User's Manual

Model FX1002/FX1004/FX1006 /FX1008/FX1010/FX1012

FX1000™

FX1000 Paperless Recorder Communication Interface (/C2, /C3, /C7)

Introduction

Thank you for purchasing the FX1002, FX1004, FX1006, FX1008, FX1010, or FX1012 Paperless Recorder (hereafter referred to as "FX" or "FX1000").
This User's Manual contains information about the Ethernet/serial interface communication functions. To ensure correct use, please read this manual thoroughly before operation.

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.
- Copying or reproducing all or any part of the contents of this manual without YOKOGAWA's permission 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.

QR Code

The product has a QR Code pasted for efficient plant maintenance work and asset information management.
It enables confirming the specifications of purchased products and user's manuals.
For more details, please refer to the following URL.
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Revision History

1st Edition: November, 2011
2nd Edition: September, 2012
3rd Edition: November, 2015
4th Edition: June, 2020

Revision	Product	Added or Changed Features
1	Firmware version 1.00	New edition
2	Release number 2 Up to firmware version 1.1x	Italian, Spanish, Portuguese, Russian, and Korean have been added to the available display languages. Log input option has been added. Improvements to descriptions.
3	Up to firmware version 1.2x	Models with SD card slot are released. Power monitor (/PWR5 option) is added.
4	Up to firmware version 1.3x	Changed the style (H:3)

Conventions Used in This Manual

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

- **Markings**
  The following markings are used in this manual.

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

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

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

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

- **Bold characters**
  Bold text is used to represent characters and numbers that appear on the display. The ◊ symbol indicates key and menu operations.

- **High-Speed and Medium-Speed Model Groupings**
  This manual uses the terms high-speed input model and medium-speed input model to distinguish between FX models as follows:

Model	Type Model
High-speed input model	FX1002 and FX1004
Medium-speed input model	FX1006, FX1008, FX1010, and FX1012

Names and Uses of Parts and the Setup Procedures Using the Operation Keys

Front Panel

LCD
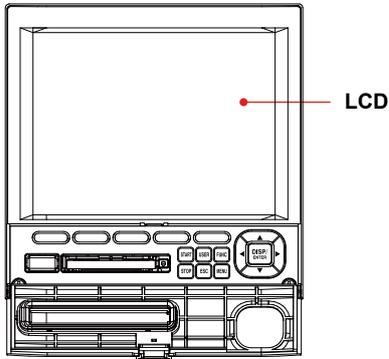
Soft keys
Press these keys to select the menu displayed on the screen.

DISP/ENTER key
Press this key to confirm the setting or to close the entry box.
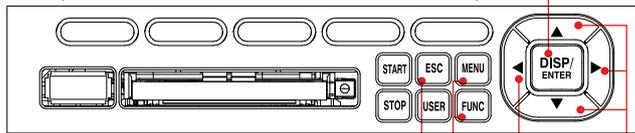
Arrow keys
Press these keys to move between setup items displayed on the screen.

MENU and FUNC keys
Press MENU, and then hold down FUNC for approximately 3 seconds to display the basic setting menu. From this menu, you can enter the communication setup menu.

ESC key
Press this key to return to the previous screen or cancel the changes that you have made to a setting.

Rear Panel

RS-232 interface connector
A serial communication connector that comes with the /C2 option

Ethernet interface connector
An Ethernet communication connector that comes with the /C7 option

RS-422A/485 interface terminal
A serial communication terminal that comes with the /C3 option

Contents

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1.1   What You Can Do with the FX1000

This section gives an overview of the communication functions that the FX can control when it is connected to a network via the Ethernet interface.

Modbus Client

- The FX acting as a Modbus client device can connect to a Modbus server device and read or write to the internal register. You can use computation channels to handle the data that you have read as the communication input data of the computation function.* You can write measured data and computed data.[1]

    1: /M1, /PM1, /PWR1, and /PWR5 options

- For details on the Modbus function codes that the FX supports, see section 6.3.
- For a description of the settings required to use this function, see section 1.10.

Modbus server device

Ethernet

FX
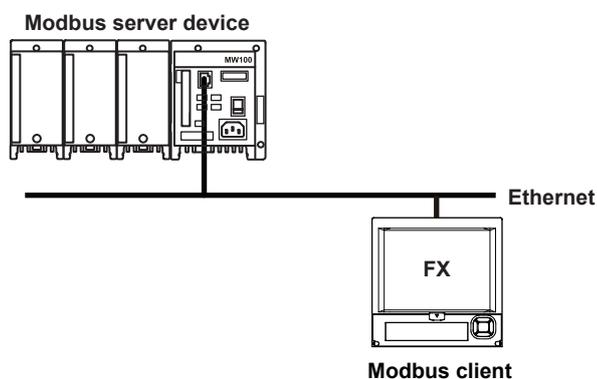
Modbus client

Modbus Server

- A Modbus client device can carry out the following operations on the FX that is operating as a Modbus server device.
  - Load data from measurement channels and computation channels[*] (using the input register)
  - Load communication input data[1] (using the hold register)
  - Write communication input data[1] (using the hold register)
  - Start and stop recording, write messages, and perform other similar operations (using the hold register)
  - Load the recording start/stop conditions and other conditions (using the hold register)
    1: /M1, /PM1, /PWR1, and /PWR5 options
- For details on the Modbus function codes that the FX supports, see section 6.3.
- For a description of the settings required to use this function, see section 1.9.

Modbus server

Modbus client device
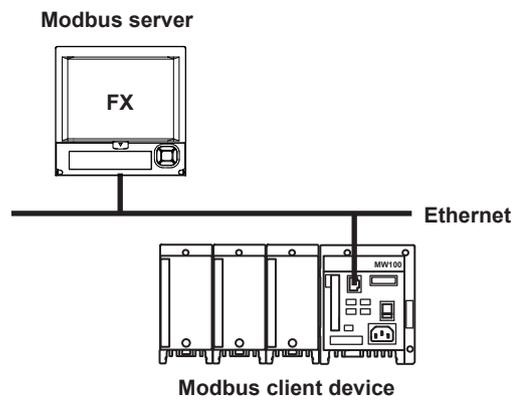
Setting/Measurement Server

- This function can be used to set almost all of the settings that can be configured using the front panel keys. However, you cannot turn the power on and off or configure the following settings:
  User registration, the key lock password, the connection destination of the FTP client function, SMTP authentication, and POP3 settings.
- The following types of data can be output.
  - Measured and computed[1] data
  - Setup channel information and setup alarm information
  - Files stored in internal memory or on external storage media.
  - Setup information and status byte.
  - A log of operation errors and communications.
  - Alarm summary and message summary.
  - Relay status information.
  The measured and computed[1] data can be output to a PC in binary or text format. The setup channel information and setup alarm information is output in binary format. Other types of data are output in text format. For a description of the data output format, see chapter 4.
    1: /M1, /PM1, /PWR1, and /PWR5 options
- For details on how to use this function, see section 1.12.
- The commands that can be used with this function are setting commands (see section 3.4), control commands (see section 3.5), basic setting commands (see section 3.6), and output commands (see sections 3.7 and 3.8).
- This function can be used when communicating through the Ethernet interface (/C7 option) or serial interface (/C2 and /C3 options).
- For information about the settings and operations for using this function through serial communications, see chapter 2.

Application timeout

This function closes the connection with the PC if there is no data transfer for a given time. For example, this function prevents a PC from being connected to the FX indefinitely without transferring data and prohibiting other users from making new connections for data transfer.

FTP Server

- You can use a PC to access the FX via FTP. You can perform operations such as retrieving directory and file lists from the external storage medium of the FX and transferring and deleting files. In addition, you can also retrieve the directory or file list and transfer files in the internal memory.
- For a description of the settings required to use this function, see section 1.6.

PC

Files on the external storage medium
Files in the internal memory

Ethernet

FTP server

FX
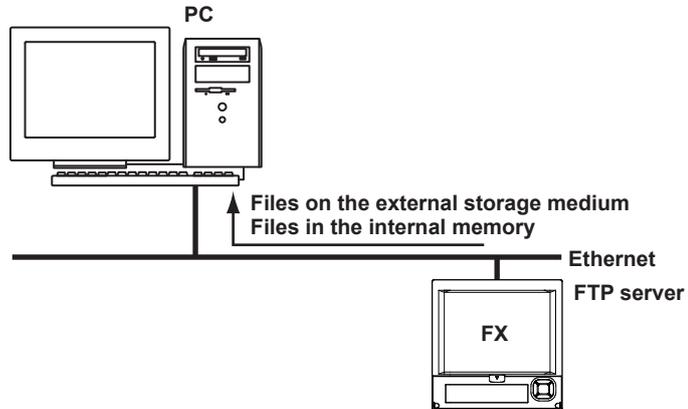
FTP Client

Automatic transferring of files

*   The display data, event data, report data (/M1, /PM1, /PWR1, and /PWR5 options), and snapshot data files that are created in the internal memory of the FX can be automatically transferred to an FTP server. The result of the transfer is recorded in the FTP log. The FTP log can be shown on the FX's display (see "Log Display" described later) or output to a PC using commands.
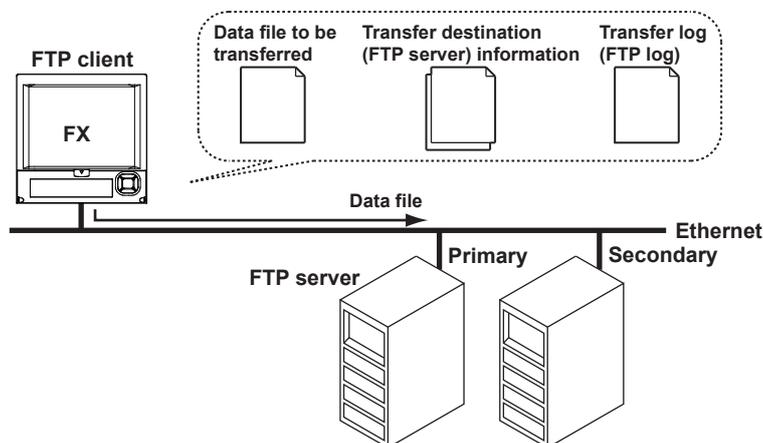
You can specify two destination FTP servers, primary and secondary. If the primary server is down, the file is transferred to the secondary server.
*   For a description of the settings required to use this function, see section 1.7.

FTP test

*   You can test whether files can be transferred by transferring a test file from the FX to an FTP server.
*   The result of the FTP test can be confirmed on the FTP log display.
*   For the procedure to use this function, see section 1.7.

Maintenance/Test Server

*   This function can be used to output connection information, network information, and other information regarding Ethernet communications.
*   The commands that can be used with this function are maintenance/test commands (see section 3.11).

Instrument Information Server

*   This function can be used to output the serial number, model name, and other information about the FX connected via the Ethernet network.
*   The commands that can be used with this function are instrument information output commands (see section 3.12).

Login

- This function can be used only when using the setting/measurement server, maintenance/test server, and the FTP server functions.
- For a description of the settings required to use this function, see the *FX1000 User's Manual*, IM 04L21B01-01EN.
- For a description of the login process of the setting/measurement server and maintenance/test server, see appendix 2.

User registration

Users are registered using the login function of the FX. There are two user levels: administrator and user.

- **Administrator**
  An administrator has privileges to use all the functions of the setting/measurement server, maintenance/test server, and FTP server. An administrator can access the operator and monitor pages through the Web server function.

- **User**
  A user has limited privileges to use the setting/measurement server, maintenance/test server, and FTP server functions. For the limitation on the commands, see section 3.2.
  - Limitations on the use of the setting/measurement server
    A user is not authorized to change the settings that would change the operation of the FX. However, a user can output measured and setting data.
  - Limitations on the use of the maintenance/test server
    A user cannot disconnect a connection between another PC and the FX.
  - Limitations on the use of the FTP server
    A user cannot save files to the external storage medium of the FX or delete files on it. A user can load files.

  A user can access the monitor page through the Web server function.

Web Server

Microsoft Internet Explorer can be used to display the FX screen on the PC.
- The following two pages are available.
  - Monitor page: Screen dedicated for monitoring.
  - Operator page: You can switch the FX screen. You can also modify and write messages.
- You can set access control (user name and password specified with the login function) on each page.
- The screen can be updated at a constant period (approximately 10 s).
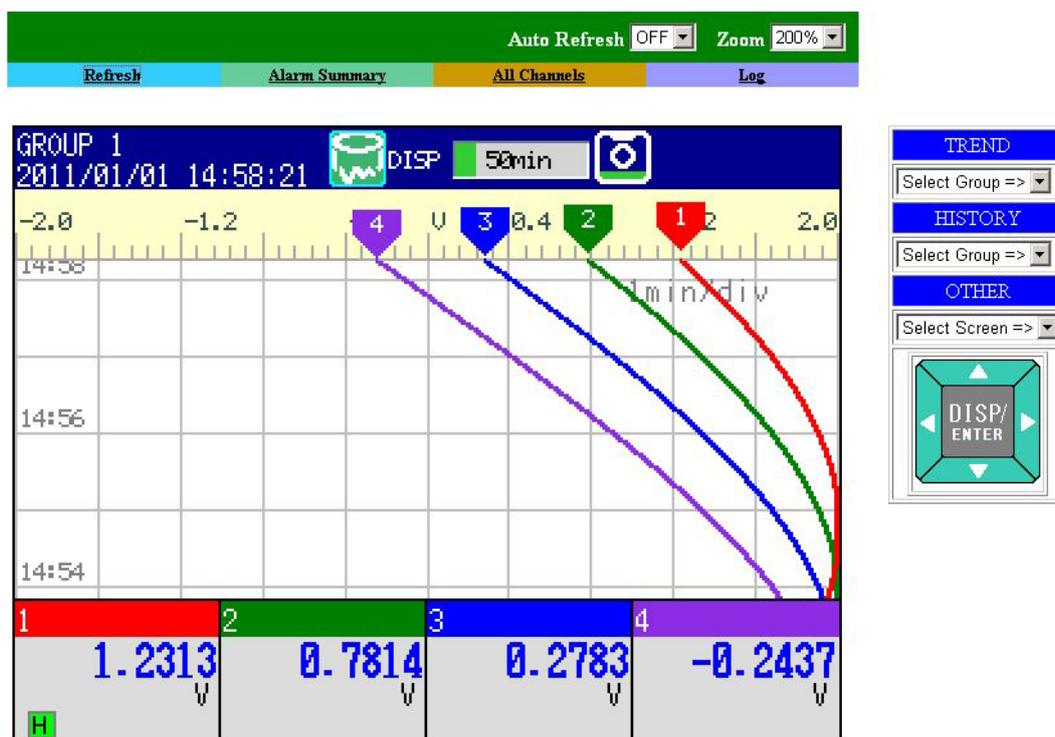
For the procedure to set the Web server function, see section 1.5.
For operations on the monitor page and operator page, see section 1.5.

E-mail Transmission

Transmitting e-mail messages

The available types of e-mails are listed below. E-mail can be automatically transmitted for each item. You can specify two groups of destinations and specify the destination for each item. In addition, you can set a header string for each item.

- Alarm mail

  Reports alarm information when an alarm occurs or clears.

- System mail

  Notifies the time of the power failure and the time of recovery when the FX recovers from a power failure.

  Notifies the detection of memory end when it is detected.

  Notifies the error code and message when a media-related error occurs (an error on the external storage medium or when the data cannot be stored due to insufficient free space on the external storage medium).

  Notifies the error code and message when an error related to FTP client (when a data transfer fails using the FTP client function) occurs.

- Scheduled mail

  Transmits an e-mail message when the specified time is reached. This can be used to confirm that the e-mail transmission function including the network is working properly. You can specify the reference time and the e-mail transmission interval for each destination.

- Report mail (only on models with the /M1, /PM1, /PWR1, or /PWR5 math option)

  Notifies the report results.

For the procedure to set the e-mail transmission function, see section 1.4.

For the e-mail transmission format, see section 1.4.

For the procedure to start/stop e-mail transmission, see section 1.4.

Example of an e-mail sent at a scheduled time

```
From: FX1000@recorder.com
Date: Sun, 2 Oct 2011 08:00:45 +0900 (JST)
Subject: Periodic_data ──────────────── Subject
To: user1@recorder.com, user2@daq.co.jp

LOOP1 ───────────────────────── Header 1
TEMPERATURE ─────────────────── Header 2

Time
Host name
FX1000

Time of transmission
10/02 08:00:01
```

E-mail test

- You can send a test message from the FX to the recipient to check that e-mails are transmitted.
- You can confirm the result of the e-mail test on the e-mail log screen.
- For the procedure to use this function, see section 1.4.

SNTP Server/Client

The client function retrieves time information from a specified SNTP server such as at the specified interval.

The server function provides time information to FXs connected to the same network.

DHCP Client

This function can be used to automatically retrieve IP addresses from a DHCP server. You can also manually request or release network information.

Other Functions

Checking the connection status of the Ethernet interface

You can check the connection status of the Ethernet interface on the rear panel or on the display of the FX.

For a description on the location and meaning of the connection status indicator, see section 1.3.

Keepalive (extension function of TCP)

This function drops the connection if there is no response to the inspection packet that is periodically transmitted at the TCP level.

For a description of the settings required to use this function, see section 1.3.

Log display

You can display operation logs on the log display. The log can also be confirmed using a communication command. In addition, the Web screen can show the log display (excluding the communication log and DHCP log).

- Error log screen: Log of operation errors
- Communication log screen: Log of communication input/output to the setting
                                measurement server
- FTP log screen :   Log of file transfers carried out using the FTP client
                                function.
- WEB log screen :   Log of operations using the Web server function
- Mail log screen :   Log of E-mail transmissions
- Login log screen: Log of logins, logouts, and items related to time
                                adjustment
- SNTP log screen :   Log of access to the SNTP server
- DHCP log screen :   Log of access to the DHCP server
- Modbus log screen :   Log of Modbus statuses (master and client operation
                                statuses)

For the operating procedure of the log screen and the details on the displayed contents, see the *FX1000 User's Manual*, IM 04L21B01-01EN. For details on the Modbus status log, see section 1.10. For details on the log output using communication commands, see section 4.2. For a description of the log display on the Web screen, see section 1.5.

1.2 Flow of Operation When Using the Ethernet Interface

Follow the flowchart below to set the Ethernet communications.

```
                        ┌──────────────────┐
                        │  Start of setting │
                        └──────────────────┘
                                  │
                        ┌──────────────────┐
                        │ Connect the connector │
                        └──────────────────┘
                                  │
                                  ▼                Automatic retrieval of the
                          ◇ IP address assignment ◇   IP address (DHCP)
                          ◇       method        ◇──────────────────────────┐
                    Fixed IP address                                        │
                                  │                                         │
                        ┌──────────────────┐            ┌──────────────────┐
                        │ Set the IP address │            │ Set the auto retrieval │
                        └──────────────────┘            │    of the DNS      │
                                  │                      └──────────────────┘
                        ┌──────────────────┐                      │
                        │ Set the subnet mask │            ┌──────────────────┐
                        └──────────────────┘            │ Automatically register │
                                  │                      │   the host name    │
                        ┌──────────────────┐            └──────────────────┘
                        │ Set the default gateway │                │
                        └──────────────────┘            ┌──────────────────┐
                                  │                      │ Set the host name  │
                        ┌──────────────────┐            └──────────────────┘
                        │ Set the host name  │                      │
                        │    (optional)     │            ┌──────────────────┐   Not specified when the DNS
                        └──────────────────┘            │ Set the domain name │   auto setting is enabled.
                                  │                      └──────────────────┘
                        ┌──────────────────┐                      │
                        │ Set the domain name │            ┌──────────────────┐   Not specified when the DNS
                        │    (optional)     │            │ Set the DNS server │   auto setting is enabled.
                        └──────────────────┘            │   search order    │
                                  │                      └──────────────────┘
                        ┌──────────────────┐                      │
                        │ Set the DNS server │                     │
                        │   search order    │                     │
                        └──────────────────┘                     │
                                  │◄────────────────────────────┘
                        ┌──────────────────┐
                        │ Set the domain suffix │
                        │   search order    │
                        └──────────────────┘
                                  │
                        ┌──────────────────┐
                        │  End of setting   │
                        └──────────────────┘
```

1.3 Connecting the FX

Connecting to the Port

Connector
Connect an Ethernet cable to the Ethernet port on the FX rear panel.
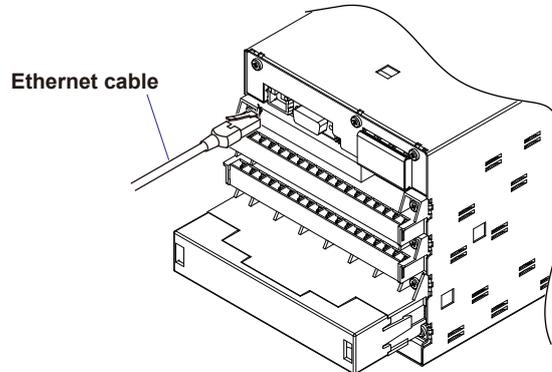
Ethernet cable

CAUTION

Do not connect an Ethernet cable whose plug does not comply with FCC specifications. If you do, the FX may malfunction.

Connecting to the PC
Make the connection via a hub. For a one-to-one connection with a PC, make the connection as shown in the figure below. Multiple FXs can be connected to a single PC in a similar manner.

PC

Hub

FX

Ethernet cable
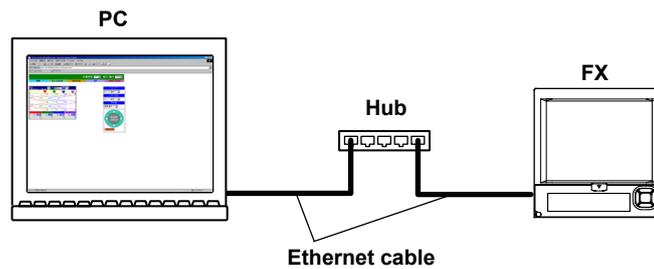
Setting the IP Address Host Information and DNS

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **IP address**.

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Host settings**.

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **DNS settings**.

IP address setting

Basic Setting Mode   Ethernet Link

IP-address

DHCP   Not

Fixed IP-address
IP-address   10. 0. 23. 75
Subnet mask   255.255.255. 0
Default gateway   10. 0. 23. 1

Use   Not

Host information setting

Basic Setting Mode   Ethernet Link

Host settings

Host name
FX1000
Domain name
recorder.com

Input   Clear   Copy

DNS setting

Basic Setting Mode   Ethernet Link

Server search order
Primary   10. 0. 10. 25
Secondary   0. 0. 0. 0
Domain suffix search order
Primary
pri.recorder.com
Secondary
sec.recorder.com

Input

Set the IP address to a fixed IP address or obtain it automatically (DHCP).

Consult with your network administrator for the network parameters such as the IP address, subnet mask, default gateway, and DNS.

When using a fixed IP address

- **DHCP**
  Set DHCP to **Not**.

- **IP address**
  Set the IP address to assign to the FX.

- **Subnet mask**
  Set the subnet mask according to the system or network to which the FX belongs.

- **Default gateway**
  Set the IP address of the gateway.

- **Host name**
  Set the FX's host name using up to 64 alphanumeric characters. You do not have to set this parameter.

- **Domain name**
  Set the network domain name that the FX belongs to using up to 64 characters. You do not have to set this parameter.

- **Server search order**
  Register up to two IP addresses for the primary and secondary DNS servers.

- **Domain suffix search order**
  Set up to two domain suffixes: primary and secondary.

When obtaining the IP address from DHCP

- **DHCP**
  Set DHCP to **Use**.

- **DNS accession**
  To automatically obtain the DNS server address, select **Use**. Otherwise, select **Not**. If you select Not, you must set the server search order.

- **Host-name register**
  To automatically register the host name to the DNS server, select **Use**.

- **Host name**
  Set the FX's host name using up to 64 alphanumeric characters.

- **Domain name**
  Set the network domain name that the FX belongs to using up to 64 characters.
  This is enabled when **DNS accession** is set to **Not**.

- **Server search order (not necessary when DNS accession is enabled)**
  Register up to two IP addresses for the primary and secondary DNS servers.

- **Domain suffix search order**
  Set up to two domain suffixes: primary and secondary.

Requesting/Releasing Network Information from DHCP

You can manually request or release network information such as the IP address.
This operation applies when DHCP is set to Use. Perform the request or release after displaying the network information screen.

Requesting Network Information

1. Display the network information screen.

◊ Press **FUNC** and select **Network info**.
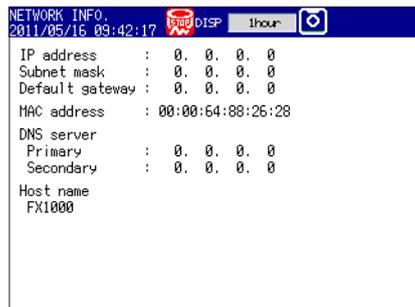
2. Execute the network information request.

◊ Press **FUNC** and select **Network info** > **Request**.
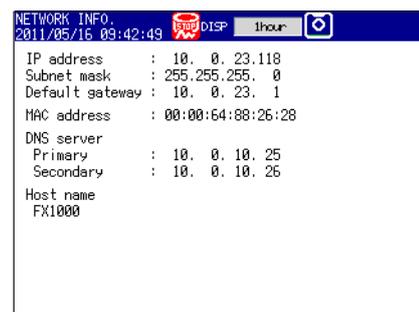
The network information is displayed.

Releasing Network Information

1. Display the network information screen.

◊ Press **FUNC** and select **Network info**.

```
NETWORK INFO.
2011/05/16 09:40:18           DISP  1hour

IP address      :  10.  0. 23.118
Subnet mask     : 255.255.255.  0
Default gateway :  10.  0. 23.  1

MAC address     : 00:00:64:88:26:28

DNS server
 Primary        :  10.  0. 10. 25
 Secondary      :  10.  0. 10. 26

Host name
 FX1000
```
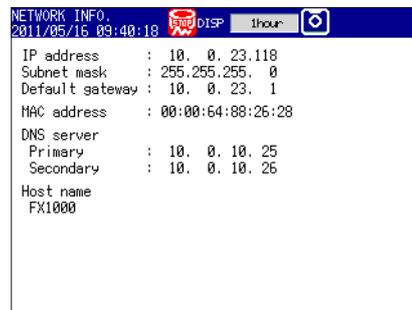
2. Execute the network information release.

◊ Press **FUNC** and select **Network info** > **Release**.

```
NETWORK INFO.
2011/05/16 09:40:30           DISP  1hour

IP address      :  10.  0. 23.118
Subnet mask     : 255.255.255.  0
Default gateway :  10.  0. 23.  1

MAC address     : 00:00:64:88:26:28

DNS server
 Primary        :  10.  0. 10. 25
 Secondary      :  10.  0. 10. 26

Host name
 FX1000

Domain name
 cpc.jp.ykgw.net

System  Network              Next 3/3
 info    info
```

```
NETWORK INFO.
2011/05/16 09:40:45           DISP  1hour

IP address      :  10.  0. 23.118
Subnet mask     : 255.255.255.  0
Default gateway :  10.  0. 23.  1

MAC address     : 00:00:64:88:26:28

DNS server
 Primary        :  10.  0. 10. 25
 Secondary      :  10.  0. 10. 26

Host name
 FX1000

Domain name
 cpc.jp.ykgw.net

Release
```

```
NETWORK INFO.
2011/05/16 09:41:08           DISP  1hour

IP address      :   0.  0.  0.  0
Subnet mask     :   0.  0.  0.  0
Default gateway :   0.  0.  0.  0

MAC address     : 00:00:64:88:26:28

DNS server
 Primary        :   0.  0.  0.  0
 Secondary      :   0.  0.  0.  0

Host name
 FX1000
```

```
NETWORK INFO.
2011/05/16 09:40:57           DISP  1hour

IP address      :  10.  0. 23.118
Subnet mask     : 255.255.255.  0
Default gateway :  10.  0. 23.  1

MAC address     : 00:00:64:88:26:28

        If released, network will be
        disconnected. Continue?

        Yes              No
```

The network information is released.   **DISP/ENTER key**

Setting the Communication Status

◇ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Keep alive, Timeout**.
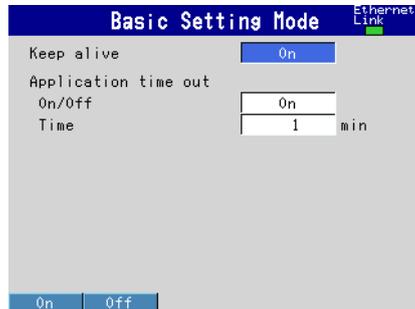
Setting the keepalive

To disconnect when there is no response to the test packets that are periodically sent, select **On**. Otherwise, select **Off**.

Setting the application timeout

*   Selecting On/Off

    To use the application timeout function, select **On**. Otherwise, select **Off**. If you select **On**, a timeout item is displayed.
*   Time

    Set the timeout value between 1 and 120 (minutes).

Checking the communication status

The Ethernet communication status can be confirmed with the LED lamp that is provided on the Ethernet connector on the FX rear panel or the Ethernet link that is shown at the upper right of the basic setting mode screen.

1.4 Sending E-mail Messages

Settings for Sending E-mail

Set the server configuration and the contents of the e-mail transmission.

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **E-Mail**.

Basic settings

```
           Basic Setting Mode    Ethernet
                                  Link
Basic settings
  SMTP server name    [                    ]
  Port number                25
  Security                   Auth
SMTP authorization
  User name           [                    ]
  Password            ********************

  Input        Clear    Copy
```

Recipients

```
           Basic Setting Mode    Ethernet
                                  Link
Recipients
  Recipient 1    [                    ]
  Recipient 2    [                    ]
  Sender         [                    ]

  Input        Clear    Copy
```

POP3 Settings

```
           Basic Setting Mode    Ethernet
                                  Link
POP3 Settings
  POP3 Server name   [                    ]
  Port number              110
  Login name
  Password           ********************

  Input        Clear    Copy
```

Alarm settings

```
           Basic Setting Mode    Ethernet
                                  Link
Alarm settings
  Recipient 1   Off    Recipient 2   Off
  Active Alarms
  Alarm 1    Off    Alarm 2    Off
  Alarm 3    Off    Alarm 4    Off

  Include INST                  Off
  Include source URL            Off
  Subject     Alarm_summary
  Header 1
  Header 2

  On      Off
```

Scheduled settings

```
           Basic Setting Mode    Ethernet
                                  Link
Scheduled settings
  Recipient 1  Off    Recipient 2  Off
  Interval    24h     Interval    24h
  Ref.time   00:00    Ref.time   00:00

  Include INST                  Off
  Include source URL            Off
  Subject     Periodic_data
  Header 1
  Header 2

  On      Off
```

System settings

```
           Basic Setting Mode    Ethernet
                                  Link
System settings
  Recipient 1 Off    Recipient 2  Off

  Include source URL            Off
  Subject     System_warning
  Header 1
  Header 2

  On      Off
```

Report settings

```
           Basic Setting Mode    Ethernet
                                  Link
Report settings
  Recipient 1 Off     Recipient 2  Off

  Include source URL            Off
  Subject     Report_data
  Header 1
  Header 2

  On      Off
```

Basic Settings

Set the SMTP server and mail address.

- **SMTP server name**
  Enter the host name or IP address of the SMTP server.
- **Port number**
  Unless specified otherwise, set the number to the default value. The default value is 25.
- **Security**
  Select **PbS** if you want to enable POP before SMTP. To enable authenticated e-mail transmission (Authentication SMTP), select **Auth**. When you select **Auth**, the SMTP authorization items appear.

SMTP authorization

To enable support for authenticated e-mail transmission (Authentication SMTP), set a user name and password to use for authentication.

- **User name**
  Enter the user name. You can enter up to 32 characters.
- **Password**
  Enter the password. You can enter up to 32 characters.

Recipients

- **Recipient1 and Recipient2**
  Enter the e-mail address. Multiple e-mail addresses can be entered in the box of one recipient. When entering multiple addresses, delimit each address with a space. Up to 150 characters can be entered.
- **Sender**
  Enter the sender e-mail address. You can enter up to 64 characters.

POP3 Settings

If you need to use POP before SMTP, specify the POP3 server that will be used for authentication.

For instructions on how to set the POP3 login method, see "Configuring the POP3 Server Connection" later in this section.

- **POP3 Server name**
  Enter the POP3 server host name or IP address.
- **Port number**
  Use the default setting unless you need to change it. The default value is 110.
- **Login name**
  Enter the POP3 server login name.
- **Password**
  Enter the POP3 server login password using up to 32 characters.

Alarm Settings

Specify the settings for sending e-mail when alarms occur or release.

- **Recipient1 and Recipient2**
  Set the e-mail recipients. For Recipient1 and Recipient2, select **On** to send e-mail or **Off** to not send e-mail.
- **Active alarms**
  Sends an e-mail when an alarm occurs or releases. You can select On (send e-mail) or Off (not send e-mail) for alarms 1 to 4.
- **Include instantaneous value**
  Select **On** to attach instantaneous value data. The data that is attached is the instantaneous value that is measured at the time the e-mail is transmitted.

- **Include source URL**

  Select **On** to attach the source URL. Attach the URL when the Web server is enabled.

- **Subject**

  Enter the subject of the e-mail using up to 32 alphanumeric characters. The default setting is Alarm_summary.

- **Header1 and Header2**

  Enter header 1 and header 2 using up to 64 characters.

Scheduled Settings

Specify the settings for sending e-mail at scheduled times.

- **Recipient1 and Recipient2**

  Set the e-mail recipients. For Recipient1 and Recipient2, select **On** to send e-mail or **Off** to not send e-mail.

- **Interval**

  Select the interval for sending e-mail to Recipient1 and Recipient2 from 1, 2, 3, 4, 6, 8, 12, and 24 hours.

- **Ref. time**

  Enter the time used as a reference for sending the e-mail at the specified interval to Recipient1 and Recipient2.

- **Include instantaneous value, Include source URL, Subject, and Header**

  These items are the same as the e-mail that is sent when an alarm occurs. The default subject is Periodic_data.

System Settings

Specify the settings for sending e-mail when the FX recovers from a power failure, at memory end, and when an error occurs.

- **Recipient1 and Recipient2**

  Set the e-mail recipients. For Recipient1 and Recipient2, select **On** to send e-mail or **Off** to not send e-mail.

- **Include source URL, Subject, and Header**

  See the explanation of alarm e-mail. The default subject is System_warning.

Report Settings (/M1, /PM1, /PWR1, and /PWR5 options)

Specify the settings for sending e-mail when reports are created.

- **Recipient1 and Recipient2**

  Set the recipients. For Recipient1 and Recipient2, select **On** to send e-mail or **Off** to not send e-mail.

- **Include source URL, Subject, and Header**

  See the explanation of alarm e-mail. The default subject is Report_data.

Configuring the POP3 Server Connection

Specify how the FX operates when it connects to a POP server.

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode) and select the **Environment** tab > **Communication** > **POP3 Details**.

Send delay [seconds]

Enter the delay between a POP3 server authentication and the transmission in the range of 0 to 10 seconds.

POP3 Login

To encrypt the password when logging into the POP3 server, select **APOP**. To send it in plain text, select **PLAIN**.

E-mail Test

◊ Press **FUNC** and select **E-mail test** > **Recipient1** or **Recipient2**.

You can send a test e-mail to check the e-mail settings.

Starting/Stopping the E-mail Transmission

Starting the e-mail transmission

◊ Press **FUNC** and select **E-Mail START**.

The e-mail transmission function is enabled.

Stopping the e-mail transmission

◊ Press **FUNC** and select **E-Mail STOP**.

The e-mail transmission function is disabled. Unsent e-mail messages are cleared.

E-mail retransmission

If the e-mail transmission fails, the message is retransmitted up to three times at 30-s, 1-minute, or 3-minute intervals. If retransmission fails, the e-mail message is discarded.

1

E-mail Format

The formats of alarm e-mails, scheduled e-mails, system e-mails, report e-mails, and test e-mails are given below. For details on the common display items, see "Common Display Items for All Formats" in this section.

Alarm Notification E-mail Format

- **Subject**

  Subject: [Alarm Summary]

- **Syntax**

  header1*CRLF*

  header2*CRLF*

  CRLF

  Alarm_summary.*CRLF*

  <Host_name>*CRLF*

  host*CRLF*

  CRLF

  <CH>ccc···c*CRLF*

  <Type>lq*CRLF*

  <aaa>mo/dd_hh:mi:ss*CRLF*

  CRLF

  <Inst._value>*CRLF*

  mo/dd_hh:mi:ss*CRLF*

  ccc···c=ddd···d*CRLF*

  ···························

  CRLF

  Access_the_following_URL_in_order_to_look_at_a_screen.*CRLF*

  http://host.domain/*CRLF*

  CRLF

ccc···c	Channel number or tag
	(Up to 16 characters. Channels set to Skip or Off are not output. (For the channel number, see section 3.3.)
l	Alarm level (1 to 4)
q	Alarm type (H, L, h, l, R, r, T, t)
	H (high limit alarm), L (low limit alarm), h (difference high limit alarm), l (difference low limit alarm), R (high limit on rate-of-change alarm), r (low limit on rate-of-change alarm), T (delay high limit alarm), t (delay low limit alarm)
aaa	Alarm status (off or on)
ddd···d	Measured/Computed value (up to 10 digits including the sign and decimal point) + unit (up to 6 characters)

+OVER:	Positive overrange
−OVER:	Negative overrange
Burnout:	Burnout data
*****:	Error data

The FX transmits channel numbers, alarm types, and alarm statuses for up to 10 events in a single e-mail.

Scheduled E-mail Format

- **Subject**

  `Subject:Periodic_Data`

- **Syntax**

  `header1`*CRLF*

  `header2`*CRLF*

  CRLF

  `Periodic_data.`*CRLF*

  `<Host_name>`*CRLF*

  `host`*CRLF*

  CRLF

  `<Time>`*CRLF*

  `mo/dd_hh:mi:ss`*CRLF*

  CRLF

  `E-mail_message(s)_did_not_reach_intended_recipient(s).`*CRLF*

  `ttt···t`

  `Count=nn`*CRLF*

  `mo/dd_hh:mi:ss`*CRLF*

  `.............................`

  CRLF

  `<Time>`*CRLF*

  `mo/dd_hh:mi:ss`*CRLF*

  `ccc···c=ddd···d`*CRLF*

  `.............................`

  CRLF

  `Access_the_following_URL_in_order_to_look_at_a_screen.`*CRLF*

  `http://host.domain/`*CRLF*

  CRLF

`ccc···c`	Channel number or tag
	(Up to 16 characters. Channels set to Skip or Off are not output. (For the channel number, see section 3.3.)
`ttt···t`	Type of discarded e-mail

	`Alarm_summary:`	Alarm mail
	`Periodic_data:`	Scheduled mail
	`System_warning:`	System mail
	`Report_data:`	Report mail

`nn`	Number of discarded e-mails
`ddd···d`	Measured/Computed value (up to 10 digits including the sign and decimal point) + unit (up to 6 characters)

	`+OVER:`	Positive overrange
	`-OVER:`	Negative overrange
	`Burnout:`	Burnout data
	`*****:`	Error data

The time that follows the type and count of discarded e-mails is the time when the e-mail is discarded last.

System Mail (Power Failure) Format

- **Subject**
  Subject: System_warning

- **Syntax**
  header1*CRLF*
  header2*CRLF*
  CRLF
  Power_failure.*CRLF*
  <Host_name>*CRLF*
  host*CRLF*
  CRLF
  <Power_fail>mo/dd_hh:mi:ss*CRLF*
  <Power_on>mo/dd_hh:mi:ss*CRLF*
  CRLF
  Access_the_following_URL_in_order_to_look_at_a_screen.*CRLF*
  http://host.domain/*CRLF*
  CRLF

System Mail (Memory Full) Format

- **Subject**
  Subject:System_warning

- **Syntax**
  header1*CRLF*
  header2*CRLF*
  CRLF
  Memory_full.*CRLF*
  <Host_name>*CRLF*
  host*CRLF*
  CRLF
  mo/dd_hh:mi:ss*CRLF*
  <Memory_remain>ppp···pMbytes*CRLF*
  <Memory_blocks>bbb/400*CRLF*
  <Media_remain>rrr···rMbytes*CRLF*
  CRLF
  Access_the_following_URL_in_order_to_look_at_a_screen.*CRLF*
  http://host.domain/*CRLF*
  CRLF

  ppp···p   Remaining amount of internal memory
  bbb   Number of unsaved blocks (0 to 400)
  rrr···r   Remaining free space on the external storage medium (when an external storage medium is connected)

System Mail (Error) Format
- **Subject**
  `Subject:System_warning`
- **Syntax**
  `header1`*CRLF*

  `header2`*CRLF*

  CRLF

  `Error.`*CRLF*

  `<Host_name>`*CRLF*

  `host`*CRLF*

  CRLF

  `mo/dd_hh:mi:ss`*CRLF*

  `ERROR:fff`*CRLF*

  `.............................`

  `"Operation_aborted_because_an_error_was_found_in_media."`*CRLF*

  CRLF

  `Access_the_following_URL_in_order_to_look_at_a_screen.`*CRLF*

  `http://host.domain/`*CRLF*

  CRLF

  `fff`   Error number (200, 201, 211, 281 to 285)
  The error messages that appear vary depending on the error type. For details on the error, see the *FX1000 User's Manual*, IM 04L21B01-01EN.

Report Mail Format
- **Subject**
  Subject:Report_data
- **Syntax**
  header1*CRLF*
  header2*CRLF*
  CRLF
  ti_report.*CRLF*
  <Host_name>*CRLF*
  host*CRLF*
  CRLF
  mo/dd_hh:mi:ss*CRLF*
  <CH>ccc···c*CRLF*
  <tp>eee···e*CRLF*
  <tp>eee···e*CRLF*
  <tp>eee···e*CRLF*
  <tp>eee···e*CRLF*
  <Unit>uuu···u*CRLF*
  ....
  CRLF
  Access_the_following_URL_in_order_to_look _at_ a_ screen.*CRLF*
  http://host.domain/*CRLF*
  CRLF

ti	Contents of the report mail (hourly, daily, weekly, or monthly report)
ccc···c	Channel number or tag
	(Up to 16 characters. Channels set to Skip or Off are not output. For the channel number, see section 3.3.)
tp	Report content (average, maximum, minimum, instantaneous, and sum. Four items among these are output.)
eee···e	Measured/Computed value (up to 10 digits including the sign and decimal point). However, for the sum value, the value is output as a combination of the sign, mantissa, E, sign, and exponent such as in -3.8000000E+02.

+OVER:	Positive overrange
-OVER:	Negative overrange
Burnout:	Burnout data
Empty data:	Error data

| uuu···u | Unit (up to 6 characters) |

Test E-mail Format
- **Subject**

  `Subject: Test`

- **Syntax**

  `Test_mail.`*CRLF*

  `<Host_name>`*CRLF*

  `host`*CRLF*

  CRLF

  `<Time>`*CRLF*

  `mo/dd_hh:mi:ss`*CRLF*

  CRLF

  `<Message>`*CRLF*

  `x:ms`*CRLF*

  `...........................`

  CRLF

  `x`   Message number (`1` to `10`)

  `ms`   Message content (only specified messages are output.)

Common Display Items for All Formats
- Time information

  `mo`   Month (`01` to `12`)

  `dd`   Day (`01` to `31`)

  `hh`   Hour (`00` to `23`)

  `mi`   Minute (`00` to `59`)

  `ss`   Second (`00` to `59`)

  The month, day, hour, minute, and second of the time information are output in the order specified by the date format in the basic setting mode.
- Host name, domain name, and header information

  `header1` Header 1 (displayed only when it is set)

  `header2` Header 2 (displayed only when it is set)

  `host`   Host name or IP address (IP address when the host name is not assigned. In the case of an IP address, the <Host> section is set to <IP address>.)

  `domain`   Domain name

  `_`   Space

1.5   Monitoring the FX on a PC Browser

Setting the Web Server Function

From the basic setting mode menu, set the server function and Web page of Communication (Ethernet).

Setting the Web server

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Server** > **Server modes**.

```
        Basic Setting Mode      Ethernet
                                Link
Server
  FTP                  │  Use  │
  Web                  │  Use  │
  SNTP                 │  Not  │
  Modbus               │  Not  │



  Use      Not
```
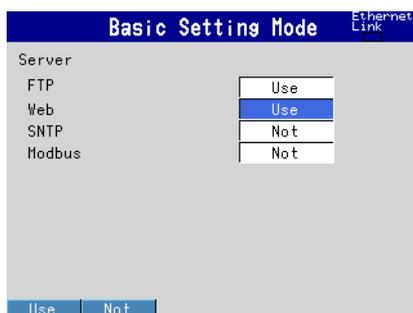
• Web

For the Web item under Server, select **Use** or **Not** (don't use). When **Use** is selected, the Web page item is added to the basic setting mode menu.

Port Number

The default value is 80. To change the setting,

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Environment** tab > **Communication** > **Service port**.

For the selectable range of port numbers, see section 6.1.

Setting the Web page

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Web page**.

```
        Basic Setting Mode      Ethernet
                                Link
Page type              │Operator│

  On/Off               │   On   │
  Access control       │  Off   │
  Command              │  Use   │




Operator Monitor
```
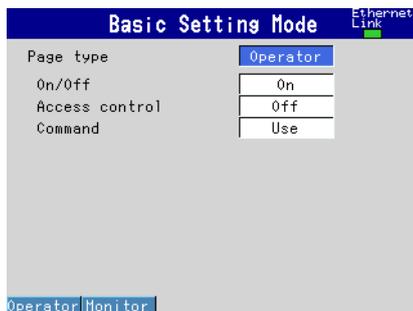
Page Type
*   Monitor
    Configure the monitor page. You can carry out the following operations on the monitor page.
    *   Display the alarm summary
    *   Display the measured and computed values of all channels
    *   Display logs (message summary, error log, etc.)
    For screen examples, see "Monitoring with a Browser" in this section.
*   Operator
    Set the operator page. The following operations can be carried out in addition to the functions available on the monitor page.
    *   Switch the operation screen
    *   Control the FX's DISP/ENTER key and arrow keys
    *   Write messages
    For screen examples, see "Monitoring with a Browser" in this section.

Setting the monitor page
*   Page type
    Select **Monitor**.
*   Setting On/Off
    To display the monitor page on a browser, select **On**; otherwise, select **Off**.
*   Access control
    To use access control, select **Admin** (for an administrator) or **User**.
    You must enter a user name and password to display the monitor page. Set the user name and password through the **Login** item. For details, see the *FX1000 User's Manual, IM 04L21B01-01EN*.

Setting the operator page
*   Page type
    Select **Operator**.
*   On/Off
    To display the operator page in the browser, select **On**. Otherwise, select **Off**.
*   Access control
    To use access control, select **Admin** (for an administrator). You must enter a user name and password to display the operator page. Set the user name and password through the **Login** item. See the *FX1000 User's Manual*, IM 04L21B01-01EN.
*   Command input
    To use message write commands, select **On**. Otherwise, select **Off**.

Monitoring with a Browser

Setting the URL

Set the URL appropriately according to the network environment that you are using. You can access the FX by setting the URL as follows:

http://host name.domain name/file name

http
Protocol used to access the server.

Host name.domain name
Host name and domain name of the FX.
You can also use the IP address in place of the host name and domain name.

File name
File name of the monitor page and operator page of the FX.
File name of the monitor page: monitor.htm
File name of the operator page: operator.htm
Omitting the file name is equivalent to specifying the monitor page. However, if the monitor page is disabled, it is equivalent to specifying the operator page.

Example
To display the operator page on a PC in the same domain as the FX, enter the URL in the Address box of the browser as follows:

http://fx1000.recorder.com/operator.htm or
http://192.168.1.100/operator.htm

(In the example, the domain name is set to recorder.com, the host name to fx1000, and the IP address to 192.168.1.100.)

Login

You need to configure the following settings to use the login function.

No.	Setting	Description and Reference
1	Communication login (Security > Communication)	To access the FX through a communication interface, you must log in. For details, see section 8.2 in the *FX1000 User's Manual*, IM 04L21B01-01EN.
2	Login	Register the users who can access the Web server. For details, see section 8.2 in the *FX1000 User's Manual*, IM 04L21B01-01EN.
3	Web page	Set Access control to On in the operator and monitor pages.

Only users whose mode is set to Web, Com, or Key+Com can access the FX Web page. When you access the page, you will be prompted for a user name and password. Enter the user name and password that you set in item 2 in the table.

Contents of the Monitor Page

Note

> If the FX is in setting mode or basic setting mode, you cannot display the monitor page or the operator page. If you try to do so, an error message appears. For details on the modes, see the *FX1000 First Step Guide*, IM 04L21B01-02EN.

Refresh the screen

Display the alarm summary
Displays the alarm summary in a separate window.

All channel display
Displays the measured values and alarm statuses of all channels in a separate window.

Automatically refresh the screen
Set this to ON to automatically refresh the screen.

Log
Displays various logs in a separate window.

Zoom
Change the zoom rate of the screen.
100%, 200%

Auto Refresh OFF | Zoom 100%

Refresh | Alarm Summary | All Channels | Log
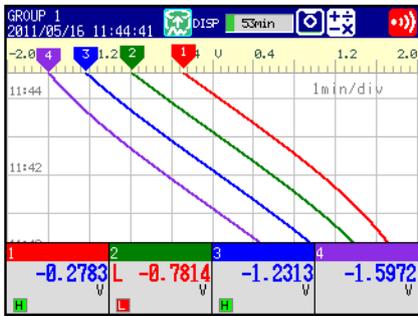
FX screen image

Refreshing the page

The monitor page can be refreshed automatically or manually.

- Auto Refresh ON

  Refreshes the monitor page once approximately every 10 seconds.

- Auto Refresh OFF

  Does not automatically refresh the monitor page. It is refreshed when you click **Refresh**. You cannot refresh the page within approximately 10 seconds of the previous refreshing of the page, even if you click **Refresh**.

Zoom

Select the zoom factor from the list box to zoom into or out of the FX screen.

Contents of the Operator Page

Message
Write a message.

Auto Refresh OFF Zoom 100%

Refresh | Alarm Summary | All Channels | Log | Message

GROUP 1
2011/01/01 14:45:30 DISP 51min
-2.0   -1.2   4 V 3 0.4 2   1 2   2.0
14:44   1min/div
14:42

1   2   3   4
1.2244   0.7734   0.2697   -0.2523
    V   V   V   V
H

TREND
Select Group =>

HISTORY
Select Group =>

OTHER
Select Screen =>

DISP/
ENTER

Select the trend screen
Directly select the group you want to display.

Select the historical screen
Directly select the group you want to display.

Select other displays
You can select the overview display, digital display, or bar graph display.

Arrow keys and DISP/ENTER key
These keys carry out the same operations as the corresponding keys on the FX.

Switching the Screen (Operator page only)
- **Trend and Historical Trend**
  Using the **Select Group** list box, you can switch to the trend or historical trend display for the group that you specify.

- **Other Screens**
  From the **Select Screen** list box, you can switch the screen by specifying digital, bar graph, or overview.

- **DISP/ENTER Key and Arrow Keys**
  If the FX is in operation mode, you can click the DISP/ENTER and arrow keys to carry out the corresponding operation on the FX.

Alarm Summary

Click **Alarm Summary** to display the alarm summary. Click **Refresh** to update the data.

- You can display information for up to 400 alarms.
- Based on the FX settings, the **Channel** column displays channel numbers or tags.

Status	Channel	Type	Alarm Time
ON	ABC-3	1L	2008/12/06 16:50:41
OFF	ABC-1	1H	2008/12/06 16:49:45
OFF	ABC-2	2H	2008/12/06 16:47:43
ACK			2008/12/06 16:42:14
ON	ABC-2	2H	2008/12/06 16:39:41
ON	ABC-1	1H	2008/12/06 16:39:38

Creation date : 2008/12/06 16:51:03

All Channel Display

Click **All Channels** to display the measured values and alarm status of all channels.
Click **Refresh** to update the data.

- Based on the FX settings, the **Channel** column displays channel numbers or tags.

All channel display example

Creation date : 2008/12/02 13:29:32

Channel	Alarm status 1 2 3 4	Reading	Units
ABC-1	H	-0.6014	V
ABC-2	H	-1.0745	V
ABC-3	L	-1.4745	V
ABC-4		-1.7740	V

Log

Displays the message summary,[1] error log, FTP log, login log, Web operation log, e-mail log, SNTP log, and Modbus log in a separate window. From the **Log** list box, select the log you want to display. Click **Refresh** to update the data.

> 1: You can display up to 100 messages and up to 50 added messages.

LOG
MESSAGE

Creation date : 2008/12/02 13:54:41

Time	Message	Group	User Name
2008/12/02 13:54:29	hold1	ALL	[Communication]
2008/12/02 13:53:25	start	ALL	[Key]
2008/12/02 13:53:15	hold1	ALL	[Key]
2008/12/02 13:53:09	start	ALL	[Key]
2008/12/02 13:52:56	stop	ALL	[Key]
2008/12/02			

Writing Messages (Operator page only)

You can assign a text string to one of the FX messages 1 through 10 and write the message to a specified group at the same time. The maximum message length is 32 alphanumeric characters. The current message setting is overwritten.

Example of Writing a Message

Use message number 9 and write the message "ALARM" to all groups. Successful completion of the writing operation is indicated in the Command Response box.

Specify a message number to display the corresponding character string.

1.6 Accessing the Measurement Data File on the FX from a PC

You can access data files stored on the external storage medium and data files stored in internal memory. However, you cannot access the external storage medium on models that do not have a CF card slot and an SD card slot.

Setting the FTP Server

Server Function
◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Server** > **Server modes**.
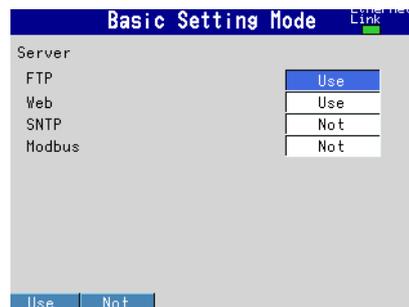
- **FTP**
  For the FTP item under Server, select **Use** or **Not** (don't use).

FTP Server Output Directory Format
◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Environment** tab > **Communication** > **FTP Server Details**.
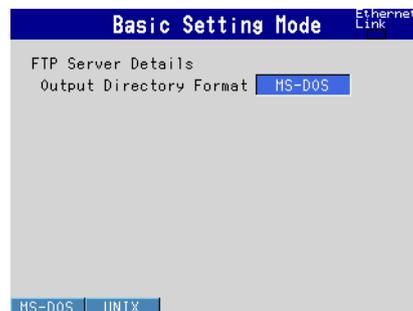
- **Output Directory Format**
  Set the directory output format to **MS-DOS** or **UNIX**.

When Not Using the Login Function

You can connect to the server using the user name "admin," "user," or "anonymous." You can use a PC to access the FX via FTP. You can perform operations such as retrieving directory and file lists from the external storage medium of the FX and transferring and deleting files. In addition, you can also retrieve the directory or file list and transfer files in the internal memory.

Using a Web Browser to Access the FX

An example of retrieving files using a browser is described below. In the Address box, enter the following:

ftp://host name.domain name/file name

Drag the data you want to retrieve from the /MEMO/DATA0 folder in the case of internal memory data or the /DRV0 folder in the case of data on the external storage medium to the PC. You can also use the IP address in place of the "host name.domain name."

When Using the Login Function

You will be prompted for a user name and password when you access the server. Enter a user name and password that are registered on the FX to connect to it. For information about the operations that can be executed, see the "Login" explanation in section 1.1.

Port Number

The default value is 21. To change the setting,

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Environment** tab > **Communication** > **Service port**

For the selectable range of port numbers, see section 6.1.

1.7 Transferring Measurement Data Files and Other Files from the FX

The display and event data files, report data files, and snapshot data files created in the internal memory of the FX can be automatically transferred using FTP at the time the files are created.

Files to Be Transferred via FTP

The display, event, and report data files are transferred automatically to the FTP destination at appropriate times.

File Type	Description
Display data file	Data files are automatically transferred at each file save interval.
Event data file	Files are automatically transferred when the data length of data is recorded.
Report data file	Data files are automatically transferred when a report file is closed (or divided). For example, data files are transferred once per month when generating only daily reports.
Snapshot data file	The files are automatically transferred when a snapshot[1] is executed. 1: Indicates a snapshot taken using the FUNC key, communication command (EV2 command), USER key, or remote control function.

Setting the FTP Client

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **FTP client** > **FTP transfer file** or **FTP connection**.

FTP transfer file settings

Basic Setting Mode	Ethernet Link

FTP transfer file

Disp&Event data	Off
Report	Off
Snapshot	Off

| On | Off |

FTP connection settings

Basic Setting Mode	Ethernet Link

FTP connection	Primary
Server name	
Port number	21
Login name	
Password	****************************
Account	
PASV mode	Off
Initial path	

| Primary | Second |

Setting the FTP transfer files

- **Display and Event Data**
  Select **On** when automatically transferring display and event data files.

- **Report**
  Select **On** when automatically transferring report data files.

- **Snapshot**
  Select **On** when automatically transferring snapshot data files.

Setting the FTP Connection Destination

Consult your network administrator when setting parameters such as the primary/ secondary FTP servers, port number, login name, password, account, availability of the PASV mode, and the initial path.

- **FTP connection**
  You can specify two destination FTP servers, **Primary** and **Secondary**. If the primary FTP server is down, the file is transferred to the secondary FTP server.

- **FTP server name**
  Enter the name of the file transfer destination FTP server using up to 64 alphanumeric characters.
  - If the DNS is used, you can set the host name as a server name. For details on setting the DNS, see section 1.3.
  - You can also set the IP address. In this case, the DNS is not required.

- **Port number**
  Enter the port number of the file transfer destination FTP server in the range of 1 to 65535. The default value is 21.

- **Login name**
  Enter the login name for accessing the FTP server using up to 32 alphanumeric characters.

- **Password**
  Enter the password for accessing the FTP server using up to 32 alphanumeric characters.

- **Account**
  Enter the account (ID) for accessing the FTP server using up to 32 alphanumeric characters.

- **PASV mode**
  Select **On** when using the FX behind a firewall that requires the passive mode. The default setting is **Off**.

- **Initial path**
  Enter the directory of the file transfer destination using up to 64 alphanumeric characters. The delimiter for directories varies depending on the implementation of the destination FTP server.
  Example) When transferring files to the "data" directory in the "home" directory of an FTP server on a UNIX file system.
  /home/data

When There Is a File with the Same Name at the Transfer Destination

Under all circumstances, when there is a file with the same name at the transfer destination, it is overwritten

Operation When the Data Transfer Fails

If the FX fails to transfer files to both the primary and secondary FTP servers, the FX aborts the file transfer operation. When the FX is attempting to transfer display data files, event data files, or report data files, if the connection to the destination recovers, the FX transfers new data files along with the files that the FX failed to transfer. Note that because the FX transfers data from its internal memory, if the data that the FX failed to transfer is overwritten, it is lost.

1

Using the Ethernet Interface (/C7 Option)

Testing the FTP Transfer

You can test whether a test file can be transferred from the FX to an FTP server.

◊ Press **FUNC** and select **FTPtest**.

Items to check before performing this test

• Connect the Ethernet cable correctly. For the connection procedure, see section 1.3.

• Check that the Ethernet interface settings are correct. For the procedure, see section 1.3.

Checking the results of the FTP test

• When an FTP test is executed, a test file named FTP_TEST.TXT is transferred to the directory indicated by the initial path at the FTP destination specified in this section.

• You can view the result of the FTP test in the FTP log. This log can be displayed on the FX (see the *FX1000 User's Manual*, IM 04L21B01-01EN), displayed in a Web browser (see section 1.5), or output with the FL command (see section 3.8).

1.8　Synchronizing the Time

The FX time can be synchronized to the time on an SNTP server. The FX can also function as an SNTP server.

Setting the SNTP Client

Synchronize the FX time to the time on an SNTP server.

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **SNTP client**.

```
         Basic Setting Mode      Ethernet
                                  Link
 SNTP client

 Use/Not                    │    Use    │
 Server name
 │sntp.recorder.com                     │
 Port number               │      123  │
 Access interval           │      8h   │
 Access reference time      │    00:00  │
 Access timeout            │      30s  │
 Time adjust on Start action│     Off   │


 │ Use  │  Not │
```

- **Use/Not**
  Select **Use** to use the SNTP client function; Otherwise, select **Not**. If you select **Use**, the SNTP client settings are displayed.

- **SNTP server name**
  Set the SNTP server name using up to 64 alphanumeric characters.
  - If the DNS is used, you can set the host name as a server name. For details on setting the DNS, see section 1.3.
  - You can also set the IP address. In this case, the DNS is not required.

- **Port number**
  Enter the port number of the SNTP server in the range of 1 to 65535. The default value is 123.

- **Access interval**
  Set the time interval for synchronizing the time with the server to OFF, 1, 8, 12, or 24h. If you select OFF, you can synchronize the time manually by operating soft keys. If the difference between the FX time and the server time is greater than or equal to 10 minutes, the time is not corrected.

- **Access reference time**
  Set the reference time for making queries.

- **Access timeout**
  Set the time to wait for the response from the SNTP server when querying the time to 10, 30, 90s.

- **Time adjust on Start action**
  Select **On** to synchronize the time using SNTP when memory start is executed; Otherwise, select **Off**.

Manually Synchronizing the Time

You can synchronize the time at any time by operating the FUNC key. The SNTP client setting must be enabled.

◊ Press **FUNC** and select **SNTP**.

Setting the SNTP Server

Carry out the steps below to run the FX as an SNTP server.

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Server** > **Server modes**
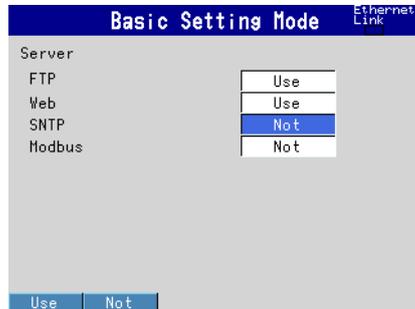
• **SNTP**

For the SNTP item under Server, select **Use** or **Not** (don't use).

When an SNTP client on the network queries the time information to the FX, the FX sends the time information.

Port Number

The default value is 123. To change the setting,

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Environment** tab > **Communication** > **Service port**.

For the selectable range of port numbers, see section 6.1.

1.9   Using the Modbus Server Function

The FX is used as a Modbus server.

For the Modbus specifications, see section 6.3.

Setting the Modbus Server

Carry out the steps below to enable another device to read the FX data or write data to the FX using Modbus.

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Server** > **Server modes**.
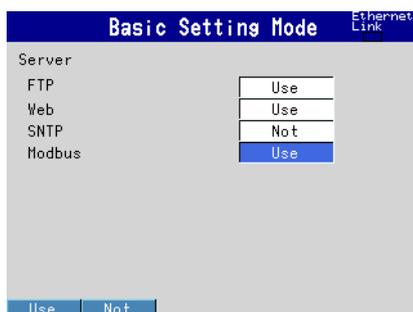
* **Modbus**

  For the Modbus item under Server, select **Use** or **Not** (don't use).

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Server** > **Allowed Modbus clients**.
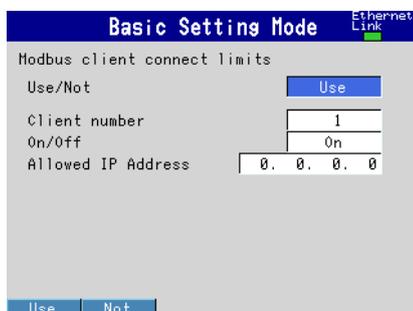
* **Use/Not**

  To place a limitation on the IP addresses that can connect to the FX Modbus server, select **Use**. Only the IP addresses specified here can connect to the FX Modbus server. To not place a limitation, select **Not**.

* **Client number**

  You can register up to 10 IP addresses. Select the client number from 1 to 10.

* **On/Off**

  To allow connections, select **On**.

* **Allowed IP Address**

  Enter the IP address in the range of 0.0.0.0 to 255.255.255.255. You cannot enter a host name.

Port Number

The default value is 502. To change the setting,

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic
    setting mode), and select the **Environment** tab > **Communication** > **Service port**.

For the selectable range of port numbers, see section 6.1.

Reading/Writing the FX Data on Another Device

Another device (client device) sends commands to the FX to read the FX data or write
data to the FX. You can perform some operations, such as memory start, by writing in the
registers.

For the function codes that the FX supports and the FX registers that the client device
can access, see "Modbus Server Function" in section 6.3.

Specifying the Register Number

Specify the FX register on the client device according to the instructions below.

• If you are using a commercial SCADA system or something similar, specify the
  register number (a number such as 400001; referred to as the "reference number")
  listed under Modbus Server Function in section 6.3, "Modbus Protocol Specifications."

• If you are using a custom communication program, specify the "relative number"
  in relation to the reference number. Compute the relative number in the manner
  indicated in the examples below.

  Examples

  The relative number for input register 300100 is 99, which is the difference between
  300100 and 300001.

  300100 – 300001 = 99

  The relative number for input register 400011 is 10, which is the difference between
  400011 and 400001.

  400011 – 400001 = 10

1.10 Using Modbus to Read Data From and Write Data to Other Devices

The FX is used as a Modbus client.
For the Modbus specifications, see section 6.3.

Setting the Modbus Client

Carry out the steps below to enable the FX to read the data of another device or write data to another device using Modbus.

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Modbus client**.

Basic settings

Destination server settings

Transmitted command settings

Basic settings

- **Read cycle**

  Set the read cycle to 1, 2, 5, or 10s.

- **Retry interval**

  Set the interval for retrying the connection when the connection is interrupted for some reason. Select Off, 10, 20, or 30 s, 1, 2, 5, 10, 20, or 30 min, or 1 h. When Off is selected, the connection is not retried. The communication stops if the communication fails.

Destination server settings

- **Server number**

  Select 1 to 16 for the server registration numbers to be configured.

- **Port**

  Enter the port number in the range of 0 to 65535 for the selected server. The default value is 502.

- **Modbus server name**

  Set the destination Modbus server name using up to 64 alphanumeric characters.
  - If the DNS is used, you can set the host name as a server name.
  - You can also set the IP address. In this case, the DNS is not required.

- **Unit**
  Select **Auto** if the unit number of the destination server is not required; Otherwise, select **Fixed**. If you select **Fixed**, the unit number item is displayed.

- **No.**
  Enter a fixed unit number in the range of 0 to 255.

Setting the transmitted commands

- **Client command number**
  Select 1 to 16 for the transmitted command numbers to be configured.

- **Command type**
  Set the command type to Off, R-M, W, or W-M. If you select a command type other than **Off**, the client channel, server number, register, and data type items are displayed.

  R-M: Read to the communication input data (32-bit floating point type) from the server.

  W: Write the measurement channel (16-bit signed integer type) to the server.

  W-M: Write the computation channel (32-bit signed integer type) to the server.
  You can only select R-M and W-M on models that have the /M1, /PM1, /PWR1, or /PWR5 math option.

- **First/Last (client channels)**
  Enter the first and last channel numbers for I/O. The range of channels that you can enter varies depending on the command type as follows:
  R-M: C01 to C24, W: 001 to 012, W-M: 101 to 124

- **Server (server number)**
  Select the server number from 1 to 16.

- **Regi. (registers on the server)**
  Set the register number of the server.
  For an input register, select in the range of 30001 to 39999 and 300001 to 365536.
  For a hold register, select in the range of 40001 to 49999 and 400001 to 465536.
  The register numbers you can specify vary depending on the command type. See section 6.3.

  Specifying the Register Number
  Specify the register number on the FX by using the "reference number" (such as the number 40001 written above). For example, for the YOKOGAWA UT35A digital indicating controller, the D register number corresponds to the reference number as shown in the following table.

D-Reg. No.	Ref. No.
D2001	42001

  For a server device that calls the register using a "relative number," add 30001, 300001, 40001, or 400001 to obtain a reference number.

Register Type	Relative Number	Reference Number	Expression
Hold register	1004	41005	1004 + 40001
	14567	414568	14567 + 400001
Input register	0000	30001	0000 + 30001

- **Type**
  Data type.
  Select INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, or FLOAT_L.
  The data type you can specify vary depending on the command type. See section 6.3.

Examples of Setting Commands

The following are examples of setting commands for the Modbus Client function. For the Modbus Master function, substitute "master" for "client," and "slave" for "server."

Connection example

| FX (Modbus client) | Instrument A (Modbus server 1) | Instrument B (Modbus server 2) |

Ethernet
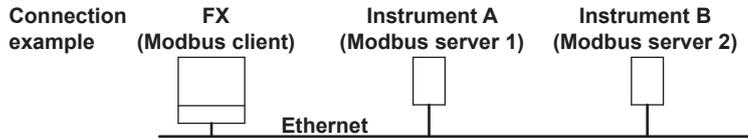
Loading to Communication Input Data

The FX inputs data loaded from the server to communication input data as floating point type data.

- **Example 1**

  Load the value of the 16-bit signed integer assigned to register 30001 of instrument A to C01.

  Communication input data   **Register of instrument A**

  | C01 | ← | 30001 | 16-bit signed integer |

  Command setting

  | R-M | C01 - C01 | ← | 1 | 30001 | INT16 |

- **Example 2**

  Load the value of the 32-bit signed integer assigned to registers 30003 and 30004 of instrument B to C03. Only the smallest register number need be specified in commands.

  Communication input data   **Register of instrument B**

  | C03 | ← | 30003 | lower bytes |
  | | | 30004 | higher bytes | 32-bit signed integer |

  Command setting

  | R-M | C03 - C03 | ← | 2 | 30003 | INT32_L |
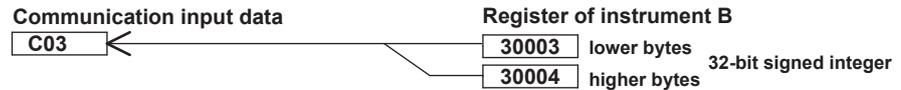
- **Example 3**

  Load the values of the 16-bit signed integers assigned to registers 30001 and 30002 of instrument B to C01 and C02. Only the smallest register number need be specified in commands.

  Communication input data   **Register of instrument B**

  | C01 | ← | 30001 | 16-bit signed integer |
  | C02 | ← | 30002 | 16-bit signed integer |

  Command setting

  | R-M | C01 - C02 | ← | 2 | 30001 | INT16 |
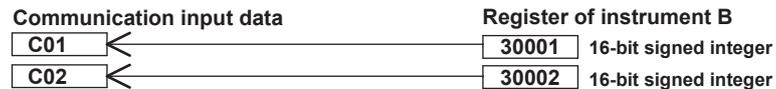
- **Example 4**

  Load the values of the 32-bit floating point assigned to registers 30005 and 30006 of instrument B to C04. Only the smallest register number need be specified in commands.
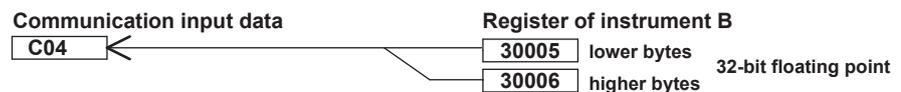
  Communication input data   **Register of instrument B**

  | C04 | ← | 30005 | lower bytes |
  | | | 30006 | higher bytes | 32-bit floating point |

  Command setting

  | R-M | C04 - C04 | ← | 2 | 30005 | FLOAT_L |

Writing Measured Values to the Server

- **Example**

Write the measured value (16-bit signed integer) from channel 001 to register 40001
of instrument A.

Measurement channel   **Register of instrument A**

| 001 | ————————————————————⟩ | 40001 | **16-bit signed integer**

Command setting

| W | | 001 - 001 | ➡ | 1 | | 40001 | | INT16 |

Writing Computed Values to the Server

- **Example**

Write the computed values (32-bit signed integers) from channel 101 to registers
40001 and 40002 of instrument A, in the order lower 16 bits/higher 16 bits. Only the
smallest register number need be specified in commands.
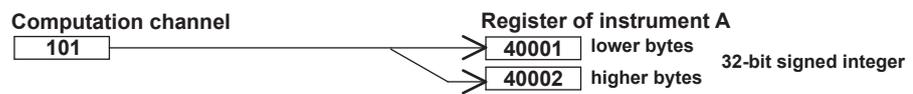
Computation channel   **Register of instrument A**

| 101 | ⟩ | 40001 | **lower bytes**
                        ⟩ | 40002 | **higher bytes**   **32-bit signed integer**

Command setting

| W-M | | 101 - 101 | ➡ | 1 | | 40001 | | INT32_L |

Checking the Modbus Operating Status

Displaying the Modbus Operating Status
◊ Press **DISP/ENTER** and select **INFORMATION** > **MODBUS CLIENT**.

Note

To display **MODBUS CLIENT** on the screen selection menu, you need to change the setting using the menu customize function. The operation is as follows:

◊ Press **MENU** (to switch to setting mode), and select the **Menu** tab > **Menu customize** > **Display menu**
   1. Select **INFORMATION** > **MODBUS CLIENT**
   2. Press the **View** soft key.

Communication condition

```
MODBUS CLIENT
2005/10/10 10:10:10        DISP  58min
Read cycle    : 1s
Conect.retry : 10min

                Comm.Data
    No. Status First  Last  Server name      Registers
➡  1 R ● Good  C01 - C08  modbus.daystati    30001
    2 W ○ None    1 -   4  192.168.1.80       40001
    3 W ○ None  101 - 105  192.168.1.80       40010
    4
    5
    6
    7
    8
    9
   10
   11
   12
   13
   14
   15
   16
```

Register number

Host name or IP address of the server device

FX channels

Detail code

Status lamp

Cursor to select a command
(Used when resuming command transmission
to a server device using the front panel keys)

* **Communication Conditions**
  The Read cycle and Connect.retry settings are displayed.

* **Communication Status**
  The communication status is displayed using the status lamp and the detail code.

Status Lamp	Detail Code	Meaning
Green	Good	Communication is operating normally.
Yellow		Command is readying.
Orange		Trying to establish a TCP connection.
Red		Communication is stopped.
Common to yellow, orange, and red	None	No response from the server device.
	Func	The server device cannot execute the command from the FX.
	Regi	The server device does not have the specified register.
	Err	There is an error in the response data from the server device.
	Link	Ethernet cable is disconnected.
	Host	Unable to resolve the IP address from the host name.
	Cnct	Failed to connect to the server.
	Send	Failed to transmit the command.
	BRKN	Failed to receive the response data or detected a disconnection.
	(Space)	The detail code is not displayed until the status is confirmed when communication is started.

Resuming Command Transmission

You can use the front panel keys to resume command transmission to a server device to which communication is stopped (red status lamp).

1. Using the up and down arrow keys, select the command corresponding to the server device to which transmission will be resumed. The message "Push [right arrow] key to refresh" appears.

2. Press the right arrow key. The FX starts command transmission to the specified server.

Data When Communication Is Stopped and during Connection Retrials

If the command transmission stops such as due to a connection drop, the status turns orange or red, and the communication input data will be error data. On communication channels, "+OVER" or –OVER is displayed according to the FX settings.

Data Dropout

Data drop occurs when the commands from 1 to 16 do not complete within the read cycle (see appendix 1). When a data dropout occurs, the communication input data is held at the previous value. A message indicating the data dropout is also displayed on the Modbus operating status display. If this happens, take measures such as making the read cycle longer or reducing the number of commands. Confirm that no data dropout occurs on the modbus status log screen.

1.11 Usage Example of the Modbus Function

Explains the setting example for both Modbus client and server on FX1000s connected via the Ethernet. In this section, the FX that has been set as the Modbus server is referred to as "FX1000 server." FXs that have been set as Modbus clients are each referred to as "FX1000 client."

System Configuration and Actions

Uses the measurement channel, computation channel, and communication input data as described in the figure below. Assumes other conditions are set properly.
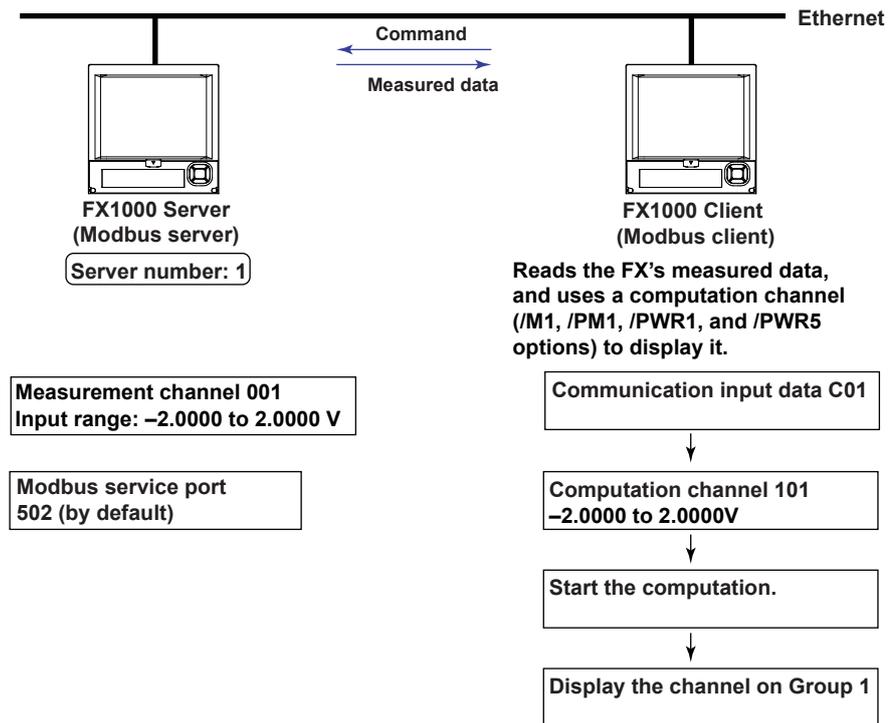
Action

*   The **FX1000 client** reads the measured value of channel 001 on the **FX1000 server** into the communication input data C01. C01 is displayed on a computation channel 101 by including the data in the equation. The computation channel 101 is assigned to Group1.
*   The measured value of channel 001 on the **FX1000 server** is transferred to the **FX1000 client** as an integer in the range of –20000 to 20000.
*   The **FX1000 client** displays the read data as –2.0000 to 2.0000 V using the computation channel 101. The following conversion is applied.
    Value on the computation channel 101 of the FX1000 client
    = Communication input data C01 x 0.0001

Settings on the FX1000 Server (Modbus Server)

Setting the Modbus Server Function
◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Server** > **Server modes**.
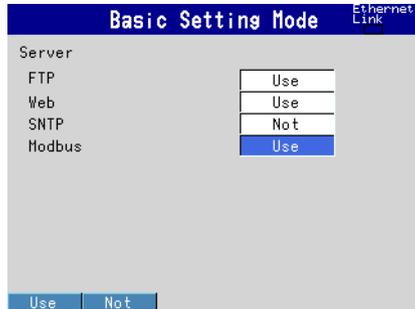
Item	Settings
Modbus	Use

About the Port Number
The port number is 502 by default.

Setting the Measurement Channel
◊ Press **MENU** (to switch to setting mode), and select the **Menu** tab > **Meas channel** > **Range, Alarm**.
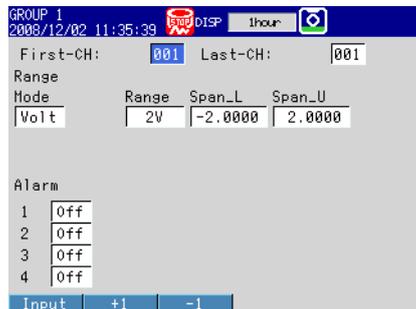
Item	Settings
First-CH, Last-CH	001
Mode	Volt
Range	2V
Span_L	–2.0000
Span_U	2.0000

Setting the FX1000 Client (Modbus Client)

Assumes the settings other than that for the server and the command are left to default values.

Registering the Destination Server

Register the FX1000 server to number 1.

The IP address of the FX1000 server is "190.168.1.101" as an example.

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Modbus client** > **Modbus server settings**.
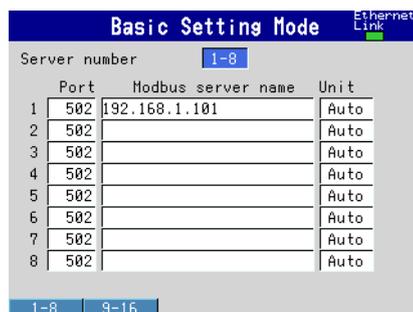
Item	Settings
Port	502
Modbus server name	192.168.1.101
Unit	Auto

Setting Command

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Modbus client** > **Command settings**.
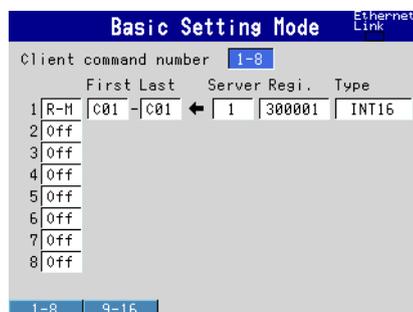
Item	Settings
Command type	R-M
First and Last	C01
Server	1
Regi.	300001
Type	INT16

Setting the Computation Channel

◊ Press **MENU** (to switch to setting mode), and select the **Menu** tab > **Math channel** > **Expression, Alarm**.

Item	Settings
First-CH, Last-CH	101
Math	On
Calculation expression	C01*K01
Span_L	–2.0000
Span_U	2.0000
Unit	V

◊ Press **MENU** (to switch to setting mode), and select the **Menu** tab > **Math channel** > **Constant**.

Item	Settings
Number of constant	K01
Value	0.0001

Assigning the channel to a Group

◊ Press **MENU** (to switch to setting mode), and select the **Menu** tab > **Group set, Trip line**.

Item	Settings
Group number	1
On/Off	On
Group name	GROUP 1
CH set	101

Starting the Computation (FX1000 Client)

◊ Press **FUNC** and select **Math start**.

The computation starts. A computation icon is displayed on the status display section. The value of computation channel 101 displayed in group 1 on the **FX1000 client** varies in sync with the measured value of channel 001 on the **FX1000 server**.
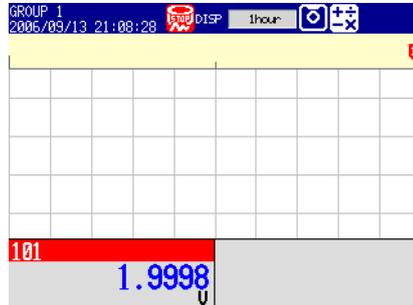
Confirming the Communication Status (FX1000 Client)

Showing a Menu to Switch to the Modbus Client Screen

This is the operation to show INFORMATION > MODBUS CLIENT on the display selection menu.

◊ Press **MENU** (to switch to setting mode), and select the **Menu** tab > **Menu customize** > **Display menu**.

1. Select **INFORMATION** > **MODBUS CLIENT** using the arrow keys.
   Select **INFORMATION > MODBUS MASTER** when you use the Modbus master via the serial communication.

2. Press the **View** soft key.
   The selected item displays in white.
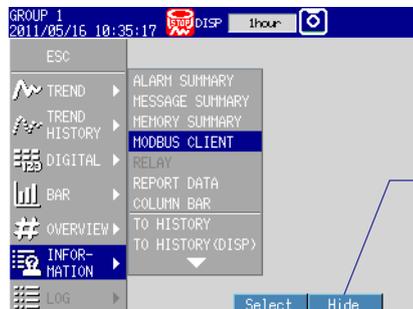
View/Hide soft key
Toggles **View** and **Hide** each time you press the soft key.

3. Press **ESC** to return to the operation screen.

Displaying the Modbus Client Screen

◊ Press **DISP/ENTER** and select **INFORMATION** > **MODBUS CLIENT**.

Select **INFORMATION > MODBUS MASTER** when you use the Modbus master via the serial communication.

1.12 Using the Setting/Measurement Server

This section explains how to use the setting/measurement server. You can use this function to send commands to retrieve data from the FX and to control it. For information about the maximum number of simultaneous connections, see section 6.1.

When Not Using the Login Function

Access the server using the user name "admin" or "user." Of the commands in chapter 3, you can use either the administrator (admin) or user commands, depending on which name you used to log in.

When Using the Login Function

Log in as a administrator or user who has been registered on the FX. Of the commands in chapter 3, you can use either the administrator (system administrator) or user (normal user) commands, depending on which name you used to log in.

1.13 Using the Maintenance/Test Server

When Not Using the Login Function

Access the server using the user name "admin" or "user." You can use either the administrator (admin) or user commands, depending on which name you used to log in.

When Using the Login Function

Log in as an administrator or user who has been registered on the FX. Of the commands in chapter 3, you can use either the administrator (system administrator) or user (normal user) commands, depending on which name you used to log in.

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2.1   What You Can Do with the FX1000

You can use an RS-232 or RS-422A/485 interface to perform serial communications. Explains the serial communication functions.

Modbus Master

- The FX can connect to a Modbus slave device and read or write to the internal register. You can use computation channels to handle the data that you have read as the communication input data of the computation function.[1] You can write measured data and computed data.[1]

  1: /M1, /PM1, /PWR1, and /PWR5 options
- For details on the Modbus function codes that the FX supports, see section 6.3.
- For the setting procedure, see sections 2.4, 2.6, and 2.7.

Modbus master

FX

Serial communication

MW100

Modbus slave device
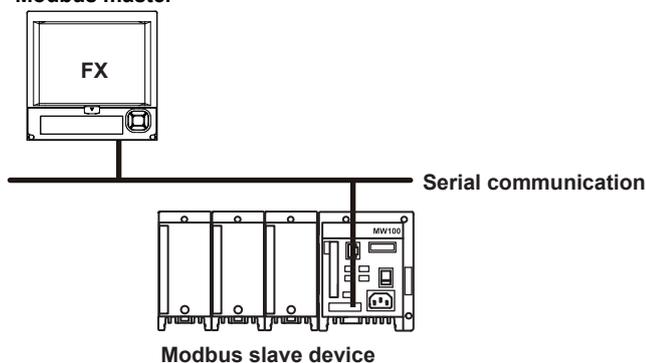
Modbus Slave

- A Modbus master device can carry out the following operations on the FX that is operating as a Modbus slave device.
  - Load data from measurement channels and computation channels[1] (using the input register)
  - Load communication input data[1] (using the hold register)
  - Write communication input data[1] (using the hold register)
  - Start and stop recording, write messages, and perform other similar operations (using the hold register)
  - Load the recording start/stop condition, message strings, and other types of data (using the hold register)
    1: /M1, /PM1, /PWR1, and /PWR5 options
- For details on the settings required to use this function and the Modbus function codes that the FX supports, see section 6.3.
- For the setting procedure, see sections 2.4, 2.5, and 2.7.

Modbus master device

Serial communication

FX

Modbus slave
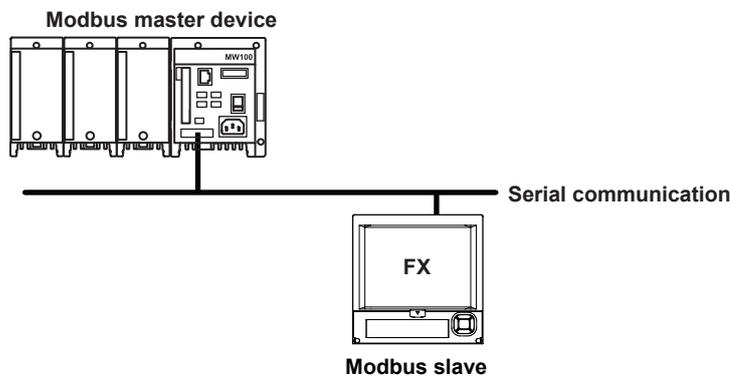
Setting/Measurement Function

- This function can be used to set almost all of the settings that can be configured using the front panel keys. For details, see section 1.1.
- For a description of the settings required to use this function, see section 2.4. For information about how to use the function, see section 2.8.

2.2 Flow of Operation When Using the Serial Interface

The following flow chart shows the procedure to follow to configure communications using RS-232 or RS-422A/485.
The procedure varies for RS-232 and RS-422A/485.

```
        ( Start of setting )
                |
      ┌─────────────────────┐
      │  Connect the cable   │
      └─────────────────────┘
                |
      ┌─────────────────────┐
      │   Set the baud rate  │
      └─────────────────────┘
                |
      ┌─────────────────────┐
      │  Set the data length │
      └─────────────────────┘
                |
      ┌─────────────────────┐
      │    Set the parity    │
      └─────────────────────┘
                |
            Communication         RS-422A/485
            < type >──────────────────────────┐
    RS-232      |                              |
      ┌─────────────────────┐      ┌─────────────────────┐
      │   Setting the       │      │   Set the address   │
      │   handshaking       │      └─────────────────────┘
      └─────────────────────┘              |
                |────────────────────────────┘
      ┌─────────────────────┐
      │   Set the protocol   │
      └─────────────────────┘
                |
      ┌─────────────────────┐    Configuration required when Modbus master
      │   Set the Modbus     │    is selected in the protocol setting.
      │   master             │
      └─────────────────────┘
                |
        ( End of setting )
```
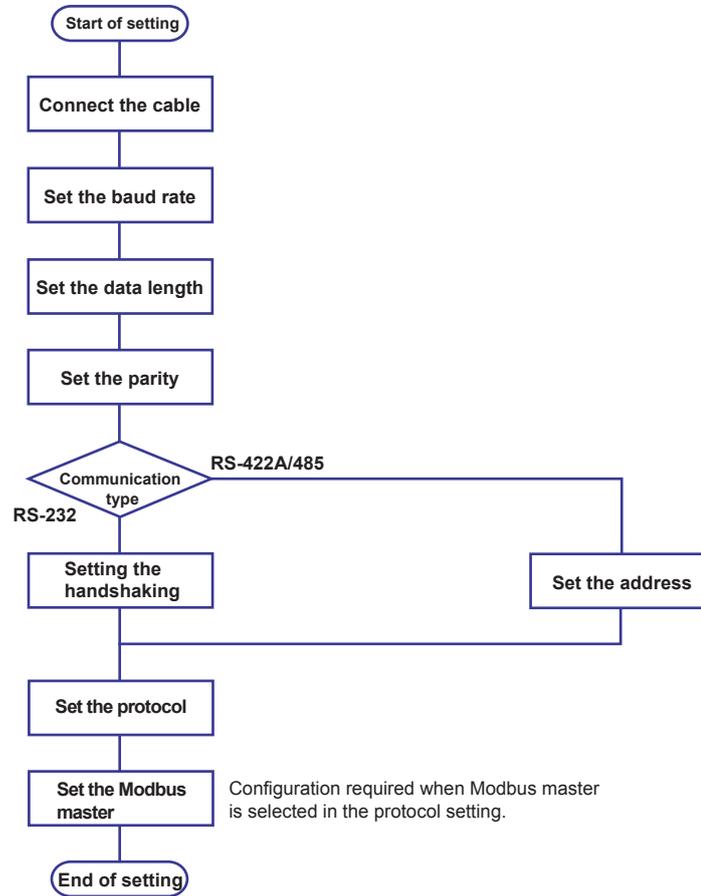
2.3 Connecting the FX

Connecting the cable

Connect a cable to the serial port on the FX rear panel.

RS-232 Connection Procedure

Connect a cable to the 9-pin D-sub RS-232 connector.

Connector pin arrangement and signal names

(Rear panel)
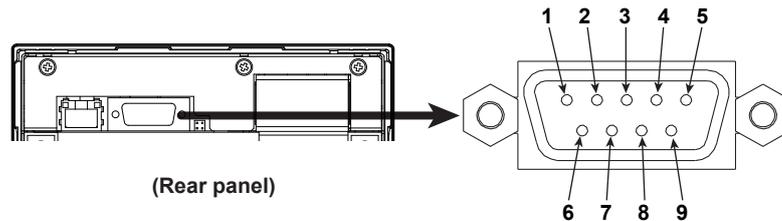
Each pin corresponds to the signal indicated below.

The following table shows the signal name, RS-232 standard, JIS, and ITU-T standard signals.

Pin	Signal Name			Name	Meaning
	JIS	ITU-T	RS-232		
2	RD	104	BB(RXD)	Received data	Input signal to the FX.
3	SD	103	BA(TXD)	Transmitted data	Output signal from the FX.
5	SG	102	AB(GND)	Signal ground	Signal ground.
7	RS	105	CA(RTS)	Request to send	Handshaking signal when receiving data from the PC. Output signal from the FX.
8	CS	106	CB(CTS)	Clear to send	Handshaking signal when receiving data from the PC. Input signal to the FX.

Note: Pins 1, 4, 6, and 9 are not used.

Connection

• Signal direction
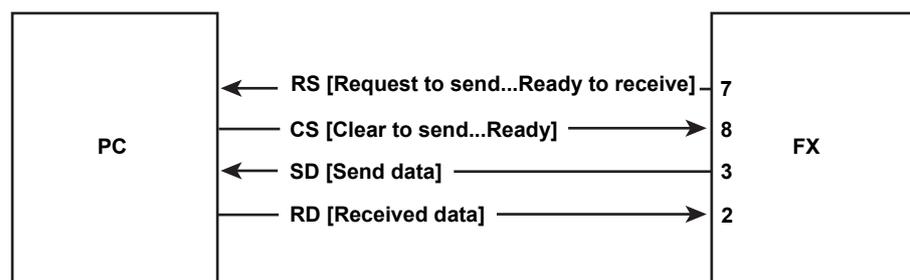
• Connection example

• OFF-OFF/XON-XON
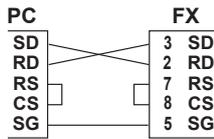
• CS-RS(CTS-RTS)
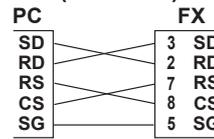
• XON-RS(XON-RTS)
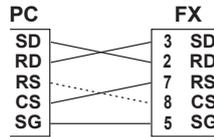
The connection of RS on the PC and CS on the FX is not necessary. However, we recommend that you wire them so that the cable can be used in either direction.

Handshaking

When using the RS-232 interface for transferring data, it is necessary for equipment on both sides to agree on a set of rules to ensure the proper transfer of data. The set of rules is called handshaking. Because there are various handshaking methods that can be used between the FX and the PC, you must make sure that the same method is chosen by both the FX and the PC.
You can choose any of the four methods on the FX in the table below.

Table of Handshaking Methods (Yes indicates that it is supported)

Handshaking	Data transmission control (Control used when sending data to a computer)			Data Reception Control (Control used when receiving data from a computer)		
	Software Handshaking	Hardware Handshaking		Software Handshaking	Hardware Handshaking	
	Stops transmission when X-OFF is received. Resume when X-ON is received.	Stops sending when CS (CTS) is false. Resumes when it is true.	No handshaking	Sends X-OFF when the receive data buffer is 3/4 full. Sends X-ON when the receive data buffer is 1/4th full.	Sets RS (RTS) to False when the receive data buffer is 3/4 full. Sets RS (RTS) to True when the receive data buffer becomes 1/4 full.	No handshaking
OFF-OFF			Yes			Yes
XON-XON	Yes			Yes		
XON-RS	Yes				Yes	
CS-RS		Yes			Yes	

• **OFF-OFF**
  • Data transmission control
    There is no handshaking between the FX and the PC. The "X-OFF" and "X-ON" signals received from the PC are treated as data, and the CS signal is ignored.
  • Data reception control
    There is no handshaking between the FX and the PC. When the received buffer becomes full, all of the data that overflows are discarded.
    RS = True (fixed).

- **XON-XON**
  - Data transmission control
    Software handshaking is performed between the FX and the PC. When an "X-OFF" code is received while sending data to the PC, the FX stops the data transmission. When the FX receives the next "X-ON" code, the FX resumes the data transmission. The CS signal received from the PC is ignored.
  - Data reception control
    Software handshaking is performed between the FX and the PC. When the free area of the received buffer decreases to 1537 bytes, the FX sends an "X-OFF" code. When the free area increases to 511 bytes, the FX sends an "X-ON" code. RS = True (fixed).

- **XON-RS**
  - Data transmission control
    The operation is the same as with XON-XON.
  - Data reception control
    Hardware handshaking is performed between the FX and the PC. When the free area of the received buffer decreases to 1537 bytes, the FX sets "RS=False." When the free area increases to 511 bytes, the FX sets "RS=True."

- **CS-RS**
  - Data transmission control
    Hardware handshaking is performed between the FX and the PC. When the CS signal becomes False while sending data to the PC, the FX stops the data transmission. When the CS signal becomes True, the FX resumes the data transmission. The "X-OFF" and "X-ON" signals are treated as data.
  - Data reception control
    The operation is the same as with XON-RS.

Note

- The PC program must be designed so that the received buffers of both the FX and the PC do not become full.
- If you select XON-XON, send the data in text format.

RS-422A/485 Connection Procedure

Terminal arrangement and signal names

Connect a cable to the clamp terminal.
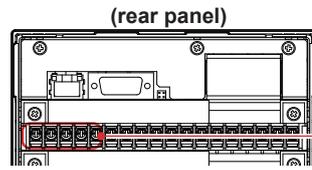
(rear panel)

RS-422A/485 interface terminal
A serial communication terminal that
comes with the /C3 option

Each terminal corresponds to the signal indicated below.

Signal Name	Meaning
FG	Frame ground of the FX.
SG	Signal ground.
SDB	Send data B (+).
SDA	Send data A (−).
RDB	Receive data B (+).
RDA	Receive data A (−).

Connection

As shown in the figure below, remove approximately 5 mm of the covering from the end of the cable to expose the conductor. Keep the exposed section from the end of the shield within 5 cm.

Four-wire system   **Two-wire system**

FG   SG   SDB   SDA   RDB   RDA   FG   SG   SDB   SDA   RDB   RDA

← Shield

Electric potential of the shield
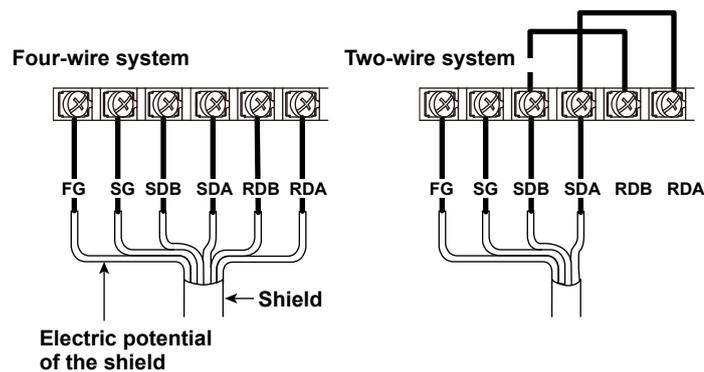
Connecting to the host device

The figure below illustrates the connection of the FX to a host device. If the port on the host device is an RS-232 interface, connect a converter.

Host computer or host device   **RS-422A/485 terminal on the FX**

Host device side

RS-422A/485

Host computer   **RS-422A/485 terminal on the FX**

Host device side

Converter

RS-232   **RS-422A/485**

2

Using the Serial Communication Interface (/C2 and /C3 Options)
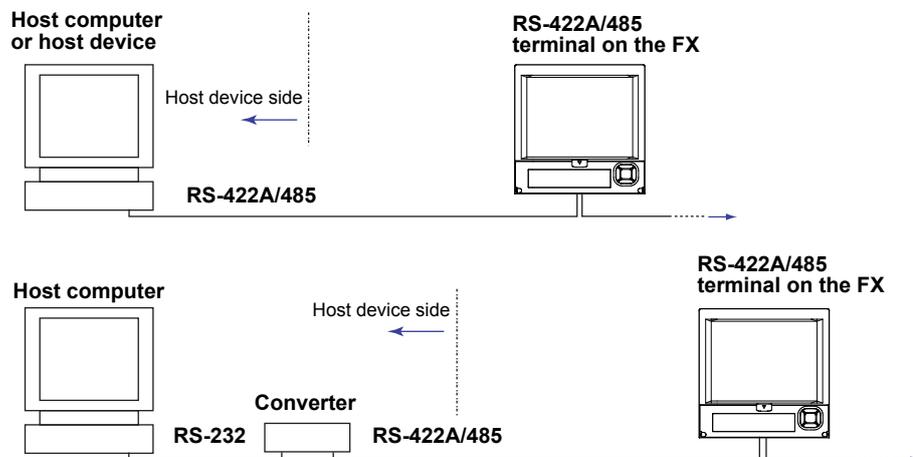
Connection example to the host device

You can connect the FX to a host device that has an RS-232, RS-422A, or RS-485 port. Use a converter to connect to an RS-232 port. See the following connection examples for typical converter terminals. For details, see the manual that comes with the converter.

RS-422A/485 Port	Converter
SDA(–)	TD(–)
SDB(+)	TD(+)
RDA(–)	RD(–)
RDB(+)	RD(+)
SG	SHIELD
FG	EARTH

There is no problem of connecting a 220 Ω terminator at either end if YOKOGAWA's PLCs or temperature controllers are also connected to the communication line.

- **Four-wire system**

  Generally, a four-wire system is used to connect to a host device. In the case of a four-wire system, the transmission and reception lines need to be crossed over.
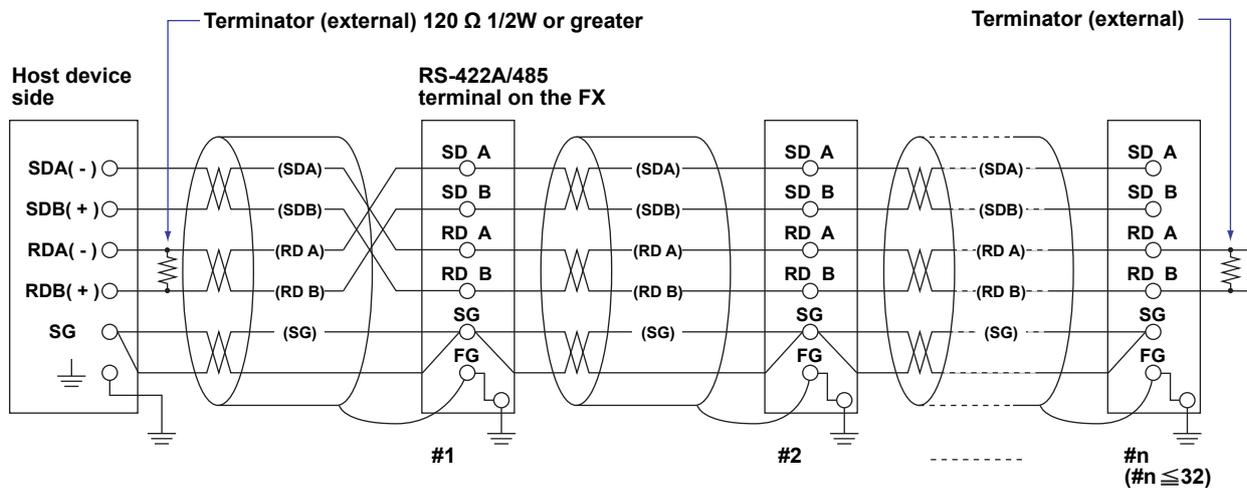
Do not connect terminators to #1 through #n-1.

- **Two-wire system**

  Connect the transmission and reception signals with the same polarity on the RS-422A/485 terminal block. Only use two wires to connect to the external device.
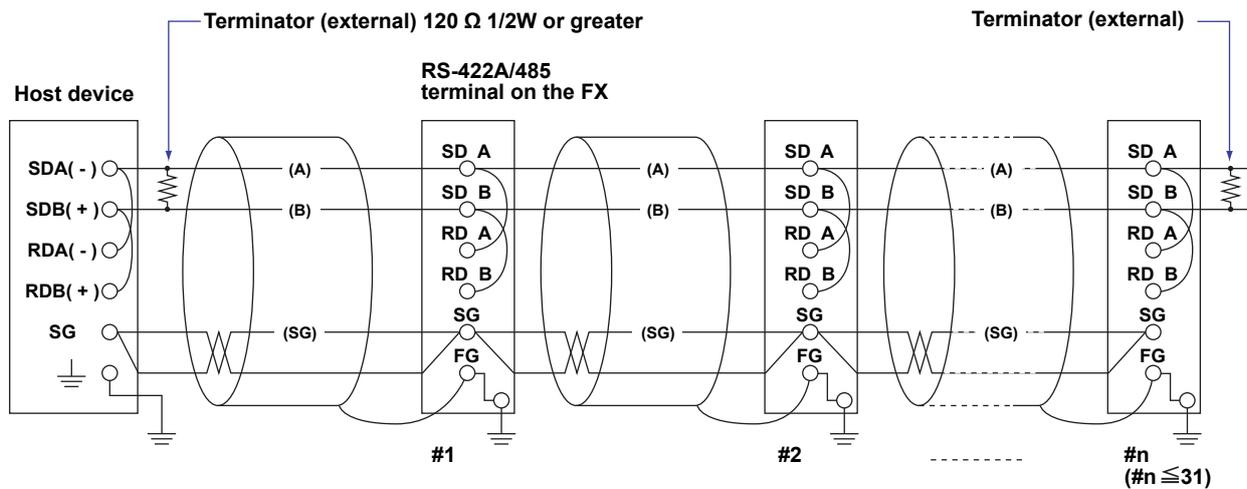
Do not connect terminators to #1 through #n-1.

Note

- The method used to eliminate noise varies depending on the situation. In the connection example, the shield of the cable is connected only to the FX's ground (one-sided grounding). This is effective when there is a difference in the electric potential between the computer's ground and the FX's ground. This may be the case for long distance communications. If there is no difference in the electric potential between the computer's ground and the FX's ground, the method of connecting the shield also to the computer's ground may be effective (two-sided grounding). In addition, in some cases, using two-sided grounding with a capacitor connected in series on one side is effective. Consider these possibilities to eliminate noise.
- You can only select the two-wire interface when you are using the Modbus protocol.
- When using the two-wire interface, the 485 driver must be set to high impedance within 3.5 characters after the last data byte is sent by the host computer.

Serial interface converter
The recommended converter is given below.
SYSMEX RA CO.,LTD./MODEL RC-770X, LINE EYE/SI-30FA, YOKOGAWA/ML2

CAUTION

Some converters not recommended by Yokogawa have FG and SG pins that are not isolated. In this case, do not follow the diagram on the previous page (do not connect anything to the FG and SG pins). Especially in the case of long distance communications, the potential difference that appears may damage the FX or cause communication errors. For converters that do not have the SG pin, they can be used without using the signal ground. For details, see the manual that comes with the converter.

On some non-recommended converters, the signal polarity may be reversed (A/B or +/- indication). In this case, reverse the connection.

For a two-wire system, the host device must control the transmission driver of the converter in order to prevent collisions of transmit and received data. When you are using the recommended converter, (1) use the feature that automatically switches between transmission and reception signals or (2) use the RS (RTS) signal on the RS-232 to turn the transmission driver on and off.

When the System Has Instruments That Support Only the RS-422A Interface
When using the four-wire system, up to 32 FXs can be connected to a single host device. However, this may not be true if the system has instruments that support only the RS-422A interface.

When the System Has YOKOGAWA Recorders That Support Only the RS-422A Interface
The maximum number of connection is 16. Some conventional YOKOGAWA recorders (such as the HR2400 and μR) only support the RS-422A driver. In this case, only up to 16 units can be connected.

Note

According to the RS-422A specification, up to 10 devices can be connected to a single port (when the four-wire system is being used).

Terminator
When using a multidrop connection (including a point-to-point connection), connect a terminator to the FX if the FX is connected to the end of the chain. Do not connect a terminator to a FX in the middle of the chain. In addition, turn ON the terminator on the host device (see the manual of the host device). If a converter is being used, turn ON its terminator. The recommended converter is a type that has a built-in terminator.
Select the appropriate terminator (120 Ω), indicated in the figure, according to the characteristic impedance of the line, the installation conditions of the instruments, and so on.

2

Using the Serial Communication Interface (/C2 and /C3 Options)

2.4 Setting the Serial Communication

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Serial)** > **Basic settings**.
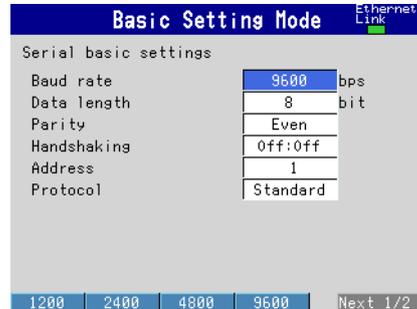
For RS-232

- **Baud rate**
  Select 1200, 2400, 4800, 9600, 19200, or 38400 (bps).

- **Data length**
  Select 7 or 8 (bits). To output the data in binary format, select 8.

- **Parity**
  Set the parity check method to Odd, Even, or None.

- **Handshaking**
  Select Off:Off, XON:XON, XON:RS, or CS:RS.

- **Address**
  For Modbus protocol, enter a value in the range of 1 to 99. For a general purpose communication protocol, this value is not set.

- **Protocol**
  Select [Standard] for a general purpose communication protocol, [Modbus] for Modbus slave, and [Modbus-M] for Modbus master.
  If Modbus master is selected, Modbus master settings must be entered. See section 2.6.

For RS-422A/485

- **Baud rate**
  Select 1200, 2400, 4800, 9600, 19200, or 38400 (bps).

- **Data length**
  Select 7 or 8 (bits). To output the data in binary format, select 8.

- **Parity**
  Set the parity check method to Odd, Even, or None.

- **Handshaking**
  Not specified.

- **Address**
  Select a number from 1 to 99.

- **Protocol**
  This is the same as with the RS-232.

2.5 Using the Modbus Slave Function

The FX is used as a Modbus slave.
For the Modbus specifications, see section 6.3.

Setting the Serial Communication

Select **Modbus** as a protocol on the **Basic settings**. For detail, see section 2.4, "Setting the Serial Communication."

Reading/Writing the FX Data on Another Device

Another device (master device) sends commands to the FX to read the FX data or write data to the FX. You can perform some operations, such as memory start, by writing in the registers.
For the function codes that the FX supports and the FX registers that the master device can access, see "Modbus Server Function" in section 6.3.

2.6 Using Modbus to Read Data From and Write Data to Other Devices

The FX is used as a Modbus master.

For the Modbus specifications, see section 6.3.

Setting the Serial Communication

Select **Modbus-M** as a protocol on the **Basic settings**. For detail, see section 2.4, "Setting the Serial Communication."

Setting the Modbus Master

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Serial)** > **Modbus master** > **Basic settings** or **Command settings**.

Basic settings

Command settings

Basic settings

- **Read cycle**
  Set the data read cycle to 1s, 2s, 5s, or 10s.
- **Timeout**
  Set the timeout value to 125 ms, 250 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, or 1 min. The timeout value is the maximum amount of time the FX waits for a response from the specified slave after the FX sends a command.
- **Retrials**
  Set the number of retrials when there is no response from the slave. Select Off, 1, 2, 3, 4, 5, 10, or 20.
- **Inter-block delay**
  Set the amount of time the FX waits after receiving a response to send the next command. Set the amount of time to Off, 5 ms, 10 ms, 15 ms, 45 ms, or 100 ms.
- **Auto recovery**
  Set the auto recovery time from communication halt. Select Off, 1min, 2min, 5min, 10min, 20min, 30min, or 1h.

Command settings

- **Master command number**
  Select 1-8 or 9-16 for the command numbers to be configured.
- **Command type**
  Set the operation of transmitted commands to Off, R-M, W, or W-M.
    - R-M: Read to the communication input data (32-bit floating point type) from the slave.
    - W: Write the measurement channel (16-bit signed integer type) to the slave.
    - W-M: Write the computation channel (32-bit signed integer type) to the slave.
      You can only select **R-M** and **W-M** on models that have the /M1, /PM1, /PWR1, or /PWR5 math option.

* **First/Last (FX channel numbers)**
Enter the first and last channel numbers for I/O. The range of channels that you can enter varies depending on the command type as follows:
R-M: C01 to C24, W: 001 to 012, W-M: 101 to 124

* **Address**
Enter the address of the slave device in the range of 1 to 247.

* **Regi.**
Set the register number of the slave.
For an input register, select in the range of 30001 to 39999 and 300001 to 365536.
For a hold register, select in the range of 40001 to 49999 and 400001 to 465536.
The register numbers you can specify vary depending on the command type. See section 6.3.

* **Type**
Select INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, or FLOAT_L.
The register numbers you can specify vary depending on the command type. See section 6.3.

Examples of Setting Commands

See page 1-45.

Checking the Modbus Operating Status

Displaying the Modbus Operating Status
◊ Press **DISP/ENTER** and select **INFORMATION** > **MODBUS MASTER**.

Note

To display the **MODBUS MASTER** on the screen selection menu, you need to change the setting using the menu customize function. Operate as follows:
◊ Press **MENU** (to switch to setting mode), and select the **Menu** tab > **Menu customize** > **Display menu**.
1. Select **INFORMATION** > **MODBUS MASTER**.
2. Press the **View** soft key.

- **Communication conditions**

    The read cycle, Inter-block delay, Time out, Auto recovery, and Retrials settings are displayed.

- **Communication Status**

    The communication status is displayed using the status lamp and the detail code.

Status Lamp	Detail Code	Meaning
Green	Good	Communication is operating normally.
Yellow		Command is readying.
Red		Communication is stopped.
Common to yellow and red	None	No response from the slave device.
	Func	The slave device cannot execute the command from the FX.
	Regi	The slave device does not have the specified register.
	Err	The response data from the slave device is broken (communication error).
	(Space)	The detail code is not displayed until the status is confirmed when communication is started.

Resuming Command Transmission

You can use the front panel keys to resume command transmission to a slave device to which communication is stopped (red status lamp).

1. Using the up and down arrow keys, select the command corresponding to the slave device to which transmission will be resumed. The message "Push [right arrow] key to refresh" appears.

2. Press the right arrow key. The FX starts command transmission to the specified slave.

Data When Communication Is Stopped and during Connection Retrials

For Modbus master, the communication input data is held at the previous values while the command is being retried.

If the command transmission stops such as due to a connection drop, the status turns red, and the communication input data will be error data. On communication channels, "+OVER" or –OVER is displayed according to the FX settings.

Data Dropout

Data drop occurs when the commands from 1 to 16 do not complete within the read cycle (see appendix 1). When a data dropout occurs, the communication input data is held at the previous value. A message indicating the data dropout is also displayed on the Modbus status display. If this happens, take measures such as making the read cycle longer or reducing the number of commands. Confirm that no data dropout occurs on the modbus status log screen.

2.7 Usage Example of the Modbus Function

Explains the setting example for both Modbus master and slave on FX1000s connected via the serial communication. In this section, the FX that has been set as the Modbus master is referred to as "FX1000 master." FXs that have been set as Modbus slaves are each referred to as "FX1000 slave."

System Configuration and Actions

Uses the measurement channel, computation channel, and communication input data as described in the figure below. Assumes other conditions are set properly.
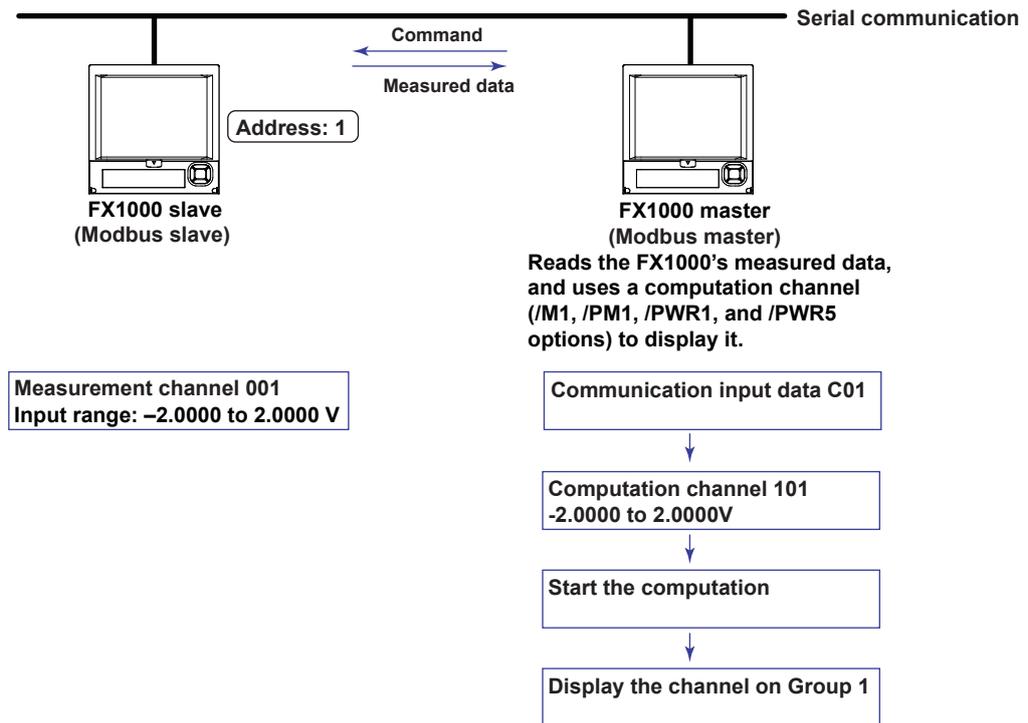
Action
- The **FX1000 master** reads the measured value of channel 001 on the **FX1000 slave** into the communication input data C01. C01 is displayed on a computation channel 101 by including the data in the equation. The computation channel 101 is assigned to Group1.
- The measured value of channel 001 on the **FX1000 slave** is transferred to the **FX1000 master** as an integer in the range of –20000 to 20000.
- The **FX1000 master** displays the read data as –2.0000 to 2.0000 V on the computation channel 101. The following conversion is applied.
  Value on the computation channel 101 of the FX master
  = Communication input data C01 x 0.0001

Settings on the FX1000 Slave (Modbus Slave)

Setting the Modbus Slave Function

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Serial)** > **Basic settings**.
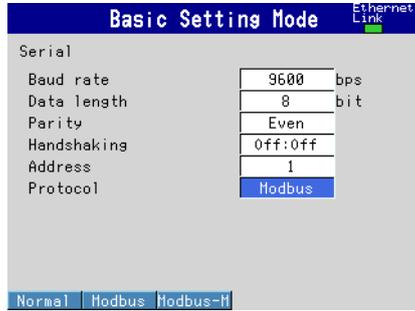
Item	Settings
Address	1
Protocol	Modbus

Note: Set the communication conditions the same as those of the master device.

Setting the Measurement Channel

◊ Press **MENU** (to switch to setting mode), and select the **Menu** tab > **Meas channel** > **Range, Alarm**.
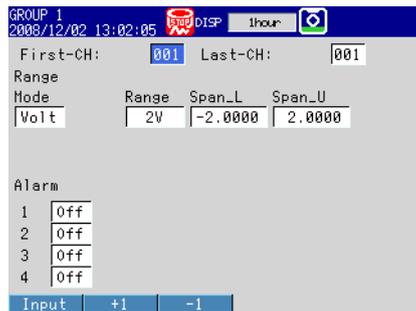
Item	Settings
First-CH, Last-CH	001
Mode	Volt
Range	2V
Span_L	–2.0000
Span_U	2.0000

Setting the FX1000 Master (Modbus Master)

Assumes the settings other than those below are left to default values.

Setting the Modbus Master Function

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Serial)** > **Basic settings**.
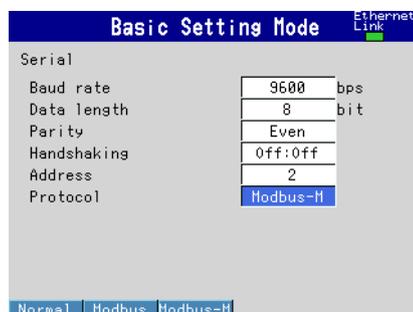
Item	Settings
Address	You can specify any value. The Modbus master does not use this setting.
Protocol	Modbus-M

Note: Set the communication conditions the same as those of the slave device.

Setting Command

◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Serial)** > **Modbus master** > **Command settings**.
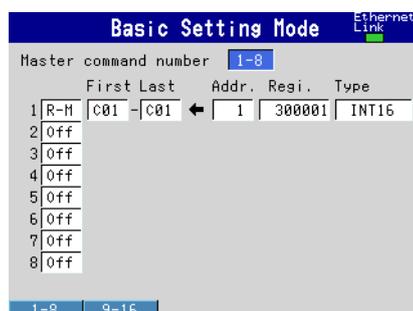
Item	Settings
Command type	R-M
First and Last	C01
Addr.	1
Regi.	300001
Type	INT16

Setting the Computation Channel

See section 1.11, "Usage Example of the Modbus Function."

Assigning the channel to a Group

See section 1.11, "Usage Example of the Modbus Function."

Starting the Computation

See section 1.11, "Usage Example of the Modbus Function."

Confirming the Communication Status

See section 1.11, "Usage Example of the Modbus Function."

2

Using the Serial Communication Interface (/C2 and /C3 Options)

2.8 Using the Setting and Measurement Function

This section explains the setting and measurement function. You can use this function to send commands to retrieve data from the FX and to control it.

Connecting to the FX

Perform the operations that are appropriate for your PC, software, and network environment.

For RS-232
The FX is ready to receive commands as soon as you connect it to the PC.

For RS-422A/485
The FX is ready to receive commands after you connect it to the PC and open it with the open command (ESC o).

RS-422A/485 Disconnection
The connection is closed when:
• A command is sent that closes the connection.
  The close command (ESC c) is sent.
• A connection is opened with another device.
  Example: If you open the FX at address 1 and then open the FX at address 2, the connection with the FX at address 1 is closed automatically.

3.1   Command Syntax

Command Syntax

The syntax of the FX's setting, basic setting, and output commands (see sections 3.4 to 3.9) is given below. ASCII (see appendix 3) is the supported character code. For the syntax of the maintenance/test commands (see section 3.11) and instrument information output commands (see section 3.12), see the corresponding sections or the examples for each command.

Command example

```
SR002,SKIP;SR003,VOLT,2V,-1500,1800
```

Parameter

Delimiter (,)
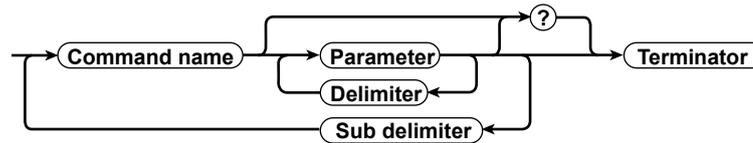
Command name (SR)
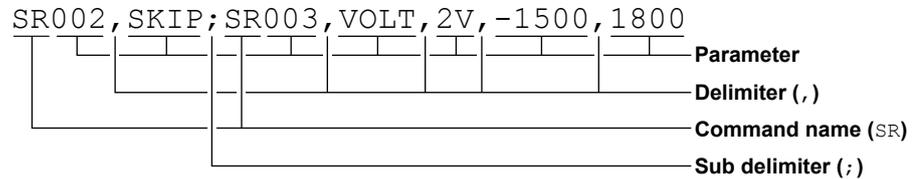
Sub delimiter (;)

Command Name
A command name is defined using two alphabet characters.

Parameters
* These are the command arguments.
* These are set using alphabet characters or numeric values.
* Parameters are separated by delimiters (commas).
* All numeric values are specified using integers.
* The valid ranges of numeric parameters vary depending on the command.
* Spaces around parameters are ignored. However, spaces are valid for parameters— for example, units—that are specified using ASCII character strings. In the examples given in this manual, spaces are not used.
* You can omit the parameters that do not need to be changed from their current settings. However, delimiters cannot be omitted.
    Example SR001,,2V<terminator>
* If multiple parameters are omitted and there are multiple delimiters at the end of the command, those delimiters can be omitted.
    Example SR001,VOLT,,,<terminator> → SR001,VOLT<terminator>
* For the following parameters, the number of digits or characters is fixed. If a value is entered with the incorrect number of digits, a syntax error will occur.
    * Date   YY/MM/DD (8 characters)
        YY: Enter the last two digits of the year.
        MM: Month
        DD: Day
    * Time   HH:MM:SS (8 characters)
        HH: Hour
        MM: Minute
        SS: Second
    * Channel number: 3 characters
    * Relay number: 3 characters

Query

- A question mark is used to specify a query.
- By placing a query after a command or parameter, you can query the corresponding command's setting. Some commands cannot be executed as queries. For the query syntax of each command, see sections 3.4 to 3.7.

  Example 1 SR[p1]?   SR? or SRp1? can be executed.
  Example 2 SA[p1[p2]]? SA?, SAp1?, and SAp1,p2? can be executed.

Delimiter

- A comma is used as the delimiter.
- Parameters are separated by delimiters.

Sub Delimiter

- A semicolon is used as the sub delimiter.
- By separating each command with a sub delimiter, you can specify up to 10 commands one after another. However, the following commands and queries must be used independently. You cannot specify them as part of a sequence of commands.
  - Output commands other than BO, CS, IF, and CB.
  - The YO command.
  - Queries

  Note: Consecutive sub delimiters are seen to be a single sub delimiter. In addition, sub delimiters at the front and at the end of a command are ignored.

    Example   ;SR001,VOLT;;;SR002,VOLT;<terminator> is taken to be
               SR001,VOLT;SR002,VOLT<terminator>.

Terminator

Use either of the following as the terminator.

- CR+LF (0DH 0AH in ASCII code)
- LF (0AH in ASCII code)

Note

- Do not specify a channel or relay number that is not available on the FX. If you do, an error will occur.
- The total data length from the first character to the terminator must be less than or equal to 2047 bytes.
- Commands are not case sensitive with the exception of user-specified character strings.
- All the commands that are listed using sub delimiters are executed even if there are erroneous commands within the list.
- Spaces that are inserted before and after a parameter are ignored. However, if spaces are inserted before a command, after a sub delimiter, or after a query, an error will occur.

Response

The FX returns a response (affirmative or negative acknowledgment) to each command that is delimited by a terminator.[1] The controller should follow the one command to one response format. If the command-response rule is not followed, the operation of the FX is not guaranteed. For the response syntax, see section 4.1.

1: RS-422A/485 commands (see section 3.9) and instrument information output commands (see section 3.12) are exceptions.

3.2 List of Commands

FX Execution Modes

The FX has two execution modes. If you attempt to execute a command in an execution mode that is different from the mode that the command is specified for, a syntax error will occur. Use the DS command to switch to the appropriate execution mode, and then execute the command. Queries can be executed in either mode.

• **Basic setting mode**

This mode is used to change the settings. In this mode, measurements and computations are stopped.

• **Operation mode**

As a general rule, commands other than those used in the basic setting mode described above are used in this mode.

Administrator and User

The distinction between administrators and normal users indicates the user levels set through the FX Ethernet login function. "Administrator" refers to a "system administrator" or "admin." "User" refers to a "normal user" or "user." For details, see section 1.1.

"Yes" and "No" in the table indicate the following:

Yes: The command can be used.

No: The command cannot be used.

Setting Commands

Command Name	Function	Execution Mode	Administrator	User	Page
SR	Sets an input range	Operation mode	Yes	No	3-12
SO	Sets an expression (/M1, /PM1, /PWR1, and /PWR5 options)	Operation mode	Yes	No	3-14
TJ	Sets memory sampling	Operation mode	Yes	No	3-14
SA	Sets an alarm	Operation mode	Yes	No	3-15
SW	Sets the trend interval and auto save interval	Operation mode	Yes	No	3-16
TW	Sets the secondary trend interval	Operation mode	Yes	No	3-16
TE	Sets sampling conditions for event data	Operation mode	Yes	No	3-17
SZ	Sets a zone	Operation mode	Yes	No	3-17
SP	Sets a partial expanded display	Operation mode	Yes	No	3-17
ST	Sets a tag	Operation mode	Yes	No	3-18
SX	Sets a display group	Operation mode	Yes	No	3-18
SL	Sets a trip line	Operation mode	Yes	No	3-18
SG	Sets a message	Operation mode	Yes	No	3-18
TH	Sets the directory on the external storage medium for saving data	Operation mode	Yes	No	3-18
TZ	Sets a file header	Operation mode	Yes	No	3-18
TF	Sets a data file name	Operation mode	Yes	No	3-19
SD	Sets the date and time	Operation mode	Yes	No	3-19
TD	Sets daylight saving time	Operation mode	Yes	No	3-19
TT	Sets the trend display	Operation mode	Yes	No	3-19
SE	Sets the line width and the number of grid sections to use on the trend graph	Operation mode	Yes	No	3-20
TB	Sets the bar graph display	Operation mode	Yes	No	3-20
SB	Sets the bar graph for a channel	Operation mode	Yes	No	3-20
TN	Sets a scale	Operation mode	Yes	No	3-20
SV	Sets a measurement channel's moving average	Operation mode	Yes	No	3-20
SC	Sets a channel display color	Operation mode	Yes	No	3-20
TA	Sets an alarm point mark	Operation mode	Yes	No	3-20
TG	Sets a color scale band	Operation mode	Yes	No	3-21
SQ	Sets the LCD brightness and the screen backlight saver	Operation mode	Yes	No	3-21
TC	Sets the background color	Operation mode	Yes	No	3-21
TP	Sets automatic display group switching	Operation mode	Yes	No	3-21
TR	Sets the automatic monitor return function	Operation mode	Yes	No	3-22

Command Name	Function	Execution Mode	Administrator	User	Page
TQ	Sets a timer	Operation mode	Yes	No	3-22
TK	Sets a match time timer	Operation mode	Yes	No	3-22
TU	Sets an event action	Operation mode	Yes	No	3-23
SK	Sets a computation constant (/M1, /PM1, /PWR1, and /PWR5 options)	Operation mode	Yes	No	3-24
SI	Sets the rolling average function of a computation channel (/M1, /PM1, /PWR1, and /PWR5 options)	Operation mode	Yes	No	3-24
SJ	Sets a TLOG timer (/M1, /PM1, /PWR1, and /PWR5 options)	Operation mode	Yes	No	3-24
TX	Sets the ancillary operation of the start key (/M1, /PM1, /PWR1, and /PWR5 options)	Operation mode	Yes	No	3-25
BH	Sets a batch text field	Operation mode	Yes	No	3-25
EH	Sets calibration correction (/CC1 option)	Operation mode	Yes	No	3-25
BD	Sets an alarm delay	Operation mode	Yes	No	3-25
NP	Sets the VT ratio, CT ratio, and low-cut power (/PWR1 or /PWR5 option)	Operation mode	Yes	No	3-25
FR	Sets the interval for acquiring data to the FIFO buffer	Operation mode	Yes	No	3-26
SM	Sets the custom menu	Operation mode	Yes	No	3-27

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Commands

Control Commands

Command Name	Function	Execution Mode	Administrator	User	Page
BT	Sets a batch name	Operation mode	Yes	No	3-30
BU	Sets a batch comment	Operation mode	Yes	No	3-30
UD	Switches the screen	Operation mode	Yes	No	3-30
PS	Starts or stops recording	Operation mode	Yes	No	3-30
AK	Clears alarm output (acknowledges alarms)	Operation mode	Yes	No	3-30
EV	Executes manual sample, generates a manual trigger, takes a snapshot, or causes a timeout	Operation mode	Yes	No	3-31
CL	Executes manual SNTP (/C7 option)	Operation mode	Yes	No	3-31
CV	Switches between the normal and secondary trend intervals	Operation mode	Yes	No	3-31
MS	Writes a message (display and write)	Operation mode	Yes	No	3-31
BJ	Writes a free message	Operation mode	Yes	No	3-31
EJ	Changes the password of the login function (/C7 option)	Operation mode	Yes	Yes	3-31
TL	Starts, stops, resets computation (MATH) or clears the computation dropout status display (/M1, /PM1, /PWR1, and /PWR5 options)	Operation mode	Yes	No	3-31
DS	Switches between execution modes (operation and basic setting)	All modes	Yes	No	3-31
LO	Loads setup data for setting mode	Operation mode	Yes	No	3-32
LI	Saves setup data (/C7 option)	Operation mode	Yes	No	3-32
CM	Sets communication input data (/M1, /PM1, /PWR1, and /PWR5 options)	Operation mode	Yes	No	3-32
EM	Starts or stops the e-mail transmission function (/C7 option)	Operation mode	Yes	No	3-32
CU	Recovers Modbus manually (/C2, /C3, and /C7 options)	Operation mode	Yes	No	3-33
YO	Loads a setup file that includes the settings for basic setting mode	Basic setting mode	Yes	No	3-33
YC	Clears measured and computed data and initializes setup data	Basic setting mode	Yes	No	3-33
IR	Resets a relative timer	Operation mode	Yes	No	3-33
BV	Enters a string (can only be used during serial communication)	All modes	Yes	No	3-33
KE	Performs key operations	Operation mode	Yes	No	3-33

Basic Setting Commands

- To apply settings that you have changed using the basic setting commands, you need to save the settings using the YE or XE command. Be sure to save the settings before you change the execution mode from the basic setting mode to the operation mode. Otherwise, the new settings will not be applied.
- The settings that are returned in response to a query in basic setting mode contain the new settings even if they have not been saved. However, the new settings are not applied unless they are saved. If the settings are cleared or if you change the execution mode from basic setting mode to operation mode before saving the settings, the settings that are returned in the response to a query contain the settings that were in use before they were changed.

Note

- The settings that are changed using the YA, YK, RU, YQ, YS, YB, YD, WS, WW, and WQ commands are applied after saving the new settings using the XE command and restarting the FX.
- When you execute the YE or YO command, communication is disconnected. Commands listed after the YO or YE command are ignored.

Command Name	Function	Execution Mode	Administrator	User	Page
WU	Sets the environment	Basic setting mode	Yes	No	3-34
WO	Sets alarm and DO settings	Basic setting mode	Yes	No	3-36
WH	Sets alarm hysteresis	Basic setting mode	Yes	No	3-36
XV	Sets the scan interval and A/D integration time	Basic setting mode	Yes	No	3-37
XB	Sets burnout detection	Basic setting mode	Yes	No	3-37
XJ	Sets RJC	Basic setting mode	Yes	No	3-37
XM	Sets the memory sampling condition	Basic setting mode	Yes	No	3-37
RF	Sets the key lock	Basic setting mode	Yes	No	3-37
RN	Sets basic login	Basic setting mode	Yes	No	3-38
RP	Sets user limitations	Basic setting mode	Yes	No	3-38
RO	Sets the type of report and when to create reports (/M1, /PM1, / PWR1, and /PWR5 options)	Basic setting mode	Yes	No	3-38
RM	Sets a report channel (/M1, /PM1, /PWR1, and /PWR5 options)	Basic setting mode	Yes	No	3-39
XG	Sets the time zone	Basic setting mode	Yes	No	3-39
XN	Sets the date format	Basic setting mode	Yes	No	3-39
YB	Sets host information (/C7 option)	Basic setting mode	Yes	No	3-39
YD	Sets network parameters (/C7 option)	Basic setting mode	Yes	No	3-40
YA	Sets the IP address, subnet mask, and default gateway (/C7 option)	Basic setting mode	Yes	No	3-40
YK	Sets keepalive (/C7 option)	Basic setting mode	Yes	No	3-40
RU	Sets DNS parameters (/C7 option)	Basic setting mode	Yes	No	3-40
WS	Sets a server (/C7 option)	Basic setting mode	Yes	No	3-40
WW	Sets web page parameters (/C7 option)	Basic setting mode	Yes	No	3-40
YQ	Sets the communication timeout (/C7 option)	Basic setting mode	Yes	No	3-41
YT	Sets the FTP transfer timing (/C7 option)	Basic setting mode	Yes	No	3-41
YU	Sets what kind of information to send using e-mail (/C7 option)	Basic setting mode	Yes	No	3-41
YV	Sets an e-mail recipient address (/C7 option)	Basic setting mode	Yes	No	3-42
YW	Sets the e-mail sender address (/C7 option)	Basic setting mode	Yes	No	3-42
YX	Sets the e-mail SMTP server name (/C7 option)	Basic setting mode	Yes	No	3-42
YJ	Sets the Modbus client's destination server (/C7 option)	Basic setting mode	Yes	No	3-42
YP	Sets basic Modbus client settings (/C7 option)	Basic setting mode	Yes	No	3-43
YR	Sets the Modbus client's transmit command (/C7 option)	Basic setting mode	Yes	No	3-43
WB	Sets SNTP client parameters (/C7 option)	Basic setting mode	Yes	No	3-43
WC	Sets the SNTP operation that is performed when memory start is executed (/C7 option)	Basic setting mode	Yes	No	3-44
YS	Sets the serial interface (/C2 and /C3 options)	Basic setting mode	Yes	No	3-44
YL	Sets the operation of the Modbus master function (/C2 and /C3 options)	Basic setting mode	Yes	No	3-44

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Commands

Command Name	Function	Execution Mode	Administrator	User	Page
YM	Sets a transmit command of the Modbus master function (/C2 and /C3 options)	Basic setting mode	Yes	No	3-44
WR	Sets the instrument information output (/F1 option)	Basic setting mode	Yes	No	3-45
QA	Sets the number of mantissa digits to display (/LG1 option)	Basic setting mode	Yes	No	3-46
RH	Sets LogType2 (/LG1 option)	Basic setting mode	Yes	No	3-46
WF	Sets the Modbus connection limitation (/C7 option)	Basic setting mode	Yes	No	3-46
WG	Sets an IP address that is allowed to connect through the Modbus interface (/C7 option)	Basic setting mode	Yes	No	3-46
WP	Sets the phase, wiring system, and input voltage (/PWR1 or /PWR5 option)	Basic setting mode	Yes	No	3-46
XE	Applies basic settings	Basic setting mode	Yes	No	3-46
YE	Applies basic settings (cold reset)	Basic setting mode	Yes	No	3-46

Output Commands

Note

Output commands except BO, CS, and IF cannot be placed in a command sequence.

Command Name	Function	Execution Mode	Administrator	User	Page
Control					
BO	Sets the byte output order	All modes	Yes	Yes	3-47
CS	Sets the check sum (/C2 and /C3 options)	All modes	Yes	Yes	3-47
IF	Sets status filters	All modes	Yes	Yes	3-47
CB	Sets the data output format	All modes	Yes	Yes	3-47
CC	Disconnects the Ethernet connection (/C7 option)	All modes	Yes	Yes	3-47
Setup, measurement, and computed data output					
FC	Outputs screen image data	All modes	Yes	Yes	3-48
FE	Outputs setup data	All modes	Yes	Yes	3-48
FD	Outputs the most recent measured data and computed data	Operation mode	Yes	Yes	3-48
FF	Outputs FIFO data	Operation mode	Yes	Yes	3-49
FL	Outputs a log, alarm summary, or message summary	All modes	Yes	Yes	3-49
IS	Outputs status information	All modes	Yes	Yes	3-49
FU	Outputs user levels	All modes	Yes	Yes	3-50
FA	Outputs internal FX information	All modes	Yes	Yes	3-50
ME	Outputs data stored on the external storage medium and in internal memory	Operation mode	Yes	No	3-50
MO	Manages and outputs the data that has been written to internal memory	Operation mode	Yes	No	3-51
RS-422A/485 commands					
Esc O	Opens an instrument	All modes	Yes	Yes	3-51
Esc C	Closes an instrument	All modes	Yes	Yes	3-51
Common commands among instruments					
*I	Outputs instrument information	All modes	Yes	Yes	3-52

Maintenance/Test Commands (Available when using the maintenance/test server function through Ethernet communications)

Command Name	Function	Administrator	User	Page
close	Closes another device's connection	Yes	No	3-52
con	Outputs connection information	Yes	Yes	3-52
eth	Outputs Ethernet statistics	Yes	Yes	3-53
help	Outputs help	Yes	Yes	3-53
net	Outputs network statistics	Yes	Yes	3-53
quit	Closes the connection to the instrument that you are operating	Yes	Yes	3-53

Instrument Information Output Commands (Available when using the instrument information server function through Ethernet communications)

Parameter Name	Function	Page
serial	Outputs the serial number	3-54
host	Outputs the host name	3-54
ip	Outputs the IP address	3-54

3.3 Setup Parameters

Example of Entering Measuring Range Parameters

When you enter the span upper and lower limit parameters of the SR command (the input range setting command), you have to enter all the digits including those to the right of the decimal point. For example, if you want to set the upper limit to 1.0000 V when the measuring range is –2.0000 V to 2.0000 V, you have to enter "10000." If you want to set the limit to 0.5000 V, you have to enter "5000."

The table below shows configuration examples.

Measuring Range	Input Type Parameter	Selectable Range of the Measuring Range	Specified Range	Parameter
VOLT	20mV	−20.000mV to 20.000mV	−10.000mV to 20.000mV	−10000 to 20000
/SQRT	2V	−2.0000V to 2.0000V	−2.0000V to 0.5000V	−20000 to 5000
TC	R	0.0 to 1760.0	0.0 to 400.0	0 to 4000
	K	−200.0 to 1370.0	−200.0 to 1370.0	−2000 to 13700
RTD	Pt100	−200.0 to 600.0	−10.0 to 500.0	−100 to 5000
DI	LEVEL	0 to 1	0 to 1	0 to 1

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Commands

List of Measuring Range Parameters

The table below shows the relationship between the input types and the range parameters. For details on the selectable range, see the *FX1000 User's Manual*, IM 04L21B01-01EN.

Input Type	Input Type Parameter	Range	Range Parameter	Required Option
DC voltage	VOLT	20 mV	20MV	
		60 mV	60MV	
		200 mV	200MV	
		1 V	1V	
		2 V	2V	
		6 V	6V	
		20 V	20V	
		50 V	50V	
Thermocouple	TC	R	R	
		S	S	
		B	B	
		K	K	
		E	E	
		J	J	
		T	T	
		N	N	
		W	W	
		L	L	
		U	U	
		Kp vs Au7Fe	KP	/N3F
		PLATINEL	PLATI	/N3F
		PR40-20	PR	/N3F
		NiNiMo	NIMO	/N3F
		WRe	WRE	
		W/WRe26	W/WRE	/N3F
		TypeN (AWG14)	N2	/N3F
		XK GOST	XK	/N3F
RTD	RTD	Pt	PT	
		JPt	JPT	
		Ni100 (SAMA)	NI1	/N3F
		Ni100 (DIN)	NI2	/N3F
		Ni120	NI3	/N3F
		Pt100 GOST	Pt100G	/N3F
		Cu100 GOST	Cu100G	/N3F
		Cu50 GOST	Cu50G	/N3F
		Pt200W (WEED)	Pt200W	/N3F
Contact input	DI	Level	LEVEL	
		Cont	CONT	
1-5V voltage	1-5V	1-5V	1-5V	

List of Notations Such as Channel Numbers and Valid Ranges

Type	Notation and Valid Range	Notes
Measurement channel	001 to 012	Varies depending on the model
Computation channel	101 to 112	High-speed input model, /M1, /PM1, /PWR1, and /PWR5
	101 to 124	Medium-speed input model, /M1, /PM1, /PWR1, and /PWR5
Report channels	R01 to R12	High-speed input model, /M1, /PM1, /PWR1, and /PWR5
	R01 to R24	Medium-speed input model, /M1, /PM1, /PWR1, and /PWR5
Internal switches	S01 to S30	
Output relays	I01 to I06, I11 to I16	Varies depending on the option (/A[ ] or /A4A)
Constants	K01 to K60	/M1, /PM1, /PWR1, /PWR5
Communication input data	C01 to C24	/M1, /PM1, /PWR1, /PWR5
Display groups	1 to 10	
Remote control terminals	1 to 8	/R1, /PM1
Pulse inputs	1 to 8	/PM1
Flags	1 to 8	/M1, /PM1, /PWR1, /PWR5
Timers	1 to 4	
Match time timers	1 to 4	
Report groups (stacked bar graphs)	1 to 2	High-speed input model, /M1, /PM1, /PWR1, and /PWR5
	1 to 4	Medium-speed input model, /M1, /PM1, /PWR1, and /PWR5

High-speed input models FX1002 and FX1004
Medium-speed input models FX1006, FX1008, FX1010, and FX1012

Note

Regarding "Don't care" parameters for each command

"Don't care" parameters do not affect the settings that are made by a command. Set these parameters to any values that you want.

Examples: ,abc,   When "abc" is entered.
,1,   When 1 is entered.
,,   When nothing is entered.
, ,   When a space is entered.

3.4 Setting Commands

SR   Sets an input range

You cannot use this command to configure settings while recording (memory sampling) or computation is in progress.

When Setting Channels to Skip

Syntax   `SR p1,p2<terminator>`

p1   Measurement channel number
p2   Setting type (SKIP)

Query   `SR[p1]?`

Example   Skip channel 001.
`SR001,SKIP`

Description •   Channels set to SKIP are not measured.
•   Set p1 by referring to the table in section 3.3.

When Setting the Channels to Voltage, TC, RTD, or ON/OFF Input

Syntax   `SR p1,p2,p3,p4,p5<terminator>`

p1   Measurement channel number
p2   Input type

VOLT   DC voltage
TC   Thermocouple
RTD   Resistance temperature detector
DI   ON/OFF input

p3   Measuring range
p4   Span lower limit
p5   Span upper limit

Query   `SR[p1]?`

Example   Set the channel 001 input type to TC type R, the span lower limit to 0°C, and the span upper limit to 1760.0°C.
`SR001,TC,R,0,17600`

Description •   Set p1 and p3 by referring to the table in section 3.3.
•   For parameters p4 and p5, enter values with five digits or less excluding the decimal point.

When Computing the Difference between Channels

Syntax   `SR p1,p2,p3,p4,p5,p6,p7<terminator>`

p1   Measurement channel number
p2   Setting type (DELTA)
p3   Input type

VOLT   DC voltage
TC   Thermocouple
RTD   Resistance temperature detector
DI   ON/OFF input

p4   Measuring range
p5   Span lower limit
p6   Span upper limit
p7   Reference channel number (measurement channel number)

Query   `SR[p1]?`

Example   Set the channel 010 setting type to differential computation between channels with the reference channel set to 001, and set the input type to TC. Set the measuring range to R. Set the span lower limit to 10.0°C and the span upper limit to 100.0°C.
`SR010,DELTA,TC,R,100,1000,001`

Description •   Set p1 and p4 by referring to the table in section 3.3.
•   For parameters p5 and p6, enter values with five digits or less excluding the decimal point.

When Setting Channels to Scaling

Syntax   `SR p1,p2,p3,p4,p5,p6,p7,p8,p9,p10`
`<terminator>`

p1   Measurement channel number
p2   Setting type (SCALE)
p3   Input type

VOLT   DC voltage
TC   Thermocouple
RTD   Resistance temperature detector
DI   ON/OFF input

p4   Measuring range
p5   Span lower limit
p6   Span upper limit
p7   Scaling lower limit (–30000 to 30000)
p8   Scaling upper limit (–30000 to 30000)
p9   Scaling decimal place (0 to 4)
p10   Unit (up to 6 characters)

Query   `SR[p1]?`

Example   Convert the DC voltage measured on channel 002 to DC current. Set the measuring range to 6 V, the span lower limit to 1 V, the span upper limit to 5 V, the scaling lower limit to 1.00 A, and the scaling upper limit to 5.00 A.
`SR002,SCALE,VOLT,6V,1000,5000,100,`
`500,2,A`

Description •   Set p1 and p4 by referring to the table in section 3.3.
•   For parameters p5 and p6, enter values with five digits or less excluding the decimal point.
•   For parameters p7, p8, and p9, either set all three parameters, or omit all three parameters.

When Setting Channels to Square Root Computation

Syntax   SR p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,
          p11<terminator>

    p1 Measurement channel number

    p2 Setting type (SQRT)

    p3 Measuring range

    p4 Span lower limit

    p5 Span upper limit

    p6 Scaling lower limit (–30000 to 30000)

    p7 Scaling upper limit (–30000 to 30000)

    p8 Scaling decimal place (0 to 4)

    p9 Unit (up to 6 characters)

    p10 Low-cut function (OFF, ON)

    p11 Low-cut point (0 to 50)

Query   SR[p1]?

Example   Convert the DC voltage measured on channel 001 to a flow amount using the square root computation. Set the measuring range to 6 V, the span lower limit to 1 V, the span upper limit to 5 V, the scaling lower limit to 10.0 m^3/s, and the scaling upper limit to 100.0 m^3/s.

SR001,SQRT,6V,1000,5000,100,1000,1,
m3/s

Description • Set p1 and p3 by referring to the table in section 3.3.

• For parameters p4 and p5, enter values with five digits or less excluding the decimal point.

• For parameters p6, p7, and p8, either set all three parameters, or omit all three parameters.

For 1-5V DC Voltage Input

Syntax   SR p1,p2,p3,p4,p5,p6,p7,p8,p9,p10
          <terminator>

    p1 Measurement channel number

    p2 Input type (1-5V)

    p3 Measuring range (1-5V)

    p4 Span lower limit (800 to 5200)

    p5 Span upper limit (800 to 5200)

    p6 Scaling lower limit (–30000 to 30000)

    p7 Scaling upper limit (–30000 to 30000)

    p8 Scaling decimal place (0 to 4)

    p9 Unit (up to 6 characters)

    p10 Low-cut function (ON/OFF)

Query   SR[p1]?

Example   Set the channel 005 input type to 1-5V, the span lower limit to 1 V, the span upper limit to 5 V, and turn on the 1-5V low-cut function.

SR005,1-5V,1-5V,1000,5000,,,,,ON

Description • Set p1 by referring to the table in section 3.3.

• For parameters p4 and p5, enter values with four digits or less excluding the decimal point.

• For parameters p6, p7, and p8, either set all three parameters, or omit all three parameters.

When Setting Channels to Log Scale (/LG1 option)

For details on "log input" and "log linear input/pseudo log input", see section 3.13 in the *FX1000 User's Manual*, IM 04L21B01-01EN.

• When Setting Channels to Log Input

Syntax   SR p1,p2,p3,p4,p5,p6,p7,p8,p9,p10
          <terminator>

    p1 Measurement channel number

    p2 Setting type (LogT1)

    p3 Measuring range (20MV, 60MV, 200MV, 1V, 2V, 6V, 20V, 50V)

    p4 Span lower limit

    p5 Span upper limit

    p6 Mantissa of the scaling lower limit (100 to 999)

    p7 Exponent of the scaling lower limit (–15 to 15)

    p8 Mantissa of the scaling upper limit (100 to 999)

    p9 Exponent of the scaling upper limit (–15 to 15)

    p10 Unit (up to 6 characters)

Query   SR[p1]?

Example   Execute a logarithmic scaling computation on the DC voltage measured by channel 001, and output the result. Set the measuring range to 6 V, the span lower limit to 1 V, the span upper limit to 5 V, the scaling lower limit to 1.00E+01, the scaling upper limit to 1.00E+04, and the unit to Unit1.

SR001,LogT1,6V,1000,5000,100,1,100,
4,Unit1

Description • Set the parameters so that p4 is less than p5.

• The settable scaling range is 1.00E–15 to 1.00E+15.

• Use three digits to set p6 and p8. "100" means "1.00."

• Set the parameters so that p7 is less than p9.

• Set the parameters so that "p9 – p7" conforms to the following conditions:

    • The maximum value is 15.

    • When p6 is 100, the minimum value is 1.

    • When p6 is a value other than 100, the minimum value is 2.

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• When Setting Channels to Log Linear Input/ Pseudo log input

Syntax   SR p1,p2,p3,p4,p5,p6,p7,p8,p9,p10 <terminator>

p1   Measurement channel number

p2   Setting type (LogT2)

p3   Measuring range (20MV, 60MV, 200MV, 1V, 2V, 6V, 20V, 50V)

p4   Span lower limit

p5   Span upper limit

p6   Mantissa of the scaling lower limit (100 to 999)

p7   Exponent of the scaling lower limit (–15 to 15)

p8   Mantissa of the scaling upper limit (Don't care)

p9   Exponent of the scaling upper limit (–15 to 15)

p10 Unit (up to 6 characters)

Query   SR[p1]?

Example   Execute a logarithmic scaling computation on the DC voltage measured by channel 001, and output the result. Set the measuring range to 6 V, the span lower limit to 1 V, the span upper limit to 5 V, the scaling lower limit to 1.00E+01, and the scaling upper limit to 1.00E+04.

SR001,LogT2,6V,1000,5000,100,1,100,4

Description • Set the parameters so that p4 is less than p5.

• The settable scaling range is 1.00E–15 to 1.00E+15.

• Use three digits to set p6. "100" means "1.00."

• You cannot set p8. It is set to the same value as p6.

• You can set the parameters so that p7 is less than p9 or p7 is greater than p9.

• Set the parameters so that the absolute value of "p9 – p7" is greater than or equal to 1 and less than or equal to 15.

• When p6 is a value other than 100, the maximum value of the exponent is 14, and the maximum absolute value of "p9 – p7" is 14.

SO   Sets an expression (/M1, /PM1, / PWR1, and /PWR5 options)

Syntax   SO p1,p2,p3,p4,p5,p6,p7<terminator>

p1   Computation channel number

p2   Computation (ON, OFF)

p3   Expression (up to 120 characters)

p4   Span lower limit (–9999999 to 99999999)

p5   Span upper limit (–9999999 to 99999999)

p6   Span decimal place (0 to 4)

p7   Unit (up to 6 characters)

Query   SO[p1]?

Example   Compute the sum of channels 001 and 002 using channel 106. Set the span lower limit to –10.0000, the span upper limit to 15.0000, and the unit to V.

SO106,ON,001+002,–100000,150000,4,V

Description • You cannot use this command to configure settings while recording (memory sampling) or computation is in progress.

• For details on expressions, see the *FX1000 User's Manual*, IM 04L21B01-01EN.

• Set p1 by referring to the table in section 3.3.

• For parameters p4 and p5, enter values with seven digits or less for negative numbers and with eight digits or less for positive numbers. In both cases, the number of digits excludes the decimal.

• For parameters p4, p5, and p6, either set all three parameters, or omit all three parameters.

TJ   Sets memory sampling

Syntax   TJ p1,p2<terminator>

p1   Measurement or computation channel number

p2   Memory sampling (OFF, ON)

Query   TJ[p1]?

Example   Perform memory sampling on channel 002.

TJ002,ON

Description • You can specify computation channels (including in queries) on models with the /M1, /PM1, /PWR1, or /PWR5 math option.

• You cannot use this command to configure settings while recording (memory sampling) or computation is in progress.

SA   Sets an alarm

When Not Using Alarms

Syntax   `SA p1,p2,p3<terminator>`

  `p1` Measurement or computation channel
     number

  `p2` Alarm number (1 to 4)

  `p3` Alarm on or off (OFF)

Query   `SA[p1[,p2]]?`

Example   Turn off alarm number 1 of channel 010.
    `SA010,1,OFF`

Description You can specify computation channels (including
in queries) on models with the /M1, /PM1, /
PWR1, or /PWR5 math option.

When Using Alarms

Syntax   `SA p1,p2,p3,p4,p5,p6,p7,p8,p9`
    `<terminator>`

  `p1` Measurement or computation channel
     number

  `p2` Alarm number (1 to 4)

  `p3` Alarm on or off (ON)

  `p4` Alarm type

    `H`   High limit alarm

    `L`   Low limit alarm

    `h`   Difference high limit alarm

    `l`   Difference low limit alarm

    `R`   High limit on rate-of-change alarm

    `r`   Low limit on rate-of-change alarm

    `T`   Delay high limit alarm

    `t`   Delay low limit alarm
       (This parameter is case-sensitive.)

  `p5` Alarm value (when using a channel that is
     set to Log scale—/LG1 option—this is the
     mantissa of the alarm value)

  `p6` Relay setting

    ON   Relay setting on

    OFF   Relay setting off

  `p7` Relay number when p6 is set to ON
     A space when p6 is set to OFF

  `p8` Alarm detection (ON, OFF)

  `p9` Exponent of the alarm value (when using
     a channel that is set to Log scale—/LG1
     option)

Query   `SA[p1[,p2]]?`

Example   Set a high limit alarm (alarm value = 1000) on
alarm number 1 of channel 002, and activate
relay I01 when an alarm occurs.
    `SA002,1,ON,H,1000,ON,I01`

Description • For a channel whose input range is set to
    SKIP (using the SR command), p3 cannot be
    set to ON.

   • For a channel whose computation channel
    is set to OFF (using the SO command), p3
    cannot be set to ON.

• All alarm settings on a channel are set to OFF
 when:
  • Its input type is changed (VOLT, TC, etc.).
  • Its measuring range is changed.
  • Its span value or scaling value is changed
   (this includes changing the decimal place).
  • The channel is a computation channel,
   and the channel is turned on or off, or an
   expression or a span value is changed.

• The h and l settings of p4 are valid only when
 the measuring range is set to differential
 computation between channels.

• If p4 is set to R or r, set the interval for the
 high/low limit on the rate-of-change alarm
 using the WO command.

• If p4 is set to T or t, set the alarm delay time
 using the BD command.

• Set the p5 alarm to a value within the following
 ranges based on the p4 alarm type or the
 target channel.
  • For upper, lower, delay upper and delay
   lower alarms
   DC voltage, thermocouple, or RTD input:
   A value within the measurable range
   Contact input: 0 or 1
   Scaling (1-5V, scaling, and square root):
   –5 to 105% of the span (and between
    –30000 and 30000)
  • Difference high limit and difference low limit
   alarms
   A value within the measurable range
  • High limit on rate-of-change and low limit on
   rate-of-change alarms
   A value that consists of at least one non-
   zero digit. For example, 0.0001 for the 2 V
   range.
   The maximum value must be within the
   measurable range (and between –30000
   and 30000). For example, 3.0000 for the
   2 V range.
   For contact input, you can only specify "1."
  • Computation channels
   –9999999 to 99999999 (excluding the
   decimal point; set using an integer)
  • When using a channel that is set to Log
   scale (/LG1 option):
   The alarm types that you can select from
   are H (high limit alarm), L (low limit alarm),
   T (delay high limit alarm), and t (delay
   low limit alarm). Set the alarm value by
   specifying the mantissa (p5) and exponent
   (p9).
   Set the mantissa of the alarm value (p5) to
   a value between 100 and 999 (excluding
   the decimal point; set using an integer).
   "100" means "1.00."
   The alarm hysteresis is fixed to 0.

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- If p6 is set to OFF, the relay number (p7) is a Don't care value in setting commands. In queries, this parameter will always be returned as a space.
- An error will occur if p7 is set to a number of a relay that is not installed.
- Parameter p8 is valid when No logging under Alarm is set to "On" in basic setting mode. When parameter p8 is invalid, it is a Don't care value in setting commands. In queries, this parameter will always be returned as "On."
- Parameter p9 is valid on models with the Log scale (/LG1) option.
- Parameter p9 is valid when p1 is set to a measurement channel.
- Use parameter p9 to set the alarm value's exponent.
  - When using a channel that is not set to Log scale (/LG1 option):
    In setting commands, this parameter is a Don't care value. In queries, this parameter will always be returned as 0.
  - When using a channel that is set to Log scale (/LG1 option):
    If the mantissa of the alarm value is 100: −16 to 16
    If the mantissa of the alarm value is a value other than 100:   −16 to 15
- You can specify computation channels (including in queries) on models with the /M1, /PM1, /PWR1, or /PWR5 math option.
- For computation channels, the only alarm types that you can specify are H (high limit alarm), L (low limit alarm), T (delay high limit alarm), and t (delay low limit alarm).

SW   Sets the trend interval and auto save interval

Syntax   `SW p1,p2,p3,p4<terminator>`
`p1` 1
`p2` Waveform type (T-Y)
`p3` Trend interval (15S, 30S, 1MIN, 2MIN, 5MIN, 10MIN, 15MIN, 20MIN, 30MIN, 1H, 2H, 4H, 10H)
`p4` Auto save interval (10MIN, 20MIN, 30MIN, 1H, 2H, 3H, 4H, 6H, 8H, 12H, 1DAY, 2DAY, 3DAY, 5DAY, 7DAY, 10DAY, 14DAY, 31DAY)

Query   `SW[p1[,p2]]?`
Example   Set the trend interval to `5MIN` and the auto save interval to `1H`.
`SW1,T-Y,15MIN,1H`

Description
- You cannot use this command to configure settings while recording (memory sampling) is in progress.
- The selectable auto save intervals (p4) vary depending on the trend interval (p3). For details, see the *FX1000 User's Manual*, IM 04L21B01-01EN.
- You can specify 15S on the high-speed input models.
- Set the trend interval (p3) to a value less than the scan interval.

TW   Sets the secondary trend interval

Syntax   `TW p1<terminator>`
`p1` Trend interval (15S, 30S, 1MIN, 2MIN, 5MIN, 10MIN, 15MIN, 20MIN, 30MIN, 1H, 2H, 4H, 10H)

Query   `TW?`
Example   Set the trend interval to 2 minutes.
`TW2MIN`

Description
- Set the trend interval (p1) to a value less than the scan interval.
- You can specify 15S on the high-speed input models.

TE — Sets sampling conditions for event data

Syntax TE p1,p2,p3,p4,p5,p6<terminator>
p1 1
p2 Sample rate (125MS, 250MS, 500MS, 1S, 2S, 5S, 10S, 30S, 1MIN, 2MIN, 5MIN, 10MIN)
p3 Sample mode
  FREE Starts data acquisition at memory start and stops data acquisition at memory stop.
  SINGLETRIGGER Acquires data once for a specified length of time after a trigger occurs and then stops.
  REPEATTRIGGER Acquires data and then enters the trigger-wait state.
p4 Sampling time (10MIN, 20MIN, 30MIN, 1H, 2H, 3H, 4H, 6H, 8H, 12H, 1DAY, 2DAY, 3DAY, 5DAY, 7DAY, 10DAY, 14DAY, 31DAY)
p5 Pretrigger length as percentage (0, 5, 25, 50, 75, 95, 100)
p6 Key trigger source disable or enable (OFF, ON)
  Parameters p5 to p6 are valid when p3 is set to SINGLETRIGGER or REPEATTRIGGER.
Query TE[p1]?
Example Acquire data at a sampling rate of 125 ms for 10 minutes using single trigger mode.
  TE1,125MS,SINGLETRIGGER,10MIN
Description • You cannot choose a sample interval that is shorter than the scan interval.
  • You cannot use this command to configure settings while recording (memory sampling) is in progress.

SZ — Sets a zone

Syntax SZ p1,p2,p3<terminator>
p1 Measurement or computation channel number
p2 Lower zone boundary position (0 to 95) as a percentage
p3 Upper zone boundary position (5 to 100) as a percentage
Query SZ[p1]?
Example Display channel 002 in a zone between 30% and 50%.
  SZ002,30,50

Description • You can specify computation channels (including in queries) on models with the /M1, /PM1, /PWR1, or /PWR5 math option.
  • Set the boundary positions as percentages of the entire amplitude axis in the waveform display area.
  • The zone size must be at least 5%.
  • Set the parameters so that the upper zone boundary position is greater than the lower zone boundary position.

SP — Sets a partial expanded display

Syntax SP p1,p2,p3,p4<terminator>
p1 Measurement or computation channel number
p2 Partial expanded display (ON, OFF)
p3 Boundary position (1 to 99) as a percentage
p4 Boundary value
Query SP[p1]?
Example Partially expand the display of channel 001. Set the boundary position to 25% and the boundary value to 1.00 V.
  SP001,ON,25,100
Description • You can specify computation channels (including in queries) on models with the /M1, /PM1, /PWR1, or /PWR5 math option.
  • For a channel whose input range is set to SKIP (using the SR command), p2 cannot be set to ON.
  • For a channel whose computation channel is turned off (using the SO command), p2 cannot be set to ON.
  • Set p3 as a percentage of the range defined by the span upper and lower limits (scaling upper and lower limits when scaling is enabled).
  • Set p4 to a value from (span upper limit – 1) to (span lower limit + 1). If scaling is enabled, set p4 to a value from (scaling upper limit – 1) to (scaling lower limit + 1).
  • The decimal place and the number of digits are the same as those for the span or scaling settings (see the SR command).
  • You can use this command (including its query) when the partial expanded display function is set to ON (using the WU command).
  • You cannot use this command if the partial expanded display range does not exist (for example when the span range is 1).
  • You cannot use the partial expanded display on a channel that is set to Log scale (/LG1 option).

ST — Sets a tag

Syntax   ST p1,p2<terminator>

    p1   Measurement or computation channel
          number
    p2   Tag (up to 16 characters)

Query   ST[p1]?

Example   Set the channel 002 tag to TAG2.

    ST002,TAG2

Description • For the characters that you can use for tags,
          see appendix 3, "ASCII Character Codes."
          Note that you cannot use semicolons or
          commas.
        • You can specify computation channels
          (including in queries) on models with the /M1,
          /PM1, /PWR1, or /PWR5 math option.

SX — Sets a display group

Syntax   SX p1,p2,p3,p4<terminator>

    p1   Display group number
    p2   Enable or disable (ON, OFF)
    p3   Display group name (up to 16 characters)
    p4   Channel configuration

Query   SX[p1]?

Example   Assign channels 001, 003, and 004 to 006 to
        group number 1 and name the group GROUP2.

    SX1,ON,GROUP2,001.003.004-006

        Assign channels by using periods to separate
        each channel and hyphens to specify ranges of
        channels.

Description • For the characters that you can use for group
          names, see appendix 3, "ASCII Character
          Codes." Note that you cannot use semicolons
          or commas.
        • Set p1 by referring to the table in section 3.3.

SL — Sets a trip line

Syntax   SL p1,p2,p3,p4,p5,p6<terminator>

    p1   Display group number
    p2   Trip line number (1 to 4)
    p3   Trip line display (ON, OFF)
    p4   Display position (0 to 100) as a percentage
    p5   Display color (RED, GREEN, BLUE,
          B.VIOLET, BROWN, ORANGE,
          Y.GREEN, LIGHTBLUE, VIOLET, GRAY,
          LIME, CYAN, DARKBLUE, YELLOW,
          LIGHTGRAY, PURPLE, BLACK, PINK,
          L.BROWN, L.GREEN, DARKGRAY, OLIVE,
          DARKCYAN, S.GREEN)
    p6   Line width (1, 2, 3)

Query   SL[p1[,p2]]?

Example   Display trip line 1 in red at the 10% position of
        group 1. Set the line width to 1.

    SL1,1,ON,10,RED,1

Description • Set the boundary positions as percentages
          of the entire amplitude axis in the waveform
          display area.
        • Set p1 by referring to the table in section 3.3.

SG — Sets a message

Syntax   SG p1,p2<terminator>

    p1   Message number (1 to 100)
    p2   Message (up to 32 characters)

Query   SG[p1]?

Example   Assign character string "MESSAGE1" to
        message number 2.

    SG2,MESSAGE1

Description For the characters that you can use for
        messages, see appendix 3, "ASCII Character
        Codes." Note that you cannot use semicolons or
        commas.

TH — Sets the directory on the external storage medium for saving data

Syntax   TH p1<terminator>

    p1   Directory name (up to 20 characters)

Query   TH?

Example   Select the DATA1 folder on the external storage
        medium for saving data.

    THDATA1

Description You cannot use this command on models that
        do not have a CF card slot/SD card slot or USB
        interface (/USB1 option).

TZ — Sets a file header

Syntax   TZ p1,p2<terminator>

    p1   Fixed to 1
    p2   File header (up to 50 characters)

Query   TZ[p1]?

Example   Set the header to "FX1000DATA."

    TZ1,FX1000DATA

TF Sets a data file name

Syntax `TF p1,p2,p3<terminator>`

p1 Fixed to 1

p2 Configuration

    `BATCH`   File name based on the batch name

    `DATE`   User-assigned character string + date

    `SERIAL`   User-assigned character string + serial number

p3 User-assigned character string (up to 16 characters)

    (valid when p2 is set to DATE or SERIAL)

Query `TF[p1]?`

Example Set the file name configuration to SERIAL, and set the user-assigned character string to "FX1DATA."

`TF1,SERIAL,FX1DATA`

SD Sets the date and time

Syntax `SD p1,p2<terminator>`

p1 Date in YY/MM/DD format (fixed)

    `YY`   Year (00 to 79)

    `MM`   Month (01 to 12)

    `DD`   Day (01 to 31)

p2 Time in HH:MM:SS format (fixed)

    `HH`   Hour (00 to 23)

    `MM`   Minute (00 to 59)

    `SS`   Second (00 to 59)

Query `SD?`

Example Set the internal clock to 13:00:00 on March 1, 2011.

`SD11/03/01,13:00:00`

Description • The p1 and p2 formats are fixed to eight characters in length. Use the formats below. Do not insert spaces. If you do, an error will occur.

    p1 = YY/MM/DD (lower two digits of the year/ month/day)

    p2 = HH:MM:SS (hour:minute:second)

    • When you send an SD command, the FX switches to setting mode and sets the date and time.

TD Sets daylight saving time

Syntax `TD p1,p2,p3,p4,p5,p6,p7,p8,p9 <terminator>`

p1 Enable or disable (USE, NOT)

p2 Month when daylight saving time will start (JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC)

p3 Week when daylight saving time will start (1ST, 2ND, 3RD, 4TH, LAST)

p4 Day when daylight saving time will start (SUN, MON, TUE, WED, THU, FRI, SAT)

p5 Hour when daylight saving time will start (0 to 23)

p6 Month when daylight saving time will end (JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC)

p7 Week when daylight saving time will end (1ST, 2ND, 3RD, 4TH, LAST)

p8 Day when daylight saving time will end (SUN, MON, TUE, WED, THU, FRI, SAT)

p9 Hour when daylight saving time will end (0 to 23)

Query `TD?`

Example Switch to daylight saving time on the first Sunday of June and switch out of it on the first Sunday in December.

`TDUSE,JUN,1ST,SUN,0,DEC,1ST,SUN,0`

TT Sets the trend display

Syntax `TT p1,p2,p3,p4,p5<terminator>`

p1 Graph display direction

    `HORIZONTAL`

    `VERTICAL`

    `WIDE`   Horizontal wide display

p2 Clear waveform at start (ON, OFF)

p3 Message display direction

    `HORIZONTAL`

    `VERTICAL`

p4 Scale digits

    `NORMAL`   3-digit display

    `FINE`   4-digit display

p5 Current value display

    `MARK`   Displays the trend using marks

    `BARGRAPH`   Displays the trend using a bar graph

Query `TT?`

Example Display waveforms horizontally, set the message direction to vertical, and display waveforms by clearing the existing waveforms at memory start.

`TTHORIZONTAL,ON,VERTICAL`

3

Commands

SE Sets the line width and the number of grid sections to use on the trend graph

Syntax   SE p1,p2<terminator>

p1   Trend line width (1 to 3) in dots

p2   Number of grid segments (4 to 12, AUTO)

Query   SE?

Example   Set the trend waveform line width to 1 dot and the number of grid segments to 10.

SE1,10

TB Sets the bar graph display

Syntax   TB p1<terminator>

p1   Bar graph display direction

HORIZONTAL

VERTICAL

Query   TB?

Example   Display bar graphs horizontally.

TBHORIZONTAL

SB Sets the bar graph for a channel

Syntax   SB p1,p2,p3<terminator>

p1   Measurement or computation channel number

p2   Bar graph base position

NORMAL   Normal (lower limit)

CENTER

LOWER   Lower limit

UPPER   Upper limit

p3   Number of scale divisions (4 to 12)

Query   SB[p1]?

Example   Set the number of scale divisions on the bar graph for channel 002 to 5, and display the bar graph from the span lower limit (the scaling lower limit if scaling is enabled).

SB002,NORMAL,5

Description   You can specify computation channels (including in queries) on models with the /M1, /PM1, / PWR1, or /PWR5 math option.

TN Sets a scale

Syntax   TN p1,p2,p3<terminator>

p1   Measurement or computation channel number

p2   Display position (OFF, 1 to 6)

p3   Number of divisions (4 to 12, C10)

Query   TN[p1]?

Example   Set the scale display position for channel 003 to 2, and set the number of divisions to 10.

TN003,2,10

Description   You can specify computation channels (including in queries) on models with the /M1, /PM1, / PWR1, or /PWR5 math option.

SV Sets a measurement channel's moving average

Syntax   SV p1,p2,p3<terminator>

p1   Measurement channel number

p2   Moving average (OFF, ON)

p3   Number of moving average samples (2 to 400)

Query   SV[p1]?

Example   Set the number of moving average samples for channel 002 to 12.

SV002,ON,12

SC Sets a channel display color

Syntax   SC p1,p2<terminator>

p1   Measurement or computation channel number

p2   Display color (see the SL command, which is used to set a trip line)

Query   SC[p1]?

Example   Set the channel 002 display color to blue.

SC002,BLUE

Description   You can specify computation channels (including in queries) on models with the /M1, /PM1, / PWR1, or /PWR5 math option.

TA Sets an alarm point mark

Syntax   TA p1,p2,p3,p4,p5,p6,p7<terminator>

p1   Measurement or computation channel number

p2   Mark kind

ALARM   Alarm mark

FIXED   Fixed mark

p3   Scale board display (ON, OFF)

p4   Alarm level 1 display color (24 colors; see the SL command, which is used to set a trip line)

p5   Alarm level 2 display color (24 colors; see the SL command, which is used to set a trip line)

p6   Alarm level 3 display color (24 colors; see the SL command, which is used to set a trip line)

p7   Alarm level 4 display color (24 colors; see the SL command, which is used to set a trip line)

Query   TA[p1]?

Example   Display alarm marks on the channel 004 scale.

TA004,ALARM,ON

Description   You can specify computation channels (including in queries) on models with the /M1, /PM1, / PWR1, or /PWR5 math option.

TG Sets a color scale band

Syntax `TG p1,p2,p3,p4,p5,p6,p7<terminator>`

p1 Measurement or computation channel number

p2 Area (OFF, IN, OUT)

p3 Display color (24 colors; see the SL command, which is used to set a trip line)

p4 Lower display position limit

p5 Upper display position limit

p6 Lower display position limit (exponent)

p7 Upper display position limit (exponent)

Query `TG[p1]?`

Example Set the channel 005 color scale band to the range from −1.0000 to 0.5000 V (2-V range), and set the display color to green.

`TG005,IN,GREEN,-10000,5000`

Description • Parameters p6 and p7 are valid on models with the Log scale (/LG1) option.
• Parameters p6 and p7 are valid when p1 is set to a measurement channel.
• Configure the settings as shown below.
When using a channel that is not set to Log scale (/LG1 option):
    • Parameters p4 and p5 are the corresponding channel's span range (the scaling range when scaling is enabled).
    • Set the parameters so that p4 is less than p5.
    • Parameters p6 and p7 are Don't care values in setting commands. In queries, these parameters will always be returned as 0.
When using a channel that is set to Log scale (/LG1 option):
    • Parameters p4 and p5 are the mantissas of the upper and lower limits, respectively, of the color scale band.
    • Parameters p6 and p7 are the exponents of the upper and lower limits, respectively, of the color scale band.
    • The range defined by the display position lower limit and the display position upper limit is 1.00E−16 to 1.00E+16.
    Mantissas p4 and p5
    100 to 999: The corresponding values are 1.00 to 9.99.
    Exponents p6 and p7
    Parameter p6 must be between −16 and 16 when p4 is 100. Parameter p6 must be between −16 and 15 when p4 is a value other than 100. The same conditions hold for the relationship between parameters p7 and p5.
    • Set the parameters so that the lower display position limits (p4 and p6) are less than their upper display position limits (p5

and p7).

SQ Sets the LCD brightness and the screen backlight saver

Syntax `SQ p1,p2,p3,p4<terminator>`

p1 LCD brightness
    1 to 8

p2 Screen backlight saver type
    OFF   Disables the saver function
    DIMMER   Dims the backlight
    TIMEOFF Turns off the backlight

p3 Amount of time until the FX switches to saver mode
    1MIN, 2MIN, 5MIN, 10MIN, 30MIN, 1H

p4 Event that causes the FX to return from saver mode
    KEY   Pressing of a key
    KEY+ALM Pressing of a key or occurrence of an alarm

Query `SQ?`

Example Set the LCD brightness to 2 and the screen backlight saver type to DIMMER. Set the amount time of until the FX switches to saver mode to 5 minutes and the event that causes the FX to return from saver mode to the pressing of a key.

`SQ2,DIMMER,5MIN,KEY`

Description If p2 is set to OFF, do not set p3 or p4.

TC Sets the background color

Syntax `TC p1,p2<terminator>`

p1 Screen (WHITE, BLACK)

p2 Historical trend screen (WHITE, CREAM, LIGHTGRAY, BLACK)

Query `TC?`

Example Set the screen background color to black and the historical trend screen background color to cream.

`TCBLACK,CREAM`

TP Sets automatic display group switching

Syntax `TP p1<terminator>`

p1 Auto switching interval (5S, 10S, 20S, 30S, 1MIN)

Query `TP?`

Example Switch between display groups at 5-second intervals.

`TP5S`

3

Commands

TR Sets the automatic monitor return function

Syntax   `TR p1<terminator>`

    `p1`   Automatic return time limit (OFF, 1MIN, 2MIN, 5MIN, 10MIN, 20MIN, 30MIN, 1H)

Query   `TR?`

Example   Set the automatic return time limit to 5 minutes.

    `TR5MIN`

TQ Sets a timer

When p2 is set to OFF (no timer)

Syntax   `TQ p1,p2<terminator>`

    `p1`   Timer number

    `p2`   Timer type (OFF)

When p2 is set to ABSOLUTE (absolute time)

Syntax   `TQ p1,p2,p3,p4<terminator>`

    `p1`   Timer number

    `p2`   Timer type (ABSOLUTE)

    `p3`   Time interval (1MIN to 6MIN, 10MIN, 12MIN, 15MIN, 20MIN, 30MIN, 1H to 4H, 6H, 8H, 12H, 24H)

    `p4`   Reference time (hh; fixed format)

      `hh`   Hour (00 to 23)

When p2 is set to RELATIVE (relative time)

Syntax   `TQ p1,p2,p3,p4<terminator>`

    `p1`   Timer number

    `p2`   Timer type (RELATIVE)

    `p3`   Time (hh:mm; fixed format)

      `hh`   Hour (00 to 24)

      `mm`   Minute (00 to 59)

    `p4`   Reset at computation start (OFF, ON)

Query   `TQ[p1]?`

Example   Set the timeout value of timer number 1 to 10 hours 30 minutes. Set the timer so that it is not reset when computation is started.

    `TQ1,RELATIVE,10:30,OFF`

Description • Set p1 by referring to the table in section 3.3.

    • You cannot use this command to configure settings while recording (memory sampling) is in progress.

    • When p2 is set to RELATIVE, you can set p3 to a value less than or equal to 24:00.

TK Sets a match time timer

When p2 is set to OFF (the match time timer is disabled)

Syntax   `TK p1,p2<terminator>`

    `p1`   Timer number

    `p2`   Timer type (OFF)

When p2 is set to DAY (specify the time)

Syntax   `TK p1,p2,p3,p4,p5<terminator>`

    `p1`   Timer number

    `p2`   Timer type (DAY)

    `p3`   Day (1 to 28)

    `p4`   Time (hh:mm; fixed format; 00:00 to 23:59)

    `p5`   Timer operation (SINGLE, REPEAT)

      `SINGLE` The action is executed once when the condition is met.

      `REPEAT` The action is executed each time that the condition is met.

When p2 is set to WEEK (specify the day and time)

Syntax   `TK p1,p2,p3,p4,p5<terminator>`

    `p1`   Timer number

    `p2`   Timer type (WEEK)

    `p3`   Day of the week (SUN, MON, TUE, WED, THU, FRI, SAT)

    `p4`   Time (hh:mm; fixed format; 00:00 to 23:59)

    `p5`   Timer operation (SINGLE, REPEAT)

When p2 is set to MONTH (specify the date and time)

Syntax   `TK p1,p2,p3,p4,p5<terminator>`

    `p1`   Timer number

    `p2`   Timer type (MONTH)

    `p3`   Day (1 to 28)

    `p4`   Time (hh:mm; fixed format; 00:00 to 23:59)

    `p5`   Timer operation (SINGLE, REPEAT)

TU   Sets an event action

Syntax   TU p1,p2,p3,p4,p5,p6,p7<terminator>

p1   Logic number (1 to 40)

p2   Event type

NONE	
REMOTE	Remote control input
RELAY	Alarm output relay
SWITCH	Internal switch
ALARM	Alarm
TIMER	Timer
MATCHTIMETIMER	Match time
USERKEY	USER key

p3   Event details

p2 = REMOTE	Remote number
p2 = RELAY	Relay number
p2 = SWITCH	Internal switch number
p2 = TIMER	Timer number
p2 = MATCHTIMETIMER	
	Match time timer number
p2 = Any other value	
	Don't care

p4   Action type

MEMORYSTART/STOP	
	Memory start or memory stop
MEMORYSTART	Memory start
MEMORYSTOP	Memory stop
TRIGGER	Event trigger
ALARMACK	Alarm acknowledgement
MATHSTART/STOP	Starts or stops computation
MATHSTART	Starts computation
MATHSTOP	Stops computation
MATHRESET	Resets computation
SAVEDISPLAY	Causes a timeout in display data
SAVEEVENT	Causes a timeout in event data
MESSAGE	Writes a message
SNAPSHOT	Takes a snapshot
MANUALSAMPLE	Performs manual sampling
TIMERRESET	Resets the relative timer
DISPLAYRATE1/2	Switches the trend interval
DISPLAYGROUPCHANGE	Switches the display group
FLAG	Raises a flag
TIMEADJUST	Adjusts the time
PANELLOAD	Loads settings

p5   Action details 1

p4 = TIMERRESET	Timer number
p4 = DISPLAYGROUPCHANGE	
	Display group number
p4 = FLAG	Flag number
p4 = MESSAGE	Message number (1 to 100)
p4 = PANELLOAD	Setup file number (1 to 3)

p6   Action details 2

p4 = MESSAGE	Method of specifying the destination to write the message
ALL	All display groups
SELECT	A specific display group

p7   Action details 3

p4 = MESSAGE and p6 = SELECT	
	Display group number

Query   TU[p1]?

Example   Use the remote control input (terminal 1) to execute a memory start.
TUREMOTE,1,MEMORYSTART

Description
- Set the numbers (such as the relay number and internal switch number) by referring to the table in section 3.3.
- Depending on the value of parameter p2 (event type), there are some values that you cannot select for parameter p4 (action type).
- Depending on other FX settings or the installed options, there are some values that you cannot select for parameter p4 (action type).
- You can specify SNAPSHOT and MANUALSAMPLE regardless of the FX specifications. However, depending on the FX specifications and the settings, the corresponding functions may not operate.
- You cannot specify PANELLOAD on models that do not have a CF card slot/SD card slot.

3

Commands

SK — Sets a computation constant (/M1, /PM1, /PWR1, and /PWR5 options)

Syntax `SK p1,p2<terminator>`

p1 Computation constant number

p2 Constant (–9.9999E+29 to –1.0000E–30, 0, 1.0000E–30 to 9.9999E+29; five significant digits)

Query `SK[p1]?`

Example Set the constant in computation constant number K01 to 1.0000E–10.

`SKK01,1.0000E-10`

Description
• You cannot use this command to configure settings while recording (memory sampling) or computation is in progress.
• Set p1 by referring to the table in section 3.3.

SI — Sets the rolling average function of a computation channel (/M1, /PM1, /PWR1, and /PWR5 options)

Syntax `SI p1,p2,p3,p4<terminator>`

p1 Computation channel number

p2 Moving average (ON, OFF)

p3 Sampling interval (1S, 2S, 3S, 4S, 5S, 6S, 10S, 12S, 15S, 20S, 30S, 1MIN, 2MIN, 3MIN, 4MIN, 5MIN, 6MIN, 10MIN, 12MIN, 15MIN, 20MIN, 30MIN, 1H)

p4 Number of samples (1 to 1500)

Query `SI[p1]?`

Example Enable the moving average of computation channel 107, set the sampling interval to 1 minute, and set the number of samples to 20.

`SI107,ON,1MIN,20`

Description
• If p2 is set to OFF, do not set p3 or p4.
• Set the sampling interval to a value that is greater than or equal to the scan interval.

SJ — Sets a TLOG timer (/M1, /PM1, /PWR1, and /PWR5 options)

Syntax `SJ p1,p2,p3,p4<terminator>`

p1 Computation channel number

p2 Timer number

p3 Conversion of the unit of time for TLOG. SUM computation

`OFF` Values are not converted.

`/S` Values are converted as though the physical values are integrated in units of seconds.

`/MIN` Values are converted as though the physical values are integrated in units of minutes.

`/H` Values are converted as though the physical values are integrated in units of hours.

p4 Reset (ON, OFF)

Query `SJ[p1]?`

Example Assign timer 1 to computation channel number 110. Do not convert the unit of time, and enable the reset setting.

`SJ110,1,OFF,ON`

Description
• Set p1 and p2 by referring to the table in section 3.3.
• You cannot use this command to configure settings while computation is in progress.
• About parameter p3

Because the FX integrates sampled data over each scan interval, the physical value measured over a given unit of time may be different from the actual integrated value (because the unit of time is different from the scan interval). If this occurs, set p3 to the same unit of time as that which is being used for the physical value that you are measuring. The FX calculates the integrated value using one of the following conversion formulas based on the parameter.

OFF Σ(measured value)

/S Σ(measured value) × scan interval

/MIN Σ(measured value) × scan interval/60

/HOUR Σ(measured value) × scan interval/3600

The scan interval unit is seconds.

TX Sets the ancillary operation of the start key (/M1,/PM1, /PWR1, and /PWR5 options)

Syntax TX p1<terminator>
    p1 Computation operation (OFF, START, RESET+START)

Query TX?

Example Configure the start key so that computation also begins when the start key is pressed.
TXSTART

BH Sets a batch text field

Syntax BH p1,p2,p3,p4<terminator>
    p1 Fixed to 1
    p2 Field number (1 to 8)
    p3 Field title (up to 20 characters)
    p4 Field string (up to 30 characters)

Query BH[p1[,p2]]?

Example Set the field title to "OPERATOR" and the field string to "123-01" for field number 2.
BH1,2,OPERATOR,123-01

Description For the characters that you can use, see appendix 3.

EH Sets calibration correction (/CC1 option)

You cannot specify calibration correction for a channel whose log scale (/LG1 option) mode is set to LogType2.

When p2 is set to BEGIN

Syntax EH p1,p2,p3<terminator>
    p1 Measurement channel number
    p2 Type of operation (BEGIN)
    p3 Number of break points of the calibration segment (OFF, 2 to 16)
        OFF   Turns calibration off
        2 to 16   Number of break points

When p2 is set to SET

Syntax EH p1,p2,p3,p4,p5<terminator>
    p1 Measurement channel number
    p2 Type of operation (SET)
    p3 A specific break point (1 to 16)
    p4 Input value of the specific break point
    p5 Output value of the specific break point

Description • Set p1 by referring to the table in section 3.3.
• The range of p4 and p5 varies depending on the currently specified range.
• When the measurement range is set to scale, the range of p4 and p5 is –30000 to 30000.
• Set input value p4 so that the value increases as break point p3 increases.

When p2 is set to END

Syntax EH p1,p2<terminator>
    p1 Measurement channel number
    p2 Type of operation (END)

Example Set three break points on channel 002.
EH002,BEGIN,3
EH002,SET,1,0,1
EH002,SET,2,50,49
EH002,SET,3,100,101
EH002,END

Description • First, send the command with p2 set to BEGIN to specify the number of break points.
• Then, send this command with p2 set to SET as many times as is necessary to specify the values of each break point.
• Finally, send this command with p2 set to END to finalize the settings.
• Send the command "EH2?" to have the FX return the channel 002 settings.
• The FX returns the settings in the format shown in the above example.

BD Sets an alarm delay

Syntax BD p1,p2<terminator>
    p1 Measurement or computation channel number
    p2 Alarm delay (1 to 3600)

Query BD[p1]?

Example Set the channel 001 alarm delay to 120 seconds.
BD001,120

Description • Set p1 by referring to the table in section 3.3.
• The p2 unit is seconds.

NP Sets the VT ratio, CT ratio, and low-cut power (/PWR1 or /PWR5 option)

You cannot use this command to configure settings while recording (memory sampling) or computation is in progress.

Setting the VT ratio and CT ratio

Syntax NP p1,p2,p3,p4<terminator>
    p1 Setting type (VTCT)
    p2 VT ratio (10 to 60000)
    p3 CT ratio decimal place (0 to 2)
    p4 CT ratio value

Query NP[p1[,p2]]?

Example Set the VT ratio to 10.0 and the CT ratio to 123.45.
NPVTCT,100,2,12345

3

Commands

Description • Use parameter p2 to set the VT ratio.
VT ratio (p2): 10 to 60000
Set this value using an integer without a decimal point. (10 means "1.0.")

• About the CT ratio setting
The range of the CT ratio is 0.05 to 32000. Parameters p4 (the integer) and p3 (the decimal place) are used to display the value. (Example: If p3 is 2 and p4 is 12345, the CT ratio is 123.45.)

• The range of parameter p3 is 0 to 2. The ranges of p4 in relation to p3 are shown in the following table.

Parameter Range		Setting
p3	p4	
2	5 to 99999	0.05 to 999.99
1	10000 to 99999	1000 to 9999.9
0	10000 to 32000	10000 to 32000

For parameters p3 and p4, either set both parameters, or omit both parameters.

• Set the VT ratio and CT ratio so that they meet the following condition.
(Secondary rated power × 1.2 × VT ratio × CT ratio) < 10 (GW).
The secondary rated power is shown in the following table.

	Input Voltage	Secondary Rated Power	
		/PWR1	/PWR5
Single-phase two-wire system	120 V	100 W	500 W
	240 V	200 W	1000 W
Single-phase three-wire system	200 V	200 W	1000 W
Three-phase three-wire system	120 V	200 W	1000 W
	240 V	400 W	2000 W

Setting the low-cut power

Syntax NP p1,p2<terminator>

p1   Setting type (LOWCUT)

p2   Low-cut power (5 to 2000)

Query NP[p1[,p2]]?

Example Set the low-cut power to 1.00.

NPLOWCUT,100

Description Use parameter p2 to set the low-cut power. The range is 5 to 2000, which corresponds to actual settings of 0.05 to 20.00.

FR Sets the interval for acquiring data to the FIFO buffer

Syntax FR p1,p2<terminator>

p1 Fixed to 1

p2 FIFO acquisition interval (125MS, 250MS, 500MS, 1S, 2S, 5S)

Query FR?

Example Set the FIFO acquisition interval to 1 second.

FR1,1S

Description • Set the acquisition interval to a value that is greater than or equal to the scan interval.

• If you use the XV command or the FX screen to set the scan interval to a value greater than the acquisition interval, the acquisition interval is automatically set to the same value as the scan interval.

• The FX has a FIFO (First In First Out) ring buffer. The FX acquires measured values and computed values in the internal memory at predetermined time intervals from the time that the FX is turned on. The FX outputs the data in internal memory when it receives an FF command. The FX retains the previous output position for each connection and updates the position when it outputs the next set of data upon the receipt of another FF command. This scheme compensates for the communication delay and the differences in the processing power of the measurement PCs. Provided that a measurement PC reads the data before the ring buffer is overwritten, this scheme makes it possible to retrieve data without any dropouts. For details on the FIFO data output process, see appendix 5.

SM Sets the custom menu

Setting the main menu

Syntax SM p1,p2,p3,p4,p5,p6,p7,p8,p9
<terminator>

p1 Type (DISP_MAIN)

p2 to p9   Menu item to display

The FX displays menu items in the specified order.

Menu items that are not specified are not displayed.

TREND
DIGITAL
BAR   Bar graph
OVERVIEW
INFORMATION
TRENDHISTORY Historical trend
LOG
ESC
SEPARATOR

Example Set the first menu item to TREND and the second menu item to TRENDHISTORY.

SMDISP_MAIN,TREND,TRENDHISTORY

Description • If you omit parameter p2 and the subsequent parameters, all menu items are hidden.
• If you specify the same menu item multiple times, a command error will occur.
• You can specify up to three separators. If you specify any more, an error will occur.
• You cannot use delimiters to omit parameters (, ,).
• If you specify "SEPARATOR" as the first menu item, it will be ignored.

Setting the submenu

Syntax SM p1,p2,p3,. . .<terminator>

p1 Type (DISP_SUB)

p2 Menu type (TREND, DIGITAL, BAR, TRENDHISTORY, OVERVIEW, INFORMATION, LOG)

p3 and additional parameters   Submenu items to display

The FX displays menu items in the specified order.

Menu items that are not specified are not displayed.

When p2 is set to TREND, select from the items below

GROUP1 to GROUP10 Display group
ALL_CHANNEL   All channel display
SCALE   Scale display
DIGITAL   Digital display
MESSAGE_DISP   Message display
TREND_SPACE   Trend space
AUTO   Auto switching
SEPARATOR

When p2 is set to DIGITAL, select from the items below

GROUP1 to GROUP10 Display group
AUTO   Auto switching
SEPARATOR

When p2 is set to BAR, select from the items below

GROUP1 to GROUP10 Display group
AUTO   Auto switching
SEPARATOR

When p2 is set to TRENDHISTORY, select from the items below

GROUP1 to GROUP10 Display group
SEPARATOR

When p2 is set to OVERVIEW, select from the items below

CURSOR   Cursor display
TO_ALARM   Jump to the alarm summary
TO_TREND   Jump to the trend display
TO_DIGITAL   Jump to the digital display
TO_BAR   Jump to the bar graph display
SEPARATOR

3

Commands

When p2 is set to `INFORMATION`, select from the items below

ALARM	Alarm summary
MESSAGE	Message summary
MEMORY	Memory summary
MODBUS_CLIENT	Modbus TCP status display
MODBUS_MASTER	Modbus RTU status display
RELAY	Relay status display
REPORT	Report display
TO_HISTORY	To the historical display
TO_HISTORY_D	To historical (display data)
TO_HISTORY_E	To historical (event data)
TO_OVERVIEW	To the overview display
SORT_KEY	Sort key switching
SORT_ORDER	Sort order switching
DISP_ITEM	Date/user name switching
DATA_KIND	Data type switching
DATE/FILE	Date/file name switching
SELECT_SAVE	Select save
REPORT_CHANNEL	Report channel display switching
ALL_SAVE	Save all
MANUAL_SAVE	Save manual samples
REPORT_SAVE	Save reports
DATA_SAVE_MODE	Data save mode
COLUMN_BAR	Stacked bar graph
COLUMN_BAR_DISP	Single graph or dual graph
COLUMN_BAR_SELECT	
	Selects bar or group
REPORT_GROUP1 to REPORT_GROUP4	
	Selects the report group
DISP_GROUP	Group number display
SEPARATOR	

When p2 is set to `LOG`, select from the items below

LOGIN_LOG	Login log
ERROR_LOG	Error log
COMMU_LOG	Communication log
FTP_LOG	FTP log
WEB_LOG	Web log
MAIL_LOG	E-mail log
SNTP_LOG	SNTP log
DHCP_LOG	DHCP log
MODBUS_LOG	Modbus log
SEPARATOR	

Example　Display the following items in the following order on the Trend main menu's sub menu: SCALE and DIGITAL.
`SMDISP_SUB,TREND,SCALE,DIGITAL`

Description •　The items that you can set for p3 and the subsequent parameters vary depending on p2.

•　If you omit parameter p3 and the subsequent parameters, all menu items are hidden.

•　If you specify the same menu item multiple times, a command error will occur.

•　You can specify up to three separators. If you specify any more, an error will occur.

•　You cannot use delimiters to omit parameters (, ,).

•　The SMDISP_SUB? command causes the FX to also return sub menu items that are not being displayed.

•　If you specify "SEPARATOR" as the first menu item, it will be ignored.

•　The display on/off setting of the display group parameters "GROUP1" to "GROUP10" and the auto switching parameter "AUTO" apply to the trend, digital, bar graph, and historical trend menus. (For example, if you set AUTO to off for the trend menu, and then set AUTO to on for the digital menu, AUTO will be turned on for the trend, digital, bar graph, and historical trend menus.)

•　You cannot specify DATA_SAVE_MODE, SELECT_SAVE, REPORT_SAVE, ALL_SAVE, and MANUAL_SAVE on models that do not have a CF card slot/SD card slot or USB interface (/USB1 option).

•　You cannot specify MODBUS_CLIENT, FTP_LOG, MAIL_LOG, WEB_LOG, SNTP_LOG, and DHCP_LOG on models that do not have an Ethernet interface (/C7 option).

•　You cannot specify MODBUS_MASTER on models that do not have a serial interface (/C2 or /C3 option).

•　You cannot specify COMMU_LOG and MODBUS_LOG on models that do not have a communication interface (/C2, /C3, or /C7 option).

•　You cannot specify REPORT, REPORT_ CHANNEL, REPORT_SAVE, COLUMN_ BAR, COLUMN_BAR_DISP, COLUMN_BAR_ SELECT, or REPORT_GROUP on models that do not have the /M1, /PM1, /PWR1 or /PWR5 math option.

Setting the function menu

p1   Type (FUNC)

p2 and additional parameters   Menu item to display

The FX displays the functions that you select from below in the specified order on the menu. Menu items that are not specified are not displayed.

ALARMACK	AlarmACK
MESSAGE	Message
FREE_MESSAGE	Free message
MEDIA_EJECT	Media eject
SNAPSHOT	
MANUAL_SAMPLE	Manual sample
TRIGGER	Event trigger
SAVE_DISPLAY	Saves display data
SAVE_EVENT	Saves event data
SAVE_STOP	Interrupts a save operation
MATH_START/STOP	Starts or stops computation
MATH_RESET	Resets computation
MATH_ACK	Computation data dropout acknowledgment
TIMER_RESET	Timer reset
KEYLOCK	Locks or unlocks the keys
LOGOUT	Logout
PASSWORD_CHANGE	Password change
RATE_CHANGE	Switches between display rate 1 and display rate 2
BATCH	
TEXT_FIELD	Text field display
JUMP_DISPLAY	Registers the screen to return to
SYSTEM_INFO	System information
NETWORK_INFO	Network information
SNTP	
EMAIL_START/STOP	Starts or stops sending E-mail
EMAIL_TEST	E-mail transmission test
FTP_TEST	

Example   Display FREE MESSAGE and SNAPSHOT on the function menu in that order.

SMFUNC,FREE_MESSAGE,SNAPSHOT

Description • If you specify the same menu item multiple times, a command error will occur.
- You cannot specify "SEPARATOR."
- You cannot use delimiters to omit parameters (, ,).
- You cannot hide the "LOGOUT" menu item. If you do not include it in the parameters, it will be displayed as the last item.
- You can specify SNAPSHOT and MANUALSAMPLE regardless of the FX specifications. However, depending on the FX specifications and the settings, the corresponding functions may not operate.
- You cannot specify MEDIA_EJECT and SAVE_STOP on models that do not have a CF card slot/SD card slot or USB interface (/USB1 option).
- You cannot specify NETWORK_INFO, SNTP, EMAIL_START/STOP, EMAIL_TEST, and FTP_TEST on models that do not have the Ethernet interface (/C7 option).
- You cannot specify MATH_START/STOP, MATH_RESET, or MATH_ACK on models that do not have the /M1, /PM1, /PWR1, or /PWR5 math option.

Query   SM?

When you want to query all menu items.

SMDISP_MAIN?

When you want to query all main menu items.

SMDISP_SUB?

When you want to query all sub menu items.

SMDISP_SUB,TREND?

When you want to query the trend sub menu items.

SMFUNC?

When you want to query all function menu items.

3.5 Control Commands

BT — Sets a batch name

Syntax BT p1,p2,p3<terminator>

p1 Fixed to 1

p2 Batch number (up to 32 characters)

p3 Lot number (up to 8 digits)

Query BT[p1]?

Example Set the batch name structure to have the batch number "PRESS5LINE" and the lot number 007.

BT1,PRESS5LINE,007

Description Set p1 by referring to the table in section 3.3.

BU — Sets a batch comment

Syntax BU p1,p2,p3<terminator>

p1 Fixed to 1

p2 Comment number (1 to 3)

p3 Comment string (up to 50 characters)

Query BU[p1[,p2]]?

Example Set comment number 2 to "THIS_PRODUCT_IS_COMPLETED."

BU1,2,THIS_PRODUCT_IS_COMPLETED

Description Set p1 by referring to the table in section 3.3.

UD — Switches the screen

To return to the screen that was in use before you started using communication commands

Syntax UD p1<terminator>

p1 Screen type (0)

Example Return to the screen that was in use before you started using communication commands.

UD0

To switch between displays

Syntax UD p1,p2,p3<terminator>

p1 Screen type (1)

p2 Display item

TREND	Trend display
DIGITAL	Digital display
BAR	Bar graph display
OVERVIEW	Overview display (alarm indicator)
ALARM	Alarm summary display
MESSAGE	Message summary display
MEMORY	Memory summary display
MODBUS-M	Modbus master status display
MODBUS-C	Modbus client status display
RELAY	Relay status display
REPORT	Report display
HISTRICAL	Historical trend display
COLUMN_BAR	Stacked bar graph

p3 Display group number

Example Switch to the trend display, and select display group number 4.

UD1,TREND,4

Description
• The setting p2 = MODBUS-M is only valid if the serial interface protocol is set to MODBUS-M.
• The settings p2 = REPORT and p2 = COLUMN_BAR are only valid on models with the /M1, /PM1, /PWR1, or /PWR5 math option.
• The setting p2 = MODBUS-C is only valid on models with the Ethernet interface (/C7 option).
• Set p3 by referring to the table in section 3.3.

To switch the operation screen

Syntax UD p1,p2,p3,p4,p5,p6,p7<terminator>

p1 Screen type (4)

p2 Automatic display switching (ON, OFF)

p3 Switches between all channel display and group display (ALL, GROUP)

p4 Scale display (ON, OFF)

p5 Digital display (ON, OFF)

p6 Message display options

1 Normal display

2 List display

p7 Trend space (ON, OFF)

Example Turn on automatic display switching, switch to the group display, turn on the scale display, and turn off the digital display.

UD4,ON,GROUP,ON,OFF

Description
• Parameter p2 is valid for the trend, digital, and bar graph displays. Use the SE command to set the switching interval.
• Parameters p3 to p7 are valid for the trend display.

PS — Starts or stops recording

Syntax PS p1<terminator>

p1 Starts or stops recording

0 Start

1 Stop

Example Start recording.

PS0

Description When you start recording, the FX records display, event, and report data to the internal memory.

AK — Clears alarm output (acknowledges alarms)

Syntax AK p1<terminator>

p1 Executes alarm acknowledgement

0 Alarm acknowledge

Example Clear the alarm output (acknowledge alarms).

AK0

EV **Executes manual sample, generates a manual trigger, takes a snapshot, or causes a timeout**

Syntax   EV p1<terminator>

p1   Action type

0   Executes manual sampling
1   Generates a manual trigger
2   Takes a snapshot
3   Causes a timeout in display data
4   Causes a timeout in event data

Example   Execute manual sampling.
EV0

Description EV1 is only valid when the key trigger is set to ON using the event data sample condition command (the TE command). The EV1 command is equivalent to a key trigger.

CL **Executes manual SNTP (/C7 option)**

Syntax   CL p1<terminator>

p1   Executes manual SNTP (0)

Example   Synchronize the clock.
CL0

CV **Switches between the normal and secondary trend intervals**

Syntax   CV p1<terminator>

p1   Trend interval (0, 1)

0   Switches to the first trend interval (the normal trend interval)
1   Switches to the secondary trend interval

Example   Set the trend interval to the secondary trend interval.
CV1

MS **Writes a message (display and write)**

Syntax   MS p1,p2,p3<terminator>

p1   Message number (1 to 100)
p2   Message write destination
    GROUP   A specific display group
    ALL   All display groups
p3   Display group number
    The display group number when p2 is set to GROUP.
    This parameter has no meaning when p2 is set to ALL.

Example   Write the message in message number 8 to display group 1.
MS8,GROUP,1

Description • If you omit p2, the message is written to all display groups.
• Set p3 by referring to the table in section 3.3.

BJ **Writes a free message**

Syntax   BJ p1,p2,p3,p4<terminator>

p1   Message number (1 to 10)
p2   Message (up to 32 characters)
p3   Message write destination
    GROUP   A specific display group
    ALL   All display groups
p4   Display group number
    The display group number when p2 is set to GROUP.
    This parameter has no meaning when p2 is set to ALL.

Example   Using message number 3, write the string "ALARM" to all groups.
BJ3,ALARM,ALL

Description • If you omit p3, the message is written to all display groups.
• Set p3 and p4 by referring to the table in section 3.3.

EJ **Changes the password of the login function (/C7 option)**

Syntax   EJ p1,p2,p3<terminator>

p1   Old password (up to 8 characters)
p2   New password (up to 8 characters)
p3   New password (up to 8 characters)

Example   Change the password from "PASS001" to "WORD005."
EJPASS001,WORD005,WORD005

TL **Starts, stops, resets computation (MATH) or clears the computation dropout status display (/M1, /PM1, /PWR1, and /PWR5 options)**

Syntax   TL p1<terminator>

p1   Action type

0   Starts computation
1   Stops computation
2   Resets computation
3   Clears the computation data dropout display

Example   Start computation.
TL0

Description You cannot use this command while the FX is saving or loading setup data.

DS **Switches between execution modes (operation and basic setting)**

Syntax   DS p1<terminator>

p1   Mode

0   Operation mode
1   Basic setting mode

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Example   Switch the FX to basic setting mode.
           `DS1`

Description • You cannot set p1 to 1 when the FX is
             recording (memory sampling) or computing, is
             formatting an external storage medium, or is
             storing data to an external storage medium.
           • You cannot set p1 to 1 when the FX is
             formatting an external storage medium or is
             storing data to an external storage medium.
           • To apply settings that you have changed using
             the basic setting commands, you need to save
             the settings using the XE command. Be sure
             to save the settings using the XE command
             before you change the execution mode
             from the basic setting mode to the operation
             mode. Otherwise, the new settings will not be
             applied.

LO   Loads setup data for setting mode

Syntax   `LO p1,p2<terminator>`
          p1 File name (up to 32 characters)
          p2 Medium
              0   CF card slot/SD card slot
              1   USB

Example   Load the setting mode setup data from a setup
          file named SETFILE1.
          `LOSETFILE1`

Description • When you specify the file name, do not specify
             the extension.
           • You can set p2 to 1 on models that have the
             USB interface (/USB1 option).
           • If you omit parameter p2, the medium is set to
             the CF card slot/SD card slot.
           • You cannot use this command to load basic
             setting mode setup data. To load setting mode
             setup data and basic setting mode setup data,
             use the YO command.
           • You cannot use this command when there is
             no external storage medium inserted in the
             FX.
           • You cannot use this command on models that
             do not have a CF card slot/SD card slot or
             USB interface (/USB1 option).

LI   Saves setup data

Syntax   `LI p1<terminator>`
          p1 File name (up to 32 characters)
          p2 Medium
              0   CF card slot/SD card slot
              1   USB

Example   Save setting mode setup data and basic setting
          mode setup data to a file named SETFILE2 on
          the CF card/SD card.
          `LISETFILE2`

Description • When you specify the file name, do not specify
             the extension.
           • You can set p2 to 1 on models that have the
             USB interface (/USB1 option).
           • If you omit parameter p2, the medium is set to
             the CF card slot/SD card slot.
           • An extension is appended to the file name
             when you save the file.
           • You cannot use this command when there is
             no external storage medium inserted in the
             FX.
           • You cannot use this command on models that
             do not have a CF card slot/SD card slot or
             USB interface (/USB1 option).

CM   Sets communication input data (/M1, /PM1, /PWR1, and /PWR5 options)

Syntax   `CM p1,p2<terminator>`
          p1 Communication input data number
          p2 Communication input data
              The ranges are –9.9999E+29 to
              –1.0000E–30 and 1.0000E–30 to
              9.9999E+29. You can also specify 0.
              Five significant digits

Query   `CM?`
Example   Set communication input data C01 to
          1.0000E–10.
          `CMC01,1.0000E-10`

EM   Starts or stops the e-mail transmission function (/C7 option)

Syntax   `EM p1<terminator>`
          p1 Action type
              0   Start
              1   Stop

Example   Start the e-mail transmission function.
          `EM0`

Description To use the e-mail transmission function, you
            must configure the Ethernet interface, set e-mail
            addresses, and enter the contents you want to
            transmit.

CU — Recovers Modbus manually

Syntax   CU p1<terminator>

p1   Communication type

0	Modbus client (Ethernet)
1	Modbus master (serial)

YO — Loads a setup file that includes the settings for basic setting mode

Syntax   YO p1,p2<terminator>

p1   Name of the file to load (up to 32 characters)

p2   Medium

0	CF card slot/SD card slot
1	USB

Example   Load the CONFIG1 file from the CF card/SD card.

YOCONFIG1,0

Description • When you specify the file name, do not specify the extension.

• You can set p2 to 1 on models that have the USB interface (/USB1 option).

• If you omit parameter p2, the medium is set to the CF card slot/SD card slot.

• You cannot use this command on models that do not have a CF card slot/SD card slot or USB interface (/USB1 option).

YC — Clears measured and computed data and initializes setup data

Syntax   YC p1<terminator>

p1   The types of data to be initialized and cleared

0	Basic setting mode settings, setting mode settings, measured and computed data, and log data ("Clear 1" on the FX)
1	Setting mode settings, measured and computed data, and log data ("Clear 2" on the FX)
2	Measured and computed data and log data ("Clear 3" on the FX)

Example   Perform "Clear 3" on the FX.

YC2

IR — Resets a relative timer

Syntax   IR p1<terminator>

p1   Number of the timer to reset

0	All timers
1,2,...	Timer number

Example   Reset timer 2.

IR2

Description Set p1 by referring to the table in section 3.3.

BV — Enters a string (can only be used during serial communication)

Syntax   BV p1,p2<terminator>

p1   0

p2   Character string (up to 100 characters)

Example   Enter "user123."

BV0,user123

Description You can use this command to enter character strings when the FX is displaying the character input window.

KE — Performs key operations

Syntax   KE p1<terminator>

p1   Key

F1 to F5	Soft keys 1 to 5
ESC	ESC key
MENU	MENU key
FUNC	FUNC key
START	START key
STOP	STOP key
USER	USER key
DISP	DISP/ENTER key
UP	The up arrow key
DOWN	The down arrow key
RIGHT	The right arrow key
LEFT	The left arrow key

Example   Press the DISP/ENTER key.

KEDISP

Description • This command performs the same operations as pressing the keys on the FX. When you send multiple key operations, send them in the same order that you would perform them on the FX.

• When you perform this command, it is logged on the FX as "KEY." This command is valid regardless of whether the keys are locked.

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3.6   Basic Setting Commands

<u>WU</u>   Sets the environment

Setups   GENERAL, BATCH, DISPLAY, MESSAGE,
INPUT, ALARM, SECURITY, MEDIA, MATH,
REPORT, SERVICEPORT, DECIMALPOINT,
POP3, and FTPSERVER

General environment settings

Syntax   WU p1,p2,p3<terminator>
  p1   Setting type (GENERAL)
  p2   Selects tag or channel number
    TAG   Tag
    CHANNEL Channel number
  p3   Language
    ENGLISH
    JAPANESE
    CHINESE
    GERMAN
    FRENCH
    ITALIAN
    SPANISH
    PORTUGUESE
    RUSSIAN
    KOREAN

Batch settings

Syntax   WU p1,p2,p3,p4<terminator>
  p1   Setting type (BATCH)
  p2   Batch function (OFF, ON)
    OFF   Disables the batch function
    ON   Enables the batch function
  p3   Number of lot number digits (OFF, 4, 6, 8)
  p4   Auto increment (ON, OFF)
Description   Parameters p3 and p4 are valid when p2 is set to
    ON.

Display settings

Syntax   WU p1,p2,p3,p4<terminator>
  p1   Setting type (DISPLAY)
  p2   Trend type
    T-Y   T-Y display
  p3   Partial expanded display (OFF, ON)
  p4   Trend interval switching (OFF, ON)

Message settings

Syntax   WU p1,p2,p3,p4<terminator>
  p1   Setting type (MESSAGE)
  p2   Where to write messages that you enter
    using keys
    COMMON All display groups
    SEPARATE The display group that you
         specify
  p3   Power failure message (OFF, ON)
  p4   Change message (OFF, ON)

Input settings

Syntax   WU p1,p2<terminator>
  p1   Setting type (INPUT)
  p2   How to detect values that exceed the scale
    FREE When the measuring range is
        exceeded
    OVER When ±105% of the scale is
        exceeded
Description The setting of parameter p2 (how to detect
    values that exceed the scale) is not applied to
    channels that are set to Log scale (/LG1 option).

Alarm settings

Syntax   WU p1,p2<terminator>
  p1   Setting type (ALARM)
  p2   Alarm suppression function (OFF, ON)

Security settings

Syntax   WU p1,p2,p3<terminator>
  p1   Setting type (SECURITY)
  p2   Key
    OFF   Disables the security features
    KEYLOCK Locks the keys
    LOGIN Enables the login function
  p3   Communication
    OFF   Disables the security features
    LOGIN Enables the login function
Description On models that do not have the Ethernet
    interface (/C7 option), p3 is fixed to OFF.

Media settings

Syntax   WU p1,p2,p3<terminator>
  p1   Setting type (MEDIA)
  p2   Automatic saving (OFF, ON)
  p3   Media FIFO (OFF, ON)
Example   Use media FIFO.
    WUMEDIA,ON,ON
Description •   Parameter p3 is valid when p2 is set to ON.
    •   You cannot use this command on models that
      do not have a CF card slot/SD card slot.

Computation settings

Syntax `WU p1,p2,p3,p4<terminator>`

p1 Setting type (MATH)

p2 Display on error

   `+OVER`   Positive overflow

   `-OVER`   Negative overflow

p3 Data when the SUM or AVE value overflows

   `ERROR`   Sets the computed result to the value of the computation error

   `SKIP`   Discards the data that overflowed and continues the computation

   `LIMIT`   Processes the data as follows:

- For measurement channels that do not have linear scaling specified, the FX sets the data to the upper or lower limit of the measuring range.
- For measurement channels that have linear scaling specified, the FX sets the data to the specified scan upper or lower limit.
- For computation channels, the FX sets the data to the specified span upper or lower limit.

p4 Data when the MAX, MIN, or P-P value overflows

   `OVER`   Uses the data that overflowed to perform computations

   `SKIP`   Discards the data that overflowed and continues the computation

Description On models with the /M1, /PM1, /PWR1, or /PWR5 math option, you can set p1 to MATH.

Report settings

Syntax `WU p1,p2,p3,p4,p5,p6<terminator>`

p1 Setting type (REPORT)

p2 Report computation type 1

   `MAX`   Maximum value

   `MIN`   Minimum value

   `AVE`   Average value

   `SUM`   Integrated value

   `INST`   Instantaneous value

p3 Report computation type 2

   `OFF`   Disables report computation

   `MAX`   Maximum value

   `MIN`   Minimum value

   `AVE`   Average value

   `SUM`   Integrated value

   `INST`   Instantaneous value

p4 Report computation type 3

   The same as p3

p5 Report computation type 4

   The same as p3

p6 How to create the "hourly+daily," "daily+weekly," and "daily+monthly" files

   `COMBINE`   Saves reports to one file

   `SEPARATE`   Saves reports to separate files

Description • On models with the /M1, /PM1, /PWR1, or /PWR5 math option, you can set p1 to REPORT.

- For parameters p2 to p5, you cannot specify the same computation type. The exception is OFF, which can be specified for multiple parameters. However, you cannot set all these parameters to OFF.

Service ports

Syntax `WU p1,p2,p3,p4,p5<terminator>`

p1 Setting type (SERVICEPORT)

p2 FTP service port (1 to 65535)

p3 Web service port (1 to 65535)

p4 SNTP service port (1 to 65535)

p5 Modbus service port (1 to 65535)

Description On models that have the Ethernet interface (/C7 option), you can set p1 to SERVICEPORT.

Decimal point type

Syntax `WU p1,p2<terminator>`

p1 Setting type (DECIMALPOINT)

p2 Decimal point type (POINT, COMMA)

   `POINT`   A period is used for the decimal point.

   `COMMA`   A comma is used for the decimal point.

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Detailed POP3 settings

Syntax   `WU p1,p2,p3<terminator>`
     `p1`   Setting type (POP3)
     `p2`   Delay after accessing POP3 until
         transmission (in seconds; 0 to 10)
     `p3`   POP3 login method (PLAIN, APOP)

Description On models that have the Ethernet interface (/C7
     option), you can set p1 to POP3.

Detailed FTP server settings

Syntax   `WU p1,p2<terminator>`
     `p1`   Setting type (FTPSERVER)
     `p2`   Directory output format (MS-DOS, UNIX)
        `MS-DOS`
        `UNIX`

Description On models that have the Ethernet interface (/C7
     option), you can set p1 to FTPSERVER.

Query   `WU[p1]?`
Example This is an example for general environment
     settings. Display tags and use English as the
     display language.
     `WUGENERAL,TAG,ENGLISH`

WO   Sets alarm and DO settings

Alarm and DO settings

Syntax   `WO p1,p2,p3,p4,p5<terminator>`
     `p1`   Alarm setting (ALARM)
     `p2`   Reflash operation (OFF, ON)
     `p3`   Interval for the low limit on the rate-of-
        change (1 to 32)
     `p4`   Interval for the high limit on the rate-of-
        change (1 to 32)
     `p5`   Holding of the alarm status display
        `HOLD`
        `NONHOLD`

Internal switch settings

Syntax   `WO p1,p2<terminator>`
     `p1`   DO type (SWITCH)
     `p2`   AND switch number
        `NONE`   No AND setting
        `S01`   Only specify S01
        `S01-Sxx` Specify S01 to Sxx
                 xx = 02 to 30

Output relay settings

Syntax   `WO p1,p2,p3,p4,p5<terminator>`
     `p1`   DO type (RLY)
     `p2`   Relay number
        `NONE`   No AND setting
        `I01`   Only specify I01
        `I01-Ixx` Specify I01 to Ixx
                 xx = 02 to 06 and 11 to 16
     `p3`   Energize or de-energize the relay
        `DE_ENERGIZE`
        `ENERGIZE`
     `p4`   Holding of the relay
        `NONHOLD`
        `HOLD`
     `p5`   Relay action on ACK
        `NORMAL`
        `RESET`

Query   `WO[p1]?`
Example Specify no AND operation of the output relays,
     set the relay action to energize, and release
     the relay output when the ACK operation is
     performed regardless of the alarm status.
     `WORLY,NONE,ENERGIZE,HOLD,RESET`

WH   Sets alarm hysteresis

Measurement channels

Syntax   `WH p1,p2,p3<terminator>`
     `p1`   Channel type (MEASURE)
     `p2`   Hysteresis on high and low limit alarms
        (0 to 50)
     `p3`   Hysteresis on difference high and low limit
        alarms (0 to 50)

Computation channels

Syntax   `WH p1,p2<terminator>`
     `p1`   Channel type (MATH)
     `p2`   Hysteresis on high and low limit alarms
        (0 to 50)

Query   `WH[p1]?`
Example For measurement channels, set the high and low
     limit alarm hysteresis to 4.0% and the difference
     high and low limit alarm hysteresis to 0.0%.
     `WHMEASURE,40,0`

Description • You can set computation channels on models
       with the /M1, /PM1, /PWR1, or /PWR5 math
       option.
     • The hysteresis of any channels that are set to
       Log scale (/LG1 option) is fixed to 0.

XV — Sets the scan interval and A/D integration time

Syntax   XV p1,p2,p3,p4<terminator>
  p1   Fixed to 1
  p2   NORMAL   Fixed
  p3   Scan interval (125MS, 250MS, 1S, 2S, 5S)
  p4   A/D integration time (AUTO, 50Hz, 60Hz, 100ms)
Query   XV[p1]?
Example Set the scan interval to 1 second.
    XV1,NORMAL,1S
Description The selectable scan intervals vary depending on the model. See the *FX1000 User's Manual*, IM 04L21B01-01EN. You can only set p4 to 100ms when p3 is set to 2S or 5S.

XB — Sets burnout detection

Syntax   XB p1,p2<terminator>
  p1   Measurement channel number
  p2   Burnout processing
    OFF   No processing
    UP   Sets the measured result to positive overflow
    DOWN   Sets the measured result to negative overflow
Query   XB[p1]?
Example Set the measured result to UP (positive overflow) when a burnout is detected on channel 001.
    XB001,UP
Description Set p1 by referring to the table in section 3.3.

XJ — Sets RJC

When using the internal compensation circuit
Syntax   XJ p1,p2<terminator>
  p1   Measurement channel number
  p2   RJC mode (INTERNAL)
Query   XJ[p1]?
Example Set the channel 001 RJC to internal compensation circuit.
    XJ001,INTERNAL

When using an external RJC
Syntax   XJ p1,p2,p3<terminator>
  p1   Measurement channel number
  p2   RJC mode (EXTERNAL)
  p3   External RJC value (–20000 to 20000)
Query   XJ[p1]?
Example Set the channel 002 RJC to external, and set the compensation value to 0 μV.
    XJ002,EXTERNAL,0
Description • Set p1 by referring to the table in section 3.3.
    • The p3 unit is μV.

XM — Sets the memory sampling condition

Syntax   XM p1<terminator>
  p1   Data type
    DISPLAY   Display data
    EVENT   Event data
    E+D   Display data and event data
Query   XM?
Example Set the memory sampling condition to display data.
    XMDISPLAY
Description You cannot specify E+D when:
    • Trend interval switching is on.

RF — Sets the key lock

When p1 is set to KEY
Syntax   RF p1,p2,p3,p4,p5,p6<terminator>
  p1   Type (KEY)
  p2   START key (FREE, LOCK)
  p3   STOP key (FREE, LOCK)
  p4   MENU key (FREE, LOCK)
  p5   USER key (FREE, LOCK)
  p6   DISP/ENTER key (FREE, LOCK)

When p1 is set to FUNC (function key)
Syntax   RF p1,p2,p3,p4,p5,p6,p7,p8<terminator>
  p1   Type (FUNC)
  p2   Alarm ACK (FREE, LOCK)
  p3   Message and batch (FREE, LOCK)
  p4   Computation (FREE, LOCK)
  p5   Data save (FREE, LOCK)
  p6   E-mail and FTP (FREE, LOCK)
  p7   Time operations (FREE, LOCK)
  p8   Display operations (FREE, LOCK)
Description Even on models that do not have the Ethernet interface (/C7 option), if you set p1 to FUNC, you can specify a value for parameter p6 (the E-mail and FTP setting), but it will be ignored.

When p1 is set to MEDIA (external storage media)
Syntax   RF p1,p2,p3<terminator>
  p1   Type (MEDIA)
  p2   External storage media operations (FREE, LOCK)
  p3   Setting load operations (FREE, LOCK)
Description You cannot use this command with p1 set to MEDIA on models that do not have a CF card slot/SD card slot or USB interface (/USB1 option).
Query   RF[p1]?
Example Only lock the MENU key.
    RFKEY,FREE,FREE,LOCK,FREE,FREE,FREE

3

Commands

RN — Sets basic login

Syntax   `RN p1,p2<terminator>`
        p1   Auto logout (OFF, 1MIN, 2MIN, 5MIN, 10MIN)
        p2   Operation without Login
            `OFF`   Disables FX operation
            `DISPLAY`   Only enables screen operation
Query   `RN?`
Example   Set the auto logout time to 1 minute, and disable FX operation when logged out.
        `RN1MIN,OFF`

RP — Sets user limitations

Syntax   `RP p1,p2,...<terminator>`
        p1   User limitation number (1 to 10)
        p2   User limitation item (KEY, FUNC, MEDIA)
        Parameter p3 and subsequent parameters vary as shown below depending on the p2 setting.

When p2 is set to KEY

Syntax   p3   START key (FREE, LOCK)
        p4   STOP key (FREE, LOCK)
        p5   MENU key (FREE, LOCK)
        p6   USER key (FREE, LOCK)
        p7   DISP/ENTER key (FREE, LOCK)

When p2 is set to FUNC (function key)

Syntax   p3   Alarm ACK (FREE, LOCK)
        p4   Message and batch (FREE, LOCK)
        p5   Computation (FREE, LOCK)
        p6   Data save (FREE, LOCK)
        p7   E-mail and FTP (FREE, LOCK)
        p8   Time operations (FREE, LOCK)
        p9   Display operations (FREE, LOCK)
Description   Even on models that do not have the Ethernet interface (/C7 option), if you set p2 to FUNC, you can specify a value for parameter p7 (the E-mail and FTP setting), but it will be ignored.

When p2 is set to MEDIA (external storage media)

Syntax   p3   External storage media operations (FREE, LOCK)
        p4   Setting load operations (FREE, LOCK)
Description   You cannot use this command with p2 set to MEDIA on models that do not have a CF card slot/SD card slot or USB interface (/USB1 option).
Query   `RP[p1,[p2]]?`

Example   Lock the START, STOP, and DISP/ENTER keys.
        `RP1,KEY,LOCK,LOCK,,,LOCK`

RO — Sets the type of report and when to create reports (/M1, /PM1, /PWR1, and /PWR5 options)

When you are not creating reports

Syntax   `RO p1<terminator>`
        p1   Report type (OFF)
Query   `RO?`
Example   Set the FX to not create reports.
        `ROOFF`

When you are creating hourly, daily, hourly + daily, and daily + monthly reports

Syntax   `RO p1,p2,p3<terminator>`
        p1   Report type
            `HOUR`   Hourly report
            `DAY`   Daily report
            `HOUR+DAY`   Hourly and daily reports
            `DAY+MONTH`   Daily and monthly reports
        p2   Day to create reports (dd; fixed format)
            `dd`   Day (01 to 28)
        p3   Hour to create reports (hh; fixed format)
            `hh`   Hour (00 to 23)
Query   `RO?`
Example   Create daily reports at 09:00 every day (in this case, parameter p2—which is 05 in this example—is invalid).
        `RODAY,05,09`

Description   • You can use this command on models with the /M1, /PM1, /PWR1, or /PWR5 math option.
        • Parameter p2 is invalid if you specify it for reports other than the monthly and daily reports.

When you are creating daily + weekly reports

Syntax   `RO p1,p2,p3<terminator>`
        p1   Report type (DAY+WEEK)
        p2   Day of the week to create reports (SUN, MON, TUE, WED, THU, FRI, SAT)
        p3   Hour to create reports (hh; fixed format)
            `hh`   Hour (00 to 23)
Query   `RO?`
Example   Create daily reports at 09:00 every day and weekly reports at 09:00 every Tuesday.
        `RODAY+WEEK,TUE,09`
Description   You can use this command on models with the /M1, /PM1, /PWR1, or /PWR5 math option.

RM Sets a report channel (/M1, /PM1, /PWR1, and /PWR5 options)

When you are not using report channels

Syntax   `RM p1,p2<terminator>`

        `p1` Report channel number

        `p2` Report channel usage (OFF)

Query   `RM[p1]?`

Example   Disable the channel 001 report channel.

        `RM001,OFF`

Description Set p1 by referring to the table in section 3.3.

When you are using report channels

Syntax   `RM p1,p2,p3,p4<terminator>`

        `p1` Report channel number

        `p2` Report channel usage (ON)

        `p3` Number of the measurement or computation channel on which to report

        `p4` Conversion of the unit of time for integration

          `OFF`   Values are not converted.

          `/S`   Values are converted as though the physical values are integrated in units of seconds.

          `/MIN`   Values are converted as though the physical values are integrated in units of minutes.

          `/H`   Values are converted as though the physical values are integrated in units of hours.

          `/DAY`   Values are converted as though the physical values are integrated in units of days.

Query   `RM[p1]?`

Example   Use report channel number R01. Set the number of the channel on which to report to 001 and convert the unit of time for integration to seconds.

        `RM001,ON,001,/S`

Description • You can use this command on models with the /M1, /PM1, /PWR1, or /PWR5 math option.

        • Set p1 and p3 by referring to the table in section 3.3. Errors are returned for any reports for channels that are set to Log scale (/LG1 option).

        • About parameter p4

        Because the FX integrates sampled data over each scan interval, the physical value measured over a given unit of time may be different from the actual integrated value (because the unit of time is different from the scan interval). If this occurs, set p4 to the same unit of time as that which is being used for the physical value that you are measuring. The FX calculates the integrated value using one of the following conversion formulas based on the parameter.

OFF	Σ(measured value)
/S	Σ(measured value) × scan interval
/MIN	Σ(measured value) × scan interval/60
/HOUR	Σ(measured value) × scan interval/3600
/DAY	Σ(measured value) × scan interval/86400

The scan interval unit is seconds.

XG Sets the time zone

Syntax   `XG p1,p2<terminator>`

        `p1` Time offset from GMT (–1300 to 1300)

           First two digits: Hour (00 to 13)

           Second two digits: Minute (00 to 59)

        `p2` Time deviation limit at which the function that gradually adjusts the time is enabled (OFF, 10S, 20S, 30S, 1MIN, 2MIN, 3MIN, 4MIN, 5MIN)

Example   Set the time offset to 9 hours ahead of GMT and the deviation limit to 30 seconds.

        `XG0900,30S`

XN Sets the date format

Syntax   `XN p1<terminator>`

        `p1` Date format (Y/M/D, M/D/Y, D/M/Y, D.M.Y)

Query   `XN?`

Example   Set the date format to year/month/day.

        `XNY/M/D`

YB Sets host information (/C7 option)

Syntax   `YB p1,p2<terminator>`

        `p1` Host name (up to 64 characters)

        `p2` Domain name (up to 64 characters)

Query   `YB?`

Example   Set the host name to "fx1000" and the domain name to "fxadv.recorder.com."

        `YBfx1000,fxadv.recorder.com`

3

Commands

YD   Sets network parameters (/C7 option)

When you are not retrieving network parameters automatically

Syntax   `YD p1<terminator>`

p1   Automatic retrieval (NOT)

When you are retrieving network parameters automatically

Syntax   `YD p1,p2,p3<terminator>`

p1   Automatic retrieval (USE)

p2   DNS information retrieval (USE, NOT)

p3   Automatic host name registration (USE, NOT)

Query   `YD?`

Example   Set the FX to automatically retrieve the IP address and DNS information and automatically register the host name.

`YDUSE,USE,USE`

YA   Sets the IP address, subnet mask, and default gateway (/C7 option)

Syntax   `YA p1,p2,p3<terminator>`

p1   IP address (0.0.0.0 to 255.255.255.255)

p2   Subnet mask
(0.0.0.0 to 255.255.255.255)

p3   Default gateway
(0.0.0.0 to 255.255.255.255)

Query   `YA?`

Example   Set the IP address to 192.168.111.24, the subnet mask to 255.255.255.0, and the default gateway to 0.0.0.0.

`YA192.168.111.24,255.255.255.0,0.0.0.0`

YK   Sets keepalive (/C7 option)

Syntax   `YK p1<terminator>`

p1   Keepalive (ON, OFF)

Query   `YK?`

Example   Disable keepalive.

`YKOFF`

RU   Sets DNS parameters (/C7 option)

Server settings

Syntax   `RU p1,p2,p3<terminator>`

p1   Setting type (SERVER)

p2   Primary DNS server address
(0.0.0.0 to 255.255.255.255)

p3   Secondary DNS server address
(0.0.0.0 to 255.255.255.255)

Suffix settings

Syntax   `RU p1,p2,p3<terminator>`

p1   Setting type (SUFFIX)

p2   Domain suffix 1 (up to 64 characters)

p3   Domain suffix 2 (up to 64 characters)

Query   `RU[p1]?`

Example   Set domain suffix 1 to "rec1.recorder.com" and domain suffix 2 to "rec2.recorder.com."

`RUSUFFIX,rec1.recorder.com,rec2.recorder.com`

WS   Sets a server (/C7 option)

Syntax   `WS p1,p2<terminator>`

p1   Server type (FTP, WEB, MODBUS, SNTP)

p2   Server usage (USE, NOT)

Query   `WS[p1]?`

Example   Enable the Web server.

`WSWEB,USE`

WW   Sets web page parameters (/C7 option)

Syntax   `WW p1,p2,p3,p4<terminator>`

p1   Web page type

`OPERATOR`   Operator page

`MONITOR`   Monitor page

p2   Web page (ON, OFF)

p3   Authentication

`OFF`   No authentication

`ADMIN`   Administrator privileges

`USER`   User privileges

p4   Command input (USE, NOT)

Query   `WW[p1]?`

Example   Enable the operator page, disable authentication, and enable command input.

`WWOPERATOR,USE,OFF,USE`

Description • Parameters p3 and p4 are valid when p2 is set to ON.
• You can set parameter p3 to OFF or ADMIN when p1 is set to OPERATOR.
• Parameter p4 is valid when p1 is set to OPERATOR.

YQ Sets the communication timeout (/C7 option)

When you are not using a timeout

Syntax `YQ p1<terminator>`
 p1 Communication timeout (OFF)

Query `YQ?`

Example Disable the communication timeout.
 `YQOFF`

When you are using a timeout

Syntax `YQ p1,p2<terminator>`
 p1 Communication timeout (ON)
 p2 Timeout value in minutes (1 to 120)

Query `YQ?`

Example Enable the communication timeout, and set the timeout value to 3 minutes.
 `YQON,3`

YT Sets the FTP transfer timing (/C7 option)

Syntax `YT p1,p2,p3<terminator>`
 p1 Automatically transfer data when display data files and event data files are created (ON, OFF)
 p2 Automatically transfer data when report data files are created (ON, OFF)
 p3 Automatically transfer data when snapshot data files are created—when a snapshot is executed (ON, OFF)

Query `YT?`

Example Set the FX to automatically transfer display data files and event data files. Do not transfer report data files or screen image data files.
 `YTON,OFF,OFF`

Description • When the method to save data to the external storage medium is set to "Auto," the FX automatically transfers data files when they are created. For the setting procedure for the method to save data to the external storage medium, see the *FX1000 User's Manual*, IM 04L21B01-01EN.

 • Parameter p2 is only valid on models with the /M1, /PM1, /PWR1, or /PWR5 math option.

YU Sets what kind of information to send using e-mail (/C7 option)

When you want to send changes in the status of alarms

Syntax `YU p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,`
 `p11,p12<terminator>`
 p1 Information to send (ALARM)
 p2 Recipient 1 (ON, OFF)
 p3 Recipient 2 (ON, OFF)
 p4 Transmission of the alarm number 1 status (ON, OFF)
 p5 Transmission of the alarm number 2 status (ON, OFF)
 p6 Transmission of the alarm number 3 status (ON, OFF)
 p7 Transmission of the alarm number 4 status (ON, OFF)
 p8 Inclusion of instantaneous data (ON, OFF)
 p9 Inclusion of the source URL (ON, OFF)
 p10 Subject (up to 32 characters)
 p11 Header 1(up to 64 characters)
 p12 Header 2(up to 64 characters)

Query `YU[p1]?`

Example Send the status of alarm numbers 1 to 4 to recipient 1. Include instantaneous data but not the source URL. Set the subject to "ALM," header 1 to "LP2," and header 2 to "FX."
 `YUALARM,ON,OFF,ON,ON,ON,ON,ON,OFF,`
 `ALM,LP2,FX`

When you want to send e-mail at scheduled times

Syntax `YU p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,`
 `p11,p12<terminator>`
 p1 Information to send (TIME)
 p2 Recipient 1 (ON, OFF)
 p3 Interval for sending e-mail to recipient 1 (1H, 2H, 3H, 4H, 6H, 8H, 12H, 24H)
 p4 Time to send e-mail to recipient 1 (00:00 to 23:59)
 p5 Recipient 2 (ON, OFF)
 p6 Interval for sending e-mail to recipient 2 (1H, 2H, 3H, 4H, 6H, 8H, 12H, 24H)
 p7 Time to send e-mail to recipient 2 (00:00 to 23:59)
 p8 Inclusion of instantaneous data (ON, OFF)
 p9 Inclusion of the source URL (ON, OFF)
 p10 Subject (up to 32 characters)
 p11 Header 1(up to 64 characters)
 p12 Header 2(up to 64 characters)

Query `YU[p1]?`

Example Send an e-mail to recipient 1 every day at 17:15. Do not include instantaneous data, but include the source URL. Set the subject to "GOOD" and header 1 to "LP2."
 `YUTIME,ON,24H,17:15,OFF,,,OFF,ON,`
 `GOOD,LP2`

When you want to send system notifications

Syntax   YU p1,p2,p3,p4,p5,p6,p7<terminator>

p1   Information to send (SYSTEM)

p2   Recipient 1 (ON, OFF)

p3   Recipient 2 (ON, OFF)

p4   Inclusion of the source URL (ON, OFF)

p5   Subject (up to 32 characters)

p6   Header 1(up to 64 characters)

p7   Header 2(up to 64 characters)

Query   YU[p1]?

Example   Send system notification e-mails that include the source URL to recipient 1. Set the subject to "SystemAlert" and header 1 to "LP2."

YUSYSTEM,ON,OFF,ON,SystemAlert,LP2

When you want to send report generation notifications

Syntax   YU p1,p2,p3,p4,p5,p6,p7<terminator>

p1   Information to send (REPORT)

p2   Recipient 1 (ON, OFF)

p3   Recipient 2 (ON, OFF)

p4   Inclusion of the source URL (ON, OFF)

p5   Subject (up to 32 characters)

p6   Header 1(up to 64 characters)

p7   Header 2(up to 64 characters)

Query   YU[p1]?

Example   Send report generation notification e-mails that include the source URL to recipient 1. Set the subject to "Report" and header 1 to "LP2."

YUREPORT,ON,OFF,ON,Report,LP2

Description • For details about system notifications, see section 1.4.

• You can use report generation notification on models with the /M1, /PM1, /PWR1, or /PWR5 math option.

• For details on e-mail settings, see section 1.4.

YV   Sets an e-mail recipient address (/C7 option)

Syntax   YV p1,p2<terminator>

p1   Selects the recipient

1   Recipient 1

2   Recipient 2

p2   Recipient address (up to 150 characters)

Query   YV[p1]?

Example   Set recipient 1 to "fxuser1@fx1000.com" and "fxuser2@fx1000.com."

YV1,fxuser1@fx1000.com fxuser2@fx1000.com

Description • To specify multiple recipients, separate each recipient with a space.

• For details on e-mail settings, see section 1.4.

YW   Sets the e-mail sender address (/C7 option)

Syntax   YW p1<terminator>

p1   Sender address (up to 64 characters)

Query   YW?

Example   Set the sender address to "fxadv."

YWfxadv

Description For details on e-mail settings, see section 1.4.

YX   Sets the e-mail SMTP server name (/C7 option)

Syntax   YX p1,p2,p3<terminator>

p1   SMTP server name (up to 64 characters)

p2   Port number (0 to 65535)

p3   Authentication (OFF, POPBEFORESMTP, AUTH)

OFF	Authentication is not used
POPBEFORESMTP	POP before SMTP is used
AUTH	SMTP authentication is used

Query   YX?

Example   Set the SMTP server to "smtp.recorder.com" and the port to 25. Use POP3 authentication.

YXsmtp.recorder.com,25,POPBEFORESMTP

Description For details on e-mail settings, see section 1.4.

YJ   Sets the Modbus client's destination server (/C7 option)

Syntax   YJ p1,p2,p3,p4,p5<terminator>

p1   Server number (1 to 16)

p2   Port number (0 to 65535)

p3   Host name (up to 64 characters)

p4   Unit number registration

AUTO   Do not use the unit number

FIXED   Use a fixed unit number

p5   Unit number (0 to 255)

Query   YJ[p1]?

Example   For server number 3, set the port number to 502, the host name to "fx1000," the unit number registration to FIXED, and the unit number to 127.

YJ3,502,fx1000,FIXED,127

YP   Sets basic Modbus client settings (/C7 option)

Syntax   `YP p1,p2<terminator>`
p1   Read cycle (1S, 2S, 5S, 10S)
p2   Connection retry interval (OFF, 10S, 20S, 30S, 1MIN, 2MIN, 5MIN, 10MIN, 20MIN, 30MIN, 1H)

Query   `YP?`
Example   Set the read cycle to 1 second and the connection retry interval to 10 minutes.
`YP1S,10MIN`

YR   Sets the Modbus client's transmit command (/C7 option)

Syntax   `YR p1,p2,p3, . . .<terminator>`
p1   Command number (1 to 16)
p2   Command type (OFF, R-M, W, W-M)
Parameter p3 and subsequent parameters vary as shown below depending on the p2 setting.

When p2 is set to OFF
There are no parameters after p3.

When p2 is set to R-M (read communication input data)

p3   First channel (communication input data number)
p4   Last channel (communication input data number)
p5   Server number (1 to 16)
p6   First register number (30001 to 39999, 40001 to 49999, 300001 to 365536, 400001 to 465536)
p7   Register data type (INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L)

When p2 is set to W (write to measurement channels)

p3   First channel (measurement channel number)
p4   Last channel (measurement channel number)
p5   Server number (1 to 16)
p6   First register number (40001 to 49999, 400001 to 465536)
p7   Register data type (INT16, FLOAT_B, FLOAT_L)

When p2 is set to W-M (write to computation channels)

p3   First channel (computation channel number)
p4   Last channel (computation channel number)
p5   Server number (1 to 16)
p6   First register number (40001 to 49999, 400001 to 465536)
p7   Register data type (INT16, UINT16, INT32_B, INT32_L, FLOAT_B, FLOAT_L)

Query   `YR[p1]?`
Example   For command number 5, set the command type to W, the first channel to 001, the last channel to 004, the server number to 1, the first register number to 40001, and the register data type to INT16.
`YR5,W,001,004,1,40001,INT16`

Description • Set p3 to a value that is less than or equal to p4.
• The number of registers that are read from or written to is determined by the values that you specify for p3, p4, and p7. An error occurs if the specified number of registers exceeds the number of registers that actually follow the first register (p6).

WB   Sets SNTP client parameters (/C7 option)

Syntax   `WB p1,p2,p3,p4,p5,p6<terminator>`
p1   SNTP client function usage (USE, NOT)
p2   SNTP server name (up to 64 characters)
p3   SNTP port number (0 to 65535)
p4   Access interval (OFF, 1H, 8H, 12H, 24H)
p5   Reference time for the access interval (00:00 to 23:59)
p6   Timeout value (10S, 30S, 90S)
Parameters p2 to p6 are invalid when p1 is set to NOT.

Query   `WB?`
Example   Enable the SNTP client function, and set the server name to "sntp.recorder.com," the port number to 123, the access interval to 24 hours, the reference time to 12:00, and the timeout value to 30 seconds.
`WBUSE,sntp.recorder.com,123,24H, 12:00,30S`

3

Commands

WC Sets the SNTP operation that is performed when memory start is executed (/C7 option)

Syntax	`WC p1<terminator>`
	`p1` Time adjustment using SNTP (ON, OFF)
Query	`WC?`
Example	Set the FX so that time is adjusted using SNTP when memory start is executed.
	`WCON`
Description	You can use this command when the SNTP client function is enabled (through the use of the WB command).

YS Sets the serial interface (/C2 and /C3 options)

Syntax	`YS p1,p2,p3,p4,p5,p6<terminator>`
	`p1` Baud rate (1200, 2400, 4800, 9600, 19200, 38400)
	`p2` Data length (7, 8)
	`p3` Parity check (ODD, EVEN, NONE)
	`p4` Handshaking (OFF:OFF, XON, XON, XON: RS, CS:RS)
	`p5` RS-422A/485 address (01 to 99)
	`p6` Protocol (NORMAL, MODBUS, MODBUS-M)
Query	`YS?`
Example	Set the baud rate to 9600, the data length to 8, the parity check to ODD, the handshaking to OFF:OFF, the RS-422A/485 address to 02, and the protocol to NORMAL.
	`YS9600,8,ODD,OFF:OFF,02,NORMAL`

YL Sets the operation of the Modbus master function (/C2 and /C3 options)

Syntax	`YL p1,p2,p3,p4,p5<terminator>`
	`p1` Read cycle (1S, 2S, 5S, 10S)
	`p2` Communication timeout (125MS, 250MS, 500MS, 1S, 2S, 5S, 10S, 1MIN)
	`p3` Number of command retries (OFF, 1 to 5, 10, 20)
	`p4` Command wait time (OFF, 5MS, 10MS, 15MS, 45MS, 100MS)
	`p5` Automatic recovery (OFF, 1MIN, 2MIN, 5MIN, 10MIN, 20MIN, 30MIN, 1H)
Query	`YL?`
Example	Set the read cycle to 1 s, the communication timeout to 250 ms, the number of retries to 2, the command wait time to 10 ms, and the automatic recovery time to 5 min.
	`YL1S,250MS,2,10MS,5MIN`
Description	You can use this command when the serial interface protocol is set to "MODBUS-M." For information about the serial interface settings, see section 2.3.

YM Sets a transmit command of the Modbus master function (/C2 and /C3 options)

When you do not want to register a command

Syntax	`YM p1,p2<terminator>`
	`p1` Registration number (1 to 16)
	`p2` Command usage (OFF)
Query	`YM[p1]?`
Example	Register no command in command registration number 1.
	`YM1,OFF`

When you are reading communication input data from another device

Syntax   YM p1,p2,p3,p4,p5,p6,p7<terminator>
     p1   Registration number (1 to 16)
     p2   Command type (R-M)
     p3   First channel number (communication input data number)
     p4   Last channel number (communication input data number)
     p5   Address of the slave device (1 to 247)
     p6   First register number (30001 to 39999, 40001 to 49999, 300001 to 365535, 400001 to 465535)
     p7   Type of data assigned to the registers (INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L)

Query   YM[p1]?

Example   Register the following command in command register number 2: read the 32-bit signed integer data that is assigned to registers 30003 (upper 16 bits) and 30004 (lower 16 bits) in the slave device assigned to address 5 into channels C02 to C05 of the FX.
     YM2,R-M,C02,C05,5,30003,INT32_B

When you are writing data from a measurement channel to another device

Syntax   YM p1,p2,p3,p4,p5,p6,p7<terminator>
     p1   Registration number (1 to 16)
     p2   Command type (W)
     p3   First channel number (measurement channel number)
     p4   Last channel number (measurement channel number)
     p5   Address of the slave device (1 to 247)
     p6   First register number (40001 to 49999, 400001 to 465535)
     p7   Type of data assigned to the registers (INT16, FLOAT_B, FLOAT_L)

Query   YM[p1]?

Example   Register the following command in command registration number 3: write the measured data of channels 003 to 006 to registers 40003 to 40006 in the slave device assigned to address 7.
     YM3,W,003,006,7,40003,INT16

When you are writing data from a computation channel to another device

Syntax   YM p1,p2,p3,p4,p5,p6,p7<terminator>
     p1   Registration number (1 to 16)
     p2   Command type (W-M)
     p3   First channel number (computation channel number)
     p4   Last channel number (computation channel number)
     p5   Address of the slave device (1 to 247)
     p6   First register number (40001 to 49999, 400001 to 465535)
     p7   Type of data assigned to the registers (INT16, UINT16, INT32_B, INT32_L, FLOAT_B, FLOAT_L)

Query   YM[p1]?

Example   Register the following command in command registration number 2: write the computed 32-bit integer data of channel 101—first write the lower 16 bits, and then write the upper 16 bits—to registers 40003 and 40004 in the slave device assigned to address 5.
     YM2,W-M,101,101,5,40003,INT32_L

Description • You can use this command when the serial interface protocol is set to "MODBUS-M." For information about the serial interface settings, see section 2.3.
     • Set p3 to a value that is less than or equal to p4.
     • The number of registers that are read from or written to is determined by the values that you specify for p3, p4, and p7. An error occurs if the specified number of registers exceeds the number of registers that actually follow the first register (p6).

<u>WR</u>   Sets the instrument information output (/F1 option)

Syntax   WR p1,p2,p3,p4<terminator>
     p1   Memory and media status (OFF, ON)
     p2   Self diagnosis (OFF, ON)
     p3   Communication errors (OFF, ON)
     p4   Memory stop (OFF, ON)

Query   WR?

Example   Set the FX to transmit each type of information.
     WRON,ON,ON,ON,ON

Description On models that do not have a communication interface (/C2, /C3, or /C7 option), you can specify a value for parameter p3 (communication errors), but it will be ignored.

and integration low-cut settings will all be initialized.

QA — Sets the number of mantissa digits to display (/LG1 option)

Syntax   `QA p1<terminator>`
      `p1` Number of digits to display (2, 3)
Query   `QA?`
Example   Set the number of mantissa digits to display to 2.
      `QA2`

RH — Sets LogType2 (/LG1 option)

Syntax   `RH p1`
      `p1` LogType2 (Linear, Pseudo)
      Linear: Sets LogType2 to log linear input
      Pseudo: Sets LogType2 to pseudo log input
Query   `RH?`
Example   Set LogType2 to pseudo log.
      `RHPSEUDO`

WF — Sets the Modbus connection limitation (/C7 option)

Syntax   `WF p1<terminator>`
      `p1` Modbus connection limitation (USE, NOT)
Query   `WF?`
Example   Place limitations on Modbus connections.
      `WFUSE`

WG — Sets an IP address that is allowed to connect through the Modbus interface (/C7 option)

Syntax   `WG p1,p2,p3<terminator>`
      `p1` Registration number (1 to 10)
      `p2` Registration (ON, OFF)
      `p3` IP address (0.0.0.0 to 255.255.255.255)
Query   `WG[p1]?`
Example   Allow connections from IP address 192.168.111.24. Use registration number 1.
      `WG1,ON,192.168.111.24`
Description   You can use this command when Modbus connection limitations have been placed (through the use of the WF command).

WP — Sets the phase, wiring system, and input voltage (/PWR1 or /PWR5 option)

Syntax   `WP p1,p2<terminator>`
      `p1` Phase and wiring system
          Single-phase two-wire: 1P2W
          Single-phase three-wire: 1P3W
          Three-phase three-wire: 3P3W
      `p2` Input voltage (120V, 240V)
Query   `WP?`
Example   Set the FX to use the single-phase two-wire system with an input voltage of 120 V.
      `WP1P2W,120V`
Description   • When parameter p1 is set to 3P3W, parameter p2—the input voltage—is fixed to 240V.
        • If you change these settings, the VT ratio, CT ratio,

XE   Applies basic settings

Syntax   `XE p1<terminator>`

            `p1`   Storage of settings (STORE, ABORT)

Example   Save the basic settings.

            `XESTORE`

Description To apply settings that you have changed using the basic setting commands, you need to save the settings using the XE command. Be sure to save the settings using the XE command before you change the execution mode from the basic setting mode to the operation mode. Otherwise, the new settings will not be applied.

YE   Applies basic settings (cold reset)

Syntax   `YE p1<terminator>`

            `p1`   Application of settings

                `STORE` Saves the basic settings and restarts the instrument

                `ABORT` Restarts the instrument without saving the basic settings

Example   Save the basic settings and restart the instrument.

            `YESTORE`

3.7   Output Commands (Control)

BO   Sets the byte output order

Syntax   `BO p1<terminator>`

            `p1`   Byte order

                `0`   Data is output MSB first.

                `1`   Data is output LSB first.

Query   `BO?`

Example   Set the FX to output data MSB first.

            `BO0`

Description This command applies to the byte order of numeric data for binary output.

CS   Sets the check sum (/C2 and /C3 options)

Syntax   `CS p1<terminator>`

            `p1`   Checksum usage

                `0`   Do not calculate (value fixed to 0)

                `1`   Calculate

Query   `CS?`

Example   Enable (calculate) the checksum.

            `CS1`

Description You can only use this command during serial communication.

IF   Sets status filters

Syntax   `IF p1,p2<terminator>`

            `p1`   Filter values for status information numbers 1 to 4
                   (0.0.0.0 to 255.255.255.255)

            `p2`   Filter values for status information numbers 5 to 8
                   (0.0.0.0 to 255.255.255.255)

Query   `IF?`

Example   Set the status filter values to 1.0.4.0 and 255.127.63.31.

            `IF 1.0.4.0,255.127.63.31`

Description For details, see chapter 5.

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CB Sets the data output format

Syntax `CB p1<terminator>`

p1 Output format

| 0 | Normal output (includes data from channels set to SKIP and OFF) |
| 1 | Do not output data from channels set to SKIP and OFF |

Query `CB?`

Example Set the output format to normal output.

`CB0`

Description
- Set this command independently for each connection.
- This command only affects the communication section; it does not affect the FX settings.
- Effective range of commands

Output Information	Corresponding Command
Instantaneous data output (binary)	FD1, FF
Instantaneous data output (text)	FD0
Decimal place information (text)	FE1
Setup channel information output (binary)	FE5
Setup alarm information output (binary)	FE6

CC Disconnects the Ethernet connection (/C7 option)

Syntax `CC p1<terminator>`

p1 Disconnection (0)

Example Disconnect the connection.

`CC0`

Note

Initialization of settings specified using the BO, CS, IF, and CB commands

- **Serial communications**
  Settings specified using the BO, CS, IF, and CB commands are reset to the following default values when you reset the FX (when you restart the FX or when you exit from basic setting mode).
  - Output byte order, checksum, output format: 0
  - Status filter: 255.255.255.255
  If you reset the FX, you must set these values again.
- **Ethernet communications**
  Settings specified using the BO, IF, and CB commands are reset to their default values when you disconnect the connection to the FX. After you reestablish the connection to the FX, set these values again.

3.8 Output Commands (Setting, measured, and computed data output)

FC Outputs screen image data

Syntax `FC p1<terminator>`

p1 GET (output screen image data)

Example Output screen image data from the FX.

`FCGET`

Description The FX captures the currently displayed screen and outputs the data in PNG format.

FE Outputs setup data

Syntax `FE p1,p2,p3<terminator>`

p1 Output data type

0	Setting mode setup data
1	Decimal place and unit information
2	Basic setting mode setup data
4	Setup data file
5	Setup channel information output
6	Setup alarm information output

p2 First channel number (measurement channel or computation channel)

p3 Last channel number (measurement channel or computation channel)

Example Output the setting mode setup data of channels 001 to 005 from the FX.

`FE0,001,005`

Description
- Make sure that the last channel number is greater than or equal to the first channel number.
- Parameters p2 and p3 are valid when p1 is set to 0, 1, 2, 5, or 6. If you omit p2 or p3, the command will specify all channels.
- Set p2 and p3 by referring to the table in section 3.3.

FD   Outputs the most recent measured data and computed data

Syntax   `FD p1,p2,p3<terminator>`

    `p1`   Output data type

        `0`   The most recent measured data and computed data in text format

        `1`   The most recent measured data and computed data in binary format

        `6`   Relay status and internal switch status

    `p2`   First channel number (measurement channel or computation channel)

    `p3`   Last channel number (measurement channel or computation channel)

Example   Output the most recent measured data and computed data for channels 001 to 005 from the FX in text format.

    `FD0,001,005`

Description   • The most recent measured data and computed data means the most recent measured data and computed data in the internal memory when the FX receives the FD command.

    • Make sure that the last channel number is greater than or equal to the first channel number.

    • Parameters p2 and p3 are valid when p1 is set to 0 or 1. If you omit p2 or p3, the command will specify all channels.

    • Set p2 and p3 by referring to the table in section 3.3.

FF   Outputs FIFO data

Syntax   `FF p1,p2,p3,p4<terminator>`

    `p1`   Action type

        `GET`   Output starting with the next block following the previous output

        `RESEND` Retransmit the previous output

        `RESET`   Set the FIFO buffer read position (block) to the most recent data position (block)

    `p2`   First channel number (measurement channel or computation channel)

    `p3`   Last channel number (measurement channel or computation channel)

    `p4`   Maximum number of blocks to read out

        `1200`   FX1002, FX1004

        `240`   FX1006, FX1008, FX1010, FX2012

        If the amount of measured data or computed data is less than the specified number of blocks, the FX sends all the available data.

Example   Output two blocks of FIFO data from channels 1 to 10.

    `FFGET,001,010,2`

Description   • The FIFO buffer is a cyclic buffer in which the oldest data is overwritten first. Use the FR command to set the acquisition interval.

    • The FX sends the specified number of blocks (p4) of FIFO data starting with the next block after those that were read out previously. Be sure to read the data within the following buffer period to prevent data dropouts. You can not resend data if the buffer period elapses.

      • High-speed input model
Maximum buffer period: 1200 × (acquisition interval)

      • Medium-speed input model
Maximum buffer period: 240 × (acquisition interval)

    • Parameters p2 to p4 are valid when p1 is set to GET.

    • If you omit p4, the command will specify all blocks.

    • Make sure that the last channel number is greater than or equal to the first channel number.

    • For details on the FIFO data output process, see appendix 5.

    • Set p2 and p3 by referring to the table in section 3.3.

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FL Outputs a log, alarm summary, or message summary

Syntax `FL p1,p2<terminator>`

p1 Log type

COM	Communication
FTPC	FTP client
ERR	Operation errors
LOGIN	Login log
WEB	Web operation
EMAIL	E-mail
SNTP	SNTP access log
DHCP	DHCP access log
ALARM	Alarm summary
MSG	Message summary
MODBUS	Modbus communication log

p2 Maximum log readout length

1 to 200	When p1 is set to COM or MODBUS
1 to 1000	When p1 is set to ALARM
1 to 450	When p1 is set to MSG
1 to 50	When p1 is set to a value other than those listed above

Example Output the 10 most recent entries in the operation error log.

`FLERR,10`

Description • Outputs the log that is stored on the FX.
• If you omit p2, the command specifies the maximum log length.
• On models that have the Ethernet interface (/C7 option), you can set p1 to FTPC, WEB, EMAIL, SNTP, or DHCP.
• On models that have a communication interface (/C2, /C3, or /C7 option), you can set p1 to COM or MODBUS.

IS Outputs status information

Syntax `IS p1<terminator>`

p1 Status information output

0	Status information entries 1 to 4
1	Status information entries 1 to 8

Example Output status information entries 1 to 4.

`IS0`

Description You can use status filters (through the use of the IF command) to mask the status output. For details about status information, see chapter 5.

FU Outputs user levels

Syntax `FU p1<terminator>`

p1 User information output

0	Information about the users who are currently logged in
1	Information about the users who are logged in to the general-purpose service

Example Output information about the users who are logged in to the general-purpose service.

`FU1`

Description This command outputs information about the users who are connected to the FX.

FA Outputs internal FX information

Syntax `FA p1<terminator>`

p1 Action type

IP	Output address information that includes the IP address, subnet mask, default gateway, and DNS server as well as the host name and domain name

Description On models that have the Ethernet interface (/C7 option), you can set p1 to IP.

ME Outputs data stored on the external storage medium and in internal memory

Syntax `ME p1,p2,p3<terminator>`

p1 Action type

DIR	File list output
GET	Output (first time)
NEXT	Output (subsequent times). This parameter is used to output the remaining data when the first output operation is not enough to output all the data.
RESEND	Retransmit the previous output
DEL	Delete
DIRNEXT	Output the subsequent file list after the file list is output by setting p1 to DIR. The number of output lists is specified by parameter p3 when p1 is set to DIR. If you set p1 to DIRNEXT and send this command after all lists have been output, the following data is output.

*EA*CRLF
*EN*CRLF

CHKDSK	Checks the disk. Outputs the free space on the external storage medium.

p2　Path name (up to 100 characters)
　　Use the full path to set the path name.

p3　Maximum number of file lists to output (1 to 1000)
　　If you omit this parameter, the FX will output all file lists in the specified directory.

Example　• Output all the file lists in the DRV0 directory.
　　`MEDIR,/DRV0/`

　　• Output the DRV0 directory file list for 10 files.
　　`MEDIR,/DRV0/,10`

　　• Output the data in the file "72615100.DAD" in the DRV0/DATA0 directory.
　　`MEGET,/DRV0/DATA0/72615100.DAD`

Description • Parameter p2 is valid when p1 is set to DIR, GET, DEL, or CHKDSK.

　　• Parameter p3 is valid when p1 is set to DIR.

　　• If an error occurs during data transmission, you can set p1 to RESEND to retransmit data.

Path name specifications

　　• The first level directories point to the following locations.
　　Paths that start with /MEMO/DATA　Internal memory
　　Paths that start with /DRV0　External storage medium
　　On models that do not have a CF card slot/SD card slot, you cannot specify the "/DRV0" directory.

　　• Path names are case sensitive.

　　• You can access files whose names are 48 characters or less in length and that are within three directory levels.

　　• Wildcards have the following limitations.
　　　• When p1 is set to DIR, you can use asterisks in parameter p2.
　　　• If a path ends with a slash, the path is equivalent to the same path ending with an asterisk.
　　　Example　/DRV0/DATA0 and /DRV0/DATA0/* are equivalent.
　　　• For file names and extensions, if you specify an asterisk, the FX will match the character at the asterisk position and all subsequent characters to any characters.
　　　Example　Assume that there are five files: ab001.ef1, ab002.ef1, ab001.ef2, ab002.ef2, and ab001.yyy.
　　　If you specify "ab*01.ef1," the FX will select ab001.ef1 and ab002.ef1.
　　　If you specify "ab001.e*1," the FX will select ab001.ef1 and ab001.ef2.

MO　Manages and outputs the data that has been written to internal memory

Syntax　`MO p1,p2,p3<terminator>`

p1　Type of operation
　　`DIR`　　Data list output
　　`GET`　　Data output
　　`SIZE`　　Data size output

p2　Output data type
　　`MANUAL`　Manual sampled data
　　`REPORT`　Report

p3　File name

Example　Output report data file
`000142_080102_004127H_.DAR` from the FX.
`MOGET,REPORT,`
`000142_080102_004127H_.DAR`

Description　Parameter p3 is valid when p1 is set to GET or SIZE.

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3.9 Output Commands (RS-422A/485 commands)

<u>ESC O</u>   Opens an instrument

ESC is 1BH in ASCII code. For details, see appendix 3.

Syntax   **ESC** `O p1<terminator>`
          `p1` Instrument address (01 to 99)

Example   Open the instrument at address 99, and enable all commands.
          ESC `O99`

Description • Specify the address of the instrument that you want to communicate with.
           • You can only open one instrument at any given time.
           • If you execute ESC O, any instrument that is already open is automatically closed.
           • When the FX receives this command successfully, it returns "**ESC** `O(instrument address)`."
           • Normally, you can use CR+LF or LF as the terminator for communication commands. However, you must terminate this command with CR+LF.

<u>ESC C</u>   Closes an instrument

ESC is 1BH in ASCII code. For details, see appendix 3.

Syntax   **ESC** `C p1<terminator>`
          `p1` Instrument address (01 to 99)

Example   Close the instrument at address 77.
          ESC `C77`

Description • This command closes the connection to the instrument you are communicating with.
           • When the FX receives this command successfully, it returns "**ESC** `C(instrument address)`."
           • Normally, you can use CR+LF or LF as the terminator for communication commands. However, you must terminate this command with CR+LF.

3.10 Output Commands (Special response commands)

<u>*I</u>   Outputs instrument information

Syntax   `*I<terminator>`

Description Upon receiving this command, the FX outputs the following information about itself as a comma-separated string of ASCII characters with a terminator at the end: manufacturer, model, serial number, and firmware version.

Output example `YOKOGAWA,FX1000,99AA0123,F1.01`

3.11 Maintenance/Test Commands (Available when using the maintenance/test server function through Ethernet communications)

close Closes another device's connection

Syntax `close,p1,p2:p3<terminator>`
  p1 Port on the FX (1 to 65535)
  p2 PC IP address
    (0.0.0.0 to 255.255.255.255)
  p3 Port on the PC (0 to 65535)
Example `close,34159,192.168.111.24:1054`
  `E0`
Description You cannot use this command to disconnect a server port. You also cannot use this command to disconnect from the instrument that you are operating. Use the quit command instead.

con Outputs connection information

Syntax `con<terminator>`
Example
```
con
EA
11/06/09 12:34:56

Active connections

Proto Local Address      Foreign Address      State
TCP   192.168.111. 24:34261 192.168.111. 24:1053 ESTABLISHED
TCP    0. 0. 0. 0:80    0. 0. 0. 0:   0 LISTEN
TCP    0. 0. 0. 0:34261   0. 0. 0. 0:   0 LISTEN
TCP    0. 0. 0. 0:34260   0. 0. 0. 0:   0 LISTEN
EN
```
　　　TCP
　　　　Protocol used
　　　Local Address
　　　　FX socket address
　　　　Displays "IP address:port number"
　　　Foreign Address
　　　　Destination socket address
　　　　Displays "IP address:port number"
　　　State
　　　　Connection state
　　　ESTABLISHED
　　　　Connection established

eth Outputs Ethernet statistics

Syntax `eth<terminator>`
Example
```
eth
EA
11/06/09 12:34:56

Ethernet Statistics

Name  In Pkt  In Err  Out Pkt  Out Err  16 Coll
lo0   0       0       0        0        0
lan0  74      0       64       0        0
EN
```

help Outputs help

Syntax `help [,p1]<terminator>`
  p1 Command name
    (close, con, eth, help, net, quit)
Example
```
help
EA
con       - echo connection information
eth       - echo ethernet information
help      - echo help
net       - echo network status
quit      - close this connection
EN
```

net Outputs network statistics

Syntax `net<terminator>`
Example
```
net
EA
11/06/09 12:34:56

Network Status

APP: power on time = 11/06/08 12:34:56
APP: applalive    = disable
APP: genetry      = 0
APP: geneok       = 0
APP: genedrops    = 0
APP: diagtry      = 1
APP: diagok       = 1
APP: diagdrops    = 0
APP: ftpstry      = 0
APP: ftpsok       = 0
APP: ftpsdrops    = 0
TCP: keepalive    = 30 s
TCP: connects     = 14
TCP: closed       = 0
TCP: timeoutdrop  = 0
TCP: keepdrops    = 0
TCP: sndtotal     = 53
TCP: sndbyte      = 0
TCP: sndrexmitpack = 0
TCP: sndrexmitbyte = 1
TCP: rcvtotal     = 0
TCP: rcvbyte      = 0
DLC: 16 collisions = 0
EN
```

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TCP: keepalive

Keepalive check cycle

TCP: connects

Total number of connections established

TCP: closed

Total number of closed connections

TCP: timeoutdrop

This is the total number of closed connections due to TCP retransmission timeout. When the transmitted packet (the unit of data that was transmitted) is not received, the FX retransmits the packet at a predetermined time interval. If the packet is not received after 14 retransmissions, a timeout occurs, and the connection is closed.

TCP: keepdrops

Total number of closed connections due to TCP keepalive timeout

TCP: sndtotal

Total number of transmitted packets

TCP: sndbyte

Total number of transmitted bytes

TCP: sndrexmitpack

Total number of retransmitted packets

TCP: sndrexmitbyte

Total number of retransmitted bytes

TCP: rcvtotal

Total number of received packets

TCP: rcvbyte

Total number of received bytes

DLC: 16 collisions

Number of collisions. A collision occurs when two or more instruments on the network attempt to transmit simultaneously. The tendency for collisions to occur increases when the network is congested. 16 collisions means that there were 16 consecutive collisions.

quit   Closes the connection to the instrument that you are operating

Syntax   quit<terminator>

3.12 Instrument Information Output Commands (Available when using the instrument information server function through Ethernet communications)

The instrument information server function interprets one UDP packet to be one command and returns a single packet (containing FX information) in response to the command.

Port number	34264/udp
Transfer data	ASCII
Receive buffer size	128
Transfer buffer size	512
Maximum number of parameters	32

In the command packet, arrange the parameters that correspond to the information that you want to receive.

Parameter	Description
serial	Outputs the serial number
host	Outputs the host name (the host name that you specified in section 1.3)
ip	Outputs the IP address (the IP address that you specified in section 1.3)

Example   Query the IP address and host name. (The first frame below contains the command packet. The second frame contains the response packet.)

```
ip host
```

```
EA
ip = 192.168.111.24
host = FX1000-1
EN
```

Description • Separate each parameter with one or more white space characters (space, tab, carriage return, or line feed).
• Parameters are not case sensitive.
• Undefined parameters are ignored.
• Parameters after the 32nd parameter are ignored.

4.1   Response Syntax

The following table shows the types of responses for various commands described in the previous chapter.

The FX returns a response (affirmative/negative response) to a command that is delimited by a single terminator. The controller should follow the one command to one response format. When the command-response rule is not followed, the operation is not guaranteed.

Commands		Response[1]	
	Group	Affirmation	Negation
Setting commands	Setting	Affirmative response	Single negative response or multiple negative responses
	Control		
Basic Setting commands			
Output commands	Control		
	Setup, measurement, and control data output	Text output	
		Binary output	
	RS-422A/485 dedicated	Dedicated response	No response
	Special resonse commands[2]	Dedicated response	

1: For the responses to the instrument information server function, see section 4.4.

2: For the responses to special response commands, see section 3.10.

Note
The *"CRLF"* used in this section denotes carriage return line feed.

Affirmative Response

When the command is processed correctly, an affirmative response is returned.

- **Syntax**
  E0*CRLF*
- **Example**
  E0

Single Negative Response

When a command is not processed correctly, a single negative response is returned.

- **Syntax**
  E1_nnn_mmm···m*CRLF*

  nnn   Error number (001 to 999)

  mmm···m Message (variable length, one line)

  _   Space
- **Example**
  E1 001 "System error"

Multiple Negative Responses

- If there is an error in any one of the multiple commands that are separated by sub delimiters, multiple negative responses are returned.
- The response is generated for each erroneous command.
- If there are multiple commands that have errors, the negative responses are separated by commas.
- The error position number is assigned to the series of commands in order starting with "1" assigned to the first command.

- **Syntax**

  E2_ee:nnn*CRLF*   (When there is only one error)

  E2_ee:nnn,ee:nnn,···,ee:nnn*CRLF*   (When there are multiple errors)

     ee   Error position (01 to 10)

     nnn   Error number (001 to 999)

     _   Space

- **Example**

  E2 02:001

Text Output

For details on the text data types and their formats, see section 4.2.

- **Syntax**

  EA*CRLF*

  ···············*CRLF*

     :

  ···············*CRLF*

  ···············*CRLF*

  EN*CRLF*

Binary Output

Conceptual Diagram
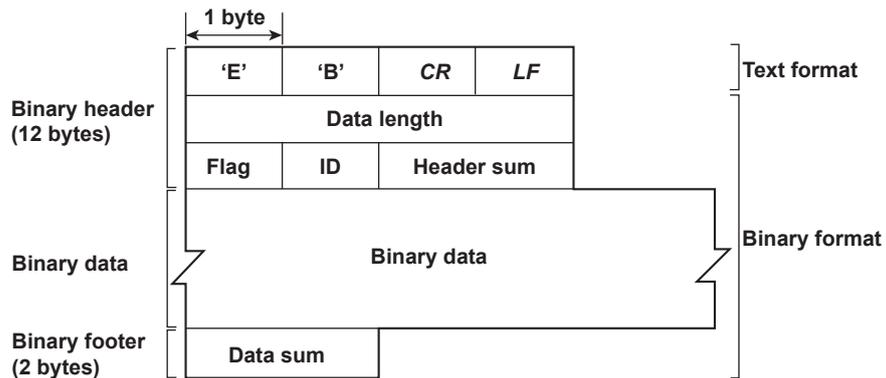
EB*CRLF*

Indicates that the data is binary.

Data Length

The byte value of "flag + identifier + header sum + binary data + data sum."

Header Sum

The sum value of "data length + flag + identifier."

Binary Data

For the output format of various data types, see section 4.3.

Data Sum

The sum value of the binary data.

> ### *Note*
> The data length of the binary header section is output according to the byte order specified with the BO command.

Flag

Bit	Name (Abbreviation)	Flag 0	Flag 1	Meaning of the Flag
7	BO	MSB	LSB	Output byte order
6	CS	No	Yes	Existence of a checksum
5	–	–	–	
4	–	–	–	
3	–	–	–	
2	–	–	–	
1	–	–	–	
0	END	Middle	End	In the middle or at the end of the continuous data

- When the BO flag is "0," the high byte is output first. When the BO flag is "1," the low byte is output first.
- If the check sum is enabled (parameter = 1) using the CS command parameter, each sum value is inserted in the header sum and data sum sections. If the check sum is disabled (parameter = 0), a zero is inserted in the header sum and data sum sections. For a sample program that calculates the sum value, see "Calculating the sum value" on the next page.
- If the amount of data output in response to a ME/MO command is large, not all the data may be returned in one output request (parameter GET). In this case the END flag becomes 0. You must send output requests (parameter NEXT) to receive the rest of the data until the END flag becomes 1.
- The bits that have "–" for the name and flag are not used. The value is undefined.

ID

An ID number indicating the binary data type. The table below indicates the data types and the corresponding output commands. Binary data that is not indicated in the above table is considered undefined files.

ID Number	Binary Data Type	Type	Format	Output Command
0	Undefined file	file (`*.*`)	–	`ME`
1	Instantaneous data	Data	Yes	`FD`
1	FIFO data	Data	Yes	`FF`
13	Screen data file	File (`*.PNG`)	–	`ME,FC`
15	Display data file	File (`*.DAD`)	No	`ME`
16	Event data file	File (`*.DAE`)	No	`ME`
17	Manual sample file	File (`*.DAM`)	Yes	`ME,MO`
18	Report file	File (`*.DAR`)	Yes	`ME,MO`
19	Setup data file	File (`*.PDL`)	No	`ME,FE4`
25	Setup channel information output	Data	Yes	`FE5`
26	Configured alarm information output	Data	Yes	`FE6`

Yes: Disclosed. No: Undisclosed. –: Common format.

- The table above shows the different types of binary data.
- Binary data comes in two types, data and file.
  - **Data**
    - Measured/computed data can be output using the FD command.
    - FIFO data can be output using the FF command.
    - The data format is disclosed. See section 4.3.

  - **File**
    - The FXA120 DAQSTANDARD software that is included with the FX can be used to manipulate display data, event data, and setup data files. For details, see the FXA120 DAQSTANDARD software user's manuals (IM 04L21B01-63EN and IM 04L21B01-64EN).
    - Files that are in common formats can be opened using software programs that are sold commercially.
    - Other formats are written in ASCII code. A text editor can be used to open these types of files.

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Responses

Calculating the Sum Value

If you set the parameter of the CS command to 1 (enabled), the checksum value is output only during serial communications. The check sum is the same as that used in the TCP/IP and is derived according to the following algorithm.

Buffer on Which the Sum Value Is Calculated

- For the header sum, it is calculated from "data length + flag + identifier" (fixed to 6 bytes).
- For the data sum, it is calculated from the binary data.

If the data length of the buffer is odd, a zero is padded so that it is even. (1) through (6) are summed as unsigned two-byte integers (unsigned short). If the digit overflows a 1 is added. Finally, the result is bit-wise inverted.

Sample Program

The sum value is determined using the following sample program, and the calculated result is returned. The sum determined by the sample program can be compared with the header sum of the output binary header section and the data sum of the output binary footer section.

```
/*
 * Sum Calculation Function (for a 32-bit CPU)
 *
 * Parameter   buff:   Pointer to the top of the data on which the sum is calculated
 *             len:    Length of the data on which the sum is calculated
 * Returned value:     Calculated sum
 */
int cksum(unsigned char *buff, int len)
{
  unsigned short *p;     /* Pointer to the next two-byte data word in the buffer that is
                            to be summed. */
  unsigned int    csum;  /* Checksum value */
  int i;
  int odd;
  csum = 0;              /* Initialize. */
  odd = len%2;           /* Check whether the number of data points is even. */
  len >>= 1;             /* Determine the number of data points using a "short"
                            data type. */
  p = (unsigned short *)buff;

  for(i=0;i<len;i++)     /* Sum using an unsigned short data type. */
    csum += *p++;
  if(odd){               /* When the data length is odd */
    union tmp{           /* Pad with a 0, and add to the unsigned short data. */
    unsigned short s;
    unsigned char      c[2];
    }tmp;
    tmp.c[1] = 0;
    tmp.c[0] = *((unsigned char *)p);
    csum += tmp.s;
  }
```

```
    if((csum = (csum & 0xffff) + ((csum>>16) & 0xffff)) 0xffff)
                                    /* Add the overflowed digits */
      csum = csum - 0xffff;         /* If the digit overflows again, add a 1. */
    return((~csum) &  0xffff);    /* bit inversion */
}
```

Dedicated Commands for RS-422A/485

The dedicated commands for the RS-422A/485 interface and the corresponding responses are listed in the following table.

Command Syntax	Meaning	Response
ESC Oxx CRLF	Opens the device.	• Response from the device with the specified address *ESC Oxx CRLF* • No response when the device with the specified address does not exist[1]
ESC Cxx CRLF	Closes the instrument.	• Response from the device with the specified address *ESC Cxx CRLF* • No response when the device with the specified address does not exist[1]

1: Some of the possible reasons that cause the condition in which the device with the specified address cannot be found are a command error, the address not matching that of the device, the device is not turned ON, and the device not being connected via the serial interface.

- The "xx" in the table indicates the device address. Specify the address that is assigned to the instrument from 01 to 99.
- Only one device can be opened at any given time.
- When a device is opened with the ESC O command, all commands on the device become active.
- When a device is opened with the ESC O command, any other device that is open is automatically closed.
- Normally, either CR+LF or LF can be used as a terminator for communication commands. However, the terminator for these commands must be set to CR+LF.

Note

The ASCII code of ESC is 1BH. See appendix 3.

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Responses

4.2 Output Format of Text Data

The following types of text data are available. The format for each type is described in this section. The table below indicates the data types and the corresponding output commands.

Data Type	Corresponding Output Command
Setting data/basic setting data	`FE0,FE2`
Decimal position/unit information	`FE1`
Measured and computed data	`FD0`
Relay status and internal switch status	`FD6`
Communication log	`FLCOM`
FTP client log	`FLFTPC`
Operation error log	`FLERR`
Login log	`FLLOGIN`
Web operation log	`FLWEB`
E-mail log	`FLEMAIL`
SNTP access log	`FLSNTP`
DHCP access log	`FLDHCP`
Modbus communication log	`FLMODBUS`
Alarm summary	`FLALARM`
Message summary	`FLMSG`
Status information	`IS0,IS1`
Ethernet information	`FAIP`
File list	`MEDIR`
Check disk	`MECHKDSK`
Manual sampled/report data information	`MODIR`
Manual sampled/report data size	`MOSIZE`
User information	`FU0,FU1`

Note
The "*CRLF*" used in this section denotes carriage return line feed.

Setting Data/Basic Setting Data
- The FE command is used to output the data.
- The setting/basic setting data is output in the order of the listed commands in the table in section 3.2, "A List of Commands." However, the setting information for the following commands is not output.
  - **Setting commands (setting)**
    SD/FR command
  - **Setting commands (control)**
    All commands from BT to IR
  - **Basic setting commands**
    XE, YO, YE, and YC commands
- The output format of the setting/basic setting data conforms to the syntax of each command.
- Some commands are output in multiple lines. (Example: Commands that are specified for each channel.)

- **Syntax**
  The two-character command name and the subsequent parameters are output in the following syntax.
  ```
  EACRLF
  ttsss···sCRLF
  ··············

  ENCRLF
  ```
tt	Command name (`SR`, `SA`···)
sss···s	Setting/basic setting data (variable length, one line)

- **Example**
  ```
  EA
  SR001,VOLT,20mV,0,20
  SR002,VOLT,20mV,0,20
  ..................
  EN
  ```

Decimal Place/Unit Information

- The FE command is used to output the data.
- You can use the CB command to specify whether to output the data of measurement channels set to skip and computation channels set to OFF.
- **Syntax**
  The data is output for each channel in the following syntax.
  ```
  EACRLF
  s_cccuuuuuu,ppCRLF
  ..................
  ENCRLF
  ```

s	Data status (N, D, or S)
	N: Normal
	D: Differential input
	S: Skip (When the measurement range is set to SKIP for a measurement channel or when the channel is turned OFF for a computation channel)
ccc	Channel number (3 digits)
	001 to 012: Measurement channel
	101 to 124: Computation channel
uuuuuu	Unit information (6 characters, left-justified)
	mV____: mV
	V_____: V
	^C____: °C
	xxxxxx: (User-defined character string)
pp	Decimal place (00 to 04)
	No decimal (00000) for 00.
	One digit to the right of the decimal (0000.0) for 01.
	Two digits to the right of the decimal (000.00) for 02.
	Three digits to the right of the decimal (00.000) for 03.
	Four digits to the right of the decimal (0.0000) for 04.
	When you are using a channel that is set to Log scale (/LG1 option), the decimal place of the FX digital display's mantissa is displayed.
_	Space

- **Example**
  ```
  EA
  N 001mV   ,01
  N 002mV   ,01
  EN
  ```

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Responses

Measured and Computed Data

- The FD command is used to output the data.
- You can use the CB command to specify whether to output the data of measurement channels set to skip and computation channels set to OFF.

- **Syntax**

  The measured/computed data is output in the following syntax along with the date and time information for each channel.

  EA*CRLF*

  DATE_yy/mo/dd*CRLF*

  TIME_hh:mm:ss.mmmt*CRLF*

  s_ccca₁a₂a₃a₄uuuuuufddddE-pp*CRLF*

  ....

  EN*CRLF*

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
mmm	Millisecond (000 to 999. A period is placed between seconds and milliseconds.)
t	Reserved (Space.)
s	Data status (N, D, S, O, E, or B)
	N: Normal
	D: Differential input
	S: Skip
	O: Over
	E: Error
	B: Burnout
ccc	Channel number (3 digits)
	001 to 012: Measurement channel
	101 to 124: Computation channel
a₁a₂a₃a₄ a₁	Alarm status (level 1)
a₂	Alarm status (level 2)
a₃	Alarm status (level 3)
a₄	Alarm status (level 4)
	(Each status is set to H, L, h, l, R, r, T, t, or space.)
	((H: high limit alarm, L: low limit alarm, h: difference high-limit alarm, l: difference low-limit alarm, R: high limit on rate-of-change alarm, r: low limit on rate-of-change alarm, T: delay high limit alarm, t: delay low limit alarm, space: no alarm)
uuuuuu	Unit information (6 characters, left-justified)
	mV____: mV
	V_____: V
	^C____: °C
	xxxxxx: (User-defined character string)
f	Sign (+, −)

ddddd   Mantissa (00000 to 99999, 5 digits)

- Eight digits for computed data.
- For abnormal data (data whose status is E) or data whose mantissa or exponent exceeds the corresponding range (data whose status is O), the mantissa is set to 99999 (99999999 for computed data).

pp   Exponent (00 to 04, 00 to 18 for channels that are set to Log scale—/LG1 option)

_   Space

- **Example**
```
EA
DATE 99/02/23
TIME 19:56:32.500
N 001h   mV     +12345E-03
N 002    mV     -67890E-01
S 003
EN
```

Note

- Data for non-existing channels are not output (not even the channel number).
- For channels set to skip, output values from alarm status to exponent are spaces.

Relay Status and Internal Switch Status

The FD command is used to output the relay status and internal switch status.

- **Syntax**
```
EACRLF
I01-I06:aaaaaaCRLF
I11-I16:aaaaaaCRLF
S01-S30:aaa···CRLF
ENCRLF
```

aaa··· Indicates the relay or the internal switch status in ascending order by number from the left.

1:     ON
0:     OFF
-:   Relay not installed

- **Example 1**
When relays I01 to I04 are on and I05 and I06 are not installed
```
EA
I01-I06: 1111--
I11-I16: ------
S01-I30:000000000000000000000000000000
EN
```

Communication Log

- The FL command is used to output the data.
- A log of setting/basic setting/output commands and responses is output. Up to 200 logs are retained. Logs that exceed 200 are cleared from the oldest data.

- **Syntax**

  EA*CRLF*

  yy/mo/dd_hh:mm:ss_n_uuu···ufd_mmm···m*CRLF*

  ·····································

  EN*CRLF*

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
n	Connection ID. A number used to identify the user that is connected.
	0: Serial
	1 to 3: Ethernet
uuu···u	User name (up to 20 characters)
f	Multiple command flag
	Space: Single
	*: Multiple
	(If multiple commands are separated by sub delimiters and output at once, "*" is displayed. The multiple commands are divided at each sub delimiter and stored as individual logs (1 log for 1 command and 1 log for 1 response.)
d	Input/Output
	>: Input
	<: Output
mmm···m	Message (up to 20 characters)
	• The communication log contains only the error number and not the error message section.
	• Normally, the transfer data are transmitted as they are, but in some cases, a special message is output. The special messages are shown below.
	Reception
	(Over length): Command length exceeded.
	(Over number): Number of commands exceeded.
	(Serial error): Received an error character through serial communications.

Transmission

`(ddd byte):`	Data output (where ddd is the number of data values)
`(Login):`	Login
`(Logout):`	Logout
`(Disconnected):`	Forced disconnection (occurs when the connection was disconnected when transmitting data using Ethernet).
`(Timed out):`	Timeout, keepalive, TCP retransmission, etc.
`E1 nnn:`	Single negative response (where nnn is the error number)
`E2 ee:nnn:`	Multiple negative response (where ee is the error position and nnn is the error number)
_	Space

• **Example**

The following example shows the log when multiple commands separated by sub delimiters, "`BO1;???;PS0,`" are transmitted. The commands are separated and output in order with the multiple command flags "*."

```
EA
11/05/11 12:31:11 1 12345678901234567890*> BO1
11/05/11 12:31:11 1 12345678901234567890*< E0
11/05/11 12:31:11 1 12345678901234567890*> ???
11/05/11 12:31:11 1 12345678901234567890*< E2 01:124
11/05/11 12:31:11 1 12345678901234567890*> PS0
11/05/11 12:31:11 1 12345678901234567890*< E0
EN
```

FTP Client Log

- The FL command is used to output the data.
- The FTP client log is output. Up to 50 file transfer logs are retained. Logs that exceed 50 are cleared from the oldest data.
- For the meanings of the error codes, see the *FX1000 User's Manual*, IM 04L21B01-01EN.

- **Syntax**
  ```
  EACRLF
  yy/mo/dd_hh:mm:ss_nnn_xxxxxxxxx_k_fff···CRLF
  ································
  ENCRLF
  ```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
nnn	Error code (001 to 999)
xxxxxxxxx	Detailed code (9 characters)
k	Server type (P,S)
	P: Primary
	S: Secondary
fff···	File name (up to 51 characters including the extension)
_	Space

- **Example**
  ```
  EA
  11/07/26 10:00:00           P 000010_.DAD
  11/07/27 10:00:00           P 000011_.DAD
  11/07/28 10:00:00 123 HOSTADDR P FTP_TEST.TXT
  EN
  ```

Operation Error Log

- The FL command is used to output the data.
- The operation error log is output. Up to 50 operation error logs are retained. Logs that exceed 50 are cleared from the oldest data.
- Other communication messages (400 to 999) and status messages (500 to 599) are not output.
- For the meanings of the error codes, see the *FX1000 User's Manual*, IM 04L21B01-01EN.

- **Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_nnn_uuu···uCRLF
· · · · · · · · · · · · · · · · · · · · · · · · · · · ·
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
nnn	Error code (001 to 999)
uuu···u	Error message
_	Space

- **Example**

```
EA
11/05/11 12:20:00 212 Range setting error
11/05/11 12:30:00 217 Media access error
EN
```

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Responses

Login Log

- The FL command is used to output the data.
- A log of users that have logged in and logged out is output. Up to 50 login/logout logs are retained. Logs that exceed 50 are cleared from the oldest data.
- If the power goes down while logged in, you will be logged out. In this case, however, it will not be recorded as a logout.
- **Syntax**

  EA*CRLF*

  yy/mo/dd_hh:mm:ss_xxxxxxxxxx_nnn_uuu···u*CRLF*

  ·································

  EN*CRLF*

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)

xxxxxxxxxx	Login history is output left-justified.	
	Login:	Login
	Logout:	Logout
	NewTime:	New time
	TimeChg:	Time change
	PowerOff:	Power Off
	PowerOn:	Power On
	TRevStart:	Start of gradual time adjustment
	TRevEnd:	End of gradual time adjustment
	TimeDST:	Switch between using daylight saving time and not
	SNTPtimset:	Time change by SNTP
nnn	Operation property	
	KEY:	Key operation
	COM:	Communication
	REM:	Remote
	SYS:	System
uuu···u	User name (up to 20 characters)	
_	Space	

- **Example**

  ```
  EA
  11/05/11 12:20:00 Login      KEY administrator
  11/05/11 12:30:00 Logout     KEY administrator
  11/05/11 12:20:00 Login      COM user
  11/05/11 12:30:00 Logout     COM user
  EN
  ```

Web Operation Log

- The FL command is used to output the data.
- The log of operations on the Web screen is output. Up to 50 operations are retained. Logs that exceed 50 are cleared from the oldest data.
- **Syntax**

  `EA`*CRLF*

  `yy/mo/dd_hh:mm:ss_ffffff_eee_???`···`?`*CRLF*

  ·······························

  `EN`*CRLF*

`yy`	Year (`00` to `99`)
`mo`	Month (`01` to `12`)
`dd`	Day (`01` to `31`)
`hh`	Hour (`00` to `23`)
`mm`	Minute (`00` to `59`)
`ss`	Second (`00` to `59`)
`ffffff`	Requested operation

	`SCREEN:`	Screen change
	`KEY:`	Key operation
	`MSG:`	Message assignment/write

`eee`	Error code when executing the requested operation

	All spaces:	Success
	`001` to `999`:	Failure (error code)

`???`···`?` Parameter for each event (see below)

- When `ffffff` = `SCREEN`

  `yy/mo/dd_hh:mm:ss_ffffff_eee_ddddd_nn`*CRLF*

  `ddddd`   Screen type

`TREND:`	Trend display
`DIGIT:`	Digital display
`BAR:`	Bar graph display
`HIST:`	Historical trend display
`OV:`	Overview display

  `nn`   Group number (`01` to `10`)

- When `ffffff` = `KEY`

  `yy/mo/dd_hh:mm:ss_ffffff_eee_kkkkk`*CRLF*

  `kkkkk`   Type of key that was operated

`DISP:`	DISP/ENTER key
`UP:`	Up key
`DOWN:`	Down key
`LEFT:`	Left key
`RIGHT:`	Right key

- When `ffffff` = `MSG`

  `yy/mo/dd_hh:mm:ss_ffffff_eee_mmm`···`m`*CRLF*

  `mmm`···`m` Message (up to 32 characters)

  `_`   Space

- **Example**

```
EA
11/02/11 12:20:00 SCREEN 275 TREND 01
11/02/11 12:21:00 SCREEN     BAR
11/02/11 12:30:00 KEY        UP
11/02/11 12:31:00 KEY        RIGHT
11/02/11 12:40:00 MSG        Hello-Hello
EN
```

E-mail Log

- The FL command is used to output the data.
- The e-mail transmission log is output. Up to 50 operations are retained. Logs that exceed 50 are cleared from the oldest data.
- **Syntax**

  EA*CRLF*

  yy/mo/dd_hh:mm:ss_ffffff_eee_n_uuu···u*CRLF*

  ·································

  EN*CRLF*

yy	Year (00 to 99)	
mo	Month (01 to 12)	
dd	Day (01 to 31)	
hh	Hour (00 to 23)	
mm	Minute (00 to 59)	
ss	Second (00 to 59)	
ffffff	E-mail type	
	ALARM:	Alarm mail
	TIME:	Scheduled mail
	REPORT:	Report timeout mail
	FAIL:	Power failure recovery mail
	FULL:	Memory full mail
	TEST:	Test mail
	ERROR:	Error message mail
eee	Error code	
	All spaces:	Success
	001 to 999:	Error code
n	Recipient list	
	1:	List 1
	2:	List 2
	+:	List 1 and list 2
uuu···u	Series of recipient e-mail addresses (up to 30 characters)	
_	Space	

- **Example**

  When list 1 is "user1@recorder.com user2@daqmaster.com" and list 2 is "adv1@daqmaster.com adv2@recorder.com."

  EA

  11/05/11 12:20:00 ALARM   + user1 user2 adv1 adv2

  11/05/11 12:30:00 REPORT 375 1 user1 user2

  EN

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Responses

SNTP Log

- The FL command is used to output the data.
- The SNTP log is output. Up to 50 accesses to the SNTP server are retained.
- **Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_nnn_xxxxxxxxxxCRLF
..................................
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
nnn	Error number (000 to 999)
xxxxxxxxxx	Detailed code (9 characters)

	SUCCESS:	Success
	OVER:	Over the limit
	DORMANT:	Internal processing error
	HOSTNAME:	Failed to look up the host name
	TCPIP:	Internal processing error
	SEND:	Failed to send the request
	TIMEOUT:	A response timeout occurred
	BROKEN:	Packet was corrupt
	LINK:	The data link is disconnected
_		Space

- **Example**

```
EA
11/05/11 12:20:00      SUCCESS
11/05/11 12:21:00      SUCCESS
11/05/11 12:30:00 292 HOSTNAME
EN
```

DHCP Log

- The FL command is used to output the data.
- The DHCP log is output. Up to 50 accesses to the DHCP server are retained.
- **Syntax**

  EA*CRLF*

  yy/mo/dd_hh:mm:ss_nnn_xxxxxxxxx*CRLF*

  ....

  EN*CRLF*

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
nnn	Error number (000 to 999)
	Description given in the table.
xxxxxxxxx	Detailed code (9 characters)
	Description given in the table.
_	Space

  The table below shows the contents of the log during normal operation.

Error Number	Detail Code	Description
562	ON	Detected that an Ethernet cable was connected.
	OFF	Detected that an Ethernet cable was disconnected.
563	RENEW	Requesting address renewal to the DHCP server.
	RELEASE	Requesting address release to the DHCP server.
564	RENEWED	Address renewal complete.
	EXTENDED	Address release extension request complete.
	RELEASED	Address release complete.
565	IPCONFIG	IP address configured.
566	NOREQUEST	Configured not to register the host name.
567	UPDATE	Registered the host name to the DNS server.
568	REMOVE	Removed the host name from the DNS server.

The table below shows the contents of the log during erroneous operation.

Error Number	Detail Code	Description
295	REJECT	Address obtained by DHCP is inappropriate.
296	ESEND	Failed to send to the DHCP server.
	ESERVER	DHCP server not found
	ESERVFAIL	No response from the DHCP server.
	ERENEWED	Address renewal rejected by the DHCP server.
	EEXTENDED	Address lease extension request rejected by the DHCP server.
	EEXPIRED	Address lease period expired by the DHCP server.
297	INTERNAL	Host name registration failure (transmission error reception timeout, etc.)
	FORMERR	Host name registration failure (format error: DNS message syntax error)
	SERVFAIL	Host name registration failure (server failure: DNS server processing error)
	NXDOMAIN	Host name registration rejection (non existent domain)
	NOTIMP	Host name registration rejected (not implemented)
	REFUSED	Host name registration rejected (operation refused)
	YXDOMAIN	Host name registration rejected (name exists)
	YXRRSET	Host name registration rejected (RR set exists)
	NXRRSET	Host name registration rejected (RR set does not exist)
	NOTAUTH	Host name registration rejection (not authoritative for zone)
	NOTZONE	Host name registration rejection (different from zon section)
	NONAME	Host name not entered on the FX.
298	INTERNAL	Host name removal failure (transmission error, reception timeout, etc.)
	FORMERR	Host name removal failure (format error: DNS message syntax error)
	SERVFAIL	Host name removal failure (server failure: DNS server processing error)
	NXDOMAIN	Host name removal rejection (non existent domain)
	NOTIMP	Host name removal rejected (not implemented)
	REFUSED	Host name removal rejected (operation refused)
	YXDOMAIN	Host name removal rejected (name exists)
	YXRRSET	Host name removal rejected (RR set exists)
	NXRRSET	Host name removal rejected (RR set does not exist)
	NOTAUTH	Host name removal rejection (not authoritative for zone)
	NOTZONE	Host name removal rejection (different from zone section)
	NOTLINKED	Physical layer was disconnected when removing the host name.

- **Example**

```
EA
11/05/11 12:20:00 563 RENEW
11/05/11 12:20:01 564 RENEWED
11/05/11 12:20:01 565 IPCONFIG
11/05/11 12:21:02 567 UPDATE
EN
```

Modbus Communication Log

- The FL command is used to output the data.
- The Modbus communication log is output. Up to 50 Modbus communication events are retained.

- **Syntax**

  EA*CRLF*

  yy/mo/dd_hh:mm:ss_c_xxxxxxx_kkkk_nn_d*CRLF*

  ....

  EN*CRLF*

yy	Year (00 to 99)	
mo	Month (01 to 12)	
dd	Day (01 to 31)	
hh	Hour (00 to 23)	
mm	Minute (00 to 59)	
ss	Second (00 to 59)	
c	Communication type (C or M)	
	C:	Modbus client (Ethernet)
	M:	Modbus master (serial)
xxxxxxx	Even that occurred (7 characters)	
	DROPOUT:	Communication could not keep up and drop out occurred.
	ACTIVE:	Activated.
	READY:	Command ready state.
	CLOSE:	Disconnected.
	HALT:	Command halted.
kkkk	Detail (4 characters)	
	GOOD:	Normal operation
	NONE:	No response from the slave device.
	FUNC:	Received a function error.
	REGI:	Received a register error.
	ERR:	Received a packet error.
	LINK:	Ethernet cable disconnected (Modbus client).
	HOST:	Unable to result the IP address from the host name (Modbus client).
	CNCT:	Failed to connect to the server (Modbus client).
	SEND:	Failed to send the command (Modbus client).
	BRKN:	Failed to receive the command.
	Space	At command start
nn	Command number (1 to 16, space)	
d	Command type (R, W, space)	
	R:	Read
	W:	Write
_	Space	

- **Example**

  ```
  EA
  11/05/11 12:20:00 C DROPOUT
  11/05/11 12:21:00 C READY     NONE 01 R
  11/05/11 12:25:00 C HALT      NONE 01 R
  EN
  ```

Alarm Summary

- The FL command is used to output the data.
- The alarm summary is output. Up to 1000 alarm events are retained. Alarm events that exceed 1000 are cleared from the oldest data.
- **Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_kkk_ccc_ls_nnnnnnnnnnCRLF
...................................
ENCRLF
```

`yy/mo/dd hh:mm:ss`		Time when the alarm occurred
	`yy`	Year (`00` to `99`)
	`mo`	Month (`01` to `12`)
	`dd`	Day (`01` to `31`)
	`hh`	Hour (`00` to `23`)
	`mm`	Minute (`00` to `59`)
	`ss`	Second (`00` to `59`)
`kkk`		Alarm cause
	`OFF:`	Alarm release
	`ON:`	Alarm occurrence
	`ACK:`	Alarm acknowledge
`ccc`		Measurement or computation channel number
`l`		Alarm level (`1` to `4`)
`s`		Alarm type (`H`, `h`, `L`, `l`, `R`, `r`, `T`, or `t`)
`nnnnnnnnnn`		Alarm sequence
`_`		Space

For all-channel alarms, the channel number, alarm level, and alarm status items are all set to asterisk.

- **Example**

```
EA
11/05/11 12:20:00 ON  001 1L        1
11/05/11 12:30:00 OFF 131 3t        2
11/05/11 12:31:00 OFF *** **        3
11/05/11 12:32:00 ACK               4
EN
```

Message Summary

- The FL command is used to output the data.
- The message summary is output. Up to 100 messages are retained. Messages that exceed 100 are cleared from the oldest log.
- **Syntax**

  EA*CRLF*

  yy/mo/dd_hh:mm:ss_mmm···_ggg···_zzz_uuu···_nnn···*CRLF*

  ······························

  EN*CRLF*

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
mmm···	Message (32 characters. Spaces are embedded when the number of characters is less than 32 characters.)
ggg···	Message write destination display group (11 characters)

  - xx: The number of the group in which the message was written (for example: 01).
  - ALL: All display groups.

zzz	Operation property

  - KEY: Key operation
  - COM: Communication
  - REM: Remote
  - ACT: Event action
  - SYS: System

uuu···	User name (up to 20 characters)
nnn···	Message sequence number (0 for add messages)
_	Space

- **Example**
  ```
  EA
  11/05/11 12:20:00 operation-start    01          KEY admin   10
  11/05/11 12:20:00 operation-start    01          KEY admin   11
  11/05/11 12:20:00*0123456789abcdefg  01          KEY admin   12
  EN
  ```

4

Responses

Status Information

- The IS command is used to output the data. The output format varies between IS0 and IS1.
- The operation status of the recorder is output.
- For details on the status information, see section 5.2, "Bit Structure of the Status Information."

Output for the IS0 command
- **Syntax**

  `EA`*CRLF*

  `aaa.bbb.ccc.ddd`*CRLF*

  `EN`*CRLF*

`aaa`	Status information 1 (`000` to `255`)
`bbb`	Status information 2 (`000` to `255`)
`ccc`	Status information 3 (`000` to `255`)
`ddd`	Status information 4 (`000` to `255`)

- **Example**

  `EA`

  `000.000.032.000`

  `EN`

Output for the IS1 Command
- **Syntax**

  `EA`*CRLF*

  `aaa.bbb.ccc.ddd.eee.fff.ggg.hhh`*CRLF*

  `EN`*CRLF*

`aaa`	Status information 1 (`000` to `255`)
`bbb`	Status information 2 (`000` to `255`)
`ccc`	Status information 3 (`000` to `255`)
`ddd`	Status information 4 (`000` to `255`)
`eee`	Status information 5 (`000` to `255`)
`fff`	Status information 6 (`000` to `255`)
`ggg`	Status information 7 (`000` to `255`)
`hhh`	Status information 8 (`000` to `255`)

- **Example**

  `EA`

  `000.000.032.000.000.000.000.000`

  `EN`

- Status information 3, 4, 7, and 8 are edge operation. They are cleared when read by the IS command.
- Status information 1, 2, 5, and 6 are level operation. They are not cleared when read. They are cleared when the event clears.
- The status information is made up of bits that correspond to each event. Each bit can be turned ON/OFF with a filter.
- If an event occurs for a bit set to OFF by the filter, status information 3, 4, 7, and 8 discard the event. Status information 1, 2, 5, and 6 hold the event.
- The default filter setting is all ON.

Ethernet Information

* The FA command is used to output the data.

* **Syntax**
  EA*CRLF*
  IP_Address_____:xxx.xxx.xxx.xxx*CRLF*
  Subnet_mask_____:xxx.xxx.xxx.xxx*CRLF*
  Default_Gateway_:xxx.xxx.xxx.xxx*CRLF*
  Primary_DNS_____:xxx.xxx.xxx.xxx*CRLF*
  Secondary_DNS___:xxx.xxx.xxx.xxx*CRLF*
  Host_____:yyy······*CRLF*
  Domain_____:zzz······*CRLF*
  EN*CRLF*

xxx	IP address number (000 to 255)
yyy···	Host name (up to 64 characters)
zzz···	Domain name (up to 64 characters)
_	Space

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Responses

File List

- The ME command is used to output the data.
- The file sizes and a list of files from the specified directory in the external storage medium or internal memory are output.
- **Syntax**

  EA*CRLF*

  yy/mo/dd_hh:mm:ss_ssssssssss_fff•••_n_xxx•••*CRLF*

  ....

  EN*CRLF*

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
ssssssssss	Data size of the file (_____0 to 99999999) [byte(s)]
fff···	File name (51 characters including the extension. If it is less than 51, spaces are entered.)
	If this is a directory, the characters <DIR> are shown at the position displaying the file data size.
n	Fixed to 0
xxx···	Data serial number (16-digit hexadecimal)
_	Space

  The "." and ".." directories are not output.
  The values n (fixed to 0) and xxx . . . (the data serial number) are included only for files in the internal memory DATA directory. For all other files, the values are blank.

- **Example 1**

  File list output of an external storage medium

  EA
  11/02/24 20:07:121204 setting.pnl
  11/02/24 20:18:36<DIR> DATA0
  EN

- **Example 2**

  Output of a file list in the DATA directory in the internal memory

  EA
  11/02/24 20:07:12   1204 006607_050101_000402.DAD   0   1ABCDE123
  11/02/24 20:07:12   1204 006608_050101_000403.DAD   0 1234567890123456
  EN

Check Disk

The ME command is used to output the free space on the storage medium.

• Syntax

EA*CRLF*

zzz···_Kbyte_free*CRLF*

EN*CRLF*

    zzz···   Free space on the storage medium (16 digits)

    _   Space

• Example

EA

12345678 Kbyte free

EN

Manual Sampled/Report Data Information

The MO command is used to output the data.

• Syntax

EA*CRLF*

slll···_yy/mo/dd_hh:mm:ss_bbbb_fff···*CRLF*

....

EN*CRLF*

s	Data flag
	Space Confirmed data
	+: Data that was overwritten
	*: Data being added
lll···	File number (10 digits)
yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
bbbb	Number of events (4 characters)
fff···	File name (up to 48 characters including the extension)
_	Space

• Example

EA

+   6 11/03/04 00:00:00 20 000018_D_.DAR

         7 11/03/05 00:00:00 20 000019_D_.DAR

         8 11/03/06 00:00:00 20 000020_D_.DAR

*   9 11/03/06 13:00:00 20 000021_D_.DAR

EN

Manual Sampled/Report Data Size

This is generated by the MO command.

- **Syntax**

  EA*CRLF*

  zzz···*CRLF*

  EN*CRLF*

     zzz···The data size (10 digits max.)

- **Example**

  EA*CRLF*

  12345

  EN*CRLF*

User Information

- The FU command is used to output the data.
- User name, user level, and other information are output.
- **Syntax**

  EA*CRLF*

  p_l_uuu···*CRLF*

  EN*CRLF*

p	Login method	
	E:	Ethernet
	S:	RS-232 or RS-422A/485
	K:	Login using keys
l	User level	
	A:	Administrator
	U:	User
uuu···	User name (up to 20 characters)	
_	Space	

- **Example 1**

  When the FU0 command is used, only the information of the logged in user is output.

  EA

  E A admin

  EN

- **Example 2**

  When the FU1 command is used, information on all users logged in through a general-purpose service or using keys is output.

  EA

  K A admin_abc

  E A admin_def

  E U user0033

  E U user0452

  EN

4.3 Output Format of Binary Data

This section describes the output format of the binary data.
For information on other binary data, see section 4.1.

- Instantaneous data (measured/computed) and FIFO data
- Configured channel information data
- Configured alarm information data
- Manual sampled data
- Report data

The measured data and computed data are output using signed 16-bit integer and signed 32-bit integer, respectively.

- **When Using a Channel That Is Not Set to Log Scale (/LG1 option)**
  These integers can be understood as physical values by adding the decimal point and the unit. The decimal place can be determined using the FE command.

  Typical Examples to Obtain Physical Values from Binary Data

Binary Value	Decimal Position Code	Physical Value (Measured Value)
10000	0	10000
10000	1	1000.0
10000	2	100.00
10000	3	10.000
10000	4	1.0000

- **When Using a Channel That Is Set to Log Scale (/LG1 option)**
  Logarithmic values are output. See the next page.

  Note

  The *"CRLF"* used in this section denotes carriage return line feed.

Measured/Computed Data and FIFO Data

- The FD command is used to output the measured/computed data.
- The FF command is used to output the FIFO data.
- You can use the CB command to specify whether to output the data of measurement channels set to skip and computation channels set to OFF.
- The ID number of the output format is 1. See "ID" in section 4.1.
- When you are using a channel that is set to Log scale (/LG1 option), the logarithmic values are output. You can convert logarithmic values to physical values.
- About logarithmic values
  The relationship between the physical value (V) and the logarithmic value (V') is shown below.

  $V = 10^{(V'/1000)}$

  $V' = 1000 \times \log V$

  However, V' must be greater than or equal to –30000 and less than or equal to 30000, and V must be greater than or equal to 1.00E–30 and less than or equal to 1.00E+30. The special data of V' (such as Skip, +Over, and –Over) may exceed 30000 or be less than –30000. This special data is output as is. For details on the special data, see the "Special Data Values" table on the following page.
  Examples:

Physical Value (V)	logV	Logarithmic Value (V')
1.00E–30	–30	–30000
2.00E–02	–1.699	–1699
2.00E+05	5.301	5301
1.00E+30	30	30000
–OVER	–	0x8001
+OVER	–	0x7FFF
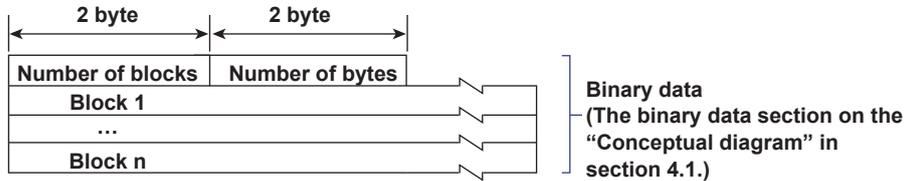
Number of Blocks
This is the number of blocks.

Number of Bytes
This is the size of one block in bytes.

Block
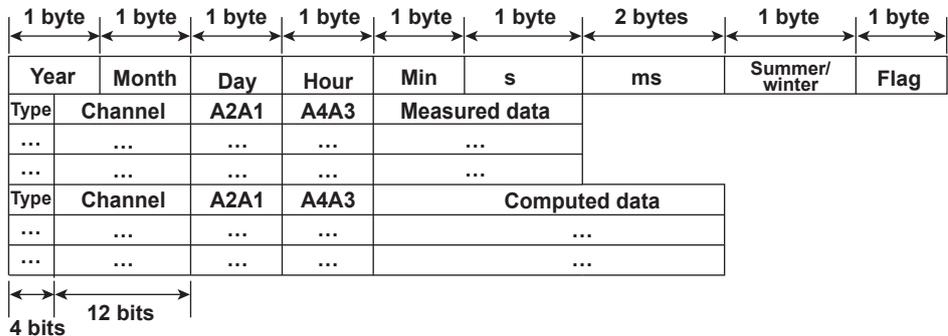
- **Flag**

The meaning of the each flag is given in the table below. The flags are valid during FIFO data output. The flags are undefined for other cases.

Bit	Flag		Meaning of the Flag
	0	**1**	
7	No	Yes	Indicates that the screen snapshot was executed.
6	–	–	
5	–	–	
4	–	–	
3	–	–	
2	No	Yes	Indicates that the decimal position or unit information was changed during measurement.
1	No	Yes	Indicates that the FIFO acquiring interval was changed with the FR command during measurement.
0	No	Yes	Indicates that the internal process took too much time (computation, for example) and that the measurement could not keep up at the specified scan interval.

The bits that have "–" for the flag column are not used. The value is undefined.

- **Block Member**

Name	Binary Value
Year	0 to 99
Month	1 to 12
Day	1 to 31
Hour	0 to 23
Minute	0 to 59
Second	0 to 59
Millisecond	0 to 999
Summer/winter	0: Winter time, 1: Summer time
Type	0x0: 16-bit integer (measurement channel) 0x8: 32-bit integer (computation channel)
Channel	1 to 12 and 101 to 124

Alarm status[1]
    A1 (Bit 0 to 3)
    A2 (Bit 4 to 7)
    A3 (Bit 0 to 3)
    A4 (Bit 4 to 7)
	0 to 8

Measured data	0 to 0xFFFF
Computed data	0 to 0xFFFFFFFF

1: A binary value 0 to 8 is entered in the upper and lower 4 bits of a byte (8 bits) for the alarm status. The binary values 0 to 8 correspond to H (high limit alarm), L (low limit alarm), h (difference high-limit alarm), l (difference low-limit alarm), R (high limit on rate-of-change alarm), r (low limit on rate-of-change alarm), T (delay high limit alarm), and t (delay low limit alarm) as follows:
    0: no alarm, 1: H, 2: L, 3: h, 4: l, 5: R, 6: r, 7: T, and 8: t.

Special Data Values

The measured/computed data take on the following values under special conditions.

Special Data Value	Measured Data	Computed Data
+ Over	7FFFH	7FFF7FFFH
– Over	8001H	80018001H
Skip	8002H	80028002H
Error	8004H	80048004H
Undefined	8005H	80058005H
Power failure data	7F7FH	7F7F7F7FH
Burnout (up setting)	7FFAH	7FFF7FFFH
Burnout (down setting)	8006H	80018001H

The number of blocks, number of bytes, and measured/computed data are output according to the byte order specified with the BO command.

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Responses

Configured Channel Information Data

- The FE5 command is used to output the data.
- The ID number of the output format is 25.
- You can use the CB command to specify whether to output the data of measurement channels set to skip and computation channels set to OFF.
- The figure below indicates the format.

1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte
Version	(Reserved)	Number of blocks	Block size	(Reserved)	(Reserved)
Configured channel information block 1					
• • •					
Configured channel information block n					
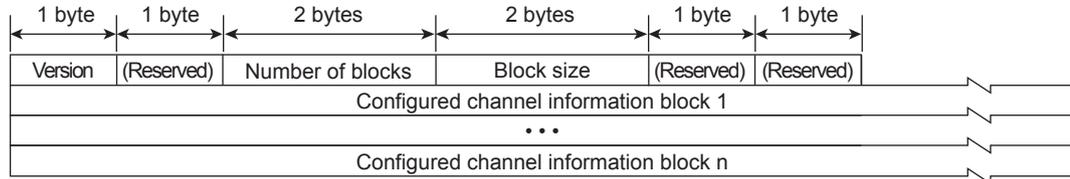
Format Details

Item	Description	Output Value
Version	Format version	1
Number of blocks[1]	Number of configured channel information blocks	Up to 36
Block size[1]	Configured channel information block size	72 (fixed)
Block 1 to n	Configured channel information blocks	Up to 2595 bytes See Block Details.

1: Output in the byte order specified by the BO command.

Block Details

Each value is the corresponding setting on the FX, but with the decimal point removed.
For example, "120" corresponds to a setting of "1.20" on the FX.

Item	Number of Bytes	Description
Channel number[1]	2	1 to 124
Decimal place	1	0 to 4 When you are using the Log scale,[2] the decimal place of the FX digital display's mantissa is displayed.
(Reserved)	1	0
Channel type[1]	4	2H for measurement channels. 4H for computation channels. Logical OR is performed on this value and 800H for channels on which the range mode is DI, 2400H on channels that are set to Log scale,[2] and 8000H for channels on which the range mode is skip.
Unit information	8	The terminator is '\0.'
Tag information	24	You can enter up to 16 characters for the tag. The terminator is '\0.'
Minimum input value[1]	4	Measurement channels: Allowable input range under the current setting
Maximum input value[1]	4	Computation channels: –9999999, +99999999 (fixed)
Span lower limit[1]	4	Measurement channels (when scaling is not used): Same value as the FX span setting
Span upper limit[1]	4	Measurement channels (when scaling is used): Same value as the FX scale setting Measurement channels (Log scale[2]): Same value as the FX span setting Computation channels: Same value as the FX span setting
Scale lower limit[1]	4	Measurement channels (when the Log scale[2] is not used): The same value as the span lower or span upper limit value in the above row.
Scale upper limit[1]	4	Measurement channels (when the Log scale[2] is used): Same value as the FX scale setting's exponent Computation channels: The same value as the span lower or span upper limit value in the above row.
FIFO type[1]	2	1
Area in the FIFO[1]	2	Indicates the position of its own channel in the FIFO block of one sample. The value starts from zero.
Scale lower limit's mantissa[1]	2	When the Log scale[2] is not used: Fixed to 0
Scale upper limit's mantissa[1]	2	When the Log scale[2] is used: Same value as the FX scale setting

1   Output in the byte order specified by the BO command.
2   /LG1 option

Configured Alarm Information Data

- The FE6 command is used to output the data.
- The ID number of the output format is 26.
- You can use the CB command to specify whether to output the data of measurement channels set to skip and computation channels set to OFF.
- The figure below indicates the format.

1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte
Version	(Reserved)	Number of blocks	Block size	(Reserved)	(Reserved)

Configured alarm information block 1
• • •
Configured alarm information block n
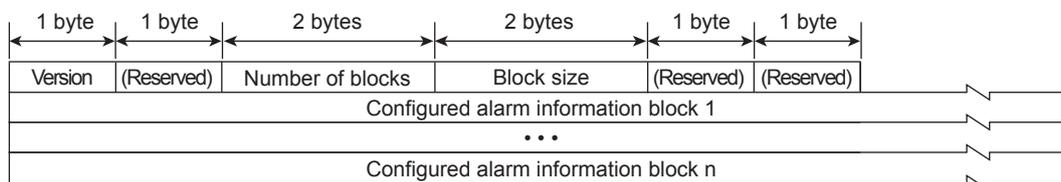
Format Details

Item	Description	Output Value
Version	Format version	2
Number of blocks[1]	Number of configured alarm information blocks	Up to 36
Block size[1]	Size of the of configured alarm information blocks	32
Block 1 to n	Configured alarm information blocks	Up to 1152 bytes See Block Details.

1: Output in the byte order specified by the BO command.

Block Details

Each value is the corresponding setting on the FX, but with the decimal point removed. For example, "120" corresponds to a setting of "1.20" on the FX.

Item	Number of Bytes	Notes
Channel number[1]	2	1 to 124
Decimal place	1	0 to 4 When you are using a channel that is set to Log scale,[2] the decimal place of the FX digital display's mantissa is displayed.
(Reserved)	1	0
Alarm type	4	The following settings are entered in order from level 1 to 4. 0: Setting off, 1: H (high limit), 2: L (low limit), 3: h (difference high limit), 4: l (difference low limit), 5: R (high limit on rate-of-change), 6: r (low limit on rate-of-change), 7: T (delay high limit), 8: t (delay low limit)
Alarm value[1]	4x4	The alarm values are entered in order from level 1 to level 4. When the Log scale[2] is not used: Alarm setting on the FX When the Log scale[2] is used: The same value as the mantissa of the alarm setting on the FX
Alarm value (exponent)	1x4	The alarm values are entered in order from level 1 to level 4. When the Log scale[2] is not used: 0 When the Log scale[2] is used: Same value as the exponent of the FX alarm setting
(Reserved)	4	0

1   Output in the byte order specified by the BO command.
2   /LG1 option

Manual Sampled Data

- The ME or MO command is used to output the data.
- The ID number of the output format is 17. See section 4.1.
- For the data format, see the *FX1000 User's Manual*, IM 04L21B01-01EN.

Report Data

- The ME or MO command is used to output the data.
- The ID number of the output format is 18. See section 4.1.
- For the data format, see the *FX1000 User's Manual*, IM 04L21B01-01EN.

4

Responses

4.4　Output Format of Instrument Information

This section describes the instrument information output format of the instrument information server.

> *Note*
> The "*CRLF*" used in this section denotes carriage return line feed.

Response

The parameters of the packet that are returned as a response are lined up according to the following format.

EA*CRLF*
(Parameter 1)_=_(value of parameter 1)*CRLF*
(Parameter 2)_=_(value of parameter 2)*CRLF*
....
EN*CRLF*

- The parameter values are output in the order specified by the command parameter.
- Even if the same parameters are specified numerous times, only the first occurrence is output.
- Lower-case characters are used for the parameters.
- An underscore (_) indicates a space.

The following table shows the parameter types.

Parameter	Output Information
serial	Serial number
host	Host name
ip	IP address

Output Example

Several output examples are indicated below.

Packet Parameter Sent as Commands	Response
Parameters are not case sensitive.	
ip HoSt	EA
	ip = 192.168.111.24
	host = FX1000
	EN
Even if the same parameters are specified numerous times, only the first occurrence is output.	
host ip host ip host	EA
	host = FX1000
	ip = 192.168.111.24
	EN
Undefined parameters will be ignored.	
(Space)	EA
	EN

5.1   Status Information and Filter

The following figure illustrates the status information and filter on the FX.
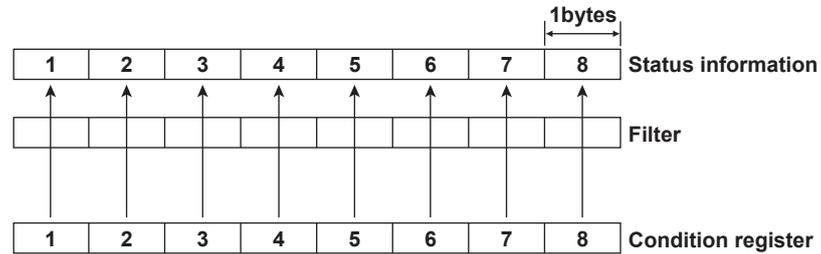
- The IF command can be used to set the filter.
- When a status indicated on the following page is entered, the corresponding bit in the condition register is set to 1. The logical AND of the condition register and the filter becomes the status information.
- The IS command is used to output the status information. Status information 3, 4, 7, and 8 are cleared when they are output. Status information 1, 2, 5, and 6 are not cleared when it is output, and remains at 1 while the event is occurring.
- When multiple connections are up, filters can be specified for the individual connection. Therefore, the status information can be held for each connection.
- Empty bits indicated as "–" are fixed to 0.

5

Status Reports

5.2 Bit Structure of the Status Information

The following four groups of status information are output in response to a status information output request using the IS command. For the output format, see "Status Information" in section 4.2, "Output Format of Text Data."

Status Information 1

Bit	Name	Description
0	Basic setting	Set to 1 during basic setting mode.
1	Memory sampling	Set to 1 during recording (memory sampling).
2	Computing	Set to 1 while computation is in progress.
3	Alarm activated	Set to 1 while the alarm is activated.
4	Accessing medium	Set to 1 while the display, event, manual sampled, report, or screen image data file are being saved to the external storage medium.
5	E-mail started	Set to 1 only when the e-mail transmission (/C7 option) is started.
6	–	–
7	–	–

Status Information 2

Bit	Name	Description
0	–	–
1	–	–
2	Memory end	Set to 1 while the free space in the internal memory or external storage medium is low. This is the same as the internal memory and CFcard/SD card status of the device information output (/F1 option; see section 1.9 in the *FX1000 User's Manual*, IM 04L21B01-01EN).
3	Logged in through keys	Set to 1 while logged in through keys.
4	–	–
5	–	–
6	Detecting measurement error	Set to 1 when an error is detected in the A/D converter, when a burnout is detected, or when the power measurement section is malfunctioning (/PWR1 or /PWR5 option).
7	Detecting communication error	Set to 1 when a command is stopping the communication on the Modbus master (/C2 or /C3 option) or Modbus client (/C7 option).

Status Information 3

Bit	Name	Description
0	Measurement dropout	Set to 1 when the measurement process could not keep up.
1	Decimal point/unit information change	Set to 1 when the decimal point/unit information is changed.
2	Command error	Set to 1 when there is a command syntax error.
3	Execution error	Set to 1 when an error occurs during command execution.
4	SNTP error when memory	Set to 1 when the time could not be adjusted using SNTP (/C7 option) on FX startup.
5	–	–
6	–	–
7	–	–

Status Information 4

Bit	Name	Description
0	A/D conversion complete	Set to 1 when the A/D conversion of the measurement is complete.
1	Medium access complete	Set to 1 when the display, event, manual sampled, report, or screen image data file are finished being saved to the external storage medium.
		Set to 1 when setup data is successfully saved or loaded.
2	Report generation complete	Set to 1 when report generation is complete (/M1, /PM1, /PWR1, and /PWR5 options).
3	Timeout	Set to 1 when the timer expires.
4	–	–
5	–	–
6	USER key detection	Set to 1 when the USER key is pressed.
7	–	–

Status Information 5 to 8

All bits are zeroes.

5

Status Reports

Blank Page

6.1 Ethernet Interface Specifications

Basic Specifications

Electrical and mechanical specifications:	Conforms to IEEE 802.3 (Ethernet frames conform to the DIX specification)
Transmission medium type:	10BASE-T
Protocol:	TCP, IP, UDP, ICMP, ARP, FTP, HTTP, SNTP, SMTP

Maximum Number of Connections and Number of Simultaneous Uses

The following table indicates the number of simultaneous uses (number of users that can use the function simultaneously), the maximum number of connections, and the port number for each function.

Function	Maximum Number of Connections	Number of Simultaneous Uses		Port Number[4]
		Administrator	User	
Setting/measurement server	3	1	2[1]	34260/tcp[2]
Maintenance/test server	1	1	1[1]	34261/tcp[2]
FTP server	2	2	2[1]	21/tcp[3]
Web server (HTTP)	–	–	–	80/tcp[3]
SNTP server	–	–	–	123/udp[3]
Modbus server	2	–	–	502/tcp[3]
Instrument information server	–	–	–	34264/udp[2]

1 There are user limitations. For details, see section 1.1.

2 The port numbers are fixed.

3 The default port number. You can set the value in the range of 1 to 65535. Use the default port number unless there is a special reason not to do so.

4 Assign a unique port number to each function.

6

Specifications

6.2   Serial Interface Specifications

RS-232 Specifications

Connector type:	D-Sub 9-pin plug
Electrical and mechanical specifications:	
	Conforms to the EIA-574 standard (for the 9-pin interface of the EIA-232 (RS-232) standard)
Connection:	Point-to-point
Transmission mode:	Half-duplex
Synchronization:	Start-stop synchronization
Baud rate:	Select from 1200, 2400, 4800, 9600, 19200, and 38400 [bps].
Start bit:	1 bit (fixed)
Data length:	Select 7 or 8 bits (To output data in BINARY format, be sure to set the data length to 8 bits.)
Parity:	Select odd, even, or none
Stop bit:	1 bit (fixed)
Hardware handshaking:	Select whether to fix the RS and CS signals to TRUE or to use the signal for flow control.
Software handshaking:	Select whether to use the X-ON and X-OFF signals to control the transmitted data only or both the transmitted and received data.
	X-ON (ASCII 11H), X-OFF (ASCII 13H)
Received buffer size:	2047 bytes

RS-422A/485 Specifications

Terminal block type:	6 point, terminal block, terminal screws: M3/nominal length 6 mm		
Electrical and mechanical specifications:			
	Conforms to the EIA-422 (RS-422A) and EIA-485 (RS-485) standards		
Connection:	Multidrop	Four-wire type	1:32
		Two-wire type	1:31
Transmission mode:	Half-duplex		
Synchronization:	Start-stop synchronization		
Baud rate:	Select from 1200, 2400, 4800, 9600, 19200, and 38400 [bps].		
Start bit:	1 bit (fixed)		
Data length:	Select 7 or 8 bits		
Parity:	Select odd, even, or none		
Stop bit:	1 bit (fixed)		
Received buffer size:	2047 bytes		
Escape sequence:	Open and close		
Electrical characteristics:	FG, SG, SDB, SDA, RDB, and RDA (six points)		
	SG, SDB, SDA, RDB, and RDA terminals and the internal circuit of the FX is functionally isolated.		
	FG terminal is the frame ground.		
Communication distance:	Up to 1.2 km		
Terminator:	External: recommended resistance 120 Ω, 1/2 W		

6.3   Modbus Protocol Specifications

Modbus Client Function

Basic Operation
- The FX, as a Modbus client device, communicates with Modbus servers periodically by sending commands at specified intervals.
- The Modbus client function operates independently from the Modbus master function via the serial communication.
- The supported functions are "reading data from the input registers and hold registers on the server" and "writing data into the hold registers on the server."

Modbus Client Specifications
Communicate via ModbusTCP

Communication media:	Ethernet 10Base-T
Read cycle:	Select from the following:
	1 s, 2 s, 5 s, and 10 s
Connection retry:	Select the reconnection interval after disconnecting the connection after the connection wait time has elapsed from the following:
	OFF, 10 s, 20 s, 30 s, 1 min, 2 min, 5 min, 10 min, 20 min, 30 min, and 1 h
Connection timeout value:	1 min
	However, when the IP address is not established with DHCP, a communication error results immediately.
Command timeout value:	10 s
Server:	Set up to 16 servers
Supported functions:	Supported Modbus client functions are as follows:
	The server device must support these functions.

Function Code	Function	Operation
3	Read the hold register (4XXXX, 4XXXXX)	The FX reads the hold register of the server device into the communication input data.
4	Read the input register (3XXXX, 3XXXXX)	The FX reads the input register of the server device into the communication input data.
16	Write to the hold register (4XXXX, 4XXXXX)	The FX writes the measured or computed data to the hold register of the server device.

Command

Command type:	R-M, W, W-M
Number of commands:	Set up to 16 commands
Data type:	See the table below.

Symbol	Description
INT16	16-bit signed integer
UINT16	16-bit unsigned integer
INT32_B	32-bit signed integer (higher and lower order)
INT32_L	32-bit signed integer (lower and higher order)
UINT32_B	32-bit unsigned integer (higher and lower order)
UINT32_L	32-bit unsigned integer (lower and higher order)
FLOAT_B	32-bit floating point (higher and lower order)
FLOAT_L	32-bit floating point (lower and higher order)

- **Reading Values into Communication Input Data**
  - Reads values from the server register into the communication input data of the FX.
  - Communication input data is an option (/M1, /PM1, /PWR1, or /PWR5).
  - The data type of the communication input data is 32-bit floating point.
  - You can display communication input data on a computation channel by including the data in the equation of an FX computation channel (/M1, /PM1, /PWR1, or /PWR5 option). The measurement range and unit are also set using the computation channel.

FX1000		Server	
Command type	**Communication input data** **Number: C01 to C24** **Data type: 32-bit floating point**	**Register**	**Data type**
R-M		30001 to 39999 300001 to 365536 40001 to 49999 400001 to 465536	INT 16, UINT 16, INT 32_B, INT 32_L, UINT 32_B, UINT 32_L, FLOAT_B, FLOAT_L

(←Read)
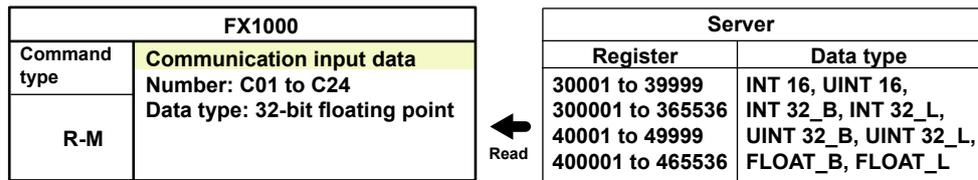
- **Writing the Measured Values of the Measurement Channels**
  - Writes the measured values of the measurement channels to the server registers.
  - The data type of measured values is signed 16-bit integer.

  When the Data Types of the Write Destination Servers Are Identical (INT16)
  - The values can be written directly including special data (See "Special Data Values" in section 4.3). Perform data processing on the server device.

  When the Data Types of the Write Destination Servers Are Different (FLOAT_L or FLOAT_B)
  - For data other than special data, the values that are calculated from the decimal point information set on each channel are written.
  - For special data, see "Writing the Computed Values of the Computation Channels." The FLOAT values in the Special values table are used.

FX1000		Server	
Command type	**Measurement channel** **Number: 001 to 012 (FX1000)** **Data type: 16 bit signed integer**	**Register**	**Data type**
W		40001 to 49999 400001 to 465536	INT 16 FLOAT_B, FLOAT_L
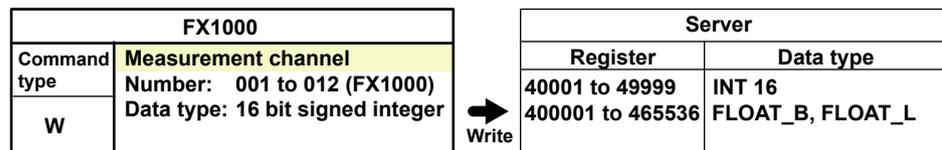
(→Write)

- **Writing the Computed Values of the Computation Channels**
  - The computation function is an option (/M1, /PM1, /PWR1, or /PWR5).
  - Writes the computed values of the computation channels to the server registers.
  - The data type of computed values is signed 32-bit integer.

FX1000		Server	
Command type	**Computation channel**	**Register**	**Data type**
	Number: 101 to 124	**40001 to 49999**	**INT 16, UINT 16,**
W-M	**Data type: 32-bit signed integer**	**400001 to 465536**	**INT 32_B, INT 32_L**
			FLOAT_B, FLOAT_L

When the Data Type of the Write Destination Server Is Identical (INT32_B or INT32_L)

The values can be written directly including special data (See "Special Data Values" in section 4.3). Perform data processing on the server device.

When the Data Types of the Write Destination Servers Are Different (INT16, UINT16, FLOAT_L or FLOAT_B)

INT16:   A value in the range of –32768 to 32767 (excluding the decimal point) can be written. If lower than –32768 the value reverts to –32768, and if higher than 32767 it reverts to 32767.

UINT16: A value in the range of 0 to 65535 (excluding the decimal point) can be written. Including special values, if the value is lower than 0, it reverts to 0, and if the value is higher than 65535, it reverts to 65535.

FLOAT: For data other than special data, the values that are calculated from the decimal point information set on each channel are written. For special data values, see the "Special values" table below.

Computed value	Data type of the write destination		
	INT16	**UINT16**	**FLOAT**
More than 32767	32767		Calculated from
-32768 to 32767	–32768 to 32767		the decimal point
Less than -32767	–32768		information set on
More than 65535		65535	each channel
0 to 65535		0 to 65535	
Less than 0		0	

Special values

Computed value	Data type of the write destination		
	INT16	**UINT16**	**FLOAT**
+ Over	32767	65535	7f800000H (+ ∞)
Burnout (Up)			7f800006H (Nan)
- Over			ff800000H (− ∞)
Burnout (Down)	–32768	0	ff800006H (Nan)
Skip			ff800002H (Nan)
Error			ff800004H (Nan)
Undefined			ff800005H (Nan)

6

Specifications

Modbus Server Function

Modbus Server Specifications

Communicate via ModbusTCP

Communication media: Ethernet 10Base-T

Port: 502/tcp (default value)

Command wait timeout: 1 minute. However, the timeout to receive the command after starting to receive the command is 10 seconds.

Maximum number of connections:
2

Supported functions: The functions that the FX supports are listed below.

Function Code	Function	Operation
3	Read the hold register (4XXXXX)	The client device reads the FX's communication input data.
4	Read the input register (3XXXXX)	The client device reads the computed, measured, alarm, and time data of the FX.
6	Single write to hold register (4XXXXX)	The client device writes to the communication input data of the FX.
8	Loopback test	The client device performs a loopback test of the FX.
16	Write to the hold register (4XXXXX)	The master device writes to the communication input data of the FX.

Register assignments (shared with the Modbus slave function)

Kind		Input register	
		Number	**Type**
Measurement ch.	Measured data	300001 to 300012	16-bit signed integer
	Alarm status	301001 to 301012	Bit string
Computation ch.	Computed data	302001 to 302048	32-bit signed integer
	Alarm status	303001 to 303024	Bit string
Measurement ch.	Alarm list	306001 to 306003	Bit string
Computation ch.	Alarm list	306021 to 306026	Bit string
Time		309001 to 309008	16-bit signed integer

Read

Client
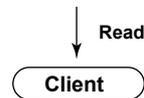
Kind	Hold register	
	Number	**Data type**
Communication input data	400001 to 400024	16-bit signed integer
	400301 to 400348	32-bit floating point
Operating devices	See "Operating Devices" under "Hold Register."	

Write   Read
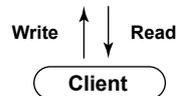
Client

Input Register (shared with the Modbus slave function)

• Common Items
- • The client device can only read the input registers.
- • Decimal position and unit are not included. Specify them on the client device.

• Details

Input Register	Data	Data Type
300001 | 300012	Measured data of measurement channel 001 | Measured data of measurement channel 012	16-bit signed integer
	• There is no decimal position information.	
301001 | 301012	Alarm status of measurement channel 001 | Alarm status of measurement channel 012	Bit string

• Register structure and alarm status values
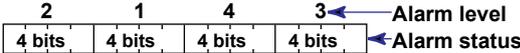
4-bits value	Meaning
0	No alarm
1	High limit alarm
2	Low limit alarm
3	Difference high limit alarm
4	Difference low limit alarm
5	High limit on rate-of-change alarm
6	Low limit on rate-of-change alarm
7	Delay high limit alarm
8	Delay low limit alarm

302001 302002 | 302047 302048	Lower bytes of the computed data of computation channel 101 Higher bytes of the computed data of computation channel 101 | Lower bytes of the computed data of computation channel 124 Higher bytes of the computed data of computation channel 124	32-bit signed integer

• Register structure

Example: Channel 101

• There is no decimal position information.

303001 | 303024	Alarm status of computation channel 101 | Alarm status of computation channel 124	Bit string

• The register structure and alarm status values are the same as the alarm status of measurement channels.

Input Register	Data	Data Type
306001	List of alarms of measurement channels 001 to 004	Bit string
|	|	
306003	List of alarms of measurement channels 009 to 012	

- Register structure
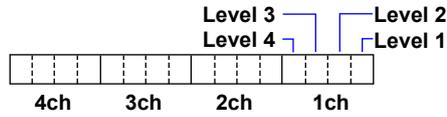
Indicates the alarm status of four channels in one register. Set to 1 when alarm is activated. The figure is an example of register 306001 (measurement channels 001 to 004).

Input Register	Data	Data Type
306021	List of alarms of computation channels 101 to 104	Bit string
|	|	
306026	List of alarms of computation channels 121 to 124	

- Register structure: Same as the list of alarms of measurement channels.

Note: Input registers 306001 to 306026 can be accessed consecutively. All unassigned register bits are read as zeroes.

Input Register	Data	Data Type
309001	Year	16-bit signed integer
309002	Month	
309003	Day	
309004	Hour	
309005	Minute	
309006	Second	
309007	Millisecond	
309008	DST	

Hold Register (shared with the Modbus slave function)

- **Common Items**
  - The client device can read and write to the hold registers.
  - Communication input data is an option (/M1, /PM1, /PWR1, or /PWR5).

- **Reading from and Writing to Communication Input Channels**
  Communication input data can be handled on a computation channel by including the data in the equation of a FX computation channel.

Hold Register	Data	Data Type
400001	Communication input data C01	16-bit signed integer
|	|	
400024	Communication input data C24	

- Precautions to be taken when the client device reads the data
  The communication input data of the FX is floating point type, but the data is converted to signed 16-bit integer when the data is read.
- Precautions to be taken when the client device writes the data
  Only data in signed 16-bit integer type can be written. Floating point values cannot be written.

Hold Register	Data	Data Type
400601	Lower bytes of communication input data C01	32-bit floating point
400602	Higher bytes of communication input data C01	
|	|	
400647	Lower bytes of communication input data C24	
400648	Higher bytes of communication input data C24	

- Precautions to be taken when the client device writes the data
  Input range: $-9.9999E29$ to $-1E-30$, 0, $1E-30$ to $9.9999E29$
  If values outside this range are used on a computation channel, a computation error occurs.

Hold Register	Data	Data Type
400301	Lower bytes of communication input data C01	32-bit signed integer
400302	Higher bytes of communication input data C01	
|	|	
400347	Lower bytes of communication input data C24	
400348	Higher bytes of communication input data C24	

- Note when a client device reads data
  The FX communication input data is floating-point, but when it is read, it is converted to 32-bit signed integer.
- Note when a client device writes data
  Data can only be written in 32-bit signed integer. Floating-point values cannot be written.

- **Operating Devices**
  You can use the following hold registers. You can perform a portion of the operations by writing in the registers.
  - Internal switch
  - Lot number
  - Batch number
  - Recording (memory sampling) start and stop
  - Alarm ACK
  - Computation start, computation stop, computation reset, computation dropout ACK
  - Manual sampling, event data sampling start trigger, and snapshot
  - Message and free message writing

6

Specifications

List of Registers

Register	Description	Supplementary Information	Type	Access	Simultaneous Access Write	Read
406061	Internal switch 1	OFF: 0. ON: 1.	INT16	R	–	
406062	Internal switch 2	OFF: 0. ON: 1.	INT16	R	–	
406063	Internal switch 3	OFF: 0. ON: 1.	INT16	R	–	
406064	Internal switch 4	OFF: 0. ON: 1.	INT16	R	–	
406065	Internal switch 5	OFF: 0. ON: 1.	INT16	R	–	
406066	Internal switch 6	OFF: 0. ON: 1.	INT16	R	–	
406067	Internal switch 7	OFF: 0. ON: 1.	INT16	R	–	
406068	Internal switch 8	OFF: 0. ON: 1.	INT16	R	–	
406069	Internal switch 9	OFF: 0. ON: 1.	INT16	R	–	
406070	Internal switch 10	OFF: 0. ON: 1.	INT16	R	–	
406071	Internal switch 11	OFF: 0. ON: 1.	INT16	R	–	
406072	Internal switch 12	OFF: 0. ON: 1.	INT16	R	–	
406073	Internal switch 13	OFF: 0. ON: 1.	INT16	R	–	
406074	Internal switch 14	OFF: 0. ON: 1.	INT16	R	–	
406075	Internal switch 15	OFF: 0. ON: 1.	INT16	R	–	
406076	Internal switch 16	OFF: 0. ON: 1.	INT16	R	–	
406077	Internal switch 17	OFF: 0. ON: 1.	INT16	R	–	
406078	Internal switch 18	OFF: 0. ON: 1.	INT16	R	–	
406079	Internal switch 19	OFF: 0. ON: 1.	INT16	R	–	
406080	Internal switch 20	OFF: 0. ON: 1.	INT16	R	–	
406081	Internal switch 21	OFF: 0. ON: 1.	INT16	R	–	
406082	Internal switch 22	OFF: 0. ON: 1.	INT16	R	–	
406083	Internal switch 23	OFF: 0. ON: 1.	INT16	R	–	
406084	Internal switch 24	OFF: 0. ON: 1.	INT16	R	–	
406085	Internal switch 25	OFF: 0. ON: 1.	INT16	R	–	
406086	Internal switch 26	OFF: 0. ON: 1.	INT16	R	–	
406087	Internal switch 27	OFF: 0. ON: 1.	INT16	R	–	
406088	Internal switch 28	OFF: 0. ON: 1.	INT16	R	–	
406089	Internal switch 29	OFF: 0. ON: 1.	INT16	R	–	
406090	Internal switch 30	OFF: 0. ON: 1.	INT16	R	–	
407833 to 407834	Lot number	Valid range: 0 to 99999999	INT32_L	R/W		
407835 to 407851	Batch number	Up to 17 registers (up to 33 characters with '¥0' termination). The batch number must be 32 characters or less.	STR34	R/W		
409503	Memory start or stop	Stop: 0. Start: 1.	INT16	R/W		
409504	Alarm acknowledge	Applies to all alarms. <When writing> Execute alarm ACK: 1 (fixed) <When reading (alarm summary)> Alarm off: 0. Alarm illuminated: 1. Alarm blinking (occurring): 2. Alarm blinking (not occurring): 3	INT16	R/W		
409506	Computation operation	<When writing> Stop: 0. Start: 1. Reset: 2. Computation dropout ACK: 4. <When reading> Stop: 0. Start: 1.	INT16	R/W		
409512	Manual sampling start or other action	Manual sampling: 0. Manual trigger: 1. Snapshot: 2.	INT16	W		
410601	Preset message writing	Message number (1 to 100)	INT16	W		
410602		Message write destination 0: All groups. 1 to 10: Specified group number.	INT16	W		
410603		Specified value.	INT16	W		
410604 to 410610	(Reserved) Preset message	-	-	-		

Register	Description	Supplementary Information	Type	Access	Simultaneous Access	
					Write	Read
410611	Free message writing	Message number (1 to 10)	INT16	W		
410612		Message write destination 0: All groups. 1 to 10: Specified group number.	INT16	W		
410613		Specified value.	INT16	W		
410614 to 410631		Free message Up to 18 registers (up to 35 characters with '¥0' termination). The message must be 32 characters or less.	STR36	W		
410632 to 410680	(Reserved) Free message	-	-	-		

Notation used in the Access column

W: Writable

R: Readable

If you read a write-only (W) register, zero is always read.

If you write to a read-only (R) register, an error will occur.

Notation used in the Simultaneous access column

Blank: Indicates a range of registers that can be written to or read from simultaneously.
You cannot simultaneously access across a solid line.

-: Not accessible.

6

Specifications

How to Use

Item	Description
Data type STRnn	Registers in which ASCII codes are entered starting with the specified register. It is terminated with a NULL character (\0). The number of characters that can be entered that includes the NULL character is indicated in the nn section. Example of setting the batch number (STR36 type) to "ABCD" "**" denotes any value.

Register	Value to Write	Hexadecimal Notation
407835	'A''B'	(4142H)
407836	'C''D'	(4344H)
407837	'¥0'*	(00**H)
407838 to 407851	**	(****H)

Item	Description
	Write the entire character string using one command. In the above example, registers 410003 to 410005 must be written using one command. If you read a write-only register (one whose access is only "W"), zero is always read.
Lot number	• Access the registers two registers at a time. • You can only access from the first register.
Batch number	• You can only access from the first register.
Message	• You can only write from the first register. • A message is written using one command. In other words, write to registers 410601 to 410603 using one command. The message write destination can be omitted (write only to 410601). If you omit it, the operation is the same as when all groups are specified.
Free message	• You can only write from the first register. • A free message is written using one command. If you omit the free message section, an all-space message is written. The message write destination and subsequent registers can be omitted (write only to 410611). If you omit them, an all-space message is written to every group. Example: To write the free message "ABCD" to all display groups in batch group number 4 using message number 10, write the values in the following table using one command. "**" denotes any value.

Register	Value to Write	Hexadecimal Notation
410611	10	(000AH)
410612	0	(0000H)
410613	1	(0001H)
410614	'A''B'	(4142H)
410615	'C''D'	(4344H)
410616	'¥0'*	(00**H)

Item	Description
Simultaneous access	• Batch numbers and lot numbers can be written using one command for each batch. Example : You can write to registers 407833 to 407851 using one command. • When reading, you can access the following registers simultaneously. • Internal switches 1 to 30

Modbus Error Response (Common to Modbus server and Modbus slave)

The FX returns the following error codes to a client or master device.

Code	Error	Description
1	ILLEGAL FUNCTION Invalid function code	An attempt was made to execute a function that is not supported.
2	ILLEGAL DATA ADDRESS Invalid register number	Failed to access the register.
3	ILLEGAL DATA VALUE Invalid number of registers	When reading, the specified number of registers was less than or equal to zero or greater than or equal to 126. When writing, the specified number of registers was less than or equal to zero or greater than or equal to 124.

7	NEGATIVE ACKNOWLEDGE
	Invalid contents written
		• A lot number that is outside the valid range was entered.
		• Invalid characters (such as '¥x1b') were written in batch number or free message registers.
		• Failed to control the following operations.
		    • Writing messages
		    • Writing free messages
		    • Writing batch numbers and lot numbers

However, no response is returned for the following errors.

• CRC error

• Errors other than those shown above

6

Specifications

Modbus Master Function

Basic Operations

- The FX, as a Modbus master device, communicates with Modbus slaves periodically by sending commands at specified intervals.
- The Modbus master function operates independently from the Modbus client function via the Ethernet communication.
- The supported functions are "reading data from the input registers and hold registers on the slave" and "writing data into the hold registers on the slave."

Serial Communication Specifications (Common to the Modbus Slave Function)

Communicate via ModbusRTU

Communication media:	RS-232, RS-422A/485
Control system:	No flow control ("None" only)
Baud rate:	Select from 1200, 2400, 4800, 9600, 19200, and 38400
Start bit:	1 bit (fixed)
Data length:	8 bit (fixed)
Parity:	Select odd, even, or none
Stop bit:	1 bit (fixed)

Message termination determination:

Time equivalent to 48 bits

Modbus Master Specifications

Read cycle: Select the cycle at which data is read from other devices from the following: 1, 2, 5, and 10 s

Timeout value: Select the timeout value when there is no response from the specified slave after sending a command from the FX from the following: 125, 250, 500ms, 1, 2, 5, 10 s, and 1 min

Retry count: Select the retry count when there is no response for a command sent from the FX to the specified slave.
OFF, 1, 2, 3, 4, 5, 10, and 20

Auto recovery cycle: Select the cycle for automatically recovering from the following:
OFF, 1, 2, 5, 10, 20, 30 min, and 1 h

Wait between commands: Select the wait time[1] after receiving a response of a command until sending the next command from the following:
OFF, 5, 10, 15, 45, and 100 ms

1: When communicating using an RS-485 two-wire system, the signals may collide, because the master and slave devices driving the communication switch in half-duplex mode. If the communication does not work, increase the wait time.

Command type: R-M, W, W-M

Command setting: Set up to 16 commands

Command items: Read channels C01 to C24
Write channels 001 to 012 and 101 to 124 (depends on the model)

Address: 1 to 247

Input register: 30001 to 39999, 300001 to 365535

Hold register: 40001 to 49999, 400001 to 465535

Access method: Same as the Modbus client.

Supported functions: Same as the Modbus client.

Data type: Same as the Modbus client.

Modbus Slave Function

Serial Communication Specifications:

                Same as the Modbus Master Function

Slave address: 1 to 99.

Supported functions: Same as the Modbus server.

Register assignments: Same as the Modbus server.

Modbus error response: Same as the Modbus server.

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Specifications

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Appendix 1   Data Dropout during Modbus Communication

Data Dropout during Modbus Client

If the response to the previous command is not complete when the FX attempts to issue a command to a server device, the FX cannot issue the command causing a data dropout. Take appropriate measures by referring to the following figures.

1. When the response from the server device takes a long time
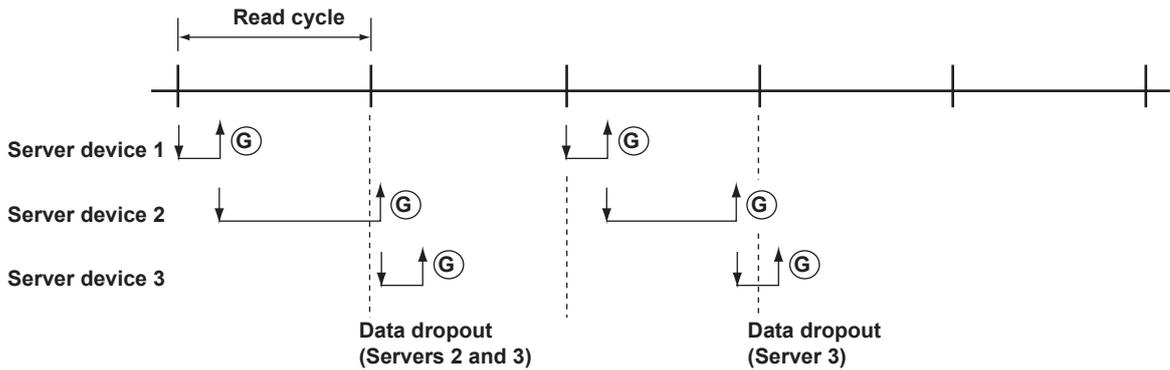
2. When the connection is dropped because there is no response from the server device
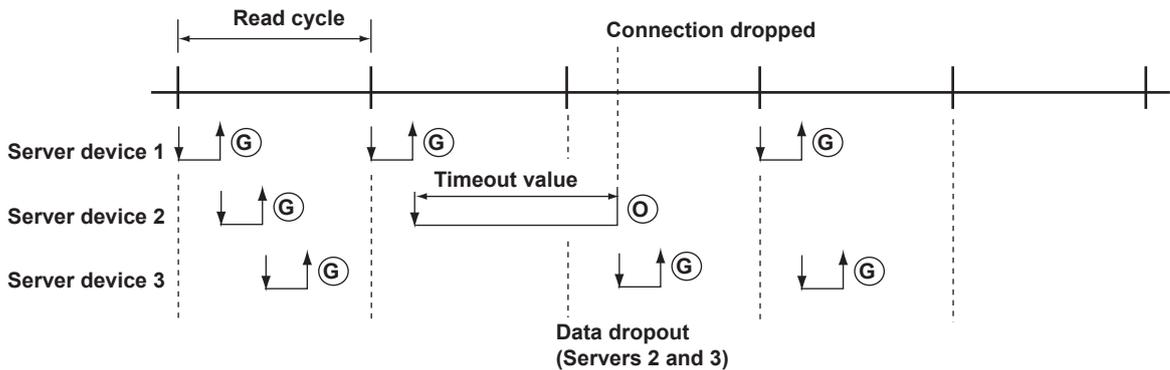
3. When the communication recovers by connection retry
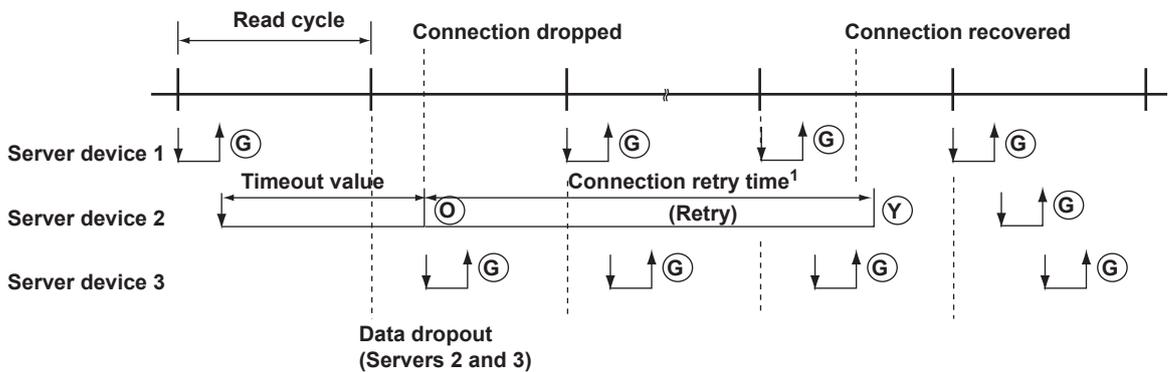
Ⓖ Ⓨ Ⓞ Ⓡ : Status lamp

↓ : Command from the FX

↑ : Response from the server device

1: The first connection retry after the connection is dropped is shorter than the specified interval. The status lamp condition is an example when connection retry is configured.

Data Dropout during Modbus Master

If the response to the previous command is not complete when the FX attempts to issue a command to a slave device, the FX cannot issue the command causing a data dropout. Take appropriate measures by referring to the following figures.

1. When the response from the slave device takes a long time
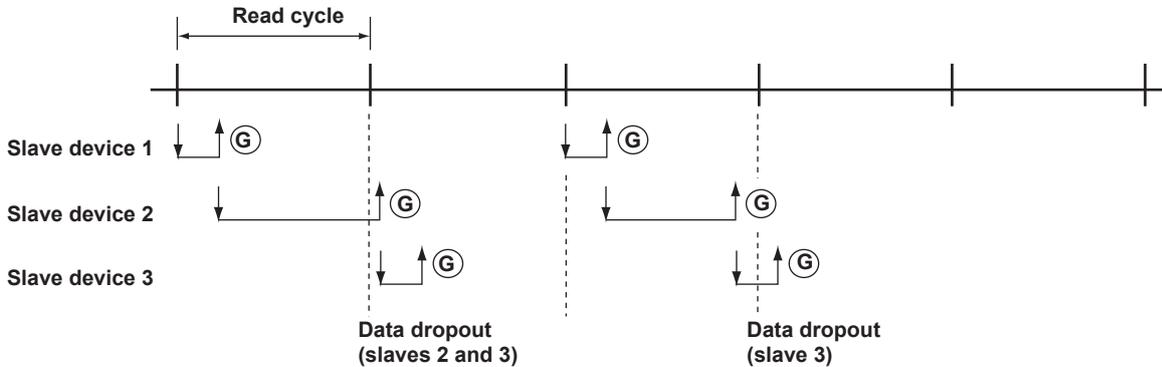
2. When there is no response from the slave device
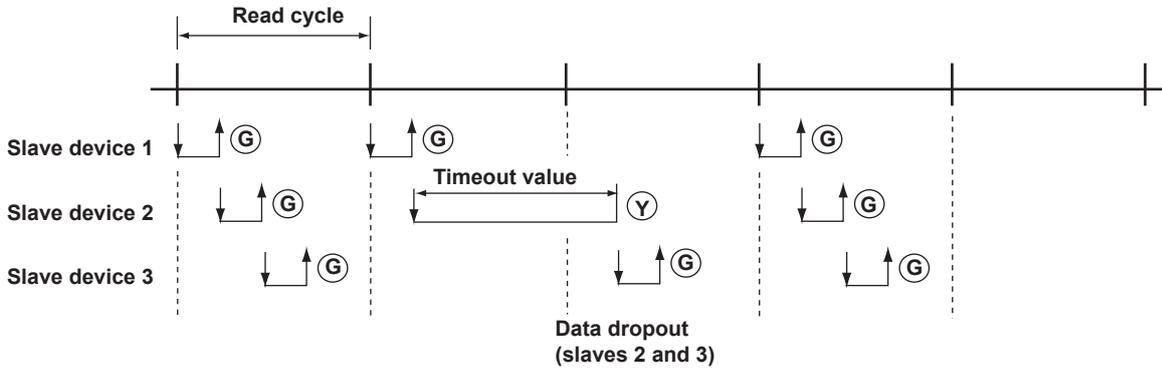
3. When the slave device that is not responding is disconnected (retry count is set to 1)
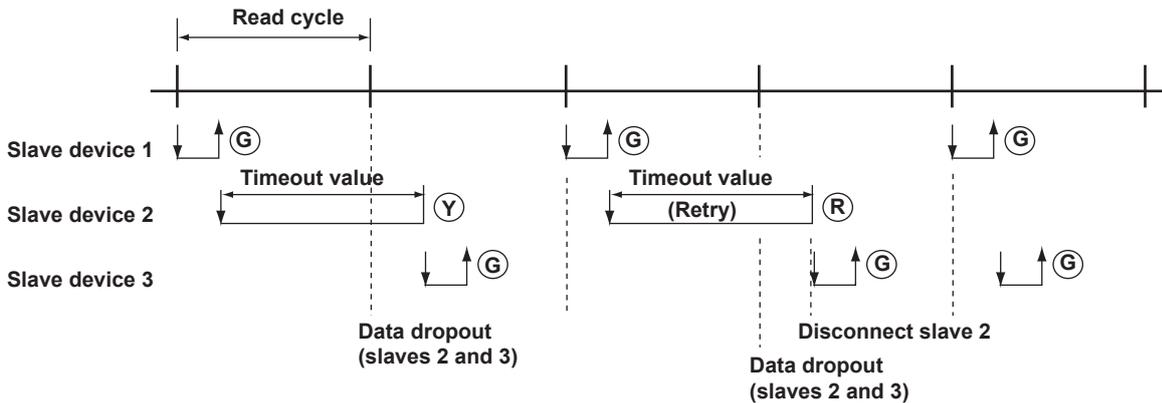
(G) (Y) (R) **Status lamp**

↓ **: Command from the FX**

↑ **: Response from the slave device**

Appendix 2 Login Procedure

You log into the FX from your PC to use the functionality of the setting/measurement server and the maintenance/test server via the Ethernet interface. If you complete the procedure successfully up to login complete in the following figure, the commands in chapter 3 become functional.

When Using the Login Function (Standard Security Function) of the FX

Legend:
- Start
- End
- User entry
- Judge
- Transit
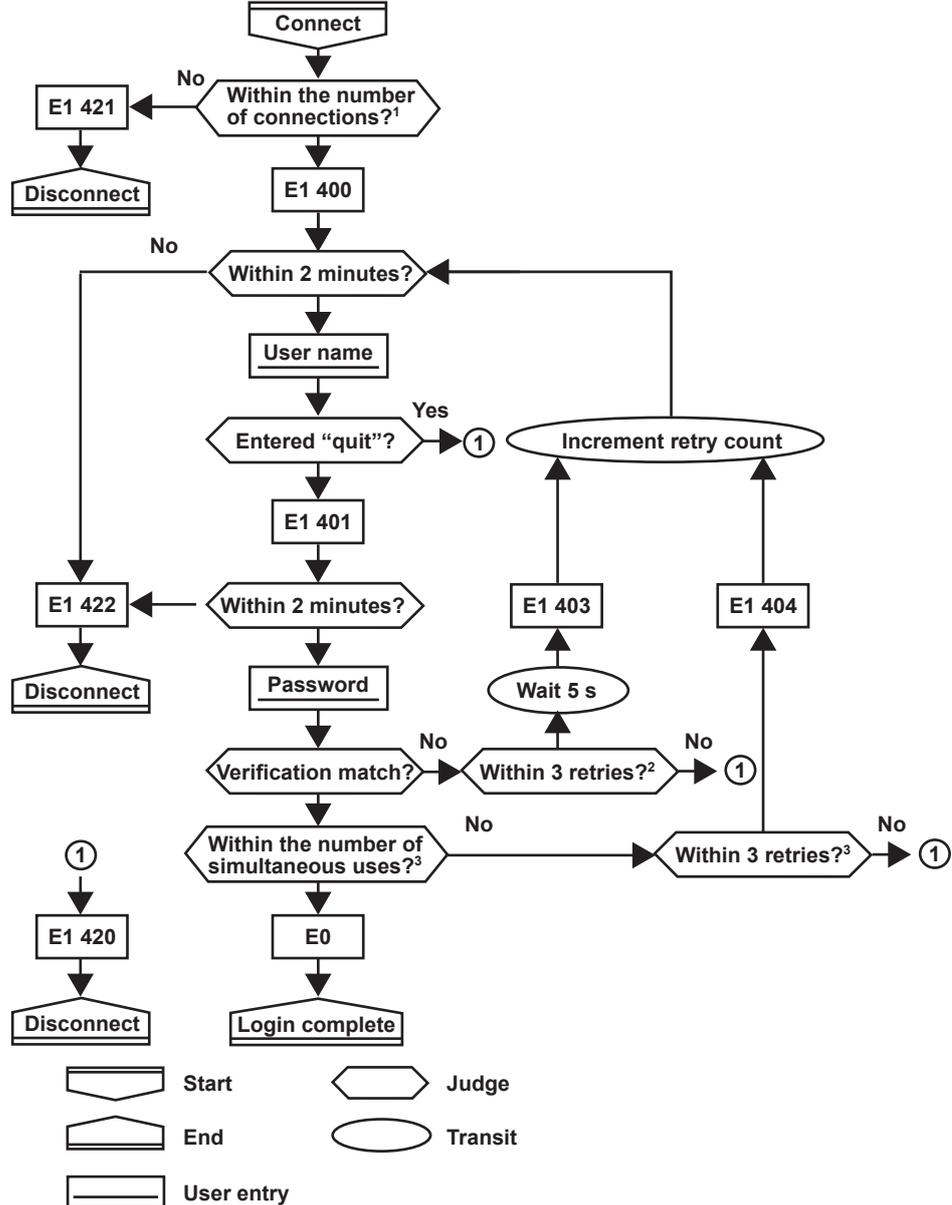
E1 403 — Response from the FX (message omitted)
For a description of the response format, see section 4.1.
Code (for a description of codes and messages, see the *FX1000 User's Manual*, IM 04L21B01-01EN)

1: Connections cannot exceed the maximum number of connections (see section 6.1).

2: If you try to log in using a wrong password four consecutive times, the communication is dropped (the number of retries for login is three).

3: If you try to log in causing the number of simultaneous uses at the administrator or user level to be exceeded (see section 6.1) four consecutive times, the communication is dropped (even if the password is correct).

App

Appendix

When Not Using the Login Function of the FX

Login as "admin" or "user."

- The user name "admin" can be used to login to the FX as an administrator.
- The user name "user" can be used to access the FX as a user.

```
                              ┌──────────────┐
                              │   Connect    │
                              └──────┬───────┘
                                     ▼
                    No     ╱────────────────────╲
   ┌────────┐  ◄──────────┤  Within the number   │
   │ E1 421 │             │  of connections?     │
   └───┬────┘              ╲────────────────────╱
       ▼                             │
 ┌────────────┐              ┌──────────────┐
 │ Disconnect │              │   E1 402     │
 └────────────┘              └──────┬───────┘
                                    ▼
        No         ╱────────────────────────╲        ◄──────────┐
   ┌──────────────┤    Within 2 minutes?     │◄────────┐        │
   │               ╲────────────────────────╱          │        │
   │                            │                       │        │
   │                    ┌──────────────┐                │        │
   │                    │  User name   │                │        │
   │                    └──────┬───────┘                │        │
   │                           ▼                        │        │
   │          Yes    ╱──────────────╲                   │        │
   │        ┌───────┤ Entered "quit"? │    ①  ╱────────────────────╲
   │        │        ╲──────────────╱     ▲  │ Increment retry count │
   │        │               │              ╲────────────────────────╱
   │        │               │                    ▲             ▲
   ▼        │               │                    │             │
┌────────┐  │               │            ┌──────────────┐ ┌──────────────┐
│ E1 422 │  │               │            │   E1 403     │ │   E1 404     │
└───┬────┘  │               │            └──────────────┘ └──────────────┘
    ▼       │               │                    ▲             ▲
┌────────────┐              │                    │             │
│ Disconnect │              │                    │             │
└────────────┘              ▼           No ╱──────────────╲  No
            ╱──────────────────╲ ┌────────┤ Within 3 retries? ├──► ①
            │ Verification match? ├─────────╲──────────────╱
             ╲──────────────────╱
                     │
                     ▼
          ╱──────────────────────╲  No          ╱──────────────╲  No
          │ Within the number of  ├────────────┤ Within 3 retries? ├──► ①
 ①        │ simultaneous uses?    │             ╲──────────────╱
 │         ╲──────────────────────╱
 ▼                   │
┌────────┐           ▼
│ E1 420 │    ┌──────────────┐
└───┬────┘    │     E0       │
    ▼         └──────┬───────┘
┌────────────┐       ▼
│ Disconnect │  ┌──────────────┐
└────────────┘  │Login complete│
                └──────────────┘
```
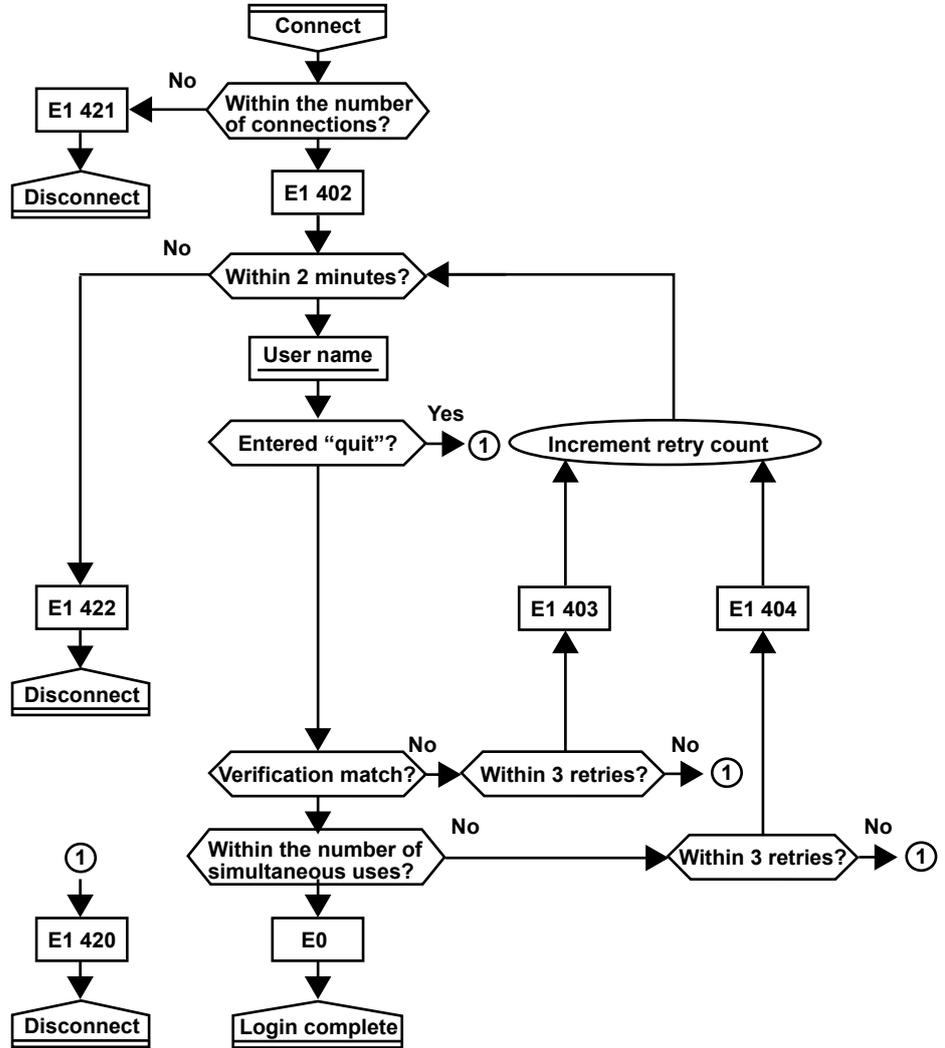
Appendix 3   ASCII Character Codes

Upper 4 bits

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P		p				°	À	Ð	à	ð
1				1	A	Q	a	q			¡		Á	Ñ	á	ñ
2				2	B	R	b	r				²	Â	Ò	â	ò
3			#	3	C	S	c	s				³	Ã	Ó	ã	ó
4				4	D	T	d	t					Ä	Ô	ä	ô
5			%	5	E	U	e	u				µ	Å	Õ	å	õ
6			&	6	F	V	f	v					Æ	Ö	æ	ö
7				7	G	W	g	w					Ç	×	ç	÷
8			(	8	H	X	h	x					È	Ø	è	ø
9			)	9	I	Y	i	y					É	Ù	é	ù
A	LF		*	:	J	Z	j	z					Ê	Ú	ê	ú
B		ESC	+	;	K	[	k						Ë	Û	ë	û
C			,		L		l						Ì	Ü	ì	ü
D	CR		-		M	]	m						Í	Ý	í	ý
E			.		N	^	n						Î	Þ	î	þ
F			/	?	O	_	o					¿	Ï	ß	ï	

Lower 4 bits

- The delimiter (,), sub delimiter (;), query symbol (?), and terminator (CR+LF) characters are reserved. You cannot use them as parameter characters.
- You can use characters 80H through FFH for items listed below.

Items	Command
Tag	ST
Message	SG
Free message	BJ
Group name	SX
File header	TZ
Field title and Field string for a batch text field setting	BH
Batch comment	BU
Header 1 and Header 2 for an e-mail setting	YU
Unit for a measurement channel setting	SR
Unit for a computation channel setting	SO

Russian Characters

The special Russian characters that you can enter are shown below.

Other characters that you can enter are the same as when the language type is English.

	80	90	A0	B0	C0	D0	E0	F0
0					А	Р	а	р
1					Б	С	б	с
2					В	Т	в	т
3					Г	У	г	у
4					Д	Ф	д	ф
5					Е	Х	е	х
6					Ж	Ц	ж	ц
7					З	Ч	з	ч
8			Ё	ё	И	Ш	и	ш
9			№		Й	Щ	й	щ
A					К	Ъ	к	ъ
B					Л	Ы	л	ы
C					М	Ь	м	ь
D					Н	Э	н	э
E					О	Ю	о	ю
F					П	Я	п	я

Korean Characters

The Korean characters that you can enter are shown below.

Other characters that you can enter are the same as when the language type is English.

Korean Characters That You Can Enter	
Symbols	0xA1A1 to 0xACF1 (excluding those whose second byte is between 0x00 and 0xA0 and those whose second byte is 0xFF)
Hangul	0xB0A1 to 0xC8FE (excluding those whose second byte is between 0x00 and 0xA0 and those whose second byte is 0xFF)

Appendix 4 Output Flow of the File or the File List on the External Storage Medium and Internal Memory

Example in Which the File 10101000.DAD Is Output

The figure below shows the output flow of the file 10101000.DAD in the DATA0 directory of the external storage medium.

□	Command to send
( )	Command description
⌐ ¬ (dashed)	Received response data

START

Send the command

`MEGET,/DRV0/DATA0/10101000.DAD` (Specify the file name using full path and output the data.)

Receive response Binary (see section 4.1)

```
Binary header
Binary data
Binary footer
```

Is there more data?[1] NO

YES

Send the command

`MENEXT` (Output the subsequent data.)

Receive response Binary (see section 4.1)

```
Binary header
Binary data
Binary footer
```

END

1: Bit 0 of the binary header flag
　0: There is more data.
　1: Data transmission is complete.

Example in Which the File List Is Output 10 Files at a Time

The figure below shows the flow in which the file list in the DATA0 directory of the external storage medium is output 10 files at a time.

```
                                        ┌──────────┐
                                        │          │   Command to send
                                        └──────────┘

                                        (          )   Command description

         START                          ┌ ─ ─ ─ ─ ┐
           │                            │          │   Received response data
           ▼                            └ ─ ─ ─ ─ ┘
  ( Send the command )
                            Output command for the first file list.
  ┌──────────────────────┐  Specify the number of file lists to be output when
  │ MEDIR,/DRV0/DATA0/,10 │  issuing this command.
  └──────────────────────┘
  ( Receive response )   Text (see section 4.2)

  ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
    ┌────────────────┐
  │ │ EA             │ │
    │ ......         │──── File list
  │ │ ......         │ │
    │ xxxKbyte free  │
  │ │ EN             │ │
    └────────────────┘
  └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
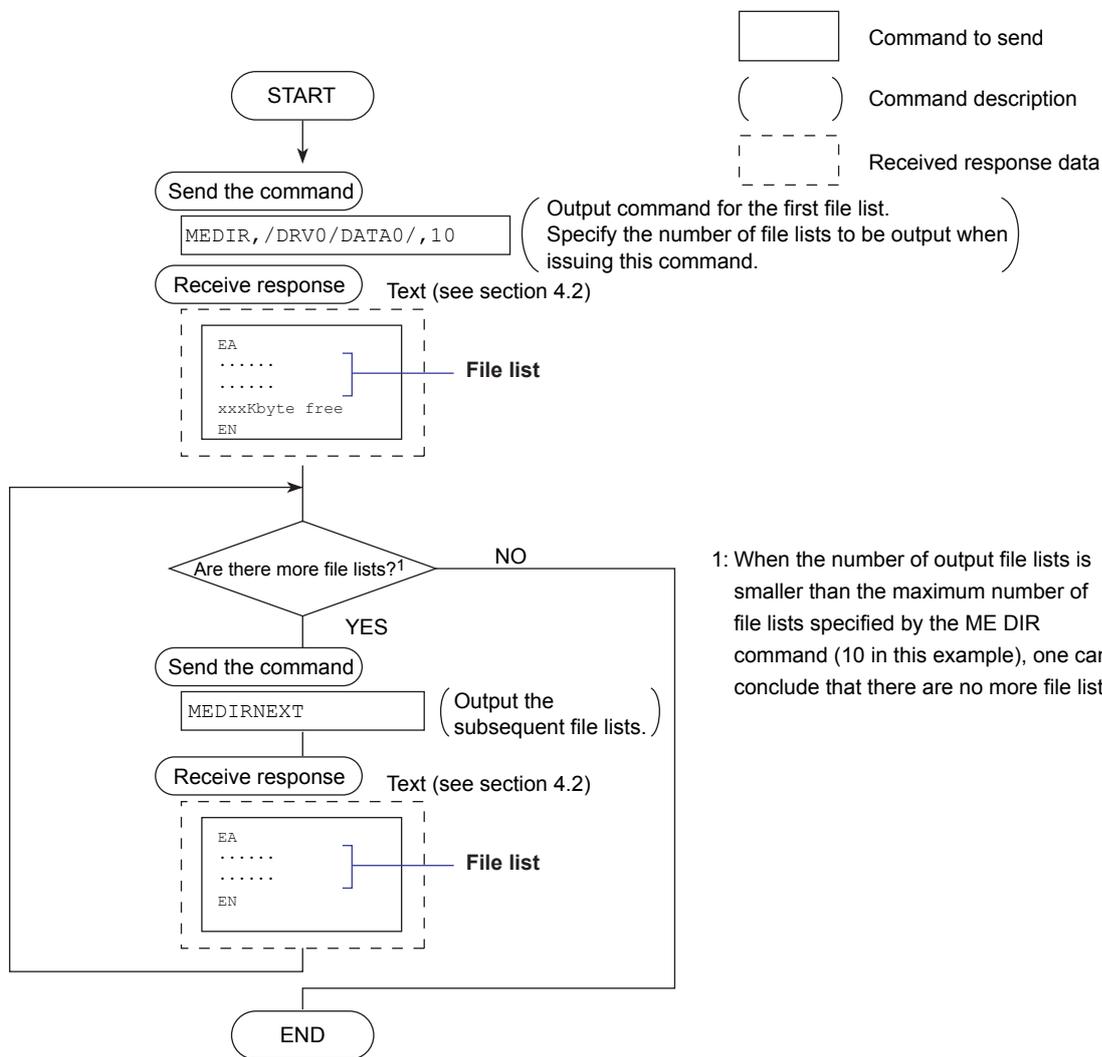
1: When the number of output file lists is smaller than the maximum number of file lists specified by the ME DIR command (10 in this example), one can conclude that there are no more file lists.

```
           │
           ▼
  ◇ Are there more file lists?1 ◇ ──── NO ────┐
           │                                  │
          YES                                 │
           │                                  │
  ( Send the command )                        │
                        Output the            │
  ┌────────────────┐   subsequent file lists. │
  │ MEDIRNEXT      │  (                      )│
  └────────────────┘                          │
  ( Receive response )  Text (see section 4.2)│
                                              │
  ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐                       │
    ┌────────────────┐                        │
  │ │ EA             │ │                       │
    │ ......         │──── File list          │
  │ │ ......         │ │                       │
    │ EN             │                         │
  │ └────────────────┘ │                      │
  └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘                       │
           │                                  │
           └──────────────────────────────────┤
                                              ▼
                                           END
```

Appendix 5 Flow Chart of the FIFO Data Output

Overview of the FIFO Buffer

The FX has a dedicated internal memory for outputting measured/computed data. This memory is structured as a FIFO (First-In-First-Out). Measured/computed data are constantly acquired to the internal memory at the specified acquiring interval (FIFO acquiring interval, set with the FR command). By using this function, it is possible to read measured/computed data that have been saved at the specified intervals regardless of the frequency at which the PC periodically reads the measured/computed data.

The following example shows the case when the acquisition interval is 1 s and the capacity of the FIFO memory is for 8 intervals.
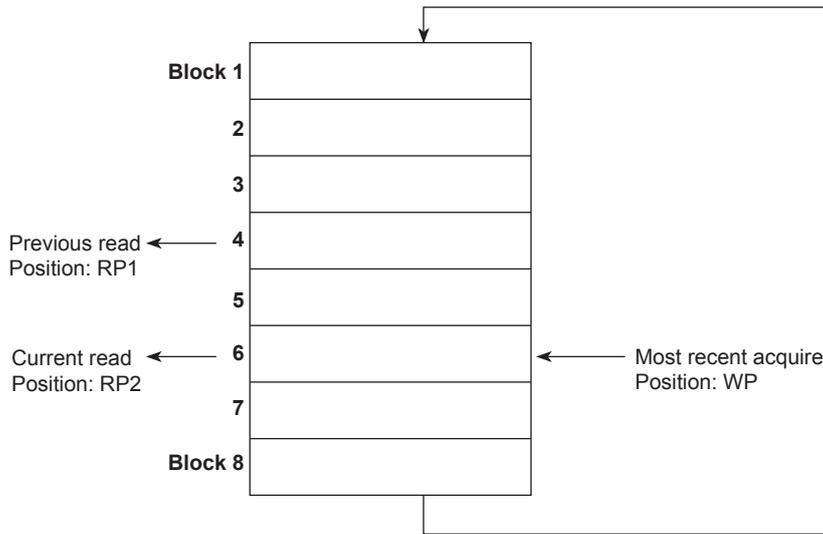
* **Acquiring of the Measured/Computed Data**
  * The measured/computed data are acquired to the internal memory at 1 s intervals.
  * Measured/computed data is acquired to positions 1 through 8 in order. After acquiring to position 8, the next data is acquired to position 1.

* **Reading the Measured/Computed Data (FF GET command is used)**
  Outputs the data from the previous read position (RP1) to the most recent acquisition position (WP).
  In this example, more than 2 s has elapsed from the previous read operation. Therefore, data in blocks 5 and 6 are output.

The size of the internal memory reserved for FIFO (FIFO buffer data size) varies depending on the model.

Model	Data size
FX1002 and FX1004	1200 intervals (150 seconds at the shortest write interval of 125 ms)
FX1006, FX1008, FX1010, and FX1012	240 intervals (240 seconds at the shortest write interval of 1 s)

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Numerics

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