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.
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Revision History

1st Edition: November, 2011
2nd Edition: September, 2012
3rd Edition: November, 2015

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

  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.

  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.

  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:

<table>
<thead>
<tr>
<th>Model</th>
<th>Type Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-speed input model</td>
<td>FX1002 and FX1004</td>
</tr>
<tr>
<td>Medium-speed input model</td>
<td>FX1006, FX1008, FX1010, and FX1012</td>
</tr>
</tbody>
</table>
Names and Uses of Parts and the Setup Procedures Using the Operation Keys

Front Panel

- **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

- **Ethernet interface connector**: An Ethernet communication connector that comes with the /C7 option.
- **RS-232 interface connector**: A serial communication connector that comes with the /C2 option.
- **RS-422A/485 interface terminal**: A serial communication terminal that comes with the /C3 option.
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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.
1.1 What You Can Do with the FX1000

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^\textsuperscript{1} (using the input register)
  - Load communication input data\textsuperscript{1} (using the hold register)
  - Write communication input data\textsuperscript{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)

\textsuperscript{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.
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.
1.1 What You Can Do with the FX1000

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.
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
To: user1@recorder.com, user2@daq.co.jp

<table>
<thead>
<tr>
<th>Subject</th>
<th>Header 1</th>
<th>Header 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Host name</td>
<td></td>
</tr>
<tr>
<td>10/02 08:00:01</td>
<td>FX1000</td>
<td></td>
</tr>
</tbody>
</table>

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
- IP address assignment method
  - Fixed IP address
    - Set the IP address
    - Set the subnet mask
    - Set the default gateway
    - Set the host name (optional)
    - Set the domain name (optional)
    - Set the DNS server search order
    - Set the domain suffix search order
  - Automatic retrieval of the IP address (DHCP)
    - Set the auto retrieval of the DNS
      - Automatically register the host name
      - Set the host name
      - Set the domain name
      - Set the DNS server search order
      - Not specified when the DNS auto setting is enabled.
1.3 Connecting the FX

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

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.
1.3 Connecting the FX

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**

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed IP-address</td>
<td>Use</td>
</tr>
<tr>
<td>IP-address</td>
<td>10.0.0.23</td>
</tr>
<tr>
<td>Subnet mask</td>
<td>255.255.255.0</td>
</tr>
<tr>
<td>Default gateway</td>
<td>10.0.0.23</td>
</tr>
</tbody>
</table>

**Host information setting**

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host settings</td>
<td>Use</td>
</tr>
<tr>
<td>Host name</td>
<td>Use</td>
</tr>
<tr>
<td>Domain name</td>
<td>Use</td>
</tr>
</tbody>
</table>

**DNS setting**

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary domain</td>
<td>10.0.0.25</td>
</tr>
<tr>
<td>Secondary domain</td>
<td>0.0.0.0</td>
</tr>
</tbody>
</table>

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.
1.3 Connecting the FX

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.
1.3 Connecting the FX

**Releasing Network Information**

1. Display the network information screen.
   ◇ Press FUNC and select Network info.

   ![Network Information Screen]

2. Execute the network information release.
   ◇ Press FUNC and select Network info > Release.

   ![Network Information Release]

   The network information is released.

   ![Network Information Released]

   DISP/ENTER key
1.3 Connecting the FX

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

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Settings</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SMTP server name</td>
<td>Port number</td>
</tr>
<tr>
<td></td>
<td>Security</td>
<td>User name</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Password</td>
</tr>
</tbody>
</table>

Recipients

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Recipients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recipient 1</td>
</tr>
<tr>
<td></td>
<td>Recipient 2</td>
</tr>
<tr>
<td></td>
<td>Sender</td>
</tr>
</tbody>
</table>

POP3 Settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POP3 Server name</td>
</tr>
<tr>
<td></td>
<td>Login name</td>
</tr>
<tr>
<td></td>
<td>Password</td>
</tr>
</tbody>
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Alarm settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Alarm settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recipient 1</td>
</tr>
<tr>
<td></td>
<td>Recipient 2</td>
</tr>
<tr>
<td></td>
<td>Active Alarm</td>
</tr>
<tr>
<td></td>
<td>Alarm 1</td>
</tr>
<tr>
<td></td>
<td>Alarm 2</td>
</tr>
<tr>
<td></td>
<td>Alarm 3</td>
</tr>
<tr>
<td></td>
<td>Alarm 4</td>
</tr>
<tr>
<td></td>
<td>Include INST</td>
</tr>
<tr>
<td></td>
<td>Include source URL</td>
</tr>
<tr>
<td></td>
<td>Subject</td>
</tr>
<tr>
<td></td>
<td>Header 1</td>
</tr>
<tr>
<td></td>
<td>Header 2</td>
</tr>
</tbody>
</table>

Scheduled settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recipient 1</td>
</tr>
<tr>
<td></td>
<td>Interval</td>
</tr>
<tr>
<td></td>
<td>Ref. time</td>
</tr>
<tr>
<td></td>
<td>Include INST</td>
</tr>
<tr>
<td></td>
<td>Include source URL</td>
</tr>
<tr>
<td></td>
<td>Subject</td>
</tr>
<tr>
<td></td>
<td>Header 1</td>
</tr>
<tr>
<td></td>
<td>Header 2</td>
</tr>
</tbody>
</table>

System settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recipient 1</td>
</tr>
<tr>
<td></td>
<td>Include source URL</td>
</tr>
<tr>
<td></td>
<td>Subject</td>
</tr>
<tr>
<td></td>
<td>Header 1</td>
</tr>
<tr>
<td></td>
<td>Header 2</td>
</tr>
</tbody>
</table>

Report settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recipient 1</td>
</tr>
<tr>
<td></td>
<td>Include source URL</td>
</tr>
<tr>
<td></td>
<td>Subject</td>
</tr>
<tr>
<td></td>
<td>Header 1</td>
</tr>
<tr>
<td></td>
<td>Header 2</td>
</tr>
</tbody>
</table>

On | Off
1.4 Sending E-mail Messages

**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**.
1.4 Sending E-mail Messages

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.
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
  
  header2
  
  CRLF
  
  Alarm_summary.CRLF
  
  <Host_name>CRLF
  
  host
  
  CRLF
  
  <CH>ccc···cCRLF
  
  <Type>lqCRLF
  
  <aaa>mo/dd:hh:mmCRLF
  
  <Inst._value>CRLF
  
  mo/dd:hh:mmCRLF
  
  ccc···c=ddd···dCRLF
  
  ................................................
  
  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**
  
  ```text
  header1
  header2
  CRLF
  Periodic_data.CRLF
  <Host_name>CRLF
  host
  CRLF
  <Time>CRLF
  mo/dd_hh:mi:ss
  CRLF
  E-mail_message(s)_did_not_reach_intended_recipient(s).CRLF
  ttt
  Count=nnCRLF
  mo/dd_hh:mi:ss
  CRLF
  Access_the_following_URL_in_order_to_look_at_a_screen.CRLF
  http://host.domain
  CRLF
  `ccccc` 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 Type of discarded e-mail
  ```

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

  ```text
  nn Number of discarded e-mails
  ddd Type of discarded e-mails
  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**
header1CRLF
header2CRLF
CRLF
Power_failure.CRLF
<Host_name>CRLF
hostCRLF
CRLF
<Power_fail>mo/dd_hh:mi:ssCRLF
<Power_on>mo/dd_hh:mi:ssCRLF
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**
header1CRLF
header2CRLF
CRLF
Memory_full.CRLF
<Host_name>CRLF
hostCRLF
CRLF
mo/dd_hh:mi:ssCRLF
<Memory_remain>ppp···pMbytesCRLF
<Memory_blocks>bbb/400CRLF
<Media_remain>rrr···rMbytesCRLF
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)
1.4 Sending E-mail Messages

System Mail (Error) Format

• **Subject**
  Subject:System_warning

• **Syntax**
  header1CRLF
  header2CRLF
  CRLF
  Error.CRLF
  <Host_name>CRLF
  hostCRLF
  CRLF
  mo/dd_hh:mm:ssCRLF
  ERROR:fffCRLF
  
  “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**

  header1CRLF
  header2CRLF
  CRLF
ti_report.CRLF
  <Host_name>CRLF
  hostCRLF
  CRLF
  mo/dd hh:mm:ssCRLF
  <CH>ccc···cCRLF
  <tp>eee···eCRLF
  <tp>eee···eCRLF
  <tp>eee···eCRLF
  <tp>eee···eCRLF
  <Unit>uuu···uCRLF
  ............................
  CRLF

  Access the following URL in order to look at a screen.
  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
  hostCRLF
  CRLF
  <Time>CRLF
  mo/dd_hh:mi:ssCRLF
  CRLF
  <Message>CRLF
  x:msCRLF
  .........................
  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.

• 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.
1.5 Monitoring the FX on a PC Browser

**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.
- **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.

<table>
<thead>
<tr>
<th>No.</th>
<th>Setting</th>
<th>Description and Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Communication login</td>
<td>To access the FX through a communication interface, you must log in. For details, see section 8.2 in the <strong>FX1000 User’s Manual</strong>, IM 04L21B01-01EN.</td>
</tr>
<tr>
<td></td>
<td>(Security &gt; Communication)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Login</td>
<td>Register the users who can access the Web server. For details, see section 8.2 in the <strong>FX1000 User’s Manual</strong>, IM 04L21B01-01EN.</td>
</tr>
<tr>
<td>3</td>
<td>Web page</td>
<td>Set Access control to On in the operator and monitor pages.</td>
</tr>
</tbody>
</table>

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.
1.5 Monitoring the FX on a PC Browser

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%

---

**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.
1.5 Monitoring the FX on a PC Browser

Contents of the Operator Page

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.
1.5 Monitoring the FX on a PC Browser

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.

<table>
<thead>
<tr>
<th>Status</th>
<th>Channel</th>
<th>Type</th>
<th>Alarm Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ABC-3</td>
<td>L</td>
<td>2008/12/06 16:06:41</td>
</tr>
<tr>
<td>OFF</td>
<td>ABC-1</td>
<td>III</td>
<td>2008/12/06 16:06:41</td>
</tr>
<tr>
<td>OFF</td>
<td>ABC-2</td>
<td>H</td>
<td>2008/12/06 16:06:41</td>
</tr>
<tr>
<td>ACK</td>
<td>ABC-2</td>
<td></td>
<td>2008/12/06 16:06:41</td>
</tr>
<tr>
<td>ON</td>
<td>ABC-4</td>
<td>III</td>
<td>2008/12/06 16:06:41</td>
</tr>
</tbody>
</table>

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.

Log
Displays the message summary, 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.
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.

<table>
<thead>
<tr>
<th>Server</th>
<th>FTP</th>
<th>Web</th>
<th>SMTP</th>
<th>Modbus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server</td>
<td>Use</td>
<td>Use</td>
<td>Not</td>
<td>Not</td>
</tr>
</tbody>
</table>

- 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.

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTP Server Details</td>
</tr>
<tr>
<td>Output Directory Format</td>
</tr>
</tbody>
</table>

- 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.

<table>
<thead>
<tr>
<th>File Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display data file</td>
<td>Data files are automatically transferred at each file save interval.</td>
</tr>
<tr>
<td>Event data file</td>
<td>Files are automatically transferred when the data length of data is recorded.</td>
</tr>
<tr>
<td>Report data file</td>
<td>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.</td>
</tr>
<tr>
<td>Snapshot data file</td>
<td>The files are automatically transferred when a snapshot is executed. 1: Indicates a snapshot taken using the FUNC key, communication command (EV2 command), USER key, or remote control function.</td>
</tr>
</tbody>
</table>

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

- **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.
1.7 Transferring Measurement Data Files and Other Files from the FX

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.
1.7 Transferring Measurement Data Files and Other Files from the FX

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.

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use/Not</td>
</tr>
<tr>
<td>Server name</td>
</tr>
<tr>
<td>Port number</td>
</tr>
<tr>
<td>Access interval</td>
</tr>
<tr>
<td>Access reference time</td>
</tr>
<tr>
<td>Access timeout</td>
</tr>
<tr>
<td>Time adjust on Start action</td>
</tr>
</tbody>
</table>

• **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.
1.8 Synchronizing the Time

**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**

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Server</td>
<td>Use</td>
<td></td>
</tr>
<tr>
<td>FTP</td>
<td>Use</td>
<td></td>
</tr>
<tr>
<td>NTP</td>
<td></td>
<td>Not</td>
</tr>
<tr>
<td>SNTP</td>
<td></td>
<td>Not</td>
</tr>
<tr>
<td>Modbus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **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.
1.9 Using the Modbus Server Function

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

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

- **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.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D2001</td>
<td>42001</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Register Type</th>
<th>Relative Number</th>
<th>Reference Number</th>
<th>Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hold register</td>
<td>1004</td>
<td>41005</td>
<td>1004 + 40001</td>
</tr>
<tr>
<td></td>
<td>14567</td>
<td>414568</td>
<td>14567 + 400001</td>
</tr>
<tr>
<td>Input register</td>
<td>0000</td>
<td>30001</td>
<td>0000 + 30001</td>
</tr>
</tbody>
</table>

- **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)

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  
C01  
Register of instrument A  
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  
C03  
Register of instrument B  
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  
C01  
C02  
Register of instrument B  
30001  
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  
C04  
Register of instrument B  
30005 lower bytes  
30006 higher bytes  
32-bit floating point

Command setting

R-M  C04 - C04 ← 2 30005 FLOAT_L
1.10 Using Modbus to Read Data From and Write Data to Other Devices

Writing Measured Values to the Server

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

  ![Diagram of measurement values]

  **Command setting**
  
  \[
  \text{W} \quad 001 - 001 \quad \Rightarrow \quad 1 \quad 40001 \quad \text{INT16}
  \]

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.

  ![Diagram of computation values]

  **Command setting**
  
  \[
  \text{W-M} \quad 101 - 101 \quad \Rightarrow \quad 1 \quad 40001 \quad \text{INT32_L}
  \]

  \[
  \text{W-M} \quad 101 - 101 \quad \Rightarrow \quad 1 \quad 40002 \quad \text{INT32_H}
  \]
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

- 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.

<table>
<thead>
<tr>
<th>Status Lamp</th>
<th>Detail Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Good</td>
<td>Communication is operating normally.</td>
</tr>
<tr>
<td>Yellow</td>
<td>None</td>
<td>No response from the server device.</td>
</tr>
<tr>
<td>Orange</td>
<td>Func</td>
<td>The server device cannot execute the command from the FX.</td>
</tr>
<tr>
<td>Red</td>
<td>Regi</td>
<td>The server device does not have the specified register.</td>
</tr>
<tr>
<td>Common to yellow, orange, and red</td>
<td>Err</td>
<td>There is an error in the response data from the server device.</td>
</tr>
<tr>
<td></td>
<td>Link</td>
<td>Ethernet cable is disconnected.</td>
</tr>
<tr>
<td></td>
<td>Host</td>
<td>Unable to resolve the IP address from the host name.</td>
</tr>
<tr>
<td></td>
<td>Cnct</td>
<td>Failed to connect to the server.</td>
</tr>
<tr>
<td></td>
<td>Send</td>
<td>Failed to transmit the command.</td>
</tr>
<tr>
<td></td>
<td>BRKN</td>
<td>Failed to receive the response data or detected a disconnection.</td>
</tr>
<tr>
<td></td>
<td>(Space)</td>
<td>The detail code is not displayed until the status is confirmed when communication is started.</td>
</tr>
</tbody>
</table>
1.10 Using Modbus to Read Data From and Write Data to Other Devices

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 Group 1.
- 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.

\[
\text{Value on the computation channel 101 of the FX1000 client} = \text{Communication input data C01} \times 0.0001
\]
1.11 Usage Example of the Modbus Function

**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**.

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus</td>
<td>Use</td>
</tr>
</tbody>
</table>

**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**.

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-CH, Last-CH</td>
<td>001</td>
</tr>
<tr>
<td>Mode</td>
<td>Volt</td>
</tr>
<tr>
<td>Range</td>
<td>2V</td>
</tr>
<tr>
<td>Span_L</td>
<td>-2.0000</td>
</tr>
<tr>
<td>Span_U</td>
<td>2.0000</td>
</tr>
</tbody>
</table>

**Usage Example of the Modbus Function**
1.11 Usage Example of the Modbus Function

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port</td>
<td>502</td>
</tr>
<tr>
<td>Modbus server name</td>
<td>192.168.1.101</td>
</tr>
<tr>
<td>Unit</td>
<td>Auto</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command type</td>
<td>R-M</td>
</tr>
<tr>
<td>First and Last</td>
<td>C01</td>
</tr>
<tr>
<td>Server</td>
<td>1</td>
</tr>
<tr>
<td>Regi.</td>
<td>300001</td>
</tr>
<tr>
<td>Type</td>
<td>INT16</td>
</tr>
</tbody>
</table>
1.11 Usage Example of the Modbus Function

Setting the Computation Channel

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-CH, Last-CH</td>
<td>101</td>
</tr>
<tr>
<td>Math</td>
<td>On</td>
</tr>
<tr>
<td>Calculation expression</td>
<td>C01*K01</td>
</tr>
<tr>
<td>Span_L</td>
<td>-2.0000</td>
</tr>
<tr>
<td>Span_U</td>
<td>2.0000</td>
</tr>
<tr>
<td>Unit</td>
<td>V</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of constant</td>
<td>K01</td>
</tr>
<tr>
<td>Value</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Assigning the channel to a Group

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group number</td>
<td>1</td>
</tr>
<tr>
<td>Group set</td>
<td>On</td>
</tr>
<tr>
<td>Group name</td>
<td>GROUP 1</td>
</tr>
<tr>
<td>CH set</td>
<td>101</td>
</tr>
<tr>
<td>Trip line</td>
<td></td>
</tr>
<tr>
<td>1 Off</td>
<td></td>
</tr>
<tr>
<td>2 Off</td>
<td></td>
</tr>
<tr>
<td>3 Off</td>
<td></td>
</tr>
<tr>
<td>4 Off</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group number</td>
<td>1</td>
</tr>
<tr>
<td>On/Off</td>
<td>On</td>
</tr>
<tr>
<td>Group name</td>
<td>GROUP 1</td>
</tr>
<tr>
<td>CH set</td>
<td>101</td>
</tr>
</tbody>
</table>
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.

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 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.
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.
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.
2.1 What You Can Do with the FX1000

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](image)

Serial communication

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 type

RS-232

Setting the handshaking

Set the address

RS-422A/485

Set the protocol

Set the Modbus master

Configuration required when Modbus master is selected in the protocol setting.

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

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

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

Connection
- Signal direction
• Connection example

• **OFF-OFF/XON-XON**

<table>
<thead>
<tr>
<th>PC</th>
<th>FX</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>3 SD</td>
</tr>
<tr>
<td>RD</td>
<td>2 RD</td>
</tr>
<tr>
<td>RS</td>
<td>7 RS</td>
</tr>
<tr>
<td>CS</td>
<td>8 CS</td>
</tr>
<tr>
<td>SG</td>
<td>5 SG</td>
</tr>
</tbody>
</table>

• **XON-RS(XON-RTS)**

<table>
<thead>
<tr>
<th>PC</th>
<th>FX</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD</td>
<td>3 SD</td>
</tr>
<tr>
<td>RD</td>
<td>2 RD</td>
</tr>
<tr>
<td>RS</td>
<td>7 RS</td>
</tr>
<tr>
<td>CS</td>
<td>8 CS</td>
</tr>
<tr>
<td>SG</td>
<td>5 SG</td>
</tr>
</tbody>
</table>

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)**

<table>
<thead>
<tr>
<th>Handshaking</th>
<th>Data transmission control (Control used when sending data to a computer)</th>
<th>Data Reception Control (Control used when receiving data from a computer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Software Handshaking</td>
<td>Hardware Handshaking</td>
</tr>
<tr>
<td>OFF-OFF</td>
<td>Stops transmission when X-OFF is received. Resume when X-ON is received.</td>
<td></td>
</tr>
<tr>
<td>XON-XON</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>XON-RS</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>CS-RS</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

• **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).
2.3 Connecting the FX

- **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. $RS = \text{True (fixed)}$.

- **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.

(To be continued)

Each terminal corresponds to the signal indicated below.

<table>
<thead>
<tr>
<th>Signal Name</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>FG</td>
<td>Frame ground of the FX.</td>
</tr>
<tr>
<td>SG</td>
<td>Signal ground.</td>
</tr>
<tr>
<td>SDB</td>
<td>Send data B (+).</td>
</tr>
<tr>
<td>SDA</td>
<td>Send data A (–).</td>
</tr>
<tr>
<td>RDB</td>
<td>Receive data B (+).</td>
</tr>
<tr>
<td>RDA</td>
<td>Receive data A (–).</td>
</tr>
</tbody>
</table>

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.

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

RS-232 to RS-422A/485 converter

RS-422A/485 terminal on the FX
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.

<table>
<thead>
<tr>
<th>RS-422A/485 Port</th>
<th>Converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA(–)</td>
<td>TD(–)</td>
</tr>
<tr>
<td>SDB(+)</td>
<td>TD(+)</td>
</tr>
<tr>
<td>RDA(–)</td>
<td>RD(–)</td>
</tr>
<tr>
<td>RDB(+)</td>
<td>RD(+)</td>
</tr>
<tr>
<td>SG</td>
<td>SHIELD</td>
</tr>
<tr>
<td>FG</td>
<td>EARTH</td>
</tr>
</tbody>
</table>

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.

- **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.
2.3 Connecting the FX

**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.
2.4 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.

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial basic settings</td>
</tr>
<tr>
<td>Baud rate</td>
</tr>
<tr>
<td>Data length</td>
</tr>
<tr>
<td>Parity</td>
</tr>
<tr>
<td>Handshaking</td>
</tr>
<tr>
<td>Address</td>
</tr>
<tr>
<td>Protocol</td>
</tr>
</tbody>
</table>

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**
  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
- **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.

<table>
<thead>
<tr>
<th>Communication condition</th>
<th>Register number</th>
<th>Address for a slave device</th>
<th>FX channels</th>
<th>Detail code</th>
<th>Status lamp</th>
<th>Cursor to select a command (Used when resuming command transmission to a slave device using the front panel keys)</th>
</tr>
</thead>
</table>
2.6 Using Modbus to Read Data From and Write Data to Other Devices

- **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.

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

**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 Group 1.
- 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.

\[
\text{Value on the computation channel 101 of the FX master} = \text{Communication input data C01} \times 0.0001
\]
2.7 Usage Example of the Modbus Function

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>1</td>
</tr>
<tr>
<td>Protocol</td>
<td>Modbus</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-CH, Last-CH</td>
<td>001</td>
</tr>
<tr>
<td>Mode</td>
<td>Volt</td>
</tr>
<tr>
<td>Range</td>
<td>2V</td>
</tr>
<tr>
<td>Span_L</td>
<td>-2.0000</td>
</tr>
<tr>
<td>Span_U</td>
<td>2.0000</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>You can specify any value. The Modbus master does not use this setting.</td>
</tr>
<tr>
<td>Protocol</td>
<td>Modbus-M</td>
</tr>
<tr>
<td>Note:</td>
<td>Set the communication conditions the same as those of the slave device.</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command type</td>
<td>R-M</td>
</tr>
<tr>
<td>First and Last</td>
<td>C01</td>
</tr>
<tr>
<td>Addr.</td>
<td>1</td>
</tr>
<tr>
<td>Regi.</td>
<td>3000001</td>
</tr>
<tr>
<td>Type</td>
<td>INT16</td>
</tr>
</tbody>
</table>

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."
2.8 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 syntax diagram]

Command example

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

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—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
3.1 Command Syntax

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.
3.1 Command Syntax

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

<table>
<thead>
<tr>
<th>Command Name</th>
<th>Function</th>
<th>Execution Mode</th>
<th>Administrator</th>
<th>User</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR</td>
<td>Sets an input range</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-12</td>
</tr>
<tr>
<td>SO</td>
<td>Sets an expression (/M1, /PM1, /PWR1, and /PWR5 options)</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-14</td>
</tr>
<tr>
<td>TJ</td>
<td>Sets memory sampling</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-14</td>
</tr>
<tr>
<td>SA</td>
<td>Sets an alarm</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-15</td>
</tr>
<tr>
<td>SW</td>
<td>Sets the trend interval and auto save interval</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-16</td>
</tr>
<tr>
<td>TW</td>
<td>Sets the secondary trend interval</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-16</td>
</tr>
<tr>
<td>TE</td>
<td>Sets sampling conditions for event data</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-17</td>
</tr>
<tr>
<td>AZ</td>
<td>Sets a zone</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-17</td>
</tr>
<tr>
<td>SP</td>
<td>Sets a partial expanded display</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-17</td>
</tr>
<tr>
<td>ST</td>
<td>Sets a tag</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-18</td>
</tr>
<tr>
<td>SX</td>
<td>Sets a display group</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-18</td>
</tr>
<tr>
<td>SL</td>
<td>Sets a trip line</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-18</td>
</tr>
<tr>
<td>SG</td>
<td>Sets a message</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-18</td>
</tr>
<tr>
<td>TH</td>
<td>Sets the directory on the external storage medium for saving data</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-18</td>
</tr>
<tr>
<td>TZ</td>
<td>Sets a file header</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-18</td>
</tr>
<tr>
<td>TF</td>
<td>Sets a data file name</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-19</td>
</tr>
<tr>
<td>SD</td>
<td>Sets the date and time</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-19</td>
</tr>
<tr>
<td>TD</td>
<td>Sets daylight saving time</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-19</td>
</tr>
<tr>
<td>TT</td>
<td>Sets the trend display</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-19</td>
</tr>
<tr>
<td>SE</td>
<td>Sets the line width and the number of grid sections to use on the trend graph</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-20</td>
</tr>
<tr>
<td>TB</td>
<td>Sets the bar graph display</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-20</td>
</tr>
<tr>
<td>SB</td>
<td>Sets the bar graph for a channel</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-20</td>
</tr>
<tr>
<td>TN</td>
<td>Sets a scale</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-20</td>
</tr>
<tr>
<td>SV</td>
<td>Sets a measurement channel’s moving average</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-20</td>
</tr>
<tr>
<td>SC</td>
<td>Sets a channel display color</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-20</td>
</tr>
<tr>
<td>TA</td>
<td>Sets an alarm point mark</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-20</td>
</tr>
<tr>
<td>TG</td>
<td>Sets a color scale band</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-21</td>
</tr>
<tr>
<td>SQ</td>
<td>Sets the LCD brightness and the screen backlight saver</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-21</td>
</tr>
<tr>
<td>TC</td>
<td>Sets the background color</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-21</td>
</tr>
<tr>
<td>TP</td>
<td>Sets automatic display group switching</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-21</td>
</tr>
<tr>
<td>TR</td>
<td>Sets the automatic monitor return function</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-22</td>
</tr>
<tr>
<td>Command Name</td>
<td>Function</td>
<td>Execution Mode</td>
<td>Administrator</td>
<td>User</td>
<td>Page</td>
</tr>
<tr>
<td>--------------</td>
<td>----------</td>
<td>----------------</td>
<td>---------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>TQ</td>
<td>Sets a timer</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-22</td>
</tr>
<tr>
<td>TK</td>
<td>Sets a match time timer</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-22</td>
</tr>
<tr>
<td>TU</td>
<td>Sets an event action</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-23</td>
</tr>
<tr>
<td>SK</td>
<td>Sets a computation constant (/M1, /PM1, /PWR1, and /PWR5 options)</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-24</td>
</tr>
<tr>
<td>SI</td>
<td>Sets the rolling average function of a computation channel (/M1, /PM1, /PWR1, and /PWR5 options)</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-24</td>
</tr>
<tr>
<td>SJ</td>
<td>Sets a TLOG timer (/M1, /PM1, /PWR1, and /PWR5 options)</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-24</td>
</tr>
<tr>
<td>TX</td>
<td>Sets the ancillary operation of the start key (/M1, /PM1, /PWR1, and /PWR5 options)</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-24</td>
</tr>
<tr>
<td>BH</td>
<td>Sets a batch text field</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-25</td>
</tr>
<tr>
<td>EH</td>
<td>Sets calibration correction (/CC1 option)</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-25</td>
</tr>
<tr>
<td>BD</td>
<td>Sets an alarm delay</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-25</td>
</tr>
<tr>
<td>NP</td>
<td>Sets the VT ratio, CT ratio, and low-cut power (/PWR1 or /PWR5 option)</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-25</td>
</tr>
<tr>
<td>FR</td>
<td>Sets the interval for acquiring data to the FIFO buffer</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-26</td>
</tr>
<tr>
<td>SM</td>
<td>Sets the custom menu</td>
<td>Operation mode</td>
<td>Yes</td>
<td>No</td>
<td>3-27</td>
</tr>
</tbody>
</table>
### 3.2 List of Commands

#### Control Commands

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

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.

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

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

### Output Commands

**Note**

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

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

### Common commands among instruments

* * Outputs instrument information (cold reset) | All modes | Yes | Yes | 3-52 |

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

<table>
<thead>
<tr>
<th>Command Name</th>
<th>Function</th>
<th>Administrator</th>
<th>User</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>close</td>
<td>Closes another device’s connection</td>
<td>Yes</td>
<td>No</td>
<td>3-52</td>
</tr>
<tr>
<td>con</td>
<td>Outputs connection information</td>
<td>Yes</td>
<td>Yes</td>
<td>3-52</td>
</tr>
<tr>
<td>eth</td>
<td>Outputs Ethernet statistics</td>
<td>Yes</td>
<td>Yes</td>
<td>3-53</td>
</tr>
<tr>
<td>help</td>
<td>Outputs help</td>
<td>Yes</td>
<td>Yes</td>
<td>3-53</td>
</tr>
<tr>
<td>net</td>
<td>Outputs network statistics</td>
<td>Yes</td>
<td>Yes</td>
<td>3-53</td>
</tr>
<tr>
<td>quit</td>
<td>Closes the connection to the instrument that you are operating</td>
<td>Yes</td>
<td>Yes</td>
<td>3-53</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>serial</td>
<td>Outputs the serial number</td>
<td>3-54</td>
</tr>
<tr>
<td>host</td>
<td>Outputs the host name</td>
<td>3-54</td>
</tr>
<tr>
<td>ip</td>
<td>Outputs the IP address</td>
<td>3-54</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Measuring Range</th>
<th>Input Type</th>
<th>Selectable Range of the Measuring Range</th>
<th>Specified Range</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLT 20mV</td>
<td>–20.000mV to 20.000mV</td>
<td>–10.000mV to 20.000mV</td>
<td>–10000 to 20000</td>
<td></td>
</tr>
<tr>
<td>/SQR 2V</td>
<td>–2.0000V to 2.0000V</td>
<td>–2.0000V to 0.5000V</td>
<td>–20000 to 5000</td>
<td></td>
</tr>
<tr>
<td>TC R</td>
<td>0.0 to 1700.0</td>
<td>0.0 to 400.0</td>
<td>0 to 4000</td>
<td></td>
</tr>
<tr>
<td>TC K</td>
<td>–200.0 to 1370.0</td>
<td>–200.0 to 1370.0</td>
<td>–20000 to 13700</td>
<td></td>
</tr>
<tr>
<td>RTD Pt100</td>
<td>–200.0 to 600.0</td>
<td>–10.0 to 500.0</td>
<td>–100 to 5000</td>
<td></td>
</tr>
<tr>
<td>DI LEVEL</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td></td>
</tr>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Input Type Parameter</th>
<th>Range</th>
<th>Range Parameter</th>
<th>Required Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC voltage</td>
<td>VOLT</td>
<td>20 mV</td>
<td>20 mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 mV</td>
<td>60 mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>200 mV</td>
<td>200 mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 V</td>
<td>1 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 V</td>
<td>2 V</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>6 V</td>
<td>6 V</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>20 V</td>
<td>20 V</td>
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</tr>
<tr>
<td></td>
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<td>50 V</td>
<td>50 V</td>
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<tr>
<td>Thermocouple</td>
<td>TC</td>
<td>R</td>
<td>R</td>
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<td></td>
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<td>KP vs Au7Fe</td>
<td>KP /N3F</td>
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<td>PLATINEL</td>
<td>PLATI /N3F</td>
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<td>PR40-20</td>
<td>PR /N3F</td>
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<td>NiNiMo</td>
<td>NiMO /N3F</td>
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<td>W/Re26</td>
<td>W/RE /N3F</td>
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<td>TypeN (AWG14)</td>
<td>N2 /N3F</td>
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<td></td>
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<td>XK GOST</td>
<td>XK /N3F</td>
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<tr>
<td>RTD</td>
<td>RTD</td>
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<td>Ni100 (SAMA)</td>
<td>Ni1 /N3F</td>
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<td>Ni100 (DIN)</td>
<td>Ni2 /N3F</td>
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<td></td>
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<td>Ni120</td>
<td>Ni3 /N3F</td>
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<td></td>
<td></td>
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</tbody>
</table>

**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 10.0°C, and the span upper limit to 100.0°C.
  SR001,TC,R,10,100
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,10,100,001
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,1000,5000,1.00,5.00,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.
### 3.4 Setting Commands

#### 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)

**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 m³/s, and the scaling upper limit to 100.0 m³/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
```

- **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)

**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
```

- **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 15)
- **p7**: Exponent of the scaling lower limit (–15 to 999)
- **p8**: Mantissa of the scaling upper limit (100 to 15)
- **p9**: Exponent of the scaling upper limit (–15 to 999)
- **p10**: Unit (up to 6 characters)

**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, and the unit to Unit1.

```
SR001,LogT1,6V,1000,5000,100,1000,1,\n```

**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.
3.4 Setting Commands

- **When Setting Channels to Log Linear Input/ Pseudo log input**

  **Syntax**
  
  \[SR\ p_1,p_2,p_3,p_4,p_5,p_6,p_7,p_8,p_9,p_{10} <\text{terminator}>\]
  
  \(p_1\) Measurement channel number
  \(p_2\) Setting type (LogT2)
  \(p_3\) Measuring range (20MV, 60MV, 200MV, 1V, 2V, 6V, 20V, 50V)
  \(p_4\) Span lower limit
  \(p_5\) Span upper limit
  \(p_6\) Mantissa of the scaling lower limit (100 to 999)
  \(p_7\) Exponent of the scaling lower limit (–15 to 15)
  \(p_8\) Mantissa of the scaling upper limit (Don’t care)
  \(p_9\) Exponent of the scaling upper limit (–15 to 15)
  \(p_{10}\) Unit (up to 6 characters)

  **Query**
  
  \[SR[p_1]?\]

  **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.

  \[SR001,\text{LogT2},6V,1000,5000,100,1,100,4\]

  **Description**
  - Set the parameters so that \(p_4\) is less than \(p_5\).
  - The settable scaling range is 1.00E–15 to 1.00E+15.
  - Use three digits to set \(p_6\). "100" means “1.00.”
  - You cannot set \(p_8\). It is set to the same value as \(p_6\).
  - You can set the parameters so that \(p_7\) is less than \(p_9\) or \(p_7\) is greater than \(p_9\).
  - Set the parameters so that the absolute value of \(p_9 – p_7\) is greater than or equal to 1 and less than or equal to 15.
  - When \(p_6\) is a value other than 100, the maximum value of the exponent is 14, and the maximum absolute value of \(p_9 – p_7\) is 14.

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

  **Syntax**
  
  \[SO\ p_1,p_2,p_3,p_4,p_5,p_6,p_7<\text{terminator}>\]
  
  \(p_1\) Computation channel number
  \(p_2\) Computation (ON, OFF)
  \(p_3\) Expression (up to 120 characters)
  \(p_4\) Span lower limit (–9999999 to 99999999)
  \(p_5\) Span upper limit (–9999999 to 99999999)
  \(p_6\) Span decimal place (0 to 4)
  \(p_7\) Unit (up to 6 characters)

  **Query**
  
  \[SO[p_1]?\]

  **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.

  \[SO106,\text{ON},001+002,-100000,150000,4,V\]

  **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 \(p_1\) by referring to the table in section 3.3.
  - For parameters \(p_4\), \(p_5\), and \(p_6\), either set all three parameters, or omit all three parameters.

- **TJ** Sets memory sampling

  **Syntax**
  
  \[TJ\ p_1,p_2<\text{terminator}>\]
  
  \(p_1\) Measurement or computation channel number
  \(p_2\) Memory sampling (OFF, ON)

  **Query**
  
  \[TJ[p_1]?\]

  **Example**
  
  Perform memory sampling on channel 002.

  \[TJ002,\text{ON}\]

  **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.
3.4 Setting Commands

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

- `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`: 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,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 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:
        - 999999 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.
### 3.4 Setting Commands

- 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. In queries, this parameter will always be returned as “On.”
- Parameter p9 is valid when p1 is set to a measurement channel.
- You can specify computation channels (including in queries) on models with the /M1, /PM1, /PWR1, or /PWR5 math option.

#### 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)
```

**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.

### 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,25,1.00
```

**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).
### 3.4 Setting Commands

#### ST Sets a tag

<table>
<thead>
<tr>
<th>Syntax</th>
<th>ST p1,p2&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1</td>
<td>Measurement or computation channel number</td>
</tr>
<tr>
<td>p2</td>
<td>Tag (up to 16 characters)</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Syntax</th>
<th>SX p1,p2,p3,p4&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1</td>
<td>Display group number</td>
</tr>
<tr>
<td>p2</td>
<td>Enable or disable (ON, OFF)</td>
</tr>
<tr>
<td>p3</td>
<td>Display group name (up to 16 characters)</td>
</tr>
<tr>
<td>p4</td>
<td>Channel configuration</td>
</tr>
</tbody>
</table>

**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

**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.

#### SL Sets a trip line

<table>
<thead>
<tr>
<th>Syntax</th>
<th>SL p1,p2,p3,p4,p5,p6&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1</td>
<td>Display group number</td>
</tr>
<tr>
<td>p2</td>
<td>Trip line number (1 to 4)</td>
</tr>
<tr>
<td>p3</td>
<td>Trip line display (ON, OFF)</td>
</tr>
<tr>
<td>p4</td>
<td>Display position (0 to 100) as a percentage</td>
</tr>
<tr>
<td>p5</td>
<td>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)</td>
</tr>
<tr>
<td>p6</td>
<td>Line width (1, 2, 3)</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Syntax</th>
<th>SG p1,p2&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1</td>
<td>Message number (1 to 100)</td>
</tr>
<tr>
<td>p2</td>
<td>Message (up to 32 characters)</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Syntax</th>
<th>TH p1&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1</td>
<td>Directory name (up to 20 characters)</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Syntax</th>
<th>TZ p1,p2&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1</td>
<td>Fixed to 1</td>
</tr>
<tr>
<td>p2</td>
<td>File header (up to 50 characters)</td>
</tr>
</tbody>
</table>

**Query**

TZ[p1]?

**Example**

Set the header to “FX1000DATA.”

TZ1,FX1000DATA
### 3.4 Setting Commands

#### 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** Horizontal wide display  
  - **VERTICAL**
- **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
### 3.4 Setting 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 sections (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
  ```

#### 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
  ```

#### 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
  ```

#### 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 of time 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 color (WHITE, BLACK)
- **p2**: Historical trend screen color (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
```
3.4 Setting 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, 20MIN, 30MIN, 1H to 4H, 6H, 8H, 12H, 24H)

p4 Reference time (hh; fixed format)

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)
### 3.4 Setting Commands

**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: General timer for a remote control input
  - MATCHTIMETIMER: Match time timer
  - 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 number
- **p4**  Action type
  - MEMORYSTART/STOP: Memory start or stop
  - MEMORYSTART: Memory start
  - MEMORYSTOP: Memory stop
  - TRIGGER: Event trigger
  - ALARMACK: Alarm acknowledgment
  - 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

- **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.
### 3.4 Setting 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, 15S, 20S, 30S, 1MIN, 2MIN, 3MIN, 4MIN, 5MIN, 6MIN, 10MIN, 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** \( \Sigma(\text{measured value}) \)
- **/S** \( \Sigma(\text{measured value}) \times \text{scan interval} \)
- **/MIN** \( \Sigma(\text{measured value}) \times \text{scan interval}/60 \)
- **/HOUR** \( \Sigma(\text{measured value}) \times \text{scan interval}/3600 \)

The scan interval unit is seconds.
3.4 Setting Commands

TX
Sets the ancillary operation of the start key (/IM1,/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

Example
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
### 3.4 Setting 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.

<table>
<thead>
<tr>
<th>Parameter Range</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>p3</td>
<td>p4</td>
</tr>
<tr>
<td>2</td>
<td>5 to 99999</td>
</tr>
<tr>
<td>1</td>
<td>10000 to 99999</td>
</tr>
<tr>
<td>0</td>
<td>10000 to 32000</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Secondary Rated Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-phase two-wire system</td>
<td>PWR1</td>
</tr>
<tr>
<td>120 V</td>
<td>100 W</td>
</tr>
<tr>
<td>240 V</td>
<td>200 W</td>
</tr>
<tr>
<td>Single-phase three-wire system</td>
<td>200 V</td>
</tr>
<tr>
<td>Three-phase two-wire system</td>
<td>120 V</td>
</tr>
<tr>
<td>Three-phase three-wire system</td>
<td>240 V</td>
</tr>
</tbody>
</table>

**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.

---

3-26
### 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
- OVERVIEW
- INFORMATION
- TRENDHISTORY
- LOG
- ESC
- SEPARATOR

**Example**
Set the first menu item to TREND and the second menu item to TRENDHISTORY.
```
SM DISP_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
### 3.4 Setting Commands

When \( p2 \) is set to **INFORMATION**, select from the items below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ALAR</strong></td>
<td>Alarm summary</td>
</tr>
<tr>
<td><strong>MESSAGE</strong></td>
<td>Message summary</td>
</tr>
<tr>
<td><strong>MEMORY</strong></td>
<td>Memory summary</td>
</tr>
<tr>
<td><strong>MODBUS_CLIENT</strong></td>
<td>Modbus TCP status display</td>
</tr>
<tr>
<td><strong>MODBUS_MASTER</strong></td>
<td>Modbus RTU status display</td>
</tr>
<tr>
<td><strong>RELAY</strong></td>
<td>Relay status display</td>
</tr>
<tr>
<td><strong>REPORT</strong></td>
<td>Report display</td>
</tr>
<tr>
<td><strong>TO_HISTORY</strong></td>
<td>To the historical display</td>
</tr>
<tr>
<td><strong>TO_HISTORY_D</strong></td>
<td>To historical (display data)</td>
</tr>
<tr>
<td><strong>TO_HISTORY_E</strong></td>
<td>To historical (event data)</td>
</tr>
<tr>
<td><strong>TO_OVERVIEW</strong></td>
<td>To the overview display</td>
</tr>
<tr>
<td><strong>SORT_KEY</strong></td>
<td>Sort key switching</td>
</tr>
<tr>
<td><strong>SORT_ORDER</strong></td>
<td>Sort order switching</td>
</tr>
<tr>
<td><strong>DISP_ITEM</strong></td>
<td>Date/user name switching</td>
</tr>
<tr>
<td><strong>DATA_KIND</strong></td>
<td>Data type switching</td>
</tr>
<tr>
<td><strong>DATE/FILE</strong></td>
<td>Date/file name switching</td>
</tr>
<tr>
<td><strong>SELECT_SAVE</strong></td>
<td>Select save</td>
</tr>
<tr>
<td><strong>REPORT_CHANNEL</strong></td>
<td>Report channel display switching</td>
</tr>
<tr>
<td><strong>ALL_SAVE</strong></td>
<td>Save all</td>
</tr>
<tr>
<td><strong>MANUAL_SAVE</strong></td>
<td>Save manual samples</td>
</tr>
<tr>
<td><strong>REPORT_SAVE</strong></td>
<td>Save reports</td>
</tr>
<tr>
<td><strong>DATA_SAVE_MODE</strong></td>
<td>Data save mode</td>
</tr>
<tr>
<td><strong>COLUMN_BAR</strong></td>
<td>Stacked bar graph</td>
</tr>
<tr>
<td><strong>COLUMN_BAR_DISP</strong></td>
<td>Single graph or dual graph</td>
</tr>
<tr>
<td><strong>COLUMN_BAR_SELECT</strong></td>
<td>Selects bar or group</td>
</tr>
<tr>
<td><strong>REPORT_GROUP{1 to 4}</strong></td>
<td>Selects the report group</td>
</tr>
<tr>
<td><strong>DISP_GROUP</strong></td>
<td>Group number display</td>
</tr>
<tr>
<td><strong>SEPARATOR</strong></td>
<td></td>
</tr>
</tbody>
</table>

When \( p2 \) is set to **LOG**, select from the items below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOGIN_LOG</strong></td>
<td>Login log</td>
</tr>
<tr>
<td><strong>ERROR_LOG</strong></td>
<td>Error log</td>
</tr>
<tr>
<td><strong>COMMU_LOG</strong></td>
<td>Communication log</td>
</tr>
<tr>
<td><strong>FTP_LOG</strong></td>
<td>FTP log</td>
</tr>
<tr>
<td><strong>WEB_LOG</strong></td>
<td>Web log</td>
</tr>
<tr>
<td><strong>MAIL_LOG</strong></td>
<td>E-mail log</td>
</tr>
<tr>
<td><strong>SNTP_LOG</strong></td>
<td>SNTP log</td>
</tr>
<tr>
<td><strong>DHCP_LOG</strong></td>
<td>DHCP log</td>
</tr>
<tr>
<td><strong>MODBUS_LOG</strong></td>
<td>Modbus log</td>
</tr>
</tbody>
</table>

**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 (/C2 or /C3 option).
  - You cannot specify `COMMU_LOG` on models that do not have a serial interface (/IC2 or /IC3 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.
### 3.4 Setting Commands

**Setting the function menu**

<table>
<thead>
<tr>
<th>p1</th>
<th>Type (FUNC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p2</td>
<td>Menu item to display</td>
</tr>
</tbody>
</table>

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**: 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 display
- **TEXT_FIELD**: Registers the screen to return to
- **JUMP_DISPLAY**: System information
- **SYSTEM_INFO**: Network information
- **NETWORK_INFO**: SNTP
- **EMAIL_START/STOP**: Starts or stops sending E-mail
- **EMAIL_TEST**: E-mail transmission test
- **FTP_TEST**: Display FREE MESSAGE and SNAPSHOT on the function menu in that order.

**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, /P,M1, /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
  - HISTORICAL: 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**

- 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**: Screen type (1)
  - 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
```

**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.
3.5 Control Commands

**EV**  Executes manual sample, generates a manual trigger, takes a snapshot, or causes a timeout

Syntax
```
EV p1<terminator>
```

<table>
<thead>
<tr>
<th>p1</th>
<th>Action type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Executes manual sampling</td>
</tr>
<tr>
<td>1</td>
<td>Generates a manual trigger</td>
</tr>
<tr>
<td>2</td>
<td>Takes a snapshot</td>
</tr>
<tr>
<td>3</td>
<td>Causes a timeout in display data</td>
</tr>
<tr>
<td>4</td>
<td>Causes a timeout in event data</td>
</tr>
</tbody>
</table>

Example
```
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.

**BJ**  Writes a free message

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

<table>
<thead>
<tr>
<th>p1</th>
<th>Message number (1 to 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p2</td>
<td>Message (up to 32 characters)</td>
</tr>
<tr>
<td>p3</td>
<td>Message write destination</td>
</tr>
<tr>
<td>p4</td>
<td>Display group number</td>
</tr>
</tbody>
</table>

Example
```
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.

**CL**  Executes manual SNTP (/C7 option)

Syntax
```
CL p1<terminator>
```

Example
```
CL0
```

**CV**  Switches between the normal and secondary trend intervals

Syntax
```
CV p1<terminator>
```

<table>
<thead>
<tr>
<th>p1</th>
<th>Trend interval (0, 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Switches to the first trend interval (the normal trend interval)</td>
</tr>
<tr>
<td>1</td>
<td>Switches to the secondary trend interval</td>
</tr>
</tbody>
</table>

Example
```
CV1
```

**MS**  Writes a message (display and write)

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

<table>
<thead>
<tr>
<th>p1</th>
<th>Message number (1 to 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p2</td>
<td>Message write destination</td>
</tr>
<tr>
<td>p3</td>
<td>Display group number</td>
</tr>
</tbody>
</table>

Example
```
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.

**EJ**  Changes the password of the login function (/C7 option)

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

<table>
<thead>
<tr>
<th>p1</th>
<th>Old password (up to 8 characters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p2</td>
<td>New password (up to 8 characters)</td>
</tr>
<tr>
<td>p3</td>
<td>New password (up to 8 characters)</td>
</tr>
</tbody>
</table>

Example
```
EJ PASS001,WORD005
```

**TL**  Starts, stops, resets computation (MATH) or clears the computation dropout status display (/M1, /PM1, /PWR1, and /PWR5 options)

Syntax
```
TL p1<terminator>
```

<table>
<thead>
<tr>
<th>p1</th>
<th>Action type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Starts computation</td>
</tr>
<tr>
<td>1</td>
<td>Stops computation</td>
</tr>
<tr>
<td>2</td>
<td>Resets computation</td>
</tr>
<tr>
<td>3</td>
<td>Clears the computation data dropout display</td>
</tr>
</tbody>
</table>

Example
```
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>
```

<table>
<thead>
<tr>
<th>p1</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Operation mode</td>
</tr>
<tr>
<td>1</td>
<td>Basic setting mode</td>
</tr>
</tbody>
</table>
### 3.5 Control Commands

#### Example
- Switch the FX to basic setting mode.
  - **DS1**

#### Description
- **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)
  - **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.
### 3.5 Control Commands

**CU**  
**Recovery Modbus manually**

**Syntax**

```
CU p1<terminator>
```

- **p1** Communication type
  - 0 Modbus client (Ethernet)
  - 1 Modbus master (serial)

**Example**

```
CU
```

**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**

```
YO CONFIG1,0
```

**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).

**IR**  
**Resets a relative timer**

**Syntax**

```
IR p1<terminator>
```

- **p1** Number of the timer to reset
  - 0 All timers
  - 1, 2,... Timer number

**Example**

```
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**

```
BV0, "user123."
```

**Description**

You can use this command to enter character strings when the FX is displaying the character input window.

**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**

```
YC2
```

**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).
- 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.
3.6 Basic Setting Commands

**WU**

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

**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 (IC7 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.
3.6 Basic Setting Commands

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 (IC7 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.
### 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.

### 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**
  - **S01** Only specify S01
  - **S01-Sxx** Specify S01 to Sxx
    - **xx** = 02 to 30

### 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
```
**3.6 Basic Setting Commands**

---

**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.

---

**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,p7,p8<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)  
Example: Only lock the MENU key. RFKEY,FREE,FREE,LOCK,FREE,FREE,FREE

---

**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.
3.6 Basic Setting 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)
- **p3** Hour to create reports (hh; fixed format)

**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)

**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.
 Commands

3.6 Basic Setting Commands

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.

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
### 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.
3.6 Basic Setting Commands

**YQ**  
Sets the communication timeout (/C7 option)

When you are not using a timeout

**Syntax**
\[ YQ \text{ p1}<\text{terminator}> \]

**p1**  Communication timeout (OFF)

**Query**
\[ YQ? \]

**Example**
Disable the communication timeout.
\[ YQ\text{OFF} \]

When you are using a timeout

**Syntax**
\[ YQ \text{ p1,p2}<\text{terminator}> \]

**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.
\[ YQ\text{ON},3 \]

**YT**  
Sets the FTP transfer timing (/C7 option)

**Syntax**
\[ YT \text{ p1,p2,p3}<\text{terminator}> \]

**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.
\[ YT\text{ON},OFF \]

**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**
\[ YU \text{ p1,p2,p3,p4,p5,p6,p7,p8,p9,p10, p11,p12}<\text{terminator}> \]

**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.”
\[ YUALARM,ON,OFF,ON,ON,ON,ON,OFF,ALM,LP2,FX \]

When you want to send e-mail at scheduled times

**Syntax**
\[ YU \text{ p1,p2,p3,p4,p5,p6,p7,p8,p9,p10, p11,p12}<\text{terminator}> \]

**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.”
\[ YUTIME,ON,24H,17:15,OFF,,,OFF,ON,GOOD,LP2 \]
3.6 Basic Setting Commands

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.

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.

XY Sets the e-mail SMTP server name (/C7 option)
Syntax  
XY p1, p2, p3<terminator>
  p1 SMTP server name (up to 64 characters)
  p2 Port number (0 to 65535)
  p3 Authentication (OFF, POPBEFORESMTP, AUTH)
Query  
XY?
Example  
Set the SMTP server to “smtp.recorder.com” and the port to 25. Use POP3 authentication.
XYsmtp.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

Description  
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.
### 3.6 Basic Setting Commands

**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

**WR**  Sets the Modbus client's transmit command (/C7 option)

**Syntax**  
WR 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**  WR?[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.
WR5,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
### WC
Sets the SNTP operation that is performed when memory start is executed (/C7 option)

**Syntax**

```plaintext
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**

```plaintext
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`

**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.

### YL
Sets the operation of the Modbus master function (/C2 and /C3 options)

**Syntax**

```plaintext
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,10MIN`

**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**

```plaintext
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 registration 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, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, 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)

---

**WR** 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.
### 3.6 Basic Setting Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
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<td><strong>QA</strong></td>
<td>Sets the number of mantissa digits to display (/LG1 option)</td>
</tr>
<tr>
<td><strong>Syntax</strong></td>
<td>QA p1&lt;terminator&gt;</td>
</tr>
<tr>
<td></td>
<td>p1 Number of digits to display (2, 3)</td>
</tr>
<tr>
<td><strong>Query</strong></td>
<td>QA?</td>
</tr>
<tr>
<td><strong>Example</strong></td>
<td>Set the number of mantissa digits to display to 2. QA2</td>
</tr>
</tbody>
</table>

**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, |

3.7 Output Commands (Control)

**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 checksum (/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.
3.8 Output Commands (Setting, measured, and computed data output)

**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

<table>
<thead>
<tr>
<th>Output Information</th>
<th>Corresponding Command</th>
</tr>
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<td>FD1, FF</td>
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<td>FE5</td>
</tr>
<tr>
<td>Setup alarm information output (binary)</td>
<td>FE6</td>
</tr>
</tbody>
</table>

**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.
### 3.8 Output Commands (Setting, measured, and computed data output)

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<td>p1</td>
<td>Output data type</td>
</tr>
<tr>
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<td>The most recent measured data and computed data in text format</td>
</tr>
<tr>
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<tr>
<td>6</td>
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</tr>
<tr>
<td>p2</td>
<td>First channel number (measurement channel or computation channel)</td>
</tr>
<tr>
<td>p3</td>
<td>Last channel number (measurement channel or computation channel)</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th><strong>FF</strong></th>
<th>Outputs FIFO data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
<td>FF p1, p2, p3, p4&lt;terminator&gt;</td>
</tr>
<tr>
<td>p1</td>
<td>Action type</td>
</tr>
<tr>
<td>GET</td>
<td>Output starting with the next block following the previous output</td>
</tr>
<tr>
<td>RESEND</td>
<td>Retransmit the previous output</td>
</tr>
<tr>
<td>RESET</td>
<td>Set the FIFO buffer read position (block) to the most recent data position (block)</td>
</tr>
<tr>
<td>p2</td>
<td>First channel number (measurement channel or computation channel)</td>
</tr>
<tr>
<td>p3</td>
<td>Last channel number (measurement channel or computation channel)</td>
</tr>
<tr>
<td>p4</td>
<td>Maximum number of blocks to read out</td>
</tr>
<tr>
<td>1200</td>
<td>FX1002, FX1004</td>
</tr>
<tr>
<td>240</td>
<td>FX1006, FX1008, FX1010, FX2012</td>
</tr>
</tbody>
</table>

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 cannot 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.
3.8 Output Commands (Setting, measured, and computed data output)

**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

**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).
- **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.
  - **CHKDSK** Checks the disk. Outputs the free space on the external storage medium.

Example
```
Output the file list output.
ME1
```
### 3.8 Output Commands/3.9 Output Commands

**MO** Manages and outputs the data that has been written to internal memory

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
</table>
| MO p1,p2,p3<terminator> | Type of operation:  
- DIR (Data list output)  
- GET (Data output)  
- SIZR (Data size output)  

**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.
## 3.9 Output Commands (RS-422A/485 commands)

### ESC O  Opens an instrument

ESC is 1BH in ASCII code. For details, see appendix 3.

**Syntax**

```
ESC O p1<terminator>
```

**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.

### ESC C  Closes an instrument

ESC is 1BH in ASCII code. For details, see appendix 3.

**Syntax**

```
ESC C p1<terminator>
```

**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)

### *I  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, 99A0123, 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 to 255.255.255.255)
- **p3** Port on the PC (0 to 65535)

**Example**
```
close,34159,192.168.111.24:1054
```

**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
```

**Active connections**

<table>
<thead>
<tr>
<th>Proto</th>
<th>Local Address</th>
<th>Foreign Address</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP</td>
<td>192.168.111.24:34261</td>
<td>192.168.111.24:1053</td>
<td>ESTABLISHED</td>
</tr>
<tr>
<td>TCP</td>
<td>0.0.0.0:80</td>
<td>0.0.0.0:0</td>
<td>LISTEN</td>
</tr>
<tr>
<td>TCP</td>
<td>0.0.0.0:34261</td>
<td>0.0.0.0:0</td>
<td>LISTEN</td>
</tr>
<tr>
<td>TCP</td>
<td>0.0.0.0:34260</td>
<td>0.0.0.0:0</td>
<td>LISTEN</td>
</tr>
</tbody>
</table>

**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
```

**Ethernet Statistics**

<table>
<thead>
<tr>
<th>Name</th>
<th>In Pkt</th>
<th>In Err</th>
<th>Out Pkt</th>
<th>Out Err</th>
<th>16 Coll</th>
</tr>
</thead>
<tbody>
<tr>
<td>lo0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>lan0</td>
<td>74</td>
<td>0</td>
<td>64</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### help
Outputs help

**Syntax**
```
help[,p1]<terminator>
```
- **p1** Command name

**Example**
```
help
```

**Commands**
- close
- con
- eth
- help
- net
- quit

### net
Outputs network statistics

**Syntax**
```
net<terminator>
```

**Example**
```
net
```

**Network Status**

<table>
<thead>
<tr>
<th>APP: power on time</th>
<th>11/06/08 12:34:56</th>
</tr>
</thead>
<tbody>
<tr>
<td>APP: applive</td>
<td>disable</td>
</tr>
<tr>
<td>APP: genetry</td>
<td>0</td>
</tr>
<tr>
<td>APP: geneok</td>
<td>0</td>
</tr>
<tr>
<td>APP: gedExceptions</td>
<td>0</td>
</tr>
<tr>
<td>APP: diagtry</td>
<td>1</td>
</tr>
<tr>
<td>APP: diagok</td>
<td>1</td>
</tr>
<tr>
<td>APP: diagExceptions</td>
<td>0</td>
</tr>
<tr>
<td>APP: ftpstatus</td>
<td>0</td>
</tr>
<tr>
<td>APP: ftpstatus</td>
<td>0</td>
</tr>
<tr>
<td>APP: ftpsok</td>
<td>0</td>
</tr>
<tr>
<td>APP: ftpsException</td>
<td>0</td>
</tr>
<tr>
<td>TCP: keepalive</td>
<td>30 s</td>
</tr>
<tr>
<td>TCP: connects</td>
<td>14</td>
</tr>
<tr>
<td>TCP: closed</td>
<td>0</td>
</tr>
<tr>
<td>TCP: timeoutdrop</td>
<td>0</td>
</tr>
<tr>
<td>TCP: keepdrops</td>
<td>0</td>
</tr>
<tr>
<td>TCP: sndtotal</td>
<td>53</td>
</tr>
<tr>
<td>TCP: sndbyte</td>
<td>0</td>
</tr>
<tr>
<td>TCP: sndexmtpack</td>
<td>0</td>
</tr>
<tr>
<td>TCP: sndexmtbyte</td>
<td>1</td>
</tr>
<tr>
<td>TCP: rcvtotal</td>
<td>0</td>
</tr>
<tr>
<td>TCP: rcvbyte</td>
<td>0</td>
</tr>
<tr>
<td>DLC: 16 collisions</td>
<td>0</td>
</tr>
</tbody>
</table>
3.12 Instrument Information Output Commands

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: sndrexitpack
  Total number of retransmitted packets
TCP: sndrexitbyte
  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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>serial</td>
<td>Outputs the serial number</td>
</tr>
<tr>
<td>host</td>
<td>Outputs the host name (the host name that you specified in section 1.3)</td>
</tr>
<tr>
<td>ip</td>
<td>Outputs the IP address (the IP address that you specified in section 1.3)</td>
</tr>
</tbody>
</table>

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.
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.

<table>
<thead>
<tr>
<th>Commands</th>
<th>Response</th>
<th>Affirmation</th>
<th>Negation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting commands</td>
<td>Group</td>
<td>Setting</td>
<td>Affirmative response</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic Setting commands</td>
<td></td>
<td>Control</td>
<td></td>
</tr>
<tr>
<td>Output commands</td>
<td></td>
<td>Setup, measurement,</td>
<td>Text output</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and control data</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RS-422A/485 dedicated</td>
<td>Dedicated response</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Special response</td>
<td>Dedicated response</td>
</tr>
<tr>
<td></td>
<td></td>
<td>commands</td>
<td></td>
</tr>
</tbody>
</table>

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
  E0CRLF

- Example
  E0

Single Negative Response
When a command is not processed correctly, a single negative response is returned.

- Syntax
  E1_nnn_mmm...mCRLF
  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.
4.1 Response Syntax

- **Syntax**
  
  ```
  E2_e:nnnCRLF
  E2_e:nnn,e:nnn,⋯,e:nnnCRLF
  ```
  
  (When there is only one error)
  
  (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
  ```

**Binary Output**

**Conceptual Diagram**

```
<table>
<thead>
<tr>
<th>Binary header</th>
<th>Binary data</th>
<th>Binary footer</th>
</tr>
</thead>
<tbody>
<tr>
<td>(12 bytes)</td>
<td></td>
<td>(2 bytes)</td>
</tr>
<tr>
<td>'E'</td>
<td>'B'</td>
<td>CR LF</td>
</tr>
<tr>
<td>Data length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flag ID</td>
<td>Header sum</td>
<td></td>
</tr>
<tr>
<td>Data sum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text format</td>
<td></td>
<td>Binary format</td>
</tr>
<tr>
<td>Binary format</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

**EBCRLF**

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.
### 4.1 Response Syntax

<table>
<thead>
<tr>
<th>Flag</th>
<th>Name (Abbreviation)</th>
<th>Flag</th>
<th>Meaning of the Flag</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>BO</td>
<td>MSB</td>
<td>Output byte order</td>
</tr>
<tr>
<td>1</td>
<td>CS</td>
<td>LSB</td>
<td>Existence of a checksum</td>
</tr>
<tr>
<td>2</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>6</td>
<td>END</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>END</td>
<td>–</td>
<td>Middle End</td>
</tr>
</tbody>
</table>

- 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.

<table>
<thead>
<tr>
<th>ID Number</th>
<th>Binary Data Type</th>
<th>Type</th>
<th>Format</th>
<th>Output Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Undefined file</td>
<td>file (<em>.</em>)</td>
<td>–</td>
<td>ME</td>
</tr>
<tr>
<td>1</td>
<td>Instantaneous data</td>
<td>Data</td>
<td>Yes</td>
<td>FD</td>
</tr>
<tr>
<td>2</td>
<td>FIFO data</td>
<td>Data</td>
<td>Yes</td>
<td>FF</td>
</tr>
<tr>
<td>13</td>
<td>Screen data file</td>
<td>File (*.PNG)</td>
<td>–</td>
<td>ME, FC</td>
</tr>
<tr>
<td>15</td>
<td>Display data file</td>
<td>File (*.DAD)</td>
<td>No</td>
<td>ME</td>
</tr>
<tr>
<td>16</td>
<td>Event data file</td>
<td>File (*.DAE)</td>
<td>No</td>
<td>ME</td>
</tr>
<tr>
<td>17</td>
<td>Manual sample file</td>
<td>File (*.DAM)</td>
<td>Yes</td>
<td>ME, MO</td>
</tr>
<tr>
<td>18</td>
<td>Report file</td>
<td>File (*.DAR)</td>
<td>Yes</td>
<td>ME, MO</td>
</tr>
<tr>
<td>19</td>
<td>Setup data file</td>
<td>File (*.DAM)</td>
<td>Yes</td>
<td>ME, MO</td>
</tr>
<tr>
<td>25</td>
<td>Setup channel information output</td>
<td>Data</td>
<td>Yes</td>
<td>FE4</td>
</tr>
<tr>
<td>26</td>
<td>Configured alarm information output</td>
<td>Data</td>
<td>Yes</td>
<td>FE6</td>
</tr>
</tbody>
</table>

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.
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 checksum 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.

```c
/*
 * Sum Calculation Function (for a 32-bit CPU)
 *
 * Parameter buf: 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{
                unsigned short s;
                unsigned char c[2];
            }tmp;
            tmp.c[1] = 0;
            tmp.c[0] = *((unsigned char *)p);
            csum += tmp.s;
        }
    }
}
```
4.1 Response Syntax

```c
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.

<table>
<thead>
<tr>
<th>Command Syntax</th>
<th>Meaning</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESC Oxx CRLF</td>
<td>Opens the device.</td>
<td>• Response from the device with the specified address ESC Oxx CRLF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• No response when the device with the specified address does not exist(^1).</td>
</tr>
<tr>
<td>ESC Cxx CRLF</td>
<td>Closes the instrument.</td>
<td>• Response from the device with the specified address ESC Cxx CRLF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• No response when the device with the specified address does not exist(^1).</td>
</tr>
</tbody>
</table>

\(^1\): 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.
## 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.

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Corresponding Output Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting data/basic setting data</td>
<td>FE0, FE2</td>
</tr>
<tr>
<td>Decimal position/unit information</td>
<td>FE1</td>
</tr>
<tr>
<td>Measured and computed data</td>
<td>FD0</td>
</tr>
<tr>
<td>Relay status and internal switch status</td>
<td>FD6</td>
</tr>
<tr>
<td>Communication log</td>
<td>FLCOM</td>
</tr>
<tr>
<td>FTP client log</td>
<td>FLFTP</td>
</tr>
<tr>
<td>Operation error log</td>
<td>FLERR</td>
</tr>
<tr>
<td>Login log</td>
<td>FLLOGIN</td>
</tr>
<tr>
<td>Web operation log</td>
<td>FLWEB</td>
</tr>
<tr>
<td>E-mail log</td>
<td>FLEMAIL</td>
</tr>
<tr>
<td>SNTP access log</td>
<td>FLSNTP</td>
</tr>
<tr>
<td>DHCP access log</td>
<td>FLDHCP</td>
</tr>
<tr>
<td>Modbus communication log</td>
<td>FLMODBUS</td>
</tr>
<tr>
<td>Alarm summary</td>
<td>FLALRM</td>
</tr>
<tr>
<td>Message summary</td>
<td>FLMMSG</td>
</tr>
<tr>
<td>Status information</td>
<td>IS0, IS1</td>
</tr>
<tr>
<td>Ethernet information</td>
<td>FAIP</td>
</tr>
<tr>
<td>File list</td>
<td>MEDIR</td>
</tr>
<tr>
<td>Check disk</td>
<td>MECHKDSK</td>
</tr>
<tr>
<td>Manual sampled/report data information</td>
<td>MODIR</td>
</tr>
<tr>
<td>Manual sampled/report data size</td>
<td>MOSIZE</td>
</tr>
<tr>
<td>User information</td>
<td>FG0, FG1</td>
</tr>
</tbody>
</table>

**Note**
The "$CRLF" used in this section denotes carriage return line feed.

### Setting Data/Basics 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
   ttss...sCRLF
   ............
ENCRLF
   tt   Command name (SR, SA...)
   sss... Setting/basic setting data (variable length, one line)
```
4.2 Output Format of Text Data

• 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
4.2 Output Format of Text Data

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.mmmm CRLF
s_ccca1a2a3a4uuuuufdddddE-pp CRLF
4.2 Output Format of Text Data

**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).

**Exponent** (00 to 04, 00 to 18 for channels that are set to Log scale—/LG1 option)

- Space

**Example**

```plaintext
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**

```plaintext
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

```plaintext
EA
I01-I06:1111--
I11-I16:-------
S01-S30:00000000000000000000000000000000
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\ldots uf\ldots m\CRLF
```

```
\ldots\ldots\ldots\ldots\ldots\ldots
```

```
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\ldots 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\ldots 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.
4.2 Output Format of Text Data

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)

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
4.2 Output Format of Text Data

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
  
  \texttt{EACRLF}

  \texttt{yy/mo/dd\_hh:mm:ss\_nnn\_xxxxxxxx\_k\_fff\_\_\_CRLF}

  \texttt{........................}

  \texttt{ENCRLF}

  \begin{tabular}{l}
    \texttt{yy} \quad \texttt{Year (00 to 99)} \\
    \texttt{mo} \quad \texttt{Month (01 to 12)} \\
    \texttt{dd} \quad \texttt{Day (01 to 31)} \\
    \texttt{hh} \quad \texttt{Hour (00 to 23)} \\
    \texttt{mm} \quad \texttt{Minute (00 to 59)} \\
    \texttt{ss} \quad \texttt{Second (00 to 59)} \\
    \texttt{nnn} \quad \texttt{Error code (001 to 999)} \\
    \texttt{xxxxxxxx} \quad \texttt{Detailed code (9 characters)} \\
    \texttt{k} \quad \texttt{Server type (P,S)} \\
    \texttt{P: Primary} \\
    \texttt{S: Secondary} \\
    \texttt{fff\_\_\_} \quad \texttt{File name (up to 51 characters including the extension)} \\
    \texttt{\_\_\_} \quad \texttt{Space}
  \end{tabular}

- Example
  
  \texttt{EA}

  \begin{tabular}{ll}
    \texttt{11/07/26 10:00:00} & \texttt{P 000010\_\_DAD} \\
    \texttt{11/07/27 10:00:00} & \texttt{P 000011\_\_DAD} \\
    \texttt{11/07/28 10:00:00 123 HOSTADDR P FTP\_TEST.TXT}
  \end{tabular}

  \texttt{EN}
4.2 Output Format of Text Data

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

```
EA CRLF
yy/mo/dd_hh:mm:ss_nnn_uuu···uCRLF
```

- Example

```
EA
11/05/11 12:20:00 212 Range setting error
11/05/11 12:30:00 217 Media access error
```

EN

- Syntax

```
yy/mo/dd_hh:mm:ss_nnn_uuu···uCRLF
```

- Example

```
11/05/11 12:20:00 212 Range setting error
11/05/11 12:30:00 217 Media access error
```
4.2 Output Format of Text Data

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**

```plaintext
yy/mo/dd hh:mm:ss_xxxxxxxxxx_nnn_uuu···u
```

- **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

```plaintext
nnn Operation property
```

- **KEY**: Key operation
- **COM**: Communication
- **REM**: Remote
- **SYS**: System

`uuu···u` User name (up to 20 characters)

- **Space**

**Example**

```plaintext
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**

```plaintext
EACRLF
yy/mo/dd_hh:mm:ss_ffffff_eee_???.CRLF
..................CRLF
EACRLF
```

<table>
<thead>
<tr>
<th>yy</th>
<th>Year (00 to 99)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mo</td>
<td>Month (01 to 12)</td>
</tr>
<tr>
<td>dd</td>
<td>Day (01 to 31)</td>
</tr>
<tr>
<td>hh</td>
<td>Hour (00 to 23)</td>
</tr>
<tr>
<td>mm</td>
<td>Minute (00 to 59)</td>
</tr>
<tr>
<td>ss</td>
<td>Second (00 to 59)</td>
</tr>
</tbody>
</table>

**ffffff** Requested operation

- **SCREEN:** Screen change
- **KEY:** Key operation
- **MSG:** Message assignment/write

<table>
<thead>
<tr>
<th>eee</th>
<th>Error code when executing the requested operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>???.</td>
<td>Parameter for each event (see below)</td>
</tr>
</tbody>
</table>

- **When fffffff = SCREEN**
  ```plaintext
  yy/mo/dd_hh:mm:ss_ffffff_eee_dddddd_nnCRLF
  dddddd 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 fffffff = KEY**
  ```plaintext
  yy/mo/dd_hh:mm:ss_ffffff_eee_kkkkkCRLF
  kkkkk Type of key that was operated
  DISP: DISP/ENTER key
  UP: Up key
  DOWN: Down key
  LEFT: Left key
  RIGHT: Right key
  ```

- **When fffffff = MSG**
  ```plaintext
  yy/mo/dd_hh:mm:ss_ffffff_eee_mmm...mCRLF
  mmm...m Message (up to 32 characters)
  ```
4.2 Output Format of Text Data

- Example

```
EA
11/02/11 12:20:00 SCREEN 275 TRENDS 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**

```
EACRLF
yy/mo/dd_hh:mm:ss_ffffff_eee_n_uuu...uCRLF
```

```
ENCRLEF
```

- `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...uu` 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
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**

```
EACHRLF

yy/mm/dd_hh:mm:ss_nnn…… EN

```

- `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)

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**

  ```
  EACRLF
  yy/mo/dd_hh:mm:ss_nnn_xxxxxxxxxCRLF
  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)
  - 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.

<table>
<thead>
<tr>
<th>Error Number</th>
<th>Detail Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>562</td>
<td>ON</td>
<td>Detected that an Ethernet cable was connected.</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Detected that an Ethernet cable was disconnected.</td>
</tr>
<tr>
<td>563</td>
<td>RENEW</td>
<td>Requesting address renewal to the DHCP server.</td>
</tr>
<tr>
<td></td>
<td>RELEASE</td>
<td>Requesting address release to the DHCP server.</td>
</tr>
<tr>
<td>564</td>
<td>RENEWED</td>
<td>Address renewal complete.</td>
</tr>
<tr>
<td></td>
<td>EXTENDED</td>
<td>Address release extension request complete.</td>
</tr>
<tr>
<td></td>
<td>RELEASED</td>
<td>Address release complete.</td>
</tr>
<tr>
<td>565</td>
<td>IPCONFIG</td>
<td>IP address configured.</td>
</tr>
<tr>
<td>566</td>
<td>NOREQUEST</td>
<td>Configured not to register the host name.</td>
</tr>
<tr>
<td>567</td>
<td>UPDATE</td>
<td>Registered the host name to the DNS server.</td>
</tr>
<tr>
<td>568</td>
<td>REMOVE</td>
<td>Removed the host name from the DNS server.</td>
</tr>
</tbody>
</table>
The table below shows the contents of the log during erroneous operation.

<table>
<thead>
<tr>
<th>Error Number</th>
<th>Detail Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>295</td>
<td>REJRECT</td>
<td>Address obtained by DHCP is inappropriate.</td>
</tr>
<tr>
<td>296</td>
<td>ESEND</td>
<td>Failed to send to the DHCP server.</td>
</tr>
<tr>
<td></td>
<td>ESERVER</td>
<td>DHCP server not found</td>
</tr>
<tr>
<td></td>
<td>ESERVFAIL</td>
<td>No response from the DHCP server.</td>
</tr>
<tr>
<td></td>
<td>ERENEWED</td>
<td>Address renewal rejected by the DHCP server.</td>
</tr>
<tr>
<td></td>
<td>EEXTENDED</td>
<td>Address lease extension request rejected by the DHCP server.</td>
</tr>
<tr>
<td></td>
<td>EEXPIRED</td>
<td>Address lease period expired by the DHCP server.</td>
</tr>
<tr>
<td>297</td>
<td>INTERNAL</td>
<td>Host name registration failure (transmission error, reception timeout, etc.)</td>
</tr>
<tr>
<td></td>
<td>FORMERR</td>
<td>Host name registration failure (format error: DNS message syntax error)</td>
</tr>
<tr>
<td></td>
<td>SERVFAIL</td>
<td>Host name registration failure (server failure: DNS server processing error)</td>
</tr>
<tr>
<td></td>
<td>NXDOMAIN</td>
<td>Host name registration rejection (non existent domain)</td>
</tr>
<tr>
<td></td>
<td>NOTIMP</td>
<td>Host name registration rejected (not implemented)</td>
</tr>
<tr>
<td></td>
<td>REFUSED</td>
<td>Host name registration rejected (operation refused)</td>
</tr>
<tr>
<td></td>
<td>YXDOMAIN</td>
<td>Host name registration rejected (name exists)</td>
</tr>
<tr>
<td></td>
<td>YXRRSET</td>
<td>Host name registration rejected (RR set exists)</td>
</tr>
<tr>
<td></td>
<td>NXRRSET</td>
<td>Host name registration rejected (RR set does not exist)</td>
</tr>
<tr>
<td></td>
<td>NOTAUTH</td>
<td>Host name registration rejection (not authoritative for zone)</td>
</tr>
<tr>
<td></td>
<td>NOTZONE</td>
<td>Host name registration rejection (different from zone section)</td>
</tr>
<tr>
<td></td>
<td>NONAME</td>
<td>Host name not entered on the FX.</td>
</tr>
<tr>
<td>298</td>
<td>INTERNAL</td>
<td>Host name removal failure (transmission error, reception timeout, etc.)</td>
</tr>
<tr>
<td></td>
<td>FORMERR</td>
<td>Host name removal failure (format error: DNS message syntax error)</td>
</tr>
<tr>
<td></td>
<td>SERVFAIL</td>
<td>Host name removal failure (server failure: DNS server processing error)</td>
</tr>
<tr>
<td></td>
<td>NXDOMAIN</td>
<td>Host name removal rejection (non existent domain)</td>
</tr>
<tr>
<td></td>
<td>NOTIMP</td>
<td>Host name removal rejected (not implemented)</td>
</tr>
<tr>
<td></td>
<td>REFUSED</td>
<td>Host name removal rejected (operation refused)</td>
</tr>
<tr>
<td></td>
<td>YXDOMAIN</td>
<td>Host name removal rejected (name exists)</td>
</tr>
<tr>
<td></td>
<td>YXRRSET</td>
<td>Host name removal rejected (RR set exists)</td>
</tr>
<tr>
<td></td>
<td>NXRRSET</td>
<td>Host name removal rejected (RR set does not exist)</td>
</tr>
<tr>
<td></td>
<td>NOTAUTH</td>
<td>Host name removal rejection (not authoritative for zone)</td>
</tr>
<tr>
<td></td>
<td>NOTZONE</td>
<td>Host name removal rejection (different from zone section)</td>
</tr>
<tr>
<td></td>
<td>NOTLINKED</td>
<td>Physical layer was disconnected when removing the host name.</td>
</tr>
</tbody>
</table>

• 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**

```
EACRLF
yy/mo/dd hh:mm:ss_c_xxxxxx_kkkk_nn_dCRLF
................................................
```

**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
```
4.2 Output Format of Text Data

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**

  ```
  EA CRLF
  yy/mo/dd_hh:mm:ss_kkkccc_lslsnnnnnnnnCRLF
  ....................
  EN CRLF
  ```

  - `yy/mo/dd hh:mm:ss` Time when the alarm occurred
  - `yyyy` 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
  ```
4.2 Output Format of Text Data

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\n  CRLF
  yy/mo/dd hh:mm:ss mmm··· ggg··· zzz_uuu··· nnn··· CRLF
  .........................
  EN\n  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
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
  aaaa.bbbccc.ddddCRLF
  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
  aaaa.bbbccc.dddd.eeedddefffggghhhCRLF
  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.
4.2 Output Format of Text Data

Ethernet Information

• The FA command is used to output the data.

• Syntax

   EACRLF
   IP_Address_____:xxx.xxx.xxx.xxxCRLF
   Subnet_mask_____:xxx.xxx.xxx.xxxCRLF
   Default_Gateway__:xxx.xxx.xxx.xxxCRLF
   Primary_DNS_____:xxx.xxx.xxx.xxxCRLF
   Secondary_DNS____:xxx.xxx.xxx.xxxCRLF
   Host___________:yyy······CRLF
   Domain__________:zzz······CRLF
   ENCRLF

   xxx            IP address number (000 to 255)
   yyy····         Host name (up to 64 characters)
   zzz····         Domain name (up to 64 characters)
   _               Space
4.2 Output Format of Text Data

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 sssssssss fff••• n_xxx••• CRLF
```

**Example 1**
File list output of an external storage medium

```
EA
11/02/24 20:07:12 1204 setting.pnl
11/02/24 20:18:36 <DIR> DATA0
```

**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
```
Check Disk

The ME command is used to output the free space on the storage medium.

- **Syntax**

  `EA
  CRLF
  zzz···_Kbyte_freeCRLF
  ENCRLF

  zzz···
  _
  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
  ENCRLF

  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)

- **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`
4.2 Output Format of Text Data

Manual Sampled/Report Data Size
This is generated by the MO command.

- **Syntax**
  
  ```
  EACRLF
  zzz···CRLF
  ENCRLF
  
  zzz···The data size (10 digits max.)
  ```

- **Example**
  
  ```
  EACRLF
  12345
  ENCRLF
  ```

User Information

- The FU command is used to output the data.
- User name, user level, and other information are output.

- **Syntax**
  
  ```
  EACRLF
  p_l_uuu···CRLF
  ENCRLF
  ```

  - **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.

<table>
<thead>
<tr>
<th>Binary Value</th>
<th>Decimal Position Code</th>
<th>Physical Value (Measured Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>0</td>
<td>10000</td>
</tr>
<tr>
<td>10000</td>
<td>1</td>
<td>1000.0</td>
</tr>
<tr>
<td>10000</td>
<td>2</td>
<td>100.00</td>
</tr>
<tr>
<td>10000</td>
<td>3</td>
<td>10.000</td>
</tr>
<tr>
<td>10000</td>
<td>4</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

• 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:**

<table>
<thead>
<tr>
<th>Physical Value (V)</th>
<th>logV</th>
<th>Logarithmic Value (V’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00E–30</td>
<td>–30</td>
<td>–30000</td>
</tr>
<tr>
<td>2.00E–02</td>
<td>–1.699</td>
<td>–1699</td>
</tr>
<tr>
<td>2.00E+05</td>
<td>5.301</td>
<td>5301</td>
</tr>
<tr>
<td>1.00E+30</td>
<td>30</td>
<td>30000</td>
</tr>
<tr>
<td>–OVER</td>
<td>–</td>
<td>0x8001</td>
</tr>
<tr>
<td>+OVER</td>
<td>–</td>
<td>0x7FFF</td>
</tr>
</tbody>
</table>

---

#### Number of Blocks
This is the number of blocks.

#### Number of Bytes
This is the size of one block in bytes.

#### Block

- 1 byte
- 1 byte
- 1 byte
- 1 byte
- 1 byte
- 2 bytes
- 1 byte
- 1 byte

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Day</th>
<th>Hour</th>
<th>Min</th>
<th>s</th>
<th>ms</th>
<th>Summer/Winter</th>
<th>Flag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Channel</td>
<td>A2A1</td>
<td>A4A3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Measured data
- Computed data

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Day</th>
<th>Hour</th>
<th>Min</th>
<th>s</th>
<th>ms</th>
<th>Summer/Winter</th>
<th>Flag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Channel</td>
<td>A2A1</td>
<td>A4A3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 12 bits
- 4 bits
4.3 Output Format of Binary Data

- **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.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Flag</th>
<th>Meaning of the Flag</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>No</td>
<td>Indicates that the screen snapshot was executed.</td>
</tr>
<tr>
<td>6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>Indicates that the decimal position or unit information was changed during measurement.</td>
</tr>
<tr>
<td>1</td>
<td>No</td>
<td>Indicates that the FIFO acquiring interval was changed with the FR command during measurement.</td>
</tr>
<tr>
<td>0</td>
<td>No</td>
<td>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.</td>
</tr>
</tbody>
</table>

The bits that have “–” for the flag column are not used. The value is undefined.

- **Block Member**

<table>
<thead>
<tr>
<th>Name</th>
<th>Binary Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>0 to 99</td>
</tr>
<tr>
<td>Month</td>
<td>1 to 12</td>
</tr>
<tr>
<td>Day</td>
<td>1 to 31</td>
</tr>
<tr>
<td>Hour</td>
<td>0 to 23</td>
</tr>
<tr>
<td>Minute</td>
<td>0 to 59</td>
</tr>
<tr>
<td>Second</td>
<td>0 to 59</td>
</tr>
<tr>
<td>Millisecond</td>
<td>0 to 999</td>
</tr>
<tr>
<td>Summer/winter</td>
<td>0: Winter time, 1: Summer time</td>
</tr>
<tr>
<td>Type</td>
<td>0x0: 16-bit integer (measurement channel) 0x8: 32-bit integer (computation channel)</td>
</tr>
<tr>
<td>Channel</td>
<td>1 to 12 and 101 to 124</td>
</tr>
<tr>
<td>Alarm status⁷</td>
<td></td>
</tr>
<tr>
<td>A1 (Bit 0 to 3)</td>
<td></td>
</tr>
<tr>
<td>A2 (Bit 4 to 7)</td>
<td>0 to 8</td>
</tr>
<tr>
<td>A3 (Bit 0 to 3)</td>
<td></td>
</tr>
<tr>
<td>A4 (Bit 4 to 7)</td>
<td></td>
</tr>
<tr>
<td>Measured data</td>
<td>0 to 0xFFFF</td>
</tr>
<tr>
<td>Computed data</td>
<td>0 to 0xFFFFFFFF</td>
</tr>
</tbody>
</table>

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:


### Special Data Values

The measured/computed data take on the following values under special conditions.

<table>
<thead>
<tr>
<th>Special Data Value</th>
<th>Measured Data</th>
<th>Computed Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Over</td>
<td>7FFFH</td>
<td>7FF7FFFH</td>
</tr>
<tr>
<td>– Over</td>
<td>8001H</td>
<td>80018001H</td>
</tr>
<tr>
<td>Skip</td>
<td>8002H</td>
<td>80028002H</td>
</tr>
<tr>
<td>Error</td>
<td>8004H</td>
<td>80048004H</td>
</tr>
<tr>
<td>Undefined</td>
<td>8005H</td>
<td>80058005H</td>
</tr>
<tr>
<td>Power failure data</td>
<td>7F7FH</td>
<td>7F7F7F7F7FH</td>
</tr>
<tr>
<td>Burnout (up setting)</td>
<td>7FFAH</td>
<td>7FF7FFFH</td>
</tr>
<tr>
<td>Burnout (down setting)</td>
<td>8006H</td>
<td>80018001H</td>
</tr>
</tbody>
</table>

The number of blocks, number of bytes, and measured/computed data are output according to the byte order specified with the BO command.
4.3 Output Format of Binary Data

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.

Format Details

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Output Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>Format version</td>
<td>1</td>
</tr>
<tr>
<td>Number of blocks</td>
<td>Number of configured channel information blocks</td>
<td>Up to 36</td>
</tr>
<tr>
<td>Block size</td>
<td>Configured channel information block size</td>
<td>72 (fixed)</td>
</tr>
<tr>
<td>Block 1 to n</td>
<td>Configured channel information blocks</td>
<td>Up to 2595 bytes (See Block Details.)</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Number of Bytes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel number</td>
<td>2</td>
<td>1 to 124</td>
</tr>
<tr>
<td>Decimal place</td>
<td>1</td>
<td>0 to 4 When you are using the Log scale,(^2) the decimal place of the FX digital display’s mantissa is displayed.</td>
</tr>
<tr>
<td>(Reserved)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Channel type</td>
<td>4</td>
<td>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.</td>
</tr>
<tr>
<td>Unit information</td>
<td>8</td>
<td>The terminator is ’(0)’.</td>
</tr>
<tr>
<td>Tag information</td>
<td>24</td>
<td>You can enter up to 16 characters for the tag. The terminator is ’(0)’.</td>
</tr>
<tr>
<td>Minimum input value</td>
<td>4</td>
<td>Measurement channels: Allowable input range under the current setting</td>
</tr>
<tr>
<td>Maximum input value</td>
<td>4</td>
<td>Computation channels: -9999999, +99999999 (fixed)</td>
</tr>
<tr>
<td>Span lower limit</td>
<td>4</td>
<td>Measurement channels (when scaling is not used): Same value as the FX span setting</td>
</tr>
<tr>
<td>Span upper limit</td>
<td>4</td>
<td>Measurement channels (when scaling is used): Same value as the FX scale setting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measurement channels (Log scale(^2)): Same value as the FX span setting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computation channels: Same value as the FX span setting</td>
</tr>
<tr>
<td>Scale lower limit</td>
<td>4</td>
<td>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.</td>
</tr>
<tr>
<td>Scale upper limit</td>
<td>4</td>
<td>Measurement channels (when the Log scale(^2) is used): Same value as the FX scale setting’s exponent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computation channels: The same value as the span lower or span upper limit value in the above row.</td>
</tr>
<tr>
<td>FIFO type</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Area in the FIFO</td>
<td>2</td>
<td>Indicates the position of its own channel in the FIFO block of one sample. The value starts from zero.</td>
</tr>
<tr>
<td>Scale lower limit’s mantissa</td>
<td>2</td>
<td>When the Log scale(^2) is not used: Fixed to 0</td>
</tr>
<tr>
<td>Scale upper limit’s mantissa</td>
<td>2</td>
<td>When the Log scale(^2) is used: Same value as the FX scale setting</td>
</tr>
</tbody>
</table>

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.

```
<table>
<thead>
<tr>
<th>1 byte</th>
<th>1 byte</th>
<th>2 bytes</th>
<th>2 bytes</th>
<th>1 byte</th>
<th>1 byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>(Reserved)</td>
<td>Number of blocks</td>
<td>Block size</td>
<td>(Reserved)</td>
<td>(Reserved)</td>
</tr>
</tbody>
</table>
| Configured alarm information block 1 | | | | | | ...
| Configured alarm information block n |
```

Format Details

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Output Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>Format version</td>
<td>2</td>
</tr>
<tr>
<td>Number of blocks</td>
<td>Number of configured alarm information blocks</td>
<td>Up to 36</td>
</tr>
<tr>
<td>Block size</td>
<td>Size of the configured alarm information blocks</td>
<td>32</td>
</tr>
<tr>
<td>Block 1 to n</td>
<td>Configured alarm information blocks</td>
<td>Up to 1152 bytes See Block Details.</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Number of Bytes</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel number</td>
<td>2</td>
<td>1 to 124</td>
</tr>
<tr>
<td>Decimal place</td>
<td>1</td>
<td>When you are using a channel that is set to Log scale, the decimal place of the FX digital display’s mantissa is displayed.</td>
</tr>
<tr>
<td>(Reserved)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Alarm type</td>
<td>4</td>
<td>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)</td>
</tr>
<tr>
<td>Alarm value</td>
<td>4x4</td>
<td>When the Log scale is not used: Alarm setting on the FX When the Log scale is used: The same value as the mantissa of the alarm setting on the FX</td>
</tr>
<tr>
<td>Alarm value (exponent)</td>
<td>1x4</td>
<td>The alarm values are entered in order from level 1 to level 4. When the Log scale is not used: 0 When the Log scale is used: Same value as the exponent of the FX alarm setting</td>
</tr>
<tr>
<td>(Reserved)</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

1: Output in the byte order specified by the BO command.

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.
4.4 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.

\[ \text{EA} \text{CRLF} \]

\[ \text{(Parameter 1)}_{-} = \text{(value of parameter 1)} \text{CRLF} \]

\[ \text{(Parameter 2)}_{-} = \text{(value of parameter 2)} \text{CRLF} \]

\[ \text{.................} \]

\[ \text{EN} \text{CRLF} \]

• 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Output Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>serial</td>
<td>Serial number</td>
</tr>
<tr>
<td>host</td>
<td>Host name</td>
</tr>
<tr>
<td>ip</td>
<td>IP address</td>
</tr>
</tbody>
</table>

Output Example

Several output examples are indicated below.

<table>
<thead>
<tr>
<th>Packet Parameter Sent as Commands</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameters are not case sensitive.</td>
<td></td>
</tr>
<tr>
<td>ip Host</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EA</td>
</tr>
<tr>
<td></td>
<td>ip = 192.168.111.24</td>
</tr>
<tr>
<td></td>
<td>host = FX1000</td>
</tr>
<tr>
<td></td>
<td>EN</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Even if the same parameters are specified numerous times, only the first occurrence is output.</td>
<td></td>
</tr>
<tr>
<td>host ip host ip host</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EA</td>
</tr>
<tr>
<td></td>
<td>host = FX1000</td>
</tr>
<tr>
<td></td>
<td>ip = 192.168.111.24</td>
</tr>
<tr>
<td></td>
<td>EN</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Undefined parameters will be ignored.</td>
<td></td>
</tr>
<tr>
<td>(Space)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EA</td>
</tr>
<tr>
<td></td>
<td>EN</td>
</tr>
</tbody>
</table>
5.1 Status Information and Filter

The following figure illustrates the status information and filter on the FX.

![Status Information and Filter Diagram]

- 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.
5.2 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

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Basic setting</td>
<td>Set to 1 during basic setting mode.</td>
</tr>
<tr>
<td>1</td>
<td>Memory sampling</td>
<td>Set to 1 during recording (memory sampling).</td>
</tr>
<tr>
<td>2</td>
<td>Computing</td>
<td>Set to 1 while computation is in progress.</td>
</tr>
<tr>
<td>3</td>
<td>Alarm activated</td>
<td>Set to 1 while the alarm is activated.</td>
</tr>
<tr>
<td>4</td>
<td>Accessing medium</td>
<td>Set to 1 while the display, event, manual sampled, report, or screen image</td>
</tr>
<tr>
<td></td>
<td></td>
<td>data file are being saved to the external storage medium.</td>
</tr>
<tr>
<td>5</td>
<td>E-mail started</td>
<td>Set to 1 only when the e-mail transmission (C7 option) is started.</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Status Information 2

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Memory end</td>
<td>Set to 1 while the free space in the internal memory or external storage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium is low. This is the same as the internal memory and CFcard/SD card</td>
</tr>
<tr>
<td></td>
<td></td>
<td>status of the device information output (F1 option; see section 1.9 in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the FX1000 User’s Manual, IM 04L21B01-01EN).</td>
</tr>
<tr>
<td>3</td>
<td>Logged in through keys</td>
<td>Set to 1 while logged in through keys.</td>
</tr>
<tr>
<td>4</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Detecting measurement error</td>
<td>Set to 1 when an error is detected in the A/D converter, when a burnout</td>
</tr>
<tr>
<td></td>
<td></td>
<td>is detected, or when the power measurement section is malfunctioning (PWR1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or PWR5 option).</td>
</tr>
<tr>
<td>7</td>
<td>Detecting communication error</td>
<td>Set to 1 when a command is stopping the communication on the Modbus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>master (C2 or C3 option) or Modbus client (C7 option).</td>
</tr>
</tbody>
</table>

### Status Information 3

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Measurement dropout</td>
<td>Set to 1 when the measurement process could not keep up.</td>
</tr>
<tr>
<td>1</td>
<td>Decimal point/unit information change</td>
<td>Set to 1 when the decimal point/unit information is changed.</td>
</tr>
<tr>
<td>2</td>
<td>Command error</td>
<td>Set to 1 when there is a command syntax error.</td>
</tr>
<tr>
<td>3</td>
<td>Execution error</td>
<td>Set to 1 when an error occurs during command execution.</td>
</tr>
<tr>
<td>4</td>
<td>SNTP error when memory</td>
<td>Set to 1 when the time could not be adjusted using SNTP (C7 option) on FX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>startup.</td>
</tr>
<tr>
<td>5</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>
### Status Information 4

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A/D conversion complete</td>
<td>Set to 1 when the A/D conversion of the measurement is complete.</td>
</tr>
<tr>
<td>1</td>
<td>Medium access complete</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>Report generation complete</td>
<td>Set to 1 when report generation is complete (/M1, /PM1, /PWR1, and /PWR5 options).</td>
</tr>
<tr>
<td>3</td>
<td>Timeout</td>
<td>Set to 1 when the timer expires.</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>USER key detection</td>
<td>Set to 1 when the USER key is pressed.</td>
</tr>
</tbody>
</table>

### Status Information 5 to 8

All bits are zeroes.
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.

<table>
<thead>
<tr>
<th>Function</th>
<th>Maximum Number of Connections</th>
<th>Number of Simultaneous Uses</th>
<th>Port Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting/measurement server</td>
<td>3</td>
<td>1</td>
<td>34260/tcp</td>
</tr>
<tr>
<td>Maintenance/test server</td>
<td>1</td>
<td>1</td>
<td>34261/tcp</td>
</tr>
<tr>
<td>FTP server</td>
<td>2</td>
<td>2</td>
<td>21/tcp</td>
</tr>
<tr>
<td>Web server (HTTP)</td>
<td>-</td>
<td>-</td>
<td>80/tcp</td>
</tr>
<tr>
<td>SNTP server</td>
<td>-</td>
<td>-</td>
<td>123/udp</td>
</tr>
<tr>
<td>Modbus server</td>
<td>2</td>
<td>-</td>
<td>502/tcp</td>
</tr>
<tr>
<td>Instrument information server</td>
<td>-</td>
<td>-</td>
<td>34264/udp</td>
</tr>
</tbody>
</table>

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.
6.2 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.

<table>
<thead>
<tr>
<th>Function Code</th>
<th>Function</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Read the hold register (4XXXX, 4XXXXX)</td>
<td>The FX reads the hold register of the server device into the communication input data.</td>
</tr>
<tr>
<td>4</td>
<td>Read the input register (3XXXX, 3XXXXX)</td>
<td>The FX reads the input register of the server device into the communication input data.</td>
</tr>
<tr>
<td>16</td>
<td>Write to the hold register (4XXXX, 4XXXXX)</td>
<td>The FX writes the measured or computed data to the hold register of the server device.</td>
</tr>
</tbody>
</table>
6.3 Modbus Protocol Specifications

Command
Command type: R-M, W, W-M
Number of commands: Set up to 16 commands
Data type: See the table below.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT16</td>
<td>16-bit signed integer</td>
</tr>
<tr>
<td>UINT16</td>
<td>16-bit unsigned integer</td>
</tr>
<tr>
<td>INT32_B</td>
<td>32-bit signed integer (higher and lower order)</td>
</tr>
<tr>
<td>INT32_L</td>
<td>32-bit signed integer (lower and higher order)</td>
</tr>
<tr>
<td>UINT32_B</td>
<td>32-bit unsigned integer (higher and lower order)</td>
</tr>
<tr>
<td>UINT32_L</td>
<td>32-bit unsigned integer (lower and higher order)</td>
</tr>
<tr>
<td>FLOAT_B</td>
<td>32-bit floating point (higher and lower order)</td>
</tr>
<tr>
<td>FLOAT_L</td>
<td>32-bit floating point (lower and higher order)</td>
</tr>
</tbody>
</table>

- **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.

<table>
<thead>
<tr>
<th>FX1000 Command type</th>
<th>Server Register</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-M</td>
<td>INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FX1000 Command type</th>
<th>Communication input data</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-M</td>
<td>Data type: 32-bit floating point</td>
</tr>
</tbody>
</table>

- **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.

<table>
<thead>
<tr>
<th>FX1000 Command type</th>
<th>Measurement channel Number: 001 to 012 (FX1000) Data type: 16 bit signed integer</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>Write</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FX1000 Command type</th>
<th>Measurement channel Number: 001 to 012 (FX1000) Data type: 16 bit signed integer</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>Write</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Server Command type</th>
<th>Server Register Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Server Command type</th>
<th>Server Register Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L</td>
</tr>
</tbody>
</table>

6-4
• 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.

<table>
<thead>
<tr>
<th>FX1000</th>
<th>Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command type</td>
<td>Computation channel</td>
</tr>
<tr>
<td>W-M</td>
<td>Number: 101 to 124</td>
</tr>
<tr>
<td>Data type: 32-bit signed integer</td>
<td>Write</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Register</th>
<th>Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001 to 49999</td>
<td>INT 16, UINT 16, INT 32_B, INT 32_L</td>
</tr>
<tr>
<td>400001 to 465536</td>
<td>FLOAT_B, FLOAT_L</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Computed value</th>
<th>INT16</th>
<th>UINT16</th>
<th>FLOAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 32767</td>
<td>32767</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-32768 to 32767</td>
<td>–32768 to 32767</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than -32767</td>
<td>–32768</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 65535</td>
<td>65535</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 65535</td>
<td>0 to 65535</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Calculated from the decimal point information set on each channel

<table>
<thead>
<tr>
<th>Special values</th>
<th>INT16</th>
<th>UINT16</th>
<th>FLOAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Over</td>
<td>32767</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burnout (Up)</td>
<td>7f800000H (+ ∞)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Over</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burnout (Down)</td>
<td>7f800006H (Nan)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skip</td>
<td>65535</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>ff800000H (– ∞)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undefined</td>
<td>ff800002H (Nan)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For special data values, see the “Special values” table below.
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.

<table>
<thead>
<tr>
<th>Function Code</th>
<th>Function</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Read the hold register (4XXXXX)</td>
<td>The client device reads the FX’s communication input data.</td>
</tr>
<tr>
<td>4</td>
<td>Read the input register (3XXXXX)</td>
<td>The client device reads the computed, measured, alarm, and time data of the FX.</td>
</tr>
<tr>
<td>6</td>
<td>Single write to hold register (4XXXXX)</td>
<td>The client device writes to the communication input data of the FX.</td>
</tr>
<tr>
<td>8</td>
<td>Loopback test</td>
<td>The client device performs a loopback test of the FX.</td>
</tr>
<tr>
<td>16</td>
<td>Write to the hold register (4XXXXX)</td>
<td>The master device writes to the communication input data of the FX.</td>
</tr>
</tbody>
</table>

Register assignments (shared with the Modbus slave function)

<table>
<thead>
<tr>
<th>Kind</th>
<th>Input register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Type</td>
</tr>
<tr>
<td>Measurement ch.</td>
<td>Measured data</td>
</tr>
<tr>
<td>Alarm status</td>
<td>301001 to 301012 Bit string</td>
</tr>
<tr>
<td>Computation ch.</td>
<td>Computed data</td>
</tr>
<tr>
<td>Alarm status</td>
<td>303001 to 303024 Bit string</td>
</tr>
<tr>
<td>Measurement ch.</td>
<td>Alarm list</td>
</tr>
<tr>
<td>Computation ch.</td>
<td>Alarm list</td>
</tr>
<tr>
<td>Time</td>
<td></td>
</tr>
</tbody>
</table>

Register assignments (shared with the Modbus slave function)

<table>
<thead>
<tr>
<th>Kind</th>
<th>Hold register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Data type</td>
</tr>
<tr>
<td>Communication input data</td>
<td>400001 to 400024 16-bit signed integer</td>
</tr>
<tr>
<td>Operating devices</td>
<td>400301 to 400348 32-bit floating point</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Input Register</th>
<th>Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>300001</td>
<td>Measured data of measurement channel 001</td>
<td>16-bit signed integer</td>
</tr>
<tr>
<td>300012</td>
<td>Measured data of measurement channel 012</td>
<td>16-bit signed integer</td>
</tr>
</tbody>
</table>

- There is no decimal position information.

<table>
<thead>
<tr>
<th>Input Register</th>
<th>Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>301001</td>
<td>Alarm status of measurement channel 001</td>
<td>Bit string</td>
</tr>
<tr>
<td>301012</td>
<td>Alarm status of measurement channel 012</td>
<td>Bit string</td>
</tr>
</tbody>
</table>

- Register structure and alarm status values

<table>
<thead>
<tr>
<th>4-bits value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No alarm</td>
</tr>
<tr>
<td>1</td>
<td>High limit alarm</td>
</tr>
<tr>
<td>2</td>
<td>Low limit alarm</td>
</tr>
<tr>
<td>3</td>
<td>Difference high limit alarm</td>
</tr>
<tr>
<td>4</td>
<td>Difference low limit alarm</td>
</tr>
<tr>
<td>5</td>
<td>High limit on rate-of-change alarm</td>
</tr>
<tr>
<td>6</td>
<td>Low limit on rate-of-change alarm</td>
</tr>
<tr>
<td>7</td>
<td>Delay high limit alarm</td>
</tr>
<tr>
<td>8</td>
<td>Delay low limit alarm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Register</th>
<th>Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>302001</td>
<td>Lower bytes of the computed data of computation channel 101</td>
<td>32-bit signed integer</td>
</tr>
<tr>
<td>302002</td>
<td>Higher bytes of the computed data of computation channel 101</td>
<td>32-bit signed integer</td>
</tr>
<tr>
<td>302047</td>
<td>Lower bytes of the computed data of computation channel 124</td>
<td>32-bit signed integer</td>
</tr>
<tr>
<td>302048</td>
<td>Higher bytes of the computed data of computation channel 124</td>
<td>32-bit signed integer</td>
</tr>
</tbody>
</table>

- Register structure

**Example: Channel 101**

```
```

- There is no decimal position information.

<table>
<thead>
<tr>
<th>Input Register</th>
<th>Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>303001</td>
<td>Alarm status of computation channel 101</td>
<td>Bit string</td>
</tr>
<tr>
<td>303024</td>
<td>Alarm status of computation channel 124</td>
<td>Bit string</td>
</tr>
</tbody>
</table>

- The register structure and alarm status values are the same as the alarm status of measurement channels.
6.3 Modbus Protocol Specifications

<table>
<thead>
<tr>
<th>Input Register</th>
<th>Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>306001</td>
<td>List of alarms of measurement channels 001 to 004</td>
<td>Bit string</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>306003</td>
<td>List of alarms of measurement channels 009 to 012</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Register structure</td>
<td></td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>Input Register</th>
<th>Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>306021</td>
<td>List of alarms of computation channels 101 to 104</td>
<td>Bit string</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>306026</td>
<td>List of alarms of computation channels 121 to 124</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Register structure: Same as the list of alarms of measurement channels.</td>
<td></td>
</tr>
</tbody>
</table>

Note: Input registers 306001 to 306026 can be accessed consecutively. All unassigned register bits are read as zeroes.

<table>
<thead>
<tr>
<th>Input Register</th>
<th>Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>309001</td>
<td>Year</td>
<td>16-bit signed integer</td>
</tr>
<tr>
<td>309002</td>
<td>Month</td>
<td></td>
</tr>
<tr>
<td>309003</td>
<td>Day</td>
<td></td>
</tr>
<tr>
<td>309004</td>
<td>Hour</td>
<td></td>
</tr>
<tr>
<td>309005</td>
<td>Minute</td>
<td></td>
</tr>
<tr>
<td>309006</td>
<td>Second</td>
<td></td>
</tr>
<tr>
<td>309007</td>
<td>Millisecond</td>
<td></td>
</tr>
<tr>
<td>309008</td>
<td>DST</td>
<td></td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Hold Register</th>
<th>Data Type</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>400001</td>
<td>Communication input data C01</td>
<td>16-bit signed integer</td>
</tr>
<tr>
<td>400024</td>
<td>Communication input data C24</td>
<td></td>
</tr>
<tr>
<td>400601</td>
<td>Lower bytes of communication input data C01</td>
<td>32-bit floating point</td>
</tr>
<tr>
<td>400602</td>
<td>Higher bytes of communication input data C01</td>
<td></td>
</tr>
<tr>
<td>400647</td>
<td>Lower bytes of communication input data C24</td>
<td></td>
</tr>
<tr>
<td>400648</td>
<td>Higher bytes of communication input data C24</td>
<td></td>
</tr>
<tr>
<td>400301</td>
<td>Lower bytes of communication input data C01</td>
<td>32-bit signed integer</td>
</tr>
<tr>
<td>400302</td>
<td>Higher bytes of communication input data C01</td>
<td></td>
</tr>
<tr>
<td>400347</td>
<td>Lower bytes of communication input data C24</td>
<td></td>
</tr>
<tr>
<td>400348</td>
<td>Higher bytes of communication input data C24</td>
<td></td>
</tr>
</tbody>
</table>

**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.
- Only data in signed 16-bit integer type can be written. Floating point values cannot be written.

**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.

**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
### List of Registers

<table>
<thead>
<tr>
<th>Register</th>
<th>Description</th>
<th>Supplementary Information</th>
<th>Type</th>
<th>Access</th>
<th>Simultaneous Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>406061</td>
<td>Internal switch 1</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406062</td>
<td>Internal switch 2</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406063</td>
<td>Internal switch 3</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406064</td>
<td>Internal switch 4</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406065</td>
<td>Internal switch 5</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406066</td>
<td>Internal switch 6</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406067</td>
<td>Internal switch 7</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406068</td>
<td>Internal switch 8</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406069</td>
<td>Internal switch 9</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406070</td>
<td>Internal switch 10</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406071</td>
<td>Internal switch 11</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406072</td>
<td>Internal switch 12</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406073</td>
<td>Internal switch 13</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406074</td>
<td>Internal switch 14</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406075</td>
<td>Internal switch 15</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406076</td>
<td>Internal switch 16</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406077</td>
<td>Internal switch 17</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406078</td>
<td>Internal switch 18</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406079</td>
<td>Internal switch 19</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406080</td>
<td>Internal switch 20</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406081</td>
<td>Internal switch 21</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406082</td>
<td>Internal switch 22</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
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<td>Internal switch 23</td>
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<td>INT16</td>
<td>R</td>
<td>-</td>
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<tr>
<td>406084</td>
<td>Internal switch 24</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
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<tr>
<td>406085</td>
<td>Internal switch 25</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406086</td>
<td>Internal switch 26</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
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<tr>
<td>406087</td>
<td>Internal switch 27</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
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<tr>
<td>406088</td>
<td>Internal switch 28</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>406089</td>
<td>Internal switch 29</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
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<tr>
<td>406090</td>
<td>Internal switch 30</td>
<td>OFF: 0. ON: 1.</td>
<td>INT16</td>
<td>R</td>
<td>-</td>
</tr>
<tr>
<td>407833 to</td>
<td>Lot number</td>
<td>Valid range: 0 to 99999999</td>
<td>INT32</td>
<td>W</td>
<td>R/W</td>
</tr>
<tr>
<td>407834</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>407835 to</td>
<td>Batch number</td>
<td>Up to 17 registers (up to 33 characters with &quot;\0&quot; termination). The batch number must be 32 characters or less.</td>
<td>STR34</td>
<td>R/W</td>
<td></td>
</tr>
<tr>
<td>407851</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>409503</td>
<td>Memory start or stop</td>
<td>Stop: 0. Start: 1.</td>
<td>INT16</td>
<td>R/W</td>
<td></td>
</tr>
<tr>
<td>409504</td>
<td>Alarm acknowledge</td>
<td>Applies to all alarms.</td>
<td>INT16</td>
<td>R/W</td>
<td></td>
</tr>
<tr>
<td>409506</td>
<td>Computation operation</td>
<td>&lt;When writing&gt;</td>
<td>INT16</td>
<td>R/W</td>
<td></td>
</tr>
<tr>
<td>410601</td>
<td>Preset message writing</td>
<td>Message number (1 to 100)</td>
<td>INT16</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>410602</td>
<td>Message write destination</td>
<td>Message write destination</td>
<td>INT16</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>410603</td>
<td>Specified value</td>
<td>Specified value.</td>
<td>INT16</td>
<td>W</td>
<td></td>
</tr>
</tbody>
</table>

### 6.3 Modbus Protocol Specifications
### 6.3 Modbus Protocol Specifications

<table>
<thead>
<tr>
<th>Register</th>
<th>Description</th>
<th>Supplementary Information</th>
<th>Type</th>
<th>Access</th>
<th>Simultaneous Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>410611</td>
<td>Free message writing</td>
<td>Message number (1 to 10)</td>
<td>INT16</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>410612</td>
<td>Message write destination</td>
<td>Message write destination&lt;br&gt;0: All groups, 1 to 10: Specified group number.</td>
<td>INT16</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>410613</td>
<td>Specified value.</td>
<td>Specified value.</td>
<td>INT16</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>410614 to 410631</td>
<td>Free message</td>
<td>Free message &lt;br&gt;Up to 18 registers (up to 35 characters with '¥0' termination).&lt;br&gt;The message must be 32 characters or less.</td>
<td>STR36</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>410632 to 410680</td>
<td>(Reserved) Free message</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

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.
### 6.3 Modbus Protocol Specifications

#### How to Use

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data type STRnn</td>
<td>Registers in which ASCII codes are entered starting with the specified</td>
</tr>
<tr>
<td></td>
<td>register. It is terminated with a NULL character (\0). The number of</td>
</tr>
<tr>
<td></td>
<td>characters that can be entered that includes the NULL character is indicated</td>
</tr>
<tr>
<td></td>
<td>in the nn section.</td>
</tr>
</tbody>
</table>

Example of setting the batch number (STR36 type) to “ABCD”

\*\*\* denotes any value.

<table>
<thead>
<tr>
<th>Register</th>
<th>Value to Write</th>
<th>Hexadecimal Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>407835</td>
<td>&quot;A&quot;&quot;B&quot;</td>
<td>(4142H)</td>
</tr>
<tr>
<td>407836</td>
<td>&quot;C&quot;&quot;D&quot;</td>
<td>(4344H)</td>
</tr>
<tr>
<td>407837</td>
<td>&quot;¥0&quot;&quot;*&quot;</td>
<td>(00**H)</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Lot number</th>
<th>Access the registers two registers at a time.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>You can only access from the first register.</td>
</tr>
</tbody>
</table>

| Batch number | You can only access from the first register. |

<table>
<thead>
<tr>
<th>Message</th>
<th>You can only write from the first register.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Free message</th>
<th>You can only write from the first register.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A free message is written using one command.</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Register</th>
<th>Value to Write</th>
<th>Hexadecimal Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>410611</td>
<td>10</td>
<td>(000AH)</td>
</tr>
<tr>
<td>410612</td>
<td>0</td>
<td>(0000H)</td>
</tr>
<tr>
<td>410613</td>
<td>1</td>
<td>(0001H)</td>
</tr>
<tr>
<td>410614</td>
<td>&quot;A&quot;&quot;B&quot;</td>
<td>(4142H)</td>
</tr>
<tr>
<td>410615</td>
<td>&quot;C&quot;&quot;D&quot;</td>
<td>(4344H)</td>
</tr>
<tr>
<td>410616</td>
<td>&quot;¥0&quot;&quot;*&quot;</td>
<td>(00**H)</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Error</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ILLEGAL FUNCTION</td>
<td>Invalid function code An attempt was made to execute a function that is not supported.</td>
</tr>
<tr>
<td>2</td>
<td>ILLEGAL DATA ADDRESS</td>
<td>Invalid register number Failed to access the register.</td>
</tr>
<tr>
<td>3</td>
<td>ILLEGAL DATA VALUE</td>
<td>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.</td>
</tr>
<tr>
<td>7</td>
<td>NEGATIVE ACKNOWLEDGE</td>
<td>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</td>
</tr>
</tbody>
</table>

However, no response is returned for the following errors.
- CRC error
- Errors other than those shown above
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

<table>
<thead>
<tr>
<th>Slave address</th>
<th>1 to 99.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported functions</td>
<td>Same as the Modbus server.</td>
</tr>
<tr>
<td>Register assignments</td>
<td>Same as the Modbus server.</td>
</tr>
<tr>
<td>Modbus error response</td>
<td>Same as the Modbus server.</td>
</tr>
</tbody>
</table>
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

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)

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

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).
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.

Appendix 2 Login Procedure
Appendix 3  ASCII Character Codes

Upper 4 bits

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>SP</td>
<td>@</td>
<td>P</td>
<td>p</td>
<td>*</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

• 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.

<table>
<thead>
<tr>
<th>Items</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tag</td>
<td>ST</td>
</tr>
<tr>
<td>Message</td>
<td>SG</td>
</tr>
<tr>
<td>Free message</td>
<td>BJ</td>
</tr>
<tr>
<td>Group name</td>
<td>SX</td>
</tr>
<tr>
<td>File header</td>
<td>TZ</td>
</tr>
<tr>
<td>Field title and Field string for a batch text field setting</td>
<td>BH</td>
</tr>
<tr>
<td>Batch comment</td>
<td>BU</td>
</tr>
<tr>
<td>Header 1 and Header 2 for an e-mail setting</td>
<td>YU</td>
</tr>
<tr>
<td>Unit for a measurement channel setting</td>
<td>SR</td>
</tr>
<tr>
<td>Unit for a computation channel setting</td>
<td>SO</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>80</th>
<th>90</th>
<th>A0</th>
<th>B0</th>
<th>C0</th>
<th>D0</th>
<th>E0</th>
<th>F0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A</td>
<td>Ð</td>
<td>Ð</td>
<td>À</td>
<td>Ñ</td>
<td>á</td>
<td>â</td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>C</td>
<td>b</td>
<td>c</td>
<td>À</td>
<td>Ñ</td>
<td>á</td>
</tr>
<tr>
<td>2</td>
<td>D</td>
<td>E</td>
<td>Ñ</td>
<td>Ñ</td>
<td>À</td>
<td>Ñ</td>
<td>á</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>G</td>
<td>Ó</td>
<td>Ó</td>
<td>À</td>
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<tr>
<td>4</td>
<td>H</td>
<td>I</td>
<td>Í</td>
<td>Í</td>
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<td>Í</td>
<td>Í</td>
</tr>
<tr>
<td>5</td>
<td>J</td>
<td>K</td>
<td>Í</td>
<td>Í</td>
<td>Í</td>
<td>Í</td>
<td>Í</td>
</tr>
<tr>
<td>6</td>
<td>L</td>
<td>M</td>
<td>Í</td>
<td>Í</td>
<td>Í</td>
<td>Í</td>
<td>Í</td>
</tr>
<tr>
<td>7</td>
<td>Ñ</td>
<td>Ñ</td>
<td>Ñ</td>
<td>Ñ</td>
<td>Ñ</td>
<td>Ñ</td>
<td>Ñ</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>Ð</td>
<td>Ð</td>
<td>À</td>
<td>Ñ</td>
<td>á</td>
</tr>
<tr>
<td>B</td>
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<td>Ñ</td>
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<tr>
<td>C</td>
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<td></td>
<td></td>
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<tr>
<td>D</td>
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<td></td>
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<td></td>
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<tr>
<td>F</td>
<td>Ð</td>
<td>À</td>
<td>Ñ</td>
<td>á</td>
<td>â</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Korean Characters That You Can Enter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symbols</strong></td>
</tr>
<tr>
<td>0xA1A1 to 0xACF1</td>
</tr>
<tr>
<td>(excluding those whose second byte is between 0x00 and 0xA0 and those whose second byte is 0xFF)</td>
</tr>
<tr>
<td><strong>Hangul</strong></td>
</tr>
<tr>
<td>0xB0A1 to 0xC8FE</td>
</tr>
<tr>
<td>(excluding those whose second byte is between 0x00 and 0xA0 and those whose second byte is 0xFF)</td>
</tr>
</tbody>
</table>
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.

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)

Is there more data?

NO

YES

Send the command

NEXT

(Output the subsequent data.)

Receive response

Binary (see section 4.1)

1: Bit 0 of the binary header flag
0: There is more data.
1: Data transmission is complete.

END
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.

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.
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.

<table>
<thead>
<tr>
<th>Model</th>
<th>Data size</th>
</tr>
</thead>
<tbody>
<tr>
<td>FX1002 and FX1004</td>
<td>1200 intervals (150 seconds at the shortest write interval of 125 ms)</td>
</tr>
<tr>
<td>FX1006, FX1008, FX1010, and FX1012</td>
<td>240 intervals (240 seconds at the shortest write interval of 1 s)</td>
</tr>
</tbody>
</table>
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