screen from setting screens..

9. MENU key

Used to enter the setting mode. Also used to return to the operation mode from the setting mode.

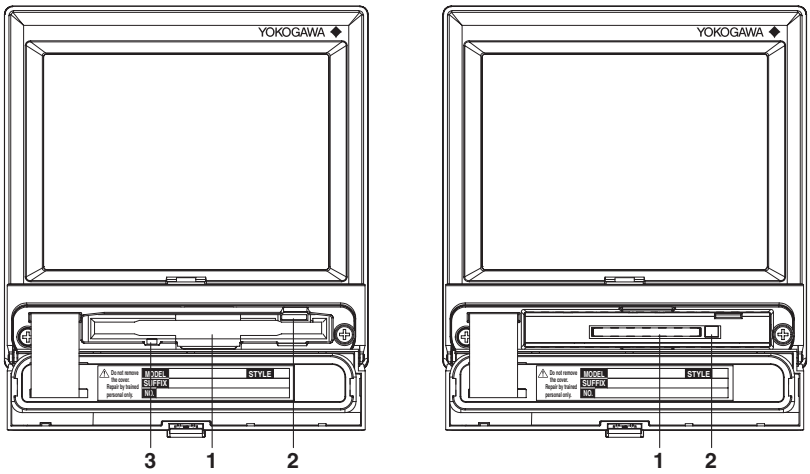
10. Soft keys

When a soft key menu is displayed at the bottom section of the display in operation mode, setting mode, or basic setting mode, these soft keys are used to carry out operations or to change the setup information.

The information above explains the basic functions of each key. For a description on how to operate the keys, see section 3.2, "Basic Key Operations."

Floppy Disk Drive/Compact Flash Card Slot

The floppy disk drive or compact flash memory card slot is visible when you open the key panel. However, no drive or slot is present on models with no external storage medium specified.



1. Floppy Disk Drive/Compact Flash Memory Card Slot

Depending on the specification you made at the time of purchase, either a floppy disk drive or an CF memory card slot is installed.

2. Eject button

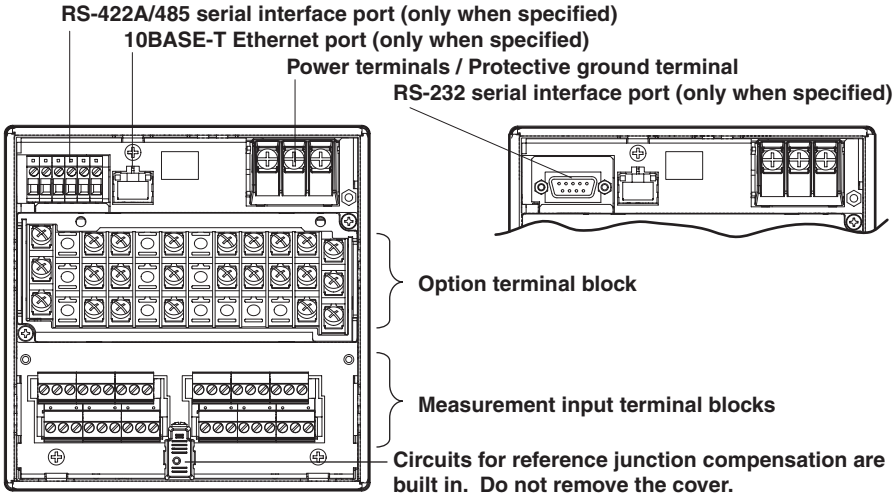
Used when ejecting the external storage medium.

3. Floppy disk access lamp

Illuminates when data is being written or read.

Rear Panel

The terminal blocks and connectors that are installed in the rear panel varies depending on the specification you made at the time of purchase.



For a description on how to connect the input/output signal wires and power supply cables, see chapter 2, "*Installation and Wiring*."

For a description on how to use the communication ports, see the *"FX100 Communication Interface User's Manual"* (IM 04L20A01-17E).

3.2 Basic Key Operations

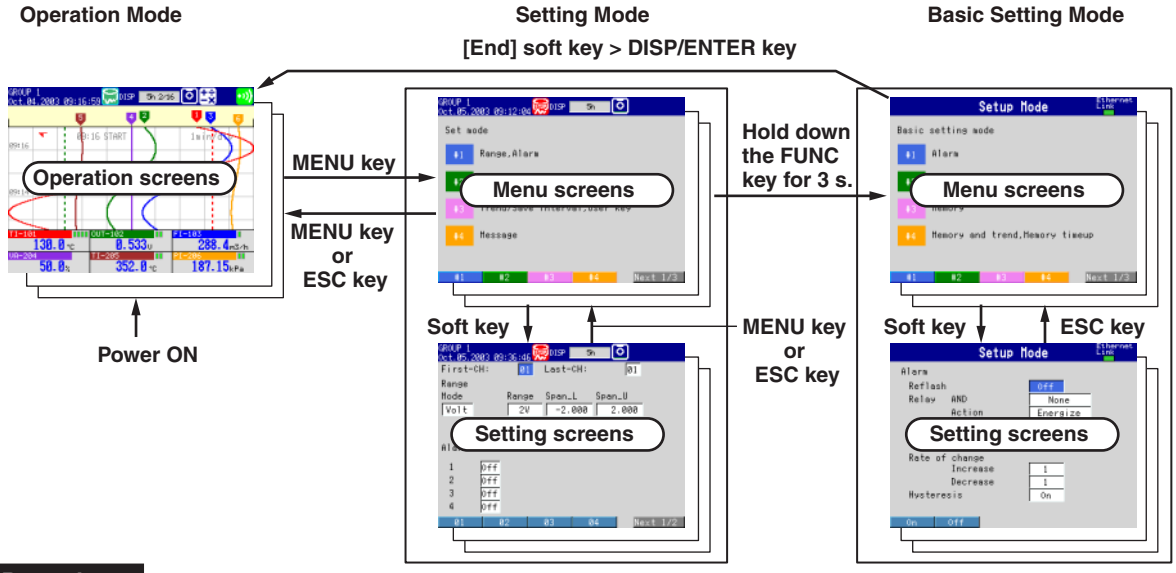
Switching Operation Modes

The FX100 has thee operation modes: operation mode, setting mode, and basic setting mode. Many of the settings in basic setting mode are prerequisites for the settings. Therefore, enter these settings first.

Mode	Types Description	Main Operations Possible
Operation mode	Mode used to conduct measurement. Contains a screen for displaying the measured data, operation history, etc.	• Display measured data. • Save or abort the saving of the measured data.
Setting mode	Mode used to set parameters* that are changeable during measurement.	• Set the operation of the measurement functions. • Set items related to the display format.
Basic setting mode	Mode used to set basic items such as the input format and the data storage format. You cannot switch to basic setting mode while data acquisition or computation is in progress.	• Set basic items of each function. • Set communication parameters. • Initialize the internal memory.

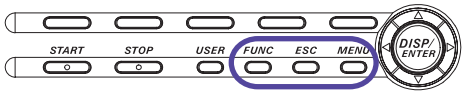
* Some of the items such as the input range or computation settings cannot be changed during data acquisition to the internal memory, or during computation.

Display Transition Diagram



Procedure

Operation Keys



Switching the Operation Mode and Setting Menu

The display switches each time the **MENU key** is pressed. The ESC key can also be used when switching to the operation mode from the setting menu.

Switching Operation Mode to Basic Setting Menu

1. Press the **MENU key** to display the setting menu.
2. Press the **FUNC key for at least 3 seconds**.

Note

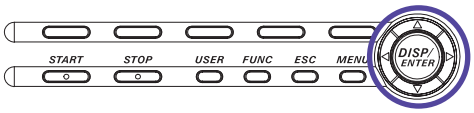
- You cannot switch to basic setting mode while data is being acquired to the internal memory, while computation is in progress, or while the external storage medium is being accessed. Stop the data acquisition to the internal memory and computation before switching to basic setting mode.
- If you change the settings under [#3 Memory] or [#4 Memory and trend, Memory timeup] (excluding memory time up items) in basic setting mode, save the new settings and return to operation mode, the measured data in the internal memory is cleared. Save important data to the external storage medium before entering basic setting mode.

Switching Screens on the Operation Mode

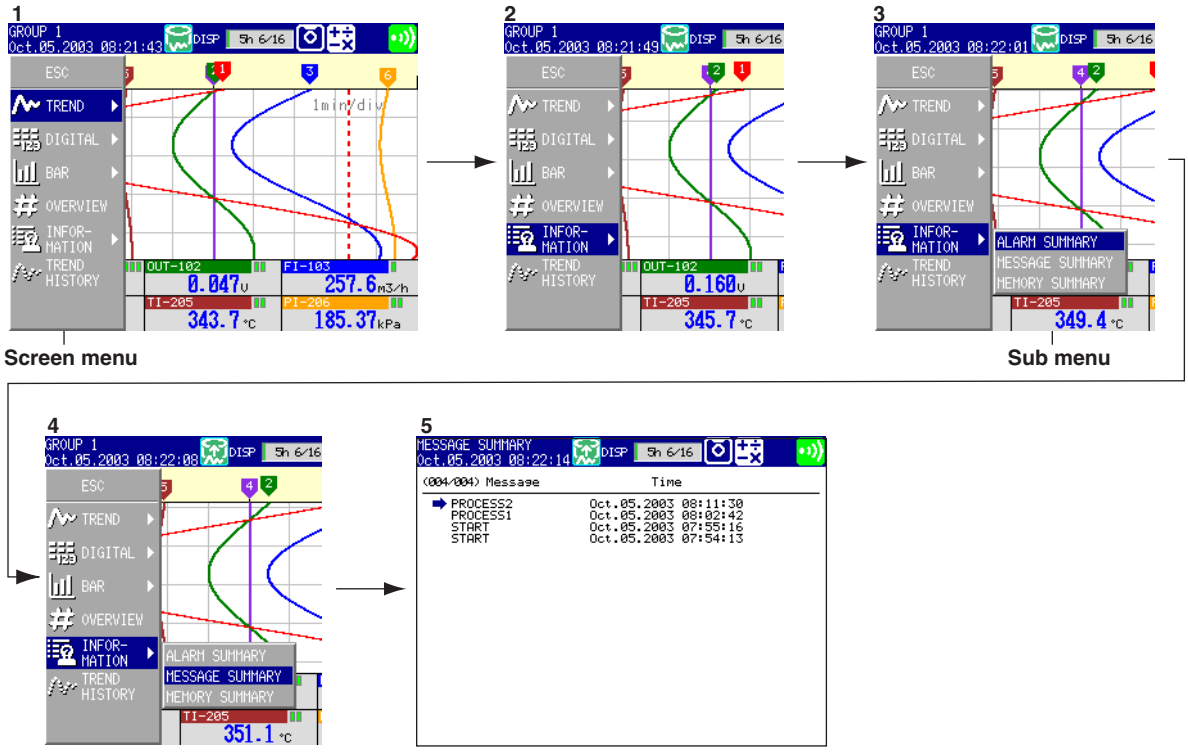
You can change the operation screens according to your needs by carrying out the following procedures.

Procedure

Operation Keys



1. Press the **DISP/ENTER key** to show the screen menu.
2. Select the menu item using the **up and down arrow keys**.
3. Press the **right arrow** key to display the sub menu.
   To close the sub menu that you opened, press the left arrow key.
4. Select the sub menu item using the **up and down arrow keys**.
5. Press the **DISP/ENTER key**.
   The selected display appears.
   To close the menu without switching the display, press the ESC key.



FUNC Key Operation in Operation Mode

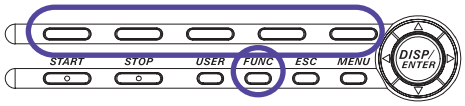
The following operation can be carried out in operation mode.

Menu	Reference	Function (conditions displayed on the soft key menu)
Media	7.3	Detects the external storage medium in the drive (only on models with a external storage drive).
Alarm ACK	4.2	Clears alarm display/relay output (valid only when the operation of the alarm display or output relay is set to “hold”).
Message	6.4	Displays messages 1 to 8 on the trend screen and writes them to the internal memory.
Manual sample	7.4	Acquires measured data of all channels to the internal memory.
Key lock	9.2	Enables/disables key lock (only when key lock is used)
Log out	9.3	Logs out (only when logged in using the key login function)
Trigger	7.2	Trigger used to start acquiring event data to the internal memory (valid only when event data is specified to be acquired to the internal memory and the trigger used to start the acquisition is set to key trigger).
Math START/ Math STOP	8.2	Starts/stops computation (only for models with the computation function (/M1, /PM1 option))
Math reset	8.2	Resets the computed value of the computation channel to 0 (only on models with the computation function (/M1, /PM1 option), while the computation is stopped).
Math ACK	8.2	Recovers the computation dropout indication icon to normal indication (only on models with the computation function (/M1, /PM1 option), when computation dropout occurs)
Snapshot*1	7.5	Saves the screen image data to the external storage medium.
Log	9.4, 3.8	Displays the log screens/system information screen.
Save Display*1	7.3	Stores the display data to the external storage medium (only when the display data is being acquired to the internal memory).
Save Event*1	7.3	Stores the event data to the external storage medium (only when the event data is being acquired to the internal memory in the free mode). internal memory in the free mode).
FTP test	*2	Executes an FTP test.
E-Mail START/E-Mail STOP	*2	Enables/disables the e-mail transmission function.
E-Mail test	*2	Sends test messages to recipient 1 and 2.
Modbus master	*2	Displays the Modbus status when the Modbus master function is used.

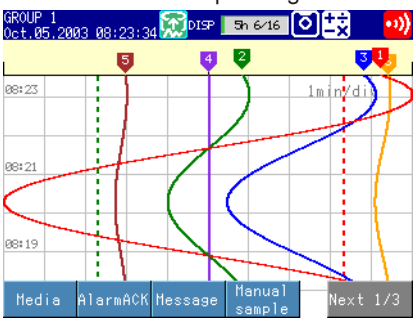
*1 Available on models with the Ethernet interface, regardless of whether an external storage medium drive is installed.
*2 See the ”*FX100 Communication Interface User’s Manual*” (IM04L20A01-17E).

Procedure

Operation Keys



1. Press the **FUNC key**.
   As shown in the following figure, menu assigned to the soft keys is displayed. The menu varies depending on the setup information and options.

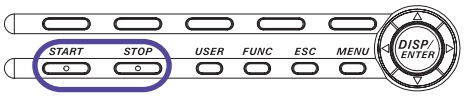


2. Press the **soft key** corresponding to the function you wish to execute.
   If [Next 1/n] (where n is the number of menu lines) appears at the right end of the menu, this indicates that there are multiple lines of menus. Press the [Next 1/n] soft key to view the next menu.
   Press a soft key to execute the function assigned to it. The result of the soft key being pressed varies depending on its function, as is explained in later sections of this manual. To clear the menu without executing functions, press the FUNC or ESC key.

Operation of Other Keys in Operation Mode

Procedure

Operation Keys



START/STOP Key

- Starts/stops the data acquisition to the internal memory. The waveform display on the trend screen is also started/stopped.

  For the operating procedure, see section 7.2.
- On models with the computation function option (/M1, /PM1), this key is also used to start/stop the computation and report.

USER Key

Executes the function assigned to it.

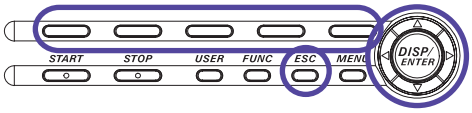
For the procedure in assigning a function to the USER key, see section 9.1.

Key Operations in Basic Setting and Setting Modes

See appendix 6, "*Settings*" for more about setting mode and basic setting mode.

Procedure

Operation Keys

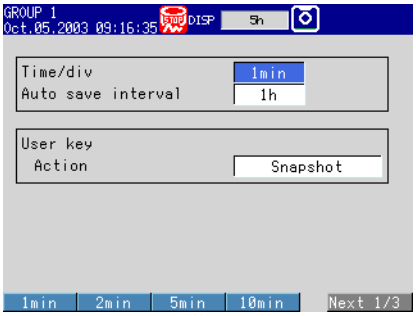


Selecting Setup Items on the Menu

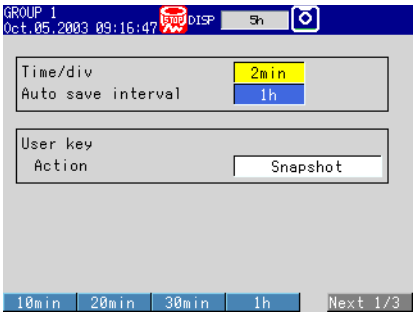
When the FX100 enters setting mode, a setting menu appears as shown in the figure below. In this menu, select the items you wish to set by pressing the **soft keys**. To close this menu, press the ESC key.

Selecting Setup Items on the Setting Display

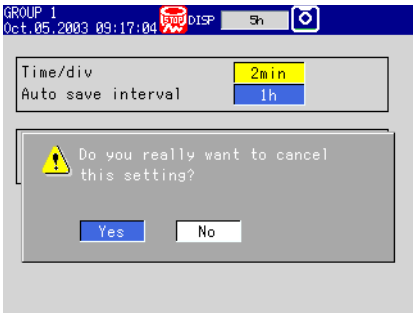
1. Use the **arrow keys** to move the cursor (blue) to the appropriate item box. The soft keys corresponding to the item are displayed at the bottom section of the display.



2. Select the item using the **soft key**.
   The box for the item you entered turns yellow, and the cursor moves to the next item.



To cancel the settings, press the ESC key. On the cancel confirmation window that appears, press the DISP/ENTER key with [Yes] is selected.



Note

If values or characters need to be entered, the soft key menu displays [Input]. For the procedure in entering values and characters, see pages 3-8 and 3-9.

Confirming Settings on the Setting Displays

Press the **DISP/ENTER key**.

The item you entered is confirmed and the item box turns white again. The cursor moves to the first item box on the setting display.

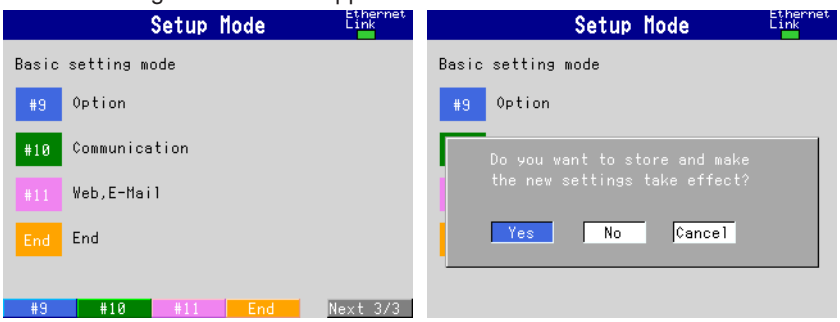
Switching from Setting Mode to Operation Mode

Display setting menu and press the **ESC key**.

Switching from Basic Setting Mode to Operation Mode and Saving the Basic Settings

Display basic setting menu, and then carry out the following procedures.

1. Press the **[End] soft key**.
   A confirmation window containing the message “Do you want to store and make the new settings take effect?” appears.



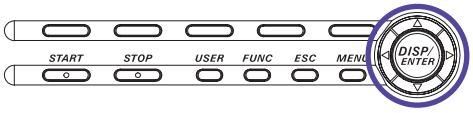
2. Press the **DISP/ENTER key** with [Yes] is selected.
   The settings are saved and the FX100 returns to operation mode.
   If you select [No] and press the DISP/ENTER key, the settings are not saved and the FX100 returns to operation mode. In this case, the settings remain unchanged. Selecting [Cancel] and pressing the DISP/ENTER key returns you to basic setting mode menu. In this case, the on-going setting changes are held.

Entering Values

A value must be entered when setting items such as the date/time and span lower/upper limit. In such cases, a numeric entry pop-up window appears as shown in the following figure. Follow the procedures below to enter the value.

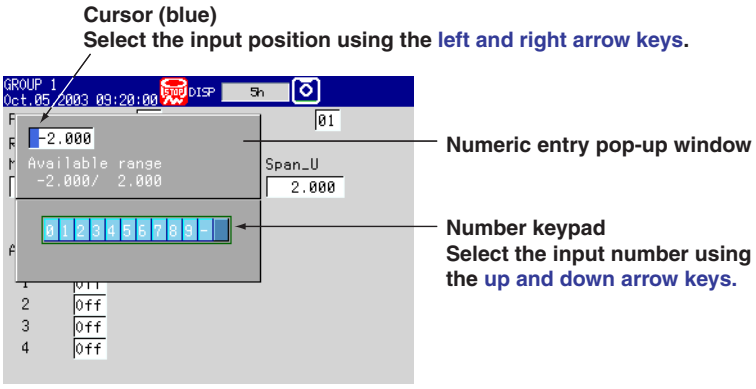
Procedure

Operation Keys



Entering Values

1. Use the **left and right arrow keys** to move the cursor (blue) to the position you wish to enter a value.
2. Use the **up and down arrow keys** to select a value you wish to enter on the number keypad.
   The selected number is displayed at the cursor position.
3. Repeat steps 1 and 2 to change the value of all digits you wish to change.
4. Press the **DISP/ENTER key**.
   The numeric entry pop-up window disappears and the value is set.
   To cancel the settings and clear the numeric entry pop-up window, press the ESC key.

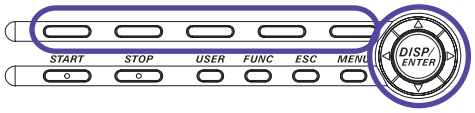


Entering Characters

Characters must be entered when setting items such as tag names and messages. In such cases, a character entry pop-up window appears as shown in the following figure. Follow the procedures below to enter the characters.

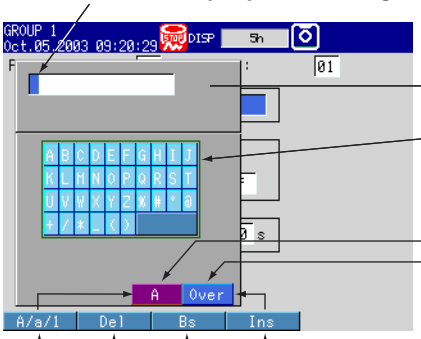
Procedure

Operation Keys



1. Use the **left and right arrow keys** to move the cursor (blue) to the position you wish to enter a character.
2. Use the **up and down arrow keys** to select a character you wish to enter on the character keypad.
   The selected character is displayed at the cursor position.
3. Repeat steps 1 and 2 to change all characters you wish to change.
4. Press the **DISP/ENTER key**.
   The character entry pop-up window disappears and the character is set.
   To cancel the settings and clear the character entry pop-up window, press the ESC key.

Cursor (blue)
Select the input position using the left and right arrow keys.



Character entry pop-up window

Character keypad
Select the input character using the up and down arrow keys.

Displayed character type
Overwrites or Inserts.
Over : Overwrites the cursor position.
Ins : Inserts at the cursor position.

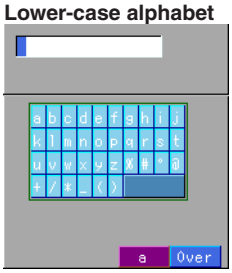
[Ins] soft key
Switches between insert and overwrite.

[Bs] soft key
Deletes the character before the cursor position.

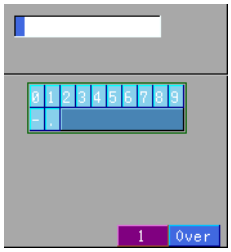
[Del] soft key
Deletes the character at the cursor position.

[A/a/1] soft key
Switches character types.
A : Upper-case alphabet
a : Lower-case alphabet
1 : Numbers

Lower-case alphabet



Numbers



3.3 Setting the Date and Time

This section explains how to set the date, time, and the daylight savings function of the FX100 internal clock.

Date and Time <Setting Mode>

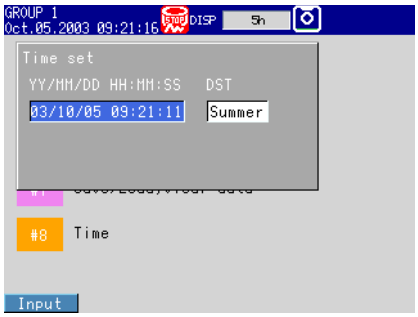
Procedure

Opening the Setting Display

- **Setting the date and time**

  MENU key (switch to setting mode) > **#8 soft key** (select [Time])

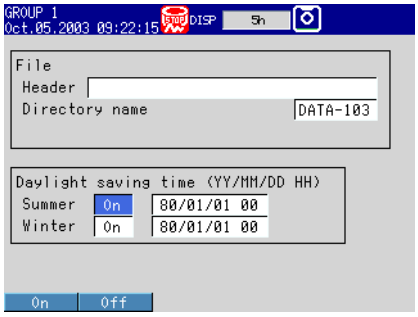
  From the operation mode, use the above keys to open the [Time] set pop-up window.



- **Setting daylight savings time**

  MENU key (switch to setting mode) > **#6 soft key** (select [File, DST])

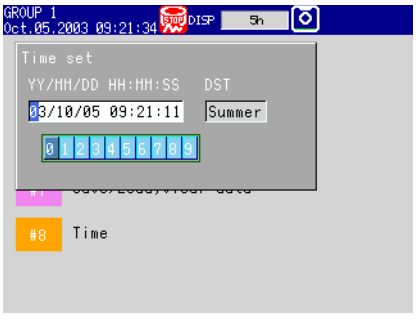
  From the operation mode, use the above keys to open the [File, DST] set dialog box.



Setup Procedure

- **Setting the Date and Time**

  1. Press the **[Input] soft key** while the cursor is on [YY/MM/DD HH:MM:SS].
     The number keypad appears and the cursor (blue) moves to the [YY] section.

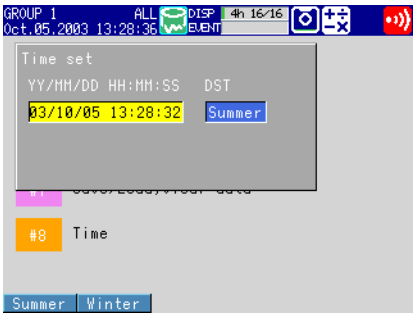


  2. Enter the date/time using the **left and right arrow keys** to move the cursor (blue), the **up and down arrow keys** to select a number.

3. Press the **DISP/ENTER key**.
   The keypad disappears and the cursor (blue) returns to the [YY/MM/DD HH:MM:SS] box.
   To set the Summer/Winter time, go to step 5 below.
4. Press the **DISP/ENTER key**.
   The pop-up window disappears and the date/time is set.
   To cancel the settings and close the [Time] set pop-up window, press the ESC key.

- **Selecting the summer or winter time**

5. Use the **right arrow key** to shift the cursor (blue) to the [DST].
   The selections are displayed at the bottom of the display.



6. Use the **soft key** to select [Summer] or [Winter].
7. Press the **DISP/ENTER key**.
   The pop-up window disappears and the date/time is set.
   To cancel the settings and close the [Time] set pop-up window, press the ESC key.

- **Setting daylight savings time**

1. Use the **arrow keys** to move the cursor (blue) to the [Summer] or [Winter] box.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to change.
   If you select [On], the box for the date and time appears to the right. The cursor (blue) moves to the right.
3. Press the **[Input] soft key**.
   The numeric entry pop-up window appears.
4. Enter the date/time using the **left and right arrow keys** to move the cursor (blue), the **up and down arrow keys** to select a number.
5. Press the **DISP/ENTER key**.
   The pop-up window disappears and the date/time is set.
   To cancel the settings and close the pop-up window, press the ESC key.
6. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Daylight Savings Time

- **Summer/Winter**
  - **Off/On**
    When set to [On], the daylight savings time is enabled.
    Summer: The time is set ahead one hour at the date and hour specified for [Summer].
    Winter: The time is set back one hour at the date and hour specified for [Winter].

- **YY/MM/DD HH**

  Enter the date and hour when the time is to be changed.
  Year (YY): Specified using the lower two digits. [00] to [79] represent year 2000 to 2079. [80] to [99] represent 1980 to 1999.
  Month (MM): [01] to [12]
  Date (DD): [01] to [31]
  Hour (HH): [00] to [23]

Note

When it elapsed the time set, the daylight saving time is automatically turned [Off]. Set [Summer] and [Winter] time every year.

3.4 Setting the Brightness of the Display and the Backlight Saver Function

This section explains how to set the brightness of the LCD and the backlight saver function used to prolong the life of the LCD backlight.

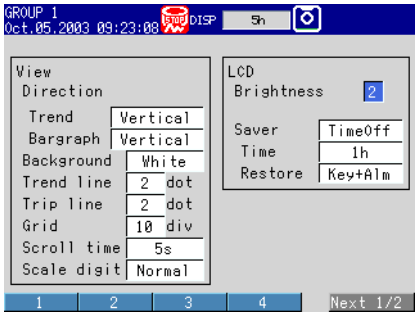
Brightness of the Display / Backlight Saver Function <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#4 soft key** (select [View, Direction, LCD]

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the [Brightness] or [Saver]. The selections are displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to change. The box for the item you changed turns yellow, and the cursor moves to the next item. If [Saver] is set to [On], [Time] and [Restore] entry boxes appear.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.
4. Press the **DISP/ENTER key** to confirm the changes. The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Brightness of the Display / Backlight Saver Function

- **LCD**
  - **Brightness**
    Select a value from [1] to [8] (initial setting is 2). The larger the value, the brighter the display becomes.
  - **Saver**
    Select [Dimmer], [TimeOff], or [NotOn] (do not use) for the LCD backlight saver.
    Dimmer: LCD backlight is automatically dimmed.
    TimeOff: LCD backlight is automatically turned off.
  - **Time**
    Select a value from [1min], [2min], [5min], [10min], [30min], [1h] (initial setting is 1h). If the specified time elapses without any key operation, the LCD backlight is automatically dimmed or turned off.
  - **Restore**
    Key: The backlight returns to the original brightness on a key operation.
    Key + Alm: The backlight returns to the original brightness on a key operation or an alarm occurrence.

Note

- When the backlight is dimmed or completely off, the backlight saver function causes it to return to its original brightness whenever you press any key on the FX100. When doing so, the key's primary function is not carried out.
- The degradation of the brightness and the discoloration of the screen (become yellowish) tend to progress faster as the brightness is set higher. Extended use at an unnecessary high setting should be avoided. It is also recommended that the backlight saver be used.

3.5 Initializing the Setup Data and Clearing the Internal Memory

This section explains how to initialize the setup data in the internal memory to factory default settings (initial settings) and how to clear the data in the internal memory.

For a list of initial settings, see appendix 6.

Initializing the Setup Data / Clearing the Internal Memory <Basic Setting Mode>

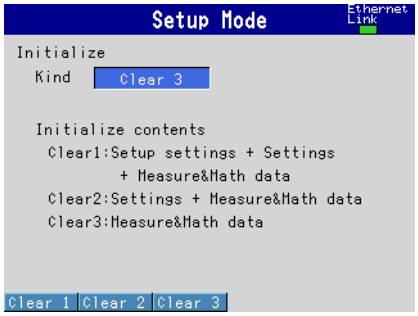
Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#8 soft key** (select [Save/Load, Initialize]) > **#5** (or **#1***) **soft key** (select [Initialize])

* For models with no external storage drive.

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Press the **soft key** corresponding to the action you wish to carry out.
2. Press the **DISP/ENTER key**.
   A confirmation dialog box appears.

3. Select [Yes] and press the **DISP/ENTER key**.
   The action is executed and the FX100 returns to the operation mode.
   To cancel the action and return to the operation mode, select [No] using the arrow keys and press the DISP/ENTER key.

Setup Items

Clearing the Internal Memory

- **Select the type of action from the following:**
  Clear1: Initializes the setup data of basic setting mode and setting mode and clears the data in the internal memory.
  Clear2: Initializes the setup data of setting mode and clears the data in the internal memory.
  Clear3: Clears the data in the internal memory.
- **Data That Are Cleared**
  Items that are cleared are, display data, event data, manual sampled data, TLOG data (/M1, /PM1 option), report data (/M1, /PM1 option), and log information.

3.6 Changing the Displayed Language

This section explains how to change the language used on the display.

Displayed Language <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#5 soft key** (select [Aux, Time zone])

From the operation mode, use the above keys to open the following setting display.

Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the [Language] box.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the language you wish to select.
   The [Language] box turns yellow, and the cursor moves to the next item.
3. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Note

On Version 1.10 or later, you can also select Spanish and Italian.

Saving the Settings

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation window appears.
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

3.7 Changing the Time Zone

This section explains how to set the time difference with respect to Greenwich Mean Time. Make sure to set this value if you are using the Web server function.

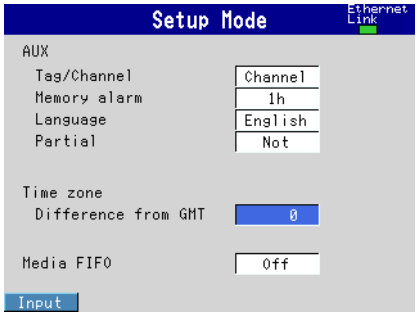
Time Zone <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#5 soft key** (select [Aux, Time zone])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the [Difference from GMT] box under [Time zone].
   [Input] is displayed at the bottom of the display.
2. Press the **[Input] soft key**.
   The pop-up window appears.
3. Enter the time difference using the **left and right arrow keys** to move the cursor (blue), the up and down arrow keys to select a number.
4. Press the **DISP/ENTER key**.
   The pop-up window disappears and the time difference is set.
   To cancel the settings and clear the pop-up window, press the ESC key.
5. Press the **DISP/ENTER key** to confirm the changes.

Saving the Settings

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation window appears.
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Time Zone

Set the time difference with respect to Greenwich Mean Time from –1200 to 1200 (the upper two digits indicate the hour; the lower two digits indicate the minute). The initial value is set to “0.”

Example: The standard time in Japan is ahead of the Greenwich Mean Time by 9 hours. In this case, enter “900.”

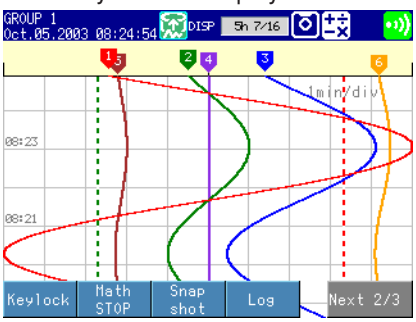
3.8 Confirming the System Configuration, Firmware Version Number, and MAC Address of the FX100

System Configuration, Firmware Version Number, MAC Address <Operation Mode>

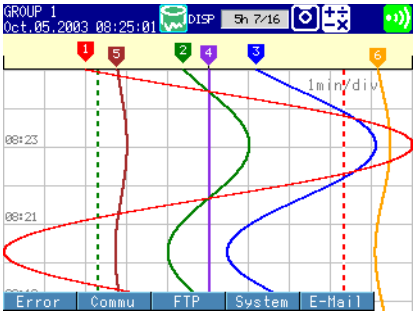
Procedure

Opening the System Information Screen

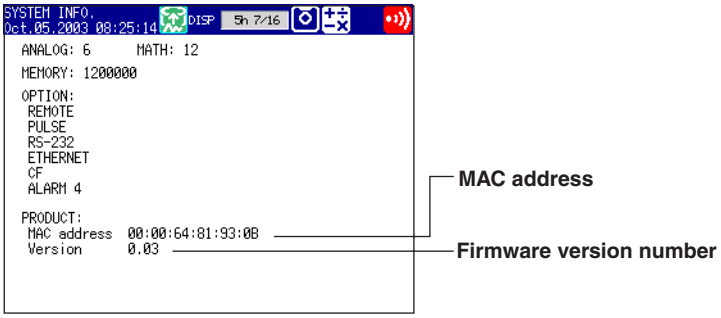
1. In the operation mode, press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.



2. Press the **[Log] soft key**.
   A soft key menu is displayed at the bottom of the display.



3. Press the **[System] soft key**.
   The system information screen appears.



To return to the operation screen from the system screen, press the **DISP/ENTER key** (display the screen menu) > **upper/lower arrow key** (select the desired screen) > **DISP/ENTER key**.

Explanation

System Information Screen

You can confirm the system configuration, firmware version number, and MAC address of the FX100.

3.9 Inserting and Ejecting the External Storage Medium

This section explains how to insert and eject the external storage medium. You can use either type of external storage medium: floppy disk or CF memory card. The type of external storage medium is specified at the time of purchase.

CAUTION

- Do not eject the external storage medium while the access lamp is illuminated. This can damage the data.
- Do not operate the floppy disk drive in a place with vibrations or shock. The disk or drive may malfunction.

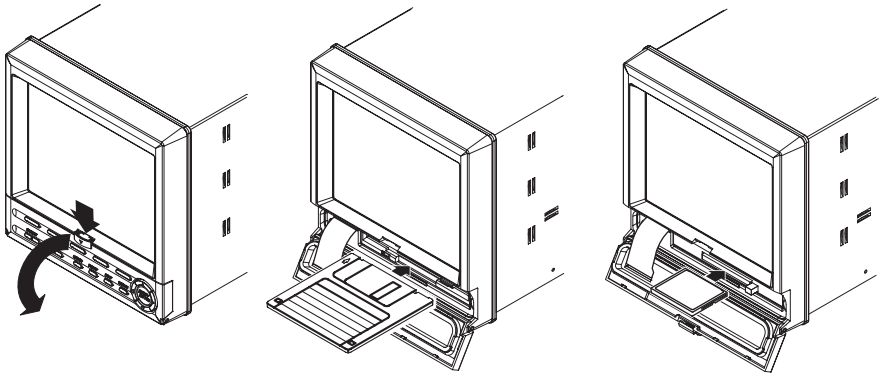
For other information regarding the handling of the external storage medium, see section 2.1, "*Handling Precautions*."

Procedure

Inserting the Storage Medium

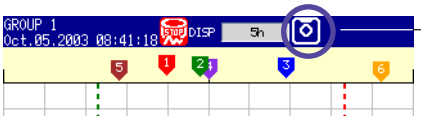
1. Pull open the key panel toward you while pushing down on the tab in the upper middle part of the panel.
   Insert a external storage medium to the drive and push in until you hear a click.

Open the operation key panel **Floppy Disk** **CF Memory Card**



For Compact Flash Memory Card

The CF memory card is detected and an icon that the CF memory card has been inserted appears in the status display section of the screen.



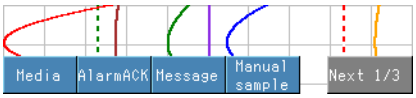
External storage medium icon

For Floppy Disk

Go to step 2.

2. Press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.

3. Press the **[Media] soft key**.
   The floppy disk is detected, and the icon indicating that the floppy disk has been inserted appears in the status display section of the screen.



Note

Keep the operation key panel closed at all times during operation except when inserting or ejecting the external storage medium. The operation key panel protects the external storage medium and the drive from foreign particles such as dust.

Ejecting the External Storage Medium

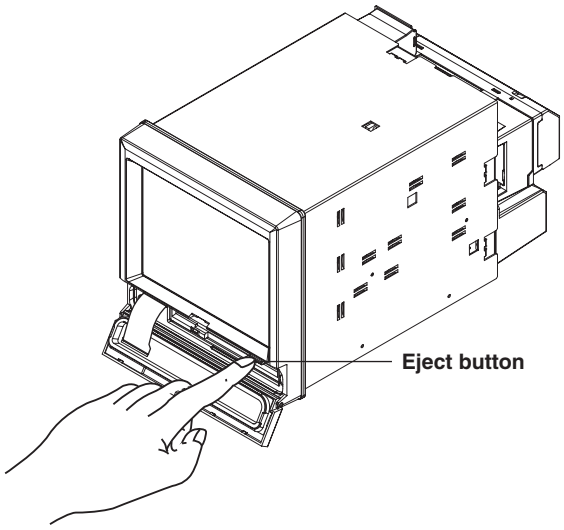
1. If the FX100 is turned ON, check that the external storage medium is not being accessed.

Note

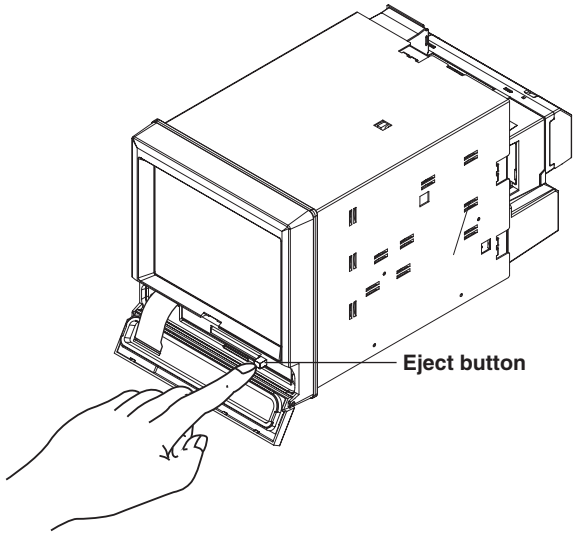
- The access lamp illuminates while the external storage medium is being accessed.
- If the data in the internal memory is being saved to the external storage medium, the message “Data are being saved to the medium” appears.

2. Open the operation key panel by pressing down on the knob that is located in the center of the upper section of the cover and pulling it forward.
3. Press the eject button and remove the external storage medium.
   For floppy disk, press the **FUNC key**, then the **[Media] soft key**.
   The external storage medium icon in the status display section disappears.

Floppy Disk



CF Memory Card



4. Close the operation key panel.

Setup Items

Formatting the External Storage Medium

Use a formatted external storage medium.
The FX100 formats external storage media as follows (for the procedure in formatting the external storage medium, see page 7-17).

- Floppy disk: 2HD, 1.44 MB.
- CF memory card: FDISK 1 partition (hard disk format).

External storage media that are formatted using other instruments can be used on the FX100, if the format is the same. External storage media of formats other than those listed above cannot be used.

4.1 Setting Parameters Related to Measurement Inputs

This section explains how to set parameters related to measurement input such as A/D integral time, scan interval, range, and filter.

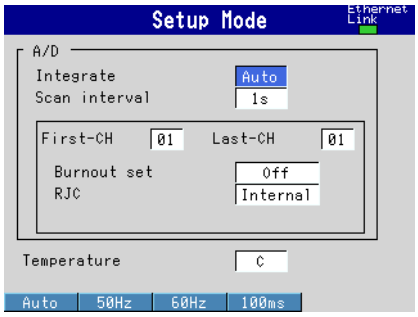
A/D Integral Time, Scan Interval, Burnout Detection, Reference Junction Compensation, Temperature Unit <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#2 soft key** (select [A/D])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [Volt (mV)] that appears when the [External] is selected for [RJC] is set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears.
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

A/D Integral Time, Scan Interval, Burnout Detection, RJC, Temperature Unit

- **Integrate**
  Select the integral time of the A/D converter. Select from [Auto], [50Hz], [60Hz], and [100ms]. The FX103, however, does not have a selection [100ms].
  Auto: The FX100 automatically detects the power supply frequency and switches between 16.7 ms (60 Hz) or 20 ms (50 Hz). Fixed to 20 ms on /P1 models that use the 24 VDC power supply.
  50Hz: The integral time is fixed to 20 ms.
  60Hz: The integral time is fixed to 16.7 ms.
  100ms: The integral time is fixed to 100 ms (the scan interval is 2 s).
- **Scan interval**
  FX103: Fixed to 250 ms
  FX106/FX112: You can select [1s] or [2s]. However, if Integrate is set to [100ms], the scan interval is fixed to [2s] ([1s] cannot be selected).
- **First-CH/Last-CH**
  Select the range of channels for setting the burnout detection and RJC.
- **Burnout set**
  Set the burnout action for the measurement inputs. Select [Off], [Up], or [Down] (initial value is Off). This setting is valid only for thermocouple inputs.
  Off: Burnout action Off
  Up: When the thermocouple burns out, the measured result is set to positive overflow and displayed as “Burnout.”
  Down: When the thermocouple burns out, the measured result is set to negative overflow and displayed as “Burnout.”
- **RJC**
  This is the reference junction compensation setting for thermocouple inputs. Select either [Internal] or [External] (initial value is Internal). This setting is valid only for thermocouple inputs.
  Internal: Uses the reference junction compensation function of the FX100.
  External: Uses the external reference junction compensation function.
  If set to [External], a box for entering the reference junction compensation voltage that is to be added to the input appears. Set the value in the range of [–20000] μV to [20000] μV (initial value is 0 μV).

Temperature Unit for Thermocouple and RTD Input

- **Temperature**
  Select from [C] (Celsius) or [F] (Fahrenheit). This setting is common to all channels with thermocouple or RTD input.

Range, Filter/Moving Average <Setting Mode>

The range setting operation is unavailable while the FX100 is writing data to the internal memory or performing computations.

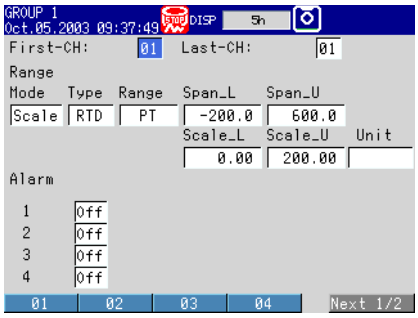
Procedure

Opening the Setting Display

- **Setting the range**

  MENU key (switch to setting mode) > **#1 soft key** (select [Range, Alarm])

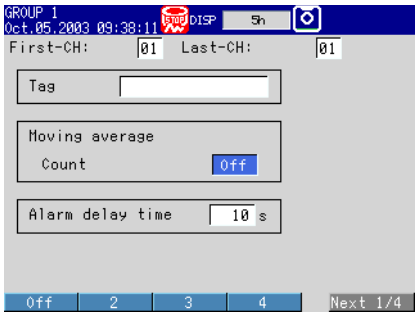
  From the operation mode, use the above keys to open the following setting display.



- **Setting the filter/moving average**

  MENU key (switch to setting mode) > **#2 soft key** (select [Tag, Moving average (or Filter), Alarm delay])

  From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [Unit] is set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Setting the Range

- **First-CH/Last-CH**
  Select the measurement channel for setting the range.
- **Range**
  First, select the input mode in the [Mode] entry box from [Volt], [TC], [RTD], [DI], [Delta], [Sqrt], and [Scale]. Then, set other parameters such as [Range], [Span Lower/Upper] according to the selected input mode as described below. Set [Skip] for channels that are not to perform measurements or displays.

Note

You cannot set the same value to [Span _L] and [Span _U].

- When set to [Volt] input

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

Note

For converting a current signal to a voltage signal, three shunt resistors can be provided (see "*Optional Accessories (Sold Separately)*." A 250 W shunt resistor, for example, is used to convert a 4 to 20 mA to a 1 to 5 V.

- When set to [TC] (thermocouple input)

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

- When set to [RTD] (resistance temperature detector)

Range	Selectable Measurement Span Range	
PT (Pt100)	–200.0 to 600.0 °C	–328.0 to 1112.0 °F
JPT (JPt100)	–200.0 to 550.0 °C	–328.0 to 1022.0 °F
PT1K (Pt1000)*	–200.0 to 600.0 °C	–328.0 to 1112.0 °F

* /N3 option

- When set to [DI] (ON/OFF input)

Range	Selectable Measurement Span Values
Level	0: Less than 2.4 V, 1: Greater than or equal to 2.4 V
Cont	0: Open, 1: Closed

- When set to [Delta] (difference computation)

Type	Range	Selectable Measurement Span Range	
Volt	20mV	–20.00 to 20.00 mV	
	60mV	–60.00 to 60.00 mV	
	200mV	–200.0 to 200.0 mV	
	2V	–2.000 to 2.000 V	
	6V	–6.000 to 6.000 V	
	20V	–20.00 to 20.00 V	
	50V	–50.00 to 50.00 V	
TC	R	–1760.0 to 1760.0 °C	–3168 to 3168 °F
	S	–1760.0 to 1760.0 °C	–3168 to 3168 °F
	B	–1820.0 to 1820.0 °C	–3276 to 3276 °F
	K	–1570.0 to 1570.0 °C	–2826 to 2826 °F
	E	–1000.0 to 1000.0 °C	–1800 to 1800 °F
	J	–1300.0 to 1300.0 °C	–2340.0 to 2340.0 °F
	T	–600.0 to 600.0 °C	–1080.0 to 1080.0 °F
	N	–1300.0 to 1300.0 °C	–2340 to 2340 °F
	W	–2315.0 to 2315.0 °C	–4167 to 4167 °F
	L	–1100.0 to 1100.0 °C	–1980 to 1980 °F
	U	–600.0 to 600.0 °C	–1080.0 to 1080.0 °F
	WRe	–2400.0 to 2400.0 °C	–4320 to 4320 °F
RTD	PT (Pt100)	–800.0 to 800.0 °C	–1440.0 to 1440.0 °F
	JPT (JPt100)	–750.0 to 750.0 °C	–1350.0 to 1350.0 °F
	JPT1K (Pt1000)*	–800.0 to 800.0 °C	–1440.0 to 1440.0 °F
DI	Level	–1 to 1	
	Cont	–1 to 1	

* /N3 option

Note

- Relationship with the reference channel
  Even if the input types (Volt, TC, RTD, or DI) or the measurement ranges between the difference computation channel and reference channel are not the same, the difference computation is performed according to the following rules.
  • If the number of digits to the right of the decimal is different between the reference channel and the difference computation channel, the number of digits to the right of the decimal of the measured value of the reference channel is matched to that of the difference computation channel, and the difference is computed.
  Example: If the measured value of the difference computation channel is 10.00 and the measured value of the reference channel is 100.0, the computed result is 10 – 100.0 = –90.00.
- If the units between the reference channel and the computation channel differ, unit correction is not performed.
  Example: If the measured value of the difference computation channel is 10.00 mV and the measured value of the reference channel is 5.00 mV, the computed result is 10.00 V – 5.00 mV = 5.00 V.
- If the [Mode] of the reference channel is set to [Scale] or [Sqrt], the scale value is used for the computation.

- When set to [Scale]
  Select this mode when scaling the measured value to a value in an appropriate unit for the measurement. Select the type (input type) from [Volt], [TC], [RTD], and [DI]. Then, set [Range], [Span Lower/Upper], as well as [Scale Lower/Upper] and [Unit] after the conversion. The selectable [Range] is on the soft key menu corresponding to the type (input type). The selectable range of [Span_L] and [Span_U] is that of the specified [Range]. The selectable range of [Scale_L] and [Scale_U] is [-30000] to [30000]. The decimal point position can be set to “X.XXXX,” “XX.XXX,” “XXX.XX,” “XXXX.X,” or “XXXXX.” The decimal point position is determined by the [Scale Lower] setting.

Note

- The FX100 converts the measured value to a value obtained by removing the decimal point from the value range specified by [Scale Lower] and [Scale Upper]. In other words, if the [Scale] setting is [–5] to [5], the value is converted to a value within the span of “10”; if the [Scale] setting is [–5.0] to [5.0], the value is converted to a value within a span of “100.” In this case, the resolution of the value converted to a span of “10” is lower than the value converted to a span of “100.” To prevent the display from becoming coarse, set the [Scale] setting so that this value is greater than 100 as much as possible.
- You cannot set the same value to [Scale_L] and [Scale_U].

- When set to [Sqrt] (square root computation)
  Select this mode when computing the square root of the DC voltage input and converting the computed result to a value with an appropriate unit for displaying. Select the input range from [20mV], [60mV], [200mV], [2V], [6V], [20V], and [50V]. Then, set [Span Lower/Upper] (measurement span) of the input as well as [Scale Lower/Upper] and [Unit] after the conversion. The selectable range of [Span_L] and [Span_U] is that of the specified input range. The selectable range of [Scale_L] and [Scale_U] is [–30000] to [30000]. The decimal point position can be set to “X.XXXX,” “XX.XXX,” “XXX.XX,” “XXXX.X,” or “XXXXX.” The decimal point position is determined by the [Scale_L] setting.

Setting the Filter

The filter can be set on the FX103.

- **First-CH/Last-CH**
  Select the channel for setting the filter.
- **Filter**
  Select the time constant for a low-pass filter from [2] s, [5] s, or [10] s.

Setting the Moving Average

The moving average can be set on the FX106 and FX112.

- **First-CH/Last-CH**
  Select the channel for setting the moving average.
- **Moving average**
  - **Count**
    Select the sampling data count of the moving average from [2] to [16].

Note

Regardless of this setting, filter and moving average operations are not performed for the digital inputs (DI).

4.2 Setting Alarm Related Parameters

This section explains how to set alarms for each channel, how to set alarm output relay (/A1, /A2, or /A3 option) action, and how to clear the alarm outputs when they occur.

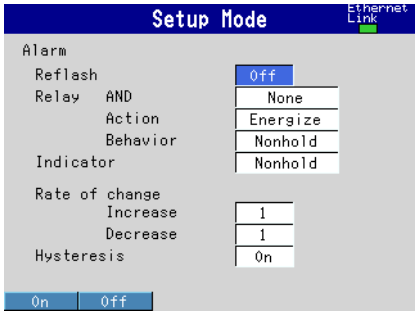
Alarm Output Relay Action, Alarm Indication, Interval for the Rate-of-Change Alarm, Alarm Hysteresis <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#1 soft key** (select [Alarm])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.
4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears.
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Alarm Output Relay Action, Action of Alarm Indication, etc.

- **Reflash**
  Set whether to enable [On] or disable [Off] (initial value) the reflash alarm function of the alarm relay output. The reflash alarm function is set to output relays I01, I02, and I03 only.
- **Relay**
  - **AND**
    Select the relays that are to operate using AND logic. Set the range of relays (from the first alarm relay) to take the AND logic. All subsequent relays will be set to OR logic. Available selections are [None], [I01] (I01 only), [I01-I02] (I01 and I02), [I01-I03] (I01 to I03), [I01-I04] (I01 to I04), [I01-I05] (I01 to I05), and [I01-I06] (I01 to I06). Only the relays that can be used on the installed alarm option terminal block (/A1, /A2, or /A3 option) are valid.

Note

If the reflash alarm is turned ON, the relays I01 to I03 are fixed to OR logic operation. [AND] setting is invalid.

  - **Action**
    Select whether the alarm output relay is energized [Energize] or de-energized [De_energize] when an alarm occurs. This setting applies to all alarm output relays.
  - **Behavior**
    Select one of the following output relay behaviors when the alarm condition switches from an alarm activated condition to an alarm released condition (normal condition). The setting applies to all alarm output relays. If the alarm output relay option is not installed, the setting is disabled.
    - Nonhold (initial value): Turn OFF output relay when the alarm is released.
    - Hold: Hold the output relay at ON until an alarm output release (alarm ACK) operation is performed.

Note

If the reflash alarm is turned ON, the relays I01 to I03 are fixed to Non-hold behavior. [Hold] setting is invalid.

- **Indicator**
  Select the alarm indication behavior when the alarm condition switches from an alarm activated condition to an alarm released condition from the following.
  - Nonhold (initial value): Clear the alarm indication when the alarm is released.
  - Hold: Hold the alarm indication until an alarm output release (alarm ACK) operation is performed.
- **Rate of change**
  - **Increase**
    Select the sampling data count used to determine the interval for the high limit on rate-of-change alarm from [1] to [15]. The interval is calculated as the scan interval multiplied by the sampling data count.
  - **Decrease**
    Select the sampling data count used to determine the interval for the low limit on rate-of-change alarm from [1] to [15]. The interval is calculated as the scan interval multiplied by the sampling data count.
- **Hysteresis**
  Turn [On] (initial value)/[Off] the alarm hysteresis. If set to [On], the hysteresis is set to 0.5% of the measurement span or scale span.

Alarm Output, Alarm Type, Alarm Delay Time <Setting Mode>

Set the alarm output after setting the range.

All alarm settings of a channel are cancelled in the following cases.

- When the input type ([Volt], [TC], etc.) is changed.
- When the input range is changed.
- When the upper or lower limit of the span or scale is changed on channels that are set to scale or square root computation (including changes in the decimal point position).

When [Range] is set to [Skip], alarm output cannot be specified (the alarm entry box is grayed).

For a description on the alarm setting of computation channels, see section 8.3.

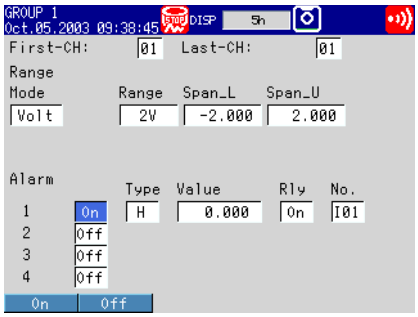
Procedure

Opening the Setting Display

- **Setting the alarm output and alarm type**

  MENU key (switch to setting mode) > **#1 soft key** (select [Range, Alarm])

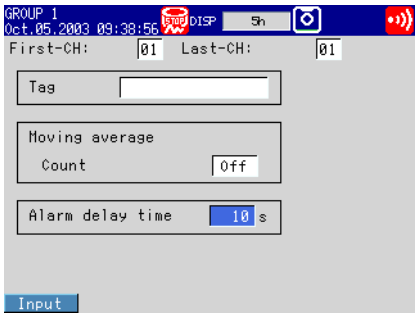
  From the operation mode, use the above keys to open the following setting display.



- **Setting the alarm delay time (when [Type] is set [T] or [t])**

  MENU key (switch to setting mode) > **#2 soft key** (select [Tag, Moving average (or Filter), Alarm delay time])

  From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change. A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select. The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [Alarm delay time] is set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes. The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Alarm Output, Alarm Type

- **First-CH/Last-CH**
  Set the target channel for setting the alarm output. The target channels are common with the range setting.
- **Off/On**
  Up to 4 alarms can be set to a single channel. For each of the alarms [1] to [4], select [On] to enable an alarm, [Off] to disable it. If [On] is selected, [Type], [Value], and [Rly] (Relay) entry boxes appear.
- **Type**
  Select the alarm type (conditions for activating the alarm) from the following eight types.

Name	Symbol	Description
Upper limit alarm	H	An alarm occurs when the measured/computed value is greater than or equal to the alarm value.
Lower limit alarm	L	An alarm occurs when the measured/computed value is less than or equal to the alarm value.
Difference upper limit alarm*1	h	An alarm occurs when the difference in the measured values of two channels is greater than or equal to the difference high limit alarm value.
Difference lower limit alarm*1	l	An alarm occurs when the difference in the measured values of two channels is less than or equal to the difference low limit alarm value.
Upper limit on rate-of-change alarm*2	R	The rate-of-change of the measured values is checked over a certain interval (set using the [Increase] entry box of basic alarm settings). An alarm occurs if the rate-of-change of the measured value in the rising direction is greater than or equal to the specified value.
Lower limit on rate-of-change alarm*2	r	The rate-of-change of the measured values is checked over a certain interval (set using the [Decrease] entry box of basic alarm settings). An alarm occurs if the rate-of-change of the measured value in the falling direction is less than or equal to the specified value.
Delay upper limit alarm	T	An alarm occurs when the measured value remains above or equal to the alarm value for the specified delay.
Delay lower limit alarm	t	An alarm occurs when the measured value remains below or equal to the alarm value for the specified delay.

*1 Can only be specified on difference computation channels.
*2 Can only be specified on measurement channels.

- **Value**
  Set the alarm value for the selected alarm type.
- **Rly**
  Select whether relay output is enabled [On] or disabled [Off]. If [On] is selected, the [Number] entry box appears.
- **No.**
  Set the alarm output relay number to output the relay contact signal from the terminal of the option terminal block. Selectable relays are [I01] and [I02] (/A1 option), [I01] to [I04] (/A2 option), or [I01] to [I06] (/A3 option). For the correspondence between the output relay numbers and the positions of the terminals of the terminal blocks, see pages 2-9 and 2-10.

Alarm Delay Time (When [Type] is set to [T] or [t])

- **First-CH/Last-CH**
  Select the measurement channels for setting the alarm delay. The target channels also apply to [Tag] and [Moving average] (or [Filter]) settings.
- **Alarm delay time**
  Set the alarm delay using an integer in the range of [1] to [3600] s.

Note

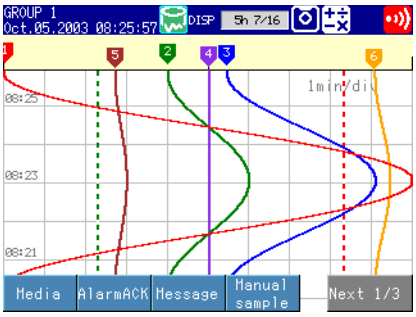
- If the scan interval is 2 s and you set an odd value for the alarm delay, it will operate at "the specified period + 1 s." Example: If the alarm delay set to 5 s, the function will operate at 6 s.
- For a description of the alarm delay setting of computation channels, see section 8.3, "*Setting Alarms on Computation Channels*."

Releasing Alarm Output (AlarmACK) <Operation Mode>

The following operation is valid only when [Behavior] is set to [Hold] or [Indicator] is set to [Hold] in basic setting mode.

Procedure

1. In operation mode, press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
2. Press the **[AlarmACK] soft key**.



Note

This operation can be assigned to the USER key. If it is, alarms can be cleared simply by pressing a single key. For the procedure in assigning a function to the USER key, see section 9.1.

Explanation

Alarm Output Release (Alarm ACK) Operation

When you perform the alarm ACK procedure, all alarm displays and relay outputs (/A1, /A2, /A3 option) are released. However, this procedure is not valid if the alarm display/output relay operation is set to non-hold. This cancellation procedure can be performed via remote control (/R1, /PM1 option) or via communication interface.

For information about remote entry of settings, see section 9.6, "*Using the Remote Control Function (/R1, /PM Option).*" For information about communication functions, see the *"FX100 Communications Interface User's Manual"* (IM 04L20A01-17E).

4.3 Setting Pulse Input (/PM1 Option)

Explains how to count the pulses input to the dedicated pulse input terminal, and how to enter settings to display the number of pulses per the unit time and the pulse sum value.

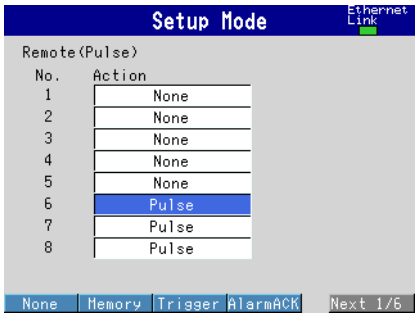
Pulse Input Terminal <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#9 soft key** (select [Option]) > **#1 soft key** (select [Remote (pulse)])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

Carry out the following operation when [Pulse] is not set to [Action] box of the pulse input terminal you are going to use. The initial value for [Action] of (terminal) numbers 6 to 8 are [Pulse].

1. Use the **arrow keys** to move the cursor (blue) to [Action] of number 6, 7, or 8.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to [Pulse].
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.
4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears.
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setting Items

Pulse Input Terminals

The pulse input terminal numbers are 6, 7, and 8. The initial setting is [Pulse]. You can use them as the remote input terminals if you set actions other than [Pulse]. Also, you can set the terminal numbers to 1 through 5 and use them as the pulse input terminals.

See section 2.2, "*Wiring*" for more information on wiring the pulse input terminals.

Note

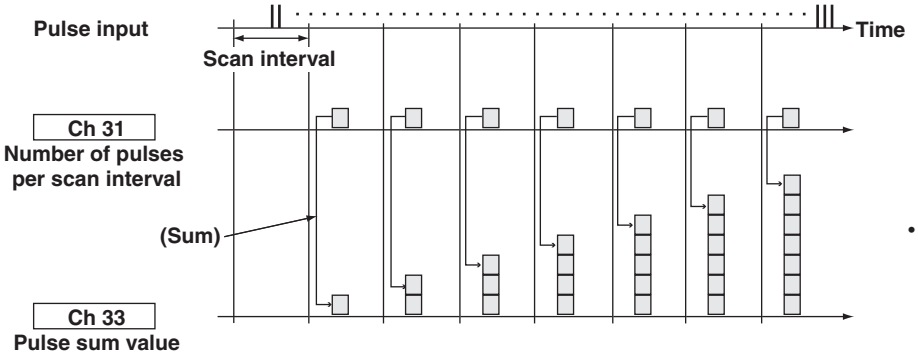
- Each pulse input terminal (numbers 6 through 8) has a common terminal (L). The remote input terminals (numbers 1 through 5) share a common terminal.
- The remote input terminals (numbers 1 through 5) are isolated from the pulse input terminals (numbers 6 through 8).

Pulse Input Measurement Example

Pulses are counted and displayed using computation channels. This is a description of the settings for the application example below. For the setting procedure of the computation channels, see section 8.1. For a description on computation function, see section 1.6.

Application Example 1: Pulse Sum Value

The pulses input through the terminal 6 is summed and displayed.



- **Computation equation**

  Assign computation channels as follows. Set computation equations for each channel. Upper/lower limit of span is set according to the application.

Note

In a single measurement interval, calculation is performed on numbered channels in the order from smallest to largest. For channels that calculate sum values, use higher-numbered channels than those of the channels that count the number of pulses at each scan interval.

Channel	Equation	Description
31	D6	Counts the number of pulses every scan interval.
33	TLOG.SUM(31)	Pulse sum value

- **Channel 31**

  Equation: D6

  D6 indicates the counting of pulses on pulse input terminal 6. The number of pulses per scan interval is counted and displayed.

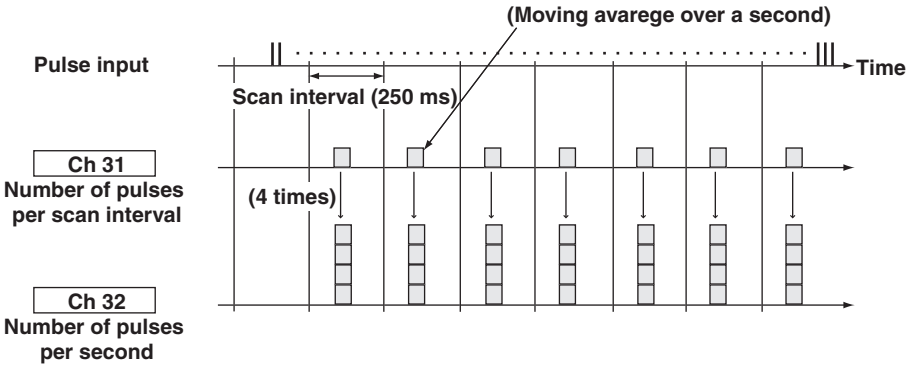
- **Channel 33**

  Equation: TLOG.SUM(31)

  The sum value of the pulses counted on channel 31 is calculated using the TLOG.SUM function, and displayed. See page 1-44 for information about TLOG.SUM.

Application Example 2: Number of Pulses per Second

Calculates number of pulses per second using pulses input through the terminal 6 on the FX103 (scan interval: 250 ms).



- **Computation equation**

  Assigne computation channels as follows. Set computation equations for each channel. Upper/lower limit of span is set according to the application.

Note

In a single measurement interval, calculation is performed on numbered channels in the order from smallest to largest. For channels that calculate the number of pulses per second, use higher-numbered channels than those of the channels that count the number of pulses at each scan interval.

Channel	Equation	Description
31	D6	Counts the number of pulses every scan interval.
32	31*K01	Number of pulses per second

Constant	Description
K01	Counts the number of pulses every scan interval.

- **Channel 31**

  Equation: D6

  Counts the number of pulses every scan interval (250 ms).

  Rolling average

  Takes the moving average over a period of 1 second. This value multiplied by 4 (=1 s/250 ms) counts the number of pulses per second.

  - Interval: 250 ms
  - Number of samples: 4

- **Channel 32**

  Equation: 31 * K01

  The value of channel 31 is multiplied times 4, and the number of pulses per second is calculated.

  Constant

  K01: 4

Note

When displaying the number of pulses per minute, the rolling average on channel 31 is set as follows, and channel 32 is set to 240 times that of the value of channel 31 (K01=240).

- Interval: 250 ms
- Number of samples: 240

5.1 Displaying Measured Data in Waveform, Numerical Values, or Bar Graph (Trend, Digital, and Bar Graph Screens)

Trend Screen (Waveform Display) <Operation Mode>

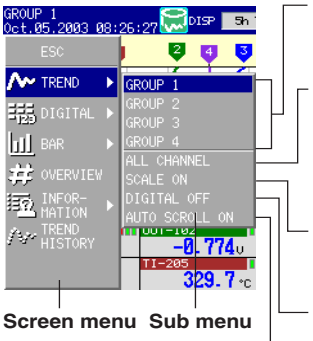
For details, see section 1.4, "*Display Function*."

Procedure

Changing the Display

1. Press the **DISP/ENTER key** to display the screen menu.
2. Press the **right arrow key** to display the sub menu.
3. Select the sub menu item using the **up and down arrow keys**.

Sub menu of the trend screen



GROUP 1 to GROUP 4: Displays group 1 to 4.
The specified group name is displayed in place of GROUP1 to GROUP4.

ALL CHANNEL:
Displays the waveform of all the channels.
(See "*Explanation*.")

GROUP CHANNEL:
Displays the waveforms of the channels registered to groups.

SCALE ON: Displays the scale
(See "*Explanation*.")
SCALE OFF: Clears the scale

DIGITAL OFF:
Clears the numerical display section.
DIGITAL ON:
Displays the numerical display section.

AUTO SCROLL ON:
Automatically switches the displayed groups.
(see "*Explanation*.")
AUTO SCROLL OFF:
Cancels the auto switching of the displayed.

4. Press the **DISP/ENTER key** to execute the display. To close the menu without switching the screen, press the ESC key.

Starting the Waveform Display/Stopping the Waveform Update

The operation to start the Waveform Display and stop updating the waveform is the same as the operation to start/stop data acquisition. When the data acquisition is started, waveforms are displayed; when the data acquisition is stopped, waveforms are not updated.

For the operating procedure, see section 7.2.

Writing Messages

For the operating procedure, see section 6.4.

Changing the Displayed Group Using the Arrow Keys

Press the **right arrow key** while displaying the trend, digital, or bar graph screen to rotate the displayed group from group 1 to group 4.

Press the **left arrow key** to rotate the displayed group in reverse order.

Explanation

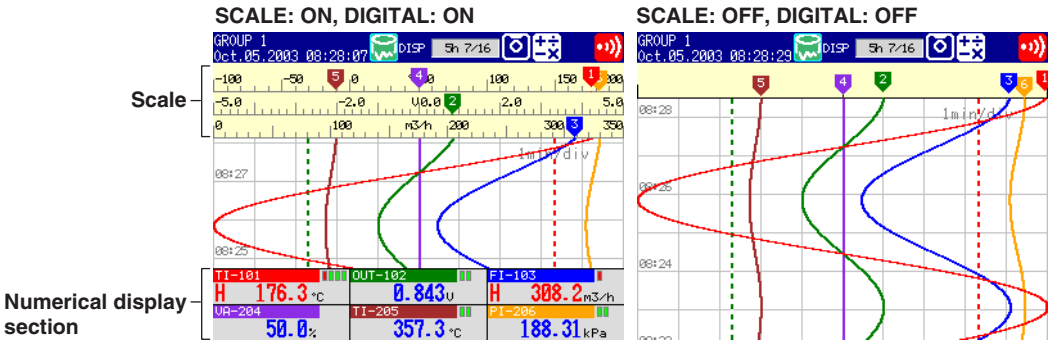
Group Display / All Channel Display

In group display, the waveforms of channels that are assigned to the group are displayed.

In all channel display, the waveforms of all channels that are set to display the trend are displayed on the current group display.

Turning ON/OFF the Scale Display, Turning ON/OFF the Numerical Display Section

You can show or hide the scale and/or numerical display section.



Auto Switching of Groups

When [AUTO SCROLL ON] is selected, the displayed group on the trend, digital, and bar graph screens can be automatically switched at a specified interval. In each screen, the displayed group rotates from group 1 to group 4. You can select 5 s, 10 s, 20 s, 30 s, and 1 min for the switch interval.

For the procedure related to setting the switch interval (scroll time), see section 6.11.

Digital Screen (Numerical Display) <Operation Mode>

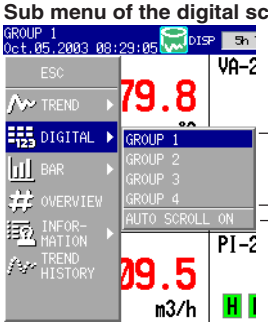
For details, see section 1.4, "*Display Function*."

Procedure

Changing the Display

1. Press the **DISP/ENTER key** to display the screen menu.
2. Press the **right arrow key** to display the sub menu.
3. Select the sub menu item using the **up and down arrow keys**.

Sub menu of the digital screen



GROUP 1 to GROUP 4: Displays group 1 to 4. The specified group name is displayed in place of GROUP1 to GROUP4.

AUTO SCROLL ON: Automatically switches the displayed groups (see "*Explanation*.")

AUTO SCROLL OFF: Cancels the auto switching of the displayed

4. Press the **DISP/ENTER key** to execute the display.
   To close the menu without switching the screen, press the ESC key.

Changing the Displayed Group Using the Arrow Keys

Press the **right arrow key** while displaying the trend, digital, or bar graph screen to rotate the displayed group from group 1 to group 4.

Press the **left arrow key** to rotate the displayed group in reverse order.

Bar Graph Screen <Operation Mode>

For details, see section 1.4, "*Display Function*."

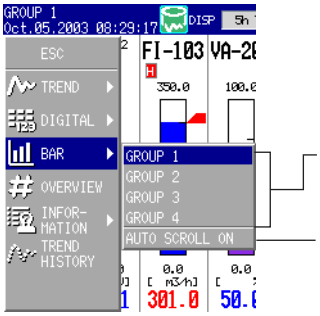
Procedure

Changing the Display

1. Press the **DISP/ENTER key** to display the screen menu.
2. Press the **right arrow key** to display the sub menu.

3. Select the sub menu item using the **up and down arrow keys**.

Sub menu of the bar graph screen



GROUP 1 to GROUP 4: Displays group 1 to 4. The specified group name is displayed in place of GROUP1 to GROUP4.

AUTO SCROLL ON: Automatically switches the displayed groups. (see "*Explanation*.")

AUTO SCROLL OFF: Cancels the auto switching of the displayed.

4. Press the **DISP/ENTER key** to execute the display.
   To close the menu without switching the screen, press the ESC key.

Changing the Displayed Group Using the Arrow Keys

Press the **right arrow key** while displaying the trend, digital, or bar graph screen to rotate the displayed group from group 1 to group 4.

Press the **left arrow key** to rotate the displayed group in reverse order.

Switching the Trend, Digital, and Bar Graph Screens Using the Arrow Keys <Operation Mode>

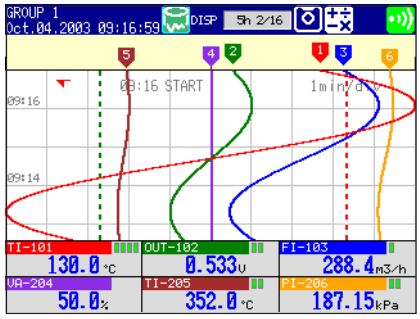
Procedure

Changing the Display

Press the **down arrow key** while displaying the trend, digital, or bar graph screen to switch the screen in the order trend, digital, bar graph, trend, and so on.

Press the **up arrow key** to switch the screen in reverse order.

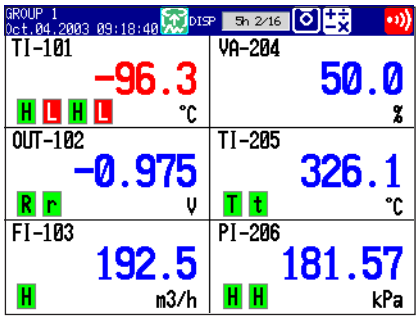
Trend screen



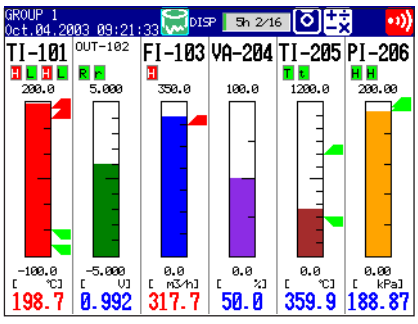
Down arrow key

Up arrow key

Digital screen



Bar graph screen



5.2 Displaying All Channels on a Screen (Overview Screen)

Overview Screen <Operation Mode>

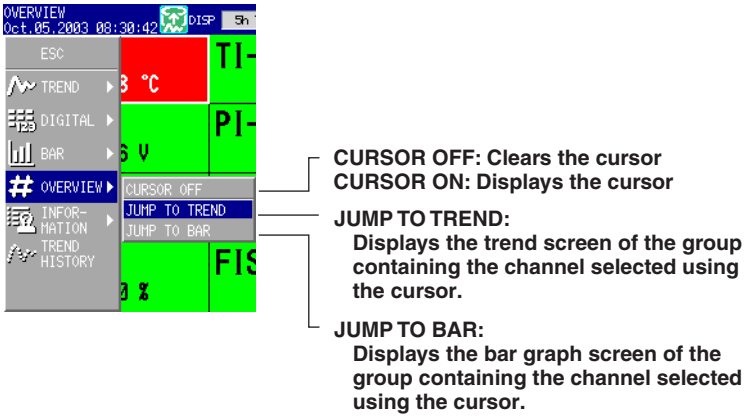
For details, see section 1.4, "*Display Function*."

Procedure

Changing the Display

1. Press the **DISP/ENTER key** to display the screen menu.
2. Press the **right arrow key** to display the sub menu.
3. Select the sub menu item using the **up and down arrow keys**.

Sub menu of the overview screen

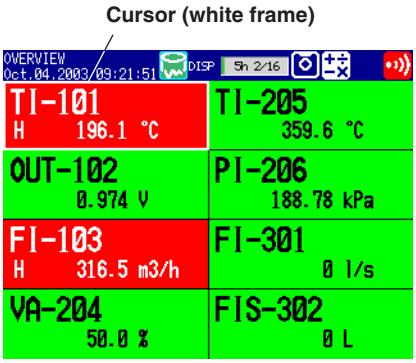


4. Press the **DISP/ENTER key** to execute the display.
   To close the menu without switching the screen, press the ESC key.

Switching to the Trend/Bar Graph Display Containing the Channel Specified Using the Cursor

The operation described here is for the screen with the cursor displayed.

1. Move the cursor using the **arrow keys** and select the channel.



2. Switch to the trend display or bar graph according to the procedure described in "*Changing the Display*."

5.3 Displaying Information List (Alarm Summary, Message Summary, and Memory Summary)

Alarm Summary, Message Summary, and Memory Summary <Operation Mode>

For details, see section 1.4, "*Display Function*."

Procedure

Changing the Display

1. Press the **DISP/ENTER key** to display the screen menu.
2. Press the **right arrow key** to display the sub menu.
3. Select the sub menu item using the **up and down arrow keys**.

Sub menu of the information screen

ALARM SUMMARY:
Displays the alarm summary

MESSAGE SUMMARY:
Displays the message summary.

Memory summary:
Displays the memory summary

JUMP TO HISTORY:
When alarm summary is displayed
Displays the historical trend for when the alarm selected using the cursor occurred.
When message summary is displayed
Displays the historical trend for when the message selected using the cursor was written.
When memory summary is displayed
Displays the historical trend for the data selected using the cursor.

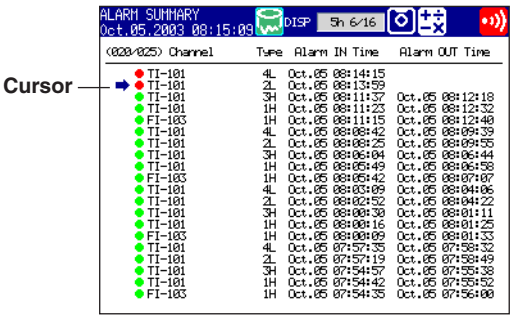
JUMP TO REPORT:
(Only when memory summary is displayed)
Displays the most recent report data.

4. Press the **DISP/ENTER key** to execute the display.
   To close the menu without switching the screen, press the ESC key.

Recalling the Historical Trend for When the Alarm Occurred.

This operation is carried out on the alarm summary.

1. Move the cursor using the **up and down arrow keys** and select the alarm.

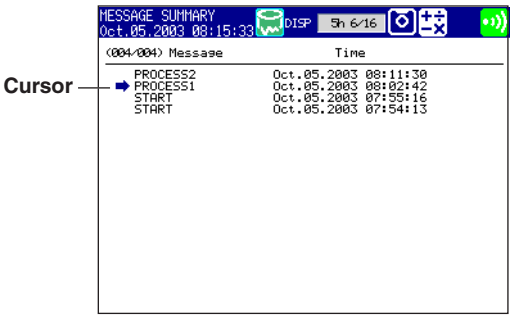


2. Display the historical trend according to the procedure described in "*Changing the Display*."
   The data of the following type is displayed.
   - When configured to acquire the display data to the internal memory: Display data
   - When configured to acquire the event data to the internal memory: Event data
   - When configured to acquire the display data and the event data to the internal memory: Data type selected in the memory summary

Recalling the Historical Trend for When the Message Was Written.

This operation is carried out on the message summary.

1. Move the cursor using the **up and down arrow keys** and select the message.



2. Display the historical trend according to the procedure described in "*Changing the Display*."

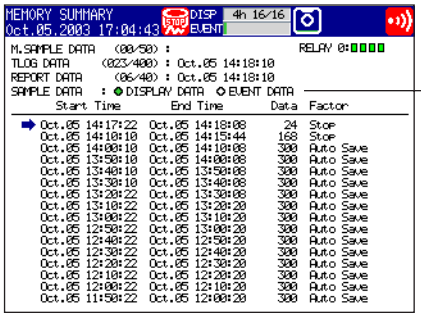
   The data of the following type is displayed.

   - When configured to acquire the display data to the internal memory: Display data
   - When configured to acquire the event data to the internal memory: Event data
   - When configured to acquire the display data and the event data to the internal memory: Data type selected in the memory summary

Selecting the Type of File (Display Data or Event Data) to Display in the Memory Summary

This operation is carried out on the memory summary screen.

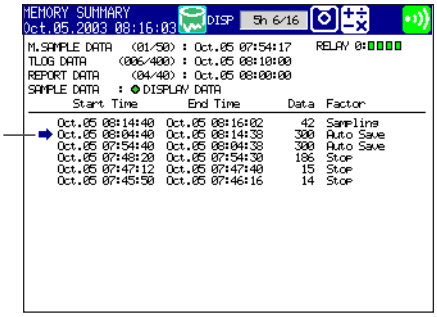
Select display data or event data using the **left and right arrow keys**. The selected file type is indicated by a green circle to the left of [DISPLAY DATA] or [EVENT DATA]. Information about the selected file is displayed. You can select display data or event data when both data reside in the internal memory.



Displaying the Historical Trend for the Data Specified by Memory Summary

This operation is carried out on the memory summary screen.

1. Move the cursor using the **up and down arrow keys** and select the data.

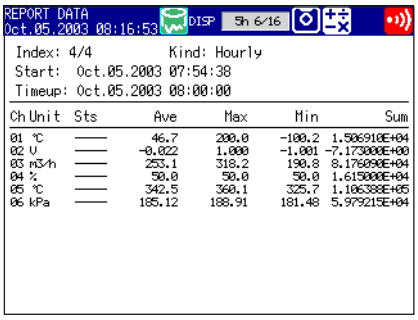


2. Display the historical trend according to the procedure described in "*Changing the Display*."

Displaying the Report Data

This operation is carried out on the memory summary screen.

Display the report data according to the procedure described in "*Changing the Display*."



- **Switching the Displayed Report Data**

  The [Index] of the report data display shows "the number of the report data being displayed/the number of report data saved to the internal memory." The largest report data number corresponds to the most recent report data.

  Press the arrow keys while displaying the report data to switch the report data to be displayed. The behavior when the four keys are pressed is as follows:

  Up arrow key: Displays the report data corresponding to report data being displayed + 1.

  Down arrow key: Displays the report data corresponding to report data being displayed − 1.

  Right arrow key: Displays the report data corresponding to report data being displayed + 10. However, if such report data does not exist, the most recent report data is displayed (maximum report data number).

  Left arrow key: Displays the report data corresponding to report data being displayed − 10. However, if such report data does not exist, the oldest report data is displayed (report data number 1).

Note

Even if a new report data is created while displaying the report data, the display is not updated. The most recent report data is displayed by performing either operation below.

- Press the right arrow key.
- Press the DISP/ENTER key and display the report data again from the screen menu.

Explanation

Displayed Contents

For the description of the displayed contents, see pages as followed:

Alarm summary: page 1-23

Message summary: page 1-24

Memory summary: page 1-25

5.4 Displaying Measured Data Previously Acquired (Historical Trend)

There are four methods for displaying the historical trend.

- Display from the alarm summary (see section 5.3.)
- Display from the message summary (see section 5.3.)
- Display from the memory summary (see section 5.3.)
- Call from the screen menu

Note

For the procedure related to displaying measured data on the external storage medium, see *section 7.6*.

Historical Trend <Operation Mode>

For details, see section 1.4, "*Display Function*."

Procedure

Changing the Display

1. Press the **DISP/ENTER key** to display the screen menu.
2. Press the **right arrow key** to display the sub menu.
3. Select the sub menu item using the **up and down arrow keys**.

Sub menu of the historical trend screen

GROUP 1 to GROUP 4: Displays group 1 to 4. The specified group name is displayed in place of GROUP1 to GROUP4.

ZOOM+: Displays by expanding the time axis. (see "*Explanation*")

ZOOM-: Displays by reducing the time axis.

ALL CHANNEL: Displays the waveform of all the channels (see "*Explanation*" in section 5.1).

GROUP CHANNEL: Displays the waveforms of the channels registered to groups.

INFORMATION ON: Displays the memory information.

CURSOR TIME ON: Displays the time at the cursor position.

4. Press the **DISP/ENTER key** to execute the display.
   To close the menu without switching the screen, press the ESC key.

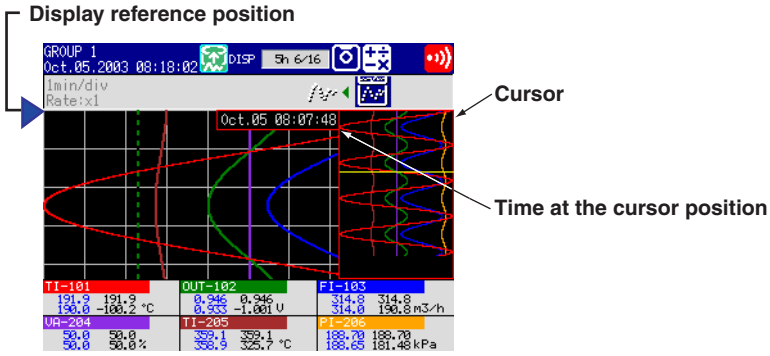
Scrolling the Waveforms

Pressing the **up or down arrow key** (vertical display) or the **left or right arrow key** (horizontal display) while displaying the historical trend scrolls the waveform by one dot along the time axis. If you keep pressing the **arrow key**, the waveform scrolls by two divisions.

Specifying the Displayed Position Using the Cursor

Enclosed in parentheses are for the horizontal trend display.

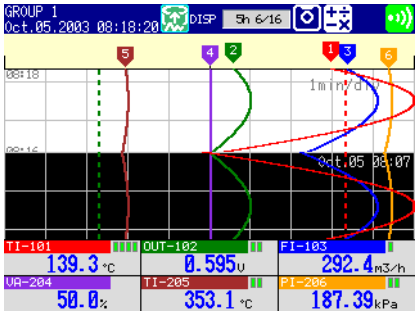
1. Press the **right (up) arrow key** to display the all data display in the right (upper) section of the screen.



2. Move the cursor to select the displayed position using the **up and down (left and right) arrow keys**.
3. Pressing the **left (down) arrow key** switches to the historical trend screen with shifted waveforms.
   The cursor position on the all data display locates the display reference position.

Displaying the Current Trend Data and the Historical Trend Data

This operation can be carried out while the display data is displayed on the historical trend screen. Enclosed in parentheses are for the horizontal trend display.
Pressing the **left (down) arrow key** displays the current display data on the upper (right) half of the screen and the historical trend on the lower (left) half of the screen.



To return to the previous screen, press the right (up) arrow key.

Explanation

Display Reference Position

The most recent data is located at the reference display position.

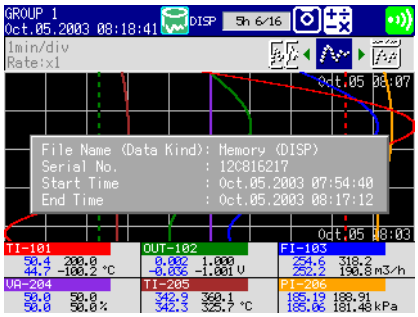
Expanding/Reducing the Time Axis

The time axis can be expanded or reduced with respect to the “display reference position.”
Display data: 2 times the trend display to 1/60 minimum
Event data: Reduction only, up to 1/60 minimum
The minimum magnification and the factor by which the display can be expanded or reduced with one operation vary depending on the display update rate for the display data and on the sampling interval for the event data. To expand or reduce the display further, repeat the procedures.

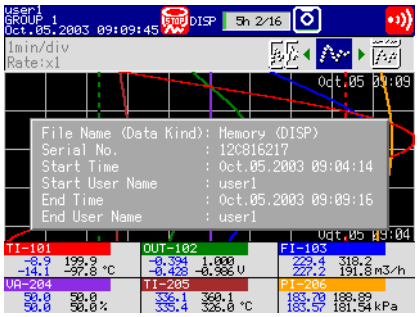
Memory Information (Information of the Data That is Being Displayed)

The following information is listed.

When the key login/logout function is enabled



When the key login/logout function is disabled



File Name (Data Kind): [Memory] indicates that the data is in the internal memory. A file name is displayed if the data is recalled from the external storage medium. [Data Kind] is either [DISP] (display data) or [EVENT] (event data).

Serial No.: Serial number of the FX100 used to acquire data.

Note

When displaying measured data from the external storage medium, the displayed serial number is that of the FX100 used to acquire the data.

Background Color of the Historical Trend

The background color of the historical trend is either black or white, opposite of the background color displayed for the current trend.

6.1 Change the Group Settings

This section explains how to rename the groups of trend, digital, and bar graph screens and how to register channels to those groups.

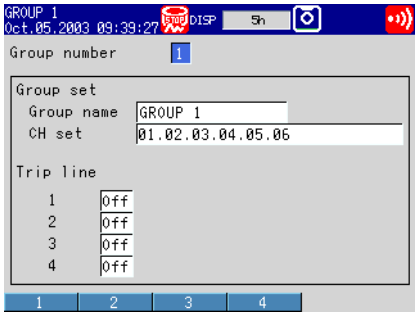
Group Name, Channel Registration to Groups <Setting Mode>

Procedure

Setup Display

MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#1 soft key** (select [Group set, Trip line])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

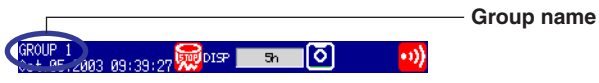
The [Group name] and [CH set] are set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Renaming Groups and Registering Channels to Groups

- **Group number**
  Select the group you wish to set from [1] to [4].
- **Group name**
  Enter the group name using up to 16 alphanumeric characters. The initial values of group name are as follows:
  Group 1: GROUP 1, Group 2: GROUP 2, Group 3: GROUP 3, Group 4: GROUP 4
  Group name is display in the status display section.



- **CH set**
  Select up to six channels from measurement channels (FX103: 01 to 03, FX106: 01 to 06, FX112: 01 to 12) and computation channels (31 to 42, /M1, /PM1 option).

Enter the measurement/computation channels to be assigned to the selected group according to the following rules.

- Enter the channel number using two digits.
- Separate each channel with a period.
- Use a hyphen to specify consecutive channels.

Example: To assign channels 1, 3, and 5 through 8 enter “01.03.05-08”.

Note

- The channels are displayed on the trend, digital, and bar graph screens in the order they are registered to the group.
- One channel can be assigned to multiple groups.
- A channel cannot be assigned twice in the same group.

The initial value varies depending on the number of measurement inputs.

FX103

All groups: 01.02.03

FX106

All groups: 01.02.03.04.05.06

FX112

Groups 1 and 3: 01.02.03.04.05.06

Groups 2 and 4: 07.08.09.10.11.12

6.2 Displaying Tag Names for Channels

This section explains how to set and display tag names that can be displayed in place of channel numbers.

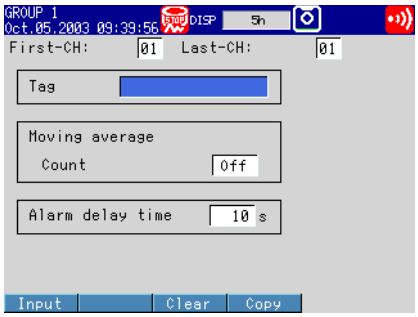
Tag Name <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#2 soft key** (select [Tag, Moving average (or Filter), Alarm delay time])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [Tag] is set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Tag Names

- **First-CH/Last-CH**
  Set the target channels. The target channels are common with other items on the screen.
- **Tag**
  Enter the tag name using up to 16 alphanumeric characters.

Note

For the procedures of setting tag strings of computation channels (/M1, /PM1 option), see section 8.1, "*Assigning Computation Channels and Setting Computing Equations, Constants, and Tags*."

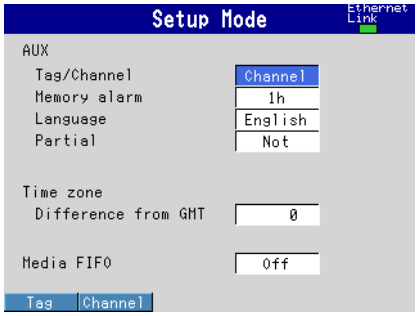
Switching between Tag Name Display and Channel Number Display <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#5 soft key** (select [Aux, Time zone])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to [Tag/Channel].
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Switching between Tag Name Display and Channel Number Display

- **Tag/Channel**

  Tag: Shows tag names. However, channel numbers are shown for those channels that tag names are not defined.

  Channel: Shows channel numbers.

6.3 Changing the Display Update Rate of the Trend Screen

This section explains how to change the display update rate of the trend screen.

Note

- The display update rate cannot be changed while data acquisition is in progress.
- The sampling interval of the display data is also determined by the display update rate.

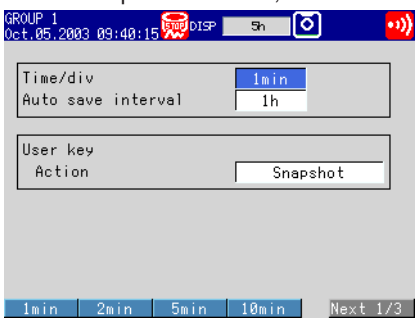
Display Update Rate <Setting Mode>

Procedure

Setup Display

MENU key (switch to setting mode) > **#3 soft key** (select [Trend/Save interval, User key])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to [Time/div].
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item.

Setup Items

Display Update Rate

- **Time/div**

  Select the time corresponding to 1 division of the time axis during trend display from the following.

  15 s*, 30 s*, 1 min, 2 min, 5 min, 10 min, 15 min, 20 min, 30 min, 1 h, 2 h, 4 h, and 10 h

  * Can be selected only on the FX103.

Note

When [Auto save] is set for saving data to the external storage medium, the [Auto save interval] box is displayed under [Time/div]. [Auto save interval] is the interval at which the display data residing in the internal memory are saved to the external storage medium. The selectable values for [Auto save interval] vary depending on the [Time/div] setting. For the setting procedure, see section 7.1.

6.4 Writing Messages on the Trend Screen

This section explains how to set and write the messages that can be displayed on the trend screen.

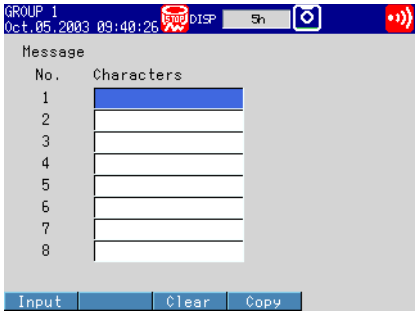
Message Strings <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#4 soft key** (select [Message, File])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to one of the [Characters] boxes under [Message].
   A soft key menu is displayed at the bottom of the display.
2. Press the **[Input] soft key**.
   A message pop-up window appears.
3. Enter the message using the **soft keys** and **arrow keys**.
4. Press the **DISP/ENTER key**.
   The message pop-up window closes, and the cursor moves to the next [Characters] box.
5. Repeat steps 1 to 4 to enter all the messages you wish.
6. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Setting the Messages

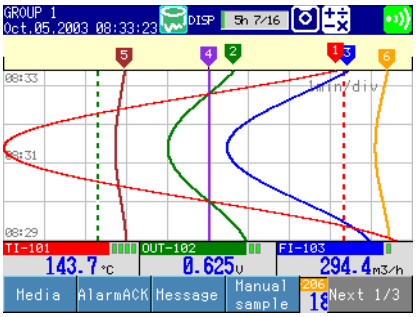
- **Characters**
  Enter the message string using up to 16 alphanumeric characters. Up to 8 messages can be entered (No. 1 to 8).

Writing Messages <Operation Mode>

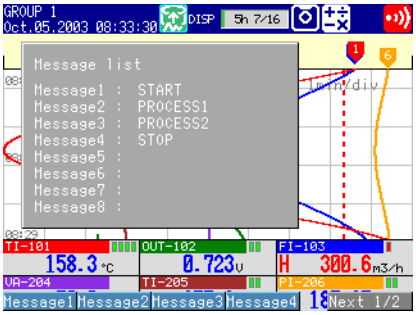
You cannot write messages if acquisition to the internal memory is stopped.

Procedure

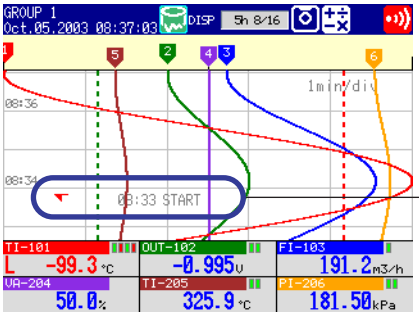
1. Press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.



2. Press the **[Message] soft key** to display a list of messages.
   A soft key menu used to select the message appears.



3. Press the **soft key** corresponding to the message you wish to write.
   A message mark, time, and the message itself are displayed on the trend display, and the information is written to the internal memory.



Message mark, time, message

Note

This operation can be assigned to the USER key. If it is, the message is written simply by pressing a single key. For the procedure in assigning a function to the USER key, see section 9.1.

Explanation

Displayed Colors of the Message

The message colors on the trend screen are shown below. They cannot be changed.

Message Number	1	2	3	4	5	6	7	8
Displayed Color	Red	Green	Blue	Blue violet	Brown	Orange	Yellow-green	Light blue

6.5 Displaying a Line to Indicate a Particular Value of Interest (Trip Line) on the Trend Screen

This section explains how to set the trip line that can be displayed on the trend screen.

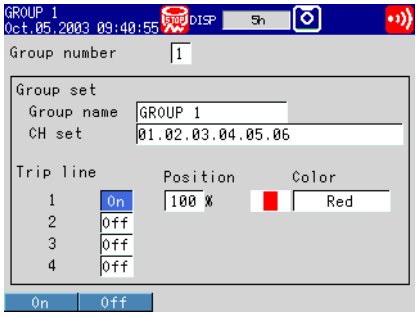
Trip Line <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#1 soft key** (select [Group set, Trip line])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. With the cursor (blue) located at the [Group number] box, select the group number for setting the trip line using the **soft keys**.
   The cursor moves to the [Group name] box.
2. Use the **arrow keys** to move the cursor (blue) to the On/Off box under [Trip line].
   A soft key menu is displayed at the bottom of the display.
3. Press the **[On]** or **[Off] soft key**.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
4. If you select [On], set [Position] and [Color] using the **soft keys**, **arrow keys**, and the **DISP/ENTER key**.

Note

The [Position] is set using the pop-up window that appears by pressing the [Input] soft key.

5. Repeat steps 2 to 4 to enter all the trip lines you wish.
6. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item.

Setup Items

Trip Lines

- **Group number**
  Select the group you wish to set a trip line to from [1] to [4].
- **Trip line**
  - **Off/On**
    On: Use the trip line.
    Off: Do not use the trip line.
  - **Position**
    Enter the position in the range of “0 to 100”% of the scale.

- **Color**

  The initial color settings of colors are as follows:

  Trip line no. 1: red, no. 2: green, no. 3: blue, no. 4: yellow

  To change the color select from the following 16 colors.

  Red, green, blue, blue violet, brown, orange, yellow-green, light blue, violet, gray, lime, cyan, dark blue, yellow, light gray, and purple.

Line Width of Trip Lines

You can select the line width of trip lines (see section 6.9).

6.6 Changing the Channel Display Color

This section explains how to change the waveform color on trend displays and the bar color on bar graph displays.

For the procedures in changing the background color of operation displays such as the trend display, see section 6.9, "*Setting the Display Direction, Background Color, Waveform Line Width, Trip Line Width, and Grid*."

For the procedure in changing the trip line color of the trend display, see section 6.5, "*Displaying a Line to Indicate a Particular Value of Interest (Trip Line) on the Trend Screen*."

Channel Display Color <Setting Mode>

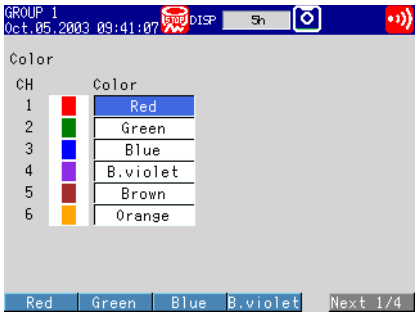
Procedure

Opening the Setting Display

- **Colors of measurement channels**

  MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#2 soft key** (select [Color])

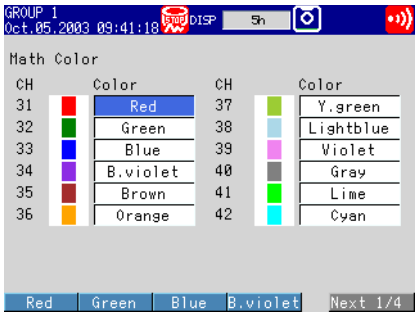
  From the operation mode, use the above keys to open the following setting display.



- **Colors of computation channels (/M1, /PM1 option)**

  MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#5 soft key** (select [Math (Color)])

  From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the [Color] box of the channel you wish to change.
   A soft key menu used to select the color appears at the bottom of the display.
2. Press the **soft key** corresponding to the color you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to set all the colors you wish.
4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item.

Setup Items

Channel Color

- **Color**

  The colors are initially set in the following order for every twelve channels.

  - **Measurement channels**

    1: Red, 2: Green, 3: Blue, 4: Blue violet, 5: Brown, 6: Orange, 7: Yellow green, 8: Light blue, 9: Violet, 10: Gray, 11: Lime, and 12: Cyan
  - **Computation channels**

    31: Red, 32: Green, 33: Blue, 34: Blue violet, 35: Brown, 36: Orange, 37: Yellow green, 38: Light blue, 39: Violet, 40: Gray, 41: Lime, and 42: Cyan

  To change the color select from the following 16 colors.

  Red, green, blue, blue violet, brown, orange, yellow-green, light blue, violet, gray, lime, cyan, dark blue, yellow, light gray, and purple.

6.7 Displaying Waveforms in Separate Zones on the Trend Screen

This section explains how to specify the waveform display zone of each channel.

Waveform Display Zone <Setting Mode>

Procedure

Opening the Setting Display

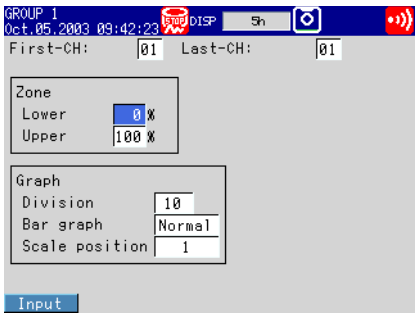
- **Waveform display zone**

  MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#3 soft key** (select [Zone, Graph]) or **#6 soft key** (select [Math (Zone, Graph)])

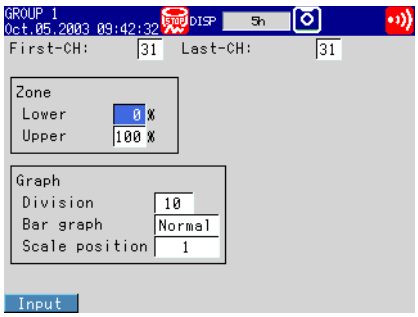
  If [Aux, Time Zone] > [Partial] is set to [Use], [Zone, Graph] in the menu appears as [Zone, Graph, Partial], and the setting display shows the [Partial] entry box.

  From the operation mode, use the above keys to open the following setting display.

For measurement channels



For computation channels (/M1, /PM1 option)



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [Zone Lower/Upper] is set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Setting Zone Lower/Upper

- **First-CH/Last-CH**

  Set the target channel (common with the [Graph] setting).

  Measurement channels: 01 to 12, computation channels: 31 to 42 (/M1, /PM1 option)

- **Zone Lower/Upper**

  Set the zone for displaying the target channel. You can set [Zone Lower] and [Zone Upper] as a position (%) when taking the maximum display width to be 0 to 100% in the following range.

  Zone Lower: 0 to 95%, Zone Upper: 5 to 100%

Note

- [Lower] must be a smaller value than [Upper].
- The width of the zone (upper limit – lower limit) must be greater than or equal to 5%.

6.8 Setting the Scale

This section explains how to set the scale division on trend/bar graph displays and the scale display position of each channel on trend screens.

Scale <Setting Mode>

Procedure

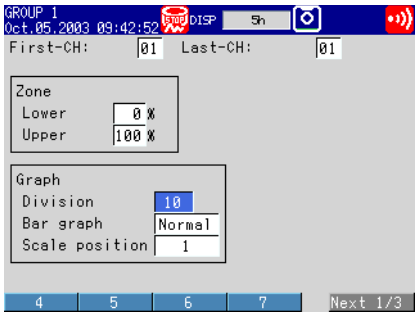
Opening the Setting Display

- **Setting the scale division, scale position of trend screens**

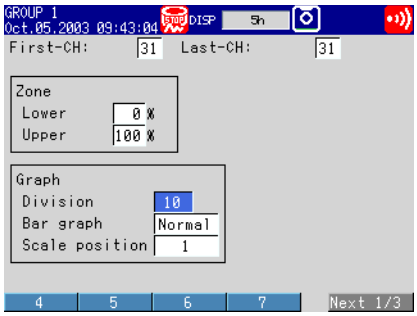
  MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#3 soft key** (select [Zone, Graph]) or **#6 soft key** (select [Math (Zone, Graph)])

  From the operation mode, use the above keys to open the following setting display.

For measurement channels



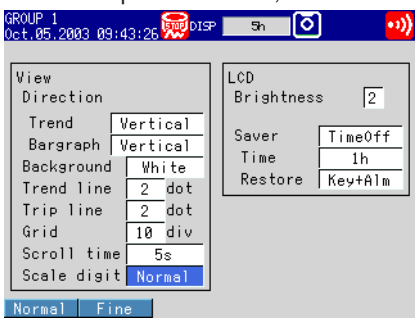
For computation channels (/M1, /PM1 option)



- **Setting the number of digits displayed for the scale**

  MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#4 soft key** (select [View, Direction, LCD])

  From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.
4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

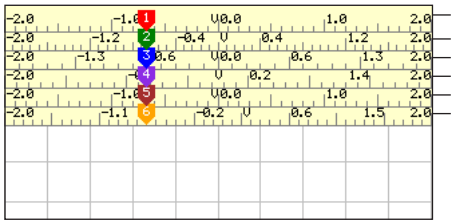
Scale Division, Scale Position of Trend Screens

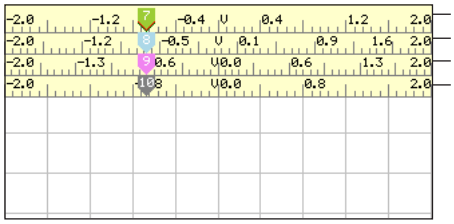
- **First-CH/Last-CH**
  Set the target channel (common with the [Zone] setting).
- **Graph**
  - **Division**
    Set the number of main scale marks from [4] to [12]. In addition to the values of [4] to [12],
    [C10] is available. When [C10] is selected, the scale is equally divided into 10 sections by main scale marks, and scale values are indicated at 0, 30, 50, 70, and 100% positions on the trend display.

Note

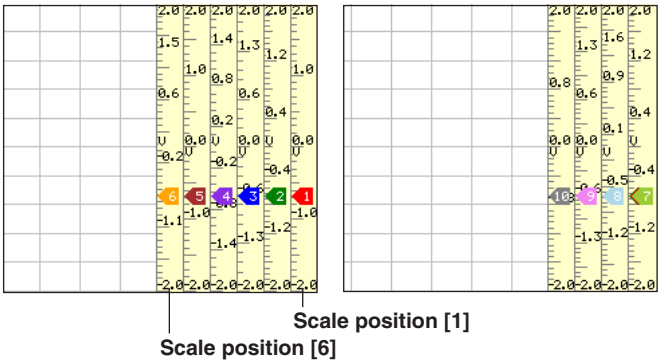
Only main marks are displayed on bar graph screens.

- **Scale position**
  Select the scale display position on the trend display from [1] to [6]. When the trend waveform is displayed vertically, the top is [1] and the bottom is [6]. When the trend waveform is displayed horizontally, the right end is [1] and the left end is [6].
  Select [Off] if you do not wish to display the scale.
  Below is an example in which the position of the scale is offset for each channel with a scale of different division setting.
  - When displaying the trend waveform vertically





  - When displaying the trend waveform horizontally



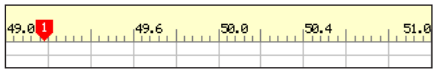
Note

- If the scales of multiple channels are set to the same position, the scale of the channel assigned earlier to the group is displayed.
  Example: If the order of assignment of a group is [03.02.01], and the scale display position of all channels is set to [1], the scale of channel 3 is displayed at display position 1.
- Even if some of the scale display positions are skipped, the scale is packed towards display position [1].
  Example: Suppose the assignment of channels to a group is [01.02.03], and the display positions of the scales are set to 1, 3, and 6, respectively. The scales are actually displayed at positions 1, 2, and 3, respectively.
- The scale marks are displayed according to the following rules.
  The scale can be divided into 4 to 12 sections using the main scale marks. When the scale is divided into 4 or 5 section, the area between the main scale marks is divided further into 10 sections using small and medium marks. When the scale is divided into 6 to 12 sections, the area between the main scale marks is divided further into 5 sections using small marks.
  However, small marks are not displayed for the following cases:
  - When the measurement/computation range resolution is smaller than the total number of sections created by small marks.
  - When zone display is used.
  - When partial expanded display is used.
- The scale values are displayed according to the following rules.
  - When the trend is displayed vertically:
    If the number of scale divisions is 4 to 6, values are displayed by all the main scale marks. If the number is 7 to 12, values are displayed by every other main scale marks.
    When the trend is displayed horizontally:
    If the number of scale divisions is 4 to 7, values are displayed by all the main scale marks. If the number is 8 to 12, values are displayed by every other main scale marks.
  - Scale upper and lower limits are displayed at the ends of the scale.
  - Scale values are displayed up to 3 digits excluding the minus sign. However, if the integer part of values at the ends of the scale are both 1 digit or the integer part for both is 0, 2 digits are displayed.
    Example: If the scale is −0.05 to 0.50, the lower limit is “−0.0” and the upper limit is “0.5.”
  - If the integer part of either end of the scale is 2 or 3 digits, the fractional part is truncated.
    Example: If the scale is 0.1 to 100.0, the lower limit is “0” and the upper limit is “100.”
  - If the integer part of either end of the scale is 4 or more digits, the value is displayed using a 3-digit mantissa and exponent like ×10" or $\times 10^2$".
    Example: If the scale is 10 to 2000, the lower limit is “1” and the upper limit is “200 ×10”.
  - The unit is displayed near the center of the scale. If partial expanded display is used, the display position is offset from the center. When the trend is displayed vertically, the number of characters that can be displayed is 6 characters or less. When the trend is displayed horizontally, the number of characters that can be displayed is 3 characters or less. If the [Scale digit] is set to [Fine], however, up to 4 characters can be displayed.

Number of Digits Displayed for the Scale

- **Scale digit**

  You can select [Normal] or [Fine]. If you select [Fine], the scale value can be displayed using 3 digits when the scale value display is 2 digits. For example, if the scale range is “49.0 to 51.0,” the scale values are displayed using 3 digits as shown below.



6.9 Setting the Waveform Display Direction, Background Color, Waveform Line Width, Trip Line Width, and Grid

This section explains how to set the display direction of the trends, the background color, the waveform line width, the trip line width, and the number of grids.

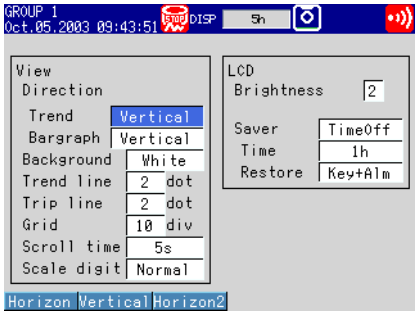
Waveform Display Direction, Background Color, Waveform Line Width, Trip Line Width, Grid <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#4 soft key** (select [View, Direction, LCD])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

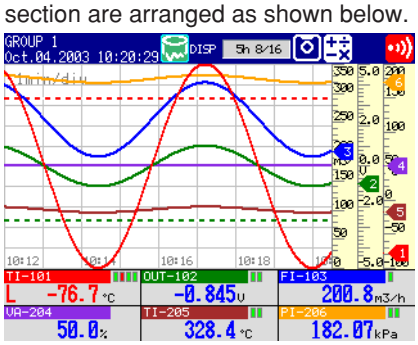
1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.
4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Waveform Display Direction, Background Color, Waveform Line Width, Trip Line Width, Grid

- **Direction**
  - **Trend**

    Select the display direction of the trends from [Horizontal], [Vertical] (initial value), and [Horizon2]. If [Horizon2] is selected, the trends, scale, and numerical display section are arranged as shown below.

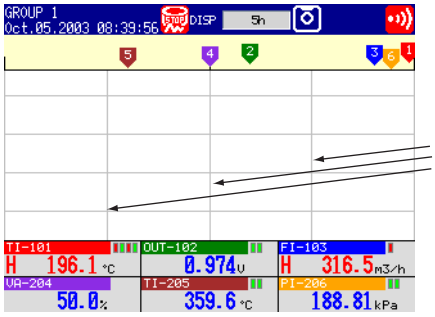


- **Background**
  Select the background color for measurement displays such as the trend screen, digital screen, bar graph screen, and information display from [White] (initial value) and [Black].

Note

The background color of the historical trend is set opposite to that of the trend screen.

- **Trend line**
  Select the line width of the trends from [1], [2], and [3] dots.
- **Trip line**
  Select the line width of trip lines from [1], [2], and [3] dots.
- **Grid**
  Select the number of grids to be displayed in the waveform display area of the trend screen. Select from [Auto], [4] to [12]. If [4] to [12] is selected, the grid is displayed so that the display width is divided into 4 to 12 sections. If [Auto] is selected, the same number of grids as the number of scale divisions of the first assigned channel of the group is displayed.



Number of lines is specified by the [Grid] setting.

6.10 Changing the Display of Bar Graphs

This section explains how to set the bar graph base position and the display direction of the bar graphs.

Bar graph Base Position, Direction of the Bar Graphs <Setting Mode>

Procedure

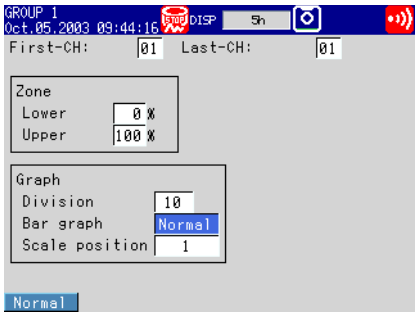
Opening the Setting Display

- **Setting the bar graph base position**

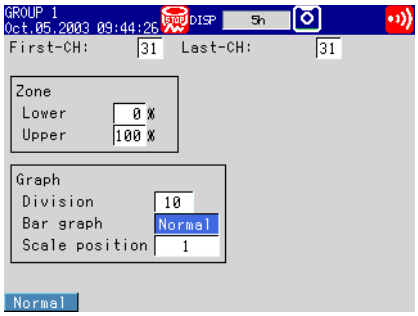
  MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#3 soft key** (select [Zone, Graph]) or **#6 soft key** (select [Math (Zone, Graph)])

  From the operation mode, use the above keys to open the following setting display.

For measurement channels



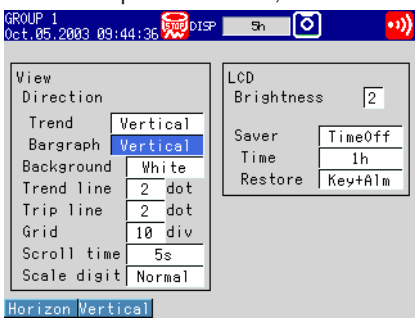
For computation channels (/M1, /PM1 option)



- **Setting the direction of the bar graphs**

  MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#4 soft key** (select [View, Direction, LCD])

  From the operation mode, use the above keys to open the following setting display.



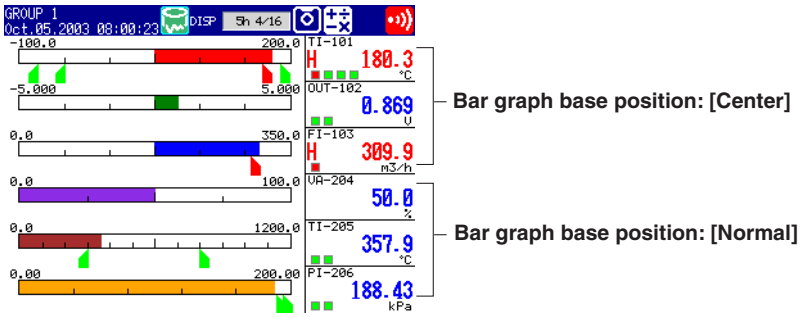
Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.
4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Bar Graph Base Position

- **First-CH/Last-CH**
  Set the target channel (common with the [Zone] setting).
- **Graph**
  - **Bar graph**
    Set the base position of the bar graph when set to horizontal display to [Normal] or [Center]. When the bar graph is displayed vertically, the base position is fixed to [Normal] (the bottom of the bar graph is the base position).



Display Direction of the Bar Graphs

- **Direction**
  - **Bar graph**
    Select the display direction of bar graphs from [Horizontal] or [Vertical].

6.11 Switching the Displayed Groups Automatically at a Specified Time Interval (Scroll Time)

This section explains how to set the automatic switching interval of the displayed groups.

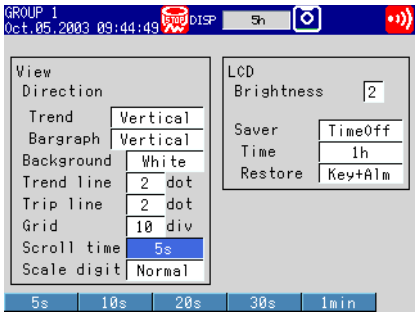
Automatic Switching Interval of the Displayed Groups (Scroll Time) <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#4 soft key** (select [View, Direction, LCD])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to [Scroll time].
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Automatic Switching Interval of the Displayed Groups

- **Scroll time**

  Select the interval used when automatically switching the displayed groups on the trend, digital, and bar graph screens from [5s], [10s], [20s], [30s], and [1min]. The displayed group rotates among group 1 to group 4.

6.12 Displaying Partially Expanded Waveforms

This section explains how to display the waveform using the partial expanded display function on the trend screen.

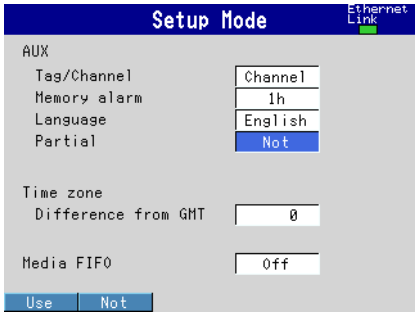
Enabling/Disabling the Partial Expanded Display Function <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#5 soft key** (select [Aux, Time zone])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to [Partial].
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Enabling/Disabling the Partial Expanded Display Function

- **Partial**

  To use the partial expanded display function, select [Use] (initial value is [Not]).

Note

The partial expanded display settings of all channels are set to Off, when the [Partial Use/Not] setting is changed in basic setting mode.

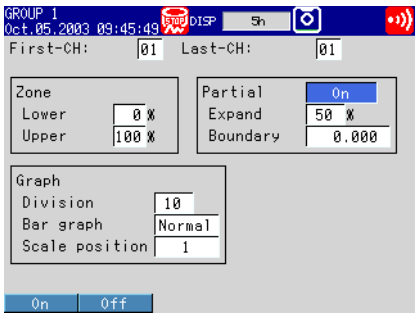
Detailed Setting of the Partial Expanded Display <Setting Mode>

Procedure

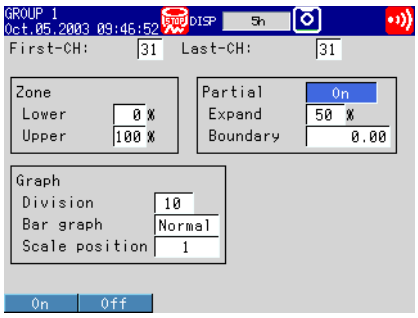
Opening the Setting Display

MENU key (switch to setting mode) > **#5 soft key** (select [Display]) > **#3 soft key** (select [Zone, Graph, Partial]) or **#6 soft key** (select [Math (Zone, Graph, Partial)])
From the operation mode, use the above keys to open the following setting display.

For measurement channels



For computation channels (/M1, /PM1 option)



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

[Expand] and [Boundary] under [Partial] are set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Detailed Setting of the Partial Expanded Display

- **First-CH/Last-CH**
  Set the target channel (common with the [Zone] and [Graph] settings).
  Measurement channels: 01 to 12, computation channels: 31 to 42 (/M1, /PM1 option)
- **Partial**
  To use partial expanded display, select [On] (initial value is [Off]). If [On] is selected, the [Expand] and [Boundary] entry boxes appear.
  - **Expand**
    Set the position where the boundary value is to be displayed within the display span in the range of [1] to [99]%.
  - **Boundary**
    Set the value that is to be the boundary between the reduced section and the expanded section in the range of "minimum span value + 1 digit to maximum span value − 1 digit." However, for channels that are set to scaling or square root computation, the selectable range is "minimum scale value + 1 digit to maximum scale value − 1 digit."
    Example
    Suppose [Expand] and [Boundary] are set to 30 and 0, respectively, for a channel with "−6 V to 6 V" measurement span.
    The measured data for "−6 V–0 V" and "0 V–6 V" are displayed in the "0%–30%" and "70%–100%" ranges, respectively.

Note

If the range setting of a channel is set to [Skip] or if the span width is less than 1 digit, partial expanded display cannot be used (the [Partial] box is grayed).

7.1 Setting Measured Data Acquisition to the Internal Memory and Data Save to the External Storage Medium

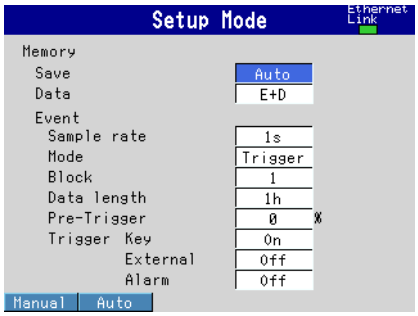
This section explains how to set data acquisition of measured data (display data and event data) to the internal memory, as well as how to set the storage of data to the external storage medium.

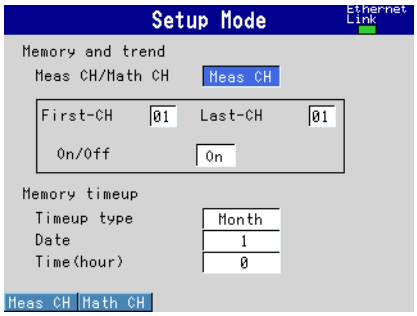
Measured Data Acquisition to the Internal Memory, Data Save to the External Storage Medium <Basic Setting Mode>

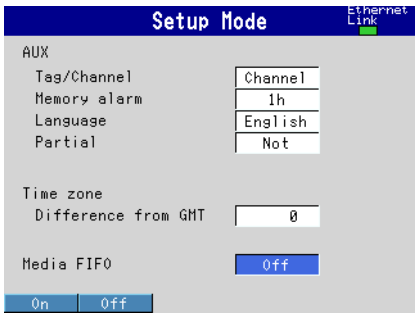
Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#3 soft key** (select [Memory]), **#4 soft key** (select [Memory and trend, Memory timeup]), and **#5 soft key** (select [Aux, Time zone])
From the operation mode, use the above keys to open the following setting display.
[Media FIFO] is displayed only on models with CF memory card slot.







Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.
4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

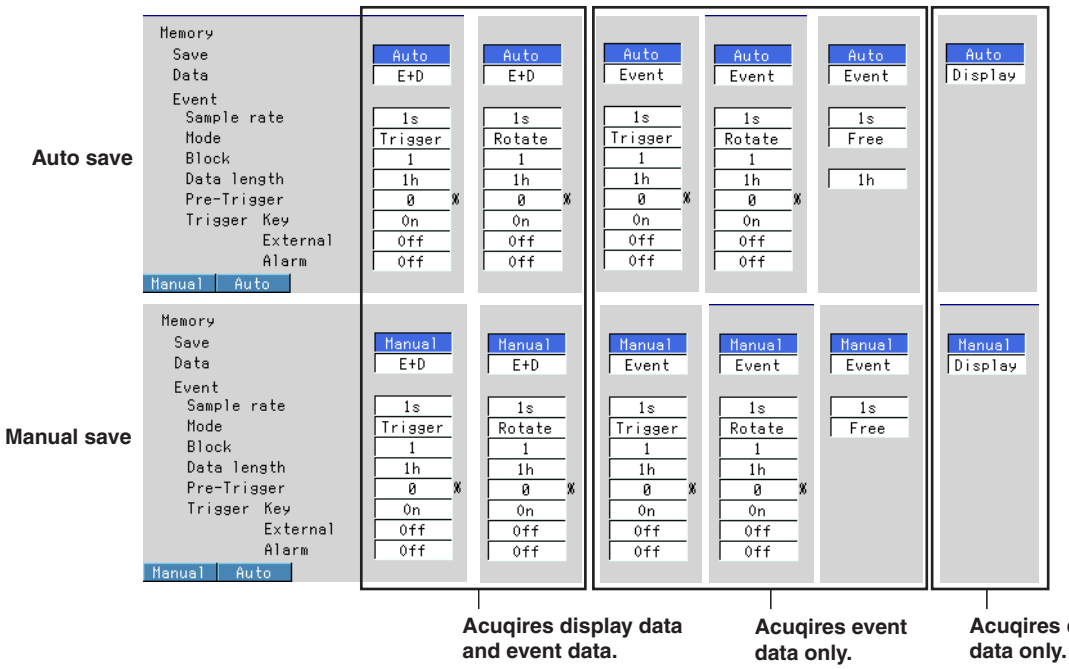
Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Acquisition to the Internal Memory and Storage to the External Storage Medium

The displayed items vary depending on the saving method you choose.



- **Save**

  Select the mode used to save the data in the internal memory to the external storage medium from [Auto] and [Manual].

  - **Manual**

    When you insert an external storage medium into the drive and carry out a given key operation (see page 7-11), a message “Do you want to save measured data?” appears. Select [Yes] and press the [DISP/ENTER] key to save the data.
    In manual save mode, set how the data is to be saved, [Unsave] (save only the data that has not been saved) or [All] (save all the data) at [File, DST] setting display > [Save data] (see page 7-6).

  - **Auto**

    By having the external storage medium inserted in the drive at all times, data save operation is automatically carried out at specified intervals. This action is called “auto save.” When auto saving the display data, set the auto save interval by choosing [#3 Trend/Save interval, User key] > [Auto save interval] (see page 7-5 for instructions).

- **Data**

  Select the type of data to be acquired to the internal memory from [Display] (display data only), [E+D] (display data and event data), and [Event] (event data only).

- **Event (only when [Data] is set to [E+D] or [Event])**

  - **Sample rate**

    Select the interval used to save the event data from the following.
    FX103: 250ms, 500ms, 1s, 2s, 5s, 10s, 30s, 60s, 120s, 300s, and 600s
    FX106: 1s, 2s, 5s, 10s, 30s, 60s, 120s, 300s, and 600s
    FX112: 1s, 2s, 5s, 10s, 30s, 60s, 120s, 300s, and 600s

  - **Mode**

    Select the mode from [Free], [Trigger], and [Rotate]. [Free] appears as a choice only when [Data] is set to [Event].

    - When [Save] is set to [Auto] and you select [Free], the [Data length] box is displayed.

- If you select [Trigger] or [Rotate], the [Block], [Data length], [Pretrigger], and [Trigger] boxes are displayed.

- **Block**
  Select the number of blocks when dividing the event data acquisition area into blocks. Select from [2], [4], [8], and [16]. Select [1] if you do not wish to divide the area into blocks. When acquiring both display data and event data, the possible selections are [1], [2], and [4].
- **Data length**
  Set the size (data length) of a single block of the event data acquisition area in terms of the amount of time data is to be acquired. The selectable data length varies depending on the sampling interval (sample rate setting) as shown in the table below. It also depends on the block setting and the number of channels.

Sample rate (s)	0.25*	0.5*	1	2	5	10	30	60	120	300	600
Data length (choices)	3 min	3 min	3 min	3 min							
	5 min	5 min	5 min	5 min							
	10 min	10 min	10 min	10 min	10 min	10 min					
	20 min	20 min	20 min	20 min	20 min	20 min					
	30 min	30 min	30 min	30 min	30 min	30 min					
	1 h	1 h	1 h	1 h	1 h	1 h	1 h	1 h	1 h	1 h	1 h
	2 h	2 h	2 h	2 h	2 h	2 h	2 h	2 h	2 h	2 h	2 h
	3 h	3 h	3 h	3 h	3 h	3 h	3 h	3 h	3 h	3 h	3 h
	4 h	4 h	4 h	4 h	4 h	4 h	4 h	4 h	4 h	4 h	4 h
	6 h	6 h	6 h	6 h	6 h	6 h	6 h	6 h	6 h	6 h	6 h
		8 h	8 h	8 h	8 h	8 h	8 h	8 h	8 h	8 h	8 h
		12 h	12 h	12 h	12 h	12 h	12 h	12 h	12 h	12 h	12 h
			1 day	1 day	1 day	1 day	1 day	1 day	1 day	1 day	1 day
				2 day	2 day	2 day	2 day	2 day	2 day	2 day	2 day
					3 day	3 day	3 day	3 day	3 day	3 day	3 day
					5 day	5 day	5 day	5 day	5 day	5 day	5 day
						7 day	7 day	7 day	7 day	7 day	7 day
						10 day	10 day	10 day	10 day	10 day	10 day
							14 day	14 day	14 day	14 day	14 day
								31 day	31 day	31 day	31 day

* for the FX103 only

- **Pre-trigger**
  Select the range when saving the data existing before the trigger condition is met as event data. Select the range as a percentage of the data length from [5], [25], [50], [75], [95], and [100]%. If you do not wish to acquire the data existing before the trigger condition is met, select [0]%.
- **Trigger**
  Set the trigger condition used to acquire the event data.
  - **Key**
    Select [On] if you wish to apply the trigger using key operation.
  - **External**
    Select [On] if you are applying the trigger signal through remote input.
  - **Alarm**
    Select [On] if you wish to use alarm occurrences as triggers.

Note

- If Alarm is set to ON, a trigger activates if even just one alarm occurs.
- If the START key is pressed while an alarm is occurring, a trigger activates.
- [Key], [External], and [Alarm] are in an “OR” relationship. If any of the conditions set to ON become true, a trigger activates.

Memory and Trend (Channels for Saving Data)

- **Meas CH/Math CH**
  Select the type of target channels from [Meas CH] and [Math CH].
- **First-CH/Last-CH**
  Set the range of channels to turn [On]/[Off] depending on the type of target channels.
  Meas CH: 01 to 03 (FX103), 01 to 06 (FX106), 01 to 12 (FX112)
  Math CH: 31 to 42 (selectable only on models with the computation function (/M1, /PM1 option)
- **Off/On**
  Select [On] to save data from the selected channel, or [Off] to not save data from the channel (all channels are [On] by default). Waveforms of channels turned [Off] cannot be displayed, but digital values, bar graphs, and alarms for those channels can be displayed.

Memory Timeup

When saving the data to the external storage medium in [Auto] mode, set the time for saving the data when specifying the time using date and time.

- **Timeup type**
  Select the time when data is to be saved from the following. Select [Off] if you are not using this function.
  Hour: Every hour
  Day: Every day at the [Time(hour)] on the hour
  Week: Every week on the day specified by [Day of the week] at the [Time(hour)] on the hour
  Month: Every month on the day specified by [Date] at the [Time(hour)] on the hour
- **Date/Day of the week**
  [Date] is a setting used when [Timeup type] is set to [Month]. Set the value in the range of [1] to [28] (29 to 31 cannot be specified). [Date] also appears when [Timeup type] is set to [Hour] or [Day]. However, the setting is valid only when [Timeup type] is set to [Month].
  [Day of the week] is a setting used when [Timeup type] is set to [Week]. Enter the day of the week using the soft key.
- **Time (hour)**
  Set the hour when the data is to be saved when [Timeup type] is set to [Day], [Week], or [Month]. This setting is invalid when [Timeup type] is set to [Hour]. Set the hour in the range of [00] to [23].

FIFO Method for the CF Memory Card

- **Media FIFO**
  The following apply when [On] is selected.
  The oldest files are deleted to make room to save new files when the external storage medium becomes full.
  This is valid when the external storage medium is a compact flash memory card, and auto save is turned ON.

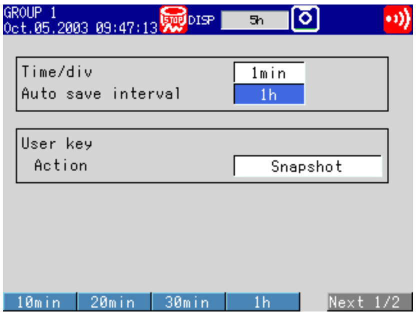
Interval to Save Data in the internal Memory to the External Storage Medium (Auto Save Interval) <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#3 soft key** (select [Trend/Save interval, User key])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to [Auto save interval].
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Auto Save Interval

- **Auto save interval**

The possible values from the following table is displayed as choices for the auto save interval. The maximum auto save interval varies depending on the display update rate (sampling interval is determined from the display update rate), the data type (display data only/display data and event data), and the number of channels to be stored.

Display update rate (/DIV)	15 s*	30 s*	1 min	2 min	5 min	10 min	15 min	20 min	30 min	1 h	2 h	4 h	10 h
Sampling interval (s)	0.5	1	2	4	10	20	30	40	60	120	240	480	1200
Auto save interval (choices)	10 min 20 min 30 min 1 h 2 h 3 h 4 h 6 h 8 h 12 h	10 min 20 min 30 min 1 h 2 h 3 h 4 h 6 h 8 h 12 h 1 day	10 min 20 min 30 min 1 h 2 h 3 h 4 h 6 h 8 h 12 h 1 day 2 day	10 min 20 min 30 min 1 h 2 h 3 h 4 h 6 h 8 h 12 h 1 day 2 day 3 day	10 min 20 min 30 min 1 h 2 h 3 h 4 h 6 h 8 h 12 h 1 day 2 day 3 day 5 day 7 day 10 day	10 min 20 min 30 min 1 h 2 h 3 h 4 h 6 h 8 h 12 h 1 day 2 day 3 day 5 day 7 day 10 day 14 day	10 min 20 min 30 min 1 h 2 h 3 h 4 h 6 h 8 h 12 h 1 day 2 day 3 day 5 day 7 day 10 day 14 day 31 day	1 h 2 h 3 h 4 h 6 h 8 h 12 h 1 day 2 day 3 day 5 day 7 day 10 day 14 day 31 day	1 h 2 h 3 h 4 h 6 h 8 h 12 h 1 day 2 day 3 day 5 day 7 day 10 day 14 day 31 day	1 h 2 h 3 h 4 h 6 h 8 h 12 h 1 day 2 day 3 day 5 day 7 day 10 day 14 day 31 day	2 h 3 h 4 h 6 h 8 h 12 h 1 day 2 day 3 day 5 day 7 day 10 day 14 day 31 day	4 h 6 h 8 h 12 h 1 day 2 day 3 day 5 day 7 day 10 day 14 day 31 day	8 h 12 h 1 day 2 day 3 day 5 day 7 day 10 day 14 day 31 day

* for the FX103 only

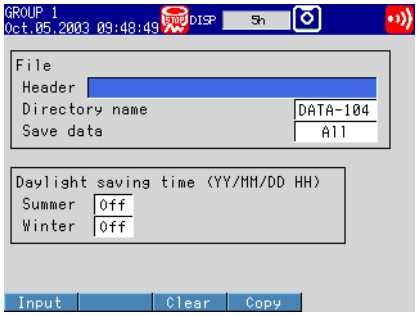
File Header, Destination Directory Name, Data to Be Saved during Manual Save Operation <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#6 soft key** (select [File, DST])

From the operation mode, use the above keys to open the following setting display. The figure below shows an example when set to manual save. When in auto save mode, the [Save data] box is not displayed.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

[Header] and [Directory name] are set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

File Header, Destination Directory Name, Data to Be Saved during Manual Save Operation

- **File**
  - **Header**
    Enter the header comment to be written to the data file using up to 32 alphanumeric characters. The specified header is written to all display data, event data, manual sampled data, TLOG data (/M1, /PM1 option), and report data (/M1, /PM1 option) files.
  - **Directory name**
    Set the name of the directory for saving the data on the external storage medium. The following characters or strings cannot be used as file names.
    “AUX,” “CON,” “PRN,” “NUL,” “CLOCK,” character strings that include a space or spaces

    All the data excluding the setup data (display data, event data, manual sampled data, TLOG data (/M1, /PM1 option), report data (/M1, /PM1 option), and screen image data) are saved to the specified directory. The setup data is saved to the root directory.

The save destination directory varies depending on how the data is saved.
Auto save: Directory specified here.
Manual save: Directory with a sequence number added to the string specified here. For example, if the specified directory name is "DATA0," the first manual save operation saves the data to the "DATA0.000" directory. The second operation saves the data to the "DATA0.001" directory.
Collectively saving data when data acquisition is stopped: Directory with "A+sequence number" added to the character string specified here.
The sequence number is incremented every time data is saved. For example, if the specified directory name is "DATA0," the first key operation saves the data to the "DATA0.A00" directory. The second key operation saves the data to the "DATA0.A01" directory.

Note

- When the directory name is changed, the sequence number is reset to zero.
- When the data are divided and saved over multiple external storage media due to lack of space on the storage medium, the same directory name is used.

- **Save data (only when [Save] is set to [Manual])**
  Set how data is to be saved in manual save mode. Select [All], which saves all the data in the internal memory, or [Unsave], which saves only the data that has not been saved. The data that is saved is display data, event data, manual sampled data, TLOG data (/M1, /PM1 option), and report data (/M1, /PM1 option).

7.2 Starting/Stopping the Acquisition to the Internal Memory

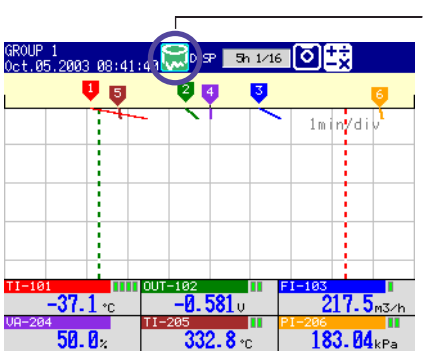
Starting the Acquisition to the Internal Memory <Operation Mode>

Procedure

Starting the Acquisition to the Internal Memory

Press the **START key**.

When data acquisition to the internal memory starts, the internal memory icon changes from stop indication to run indication as shown below.



Explanation

Actions that starts at the same time

The start operation of the acquisition to the internal memory also starts the followings.

- Waveform display on trend screen
- Computation function (/M1, /PM1 option)
  The computation icon is displayed in the status display section.
- Report function (/M1, /PM1 option)

When starting data acquisition with a trigger activated

This explanation applies to event data acquisition in [Trigger] or [Rotate] mode. When you press the START key, the FX100 enters the trigger wait state. After the trigger is activated, data acquisition to the internal memory starts. To apply a trigger using key operations, see the "*Applying a Trigger Using Key Operations*" below.

Applying a Trigger Using Key Operations <Operation Mode>

When event data is acquired in [Trigger] or [Rotate] mode, this procedure can be executed when set so that the trigger for starting writing to the internal memory is activated with a key operation.

Procedure

Applying a Trigger Using Key Operations

During the trigger wait state,

1. Press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
2. Press the **[Trigger] soft key**.
   Data acquisition to the internal memory starts.

Explanation

Trigger

Besides the trigger given by the key operation, alarm occurrence and remote input (/R1, /PM1 option) can be triggers for the data acquisition.

For the setting procedure related to triggers, see section 7.1.

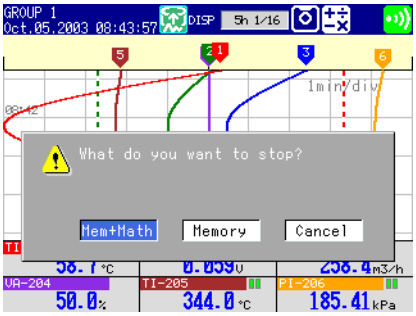
Note

This operation can be assigned to the USER key. If it is, trigger can be activated simply by pressing a single key. For the procedure in assigning a function to the USER key, see section 9.1.

Stopping the Acquisition to the Internal Memory <Operation Mode>

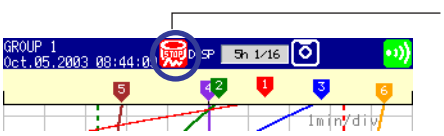
Procedure

1. Press the **STOP key**.
2. Use the **left and right arrow keys** to select [Memory] or [Mem+Math] in the confirmation window that appears.



Select [Mem+Math] if you wish to not only stop the acquisition to the internal memory, but also the computation assigned to computation channels. If the model does not have the optional computation function (/M1, /PM1), a confirmation message “Do you want to stop storage?” appears. Select [Yes].

3. Press the **DISP/ENTER key**.
When data acquisition to the internal memory stops, the internal memory icon changes from run indication to stop indication.



Explanation

Actions That Stops at the Same Time

The start operation of the acquisition to the internal memory also stops the followings.

- Updating waveform display on trend screen
- Computation function (/M1, /PM1 option), only when you select [Mem+Math] in the operation above.
  The computation icon is displayed in the status display section.
- Report function (/M1, /PM1 option)

Note

When you stop the acquisition to the internal memory, data is saved to the external storage medium. If the external storage medium is not inserted at this point, an error message “Media has not been inserted” appears.

7.3 Saving Data to the External Storage Medium (Only for Models with an External Storage Medium Drive)

This section explains how to save the measured data to the external storage medium.

Saving Data in the Internal Memory to the External Storage Medium (When Auto Save is Specified) <Operation Mode>

Procedure

Insert an external storage medium into the drive. When starting the writing of data to the internal memory, the data in the internal memory is automatically saved to the external storage medium. The data is saved to the directory specified in section 7.1.

Note

- Do not remove the external storage medium while it is being accessed.
- For the memory usage display of the internal memory, see section 1.4.
- To check the free space on the storage medium, see section 7.7.
- Be aware that data in the internal memory will be overwritten if there is not enough free space on the external storage medium or if the storage medium is not inserted in the drive in the following cases:
  - When the number of display data files exceeds 16. A file is created for each auto save interval (see section 7.1).
  - When the event data are acquired to the internal memory in the free mode and the number of files exceeds 16. A file is created at specified acquisition periods (data length, see section 7.1).

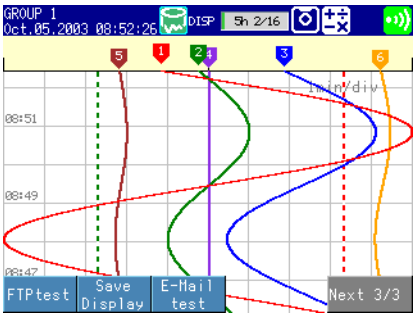
When the External Storage Medium Has Insufficient Space

The message, “Exchange media to continue the saving operation.“ appears. Replace the storage medium. For floppy disk, press the **FUNC key**, then press the **[Media] soft key**. The remaining data is saved to the external storage medium at the time for the next auto save execution.

Saving Data Using FUNC Key Operation

This operation allows you to save data to the external storage medium at arbitrary times when the auto save is specified and the data acquisition has been started.

1. Press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
2. Press the **[Save Display]** or **[Save Event] soft key**.
   The display data or event data in the internal memory is saved to the external storage medium.



Note

If you press the FUNC key when [Save] under [Memory] is set to [Auto] and the acquisition of the display data to the internal memory is started, [Save Display] appears in the soft key menu. If you press the FUNC key when the acquisition of event data to the internal memory is started in the free mode, [Save Event] appears in the soft key menu.

Explanation

Auto Save

The data in the internal memory is saved to the storage medium automatically.

Auto Save and Data Save Using Key Operation

If you carry out the key operation to save data during auto save mode, the consecutive auto save interval starts from the time this operation is carried out. However, if the date and time to save data is specified, the date and time will not be changed by the key operation to save data.

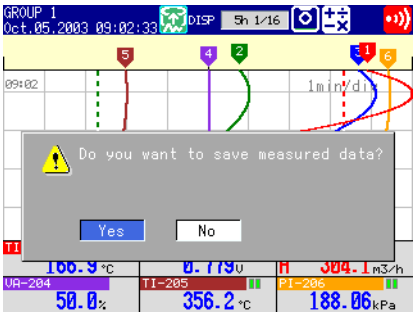
Saving Data in the Internal Memory to the External Storage Medium (When Manual Save is Specified) <Operation Mode>

This procedure saves data at arbitrary timing when manual saving is specified for measured or computed data.

Procedure

For CF Memory Card

1. Insert a CF memory card to the drive.
   A confirmation window appears.



2. Press the **DISP/ENTER key** with [Yes] is selected.
   Measured data in the internal memory is saved to the external storage medium.
3. Remove the CF memory card from the drive after the data save is finished.

When a CF memory card has been in the drive

1. Press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
2. Press the **[Media] soft key**.
   A confirmation window appears.
3. Press the **DISP/ENTER key** with [Yes] is selected.
   Measured data in the internal memory is saved to the external storage medium.
4. Remove the storage medium from the drive after the data save is finished.

For Floppy Disk

1. Insert a floppy disk to the drive.
2. Press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
3. Press the **[Media] soft key**.
   A confirmation window appears.
4. Press the **DISP/ENTER key** with [Yes] is selected.
   Measured data in the internal memory is saved to the external storage medium.
5. Remove the floppy disk from the drive after the data save is finished.

Note

- You can select whether to save all the data residing in the internal memory or only the data that have not been saved to the storage medium. See section 7.1.
- If saving to the storage medium is prevented with the key lock function and the key lock is enabled, data cannot be saved when the medium is inserted into the drive. Turn OFF the key lock before inserting the medium. See section 9.2.
- It is possible that the data in the internal memory are overwritten before the data are stored to the external storage medium due to limitations such as the capacity of the internal memory. Save the data to the external storage medium before they are overwritten. For the memory usage display of the internal memory, see section 1.4.
- Do not remove the storage medium while it is being accessed.

When the External Storage Medium Has Insufficient Space

1. The message, “Exchange media to continue the saving operation.“ appears. Replace the storage medium. For floppy disk, press the **FUNC key**, then press the **[Media] soft key**. The message, “Do you want to continue to save measured data?” is displayed.
2. Select [Yes], then press the **DISP/ENTER key**. The remaining data is saved to the external storage medium. Selecting [No] and pressing the DISP/ENTER key does not save the remaining data.

Note

The data saving operation is interrupted in five minutes after the message [Exchange media to continue.....] was displayed. The message [Memory save to media was interrupted] will be displayed in this case. The remaining data can be saved to the external storage medium by another manual save operation.

Explanation

Name of the Directory to Which to Save the Data

For the setting procedure of the directory to which to save the data, see section 7.1.

- Each time the storage medium is inserted into the drive and the data is saved, the sequence number of the directory name increments by one.
  Example: When the specified directory name is “DATA0,” the first set of data are saved to “DATA0.000” and the second set of data are saved to “DATA0.001.”
- When the directory name is changed, the sequence number is reset to zero.
- When the data are divided and saved over multiple external storage media due to lack of space on the storage medium, the same directory name is used.
- If the specified directory already exists in the external storage medium, an error message is displayed and the operation terminates (data are not saved).

Collectively Saving Data When Data Acquisition to the Internal Memory Is Stopped <Operation Mode>

Saves the data collectively when the data acquisition to the internal memory is stopped. Display data, event data, manual sampled data, TLOG data (/M1, /PM1 option), and report data (/M1, /PM1 option) are to be saved.

Procedure

Collectively Saving Data

MENU key (switch to setting mode) **#7 soft key** (select [Save/Load, Clear data]) > **#3 soft key** (select [Save data])

From the operation mode, use the above keys to save data collectively.

Note

You cannot perform the operation of collectively saving data if computation is in progress.

7.4 Saving Measured Data at Arbitrary Times (Manual Sample)

This section explains how to save the measured data of all channels at arbitrary times.

Saving Measured Data at Arbitrary Times (Manual Sample) <Operation Mode>

Procedure

1. In operation mode, press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
2. Press the **[Manual sample] soft key**.
   The measured data of all channels is acquired to the internal memory.

Explanation

Manual Sample Operation

When manual sample is executed, the instantaneous values of all channels (excluding measurement channels set to skip and computation channels set to Off) are acquired to the internal memory.

Note

- Up to 50 sets of data can be acquired to the internal memory. When 50 is exceeded, the data is overwritten from the oldest data.
- The number of manual sample data points in the internal memory can be confirmed using memory summary (see section 1.4).
- For the data format of the manual sampled data, see appendix 5, "*Data Formats of ASCII Files*."
- You can assign the manual sample function to the USER key and save the data simply by pressing a single key. For the procedure in assigning the function to the USER key, see section 9.1.

7.5 Saving the Screen Image Data (Snapshot)

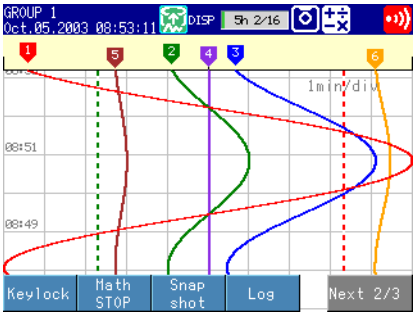
This section explains how to save the screen image data to the external storage Medium. This function is available on the following models.

- Models with an external storage drive, or;
- Models with the Ethernet communication interface (/C7 option) that are set up for snapshot FTP transfer.

Snapshot <Operation Mode>

Procedure

1. In operation mode, press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
2. Press the **[Snapshot] soft key**.
   The message "Data are being saved to media..." is displayed and the screen image data is saved.



Note

This operation can be assigned to the USER key. If it is, screen image data can be saved simply by pressing a single key. When using the steps above, only the screen image in the operation mode is possible. However, when using the USER key, screen images in the setting and basic setting mode can also be saved. For the procedure in assigning a function to the USER key, see section 9.1.

Setup Items

Saving the Screen Image Data

- **Save destination**
  - Data is saved to the external storage medium for models with that type of medium installed.
  - Data is sent via FTP for models with the Ethernet communication interface (/C7 option) that are set up for snapshot FTP transfer.
    For the description of Ethernet communication interface, see the *"FX100 Communication Interface User's Manual"* (IM 04L20A01-17E).
- **File format/data size**
  The file is in PNG format. The data size of the screen image is approximately 12 KB/screen.
- **File name**
  The file name "(month, day, hour, minute when the save operation of the screen image data was executed + sequence number).png" is automatically assigned to the screen image data files.
  Mddhhmma.PNG
  M: Month (1-9, X (October), Y (November), Z (December), dd: day, hh: hour, mm: minute, a: the lowest digit of the year (0 to 9, except if the screen image data is saved multiple times within a minute, in which case "A" to "Z" are assigned in order from the second file)

7.6 Loading the Measured Data on the External Storage Medium (Historical Trend)

This section explains how to load the display data or event data that is stored on the external storage medium and display the trend on the historical trend screen.

For the operations on the historical trend screen, see section 5.4.

Measured Data on the External Storage Medium (Historical Trend) <Setting Mode>

Writing of display data to the internal memory can be executed if set up accordingly (the [Data] item under [Memory] is set to [Display] or [E+D], see section 7.1 for more information).

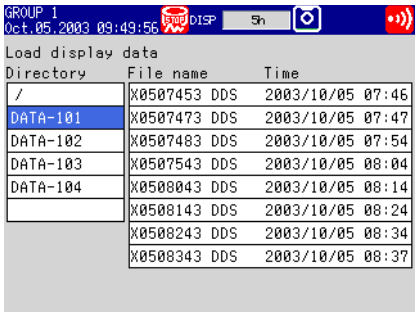
Writing of event data to the internal memory can be executed if set up accordingly (the D[ata] item under [Memory] is set to [Event] or [E+D], see section 7.1 for more information).

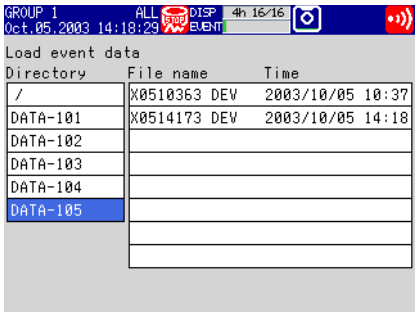
Procedure

Opening the Operation Display

MENU key (switch to setting mode) > **#7 soft key** (select [Save/Load, Clear data]) > **#4 soft key** (select [Load display data] or **#5 soft key** (select [Load event data] if event data is to be loaded)

From the operation mode, use the above keys to open the following display.





Operations on the Display

1. From the directories listed in the [Directory name] box, select the directory in which the file you wish to load is located using the **up and down arrow keys**. Root directory is denoted by [/]. A list of files in the selected directory is displayed on the right.
2. Press the **right arrow key** to move the cursor to the file list section.
3. Use the **up and down arrow keys** to select the file to be loaded.
   To move the blue cursor back to the [Directory name] column, press the left arrow key.
4. Press the **DISP/ENTER key**.
   Waveforms are displayed on the historical trend display. To return to the [Save/Load, Clear data] menu screen without displaying the historical trend, press the ESC key.

Note

The display data extension is .dds; the event data extension is .dev.

7.7 Managing Files and Checking the Free Space on the External Storage Medium

This section explains how to check the files and the free space on the external storage medium, how to delete files and directories, and how to format the external storage medium. Deleting files and directories and formatting external storage media can be carried out in either setting mode or basic setting mode.

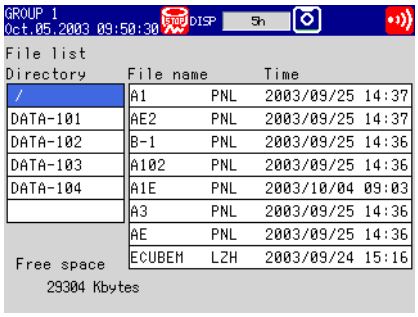
Checking the Free Space on the External Storage Medium, Deleting Files and Directories, Formatting the Medium <Setting Mode>

Procedure

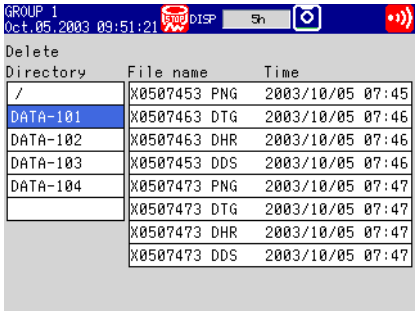
Opening the Operation Display

MENU key (switch to setting mode) > **#7 soft key** (select [Save/Load, Clear data])
From the operation mode, use the above keys to open the following display. After carrying out the steps above, select the one of the following **soft keys** according to your needs.

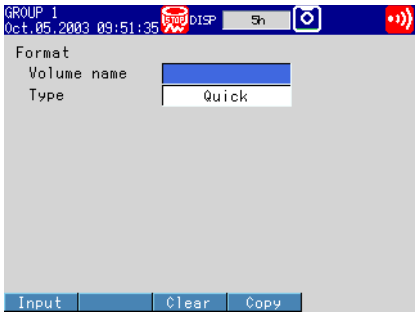
- **Checking files and free space: #6 soft key (select [File list])**
  The following display appears.



- **Deleting files: #7 soft key (select [Delete])**
  The following display appears.



- **Formatting the external storage medium: #8 soft key (select [format])**



Operations on the Display

- **Deleting files or directories**
  1. From the directories listed in the [Directory name] box, select the directory in which the file you wish to delete is located using the **up and down arrow keys**. To collectively delete all files in a directory, select the directory and proceed to step 4. To delete an entire directory, first delete all files in the directory, then proceed to step 4.
  2. Press the **right arrow key** to move the blue cursor to the file list section.
  3. Select the file to be deleted using the **up and down arrow keys**. To move the blue cursor back to the [Directory name] column, press the left arrow key.
  4. Press the **DISP/ENTER key**.
     A dialog box for confirming the deletion appears.
  5. Select [Yes] and press the **DISP/ENTER key**.
     To cancel the operation, select [No] using the right arrow key and press the DISP/ENTER key.

Note

If the ESC key is pressed in the middle of the operation, the screen returns to the [Save/Load, Clear Data] menu.

- **Formatting the external storage medium**
  1. Enter the volume name in the [Volume name] box.
     The following character strings cannot be used in the volume name.
     AUX, CON, PRN, NUL, CLOCK, and strings containing spaces.
     If you are not going to set the volume name, move the cursor to the [Type] box using the **down arrow key**.
  2. Select [Quick] or [Normal] using the **soft keys**.
  3. Press the **DISP/ENTER key**.
     A format confirmation window appears.
  4. Select [Yes] and press the **DISP/ENTER key**.
     To cancel the operation, select [No] using the right arrow key and press the DISP/ENTER key.

Setup Items

Formatting the External Storage Medium

- **Type**

  Select from the following.
  Quick: Performs only a logical format.
  Normal: Performs a physical format and a logical format.

  Disk Format

  Floppy disk: 2HD, 1.44 MB
  CF memory card: FDISK 1 partition (hard disk format)

  Format Time

Type of storage media	Quick	Normal	Note
Floppy disk	Approx. 6 s	Approx. 1 min. 30 s	
CF memory card	Approx. 3 s Approx. 5 s	Approx. 1 min. 30 s Approx. 6 min.	32 MB 160 MB

Deleting Files and Directories, Formatting the Medium <Basic Setting Mode>

Procedure

Opening the Operation Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#8 soft key** (select [Load, Initialize])

From the operation mode, use the above keys to open the following setting display. After carrying out the steps above, select the one of the following soft keys according to your needs. The display that appears are similar to those shown in setting mode.

- **Deleting files: #3 soft key (select [Delete])**
- **Formatting the external storage medium: #4 soft key (select [format])**

Operations on the Display

- **Deleting files or directories**
  See "*Deleting files or directories*" on page 7-18.
- **Formatting the external storage medium**
  See "*Formatting the external storage medium*" on page 7-18.

Setup Items

Formatting the External Storage Medium

- **Type**
  See "*Setup Items*" on page 7-18.

7.8 Clearing the Data in the Internal Memory

This section explains how to clear all the data in the internal memory including display data, event data, manual sample data, TLOG data (/M1, /PM1 option), and report data (/M1, /PM1 option). To clear the log information in addition to the above data, perform the procedure for clearing the internal memory in basic setting mode (see section 3.5).

Clearing the Data in the Internal Memory <Setting Mode>

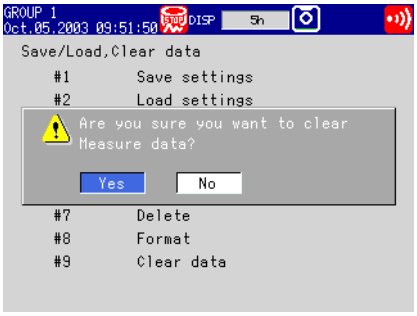
Procedure

Opening the Operation Dialog Box

MENU key (switch to setting mode) > **#7 soft key** (select [Save/Load, Clear data]) > **#9** (or **#1***) **soft key** (select [Clear data])

* For models with no external storage drive.

From the operation display, use the above keys to open the following dialog box.



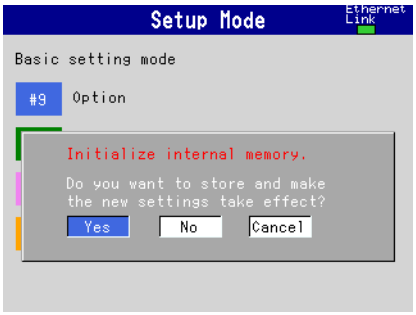
Operations on the Display

Select [Yes] and press the **DISP/ENTER key**.

The data is cleared. To cancel the operation, select [No] using the right arrow key and press the DISP/ENTER key.

Note

The data acquired in the internal memory is also cleared when memory-related settings are changed in basic setting mode. In this case, the following confirmation dialog box appears.



7.9 Saving and Loading Setup Data

This section explains how to save the setup data to the external storage medium and how to change the settings by loading the setup data from the external storage medium.

Saving Setup Data, Loading Setup Data of Setting Mode <Setting Mode>

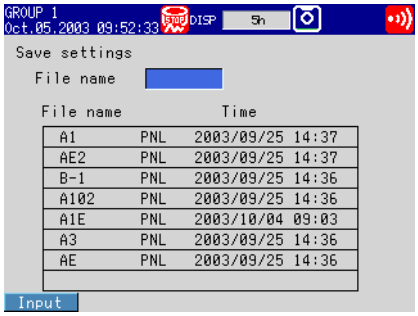
Procedure

Opening the Operation Display

- **Saving setup data**

  MENU key (switch to setting mode) > **#7 soft key** (select [Save/Load, Clear data]) > **#1 soft key** (select [Save settings])

  From the operation mode, use the above keys to open the following display.

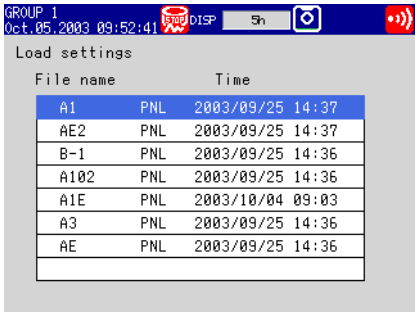


- **Loading setup data**

  Loads only the setup data of setting mode.

  MENU key (switch to setting mode) **#7 soft key** (select [Save/Load, Clear data]) > **#2 soft key** (select [Load settings])

  From the operation mode, use the above keys to open the following display.



Note

If you attempt to load the setup data and the external storage medium does not contain the setup data, a message “There is no setting file” appears.

Operations on the Display

- **Saving setup data**

  1. Enter the file name in the [File name] box (up to eight alphanumeric characters).
  2. Press the **DISP/ENTER key**.

     The setup data is saved to the external storage medium. The saved file is displayed in the file list section on the right side. If the file with the same name exists on the external storage medium, a message confirming file overwrite appears. To overwrite the file, select [Yes] and press the DISP/ENTER key. Press the ESC key to cancel the operation and return to the [Save/Load, Clear data] menu.

- **Loading setup data of setting mode**
  1. Select the file to be loaded from the file list of the external storage medium using the **up and down arrow keys**.
  2. Press the **DISP/ENTER key**.
     The setup data is loaded. When the data is loaded, the settings are changed, and the FX100 returns to the operation mode.
     Press the ESC key to cancel the operation and return to the [Save/Load, Clear data] menu.

Setup Items

Saving Setup Data

- All the setup data of both modes (setting mode and basic setting mode) are stored.
- Set the file name using up to 8 alphanumeric characters. The following character strings cannot be used.
  AUX, CON, PRN, NUL, CLOCK, and strings containing spaces.
- A .pnl extension is automatically added to the file name of the setup data.
- The size of a setup data file is approximately 16 KB at maximum.

Loading Setup Data of Setting Mode

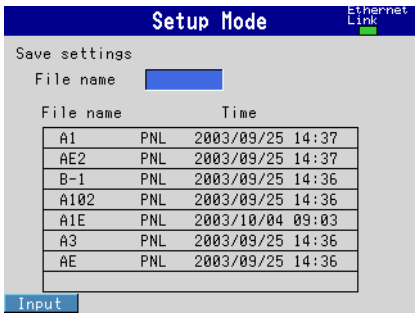
- Loading the data in setting mode loads only the setup data of setting mode. To load all of the setup data of setting mode and basic setting mode, load the setup data in basic setting mode.
- The contents of the loaded setup data that are inconsistent with the content of the basic setting mode of the FX100 will not be loaded.
- If the contents of the loaded setup data are invalid, refer to the error message log that appears by pressing the FUNC key and soft keys.
  For the procedure of displaying the error message log, see section 9.4.

Saving Setup Data, Loading Setup Data <Basic Setting Mode>

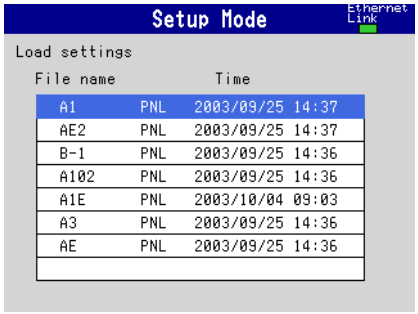
Procedure

Opening the Operation Display

- **Saving setup data**
  MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#8 soft key** (select [Save/Load, Initialize]) > **#1 soft key** (select [Save settings])
  From the operation mode, use the above keys to open the following display.



- **Loading setup data**
  MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#8 soft key** (select [Save/Load, Initialize]) > **#2 soft key** (select [Load settings])
  From the operation mode, use the above keys to open the following display.



Note

If you attempt to load the setup data and the external storage medium does not contain the setup data, a message “There is no setting file” appears.

Operations on the Display

- **Saving setup data**
  See “*Saving Setup Data*” on page 7-21.
- **Loading setup data**
  See “*Loading Setup Data of Setting Mode*” on page 7-22.

Setup Items

Saving Setup Data

See the description in “*Setup Items*” on page 7-22.

Loading Setup Data

- Loading the setup data in basic setting mode loads all of the setup data of setting mode and basic setting mode. To load only the setup data of setting mode, load the setup data in setting mode.
- If the contents of the loaded setup data are invalid, refer to the error message log that appears by pressing the FUNC key and soft keys.
  For the procedure of displaying the error message log, see section 9.4.

8.1 Assigning Computation Channels and Setting Computing Equations, Constants and Tags

This section explains how to set computing equations to computation channels and how to set tags. You cannot set computing equations while data is being acquired to the internal memory or while computation is in progress.

Computing Equations, Constants, and Tags <Setting Mode>

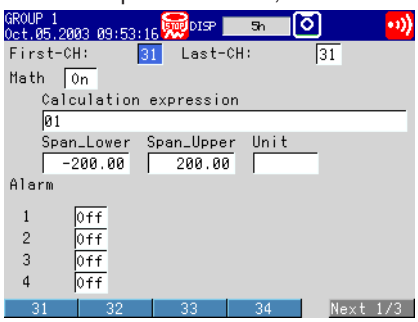
Procedure

Opening the Setting Display

- **Assigning computation channels and setting equations**

  MENU key (switch to setting mode) > **#9 soft key** (select [Math set1 (Expression, Alarm)])

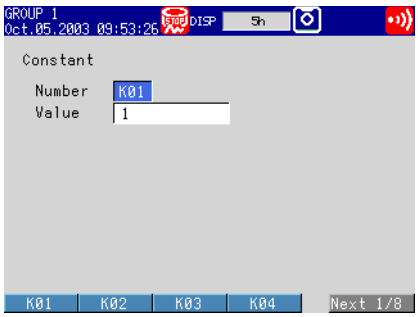
  From the operation mode, use the above keys to open the following setting display.



- **Assigning constants used in equations of computation channels**

  MENU key (switch to setting mode) > **#10 soft key** (select [Math set2 (Constant)])

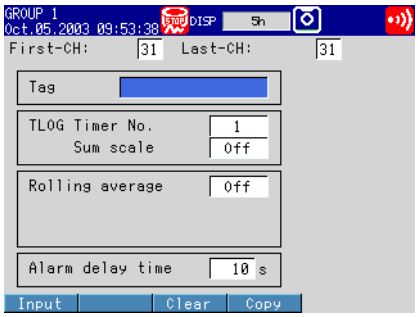
  From the operation mode, use the above keys to open the following setting display.



- **Setting tags of computation channels**

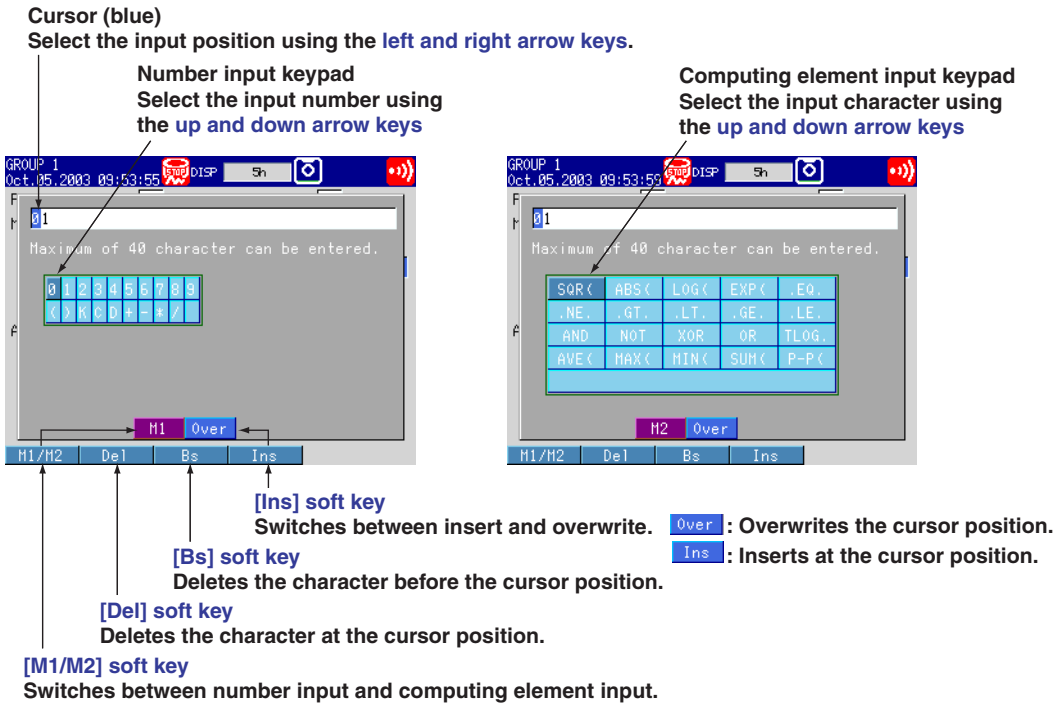
  MENU key (switch to setting mode) > **#11 soft key** (select [Math set3 (Tag, TLOG, Rolling average, Alarm delay time)])

  From the operation mode, use the above keys to open the following setting display.



Setup Procedure

- **Assigning computation channels**
  1. Use the **arrow keys** to move the cursor (blue) to the [First-CH] and [Last-CH] boxes.
  2. Press the **soft key** corresponding to the start and end channel numbers for setting the computation channels.
  3. With the cursor (blue) at the [Math] box, press the **[On] soft key**.
     The [Calculation expression], [Span Lower], [Span Upper], and [Unit] boxes appear.
- **Calculation expression**
  1. With the cursor (blue) at the [Calculation expression] box, press the **[Input] soft key**. The following expression pop-up window appears.



  2. Enter the equation using the **soft keys** and **arrow keys**.
  3. Press the **DISP/ENTER key**.
     The input equation is displayed in the [Calculation expression] box.
- **Span_Lower, Span_Upper, Unit**
  1. With the cursor (blue) at the [Span Lower], [Span Upper], and [Unit] boxes, press the **[Input] soft key**.
  2. Enter the values using the **soft keys** and **arrow keys**.
  3. Press the **DISP/ENTER key**.
     The input value or character string is displayed in the [Span Lower], [Span Upper], or [Unit] box.
- **Constant, Number, Value**
  1. Use the **arrow keys** to move the cursor (blue) to [Number] under [Constant].
     A soft key menu is displayed at the bottom of the display.
  2. Press the **soft key** to select a constant you wish to change from [K01] to [K30].
     The cursor (blue) moves to [Value].
  3. Press the **[Input] soft key**.
     A pop-up window appears.
  4. Enter the constant using the **soft keys** and **arrow keys**.
  5. Press the **DISP/ENTER key**.
     The input value is displayed in the [Value] box.

- **Tag**
  1. Use the **arrow keys** to move the cursor (blue) to the [First-CH] and [Last-CH] boxes.
  2. Press the **soft key** corresponding to the start and end channel numbers for setting the tag.
  3. Move the cursor (blue) to the [Tag] box using the **arrow keys**.
  4. Press the **[Input] soft key**.
     A pop-up window appears.
  5. Enter the tag using the **soft keys** and **arrow keys**.
  6. Press the **DISP/ENTER key**.
     The input tag is displayed in the [Tag] box.

Setup Items

Computation Channels

- **First-CH/Last-CH**
  You can assign channel numbers [31] to [42] as computation channels. The range of numbers here is used to set the range of channels for setting the computation function.
- **Math**
  Turn ON/OFF the computation function for the computation channels specified by First-CH and Last-CH.
- **Calculation expression**
  Set the equation (up to 40 characters) according to the description given on the equation pop-up window. For a description on how to create equations, see appendix 2, "*Meaning and Syntax of Computing Equations*."
- **Span_Lower, Span_Upper**
  Set the upper and lower limits of the computation span (range of computed values).
  Selectable range of values and the decimal place are as follows.
  Selectable range of values: -9999999 to 99999999
  Selectable decimal places: X.XXXX, XX.XXX, XXX.XX, XXXX.X

Note

You cannot set Span_Lower and Span_Upper to the same value.

- **Unit**
  Enter the unit of the computed result using up to 6 alphanumeric characters.

Note

If the Math On/Off, calculation expression, or span setting is changed, the alarms for that channel are turned [Off].

Constant

- **Number**
  Select the constants (K01 to K30) that are used in the equations.
- **Value**
  The number of significant digits is 5 excluding the decimal point. When specifying the constant using exponential notation, the mantissa is less than or equal to 5 digits, and the exponent less than or equal to 2 digits.
  The selectable range is as follows.
  –9.9999E+29 to –1.0000E–30, 0, 1.0000E–30 to 9.9999E+29

Setting Tags of Computation Channels

- **First-CH/Last-CH**

  You can assign channel numbers [31] to [42] as computation channels. The range of numbers here is used to set the range of channels for setting the tag. The target channels also apply to [Alarm delay time], [TLOG], and [Rolling average] settings.

- **Tag**

  Enter the tag name using up to 16 alphanumeric characters.

Note

For the Procedure in displaying tags in place of channel numbers, see section 6.2, "*Displaying Tag Names for Channels*."

8.2 Starting, Stopping, and Resetting the Computation

This section explains how to start/stop computation, how to reset computation, and how to clear the computation data dropout indication.

Starting the Computation <Operation Mode>

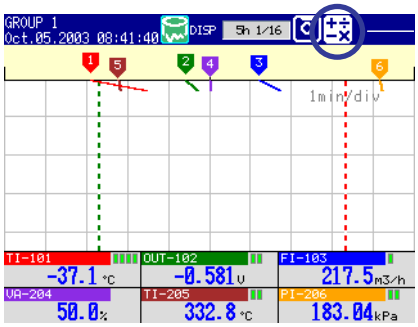
Procedure

Starting the Computations

Press the **START key**.

When the START key is pressed, computation and data acquisition to the internal memory start.

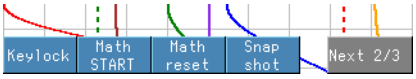
While computation is in progress, a computation icon is displayed in the status display section.



Computation icon

- **Starting Only the Computations**

1. In operation mode, press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
2. Press the **[Math START] soft key**.
   A computation icon is displayed in the status display section.

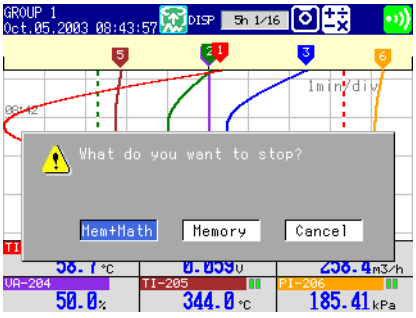


Stopping the Computation <Operation Mode>

Procedure

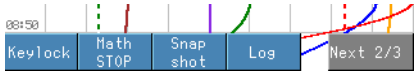
Stopping the Computations

1. Press the **STOP key**.
   The following dialog box appears for confirmation.



2. Select [Mem+Math] and press the **DISP/ENTER key**.
   When the DISP/ENTER key is pressed, computation and data acquisition to the internal memory stop.

- **Stopping only the computations**
  1. In operation mode, press the **FUNC key**.
     A soft key menu is displayed at the bottom of the display.
  2. Press the **[Math STOP] soft key**.
     Computation stops, and the computation icon disappears from the status display section.



Note

- When the computation is stopped, the computed data of the computation channel is held at the value that existed immediately before. If data is being acquired to the internal memory, the value held is written.
- This operation can be assigned to the USER key. For the Procedure in assigning a function to the USER key, see section 9.1.

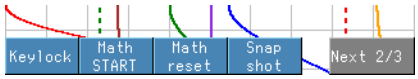
Resetting the Computations <Operation Mode>

You can carry out this operation only when the computation is stopped.

Procedure

Resetting the Computations

1. In operation mode, press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
2. Press the **[Math reset] soft key**.
   The data of all computation channels is reset to 0.



Note

This operation can be assigned to the USER key. For the Procedure in assigning a function to the USER key, see section 9.1

Clearing the Computation Dropout Indication <Operation Mode>

This operation can be carried out only when the computation data dropout occurred.

Procedure

Clearing the Computation Dropout Indication

1. In operation mode, press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
2. Press the **[Math ACK] soft key**.
   [Math ACK] appears on the soft key menu only when a computation data dropout occurs (the computation icon turns yellow). When cleared, the computation icon returns to a white color.

Note

Computation data dropout occurs when the computation process cannot be completed within the scan interval. If computation dropout occurs frequently, lessen the load on the CPU by reducing the number of computation channels or setting a longer scan interval. When computation data is written to the internal memory, the data immediately before the computation dropout is substituted as the computation data of the scan interval when dropout occurred.

8.3 Setting Computation Channel Alarms

Like measurement channels, alarms can be output based on the values of the computation channels. This section explains how to set the alarms.

Note

Set the alarm after setting the equation. When computation is turned On/Off or when equations and span settings are changed, the alarm setting for that channel is turned Off.

Computation Channel Alarms <Setting Mode>

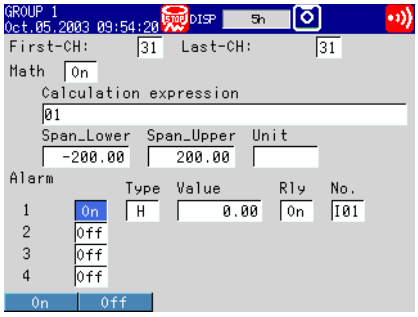
Procedure

Opening the Setting Display

- **Setting the alarm**

  MENU key (switch to setting mode) > **#9 soft key** (select [Math set1 (Expression, Alarm)])

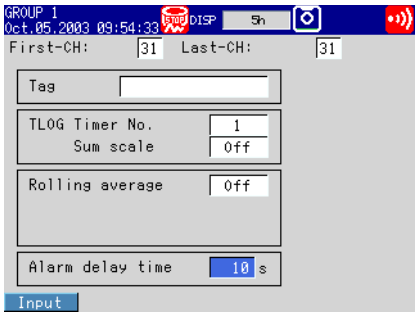
  From the operation mode, use the above keys to open the following setting display.



- **Setting the alarm delay time**

  MENU key (switch to setting mode) > **#11 soft key** (select [Math set3 (Tag, TLOG, Rolling average, Alarm delay time)])

  From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [Alarm delay time] is set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Computation Channel Alarm

- **First-CH/Last-CH**
  Set the target channel for setting the alarm output. The target channels are common with the Calculation expression setting.
- **Off/On**
  Up to 4 alarms can be set to a single channel. For each of the alarms [1] to [4], select [On] to enable an alarm, [Off] to disable it. If [On] is selected, [Type], [Value], and [Relay On/Off] entry boxes appear.
- **Type**
  Select the alarm type (conditions for activating the alarm) from the following four types.

Name	Symbol	Description
High limit alarm	H	An alarm occurs when the measured/computed value is greater than or equal to the alarm value.
Low limit alarm	L	An alarm occurs when the measured/computed value is less than or equal to the alarm value.
Delay high limit alarm	T	An alarm occurs when the measured value remains above or equal to the alarm value for the specified delay.
Delay low limit alarm	t	An alarm occurs when the measured value remains below or equal to the alarm value for the specified delay.

- **Value**
  Set the alarm value for the selected alarm type. The selectable range is the range defined by [Span_Upper/Span_Lower] that was specified in section 8.1
- **Rly**
  Select whether relay output is enabled [On] or disabled [Off]. If [On] is selected, the [Number] entry box appears.
- **No.**
  Set the alarm output relay number to output the relay contact signal from the terminal on the option terminal block. Selectable relays are [I01] and [I02] (/A1 option), [I01] to [I04] (/A2 option), or [I01] to [I06] (/A3 option). For the correspondence between the output relay numbers and the positions of the terminals of the terminal blocks, see pages 2-9 and 2-10.

Setting the Alarm Delay Time (When [Type] is set to [T] or [t])

- **First-CH/Last-CH**
  Select the target channels for setting the alarm delay. The target channels also apply to [Tag], [TLOG], and [Rolling average] settings.
- **Alarm delay time**
  Set the alarm delay using an integer in the range of [1] to [3600] s.

Note

If the scan interval is 2 s and you set an odd value for the alarm delay period, it will operate at the specified period + 1 s.
Example: If the alarm delay set to 5 s, the function will operate at 6 s.

8.4 Setting the Timer for Statistical Computations (TLOG Computation) and Data Save (TLOG Data)

This section explains how to set the timer that can be used for TLOG computation and how to set data save at intervals specified by the timer.

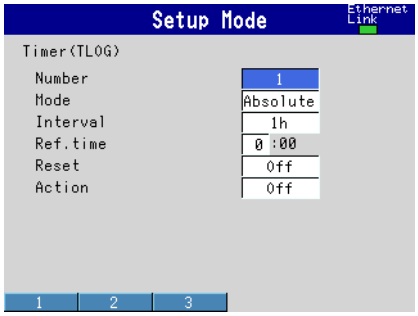
Timer, Data Save (TLOG Data) <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#9 soft key** (select [Option]) > **#3 soft key** (select Timer(TLOG))]

From the operation mode, use the above keys to open the following setting display.



Operations on the Display

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [Interval] under [Relative] timer and [Ref. Time] under [Absolute] timer are set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Setting the Timer

- **Number**
  Select timer number from [1], [2], and [3].
- **Mode**
  Select either [Relative] or [Absolute]. Select [Off] if you do not use the timer.

When Relative Is Selected

- **Interval**
  Set the time until the end of the interval in “hour:minute” (00:01 to 24:00).
- **Reset**
  Set whether to reset the TLOG computation value at every interval [On] or [Off].
- **Action**
  See “*Data Save at Intervals Specified by the Timer*” below.

When Absolute Is Selected

- **Interval**
  Set the time until the end of the interval from the following 19 types.
  1min, 2min, 3min, 4min, 5min, 6min, 10min, 12min, 15min, 20min, 30min, 1h, 2h, 3h, 4h, 6h, 8h, 12h, and 24h
- **Ref. time**
  Set the time to be used as the reference. The reference time is set in the range of 0:00 to 23:00 at 1 hour steps.
- **Reset**
  Set whether to reset the TLOG computation value at every interval [On] or [Off].
- **Action**
  See “*Data Save at Intervals Specified by the Timer*” below.

Data Save at Intervals Specified by the Timer

- **Action**
  If set to [DataSave], the instantaneous values of all measurement/computation channels are written to the internal memory at every interval. This data is called “TLOG data.” Select [Off] to disable this function.

Note

- TLOG data is acquired from the time the computation is started till the computation is stopped.
- When storing the data to the external storage medium, the data is stored to the TLOG data file (.dtg extension).

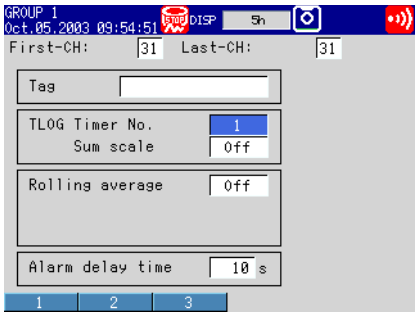
Selecting the Timer, Sum Scale <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#11 soft key** (select [Math set3 (Tag, TLOG, Rolling average, Alarm delay time)])

From the operation mode, use the above keys to open the following setting display.



Operations on the Display

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.

2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.
4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Timer Number and Sum Scale of the TLOG Computation

- **First-CH/Last-CH**
  You can assign channels numbers 31 to 42 as computation channels. Set a range of channel numbers within this range for setting the timer number and sum scale of the TLOG computation. The target channels also apply to [Tag], [Rolling average], and [Alarm delay time] settings.
- **TLOG**
  - **Timer No.**
    Select the timer number from [1], [2], and [3]. If you do not use timer, select the timer number whose [Mode] is [Off].
  - **Sum scale**
    Select the sum scale for calculating the sum (TLOG.SUM) from [Off], [/s], [/min], and [/h]. The initial value is [Off] (simply compute the sum). You only have to set the channels that are set to sum computation (TLOG.SUM).
    Off: Σ(measured/computed data every scan interval)
    /s: Σ(measured/computed data every scan interval) × scan interval
    /min: Σ(measured/computed data every scan interval) × scan interval/60
    /h: Σ(measured/computed data every scan interval) × scan interval/3600

8.5 Setting the Rolling Average

This section explains how to set the computed value to the moving average of the computed results.

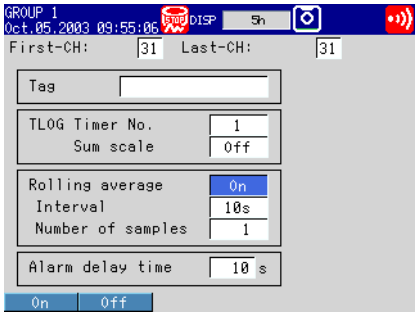
Rolling Average <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#11 soft key** (select [Math set3 (Tag, TLOG, Rolling average, Alarm delay time)])

From the operation mode, use the above keys to open the following setting display.



Operations on the Display

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [Number of samples] is set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Setup Items

Rolling Average

- **First-CH/Last-CH**
  Set the target channel for setting the alarm output. The target channels also apply to [Tag], [TLOG], and [Alarm delay time] settings.
- **Rolling average**
  To take the moving average of the measured results, select [On] (initial value is [Off]).
- **Interval**
  Select the sampling interval when taking the moving average from the following: 250ms,* 500ms,* 1s, 2s, 3s, 4s, 5s, 6s, 10s, 12s, 15s, 20s, 30s, 1min, 2min, 3min, 4min, 5min, 6min, 10min, 12min, 15min, 20min, 30min, and 1h.
  * Only for the FX103.
  However, if the scan interval is set to [2s] and the sampling interval is set to an odd-numbered sampling interval [1s], [3s], [5s], or [15s], the actual sampling interval is set to [2s], [4s], [6s], or [16s], respectively.

- **Number of samples**

  Set the average count when taking the moving average using an integer between [1] and [250].

Note

- If the number of data points to be averaged has not reached the specified number of samples immediately after computation is started, the average of the available data is calculated.
- Computation error data is excluded from the rolling average computation.
- If the computed data exceeds the upper or lower limit, the data is clipped at the upper or lower limit, and the rolling average is computed. The upper and lower limit is “±100000000" excluding the decimal point. The decimal point position is the same as that of the span lower limit.

8.6 Creating Reports

This section explains how to set the report type, report creation channels, report creation time, and other items.

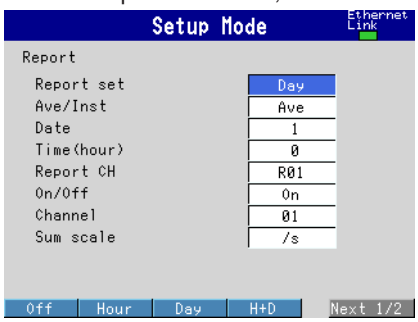
Reports <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#9 soft key** (select [Option])) > **#2 soft key** (select [Report])

From the operation mode, use the above keys to open the following setting display.



Operations on the Display

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [Date] (or [Day of the week]) and [Time] are set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Setting the Report Function

- **Report set**
  Select the type of report to be created from the following.
  Hour: Create hourly reports.
  Day: Create daily reports.
  Hour+Day: Create hourly and daily reports.
  Day+Week: Create daily and weekly reports.
  Day+Month: Create daily and monthly reports.
- **Ave/Inst**
  Select whether output average value or instantaneous value.
  Ave: the average value from the interval for the report
  Inst: the instantaneous value when the report is created
- **Date/Day of the week**
  Set the date or day of the week on which the report is to be created. If [Report set] is set to [Day+Month], [Date] is displayed. If [Day+Week] is specified, [Day of the week] is displayed. If [Hour], [Day], or [Hour+Day] is specified, [Date] is displayed. However, this setting is void.
  - **Date (for monthly reports)**
    Enter the date [01] to [28]. You cannot specify 29, 30, or 31.
  - **Day of the week (for weekly reports)**
    Select the day of the week.
- **Time (hour)**
  Set the time when the report is to be created. The reference time is set in the range of 0:00 to 23:00 at 1 hour steps. Hourly reports are created on the hour, so the Time(hour) setting is disabled.
- **Report CH**
  Select the report channel [R01] to [R12] to which measurement/computation channels are assigned. The data of measurement/computation channels are output in order according to this number.
- **Off/On**
  Select whether to use the report channel [On] or [Off].
- **Channel**
  Set the measurement or computation channel to assign to the report channel. All measurement and computation channels can be specified. However, reports are not created for channels that are set to [Skip] or those that have the computation turned [Off].
- **Sum scale**
  Select the sum scale from the following.
  Off: Σ(measured/computed data every scan interval)
  /s: Σ(measured/computed data every scan interval) × scan interval
  /min: Σ(measured/computed data every scan interval) × scan interval/60
  /h: Σ(measured/computed data every scan interval) × scan interval/3600
  /day: Σ(measured/computed data every scan interval) × scan interval/86400

Starting/Stopping the Report Function <Operation Mode>

The start/stop operation of the creation of reports is synchronized to the start/stop operation of the data acquisition to the internal memory.

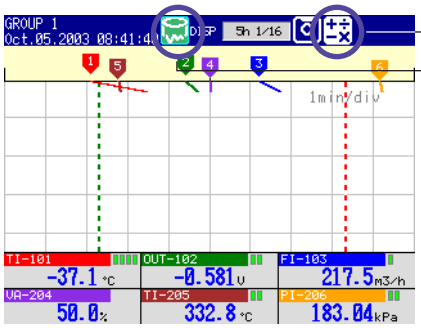
Procedure

Starting the Report Function

Press the **START key**.

The report function starts. When the time to create the report arrives, the report data is written to the internal memory.

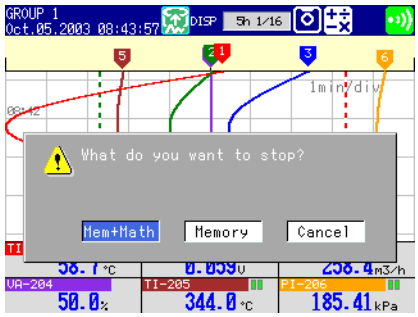
As shown in the following figure, the internal memory icon changes from stop indication to run indication. The computation icon is also displayed.



Stopping the Report Function

1. Press the **STOP key**.

   The following dialog box appears for confirmation.



2. Select [Mem+Math] or [Memory] using the **left and right arrow keys**.
3. Press the **DISP/ENTER key**.

   When data acquisition to the internal memory stops, the internal memory icon changes from run indication to stop indication.

Note

- If you clear the data in the internal memory (see section 7.8), report data is cleared along with other data such as display data.
- If you stop the report function, the report file on the external storage medium is closed. If you start the report function again, the data is saved to a new file.

9.1 Assigning an Action to the USER Key and Using the USER Key

This section explains how to assign an action to the USER key and how to use the USER key after the action has been assigned.

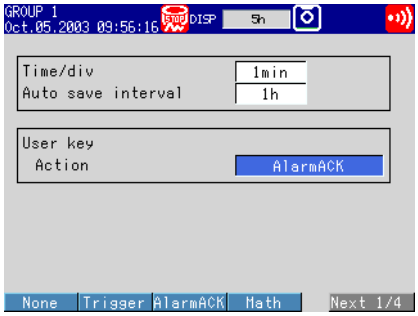
USER Key <Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **#3 soft key** (select [Trend/Save interval, User key])

From the operation mode, use the above keys to open the following setting display.



Setting a Action to the USER Key

1. Use the **arrow keys** to move the cursor (blue) to the [Action] box under [User key].
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the action you wish to select.
3. Press the **DISP/ENTER key**.
   The action you entered is confirmed.

Setup Items

Function Assignment to the USER Key

Select one of the following actions. The initial value is [AlarmACK].

Name of Action	Reference	Action
None	-	No operation.
Trigger	7.2	Supplies a trigger used to start acquiring event data to the internal memory (valid only when event data is specified to be acquired and the key trigger is set to start the acquisition).
AlarmACK	4.2	Clears the alarm indication/relay output (valid only when the operation of the alarm indication or output relay is set to “Hold”).
MathStart/Stop	8.2	Starts/stops computation (only for models with the computation function (/M1, /PM1 option))
MathReset	8.2	Resets the computed data (resets to 0, only on models with the computation function (/M1, /PM1 option) while the computation is stopped).
ManualSample	7.4	Writes the measured/computed values of all channels to the internal memory once.
Message1 to 8	6.4	Displays the message (1 to 8) on the trend screen and write it to the internal memory.
Snapshot*	7.5	Saves the current screen image data to the external storage medium.
Media	7.3	Detect the external storage medium in the drive.

* Available on models with the Ethernet interface, regardless of whether an external storage drive is installed.

USER Key Operation

Procedure

Press the **USER key** once to perform the assigned action in operation mode or setting mode. It does not operate in basic setting mode except the [Snapshot] action, which operates in all modes.

9.2 Disabling Certain Keys (Keylock Function)

This section explains how to disable/enable the key operation (including data save operation in manual save mode).

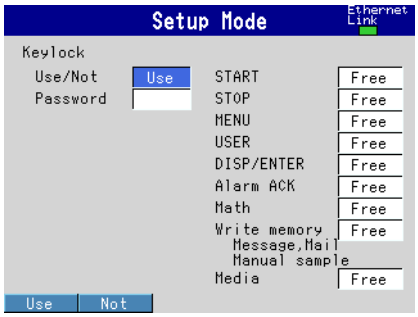
Keys to Be Locked <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#6 soft key** (select [Keylock])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [Password] is set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Keylock

- **Use/Not**
  To enable the keylock function select [Use].
- **Password**
  Enter the password for releasing the keylock. Set the password using up to 6 alphanumeric characters.

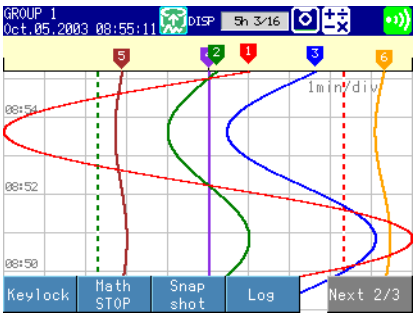
- **Keylock Items**
  Select [Lock] to apply the keylock function to the key; select [Free] otherwise.
  - START key, STOP key, MENU key, USER key, DISP/ENTER key
  - AlarmACK : [AlarmACK] soft key.
  - Math: [MathSTART], [MathSTOP], and [MathReset] soft keys.
  - Write memory: Soft keys related to memory writing including [Message], [Manual sample], [Trigger], [Save Display], and [Save Event] soft keys.
    E-mail related soft keys including [E-Mail START], [E-Mail STOP], and [E-Mail test] soft keys (see the "*FX100 Communication Interface User's Manual*" (IM 04L20A01-17E).
  - Media: Prohibit data storage during manual save mode.

Activating/Releasing the Keylock <Operation Mode>

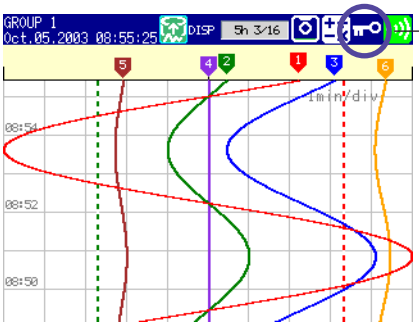
Procedure

Activating the Keylock

1. In operation mode, press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.
   The [Keylock] soft key does not appear if the Keylock Use/Not setting is [Not].



2. Press the **[Keylock] soft key**.
   A keylock icon is displayed in the operation status display section.

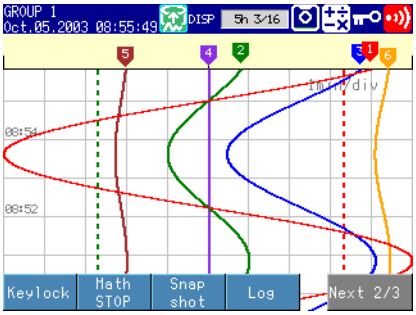


Note

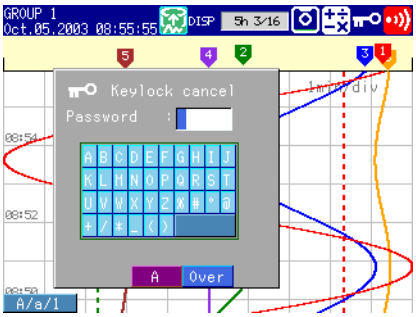
- While the keylock function is enabled, a keylock icon appears in the status indication section. For the description of the status display section, see section 1.4, "*Display Function*."
- If you press a locked key while the keylock function is enabled, a message "This key is locked" appears.
- The key lock ON/OFF condition is retained even if the power is turned OFF. Thus, the next time the power is turned ON, the preexisting state is restored.

Releasing the Keylock

1. In operation mode, press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.



2. Press the **[Keylock] soft key**.
   A password entry pop-up window appears.
3. Enter the password using the **soft keys** and **arrow keys**.



4. Press the **DISP/ENTER key**.
   If the password you entered is correct, the pop-up window closes and the keylock is released. The keylock icon in the status display section disappears.

9.3 Using Key Login/Logout Function

This section explains how to set the FX100 so that only certain users can operate the instrument, and how to log in and log out after the function is enabled.

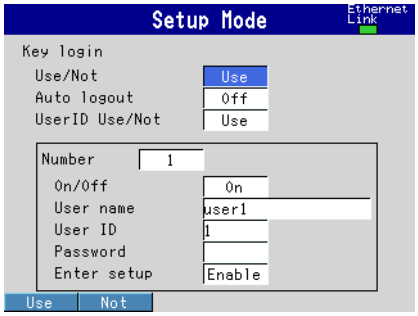
User Registration < Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#7 soft key** (select [Key login])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.

Note

The [User name], [User ID], and [Password] are set using the pop-up window that appears by pressing the [Input] soft key.

4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Key Login

- **Use/Not**
  To enable the key login function select [Use].
- **Auto logout**
  On: Automatically logs the user out if there is no key operation for ten minutes.
  Off: The user stays logged on until the user manually logs out.
- **UserID Use/Not**
  Set whether to use the User ID when logging in. If [Use] is selected, the [User ID] entry box appears.

- **Number**
  Select the user registration number from [1] to [7].
- **Off/On**
  Select whether to enable [On] or disable [Off] the key login function of the user corresponding to the registration number.
- **User name**
  Enter the user name using up to 16 alphanumeric characters. You cannot specify "quit" as a user name. In addition, the user name cannot be set to all spaces. If the user name already exists, a message "This username is already registered." appears. In this case, change the user name to a unique name.
- **User ID (only when UserID Use/Not is set to [Use])**
  Enter the user ID using up to 4 alphanumeric characters.
- **Password**
  Set the password using up to 6 alphanumeric characters.
- **Enter setup**
  Select whether to allow the user that has logged in to enter basic setting mode ([Enable]) or not ([Disable]).

Note

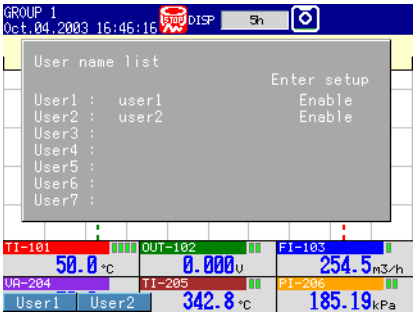
You cannot set all users to [Disable]. If you attempt to do so, the user with the smallest registration number is automatically changed to [Enable] at the time the setup data is saved.

Logging In, Logging Out <Operation Mode>

Procedure

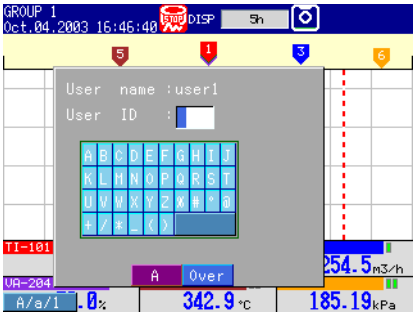
Logging in

1. In operation mode, press the **FUNC key**.
   A user name list window and a soft key menu appears.
2. Press the **soft key** corresponding to the user to be logged in.

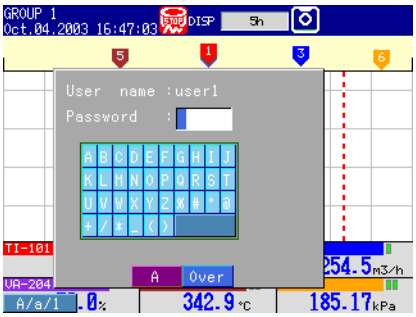


If [UserID Use/Not] is set to [Use] in the key login settings, a User ID entry pop-up window appears. Proceed to step 3. If it is set to [Not], proceed to step 4.

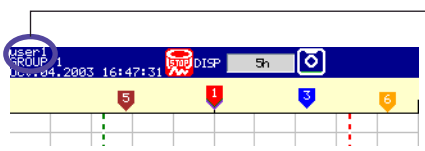
3. Enter the User ID using the **soft keys** and **arrow keys**, then press the **DISP/ENTER key**.
   A password entry pop-up window appears.



4. Enter the password using the **soft keys** and **arrow keys**, then press the **DISP/ENTER key**.



If the password is correct, the user is logged in, and the user name appears in the status indication section as shown below.



Logging out

- **Manual logout**
  1. In operation mode, press the **FUNC key**.
     A soft key menu is displayed at the bottom of the display
  2. Press the **[Logout] soft key**.
     The user name in the status indication section disappears.
- **Auto logout**
  If the auto logout function is enabled, users are automatically logged out when there is no key operation for 10 minutes in operation mode or setting mode.

Explanation

Logging In/Logging Out

- When logged out, only the login operation can be accessed.
- If the FX100 is switched from basic setting mode to operation mode, the FX100 is in a logged out condition.
- When the power is turned OFF and turned ON again, the FX100 starts in the logged out condition.
- The records of key login/logout can be viewed on the log screen. See section 9.4.

Saving the User Name

When starting/stopping the acquisition of the display data/event data to the internal memory, the user name is written to the respective files. The user name when writing messages is also written to the internal memory.

9.4 Displaying a List of Record of Errors and Operations (Displaying Logs)

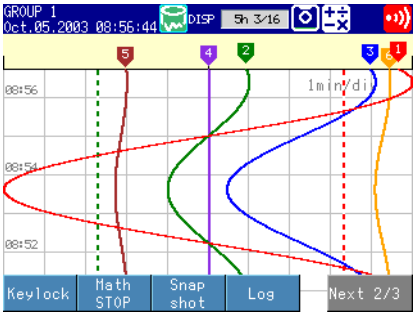
Open the log display when checking the following operation information.
Error message, login/logout log, communication command log, FTP file transfer log, E-mail transmission log, and Web browser operation log.
This section explains how to display the above information.

A List of Record of Errors and Operations (Log Display) <Operation Mode>

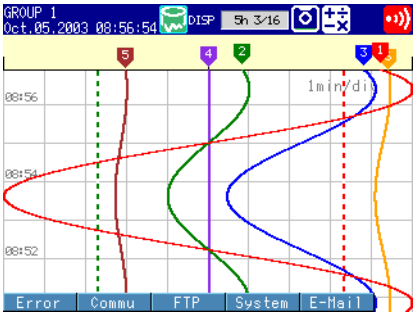
Procedure

Opening the Log Display

1. In operation mode, press the **FUNC key**.
   A soft key menu is displayed at the bottom of the display.



2. Press the **[Log] soft key**.
   The following soft key menu is displayed at the bottom of the display. [Login] and [Web] soft keys appear only when those functions are being used.

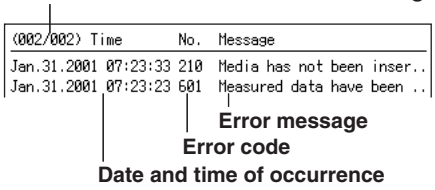


3. Press the **soft key** corresponding to the display you wish to show. Press the **up or down arrow keys** to scroll the log.
   To return to the operation screen, choose **DISP/ENTER key** (menu display) > **up/down arrow key** (select screen) > **DISP/ENTER key**.

Explanation

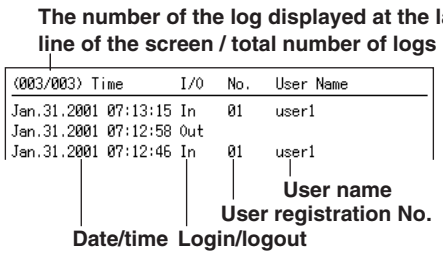
A Record of Error Messages (Error Log)

The number of the log displayed at the last line of the screen / total number of logs

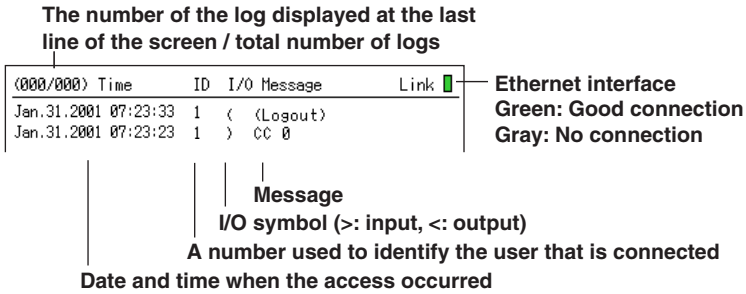


For details on error messages, see chapter 10, "*A List of Messages*."

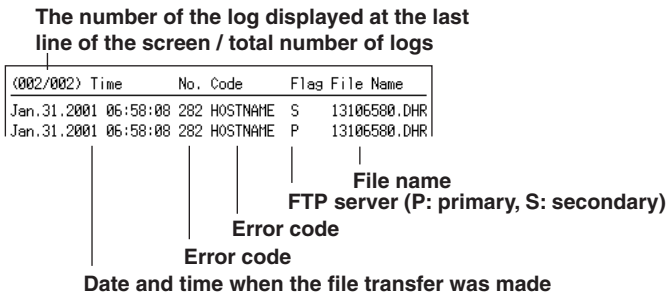
Login/logout Log



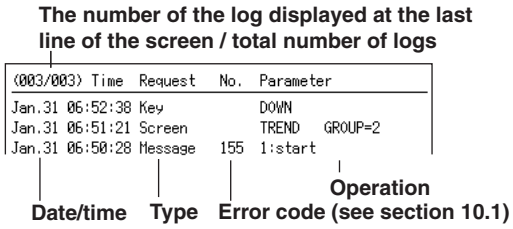
Communication Command Log



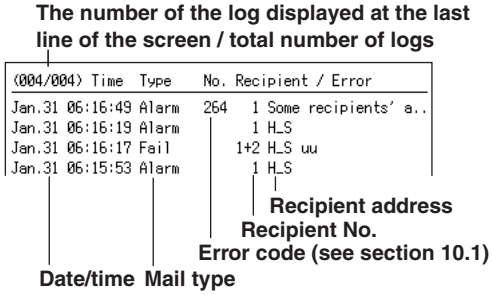
FTP File Transfer Log



Web Browser Operation Log



E-mail Transmission Log



9.5 Monitoring the Remaining Space in the Internal Memory, and Outputting Alarms (/F1 Option)

Describes the procedure for setting the function in which the time remaining when writing to the internal memory is monitored and alarms (a relay contact output) are output. This function is called “memory alarm.”

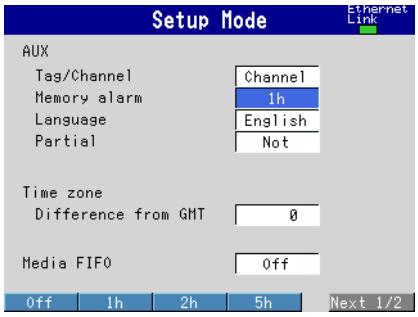
Remaining Space for Storing the Display or Event Data at Which an Alarm is Activated <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#5 soft key** (select [AUX, Time zone])

From the operation mode, use the above keys to open the following setting display.



Setup Procedure

1. Use the **arrow keys** to move the cursor (blue) to [Memory alarm].
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Remaining Space for Storing the Display or Event Data at Which an Alarm is Activated

- **Memory alarm**

  This is the minimum storage time of the internal memory at which the relay should be activated. Select a value from [1 h], [2 h], [5 h], [10 h], [20 h], [50 h], [100 h] and [off].
  [Off]: Memory alarm function is disabled.

Note

You can have the instrument make notification of an occurrence of a memory alarm using the e-mail transmission function of the Ethernet communication interface (/C7 option). See the “*FX100 Communication Interface User’s Manual*” (IM 04L20A01-17E).

9.6 Setting the Remote Control Function (/R1, /PM1 Option)

This section explains how to assign a particular action to the remote input terminal.

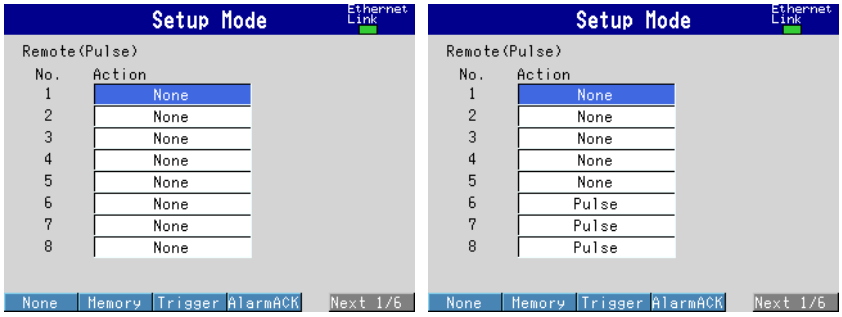
Assign Actions to the Remote Input Terminals <Basic Setting Mode>

Procedure

Opening the Setting Display

MENU key (switch to setting mode (Control)) > **Hold down the FUNC key for 3 seconds** (switch to basic setting mode) > **#9 soft key** (select [Option]) > **#1 soft key** (select [Remote]) or **#1 soft key** (select [Remote(Pulse)])

From the operation mode, use the above keys to open the following setting display.



Operations on the Display

1. Use the **arrow keys** to move the cursor (blue) to the item box you wish to change.
   A soft key menu is displayed at the bottom of the display.
2. Press the **soft key** corresponding to the value you wish to select.
   The box for the item you changed turns yellow, and the cursor moves to the next item.
3. Repeat steps 1 and 2 to change the value of all the items you wish to change.
4. Press the **DISP/ENTER key** to confirm the changes.
   The boxes for the items you changed turn from yellow to white, and the cursor returns to the first item box.

Saving the Settings in Basic Setting Mode

1. Press the **ESC key**.
   The display returns to basic setting menu.
2. Press the **[End] soft key**.
   A confirmation dialog box appears
3. Select [Yes] and press the **DISP/ENTER key**.
   The operation screen is displayed.

Setup Items

Assign Actions to the Remote Input Terminals

Eight remote inputs are available.

Note

With pulse measurement input (/PM1 option), the default setting of [Pulse] is set in [Action] boxes 6 through 8. These terminals can also be used as remote input terminals. However, you can also assign [Pulse] to terminals 1 through 5.

- **Action**

  Select the action to be assigned from the following. Select [None] if you are not assigning any action. Enclosed in [ ], are displays on the soft key menu.

  - **MemoryStart/Stop [Memory]**
    Starts/stops the acquisition of the display data/event data to the internal memory and the report function (/M1, /PM1 option).
  - **Trigger [Trigger]**
    This input is used as an external trigger for starting the acquisition of the event data to the internal memory.
  - **AlarmACK [AlarmACK]**
    Releases the alarm indication and relay output (option). This is the same function as when the [AlarmACK] soft key is pressed.
  - **Time Adjust [Time adj]**
    Adjusts the internal clock of the FX100 to the nearest hour depending on the time when the remote signal is applied.
  - **MathStart/Stop [Math] (/M1, /PM1 option)**
    Starts/stops the computation.
  - **ManualSample [M.sample]**
    Write measured data of all channels to the internal memory once.
  - **Panel1Load [Pnl1 load], Panel2Load [Pnl2 load], Panel3Load [Pnl3 load] (only on models with the storage medium drive)**
    Loads the setup data file named “LOAD1.PNL”, “LOAD2.PNL”, or “LOAD3.PNL” stored on the external storage medium and activates the settings.
  - **Message1 [Message1] to Message8 [Message8]**
    Displays a message at the position corresponding to the time when the signal was applied on the trend screen. The displayed message is also written to the internal memory.
  - **Snapshot [Snapshot]**
    Saves the current screen image data to the external storage medium. Snapshots can be taken in any mode (operation mode, setting mode, or basic setting mode). This function is available on the models with an external storage drive, or models with the Ethernet communication interface (/C7 option) that are set up for snapshot FTP transfer.
  - **Pulse [Pulse] (/PM1 option)**
    You can use the remote input terminals as the pulse input terminals.
    For the description of the pulse input, see section 4.3.

10.1 A List of Messages

Occasionally, error codes and messages appear on the screen while using the FX100. The entire list of messages is given below.

Errors Related to Parameter Settings

• Setting Errors

Code	Message	Explanation/Countermeasures/Ref. section
1	System error.	Contact your nearest YOKOGAWA dealer.
2	Incorrect date or time setting.	Check the settings. See section 3.3.
3	A disabled channel is selected.	Check communication command parameters. Confirm the number of channels of the FX100.
4	Incorrect function parameter.	Check communication command parameters.
5	The input numerical value exceeds the set range.	Enter a proper value.
6	Incorrect input character string.	Enter a proper character string.
7	Too many characters.	Enter specified number of characters.
8	Incorrect input mode.	Check communication command parameters. See section 4.1.
9	Incorrect input range code.	Check communication command parameters. See section 4.1.
21	Cannot set an alarm for a skipped channel.	Check communication command parameters. Confirm the mode setting. See section 4.1.
22	The upper and lower span limits are equal.	Cannot be the same value. See section 4.1.
23	The upper and lower scale limits are equal.	Cannot be the same value. See section 4.1.
30	The partial boundary value exceeds the range of the span.	Select a value within the measurement span. See section 6.12.
31	Partial expansion display is set ON for a SKIPPED channel.	Check communication command parameters. Confirm the mode setting. See section 4.1.
35	The upper and lower limits of the display band are equal.	(upper limit) > (lower limit). See section 6.7.
36	The lower limit of the display band is greater than the upper limit.	(upper limit) > (lower limit). See section 6.7.
37	The display band is narrower than 4% of the entire display.	(upper limit)−(lower limit) > 5%. See section 6.7.
40	Incorrect group set character string.	Example: 01.03.05-08. See section 6.1.
41	There is no specified input channel.	Check communication command parameters. FX103: 1 to 3, FX106: 1 to 6, FX112: 1 to 12
42	Exceeded the number of channels which can be set.	Check communication command parameters. FX103: 1 to 3, FX106: 1 to 6, FX112: 1 to 12
43	A channel number cannot repeat in a group.	A channel cannot be assigned twice or more to a group. See section 6.1.
45	There is no character string saved in the clipboard.	Copy a character string to the clipboard.
46	The character string saved in the clipboard is too long.	Paste a character string with the proper number of characters.
61	There is no channel specified by the MATH expression.	FX103: 1 to 3, FX106: 1 to 6, FX112: 1 to 12, Computation channels: 31 to 42.
62	MATH expression grammar is incorrect.	Check the expression. See appendix 2.
63	MATH expression sequence is incorrect.	Check the expression. See appendix 2.
64	MATH upper and lower span values are equal.	Cannot be the same value. See section 8.1.
70	MATH constant description is incorrect.	Maximum number of significant digit is 5. See section 8.1.
71	The range of the MATH constant is exceeded.	−9.9999E+29 to −1.0000E−30, 0, 1.0000E−30 to 9.9999E+29. See section 8.1.
81	All space or ‘quit’ string cannot be specified.	Use other string as a user name. See section 9.3.
85	The login password is incorrect.	Enter a correct password. See section 9.3.
86	The key-lock release password is incorrect.	Enter a correct password. See section 9.2.

Code	Message	Explanation/Countermeasures/Ref. section
87	This key is locked.	Release the key lock. See section 9.2.
88	This function is locked.	Release the key lock. See section 9.2.
89	Press [FUNC] key to login.	Log in first. See section 9.3.
90	No permission to enter to the SETUP mode.	Log in as a user who is allowed to enter basic setting mode. See section 9.3.
91	Password is incorrect.	Enter a correct password.
92	Press [ESC] key to change to the operation mode.	Press the ESC key.
93	String including space or all space cannot be specified.	Spaces are not allowed in the Web user name and password.
94	More than one address cannot be specified.	Multiple addresses cannot be specified. Only a single sender is allowed.
100	IP address doesn't belong to class A, B, or C.	Check the settings. Confirm the settings with the network administrator.
101	The result of the masked IP address is all 0s or 1s.	Check the settings. Confirm the settings with the network administrator.
102	SUBNET mask is incorrect.	Check the settings. Confirm the settings with the network administrator.
103	The net part of default gateway is not equal to that of IP address.	Check the settings. Confirm the settings with the network administrator.
104	FTP client failed because the memory mode is 'manual'.	Select auto save to transfer files via FTP. See section 7.1.

• Execution Errors

Code	Message	Explanation/Countermeasures/Ref. section
150	This action is not possible because sampling is in progress.	Stop data acquisition. See section 7.2.
151	This action is not possible during sampling or calculating.	Stop data acquisition and/or computation. See sections 7.2 and 8.2.
152	This action is not possible because saving is in progress.	Wait till the saving ends.
153	This action is not possible because formatting is in progress.	Wait till the formatting ends.
155	The message is not written while sampling is stopped.	Start data acquisition first. See sections 6.4 and 7.2.
160	Cannot load the specified data. Change the memory setting.	Load display data when display data is set to be acquired. Load event data when event data is set to be acquired. See section 7.6.
165	Snapshot FTP transmission is not effective.	Basic setting mode [#10 Communication] > [#3 FTP transfer file].

Operation Errors

• Errors related to external storage medium

Code	Message	Explanation/Countermeasures/Ref. section
200	Operation aborted because an error was found on media.	Check the storage medium.
201	Not enough free space on media.	Use another storage medium.
202	Media is read-only.	Release the write protection.
210	Media has not been inserted.	Insert a storage medium into the drive.
211	Media is damaged or not formatted.	Use another storage medium or carry out formatting.
212	Format error.	Try formatting again or use another storage medium.
213	The file is read-only.	Access to other files or make the file write-enable.
214	There is no file or directory.	Check files and directories on the storage medium.
215	Exceeded the allowable number of files.	Delete files or change storage medium.
216	The file or directory name is incorrect.	AUX, CON, PRN, NUL, CLOCK, and strings containing spaces are not allowable.
217	Unknown file type.	Access to other files. See appendix 4.

Code	Message	Explanation/Countermeasures/Ref. section
218	Directory exists. Delete the directory or change directory name.	Confirm the directory name. See section 7.7.
219	Invalid file or directory operation.	A file with the same name exists. A directory with files cannot be deleted. Delete files in the directory first.
220	The file is already in use. Try again later.	Wait till file is free.
230	There is no setting file.	Access to other files. Extension of setting files is .pnl.
231	Abnormal setting exists in file.	Access to other files. Create a new setting file.

• Errors related to historical trend

Code	Message	Explanation/Countermeasures/Ref. section
232	There is no available data.	This message may appear when recalling historical trend. Access to other files.
233	The specified historical data do not exist.	This message may appear when recalling historical trend. See section 5.3.
234	The specified channel is not assigned to the display group.	This message may appear when switching to trend or bar graph from overview. See section 5.2.

• Errors related to e-mail and Web server

Code	Message	Explanation/Countermeasures/Ref. section
260	IP address is not set or ethernet function is not available.	The IP address is not specified. Check the IP address.
261	SMTP server is not found.	Occurs when the SMTP server is specified by name. • Check the DNS setting. • Check the SMTP server name.
262	Cannot initiate E-mail transmission.	• The host name of the FX100 is not correct. Check the host name. • The port number for SMTP server is not correct. Check the port number.
263	Sender's address rejected by the server.	Check the sender's address.
264	Some recipients' addresses are invalid.	Check the recipient's address.
265	SMTP protocol error.	May occur if a network failure (cable problems, duplicate addresses, network device failure, and so on) occurs in the middle of the e-mail transmission.
266	Ethernet cable is not connected.	Check the cable connection.
267	Could not connect to SMTP server.	• Check to see that the SMTP server is connected to the network. • If the SMTP server name is specified using an IP address, check to see that the IP address is correct.
268	E-mail transmission request failed.	Contact your nearest YOKOGAWA dealer.
269	E-mail transfer error.	May occur if a network failure (cable problems, duplicate addresses, network device failure, and so on) occurs in the middle of the e-mail transmission.
275	The current image cannot be output to the Web.	The setup screen cannot be output to the Web. This message is displayed on the Web screen.
276	Image data currently being created. Unable to perform key operation.	Try again a little later. This message is displayed on the Web screen.
277	Could not output screen to Web.	Failed to create the image. This message is displayed on the Web screen.

• Errors related to FTP client

For information regarding the FTP client function of the FX100, see the "*FX100 Communication Interface User's Manual*" (IM 04L20A01-17E).

Code	Message
280	IP address is not set or FTP function is not available. Further details are provided by the character string that appears after error code 280.

Character String and Details	
HOSTADDR	The FX's IP address has not been specified. Check the IP address.*1
DORMANT	Internal processing error.*2
LINK	Data link is disconnected. Check the cable connection.

Code	Message
281	FTP mail box operation error. Further details are provided by the character string that appears after error code 281.

Character String and Details	
MAIL	Internal processing error.*2
STATUS	Internal processing error.*2
TIMEOUT	Internal processing error.*2
PRIORITY	Internal processing error.*2
NVRAM	Internal processing error.*2

Code	Message
282	FTP control connection error. Further details are provided by the character string that appears after error code 282.

Character String and Details	
HOSTNAME	Failed the DNS lookup (search the IP address corresponding to the host name). Check the DNS setting and the destination host name.*1
TCPIP	Internal processing error.*2
UNREACH	Failed to connect to a control connection server. Check the address setting and that the server is running.
OOBINLINE	Internal processing error.*2
NAME	Internal processing error.*2
CTRL	The control connection does not exist. Check that the server does not drop the connection and that it responds within the proper time period.
IAC	Failed to respond in the TELNET sequence. Check that the server does not drop the connection and that it responds within the proper time period.
ECHO	Failed to transmit data on the control connection. Check that the server does not drop the connection and that it responds within the proper time period.
REPLY	Failed to receive data on the control connection. Check that the server does not drop the connection and that it responds within the proper time period.
SERVER	The server is not in a condition to provide the service. Check that the server is in a condition in which service can be provided.

Code	Message
283	FTP command was not accepted. Further details are provided by the character string that appears after error code 283.

Character String and Details
USER Failed user name verification. Check the user name setting.*1
PASS Failed password verification Check the password setting.*1
ACCT Failed account verification. Check the account setting.*1
TYPE Failed to change the transfer type. Check that the server supports the binary transfer mode.
CWD Failed to change the directory.*1 Check the initial path setting.
PORT Failed to set the transfer connection. Check that the security function is disabled.
PASV Failed to set the transfer connection. Check that the server supports PASV commands.
SCAN Failed to read the transfer connection settings. Check that proper response to the PASV command is received from the server.

Code	Message
284	FTP transfer setting error. Further details are provided by the character string that appears after error code 284.

Character String and Details
MODE Internal processing error.*2
LOCAL Internal processing error.*2
REMOTE The destination file name is not correct. Check that you have the authority to create or overwrite files.
ABORT File transfer abort was requested by the server. Check the server for the reason for the abort request.

Code	Message
285	FTP data connection error. Further details are provided by the character string that appears after error code 285.

Character String and Details	
SOCKET	Failed to create a socket for the transfer connection.*3
BIND	Failed the transfer connection command.*3
CONNECT	Failed the transfer connection.*3
LISTEN	Failed the transfer connection reception.*3
ACCEPT	Failed to accept the transfer connection.*3
SOCKNAME	Internal processing error.*2
RECV	Failed to receive data over the transfer connection.*3
SEND	Failed to send data over the transfer connection.*3

Code	Message
286	FTP file transfer error. Further details are provided by the character string that appears after error code 286.

Character String and Details	
READ	Internal processing error.*2
WRITE	Internal processing error.*2

*1 See the "*FX100 Communication Interface User's Manual*" (IM 04L20A01-17E).
*2 Contact your nearest YOKOGAWA dealer.
*3 These errors may occur if the network experiences trouble during the data transmission (bad cable connection, duplicate addresses, network equipment failure).

Note

- The FTP client function on the FX100 has a timer function that drops the connection if there is no data transfer for two minutes. If the server does not respond within this time period, the transfer fails.
- The FTP client function on the FX100 overwrites files with the same file names on the server without any warnings, unless the server rejects the request.
- For information regarding the FTP client function of the FX100, see the "*FX100 Communication Interface User's Manual*" (IM 04L20A01-17E).

Communication Errors

For information regarding the communication function of the FX100, see the "*FX100 Communication Interface User's Manual*" (IM 04L20A01-17E).

• Errors during Setting and Basic Setting Modes, Output Communication Command Execution, and Setup Data Loading

Code	Message
300	Command is too long.
301	Too many number of commands delimited with ';'.
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.
354	This command is not available during sampling or calculating.

• Memory Access Errors during Setting and Basic Setting Modes and Output Communication Command Execution

An English error message is returned via the communication interface. It is not displayed on the screen.

Code	Message
360	Output interface must be chosen from Ethernet or RS by using 'XO' command.
361	Memory data has not been saved to the communication output buffer.
362	There are no data to send 'NEXT' or 'RESEND'.
363	All data have already been transferred.

• Maintenance and Test Communication Command Errors

An English error message is returned via the communication interface. It is not displayed on the screen.

Code	Message
390	Command error.
391	Delimiter error.
392	Parameter error.
393	No permission.
394	No such connection.
395	Use 'quit' to close this connection.
396	Failed to disconnect.
397	No TCP control block.

• Other Communication Errors

An English error message is returned via the communication interface. It is not displayed on the screen.

Code	Message
400	Input username.
401	Input password.
402	Select username from '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.

Note

For information regarding the communication function of the FX100, see the "*FX100 Communication Interface User's Manual*" (IM 04L20A01-17E).

Status Messages

Code	Message
500	Execution is complete.
501	Please wait a moment...
503	Data are being saved to media...
504	File is being loaded from media...
505	Formatting...
506	Memory save to media was interrupted.
507	Exchange media to continue the saving operation.
510	Range cannot be changed during sampling or calculating.
511	MATH expression cannot be changed during sampling or calculating.
512	Because memory save is 'manual' mode, FTP is not available.*
520	Connecting to the line...
521	The data file is being transferred.
551	FTP test is being executed...

* FTP transfer of snapshots can be used.

Cautions

Code	Message	Ref. section
600	Measured data and settings have been initialized.	–
601	Measured data have been initialized.	–
610	This username is already registered.	Use another user name. See section 9.3.
611	There is no user who can enter to the SETUP mode.	Set [Enter Setup] to a user or users. See section 9.3.

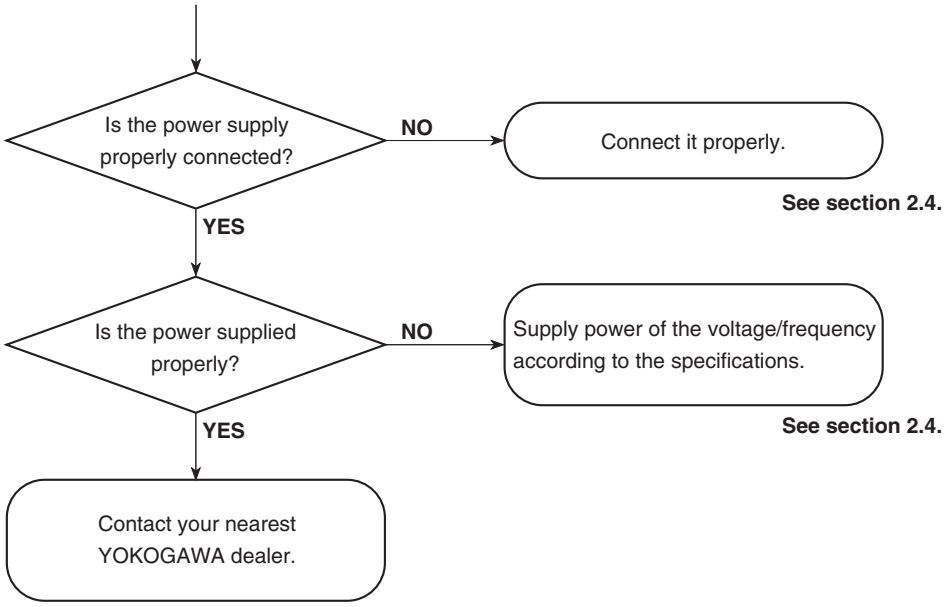
System Errors

Servicing is required when a system error occurs. Contact your nearest YOKOGAWA dealer for repairs.

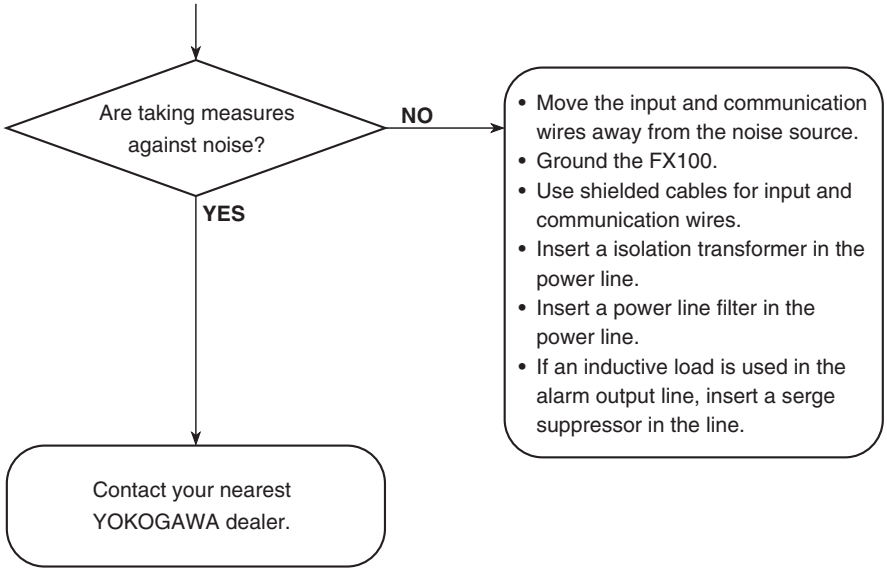
Code	Message
901	ROM failure.
902	RAM failure.
910	A/D memory failure for all input channels.
921	A/D calibration error.
930	Memory acquisition failure.
940	The ethernet module is down.

10.2 Troubleshooting Flow Chart

When Nothing Operates (Nothing Is Displayed)



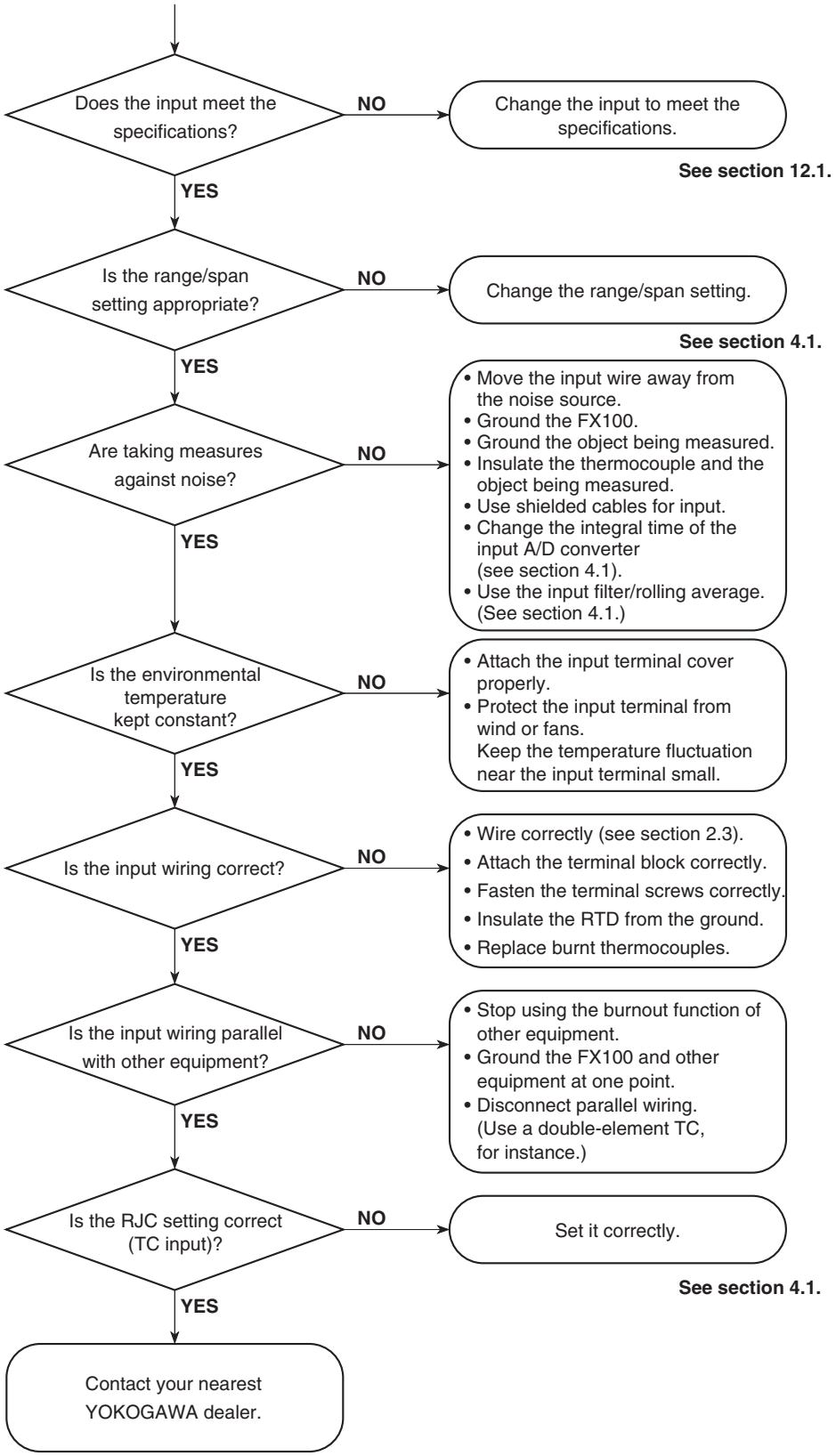
When Problems Exist on the Display or Other Functions



Measurement-Related Problems

In the following cases:

- The reading error is large.
- The trend or digital value fluctuates.
- The trend is off the scale on either the 0% or 100% side.



11.1 Periodic Inspection

Check the operation of the FX100 periodically to keep it in good working order. Conduct the following inspections, and replace worn parts as necessary.

- Is the display and storage functioning properly?
  In the event of problems, see section 10.2, "*Troubleshooting Flow Chart*."
- Has the brightness of the LCD backlight deteriorated?
  If replacement is necessary, see section 11.3, "*Replacement of Parts*."

11.2 Calibration

It is recommended that the FX100 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 an appropriate resolution is required for calibrating the FX100.

Recommended Instrument

- DC voltage standard: FLUKE Model 5520 or equivalent
  Main specifications
  Output Accuracy: ±(0.005 %+1 μV)
- Decade resistance box: Yokogawa M&C Model 2793-01 or equivalent
  Main specifications
  Accuracy for the output range of 0.1 to 500 Ω: ±(0.01 %+2 mΩ)
  Resolution: 0.001 Ω
- 0 °C standard temperature device: Model ZC-114/ZA-10 from Coper Electronics Co., Ltd. or equivalent
  Main specifications
  Accuracy of stability of the standard temperature: ±0.05 °C

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

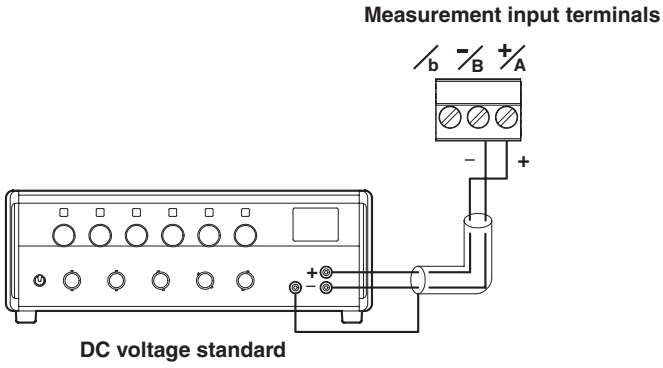
Calibration Procedure

1. Wire the FX100 and the calibration instrument as shown in the following figure, and adequately warm up the instruments (the warm-up time of the FX100 is at least 30 minutes).
2. Check that the operating environment such as ambient temperature and humidity is within the standard operating conditions (see chapter 12).
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 does not fall within the accuracy range of the specifications, contact your nearest YOKOGAWA dealer.

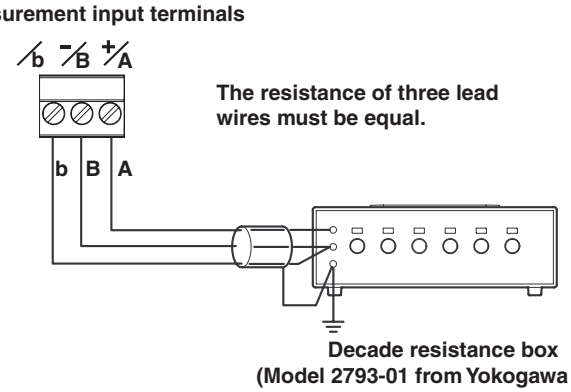
Note

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

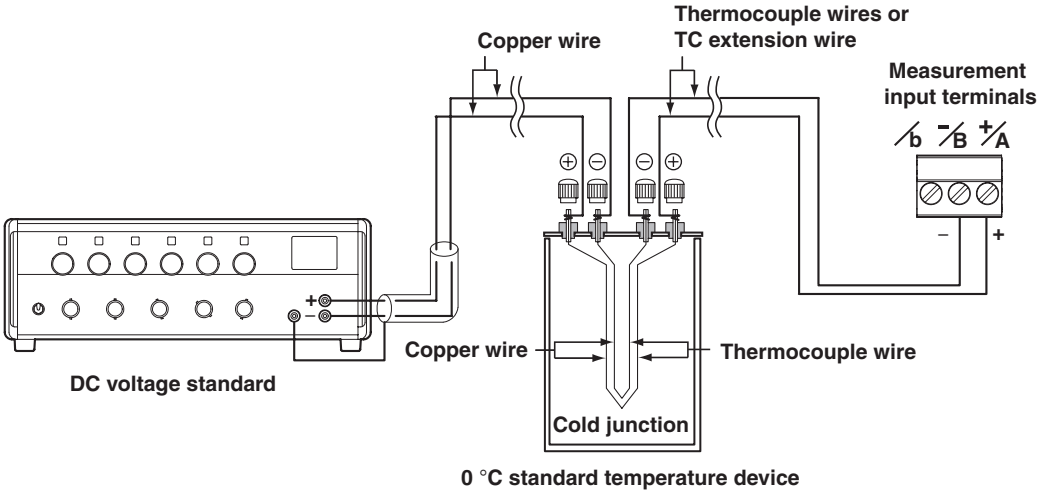
DC Voltage Measurement



Temperature Measurement When Using an RTD



Temperature Measurement When Using a thermocouple



Reference Junction Compensation of Thermocouple Input

As the measurement terminal of the FX100 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 FX100 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 the detector tip being 0 °C), the measured value indicates the temperature of the input terminal. When calibrating the FX100, this compensation voltage (thermoelectromotive force of 0 °C reference corresponding to the input terminal temperature) must be subtracted from the output of the standard generator 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.

11.3 Replacement of Parts

Recommended Replacement Period

To preserve the reliability of the FX100 and to use the FX100 in a good condition for an extended time, it is recommended that periodic replacements be made on parts.
The following table shows the recommended replacement period for expendable parts. The replacement period shown here applies when the FX100 is used under standard operating conditions. For the actual replacement period, consider the actual conditions of use.
Replacements will be carried out by a YOKOGAWA engineer or an engineer certified by YOKOGAWA. When replacement is required, contact your nearest YOKOGAWA dealer.

Item	Replacement Period	Name	Specifications	Quantity Used
LCD	5 years	Backlight module		1
Battery	10 years	Lithium battery		1
Rubber strip	5 years	Dust and water proof rubber strip	For front panel and operation key panel	1 each
Floppy disk drive	5 years			1
PWB assembly	5 years 5 years	Power supply ASSY* AD ASSY*		1 Depends on the specifications made at the time of purchase

* The aluminum electrolytic capacitor is the expendable part.

Note

- The LCD replacement period indicates the half life of the brightness when the brightness is set to the factory default setting. The half life is shortened as the brightness is set higher. The deterioration of brightness varies depending on the condition of use, and its determination is subjective. Consider these facts for determining the actual replacement period.
- The color of the LCD may become yellowish as time elapses. The discoloration tends to progress faster as the brightness is set higher.

12.1 Input Specifications

Item	Specifications
Number of inputs	FX103: 3 channels FX106: 6 channels FX112: 12 channels
Scan interval	FX103: 250 ms FX106: 1 s or 2 s (2 s when an A/D integration time is set to 100 ms) FX112: 1 s or 2 s (2 s when an A/D integration time is set to 100 ms)
Inputs	Volt (DC voltage), TC (thermocouple), RTD (resistance temperature detector), DI (digital input), DC current (with external shunt resistor attached)

Type	Range	Measurement Range	
DCV	20mV	-20.00 to 20.00 mV	
	60mV	-60.00 to 60.00 mV	
	200mV	-200.0 to 200.0 mV	
	2V	-2.000 to 2.000 V	
	6V	-6.000 to 6.000 V	
	20V	-20.00 to 20.00 V	
	50V	-50.00 to 50.00 V	
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	0.0 to 2400.0 ° C	32 to 4352 ° F
RTD	PT (Pt100)*4	-200.0 to 600.0 ° C	-328.0 to 1112.0 ° F
	JPT (JPt100)*4	-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	
	Cont	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% Rd/W-26% Rd (Hoskins Mfg. Co.), ASTM E988
*3 L: Fe-CuNi, DIN43710, U: Cu-CuNi, DIN43710
*4 Pt100: JIS C1604-1997, IEC751-1995, DIN IEC751-1996
JPt100: JIS C1604-1989, JIS C1606-1989
Measuring current: i = 1 mA (Pt100, JPt100)

Input	Floating unbalanced input Isolated between channels (however, b terminals for RTD input are common)
Thermocouple burnout	Burnout upscale/downscale function can be switched ON/OFF (for each channel). Burnout upscale/downscale selectable Normal: less than or equal to 2 kΩ, Burnout: More than or equal to 100 kΩ (parallel capacity: less than or equal to 0.1 μF) Current: Approximately 10 μA
Reference junction compensation	Internal/external selectable (for each channel).
A/D resolution	16 bits
A/D integration time	FX103: Selectable from 20 ms (50 Hz), 16.7 ms (60 Hz), or AUTO (automatic selection from 20 ms 50/50and 16.7 ms by detection of power supply frequency) FX106: Selectable from 20 ms (50 Hz), 16.7 ms (60 Hz), 100 ms, or AUTO (automatic selection from 20 ms and 16.7 ms by detection of power supply frequency) FX112: Selectable from 20 ms (50 Hz), 16.7 ms (60 Hz), 100 ms, or AUTO (automatic selection from 20 ms and 16.7 ms by detection of power supply frequency)

Item	Specifications
Filter	FX103: Signal damping On/off selectable for each channel Time constant: selectable from 2, 5, and 10 seconds FX106: Moving average On/off selectable for each channel Number of samples to be averaged is selectable from 2 to 16 FX112: Moving average On/off selectable for each channel Number of samples to be averaged is selectable from 2 to 16
Computation	
Differential computation	Between any two channels Available for Volt, TC, RTD, and DI ranges.
Linear scaling	Available for Volt, TC, RTD, and DI ranges. Scaling limits: –30000 to 30000 Decimal point: user selectable Engineering unit: user definable, up to 6 characters
Square root	Square root computation and linear scaling Available for Volt range. Scaling limits: –30000 to 30000 Decimal point: user selectable Engineering unit: user definable, up to 6 characters

12.2 Alarm Function Specifications

Item	Specifications
Number of alarms	Up to four alarms for each channel
Alarm types	Upper and lower limits, delay upper and lower limits, difference upper and lower limits, and upper limit and lower on rate-of-change
Alarm delay time	Selectable from 1 s to 3600 s for each channel
Interval time of rate-of-change alarms	The scan interval times 1 to 15, common to all channels.
Relay outputs (option) Relay action	Number of points: 2, 4, or 6 points Energized/de-energized, hold/non-hold, AND/OR, reflash actions selectable. The alarm relay condition is held even in the basic setting mode. Contact rating: 250 VAC (50/60 Hz)/3 A or 250 VDC/0.1 A (resistive load)
Hysteresis	On (0.5% of display span)/off selectable (applied to upper and lower limits alarms, common to all measurement channels)
Display	The alarm status is displayed in the operation screens upon occurrence of an alarm. A common alarm indication is also displayed in the status display section. The alarm indication behavior: non-hold or hold-type can be selectable for common to all channels.
Alarm information	The date and time of alarm occurrences/recoveries, alarm types, etc. are displayed on the alarm summary screen.

12.3 Display Specifications

Display Unit, Display Color

Item	Specifications
Display unit	5.5-inch TFT color LCD (VGA, 240 × 320 dot resolution)
Channel display color	Trend/Bar graph: Selectable from 16 colors (Red, Green, Blue, Blue violet, Brown, Orange, Yellow green, Lightblue, Violet, Gray, Lime, Cyan, Darkblue, Yellow, Light Gray, Purple)
Background	White or black selectable

Screens

Item	Specifications
Trend screen	
Direction	Vertical, horizontal, or horizontal 2 selectable
Number of indication channels	6 channels per screen (maximum)
All channels indication	24 channels (maximum, including computation channels)
Number of group screens	4
Line width	1, 2, and 3 dots selectable
Display update rate (Waveform)	FX103: 15 s, 30 s, 1, 2, 5, 10, 15, 20, 30 min., 1, 2, 4, 10 hours/div selectable FX106: 1, 2, 5, 10, 15, 20, 30 min., 1, 2, 4, 10 hours/div selectable FX112: 1, 2, 5, 10, 15, 20, 30 min., 1, 2, 4, 10 hours/div selectable
Display update rate (Numerical value)	1 s (2 s when the scan interval is 2 s.)
Contents	Waveform, Numerical value (numerical display section can be turned ON/OFF), alarm indication, unit, scale (scale display can be turned ON/OFF), grid lines (number of divisions selectable from 4 to 12), hours : minutes on time axis, trip lines (line widths are selectable from 1, 2 and 3 dots), messages (up to eight different messages of up to 16 characters for each), channel no./tag, zone display, partial expanded display Zone display and partial expanded display are available.
Digital screen	
Number of indication channels	6 channels per screen (maximum)
Number of group screens	4
Display update rate	1 s (2 s when the scan interval is 2 s)
Contents	Numerical value, alarm indication, unit, channel no./tag
Bar graph screen	
Direction	Vertical or horizontal selectable
Number of indication channels	6 channels per screen (maximum)
Number of group screens	4
Scales	4 to 12 divisions selectable
Base position of bar	Left or right end, or center (only for horizontal display)
Display update rate	1 s (2 s when the scan interval is 2 s)
Contents	Bar graph, numerical value, alarm indication, unit, scale, channel no./tag
Overview screen	Measured values and alarm status of all channels
Information screen	
Alarm summary	Displays the list of alarms. Capable to switch to historical trend screen by cursor pointing.
Message summary	Display the list of messages and time. Capable to switch to historical trend screen by cursor pointing.
Memory summary	Display the file list in internal memory. Capable to switch to historical trend screen by cursor pointing.
Historical trend screen	Display the retrieved data from internal or external memory.
Display format	Whole screen display or divided into 2 areas (only when displaying the historical trend of the display data)
Time axis operation	Can be expanded, reduced, and scrolled
Memory information	The following information of the retrieved data are displayed: File name, serial number of the FX100 which is used to acquire data, starting and ending time of data acquisition, and user name (when using key login function)

Item	Specifications
Status display section	Displays the status of the FX100 on the upper part of the screen. Date and time, displayed group name, user name (when using key login function), internal memory status, external storage medium status (only on models with storage drive), alarm indication, key lock status, status of computation function/e-mail transmission function (on models with these options equipped)

Others Items Related to Display

Item	Specifications
Tags	Number of characters: Up to 16 alphanumeric characters
Scale Number of scales Scale division	Displays scales on the trend screen Up to 6 scales per a group 4, 5, 6, 7, 8, 9, 10, 11, 12, C10 selectable.
Message Number of messages Number of characters	Writes and displays user defined messages Up to 8 messages Up to 16 alphanumeric characters
Automatic display switching	The displayed group can be automatically switched on the trend, digital, and bar graph screens. The display switching interval is selectable from 5 s, 10 s, 20 s, 30 s, and 1 min.
Backlight saver function	The LCD backlight automatically dims or turns off if no key is pressed for a certain preset time (can be set from 1, 2, 5, 10, 20 and 60 minutes).
Log display	Display the logs of error messages, key login/logout, communication interface commands, file transfers via FTP, operation from the Web browser, and e-mail transmission.
Display language	Selectable from English, German, French, Chinese, and Japanese.
Temperature unit	°C or °F selectable.
System screen	Display the number of input points, capacity of the internal memory, options, MAC address, and firmware version number.

12.4 Data Storage Specifications

Storage Medium

Item	Specifications
Internal memory	Used for temporary data storage
External storage medium	Selectable from: • Non • 3.5-inch floppy disk (2HD, 1.44 MB) • Compact flash memory card (32 to 512 MB)

Data Type

Item	Specifications
Data type (file extensions)	Display data (.dds), event data (.dev), manual sampled data (.dmn) Setup data (.pnl) Screen image data (.png) On models with computation function: TLOG data (.dtg), report data (.dhr, .ddr, .dwr, .dmr)

Display Data/Event Data

Item	Specifications
Internal memory capacity	1.2 MB When writing both display data and event data: 0.9 MB for display data, 0.3 MB for event data
Display data	
Objective channels	All channels
Sampling interval	Linked with the waveform display update rate FX103: 0.5,1, 2, 4, 10, 20, 30, 40, 60, 120, 240, 480, 1200 s FX106: 2, 4, 10, 20, 30, 40, 60, 120, 240, 480, 1200 s FX112: 2, 4, 10, 20, 30, 40, 60, 120, 240, 480, 1200 s
Data acquired	Max./min. values over the sampling intervals
Data size	Measured data: 4 bytes per data Computed data: 8 bytes per data
Format	Binary
Acquisition method	Acquires data continuously. The newest data overwrites the oldest data in the memory when the internal memory is full.
Event data	
Objective channels	All channels
Sampling interval	FX103: 250, 500 ms, and 1, 2, 5, 10, 30, 60, 120 s, 300 s, 600 s FX106: 1, 2, 5, 10, 30, 60, 120, 300, and 600 s FX112: 1, 2, 5, 10, 30, 60, 120, 300, and 600 s
Data acquired	Data at the sampling intervals
Data size	Measured data: 2 bytes per data Computed data: 4 bytes per data
Format	Binary
Acquisition method	Free: Acquires data continuously The newest data overwrites the oldest data in the memory when the internal memory is full. Trigger: Starts data acquisition when a specified event occurs. Acquires data for a specified time. No more acquisition starts when all blocks are full. Rotate: Starts data acquisition when a specified event occurs. Acquires data for a specified time. Overwrites the oldest block in the memory when all blocks are full.
Combination of data to be acquired	Selectable from: Display data only, Event data only, or Display data and event data (only for trigger or rotate mode).

Item	Specifications
Maximum sampling length	Per floppy disk during manual save The sampling length (the maximum data length) can be derived from the following equation. Maximum sampling length = the maximum number of data points per channel × sampling interval Maximum number of data points per channel Calculated from internal memory capacity, types of data, data size, and number of measurement or computation channels data to be stored

Data type	Maximum number of data points per channel
Display data only	1,200,000 bytes/(number of measurement channels × 4 + number of computation channels × 8) Except, the maximum number of data points is 100,000
Display data and event data	• Display data 900,000 bytes/(number of measurement channels × 4 + number of computation channels × 8) Except, the maximum number of data points is 75,000 • Event data 300,000 bytes/(number of measurement channels × 2 + number of computation channels × 4) Except, the maximum number of data points is 30,000
Event data only	1,200,000 bytes/(number of measurement channels × 2 + number of computation channels × 4) Except, the maximum number of data points is 120,000

Example of sampling length

When acquiring display data only
If we assume that the number of measuring channels is 12, the number of computing channels is 12, and the display rate is 30 min/div (60 sec sampling interval), then:
Number of data per channel = 1,200,000 bytes/(12 × 4 bytes + 12 × 8 bytes) = 8,333 data*
* Maximum number of data points is 100,000.
Maximum sampling length = 8,333 × 60 sec = 500,000 sec = approx. 5.7 days

When acquiring event data only
If we assume that the number of measuring channels is 12, the number of computing channels is 12, and the sampling interval is 1 sec, then:
Number of data per channel = 1,200,000 bytes/(12 × 2 bytes + 12 × 4 bytes) = 16,667 data*
* Maximum number of data points is 120,000.
Maximum sampling length = 16,667 × 1 sec = 16,667 sec = approx. 4.6 hours

When acquiring both display data and event data
The sampling length is calculated by defining the capacity for display data as 900,000 bytes and the capacity for event data as 300,000 bytes. The method of calculation is the same as shown above.
Except, the maximum number of data points is 75,000

Manual Sampled Data

Item	Specifications
Objective channels	All channels
Data acquired	Data when manual sampling operation is carried out
Format	ASCII
Trigger	Key operation, communication command (option), or remote input signals (option)
Max. number of data sets internal memory can hold	50

TLOG Data (option)

Item	Specifications
Objective channels	All channels
Data acquired	Data at the intervals specified by a timer
Format	Binary
Trigger	Timeout of the internal timer
Max. number of data sets internal memory can hold	400 data sets or 16 blocks (number of computation start-and-stop operations)

Report Data (option)

Item	Specifications
Objective channels	Specified channels (up to 12 channels)
Report type	Hourly, daily, hourly + daily, daily + weekly, or daily + monthly
Format	ASCII
Max. number of report data internal memory can hold	40

Setup Data

Item	Specifications
Contents	Setup data of the FX100
Output	External storage medium

Screen Image Data

Item	Specifications
Data format	png format
Output	External storage medium or communication interface
Trigger	Key operation, communication command (option), or remote input signals (option)

Data Saving to the External Storage Medium (Only for Models with Storage Drive)

Item	Specifications
Data Save	Saves data in the internal memory to external storage medium
Manual saving	Data saving using a given key operation when inserting external storage medium
Automatic saving	Display data: Periodic saving at auto save intervals (10 min to 31 days) or at specified time to external storage medium Event data: Free: Periodic saving at data length (3 min to 31 days) or at specified time to external storage medium Trigger: Save the data when data acquisition is finished Rotate: Save the data when data acquisition is finished Manual sampled data: Saved when manual sampling operation is carried out TLOG data: Saved when TLOG data is created Report data: Saved when report data is created

12.5 Specifications of Optional Functions

Alarm Output Relays (/A1, /A2, /A3)

Item	Specifications
Action	An alarm signal is output from terminals on the rear panel as a relay contact signal.
Number of outputs	2 (/A1), 4 (/A2), 6 (/A3)
Relay contact rating	250 VAC (50/60 Hz)/3 A, 250 VDC/0.1 A (for resistive load)
Terminal configuration	SPDT (NO-C-NC). Energized-at-alarm/de-energized-at-alarm, AND/OR, hold/non-hold, and reflash actions are selectable.

RS-232 Serial Communication Interface (/C2)

Item	Specifications
Connection	EIA RS-232
Protocols	YOKOGAWA private protocol, Modbus protocol
Synchronization method	Start-stop asynchronous transmission
Transmission speed	1200, 2400, 4800, 9600, 19200 or 38400 bps
Data length	7 or 8 bits
Stop bit	1 bit
Parity	Odd, even, or none
Handshaking	off:off, XON:XON, XON:RS, CS:RS
Modbus	Mode: RTU MASTER or RTU SLAVE RTU MASTER: Reads data from the slave device (Computation function /M1 or /PM1 is necessary) RTU SLAVE: Master device reads/writes data from the FX100.

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

Item	Specifications
Connection	RS-422-A/485
Protocols	YOKOGAWA private protocol, Modbus protocol
Synchronization method	Start-stop asynchronous transmission
Connection method	4-wire half-duplex multi-drop connection (1 : N where N = 1 to 31)
Transmission speed	1200, 2400, 4800, 9600, 19200 or 38400 bps
Data length	7 or 8 bits
Stop bit	1 bit
Parity	Odd, even, or none
Communication distance	Up to 1200 m
Modbus	Mode: RTU MASTER or RTU SLAVE RTU MASTER: Reads data from the slave device (Computation function /M1 or /PM1 is necessary) RTU SLAVE: Master device reads/writes data from the FX100.

Ethernet Communication Interface (/C7)

Item	Specifications
Connection	Ethernet (10BASE-T)
Protocols	SMTP, HTTP1.0, FTP, TCP, UDP, IP, ARP, ICMP
E-mail transmission	
Destination address	Two groups of destinations can be specified using up to 150 alphanumeric characters.
Mail type	E-mail is automatically transmitted at the following times. Groups of destinations can be selected for each mail type. Alarm activation/release, at specified times, status changes (recovery from a power failure, memory end detection, and occurrence of error related to the external storage medium or FTP client), and report creation.
Web server	Displays the FX100 screen image, alarm information, and measured data on a web browser.
Browser	Microsoft Internet Explorer 4.0 to 6.0
Page type	Monitor page: Monitoring only Operator page: Switches the screen from the browser. Modify and write messages.
Access control	Controls access on each screen using user name and password.
FTP client	Automatically transfers files to a FTP server
Files can be transported	Display data file, event data file, screen image data file, report data file
FTP server	File output on request by host computer, directory operation, and file delete on the external storage medium
Setting/measurement server	
	Uses YOKOGAWA private protocol.
Maintenance/test server	Outputs connection information, network information
Instrument information server	
	Outputs serial number and model type of the FX100.
Login function	Controls access to setting/measurement server, maintenance/test server, and FTP server.
User level: number	Administrator: 1, User: 6

FAIL/Memory End Output (/F1)

Item	Specifications
FAIL	The relay contact output on the rear panel informs of the occurrence of a system error.
Relay action	De-energized when CPU fails.
Memory end	Another relay contact output informs of the time until end of the internal memory space (selectable from 1, 2, 5, 10, 20, 50 or 100 hours) before the data is overwritten during manual save mode and auto save mode, or of the time when the remaining space on the external storage medium reaches to 10% of whole capacity during auto save mode.
Relay action	Energized on memory end
Contact specification	250 VAC (50/60 Hz)/3 A, 250 VDC/0.1 A (resistive load)

Computation Functions (/M1)

Item	Specifications
Number of channels assignable to computed data	
	12 channels
Operation	General arithmetic operations: Four arithmetic operations, square root, absolute, common logarithm, exponential, power, relational operations (<, ≤, >, ≥, =, ≠), logical operations (AND, OR, NOT, XOR) Statistical operations: Average, maximum, minimum summation, and maximum - minimum Special operations: Rolling average (moving average on computed results)
Constant	Available (up to 30 constants) Symbols: K01 to K30
Digital input data via communication	
	Digital data via communication can be used in calculation expression except statistical operations Number of data: Up to 12 data Symbols: C01 to C12
Remote input status	Remote input status (0/1) can be used in calculation expression (up to 8 inputs) Symbols: D01 to D08
Pulse input	Counts pulses (up to 3 inputs, expandable to 8 inputs) Symbols: D06 to D08 (or D01 to D08)

Item	Specifications
TLOG data	Saves data of all channels at each interval specified by a timer.
Report functions	Report type: Hourly, daily, hourly + daily, daily + monthly, and daily + weekly Operation: Average or instantaneous (selectable), maximum, minimum and summation Data format: ASCII

3 terminal Isolated RTD Input (/N2)

Item	Specifications
Terminal isolation	A, B, and b terminals are of isolated input type for each channel (terminal b is shorted across all channels as standard).

Pt 1000 Ω RTD Input (/N3)

Item	Specifications
Enable measurement using	Pt 1000 Ω RTD.
Measuring range	–200.0 to 600.0 °C, –328.0 to 1112.0 °F
Measuring current	0.16 mA
Measurement accuracy	±(0.2% of rdg + 0.4 °C)
Maximum resolution	0.1 °C
Effects of Input source resistance	See “Effects of Operating Conditions” on page 12-16.

Pulse Measurement Input, Remote Input (/PM1)

Item	Specifications
Pulse measurement input	
Number of inputs	3 (expandable to 8 using remote input terminals)
Input format	Photocoupler isolation Isolated power supply for input terminals Shared common
Input type	
Non-voltage contact	Close: less than or equal to 200 Ω, Open: more than or equal to 100 kΩ
Open collector	0.5 V or less (30 mADC) when turned ON, leakage current of 0.25 mA or less when turned OFF
Counting	Counts rising edges of pulses Non-voltage contact signal: contact changes from open to closed Open collector signal: input terminal level changes from High to Low
Allowable input voltage	30 VDC
Maximum pulse frequency	100 Hz
Minimum pulse width	More than or equal to 5 ms for both low (close) and high (open) durations
Pulse detection period	Approximately 3.9 ms (256 Hz)
Counting Accuracy	±1 pulse
Others	Pulse input terminals can be used as remote input terminals. Isolated between pulse input terminals and remote input terminals.
Remote control input	Specifications are the same as remote control input (/R1) besides the number of inputs.
Number of inputs	5 (can be used for pulse inputs)
Computation function	See the description of “Computation Functions (/M1).”

Remote Control Input (/R1)

Item	Specifications
Number of inputs	8
Input format	Photocoupler isolation Isolated power supply for input terminals Shared common
Input type	
Non-voltage contact	Close: less than or equal to 200 Ω, Open: more than or equal to 100 kΩ
Open collector	0.5 V or less (30 mADC) when turned ON, leakage current of 0.25 mA or less when turned OFF
Signal type	Level signal or trigger signal (250 ms or longer)
Control actions	This option allows the following functions to be controlled remotely by a contact or an open collector input • Start/stop of data acquisition (level) • Trigger for event data acquisition (trigger, 250 ms or longer) • Time adjustment (adjusting the internal clock to the nearest hour upon remote signal, trigger, 250 ms or longer)

Time of signal input	Processing
hh:00:00 to hh:01:59	Cut off reading of less than one minute. e.g. 10:00:50 is corrected as 10:00:00
hh:58:00 to hh:59:59	Round up reading of less than one minute. e.g. 10:59:50 is corrected as 11:00:00
hh:02:00 to hh:57:59	No process is to be performed.

- Start/stop of computation (level, /M1 or /PM1 option)
- Reset of computation data (trigger, 250 ms or longer, /M1 or /PM1 option)
- Manual sampling (trigger, 250 ms or longer)
- Writing messages (up to 8 different messages can be set, trigger, 250 ms or longer)
- Load of setting parameters (up to 3 setup data files can be set, trigger, 250 ms or longer)
- Rleasing alarm output (Alarm ACK operation, trigger, 250 ms or longer)
- Snapshot (saves the current screen image data to the external storage medium, trigger)

24 VDC/AC Power Supply (/P1)

Item	Specifications		
Rated power supply	24 VDC/AC		
Allowable power supply voltage range	21.6 to 26.4 VDC/AC		
Rated supply voltage frequency	50/60 Hz (for AC)		
Permitted supply voltage frequency range	50/60 Hz ± 2% (for AC)		
Dielectric strength	Power supply to ground terminal: 500 VAC (50/60 Hz), 1 minute		
Insulation resistance	Each terminal to ground terminal: 20 MΩ or greater (at 500 VDC)		
Rated Power consumption	17VA(for DC), 30 VA(for AC)		
Power consumption	Power supply	LCD backlight saver ON	Power consumption (maximum)
	24 VDC	7 VA	17 VA (25 VA)
	24 VAC	13 VA	30VA (35 VA)
Effects on measured value	With variation within 21.6 to 26.4 VDC/AC (50/60 Hz): ±1 digit or less With variation of ±2 Hz from rated power frequency (at 24 VAC): ±(0.1% of rdg + 1 digit) or less		

12.6 General Specifications

Construction

Item	Specifications
Mounting	Flush panel mounting (on a vertical plane)
Tilt	Mounting may be inclined backward up to 30 degrees from a horizontal plane.
Allowable panel thickness	2 to 26 mm
Material	Case: drawn steel Bezel: polycarbonate
Case color	Case: Grayish blue green (Munsell 2.0B 5.0/1.7 or equivalent) Bezel: Charcoal grey light (Munsell 10B 3.6/0.3 or equivalent)
Front panel	Water and dust-proof (based on IEC529-IP65)
Dimensions	144(W) × 144(H) × 234(D) mm
Weight	Models without storage drive: approx. 2.2 kg Models with FDD: approx. 2.5 kg Models with CF memory card slot: approx. 2.3 kg

Normal Operating Conditions

Item	Specifications
Ambient temperature	0 to 50°C (when using FDD: 0 to 40°C)
Ambient humidity	20% to 80% RH (at 0 to 40°C), 10% to 50% RH (at 40 to 50°C)
Power supply voltage	90 to 132 or 180 to 250 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 measuring range. DI (level): The peak value including the signal must be less than 1.2 times the measuring range. TC: The peak value including the signal must be less than 1.2 times the measuring thermal electromotive force. RTD: The peak value must be 100 mV or less. Common mode noise (50/60 Hz): 250 Vrms AC or less for all ranges Maximum noise voltage between channels (50/60 Hz): 250 VACrms or less
Mounting position	Can be inclined up to 30 deg backward. Mounting at an angle away from the perpendicular is not acceptable.
Warm-up time	At least 30 minutes after power on
Altitude	2000 m or less above sea level
Measurement category	II (EN61010-1)
Installation category	II (CSA1010-1)
Pollution degree	2

Power Supply

Item	Specifications		
Rated power supply	100 to 240 VAC		
Allowable power supply voltage range			
	90 to 132 or 180 to 264 VAC		
Rated power supply frequency			
	50/60 Hz		
Rated Power consumption	35 VA		
Power consumption	Power supply	LCD backlight saver ON	Power consumption (maximum)
	100 VAC	10 VA	14 VA (25 VA)
	240 VAC	18 VA	22 VA (35 VA)

Isolation

Item	Specifications
Insulation resistance	Each terminal to ground terminal: 20 MΩ or greater (at 500 VDC)
Dielectric strength	Power supply to ground terminal: 2300 VAC (50/60 Hz), 1 minute (excet for /P1 model) Power supply to ground terminal: 500 VAC (50/60 Hz), 1 minute (for /P1 model) Contact output terminal to ground terminal: 1600 VAC (50/60 Hz), 1 minute Measuring input terminal to ground terminal: 1500 VAC (50/60 Hz), 1 minute Between measuring input terminals: 1000 VAC (50/60 Hz), 1 minute (except for RTD input terminals) Between remote control terminal to ground terminal: 1000 VDC, 1 minute Between pulse input terminal to ground terminal: 1000 VDC, 1 minute
Grounding resistance	100 Ω or less

Transport and Storage Conditions

Item	Specifications
Ambient temperature	–25°C to 60°C
Humidity	5% to 95% RH (No condensation is allowed).
Vibration	10 to 60 Hz, 4.9 m/s^2 maximum
Shock	392 m/s^2 maximum (while being packed)

Safety and EMC Standards

Item	Specifications
CSA	Certified by CSA22.2 No. 1010.1, Installation category (Overvoltage category) II*1, Pollution degree 2*2
UL	Certified by UL61010B-1 (CSA NRTL/C)
CE	
EMC	Complies with EN61326-1 Complies with EN61000-3-2 Complies with EN61000-3-3 Complies with EN55011 Class A Group 1
Low voltage	Complies with EN61010-1, Measurement category II*3
C-Tick	Complies with AS/NZS2064 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 distribution board.

*2 “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.

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

Standard Performance

Item	Specifications
Measuring accuracy	The following specifications apply to operation of the FX100 under standard operation conditions: Temperature: 23 ± 2°C Humidity: 55% ± 10% RH Power supply voltage: 90 to 132 or 180 to 250 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 of the FX100.

Input	Range	Measurement accuracy (digital display)	Max. resolution of digital display
DC voltage	20 mV	± (0.1% of rdg + 2 digits)	10 μV
	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
TC (Excluding the reference junction compensation accuracy)	R	± (0.15% of rdg + 1°C) However, R, S : ± 3.7°C at 0 to 100°C, ± 1.5°C at 100 to 300°C B : ± 2°C at 400 to 600°C (Accuracy at less than 400°C is not guaranteed.)	0.1°C
	S		
	B		
	K	± (0.15% of rdg + 0.7°C) However, ± (0.15% of rdg + 1°C) at –200 to –100°C	
	E	± (0.15% of rdg + 0.5°C)	
	J	± (0.15% of rdg + 0.5°C)	
	T	However, ± (0.15% of rdg + 0.7°C) at –200 to –100°C	
	N	± (0.15% of rdg + 0.7°C)	
	W	± (0.15% of rdg + 1°C)	
	L	± (0.15% of rdg + 0.5°C)	
	U	However, ± (0.15% of rdg + 0.7°C) at –200 to –100°C	
	WRe3-25	± (0.2% of rdg + 2°C)	
RTD	Pt100	± (0.15% of rdg + 0.3°C)	0.1°C
	JPt100		
DI	DCV input	Threshold level accuracy 2.4 V: ± 0.1 V	-
	Contact input	1 kΩ or less: ON, 100 kΩ or more: OFF (Parallel capacitance: 0.01 μF or less)	

Measuring accuracy in case of scaling (digits)

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: 6 V
- measuring span: 1.000 to 5.000 V
- scaling span: 0.000 to 2.000

Then,
Measuring accuracy = ±(0.1% × 5 V + 2 digits) = ±(0.005 V [5 digits] + 2) = ±(7 digits)
Multiplier = 2000 digits (0.000 to 2.000)/4000 digits (1.000 to 5.000 V) = 0.5
Accuracy during scaling = 7 digits × 0.5 + 2 = 6 digits (rounded up)

Reference junction compensation

Internal/External selectable for each channel

Reference junction compensation accuracy (above 0°C):

When the temperture of the input terminal is even (60 minutes or more after power on)
Types R, S, B, W, WRe3-25: ±1°C
Types K, J, E, T, N, L, U: ±0.5°C

Maximum allowable input voltage

±10 V DC (continuous) for ranges of 200 mVDC or less, TC, RTD, and DI ranges
±60 V DC (continuous) for 2 VDC, 6 VDC, 20 VDC, and 50 VDC ranges

Input resistance

Approximately 10 MΩ or more for ranges of 200 mVDC or less and TC
Approximately 1 MΩ for 2 VDC, 6 VDC, 20 VDC, and 50 VDC ranges

Item	Specifications
Input source resistance	Volt, TC: 2 kΩ or less RTD: 10 Ω or less per wire (The resistance of all three wires must be equal).
Input bias current	10 nA or less (without burnout detection)
Common mode rejection ratio	120 dB (50/60 Hz ±0.1%, 500 Ω imbalance, between the minus terminal and ground)
Normal mode rejection ratio	40 dB (50/60 Hz ±0.1%)
Noise reduction method	Reduced by integral type A/D converter and low pass filter
Maximum common mode voltage	±60 V DC (under measurement category II) However, maximum common mode voltage that meets the rejection ratio is 250 Vrms AC (50/60 Hz)
Maximum common mode voltage between channels	250 Vrms AC (50/60 Hz)
Parallel capacitance for RTD input	0.01μF or less
Measurement input terminal	Cramped input terminal Terminal blocks are removable. Wire gauge: 0.2–2.5 mm^2 (AWG24–AWG17)

Effects of Operating Conditions

Item	Specifications
Ambient temperature	With temperature variation of 10°C: ±(0.1% of rdg + 1 digit) or less for Volt ranges ±(0.1% of rdg + 1 digit) or less for TC ranges Excluding the error of reference junction compensation ±(0.1% of rdg + 2 digit) or less for RTD ranges
Power supply	Except for /P1 model With variation within 90 to 132 V and 180 to 250 VAC (50/60 Hz): ±1 digit or less With variation of ±2 Hz from rated power frequency (at 90 to 132 VAC, 180 to 250 VAC): ±(0.1% of rdg + 1 digit) or less /P1 model With variation within 21.6 to 26.4 VDC/AC (50/60 Hz): ±1 digit or less With variation of ±2 Hz from rated power frequency (at 24 VAC): ±(0.1% of rdg + 1 digit) or less
Magnetic field	AC (50/60 Hz) and DC 400 A/m fields: ±(0.1% of rdg + 10 digits) or less
Input source resistance	
Volt range	With variation of +1 kΩ: Ranges of 200 mV or less: within ±10 mV Ranges of 2 V or greater: ±0.1% of rdg or less
TC range	With variation of +1 kΩ: Within ±10 μV (±100 μV when the burnout detection function is switched on)
RTD range (Pt100)	With variation of 10 Ω per wire (resistance of all three wires must be equal): ±(0.1% of rdg + 1 digit) or less With maximum difference of 40 mΩ between wires: approximately 0.1°C
RTD range (Pt1000)*	With variation of 10 Ω per wire (resistance of all three wires must be equal): ±(0.1% of rdg + 1 digit) or less With maximum difference of 400 mΩ between wires: approximately 0.1°C

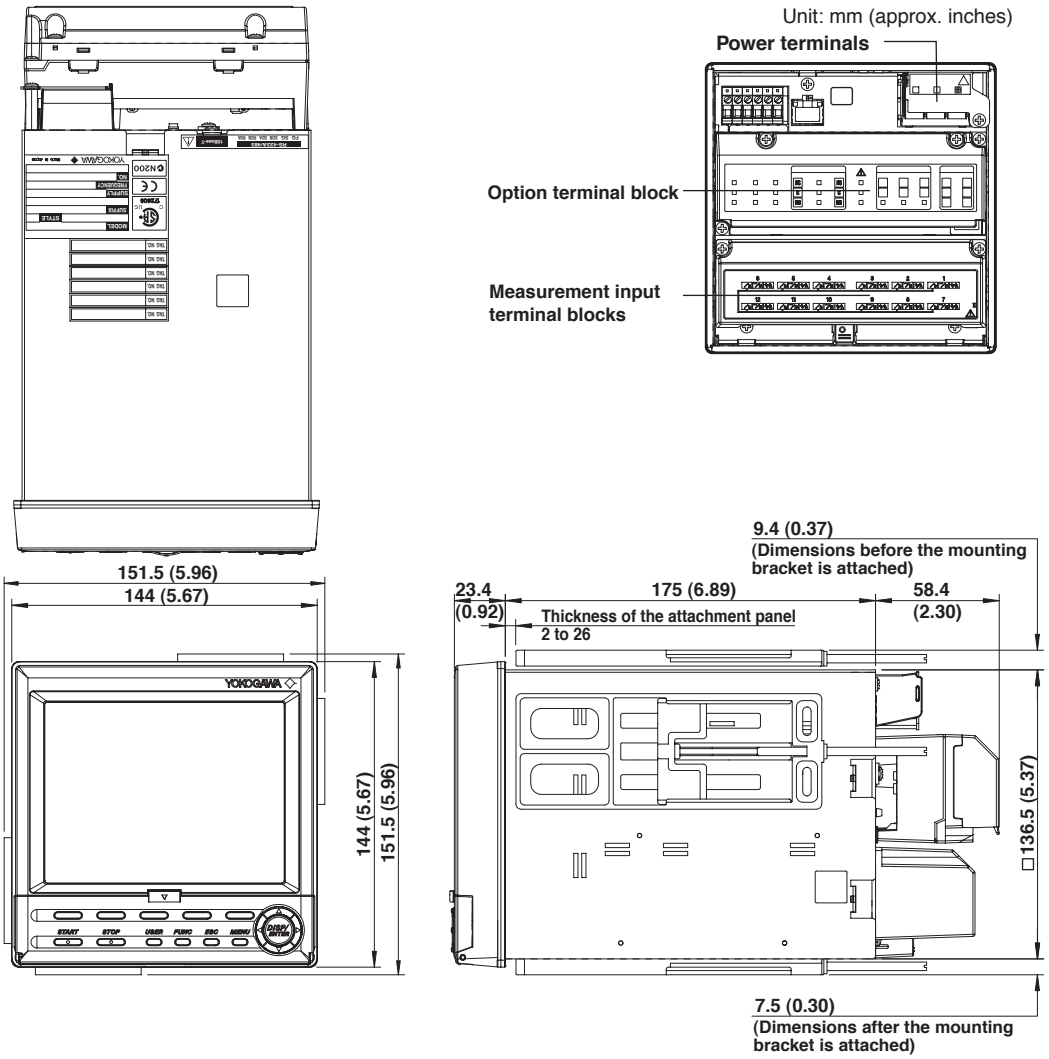
* /N3 option

Other Specifications

Item	Specifications
Clock	With calendar function (year of grace) The time can be adjusted by a remote input (remote control option).
Daylight saving	Summer and wintertime can be set.
Accuracy of clock	±100 ppm, excluding a delay (of 1 second, maximum) caused each time the power is turned on.
Memory backup	A built-in lithium battery backs up the setup parameters (battery life: approximately ten years at room temperature).
Key lock function	ON/OFF and password can be set.
Key login function	Logs in using user name, user ID and password.
USER key	Executes various actions assigned.

12.7 Dimensional Drawings

Unit: mm (approx. inches)



The dimensional tolerance is ±3% unless otherwise specified. (However, the tolerance for dimensions less than 10 mm is ±0.3 mm).

Note

When mounting to a panel, use two brackets, one each of the top and bottom of the FX100, or on the left and right sides.

Appendix 1 Time Estimate for Writing Display/ Event Data to the Internal Memory

This section describes the number of data points of the display data/event data that can be acquired and the sampling length. Use the information when determining the amount of time it takes for the internal memory to become full or when deciding the channels to be acquired or the sampling interval.
The possible range of menus of the auto save interval of display data and the data length of event data is displayed in the soft keys based on the information described here.

Maximum Sampling Length

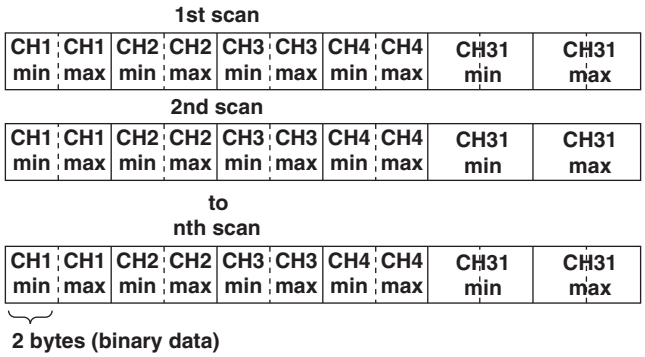
Data Format

The display data have minimum and maximum values for each sampling interval.
Event data consists of instantaneous values.
The number of data bytes per channel is shown in the following table.

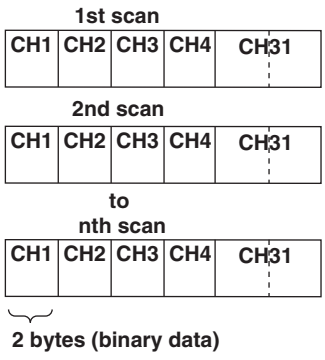
Data Type	Measurement Channel	Computation Channel
Display data	4 bytes/channel	8 bytes/channel
Event data	2 bytes/channel	4 bytes/channel

- **Example**

  Data format when the data of measurement channels 1 to 4 and a computation channel 31 are acquired.
  Display data



  Event data



Internal Memory Capacity

The capacity of the internal memory that is used for data storage is 1.2 MB. The internal memory is allocated depending on the acquired data as follows.

Data being acquired	Internal Memory Capacity
Display data only	1.2 MB
Display data and event data	Display data: 0.9 MB Event data: 0.3 MB
Event data only	1.2 MB

Maximum Sampling Length

The maximum sampling length is the time duration that the data storage area in the internal memory becomes full. The maximum sampling length can be derived from the following equation.

Maximum sampling length = maximum number of data points per channel × sampling interval

- **Maximum number of data points per channel that can be acquired**

  When the type of data to be written to the internal memory, and the number of measurement and computation channels are decided, the maximum number of data that can be written is calculated. This is called the maximum number of data points per channel (hereafter, max data no.).

  The max data no. is calculated using the equation in the table below.

Data being acquired	Max data no.
Display data only	1,200,000 bytes/(number of measurement channels × 4 + number of computation channels × 8) Except, the max data no. is 100,000
Display data and event data	• Display data 900,000 bytes/(number of measurement channels × 4 + number of computation channels × 8) Except, the maximum number of data points is 75,000 • Event data 300,000 bytes/(number of measurement channels × 2 + number of computation channels × 4) Except, the max data no. is 30,000
Event data only	1,200,000 bytes/(number of measurement channels × 2 + number of computation channels × 4) Except, the max data no. is 120,000

Note

To estimate the maximum sampling length, use the table showing the maximum number of data points per channel on pages App-4 and App-5.

Calculation example

Display Data Only

Measurement channel: 2, computation channel: none

Data	Max data no. and sampling length
Display data	Max data no. = 1,200,000/(2 CH × 4 bytes + 0 × 8 bytes) = 150,000. However, since 100,000 data points is the limit, Max data no. = 100,000 When the display update rate is 30 min/div (60 s sampling interval) Sampling length = 100,000 data points × 60 s = 6,000,000 s (approx. 69 days)

Measurement channel: 12, computation channel: 6

Data	Max data no. and sampling length
Display data	Max data no. = 1,200,000/(12 CH × 4 bytes + 6 × 8 bytes) = 12,500 When the display update rate is 30 min/div (60 s sampling interval) Sampling length = 12,500 data points × 60 s = 750,000 s (approx. 8 days)

Event Data Only

Measurement channel: 2, computation channel: None

Data	Max data no. and sampling length
Display data	Max data no. = 1,200,000/(2 CH × 2 bytes + 0 × 4 bytes) = 300,000 However, since 120,000 data points is the limit, Max data no. = 120,000 When the event data sampling interval is 1 s Sampling length = 120,000 data points × 1 s = 120,000 s (approx. 33 hours)

Measurement channel: 12, computation channel: 6

Data	Max data no. and sampling length
Event data	Max data no. = 1,200,000/(12 CH × 2 bytes + 6 × 4 bytes) = 25,000 When the event data sampling interval is 1 s Sampling length = 25,000 data points × 1 s = 25,000 s (approx. 7 hours)

Display Data and Event Data

Measurement channel: 2, computation channel: none

Data	Max data no. and sampling length
Display data	Maximum number of data points = 900,000/(2 CH × 4 bytes + 0 × 8 bytes) = 112,500 However, since 75,000 data points is the limit, Max data no. = 75,000 When the display update rate is 30 min/div (60 s sampling interval) Sampling length = 75,000 data points × 60 s = 4,500,000 s (approx. 52 days)
Event data	Max data no. = 300,000/(2 CH × 2 bytes + 0 × 4 bytes) = 75,000 However, since 30,000 data points is the limit, Max data no. = 30,000 data points When the event data sampling interval is 1 s Sampling length = 30,000 data points × 1 s = 30,000 s (approx. 8 hours)

Measurement channel: 12, computation channel: 6

Data	Max data no. and sampling length
Display data	Max data no. = 900,000/(12 CH × 4 bytes + 6 × 8 bytes) = 9,375 When the display update rate is 30 min/div (60 s sampling interval) Sampling length = 9,375 data points × 60 s = 562,500 s (approx. 6.5 days)
Event data	Max data no. = 300,000/(12 CH × 2 bytes + 6 × 4 bytes) = 6,250 When the event data sampling interval is 1 s Sampling length = 6,250 data points × 1 s = 6,250 s (approx. 1.7 hours)

Lists of Maximum Number of Data Points per Channel

The table below shows the maximum number of data points per channel, per number of measurement/computation channels to which data is saved. The maximum sampling length is calculated by multiplying that number by the sampling interval.

For example, when acquiring display data on 3 measurement channels and 3 computation channels only, at a sampling interval of 4 seconds, look up the maximum number of data points per channel value in table 1 that corresponds to 3 measurement channels and 3 computation channels (333333) and input that value into the following equation.

Max. sampling length = 33333 x 4 = 133332 seconds = approximately 37 hours

Table 1 Display data only

Number of Computation Ch.	Number of Measurement Channels											
	1	2	3	4	5	6	7	8	9	10	11	12
0	100000	100000	100000	75000	60000	50000	42857	37500	33333	30000	27273	25000
1	100000	75000	60000	50000	42857	37500	33333	30000	27273	25000	23077	21429
2	60000	50000	42857	37500	33333	30000	27273	25000	23077	21429	20000	18750
3	42857	37500	33333	30000	27273	25000	23077	21429	20000	18750	17647	16667
4	33333	30000	27273	25000	23077	21429	20000	18750	17647	16667	15789	15000
5	27273	25000	23077	21429	20000	18750	17647	16667	15789	15000	14286	13636
6	23077	21429	20000	18750	17647	16667	15789	15000	14286	13636	13043	12500
7	20000	18750	17647	16667	15789	15000	14286	13636	13043	12500	12000	11538
8	17647	16667	15789	15000	14286	13636	13043	12500	12000	11538	11111	10714
9	15789	15000	14286	13636	13043	12500	12000	11538	11111	10714	10345	10000
10	14286	13636	13043	12500	12000	11538	11111	10714	10345	10000	9677	9375
11	13043	12500	12000	11538	11111	10714	10345	10000	9677	9375	9091	8824
12	12000	11538	11111	10714	10345	10000	9677	9375	9091	8824	8571	8333

Table 2 Event data only

Number of Computation Ch.	Number of Measurement Channels											
	1	2	3	4	5	6	7	8	9	10	11	12
0	120000	120000	120000	120000	120000	100000	85714	75000	66667	60000	54545	50000
1	120000	120000	120000	100000	85714	75000	66667	60000	54545	50000	46154	42857
2	120000	100000	85714	75000	66667	60000	54545	50000	46154	42857	40000	37500
3	85714	75000	66667	60000	54545	50000	46154	42857	40000	37500	35294	33333
4	66667	60000	54545	50000	46154	42857	40000	37500	35294	33333	31579	30000
5	54545	50000	46154	42857	40000	37500	35294	33333	31579	30000	28571	27273
6	46154	42857	40000	37500	35294	33333	31579	30000	28571	27273	26087	25000
7	40000	37500	35294	33333	31579	30000	28571	27273	26087	25000	24000	23077
8	35294	33333	31579	30000	28571	27273	26087	25000	24000	23077	22222	21429
9	31579	30000	28571	27273	26087	25000	24000	23077	22222	21429	20690	20000
10	28571	27273	26087	25000	24000	23077	22222	21429	20690	20000	19355	18750
11	26087	25000	24000	23077	22222	21429	20690	20000	19355	18750	18182	17647
12	24000	23077	22222	21429	20690	20000	19355	18750	18182	17647	17143	16667

Table 3 Display data (when acquiring dispaly data and event data)

Number of Computation Ch.	Number of Measurement Channels											
	1	2	3	4	5	6	7	8	9	10	11	12
0	75000	75000	75000	56250	45000	37500	32143	28125	25000	22500	20455	18750
1	75000	56250	45000	37500	32143	28125	25000	22500	20455	18750	17308	16071
2	45000	37500	32143	28125	25000	22500	20455	18750	17308	16071	15000	14063
3	32143	28125	25000	22500	20455	18750	17308	16071	15000	14063	13235	12500
4	25000	22500	20455	18750	17308	16071	15000	14063	13235	12500	11842	11250
5	20455	18750	17308	16071	15000	14063	13235	12500	11842	11250	10714	10227
6	17308	16071	15000	14063	13235	12500	11842	11250	10714	10227	9783	9375
7	15000	14063	13235	12500	11842	11250	10714	10227	9783	9375	9000	8654
8	13235	12500	11842	11250	10714	10227	9783	9375	9000	8654	8333	8036
9	11842	11250	10714	10227	9783	9375	9000	8654	8333	8036	7759	7500
10	10714	10227	9783	9375	9000	8654	8333	8036	7759	7500	7258	7031
11	9783	9375	9000	8654	8333	8036	7759	7500	7258	7031	6818	6618
12	9000	8654	8333	8036	7759	7500	7258	7031	6818	6618	6429	6250

Display Data Sampling Interval

Display update rate (/DIV)	15s*	30s*	1min	2min	5min	10min	15min	20min	30min	1h	2h	4h	10h
Sampling interval (s)	0.5	1	2	4	10	20	30	40	60	120	240	480	1200

* for the FX103 only.

Event Data Sampling Interval

FX103: 250ms/500ms/1s/2s/5s/10s/30s/60s/120s/300s/600s

FX106: 1s/2s/5s/10s/30s/60s/120s/300s/600s

FX112: 1s/2s/5s/10s/30s/60s/120s/300s/600s

Appendix 2 Meaning and Syntax of Equations

This section describes the meaning of the computation equation and how to write them.

Rules for Writing an Equation (Common Items)

Follow the rules below in writing the computing equations.

- Use up to 40 characters to write equations.
- The precedence of computing terms can be specified using parentheses.
- Specify the channels in the equation using channel numbers. (Example: Channel 1 is “01” or “1”)
- You can use “01” or “1,” for example, to specify one-digit numbers for channels, constants, communication input data, and conditions of the remote control terminals in equations.
  Example: 01, 1, K01, K1, C01, C1, D01, D1
- The data value for the channel used in the equation, and for all channels greater in number than that channel, are substituted with data from the previous scan.
- Do not use more than 16 stacks (channel, K01 to K30, C01 to C12, D01 to D08) in one equation. Otherwise, a computation error may occur.
  Example: The number of stacks in the equation 01+K01*(03+04*K02) is five.

Order of Precedence of the Operators

The order of precedence of the operators in the equation is as follows. The operators are placed in order from the highest precedence.

Type	Operator
	(higher precedence)
Functions	ABS( ), SQR( ), LOG( ), EXP( ), TLOG.MAX( ), TLOG.MIN(), TLOG.P-P( ), TLOG.SUM( ), TLOG.AVE( )
Power	**
Logical negation	NOT
Multiplication and division	*, /
Addition and subtraction	+, –
Greater than/less than	.GT., .LT., .GE., .LE.
Equal/not equal	.EQ., .NE.
Logical AND	AND
Logical OR, exclusive OR	OR, XOR
	(lower precedence)

Four arithmetical computations

The types of data that can be used in equations are measured data, computed data, constants (K01 to K30), communication interface data (C01 to C12), and the remote control terminal conditions (D01 to D08).

EXAMPLE:

Addition (+): 01+02

Computes the measured value of channel 1 plus the measured value of channel 2

Subtraction (–): 01-02

Computes the measured value of channel 1 minus the measured value of channel 2

Multiplication (∗): 01∗K03

Computes the measured value of channel 1 multiplied by constant K03

Division (/): 01/K02

Computes the measured value of channel 1 divided by constant K02

Note

When you set an expression as e.g. 31 + 01 on channel 31, the summation of channel number 1 will be displayed in channel 31.

Power, SQR, ABS, LOG, EXP Computations

The types of data that can be used in equations are measured data, computed data, constants (K01 to K30), communication interface data (C01 to C12), and the remote control terminal conditions (D01 to D08). You can nest a computing element inside the parentheses of another computing element.

EXAMPLE:

Power (∗∗): 01∗∗02

Raises measured value of channel 1 to the power of measured value of channel 2

Square root (SQR): SQR (01)

Returns the square root of the measured value of channel 1

Absolute value (ABS): ABS (01)

Returns the absolute value of the measured value of channel 1

Logarithm (LOG): LOG (01)

Returns the common logarithm of the measured value of channel 1

Exponent (EXP): EXP (01)

Raises e to the power of the measured value of channel 1

Note

The natural logarithm is not directly provided, but can be obtained by using the following:
$\log_e x = \log_{10} x / \log_{10} e$ as $\log_b x = \log_a x / \log_a b$
Therefore, to calculate the natural logarithm of the value of channel 01, set K01 = 1.
Then the expression will become: LOG (01)/LOG (EXP(K01))

Relational Computation

The types of data that can be used in equations are measured data, computed data, constants (K01 to K30), communication interface data (C01 to C12), and the remote control terminal conditions (D01 to D08). You can specify a computing equation that performs relational computation on a computing element (Example: 01.LT.ABS(02)).

EXAMPLE:

02.LT.03

The computed result will be “1” if the measured value of channel 2 is less than the measured value in channel 3, otherwise the value will be “0.”

02.GT.03

The computed result will be “1” if the measured value of channel 2 is greater than the measured value in channel 3, otherwise the value will be “0.”

02.EQ.03

The computed result will be “1” if the measured value of channel 2 is equal to the measured value in channel 3, otherwise the value will be “0.”

02.NE.03

The computed result will be “1” if the measured value of channel 2 is not equal to the measured value in channel 3, otherwise the value will be “0.”

02.GE.03

The computed result will be “1” if the measured value of channel 2 is greater than or equal to the measured value in channel 3, otherwise the value will be “0.”

02.LE.03

The computed result will be “1” if the measured value of channel 2 is less than or equal to the measured value in channel 3, otherwise the value will be “0.”

Logical Computation

The computation is performed using e1 and e2 which are identified as either “zero” or “non zero”. The types of data that can be used in equations are measured data, computed data, constants (K01 to K30), communication interface data (C01 to C12), and the remote control terminal conditions (D01 to D08). You can specify a computing equation that performs logical computation on a computing element.

AND Logical product

Syntax:e1ANDe2

Condition: If both e1 and e2 are “non 0”, the operation results in “1”, otherwise in “0.”

Status:

e1 = 0, e2 = 0
e1ANDe2 = 0

e1 ≠ 0, e2 = 0
e1ANDe2 = 0

e1 = 0, e2 ≠ 0
e1ANDe2 = 0

e1 ≠ 0, e2 ≠ 0
e1ANDe2 = 1

OR Logical sum

Syntax:e1ORe2

Condition: If both e1 and e2 are “0”, the operation results in “0”, otherwise in “1.”

Status: e1 = 0, e2 = 0
e1ORe2 = 0

e1 ≠ 0, e2 = 0
e1ORe2 = 1

e1 = 0, e2 ≠ 0
e1ORe2 = 1

e1 ≠ 0, e2 ≠ 0
e1ORe2 = 1

XOR Mutually exclusive logical sum

Syntax:e1XORe2

Condition: If e1 and e2 have different values, the operation results in “1”, otherwise in “0.”

Status: e1 = 0, e2 = 0
e1XORe2 = 0

e1 ≠ 0, e2 = 0
e1XORe2 = 1

e1 = 0, e2 ≠ 0
e1XORe2 = 1

e1 ≠ 0, e2 ≠ 0
e1XORe2 = 0

NOT Logical negation

Syntax:NOTe1

Condition: Reverses the value of data e1

Status: e1 = 0 NOTe1 = 1
e1 ≠ 0 NOTe1 = 0

EXAMPLE:

01-02OR03.GT.04

Determines the OR of the computed results of “01-02” and “03.GT.04.”

TLOG Computation (MAX, MIN, AVE, SUM, MAX–MIN)

Only measured data and computed data can be used in the TLOG computation. In the explanation below, e1 is used to represent a measurement or computation channel. You cannot specify an equation that contains a computing element inside e1. In addition, only one TLOG computation can be specified in a single computing equation.

TLOG.MAX ( )

Syntax: TLOG.MAX (e1)
Result: Computes the maximum value of channel e1

TLOG.MIN ( )

Syntax: TLOG.MIN (e1)
Result: Computes the minimum value of channel e1

TLOG.AVE ( )

Syntax: TLOG.AVE (e1)
Result: Computes the average value of channel e1

TLOG.SUM ( )

Syntax: TLOG.SUM (e1)
Result: Computes the summation of channel e1

TLOG.P-P ( )

Syntax: TLOG.P-P (e1)
Result: Computes the maximum value – minimum value of channel e1

An Example of Computing Equations

TLOG.MAX(01)+K01*SQR(02)

Examples of Computing Equations That Are Not Allowed

TLOG.AVE(01)+TLOG.AVE(02)
Reason: TLOG appears twice in one equation.

TLOG.AVE(ABS(01))
Reason: A computing element is used inside the parentheses.

Appendix 3 Pulse Measurement Setting Example (Pulse Sum Value Reset If It Exceeds a Fixed Value) (/PM1 Option)

This is a description of how to enter settings so that the pulse sum value will reset if it exceeds a previously set value.

Application

Pulse Sum Value Reset

The pulse sum value resets if it exceeds a previously set value (reset value), and the original value is carried over after the reset.

Reset Count

Counts the number of times the reset occurs. This value can be used to calculate the total sum value up to that count. See “Calculating the Total Sum Value” on the next page.

Equation

Assign computation channels as shown below, then enter equations and constants.

Note

- In a single scan interval, calculation is performed on numbered channels in the order from smallest to largest. You must arrange channel numbers and uses according to the table below. For details, see the Note on the next page.
- If the scan interval’s pulse input value is larger than the reset value, computation cannot be performed.

Channel	Equation	Uses
31	D6	No. of pulses per scan interval
32	((34+31).GE.K01)+32	Pulse sum value reset count
33	((34+31).GE.K01)*((34+31)-K01)	No. of pulses exceeding the reset value
34	((34+31).LT.K01)*(34+31)+33	Pulse sum value

Constants	Uses
K01	Reset value (pulse sums exceeding this value are reset)

Channel 32_Reset Count

Equation: ((34+31).GE.K01)+32

Calculates the number of times the pulse sum value was reset.
((34+31).GE.K01) is 1 if the pulse sum value (34+31) is greater than or equal to the reset value (K01), otherwise it is 0. The value of channel 32 increments by 1 when the pulse sum value exceeds the reset value.

Channel 33_No. of Pulses Exceeding the Reset Value

Equation: ((34+31).GE.K01)*((34+31)-K01)

If a pulse sum value exceeded the reset value, calculates the number of pulses that exceeded the reset value.
((34+31).GE.K01) is 1 if the pulse sum value (34+31) is greater than or equal to the reset value (K01), otherwise it is 0. The number of pulses that exceeded the reset value is calculated by taking the difference between the sum value and the reset value and multiplying it by this value.

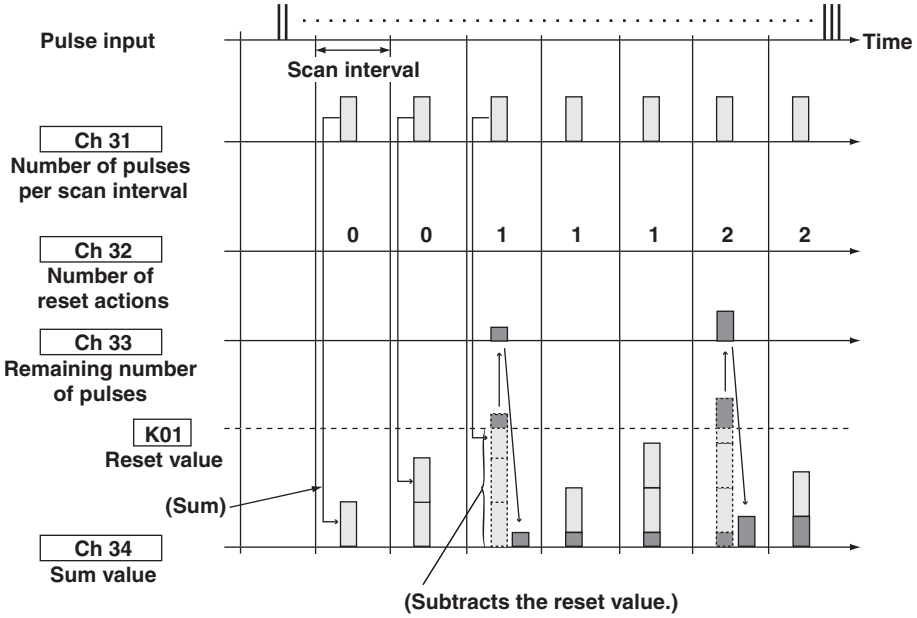
Channel 34_Pulse Sum Value

Equation: ((34+31).LT.K01)*(34+31)+33

Calculates the pulse sum value.

((34+31).LT.K01) is 1 if the pulse sum value (34+31) is less than the reset value (K01), otherwise it is 0. This pulse sum value is calculated by multiplying this value by the pulse sum value (34+31) and adding the number of pulses exceeding the reset value calculated on channel 33.

Operation Diagram



Total Sum Value Calculation

To calculate the total sum value, use channel numbers higher than the numbers of the pulse sum value channels.

Equation for figuring the total sum value: K01*32+34

The total sum value is the product of the reset value (K01) and the reset count (32) plus the pulse sum value (34).

Note

Previously Calculated Value and Current Calculated Value

The calculation is performed in order starting from the smallest numbered channels.

- If channel numbers in equations are smaller than the channel numbers of channels for setting equations, the current calculated result (current value) is used for the channel numbers in equations.
- If channel numbers in equations are greater than or equal to the channel numbers of channels for setting equations, the previously calculated result (previous value) is used for the channel numbers in equations.

  Example Equation for CH32: 32+31

  31 was already calculated, so the current value is used.

  32 has not yet been calculated, so the previous value is used.

Appendix 4 Types of Data Created on the FX100 and Their Uses

This section explains how to use data created on the FX100.

Data	Acquisition to the Internal Memory	When Saving to the External Storage Medium File Name.Extension[*1]	Format	Display Using FX100	DAQ	Appli.
Display data	Yes	Mddhhmma.DDS	BINARY (Undisclosed)	Yes	Yes	Yes[*1*2]
Event data	Yes	Mddhhmma.DEV	BINARY (Undisclosed)	Yes	Yes	Yes[*1*2]
Report data	Yes	Mddhhmma.DHR (hourly) Mddhhmma.DDR (daily) Mddhhmma.DWR (weekly) Mddhhmma.DMR (monthly)	ASCII (see appendix 5)	Yes	Yes	Yes
Manual sampled data	Yes	Mddhhmma.DMN	ASCII (see *appendix 5*)	-	-	Yes
TLOG data	Yes	Mddhhmma.DTG	BINARY (Undisclosed)	-	Yes	Yes[*2]
Setup data	Yes	(specified string).PNL	BINARY (Undisclosed)	Yes	Yes	-
Alarm summary	Yes	-	-	Yes	Yes	Yes[*2]
Message summary	Yes	-	-	Yes	Yes	Yes[*2]
Screen image data	No	Mddhhmma.PNG	PNG (general format)	-	-	Yes

DAQ: DAQSTANDARD
Appli: Application program

*1 If the data format is converted using DAQSTANDARD, it can be viewed on common software applications such as Microsoft Excel.

*2 With the communication function (optional), you can read data from the FX100 and view it using application software.

File Name

- **Mddhhmm denotes the date and time.**
  Mddhhmm of setup data and screen image data is the date and time the file was created.
  Mddhhmm of other data is the date and time the first data was sampled.
  M: Month (1-9, X (October), Y (November), Z (December), dd: day, hh: hour, mm: minute
- **"a" denotes the last digit of the year (0 to 9).**
  However, "a" becomes a sequence number for the following case. It takes a value between A and Z.
  For example, if the acquisition of the display data is started and stopped, and started again within 1 minute by pressing the START key, the two file names are the same up to Mddhhmm (month, day, hour, and minute). In this case, the second file is assigned the sequence number A.
  Example: 70112563.DDS
  7011256A.DDS
  Two display data files which sampling started on July 1st, 2003 at 12:56.

Appendix 5 Data Formats of ASCII Files

This section describes the data format of the ASCII file. The FX100 creates two types of ASCII files and the manual sampled data file.

Data Format of the Manual Sampled Data File

- The manual sampled data are output in ASCII format using values and strings that are separated by commas.
- The channel/tag, unit, and manual sampled values are not output for channels in which the input range is set to [Skip] or for which the computation is turned OFF.
- The manual sampled data are appended to the file for each manual sample operation.

Syntax

```
"MANUAL SAMPLE DATA"CRLF
"Model Serial No.:","IIIIIIIIIIIIIIII"CRLF
"File Header:","HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH"CRLF
"CH/TAG","ccccccccccccccc","ccccccccccccccc",···,"ccccccccccccccc"CRLF
"UNIT","uuuuuu","uuuuuu",···,"uuuuuu"CRLF
yyyy/mo/dd hh:mi:ss,nnn···n,nnn···n,···,nnn···nCRLF
```

III···I	Serial number of the FX100 (16 characters)
HHH···H	File header (32 characters)
ccc···c	Channel number or tag name (16 characters)
uuuuuu	Unit (6 characters)
yyyy/mo/dd	Date when the setup file is created
hh:mi:ss	Time when the setup file is created
nnn···n	Measured/computed value (measured value: 8 characters, computed value: 10 characters)

File Output Example

The following example shows a file that contains manual sampled data from channels 1, 2, 3, and 4.

```
“MANUAL SAMPLE DATA”
“Model Serial No.:”, “12A338617       ”
“File Header : ”, “Process1-Lot2                  ”
“CH/TAG”, “CH01          ”, “CH02          ”, “CH03          ”, “CH04          ”
“UNIT”, “V     ”, “V     ”, “V     ”, “mV    ”
2000/01/01 01:08:43, 0.000, 0.000, 0.000, -14.00
2000/01/01 01:08:48, 0.000, 0.000, 0.000, -14.00
2000/01/01 01:09:15, 0.000, 0.000, 0.000, -14.00

“CH/TAG”, 1 “CH01          ”, “CH02          ”, “CH03          ”, “CH04          ”
“UNIT”, “V     ”, “V     ”, “V     ”, “V     ”
2000/01/01 01:15:30, 0.000, 0.000, 0.000, -0.014
2000/01/01 01:18:12, 0.000, 0.000, 0.000, -0.014
```

Note

- Output value when detected erroneous data, measurement over range data, or computation overflow data

Channels	Data	Output value
Measurement channels	measurement error	Blank
	positive (+) over range (including burnout)	99999
	negative (–) over range (including burnout)	–99999
Computation channels	computation error	999999999
	positive (+) computation overflow	999999999
	negative (–) computation overflow	–99999999

- CH/TAG and UNIT lines
  In the following cases, both the CH/TAG line and the UNIT line are rewritten after a carriage return line feed and followed by manual sampled data.
  - When the measurement channel is switched from some setting other than [Skip] to [Skip].
  - When the measurement channel is switched from [Skip] to some other setting.
  - When the computation channels are turned On or turned Off.
  - When the unit is changed.

  Four lines from the bottom of the file example shows the output when the unit for channel 31 is changed from “mV” to “V.”

Data Format of the Report File

- The hourly, daily, weekly, and monthly reports are output in ASCII format using values and strings that are separated by commas.
- The channel/tag, unit, average value, maximum value, minimum value, and sum value are not output for channels in which the input range is set to [Skip] or for which the computation is turned OFF.
- The report data are appended to the file at each time interval.

Syntax

```
"TTT··T REPORT","START TIME",YYYY/MO/DD HH:MICRLF
"Model Serial No.:","IIIIIIIIIIIIIIII"CRLF
"File Header:","HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH"CRLF
"CH/TAG","ccccccccccccccc","ccccccccccccccc",···,"ccccccccccccccc"CRLF
"UNIT","uuuuuu","uuuuuu",···,"uuuuuu"CRLF
CRLF
yyyy/mo/dd hh:mi,eeeeeeee,eeeeeeee,···,eeeeeeeeCRLF
"AVE",nnnnnnnnnnnnn,nnnnnnnnnnnnn,···,nnnnnnnnnnnnnCRLF
"MAX",nnnnnnnnnnnnn,nnnnnnnnnnnnn,···,nnnnnnnnnnnnnCRLF
"MIN",nnnnnnnnnnnnn,nnnnnnnnnnnnn,···,nnnnnnnnnnnnnCRLF
"SUM",nnnnnnnnnnnnn,nnnnnnnnnnnnn,···,nnnnnnnnnnnnnCRLF
```

TTT···T	Title (HOURLY, DAYLY, WEEKLY, or MONTHLY)
YYYY/MO/DD	Date the report started
HH:MI	Time the report started
III···I	Serial number of the FX100 (16 characters)
HHH···H	File header (32 characters)
ccc···c	Channel number or tag name (16 characters)
uuuuuu	Unit (6 characters)
eeeeeeee	Status of the data used
	E **Error** data
	O **Over range** or **computation overflow**
	P **Power** failure
	C Time **change**
yyyy/no/dd	Date the report is created
hh:mi	Time the report is created
nnn···n	Report value (13 digits)

File Output Example

The following example shows the daily report for four channels.

```
“DAILY REPORT”, “START TIME”, 2000/01/31 20:00
“Model Serial No.:”, “12A338617       ”
“File Header:”, “Process1-Lot2                    ”
“CH/TAG”, “CH01            ”, “CH02            ”, “CH03            ”, “CH04
”
“UNIT”, “V     ”, “V     ”, “V     ”, “V     ”

2000/01/01 00:00, “       C”, “       C”, “       C”, “       C”
“AVE”,         0.00,         0.10,         0.20,         0.30
“MAX”,         0.00,         1.00,         2.00,         3.00
“MIN”,         0.00,        -1.00,        -2.00,        -3.00
“SUM”, 0.000000E-01, 1.000000E+04, 2.000000E+04, 3.000000E+04
```

Note

- When the measurement and computation channel data enter the condition described in the following table, status “E” , “O”, and “B” are output in the report.

Data Condition	Status
Common to measurement and computation channels	
Measurement error or computation error	E
For measurement channels	
Positive (+) over range	O
Negative (–) over range	O
Burnout	B
For computation channels	
Positive (+) computation overflow (when the value exceeds 3.4E + 38)	O
Negative (–) computation overflow (when the value falls below –3.4E + 38)	O

- Measurement/computation errors are discarded when MAX and MIN are determined.
- Measurement/computation errors, over range, and computation overflow are discarded when determining AVE and SUM.
- The report output values of AVE (or INST), MAX, MIN and SUM vary depending on the data condition of the measurement and computation channels as shown in the table below.

Item	Data Condition of Measurement Channels	Report Output Value
AVE (Average value)	When all data are measurement errors or over range	(Blank)
MAX, MIN, INST (Maximum value, minimum value, instantaneous value)	• When all data are measurement errors • Positive (+) over range • Negative (–) over range	(Blank) 99999 –99999
SUM (Sum value)	• When all data are measurement errors or over range • When the sum value exceeds 3.4E + 38 • When the sum value is below –3.4E + 38	(Blank) 9.999999E + 99 –9.999999E + 99

Item	Data Condition of Computation Channels	Report Output Value
AVE (Average value)	When all data are computation errors or over range	(Blank)
MAX, MIN, INST (Maximum value, minimum value) instantaneous value)	• When all data are computation errors • When the maximum value exceeds 99999999 • When the minimum value is below –9999999	(Blank) 999999999 –99999999
SUM (Sum value)	• When all data are computation errors or computation overflow • When the sum value exceeds 3.4E + 38 • When the sum value is below –3.4E + 38	(Blank) 9.999999E + 99 –9.999999E + 99

* The decimal position that was specified when the span for the equation was specified is reflected in the maximum, minimum, and instantaneous values. For example, if the span setting of the equation is “200.0,” then “99999999” is output when the value exceeds “99999999.9” and
“–99999999” is output when the value is below “–999999.9.”

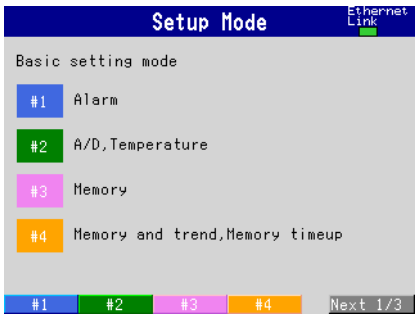
App

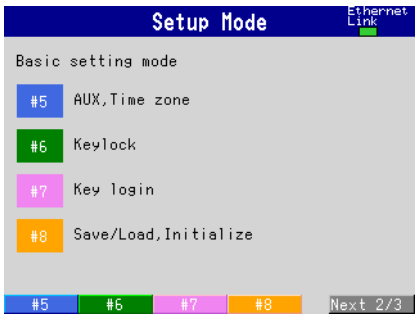
Appendix

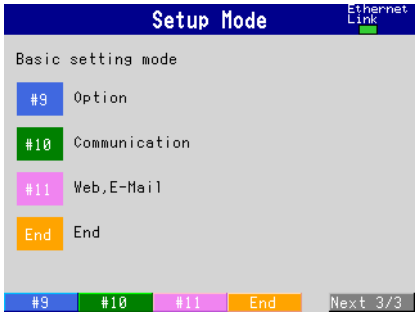
Appendix 6 List of Parameters

Below is a list of parameters for the model with the various function options.

Basic Setting Mode







#1 Alarm

Parameter	Selectable Range or Selections	Initial Value
Alarm > Reflash	On/Off	Off
Alarm > Relay > AND	None, I01, I01-I02, I01-I03, ... , or I01-I06	None
Alarm > Relay > Action	Energize or De_energize	Energize
Alarm > Relay > Behavior	Hold or Nonhold	Nonhold
Alarm > Indicator	Hold or Nonhold	Nonhold
Alarm > Rate of change > Increase/Decrease	1 to 15	1
Alarm > Hysteresis	On/Off	On

#2 A/D, Temperature

Parameter	Selectable Range or Selections	Initial Value
A/D > Integrate	FX103: Auto, 50 Hz, or 60 Hz	Auto
	FX106/FX112: Auto, 50 Hz, 60 Hz, or 100 ms	Auto
A/D > Scan interval	FX103: 250 ms	250 ms
	FX106/FX112: 1 s or 2 s	1 s
A/D > First-CH	01 to 12	01
A/D > Last-CH	01 to 12	01
A/D > Burnout set	Off, Up, or Down	Off
A/D > RJC	Internal or External	Internal
A/D > Volt (uV)	–20000 μV to 20000 μV	0 μV
Temperature > Unit	C or F	C

#3 Memory

Parameter	Selectable Range or Selections	Initial Value
Memory > Save	Manual or Auto	Auto
Memory > Data	Display, E+D, or Event	Display
Memory > Event > Sample rate	FX103: 250 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 30 s, 60 s, 120 s, 300 s, or 600 s	250 ms
	FX106/FX112: 1 s, 2 s, 5 s, 10 s, 30 s, 60 s, 120 s, 300 s, or 600 s	1 s
Memory > Event > Mode	Free, Trigger, or Rotate	Trigger
Memory > Event > Block	1, 2, 4, 8, or 16	1
Memory > Event > Data length	3 minutes to 31 days	1 h
Memory > Event > Pre-trigger	0, 5, 25, 50, 75, 95, or 100	0
Memory > Event > Trigger > Key	On/Off	On
Memory > Event > Trigger > External	On/Off	Off
Memory > Event > Trigger > Alarm	On/Off	Off

#4 Memory and Trend, Memory Timeup

Parameter	Selectable Range or Selections	Initial Value
Memory and trend > Meas CH/Math CH[1]	Meas CH, Math CH[1]	Meas CH
Memory and trend > First-CH	Meas CH: 01 to 12, Math CH[1]: 31 to 42	01
Memory and trend > Last-CH	Meas CH: 01 to 12, Math CH[1]: 31 to 42	01
Memory and trend > On/Off	On/Off	On
Memory timeup > Timeup type	Off, Hour, Day, Week, or Month	Off
Memory timeup > Date	1 to 28	1
Memory timeup > Time (hour)	0 to 23	0

[1] /M1 or /PM1 option

#5 Aux, Time zone

Parameter	Selectable Range or Selections	Initial Value
AUX > Tag/Channel	Tag or Channel	Channel
AUX > Memory alarm	Off, 1 h, 2 h, 5 h, 10 h, 20 h, 50 h, or 100 h	1 h (Off on models with no drive)
AUX > Language	English, Japanese, German, French, Chinese, Spanish, or Italian	English
AUX > Partial	Use/Not	Not
Time zone > Difference from GMT	–1200 to 1200	0
Media FIFO	On/Off	Off, only for models with a CF memory card slot

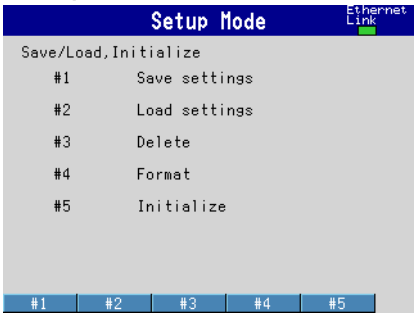
#6 Keylock

Parameter	Selectable Range or Selections	Initial Value
Keylock > Use/Not	Use/Not	Not
Keylock > Password	Up to 6 alphanumeric characters	–
Keylock > Keys such as START	Free or Lock	Free
Keylock > ALARM ACK	Free or Lock	Free
Keylock > Math	Free or Lock	Free
Keylock > Write memory	Free or Lock	Free
Keylock > Media	Free or Lock	Free

#7 Key login

Parameter	Selectable Range or Selections	Initial Value
Key login > Use/Not	Use/Not	Not
Key login > Auto logout	On/Off	Off
Key login > UserID Use/Not	Use/Not	Not
Key login > Number	1, 2, 3, 4, 5, 6, or 7	1
Key login > On/Off	On/Off	On
Key login > User name	Up to 16 alphanumeric characters	user1
Key login > User ID	Up to 4 alphanumeric characters	1
Key login > Password	Up to 6 alphanumeric characters	–
Key login > Enter setup	Enable or Disable	Enable

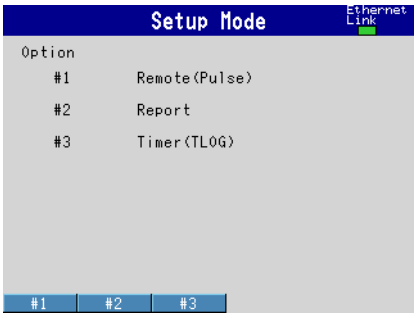
#8 Save/Load, Initialize ([#8 Initialize] on models with no storage medium drive)



Parameter	Selectable Range or Selections	Initial Value
Save/Load, Initialize > #1 Save settings	–	–
Save/Load, Initialize > #2 Load settings	–	–
Save/Load, Initialize > #3 Delete	–	–
Save/Load, Initialize > #4 Format	–	–
Save/Load, Initialize > #5 Initialize > Kind	Clear1 to Clear3	Clear3

* Only [#1 Initialize] is displayed on the models with no storage medium drive.

#9 Option



<#1 Remote> (/R1 Option)

Parameter	Selectable Range or Selections	Initial Value
Remote > Action No. 1 to No. 8	None, MemoryStart/Stop, Trigger, AlarmACK, TimeAdjust, MathStart/Stop, MathReset, Manual sample, Panel1Load, Panel2Load, Panel3Load, Message1, Message2, Message3, Message4, Message5, Message6, Message7, Message8, Snapshot	None

<#1 Remote (Pulse)> (/PM1 Option)

Parameter	Selectable Range or Selections	Initial Value
Remote (Pulse) > Action No. 1 to No. 8	None, MemoryStart/Stop, Trigger, AlarmACK, TimeAdjust, MathStart/Stop, MathReset, Manual sample, Panel1Load, Panel2Load, Panel3Load, Message1, Message2, Message3, Message4, Message5, Message6, Message7, Message8, Snapshot, Pulse	No.1 to 5: None No.6 to 8: Pulse

<#2 Report> (/M1 or /PM1 Option)

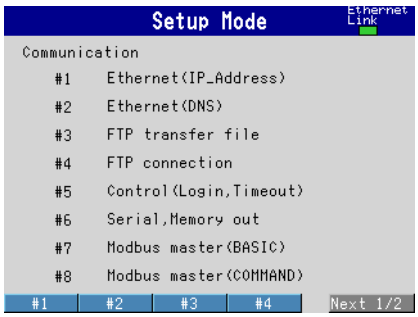
Parameter	Selectable Range or Selections	Initial Value
Report > Report set	Off, Hour, Day, Hour+Day, Day+Week, or Day+Month	Off
Report > Ave/Inst	Ave or Inst	Ave
Report > Date[1]	1 to 28	1
Report > Day of the week[2]	SUN, MON, TUE, WED, THU, FRI, or SAT	SUN
Report > Time(hour)	0 to 23	0
Report > Report CH	R01 to R12	R01
Report > Off/On	On/Off	On
Report > Channel	01 to 12, 31 to 42	01
Report > Sum scale	Off, /s, /min, /h, or /day	/s

[1] When the report type is monthly report
[2] When the report type is weekly report

<#3 Timer (TLOG)> (/M1 or /PM1 Option)

Parameter	Selectable Range or Selections	Initial Value
Timer(TLOG) > No.	1 to 3	1
Timer(TLOG) > Mode	Off, Relative, or Absolute	1: Absolute 2 and 3: Off
Timer(TLOG) > Interval (for Absolute)	1 min, 2 min, 3 min, 4 min, 5 min, 6 min, 10 min, 12 min, 15 min, 20 min, 30 min, 1 h, 2 h, 3 h, 4 h, 6 h, 8 h, 12 h, or 24 h	1 h
Timer(TLOG) > Interval (for Relative)	00:01 to 24:00	01:00
Timer(TLOG) > Ref.time (for Absolute)	0:00 to 23:00	0:00
Timer(TLOG) > Reset	On/Off	Off
Timer(TLOG) > Action	Off or DataSave	Off

#10 Communication



<#1 Ethernet (IP_Address)> (/C7 Option)

Parameter	Selectable Range or Selections	Initial Value
Ethernet (IP_Address) > IP-address	–	0.0.0.0
Ethernet (IP_Address) > Subnet mask	–	0.0.0.0
Ethernet (IP_Address) > Default gateway	–	0.0.0.0

<#2 Ethernet (DNS)> (/C7 Option)

Parameter	Selectable Range or Selections	Initial Value
Ethernet (DNS) > DNS On/Off	On/Off	Off
Ethernet (DNS) > Server search order > Primary	–	0.0.0.0
Ethernet (DNS) > Server search order > Secondary	–	0.0.0.0
Ethernet (DNS) > Host name	Up to 64 alphanumeric characters	–
Ethernet (DNS) > Domain name	Up to 64 alphanumeric characters	–
Ethernet (DNS) > Domain suffix search order > Primary	Up to 64 alphanumeric characters	–
Ethernet (DNS) > Domain suffix search order > Secondary	Up to 64 alphanumeric characters	–

<#3 FTP transfer file> (/C7 Option)

Parameter	Selectable Range or Selections	Initial Value
FTP transfer file > Disp&Event data	On/Off	Off
FTP transfer file > Report	On/Off	Off
FTP transfer file > Snapshot	On/Off	Off

<#4 FTP connection> (/C7 Option)

Parameter	Selectable Range or Selections	Initial Value
FTP connection	Primary or Secondary	Primary
FTP connection > FTP server name	Up to 64 alphanumeric characters	–
FTP connection > Port number	1 to 65535	21
FTP connection > Login name	Up to 32 alphanumeric characters	–
FTP connection > Password	Up to 32 alphanumeric characters	–
FTP connection > Account	Up to 32 alphanumeric characters	–
FTP connection > PASV mode	On/Off	Off
FTP connection > Initial path	Up to 64 alphanumeric characters	–

<#5 Control (Login, Timeout)> (/C7 Option)

Parameter	Selectable Range or Selections	Initial Value
Ethernet login > Use/Not	Use/Not	Not
Ethernet login > Level	admin, user1, user2, user3, user4, user5, or user6	admin
Ethernet login > Level > On/Off	On/Off	On
Ethernet login > Level > User name	Up to 16 alphanumeric characters	admin
Ethernet login > Level > Password	Up to 6 alphanumeric characters	0
Application time out	On/Off	Off
Application time out > Time	1 to 120	1 min
Keep alive	On/Off	On

<#6 Serial, Memory out> ([#1] on models without /C7) (/C2 or /C3 Option)

Parameter	Selectable Range or Selections	Initial Value
Serial > Baud rate	1200, 2400, 4800, 9600, 19200, or 38400 bps	9600 bps
Serial > Data length	7 or 8	8 bit
Serial > Parity	Odd, Even, and None	Even
Serial > RS-232 > Handshaking	Off:Off, XON:XON, XON:RS, or CS:RS	Off:Off
Serial > RS-422/485 > Address	1 to 32	1
Serial > Protocol	Normal, Modbus, Modbus-M	Normal
Memory output	Ethernet or Serial	Ethernet

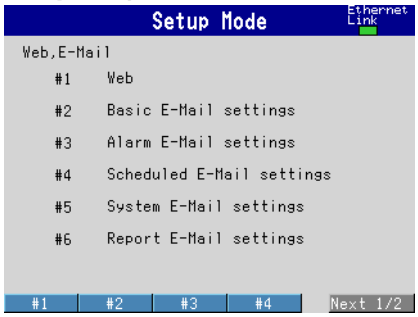
<#7 Modbus master (BASIC)> ([#2] on models without /C7) (/C2 or /C3 Option)

Parameter	Selectable Range or Selections	Initial Value
Basic settings > Read cycle	125 ms, 250 ms, 500 ms, 1 s, 2 s, 5 s, 10 s	1 s
Basic settings > Timeout	125 ms, 250 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, or 1 min	1 s
Basic settings > Retrials	Off, 1, 2, 3, 4, 5, 10, or 20	1

<#8 Modbus master (COMMAND)> ([#3] on models without /C7) (/C2 or /C3 Option)

Parameter	Selectable Range or Selections	Initial Value
Command settings > 1 to 8	On/Off	Off
Command settings > 1 to 8 > First, Last	C01 to C12	C01, C01
Command settings > 1 to 8 > Addr.	1 to 247	1
Command settings > 1 to 8 > Regi.	Input registers: 30001 to 39999, 300001 to 365535 Hold registers: 40001 to 49999, 400001 to 465535	30001
Command settings > 1 to 8 > Type	INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, or FLOAT_L	INT16

#11 Web, E-Mail (/C7 Option)



<#1 Web>

Parameter	Selectable Range or Selections	Initial Value
Web > Use/Not	Use/Not	Not
Web > Page type	Operator or Monitor	Operator
Web > Page type > On/Off	On/Off	Off
Web > Page type > Command	On/Off	Off
Web > Page type > Access control	On/Off	Off
Web > Page type > User name	Up to 16 alphanumeric characters	–
Web > Page type > Password	Up to 6 alphanumeric characters	–

<#2 Basic E-Mail Settings>

Parameter	Selectable Range or Selections	Initial Value
Basic E-Mail settings > SMTP server name	Up to 64 alphanumeric characters	–
Basic E-Mail settings > Port number	0 to 65535	25
Basic E-Mail settings > Recipient 1	Up to 150 alphanumeric characters	–
Basic E-Mail settings > Recipient 2	Up to 150 alphanumeric characters	–
Basic E-Mail settings > Sender	E-mail address assigned by the network administrator (up to 64 alphanumeric characters)	–

<#3 Alarm E-Mail Settings>

Parameter	Selectable Range or Selections	Initial Value
Alarm E-Mail settings > Recipient1	On/Off	Off
Alarm E-Mail settings > Recipient2	On/Off	Off
Alarm E-Mail settings > Alarm1 to 4	On/Off	Off
Alarm E-Mail settings > Include instantaneous value	On/Off	Off
Alarm E-Mail settings > Include source URL	On/Off	Off
Alarm E-Mail settings > Subject	Up to 32 alphanumeric characters	Alarm_summary
Alarm E-Mail settings > Header1	Up to 64 alphanumeric characters	–
Alarm E-Mail settings > Header2	Up to 64 alphanumeric characters	–

<#4 Scheduled E-Mail Settings>

Parameter	Selectable Range or Selections	Initial Value
Scheduled E-Mail settings > Recipient1	On/Off	Off
Scheduled E-Mail settings > Interval	1 h, 2 h, 3 h, 4 h, 6 h, 8 h, 12 h, or 24 h	24 h
Scheduled E-Mail settings > Ref.time	00:00 to 23:59	00:00
Scheduled E-Mail settings > Recipient2	On/Off	Off
Scheduled E-Mail settings > Interval	1 h, 2 h, 3 h, 4 h, 6 h, 8 h, 12 h, or 24 h	24 h
Scheduled E-Mail settings > Ref.time	00:00 to 23:59	00:00
Scheduled E-Mail settings > Include Include instan...	On/Off	Off
Scheduled E-Mail settings > Include source URL	On/Off	Off
Scheduled E-Mail settings > Subject	Up to 32 alphanumeric characters	Periodic_data
Scheduled E-Mail settings > Header1	Up to 64 alphanumeric characters	–
Scheduled E-Mail settings > Header2	Up to 64 alphanumeric characters	–

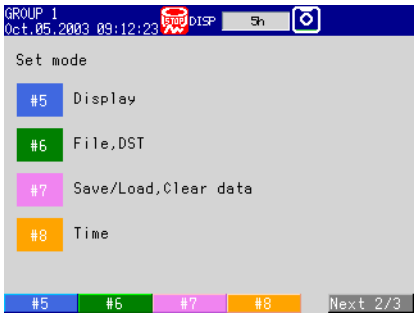
<#5 System E-Mail Settings>

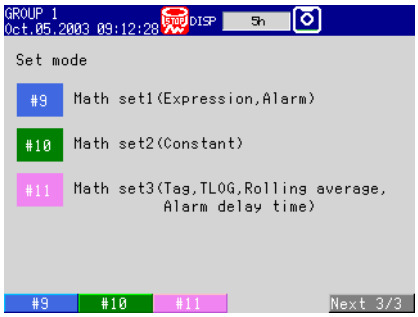
Parameter	Selectable Range or Selections	Initial Value
System E-Mail settings > Recipient1	On/Off	Off
System E-Mail settings > Recipient2	On/Off	Off
System E-Mail settings > Include source URL	On/Off	Off
System E-Mail settings > Subject	Up to 32 alphanumeric characters	System_warning
System E-Mail settings > Header1	Up to 64 alphanumeric characters	–
System E-Mail settings > Header2	Up to 64 alphanumeric characters	–

<#6 Report E-Mail Settings>

Parameter	Selectable Range or Selections	Initial Value
Report E-Mail settings > Recipient1	On/Off	Off
Report E-Mail settings > Recipient2	On/Off	Off
Report E-Mail settings > Include source URL	On/Off	Off
Report E-Mail settings > Subject	Up to 32 alphanumeric characters	Report_data
Report E-Mail settings > Header1	Up to 64 alphanumeric characters	–
Report E-Mail settings > Header2	Up to 64 alphanumeric characters	–

Setting Mode





#1 Range, Alarm

Parameter	Selectable Range or Selections	Initial Value
First-CH	01 to 12	01
Last-CH	01 to 12	01
Range > Mode	Volt, TC, RTD, Scale, Delta, DI, Sqrt, or Skip	Volt
Range > Mode ([Scale] or [Delta]) > Type	Volt, TC, RTD, or DI	Volt
Range > Range	20 mV, 60 mV, 200 mV, 2 V, 6 V, 20 V, 50 V, R, S, B, K, E, J, T, N, W, L, U, Wre, PT, JPT, PT1K[1], Level, or Cont	2 V
Range > Span_L	–	–2.000
Range > Span_U	–	2.000
Range > Mode ([Delta]) > Ref. CH	01 to 12	01
Range > Mode ([Scale] or [Sqrt]) > Scale_L, Scale_U	–30000 to 30000 (decimal point: within 4 digits to the right of the decimal point)	Scale_L: 0.00 Scale_U: 200.00
Range > Mode ([Scale] or [Sqrt]) > Unit	Up to 6 alphanumeric characters	–
Alarm > 1 to 4	On/Off	Off
Alarm > Type	H: Upper limit, L: Lower limit, R: Upper limit on rate-of-change, r: Lower limit on rate-of-change, T: Delay upper limit, t: Delay lower limit, h: Difference upper limit, l: Difference lower limit	H
Alarm > Value	–	0.000
Alarm > Rly	On/Off	Off
Alarm > No.	I01 to I06	I01

[1] /N3 option

#2 Tag, Moving average (or Filter), Alarm delay time

Parameter	Selectable Range or Selections	Initial Value
First-CH	01 to 12	01
Last-CH	01 to 12	01
Tag	Up to 16 alphanumeric characters	–
FX103: Filter >Filter	Off, 2s, 5s, 10s	Off
FX106/FX112: Moving average > Count	Off, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, or 16	Off
Alarm delay time	1 s to 3600 s	10 s

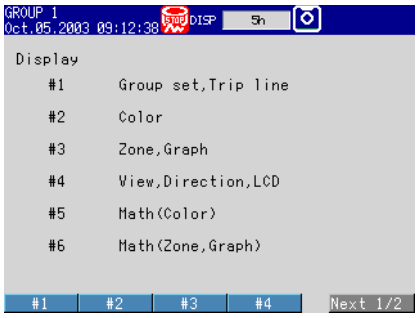
#3 Trend/Save interval, User key

Parameter	Selectable Range or Selections	Initial Value
Trend/Save interval > Time/div	1 min, 2 min, 5 min, 10 min, 15 min, 20 min, 30 min, 1 h, 2 h, 4 h, or 10 h	1 min
Trend/Save interval > Auto save interval	10 minutes to 31 days	1 h
USER key > Action	None, Trigger, AlarmACK, MathStart/Stop, MathReset, ManualSample, Message1 - Message8, Snapshot, or Media	AlarmACK

#4 Message

Parameter	Selectable Range or Selections	Initial Value
Message > Characters No. 1 to No. 8	Up to 16 alphanumeric characters	–

#5 Display



<#1 Group set, Trip line>

Parameter	Selectable Range or Selections	Initial Value
Group number	1 to 4	1
Group set > Group name	Up to 16 alphanumeric characters	GROUP 1
Group set > CH set	01 to 12, 31 to 42 (computation channels[1])	01-03, 01-06, or 07-12
Group set > Trip line > No. 1 to No. 4	On/Off	Off
Group set > Trip line > Position	0% to 100%	100%
Group set > Trip line > Color	Red, green, blue, blue violet, brown, orange, yellow-green, light blue, violet, gray, lime, cyan, dark blue, yellow, light gray, or purple	No.1: Red, No.2: Green, No.3: Blue, No.4: Yellow

[1] /M1 or /PM1 option

<#2 Color>

Parameter	Selectable Range or Selections	Initial Value
Color > CH1	Red, green, blue, blue violet, brown, orange, yellow-green, light blue, violet, gray, lime, cyan, dark blue, yellow, light gray, or purple	Red
Color > CH2	Same as above	Green
Color > CH3	Same as above	Blue
Color > CH4	Same as above	Blue-violet
Color > CH5	Same as above	Brown
Color > CH6	Same as above	Orange
Color > CH7	Same as above	yellow-green
Color > CH8	Same as above	light blue
Color > CH9	Same as above	violet
Color > CH10	Same as above	gray
Color > CH11	Same as above	lime
Color > CH12	Same as above	cyan

<#3 Zone, Graph(, Partial)>

Parameter	Selectable Range or Selections	Initial Value
First-CH	01 to 12	01
Last-CH	01 to 12	01
Zone > Lower	0% to 95%	0%
Zone > Upper	5% to 100%	100%
Graph > Division	4, 5, 6, 7, 8, 9, 10, 11, 12, or C10	10
Graph > Bar graph	Normal or Center	Normal
Graph > Scale position	Off or 1 to 6	1
Partial	On/Off	Off
Partial > Expand	1% to 99%	50%
Partial > Boundary	Minimum span value + 1 digit to maximum span value – 1 digit (for channels set to a range other than scale or square root computation) or minimum scale value + 1 digit to maximum scale value – 1 digit (for channels set to scale or square root computation)	–

<#4 View, Direction, LCD>

Parameter	Selectable Range or Selections	Initial Value
View > Direction > Trend	Horizontal, Vertical, or Horizon2	Vertical
View > Direction > Bar graph	Horizontal or Vertical	Vertical
View > Background	White or Black	White
View > Trend line	1, 2, or 3 dots	2 dots
View > Trip line	1, 2, or 3 dots	2 dots
View > Grid	Auto, 4 div, 5 div, 6 div, 7 div, 8 div, 9 div, 10 div, 11 div, or 12 div	10 div
View > Scroll time	5 s, 10 s, 20 s, 30 s, 1 min	5s
View > Scale digit	Normal or Fine	Normal
LCD > Brightness	1 to 8	2
LCD > Saver	NotOn/Dimmer/TimeOff	NotOn
LCD > Saver > Time	1 min, 2 min, 5 min, 10 min, 30 min, or 1 h	1 h
LCD > Saver > Restore	Key or Key+Alm	Key+Alm

<#5 Math (Color)> (/M1 or /PM1 option)

Parameter	Selectable Range or Selections	Initial Value
Math (Color) > CH31	Red, green, blue, blue violet, brown, orange, yellow-green, light blue, violet, gray, lime, cyan, dark blue, yellow, light gray, or purple	Red
Math (Color) > CH32	Same as above	Green
Math (Color) > CH33	Same as above	Blue
Math (Color) > CH34	Same as above	Blue-violet
Math (Color) > CH35	Same as above	Brown
Math (Color) > CH36	Same as above	Orange
Math (Color) > CH37	Same as above	Yellow-green
Math (Color) > CH38	Same as above	Light blue
Math (Color) > CH39	Same as above	Violet
Math (Color) > CH40	Same as above	Gray
Math (Color) > CH41	Same as above	Lime
Math (Color) > CH42	Same as above	Cyan

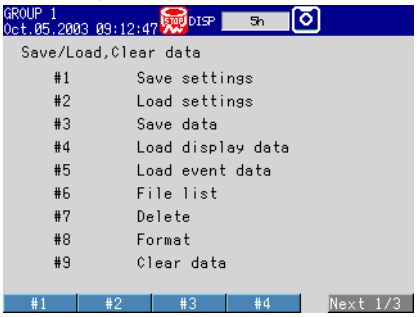
<#6 Math (Zone, Graph(, Partial)> (/M1 or /PM1 option)

Parameter	Selectable Range or Selections	Initial Value
First-CH	31 to 42	31
Last-CH	31 to 42	31
Zone > Lower	0% to 95%	0%
Zone > Upper	5% to 100%	100%
Graph > Division	4, 5, 6, 7, 8, 9, 10, 11, 12, or C10	10
Graph > Bar graph	Normal or Center	Normal
Graph > Scale position	1 to 6 or Off	1
Partial	On/Off	Off
Partial > Expand	1% to 99%	50%
Partial > Boundary	Minimum span value + 1 digit to maximum span value – 1 digit	0.00

#6 File, DST

Parameter	Selectable Range or Selections	Initial Value
File > Header	Up to 32 alphanumeric characters	–
File > Directory name	Up to 8 alphanumeric characters	DATA0
File > Save data	Unsave or All	All
Daylight saving time (YY/MM/DD HH) > Summer	Off/On	Off
Daylight saving time (YY/MM/DD HH) > Winter	Off/On	Off

#7 Save/Load, Clear data ([#7 Clear data] on models with no storage medium drive)



Parameter	Selectable Range or Selections	Initial Value
#1 Save settings	–	–
#2 Load settings	–	–
#3 Save data	–	–
#4 Load display data	–	–
#5 Load event data	–	–
#6 File list	–	–
#7 Delete	–	–
#8 Format	–	–
#9 Clear data[1]	–	–

[1] Only [#1 Clear data] is displayed on the models with no storage medium drive.

#8 Time

Parameter	Selectable Range or Selections	Initial Value
Time set > YY/MM/DD HH:MM:SS	–	–
Time set > DST	Summer or Winter	Winter

#9 Math set1 (Expression, Alarm) (/M1 or /PM1 option)

Parameter	Selectable Range or Selections	Initial Value
First-CH	31 to 42	31
Last-CH	31 to 42	31
Math	On/Off	Off
Math > Calculation expression	40 characters or less.	01
Math > Span_Lower	–9999999 to 99999999 (decimal point: within 4 digits to the right of the decimal point)	–200.00
Math > Span_Upper	–9999999 to 99999999 (decimal point: within 4 digits to the right of the decimal point)	200.00
Math > Unit	Up to 6 alphanumeric characters	–
Alarm > 1 to 4	On/Off	Off
Alarm > Type	H, L, T, or t	H
Alarm > Value	Value within the measurement span	0.00
Alarm > Rly	On/Off	Off
Alarm > No.	I01 to I06	I01

#10 Math set2 (Constant) (/M1 or /PM1 option)

Parameter	Selectable Range or Selections	Initial Value
Constant > Number	K01 to K30	K01
Constant > Value	–9.9999E+29 to –1.0000E–30, 0, 1.0000E–30 to 9.9999E+29	1

#11 Math set3 (Tag, TLOG, Rolling average, Alarm delay time) (/M1 or /PM1 option)

Parameter	Selectable Range or Selections	Initial Value
First-CH	31 to 42	31
Last-CH	31 to 42	31
Tag > Tag	Up to 16 alphanumeric characters	–
TLOG > Timer No.	1, 2, or 3	1
TLOG > Sum scale	Off, /s, /min, or /h	Off
Rolling average	On/Off	Off
Rolling average > Interval	1 s, 2 s, 3 s, 4 s, 5 s, 6 s, 10 s, 12s, 15s, 20s, 30s, 1 min, 2 min, 3 min, 4 min, 5 min, 6 min, 10 min, 12 min, 15 min, 20 min, 30 min, or 1 h	10 s
Rolling average > Number of samples	1 to 250	1
Alarm delay time	1 s to 3600 s	10 s

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