User's
Manual

DXAdvanced R4

DX1000/DX1000N/DX2000
Communication Interface

vigilantplant.®

YOKOGAWA
Yokogawa Electric Corporation

IM 04L41B01-17E
7th Edition

Thank you for purchasing the DX1000/DX2000.
This Communication Interface User's Manual contains information about the Ethernet/serial interface communication functions. To ensure correct use, please read this manual thoroughly before operation.
Keep this manual in a safe place for quick reference in the event a question arises.
The following manuals, including this one, are provided as manuals for the DX.

- **Paper manual**

Manual Name	Manual No.	Description
DX1000/DX1000N Operation Guide	IM 04L41B01-02E	Explains concisely the operating procedure of the DX1000 and DX1000N.
DX2000 Operation Guide	IM 04L42B01-02E	Explains concisely the operating procedure of the DX2000.
DX1000/DX1000N/DX2000 Control of Pollution Caused by the Product	IM 04L41B01-91C	Gives a description of pollution control.

- **Electronic manuals provided on the accompanying CD-ROM**

Manual Name	Manual No.	Description
DX1000/DX1000N Operation Guide	IM 04L41B01-02E	This is the electronic version of the paper manual.
DX2000 Operation Guide	IM 04L42B01-02E	
DX1000/DX1000N User's Manual	IM 04L41B01-01E	Describes how to use the DX. The communication and network functions, custom display functions, and some of the options are excluded.
DX2000 User's Manual	IM 04L42B01-01E	
DX1000/DX1000N/DX2000 Multi Batch (/BT2) User's Manual	IM 04L41B01-03E	Describes how to use the multi batch function (/BT2 option).
DX1000/DX1000N/DX2000 Custom Display User's Manual	IM 04L41B01-04E	Describes how to use the custom display function.
DX1000/DX1000N/DX2000 Advanced Security Function (/AS1) User's Manual	IM 04L41B01-05EN	Describes how to use the advanced security function (/AS1 option).
DX1000/DX1000N/DX2000 Communication Interface User's Manual	IM 04L41B01-17E	Explains the communication functions of the DX1000/DX1000N/DX2000 using the Ethernet/serial interface.
DX1000/DX1000N/DX2000 EtherNet/IP Communication Interface User's Manual	IM 04L41B01-18E	Describes how to use communication functions through the EtherNet/IP interface.
DX1000/DX1000N/DX2000 PROFIBUS-DP (/CP1) Communication Interface User's Manual	IM 04L41B01-19E	Describes how to use communication functions through the PROFIBUS-DP interface (/CP1 option).

- **DAQSTANDARD Manuals**

All manuals other than IM 04L41B01-66EN are contained in the DAQSTANDARD CD.

Manual Title	Manual No.
DAQSTANDARD Viewer User's Manual	IM 04L41B01-63EN
DAQSTANDARD Hardware Setup User's Manual	IM 04L41B01-64EN
DAQSTANDARD DX100P/DX200P Hardware Configurator User's Manual	IM 04L41B01-65EN
Installing DAQSTANDARD	IM 04L41B01-66EN

7th Edition : December 2010 (YK)

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. The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
- Copying or reproducing all or any part of the contents of this manual without YOKOGAWA's permission is strictly prohibited.
- The TCP/IP software of this product and the document concerning the TCP/IP software have been developed/created by YOKOGAWA based on the BSD Networking Software, Release 1 that has been licensed from the Regents of the University of California.
- This manual follows the guidelines of Microsoft Corporation for displaying screen captures.

Trademarks

- vigilantplant, DAQSTATION, Daqstation, and DXAdvanced are registered trademarks of Yokogawa Electric Corporation.
- Microsoft and Windows are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- Adobe and Acrobat are registered trademarks or trademarks of Adobe Systems Incorporated.
- Kerberos is a trademark of the Massachusetts Institute of Technology (MIT).
- Company and product names that appear in this manual are registered trademarks or trademarks of their respective holders.
- The company and product names used in this manual are not accompanied by the registered trademark or trademark symbols (® and ™).

Revisions

- 1st edition: December 2005
- 2nd edition: October 2006
- 3rd edition: April 2007
- 4th edition: December 2007
- 5th edition: November 2008
- 6th edition: March 2010
- 7th edition: December 2010

DX's version and functions described in this manual

The contents of this manual cover DXs with hardware style number 3 and firmware release number 4. For details on the functions that have been added or changed, see "DX's Version and Functions Described in This Manual" in the *DX1000/DX1000N or DX2000 User's Manual (IM04L41B01-01E* or *IM04L42B01-01E)*.

Edition	DX	Description
2	Version 1.11	Additions and improvements to functionality.
	Version 1.21	
3	Release number 2 (Version 2.0x)	Additions and improvements to functionality.
	Style number 2	NEMA4 compliance.
4	Same as edition 3.	Additions and improvements to functionality.
		Changed the direction of the clamp input terminal (/H2 option).
5	Release number 3 (Version 3.0x)	Additions and improvements to functionality.
	Style number 3	Changed the boot ROM.
6	Release number 4 (Version 4.0x)	Additions and improvements to functionality. Added models with 400 MB of internal memory (internal memory suffix code -3).
	Style number 3	
7	Same as edition 6.	Additions and improvements to explanations.

Conventions Used in This Manual

- **Unit**
  - k: Denotes 1000. Example: 5 kg, 100 kHz
  - K: Denotes 1024. Example: 640 KB

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

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

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

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

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

- **Bold characters**
  Bold characters are mainly characters and numbers that appear on the display.
  The ◊ symbol indicates key and menu operations.

Models Covered in This Manual

This manual mainly describes the operating procedures on the DX1000. When the procedures differ between the DX2000 and the DX1000, the procedures (including the menu operation) on the DX2000 are also given.

High-Speed and Medium-Speed Model Groupings

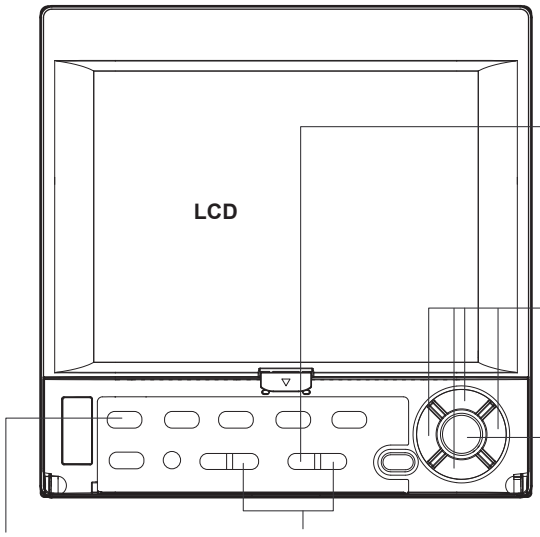
This manual uses the terms high-speed input model and medium-speed input model to distinguish between DX models as follows:

Model	Type Model
High-speed input model	DX1002, DX1004, DX1002N, DX1004N, DX2004, and MV2008
Medium-speed input model	DX1006, DX1012, DX1006N, DX1012N, DX2010, DX2020, DX2030, DX2040, and DX2048

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

Front Panel

DX1000



ESC key
Press this key to return to the previous screen or cancel the new settings.

Arrow keys
Press these keys to move between setup items displayed on the screen.

DISP/ENTER key
Press this key when confirming the setting or when closing the entry box.

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

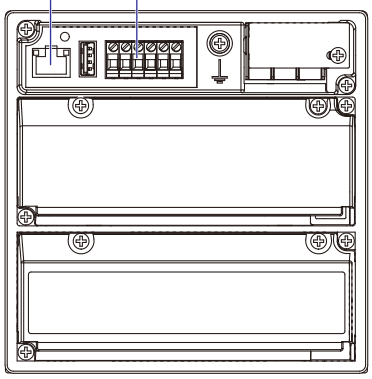
MENU and FUNC keys
Press the MENU key and then hold down the FUNC key for approximately 3 s. The basic setting menu is displayed from which you can to enter the communication setup menus.

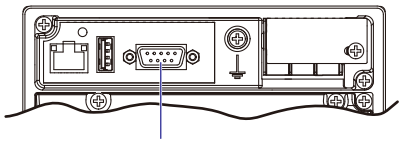
Rear Panel

DX1000

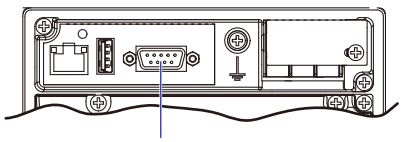
Ethernet interface connector
A connector used for standard equipped Ethernet communications.

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





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



PROFIBUS-DP port (release number 3 or later)
A PROFIBUS connector that is provided on modes with the /CP1 option.

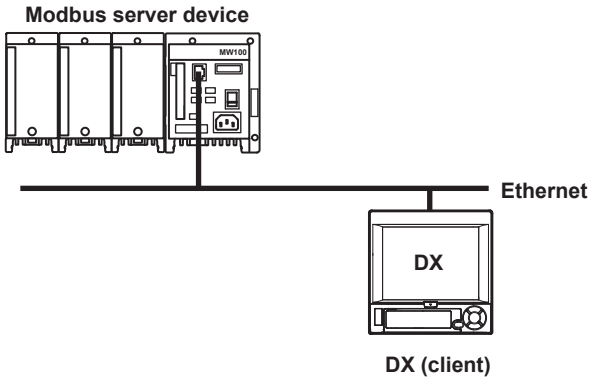
Contents

1.1 DX Features

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

Modbus Client

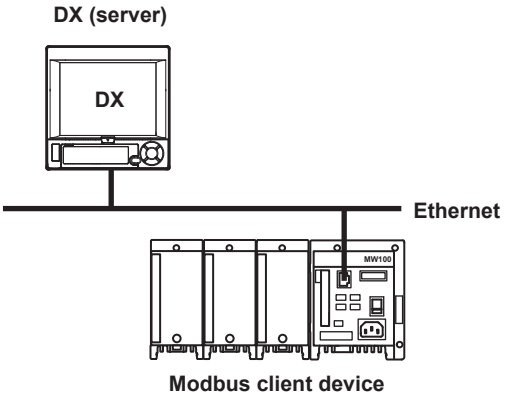
- The DX acting as a Modbus client device can connect to a Modbus server device and read or write to the internal register. The read data can be used as communication input data of the computation function* on a computation channel. The data can also be handled on the external input channel**. The data that can be written to the internal register is measured data and computed data.
  * /M1 and /PM1 options
  ** DX2000 with /MC1 option
- For details on the Modbus function codes that the DX supports, see section 6.3.
- For a description of the settings required to use this function, see section 1.10.



Modbus Server

- A Modbus client device can carry out the following operations on the DX that is operating as a Modbus server device.
  - Load data from measurement, computed,* and external input channels** (using the input register)
  - Load communication input data* (using the hold register)
  - Write communication input data* (using the hold register)
  - Write to external input channels* (using the hold register)
  - Start and stop recording, write messages, and perform other similar operations (using the hold register; models with release number 3 or later)
  - Load the recording start/stop condition, message strings, and other types of data (using the hold register; models with release number 3 or later)

  * /M1 and /PM1 options
- For details on the Modbus function codes that the DX 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[*1], the root password and authentication key of the password management function[*2], the key lock password, the connection destination of the FTP client function, SMTP authentication, and POP3 settings.
  *1 Can be configured on DXs with the /AS1 option.
  *2 /AS1 option
- The following types of data can be output.
  - Measured, computed[*3], and external input[*4] data.
  - Files in the internal memory or files on the external storage medium.
  - Setup information and status byte.
  - A log of operation errors and communications.
  - Alarm summary and message summary.
  - Relay status information.

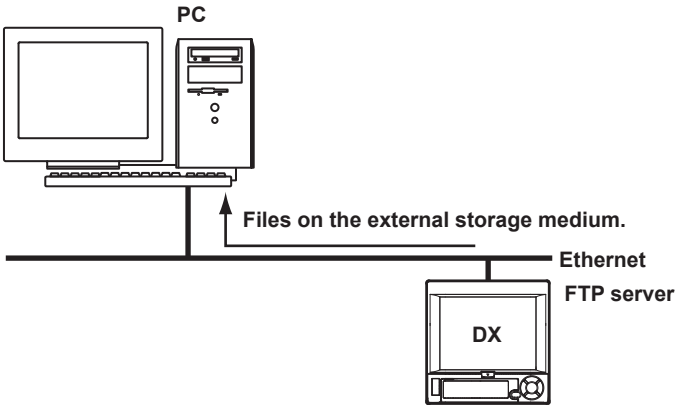
  The measured, computed[*3], and external input[*4] data can be output to a PC in BINARY or ASCII format. Other types of data are output in ASCII format. For a description of the data output format, see chapter 4.
  *3 /M1 or /PM1 option
  *4 DX2000 with /MC1 option
- For details on how to use this function, see section 1.12.
- The commands that can be used with this function are setting commands (see sections 3.4 and 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 via the Ethernet interface or the serial interface (option).
- For information about the settings and operations for using this function through serial commands, 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 DX indefinitely without transferring data and prohibiting other users from making new connections for data transfer.

FTP Server

- You can use a PC to access the DX via FTP. You can perform operations such as retrieving directory and file lists from the external storage medium of the DX and transferring and deleting files. In addition, you can also retrieve the directory or file list and transfer files in the internal memory.
- On DXs with the /AS1 advanced security option, you cannot create or delete files on the external storage media connected to the DX.
- For a description of the settings required to use this function, see section 1.6.

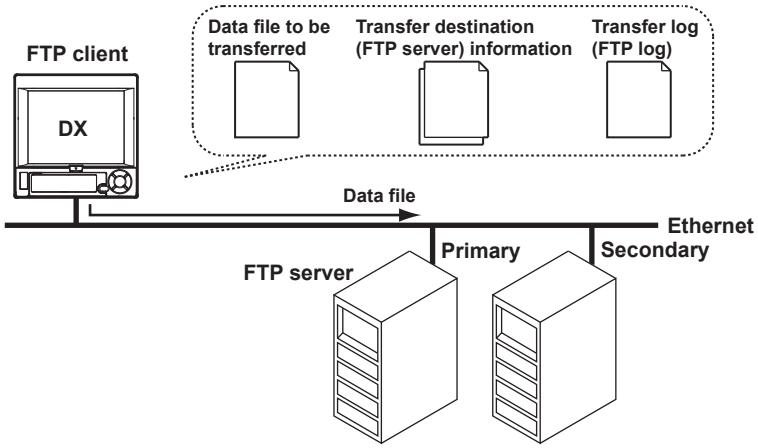


FTP Client

Automatic transferring of files

- The display data file, event data file, report data file, snapshot data file, setup file*1, and change settings log file*1 that are created in the internal memory of the DX can be automatically transferred to a remote FTP server. The result of the transfer is recorded in the FTP log. The FTP log can be shown on the DX's display (see "Log Display" described later) or output to a PC using commands.

  *1 /AS1 option



  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 DX to a remote 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 3.10).
- The close command cannot be used on DXs with the /AS1 advanced security option. The close command closes the connection between a DX (other than the DX that you are operating) and a PC.

Instrument Information Server

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

Login (On DXs without the /AS1 advanced security option)

- 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 *DX1000/ DX1000N or DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E).*
- 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 DX. 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. 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 DX. 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 DX. A user can disconnect the connection between the PC that the user is using and the DX.
  - Limitations on the use of the FTP server
    A user cannot save files to the external storage medium of the DX or delete files on it. A user can load files.

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

Login (On DXs with the /AS1 advanced security option)

- You have to log in to use the setting/measurement server and Web server functions.
- For a description of the settings required to use this function, see the *Advanced Security Function (/AS1) User's Manual (IM 04L41B01-05EN)*.
- For a description of the login process of the setting/measurement server, see appendix 2.

Setting/Measurement Server

- **User Registration**

  You can use the DX login function to register users. There are two user levels: administrator and user.

  Administrator

  There are two types of connections that can be made to the DX setting/measurement server: connections to the setting function (setting connection) and connections to the monitoring function (monitoring connections). When you connect to the setting function as an administrator, you can perform all the commands. When you connect to the monitoring function, you can only produce measurement and setup data and execute input commands for communication input data and external input channels. For information about what commands can be sent, see section 3.2.

  User

  If you log in to the monitoring function as a user, you can perform the same commands that you can perform when you log in as an administrator. When you connect to the setting function, in addition to the monitoring function commands, you can also perform some control commands. The commands that you can perform are those that have been enabled by the user privileges. See section 3.2.

Web Server

- **User Registration**

  You can use the DX login function to register Web server users. There are two user levels: administrator and user.

  Administrator

  An administrator can access the operator and monitor pages through the Web server function. See section 1.5.

  User

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

Note

Accessing the Maintenance/Test Server

Log in with the user name "admin" or "user."

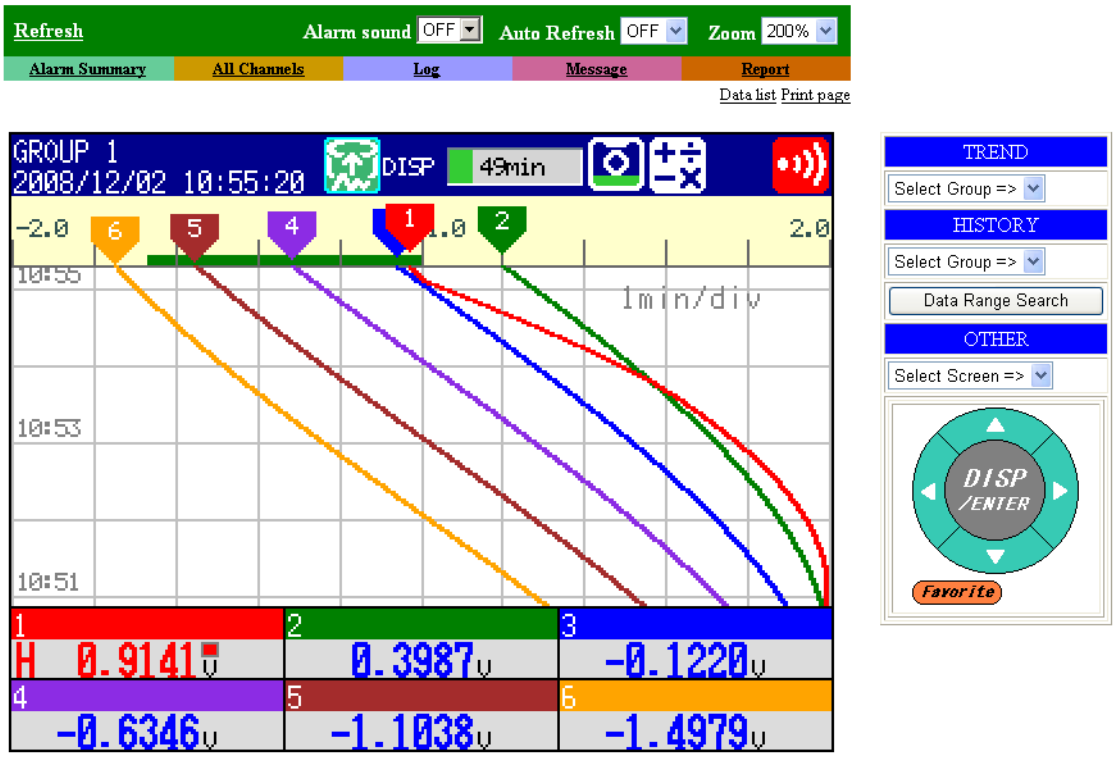
Accessing the FTP Server

Log in with the user name "admin," "user," or "anonymous."

Web Server

Microsoft Internet Explorer can be used to display the DX screen on the PC.

- The following two pages are available.
  - Monitor page: Screen dedicated for monitoring.
  - Operator page: You can switch the DX 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. Alternatively, reports alarm information only when an alarm occurs.
- System mail
  Notifies the time of the power failure and the time of recovery when the DX 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.
  On DXs with the /AS1 advanced security option, this type of e-mail indicates that a user has been locked (“Invalid user”).
- 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 computation function (/M1 or /PM1 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: DX1000@daqstation.com
Date: Sun, 5 Oct 2003 08:00:45 +0900 (JST)
Subject: Periodic_data                    <- Subject
To: user1@daqstation.com, user2@daq.co.jp

LOOP1                                     <- Header 1
TEMPERATURE                               <- Header 2

Time
Host name
DX1000

Time of transmission
10/05 08:00:01
```

E-mail test

- You can send a test message from the DX to the destination to check e-mail transmissions.
- 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 DXs 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.

EtherNet/IP Server (Release number 3 or later)

The DX supports the following features.

- Loads data for measurement, computed, and external input channels.
- Writes to communication input data and external input channels.

For operating instructions, see the *EtherNet/IP Communication Interface User's Manual (IM04L41B01-18E)*.

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 DX.
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).

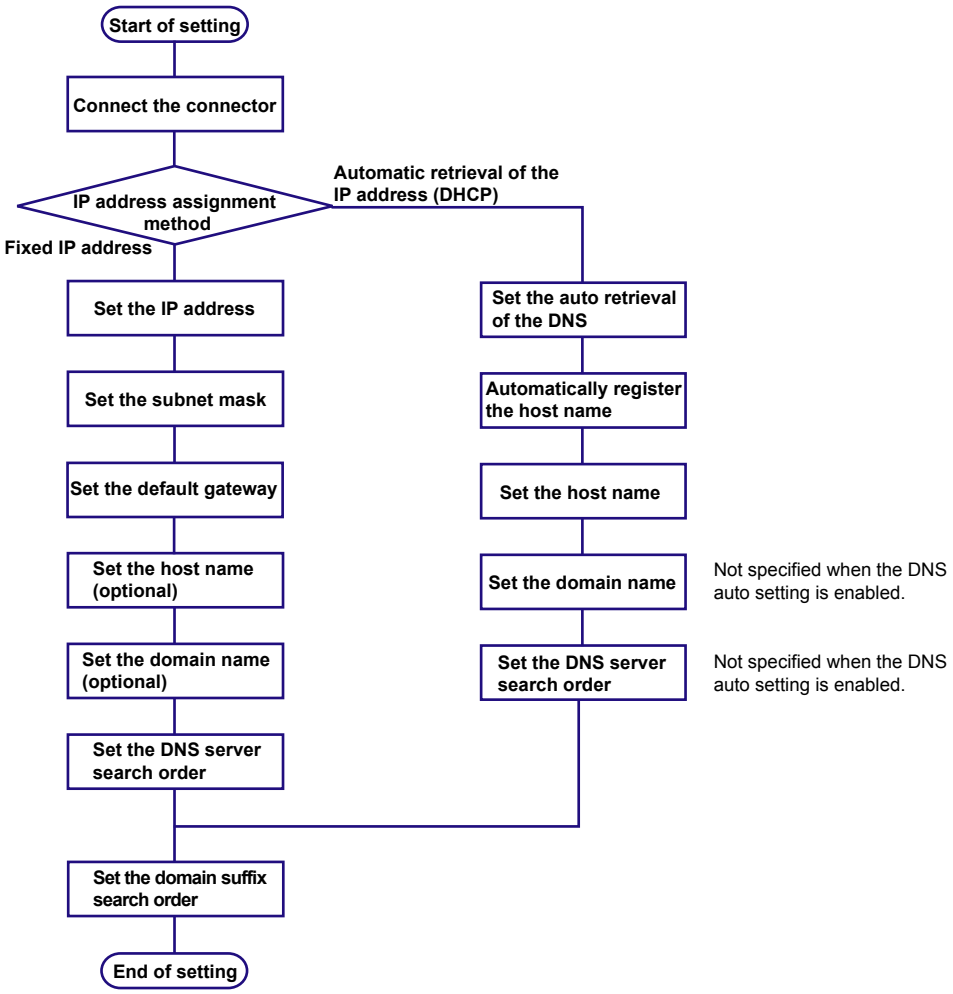
- Error log screen: Log of operation errors
- Communication log screen: Log of communication input/output to the setting measurement server
- FTP log screen : Log of file transfers carried out using the FTP client function.
- WEB log screen : Log of operations using the Web server function
- Mail log screen : Log of E-mail transmissions
- Login log screen[*1] : Log of login, logout, items related to time adjustment, and calibration management operations.
- 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 status (access to the master or client)
- Operation log screen[*2]: Log of operations
- Change settings log screen[*2]: Log of setting changes

*1 Only on DXs without the /AS1 advanced security option
*2 Only on DXs with the /AS1 advanced security option

For the operating procedure of the log screen and the details on the displayed contents, see the *DX1000/DX1000N or DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E)*. 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.

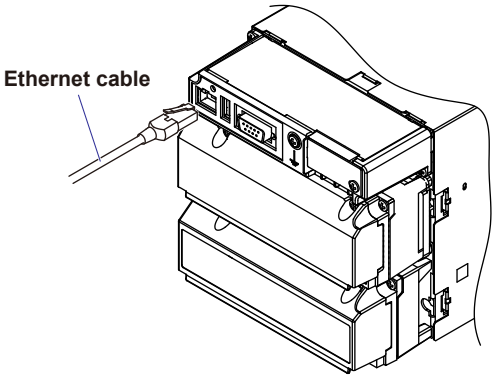


1.3 Connecting the DX

Connecting to the Port

Connector

Connect an Ethernet cable to the Ethernet port on the DX rear panel.

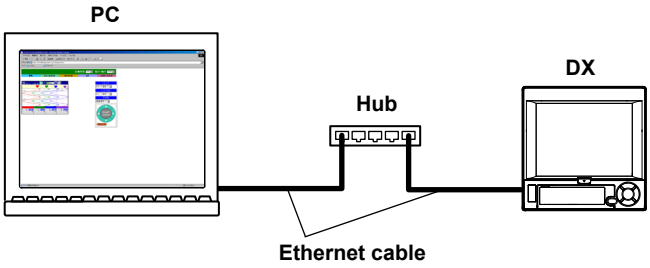


CAUTION

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

Connecting to the PC

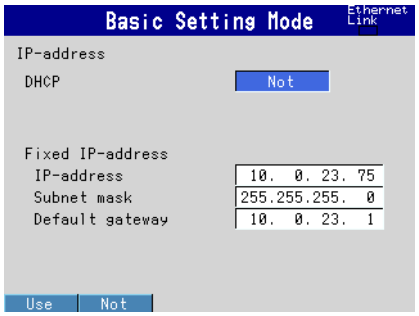
Make the connection via a hub. For a one-to-one connection with a PC, make the connection as shown in the figure below. Multiple DXs can be connected to a single PC in a similar manner.



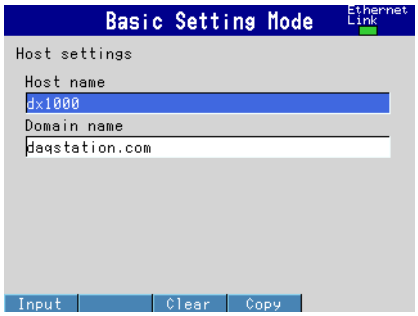
Setting the IP Address and Host Information

- DX1000
  - ◊ 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**.
- DX2000
  - ◊ 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, 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**.

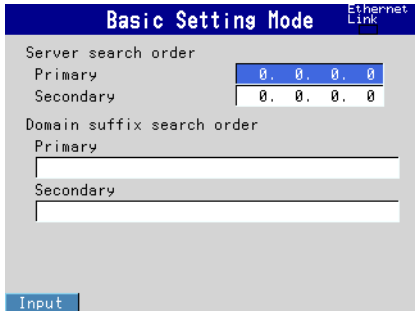
IP address setting



Host name setting



DNS setting



Set the IP address to a fixed IP address or obtain it automatically (DHCP).
Consult with your network administrator for the network parameters such as the IP address, subnet mask, default gateway, and DNS.

When using a fixed IP address

- **DHCP**
  Set DHCP to **Not**.
- **IP address**
  Set the IP address to assign to the DX.
- **Subnet mask**
  Set the subnet mask according to the system or network to which the DX belongs.
- **Default gateway**
  Set the IP address of the gateway.
- **Host name**
  Set the DX'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 DX 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

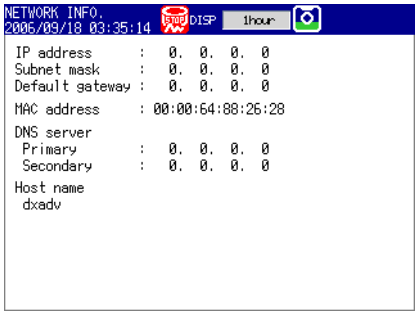
- **DHCP**
  Set DHCP to **Use**.
- **DNS accession**
  To automatically obtain the DNS server address, select **Use**. Otherwise, select **Not**. If you select Not, you must set the server search order.
- **Host-name register**
  To automatically register the host name to the DNS server, select **Use**.
- **Host name**
  Set the DX's host name using up to 64 alphanumeric characters.
- **Domain name**
  Set the network domain name that the DX belongs to using up to 64 characters.
- **Server search order (not necessary when DNS accession is enabled)**
  Register up to two IP addresses for the primary and secondary DNS servers.
- **Domain suffix search order**
  Set up to two domain suffixes: primary and secondary.

Requesting/Releasing Network Information from DHCP

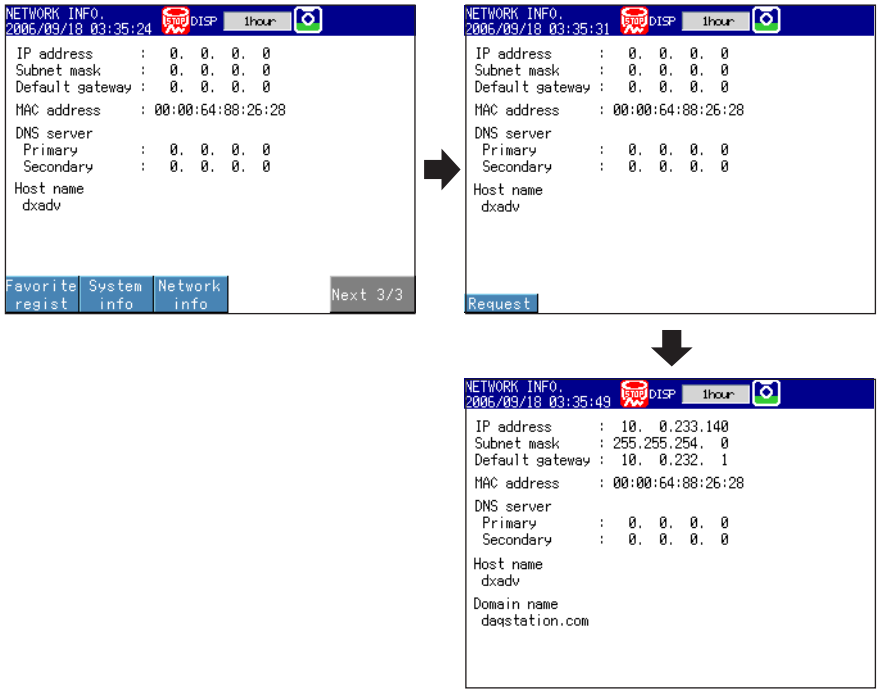
You can manually request or release network information such as the IP address. This operation applies when DHCP is set to Use. Perform the request or release after displaying the network information screen.

Requesting Network Information

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



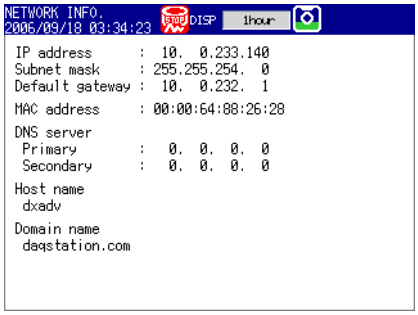
2. Execute the network information request.
   ◊ Press FUNC and select **Network info** > **Request**.



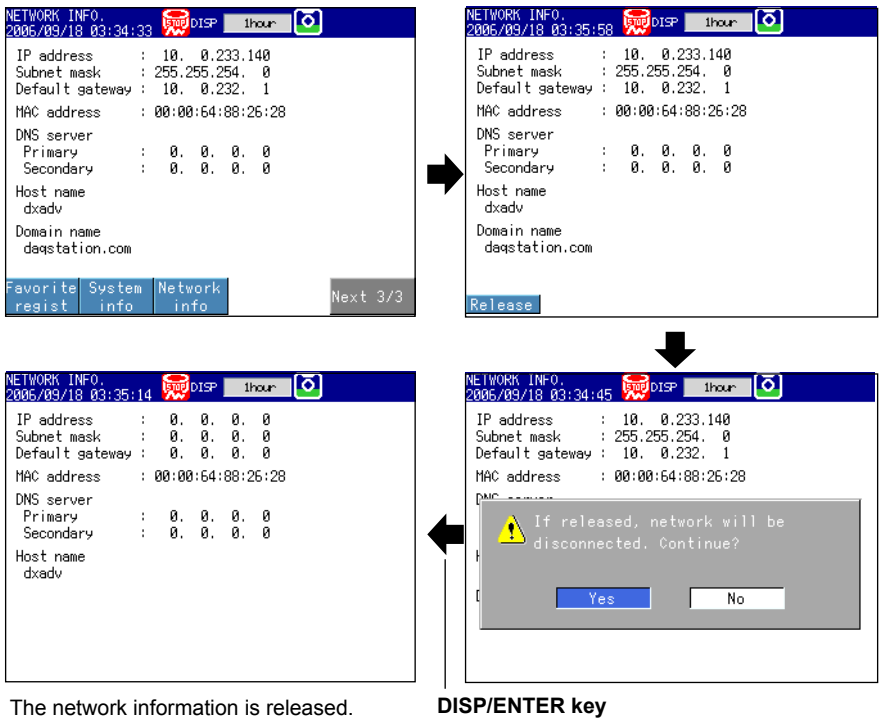
The network information is displayed.

Releasing Network Information

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



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

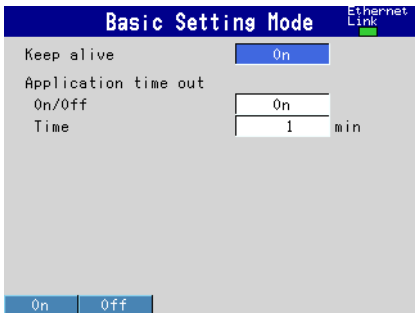


The network information is released.

DISP/ENTER key

Setting the Communication Status

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



Setting the keepalive

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

Setting the application timeout

- Selecting On/Off
  To use the application timeout function, select **On**. Otherwise, select **Off**. If you select **On**, a timeout item is displayed.
- Time
  Set the timeout value between 1 and 120 (minutes).

Checking the communication status

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

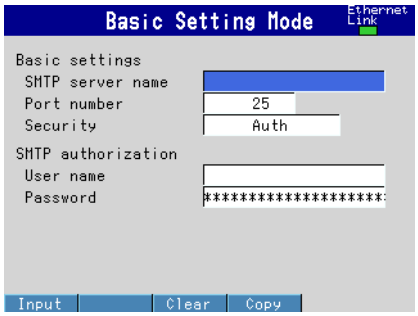
1.4 Sending E-mail Messages

Settings for Sending E-mail

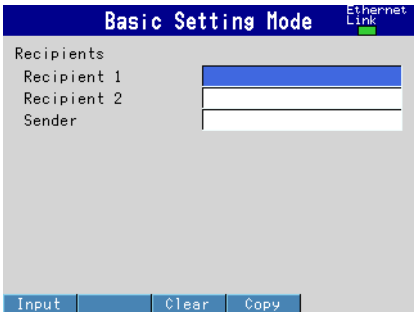
Set the server configuration and the contents of the e-mail transmission.

◊ 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**.

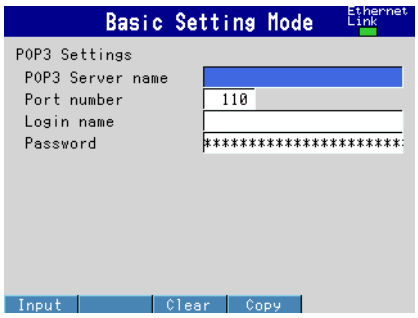
Basic settings



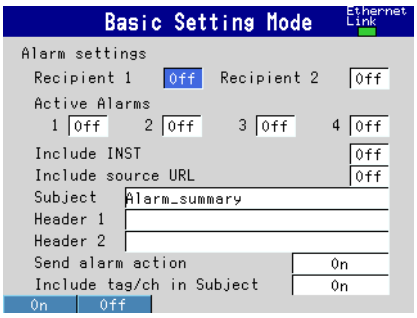
Recipients



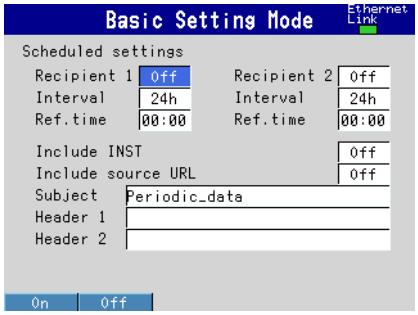
POP3 Settings



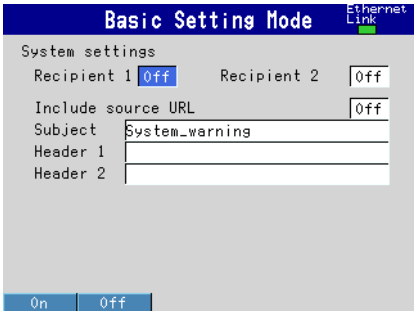
Alarm settings



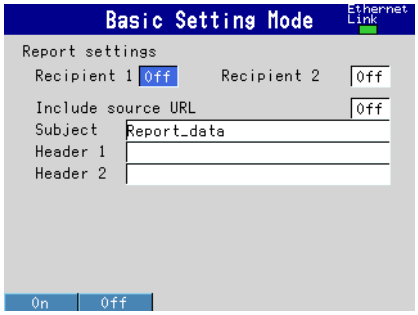
Scheduled settings



System settings



Report settings



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 (release number 3 or later)**
  Select **PbS** if you want to enable POP before SMTP. To enable authenticated e-mail transmission (Authentication SMTP), select **Auth** (release numbers 4 and later). When you select **Auth**, the SMTP authorization items appear.

SMTP authorization (Release numbers 4 and later)

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 (release number 3 or later)

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.
- **Send alarm action (Release number 3 or later)**
  To send e-mail when an alarm occurs and when it is cleared, select **On+Off**. To only send e-mail when an alarm occurs, select **On**.
- **Include tag/ch in Subject (Release number 3 or later)**
  Select **On** to include a tag number in the subject. If the tag number is not set, the corresponding channel number is included.

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

Report Settings

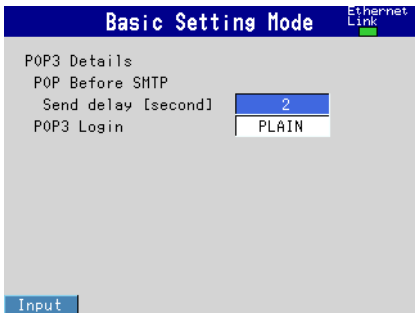
Specify the settings for sending e-mail when reports are created.

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

Configuring the POP3 Server Connection (Release number 3 or later)

Specify how the DX 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, invalid user mails (/AS1 advanced security option), 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(-[tag number or channel number])`

  The tag number or channel number enclosed in parentheses is used only when they are configured to be included in the subject (on models with release number 3 or later).

- **Syntax**

```
header1CRLF
header2CRLF
CRLF
Alarm_summary.CRLF
<Host_name>CRLF
hostCRLF
CRLF
<CH>ccc···cCRLF
<Type>lqCRLF
<aaa>mo/dd_hh:mi:ssCRLF
CRLF
<Inst._value>CRLF
mo/dd_hh:mi:ssCRLF
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, tag comment, or tag number (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`, or `r`) `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)
`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 DX transmits channel numbers, alarm types, and alarm statuses for up to 10 events in a single e-mail. If the DX is configured to include a tag number or a channel number in the e-mail subject, one e-mail is sent for each event.

Scheduled E-mail Format

- **Subject**

  Subject:Periodic_Data

- **Syntax**

```
header1CRLF
header2CRLF
CRLF
Periodic_data.CRLF
<Host_name>CRLF
hostCRLF
CRLF
<Time>CRLF
mo/dd_hh:mi:ssCRLF
CRLF
E-mail_message(s)_did_not_reach_intended_recipient(s).CRLF
ttt···t
Count=nnCRLF
mo/dd_hh:mi:ssCRLF
.........................
CRLF
<Time>CRLF
mo/dd_hh:mi:ssCRLF
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, tag comment, or tag number (Up to 16 characters. Channels set to Skip or Off are not output. (For the channel number, see section 3.3.)
ttt···t	Type of discarded e-mail
	Alarm_summary: Alarm mail
	Periodic_data: Scheduled mail
	System_warning: System mail
	Report_data: Report mail
nn	Number of discarded e-mails
ddd···d	Measured/Computed value (up to 10 digits including the sign and decimal point) + unit (up to 6 characters)
	+OVER: Positive overrange
	-OVER: Negative overrange
	Burnout: Burnout data
	*****: Error data

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

System Mail (Power Failure) Format

- **Subject**

  Subject: System_warning

- **Syntax**

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

System Mail (Memory Full) Format

- **Subject**

  Subject:System_warning

- **Syntax**

  header1*CRLF*
  header2*CRLF*
  CRLF
  Memory_full.*CRLF*
  <Host_name>*CRLF*
  host*CRLF*
  CRLF
  <Memory_remain>ppp･･･pMbytes*CRLF*
  <Memory_blocks>bbb/400*CRLF*
  <Media_remain>rrr･･･rMbytes*CRLF*
  CRLF
  Access_the_following_URL_in_order_to_look_at_a_screen.*CRLF*
  http://host.domain/*CRLF*
  CRLF

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

System Mail (Error) Format

- **Subject**

  Subject:System_warning

- **Syntax**

  header1*CRLF*
  header2*CRLF*
  CRLF
  Error.*CRLF*
  <Host_name>*CRLF*
  host*CRLF*
  CRLF
  mo/dd_hh:mi:ss*CRLF*
  ERROR:fff*CRLF*
  ....
  ”Operation_aborted_because_an_error_was_found_in_media.”*CRLF*
  CRLF
  Access_the_following_URL_in_order_to_look_at_a_screen.*CRLF*
  http://host.domain/*CRLF*
  CRLF

  fff Error number (200, 201, 211, 281 to 285)
  For details on the error, see the *DX1000/DX1000N or DX2000 User’s Manual (IM04L41B01-01E or IM04L42B01-01E)*.

System Mail (Invalid User) Format

- **Subject**

  Subject: [System_warning]

- **Syntax**

  header1*CRLF*
  header2*CRLF*
  CRLF
  User locked*CRLF*
  <Host_name>*CRLF*
  host*CRLF*
  CRLF
  mo/dd_hh:mi:ss*CRLF*
  ERROR:fff*CRLF*
  <User_name>
  uuu•••u
  ••••••••••••••••••••••••••••
  CRLF
  Access_the_following_URL_in_order_to_look_at_a_screen.*CRLF*
  http://host.domain/*CRLF*
  CRLF

  mo/dd_hh:mi:ss Time when the e-mail was created
  uuu•••u Name of the invalid user (up to 20 characters)

Report Mail Format

- **Subject**

  Subject:Report_data

- **Syntax**

```
header1CRLF
header2CRLF
CRLF
ti_report.CRLF
<Host_name>CRLF
hostCRLF
CRLF
mo/dd_hh:mi: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.CRLF
http://host.domain/CRLF
CRLF
```

ti	Contents of the report mail (hourly, daily, weekly, or monthly report)
ccc···c	Channel number, tag comment, or tag number (Up to 16 characters. Channels set to Skip or Off are not output. For the channel number, see section 3.3.)
tp	Report content (average, maximum, minimum, instantaneous, and sum. Four items among these are output.)
eee···e	Measured/Computed value (up to 10 digits including the sign and decimal point). However, for the sum value, the value is output as a combination of the sign, mantissa, E, sign, and exponent such as in -3.8000000E+02. +OVER: Positive overrange -OVER: Negative overrange Burnout: Burnout data Empty data: Error data
uuu···u	Unit (up to 6 characters)

Test E-mail Format

- **Subject**

  Subject: Test

- **Syntax**

  Test_mail.*CRLF*
  <Host_name>*CRLF*
  host*CRLF*
  CRLF
  <Time>*CRLF*
  mo/dd_hh:mi:ss*CRLF*
  CRLF
  <Message>*CRLF*
  x:ms*CRLF*
  .....
  CRLF

x	Message number (1 to 10)
ms	Message content (only specified messages are output.)

Common Display Items for All Formats

- Time information

mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mi	Minute (00 to 59)
ss	Second (00 to 59)

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

- Host name, domain name, and header information

header1	Header 1 (displayed only when it is set)
header2	Header 2 (displayed only when it is set)
host	Host name or IP address (IP address when the host name is not assigned. In the case of an IP address, the <Host> section is set to <IP address>.)
domain	Domain name
_	Space

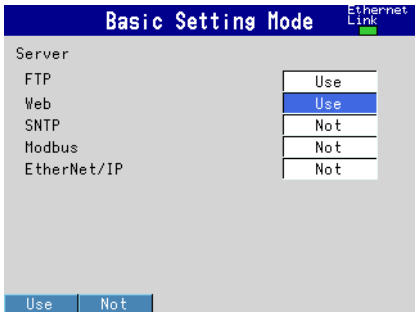
1.5 Monitoring the DX on a PC Browser

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,

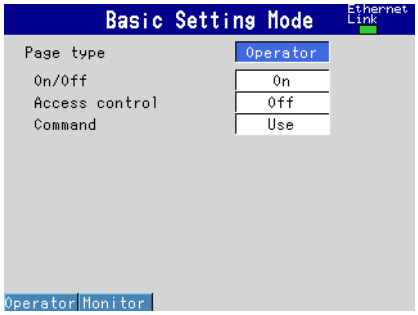
◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Environment** tab > **Communication** > **Service port**.

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

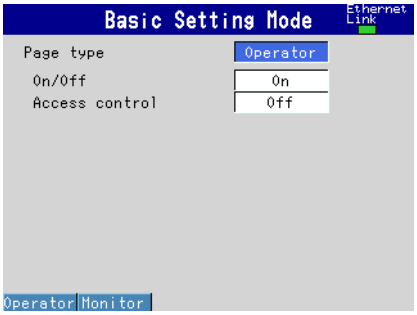
Setting the Web page

◊ 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**.

On DXs without the /AS1 advanced security option



On DXs with the /AS1 advanced security option



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.)
  - Print the DX screen with an attached title and comment
  - Display reports
  - Connect to the DX via FTP and retrieve files
  - Make an alarm sound when an alarm occurs on the DX.

  For screen examples, see “Monitoring with the 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 DX’s DISP/ENTER key, arrow keys, and favorite key
  - Write messages (this operation cannot be performed on DXs with the /AS1 advanced security option).
  - Search data by date and time

  For screen examples, see “Monitoring with the 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 **On**.
  On DXs without the /AS1 advanced security option:
  If you set this to On, 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 *DX1000/DX1000N or DX2000 User’s Manual (IM04L41B01-01E* or *IM04L42B01-01E)*.
  On DXs with the /AS1 advanced security option:
  If you set this to On, you must enter a user name and password to display the monitor page. Set the user name and password through the **Login** item. See the *Advanced Security Function (/AS1) User’s Manual (IM04L41B01-05EN)*.

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
  This is the same as the setting on the monitor page.
- Command input
  On DXs without the /AS1 advanced security option:
  To use message write commands, select **On**. Otherwise, select **Off**.
  On DXs with the /AS1 advanced security option:
  You cannot use message write commands. This setting is fixed at **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 DX 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 DX.
You can also use the IP address in place of the host name and domain name.

File name
File name of the monitor page and operator page of the DX.
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 DX, enter the URL in the Address box of the browser as follows:

http://dx1000.adv.daqstation.com/operator.htm or
http://192.168.1.100/operator.htm

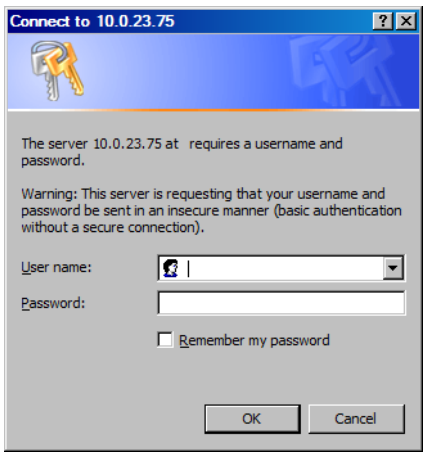
(In the example, the domain name is set to adv.daqstation.com, the host name to dx1000, and the IP address to 192.168.1.100.)

Login (On DXs without the /AS1 advanced security option)

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

No.	Setting	Description and Reference
1	Communication login (Security > Communication)	To access the DX through a communication interface, you must log in. For details, see section 8.2 in the *DX1000/DX1000N or DX2000 User's Manual*.
2	Login	Register the users who can access the Web server. For details, see section 8.2 in the *DX1000/DX1000N or DX2000 User's Manual*.
3	Web page	Set Access control to On in the operator and monitor pages.

Only users whose mode is set to Web, Com, or Key+Com can access the DX 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.



Login (On DXs with the /AS1 advanced security option)

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

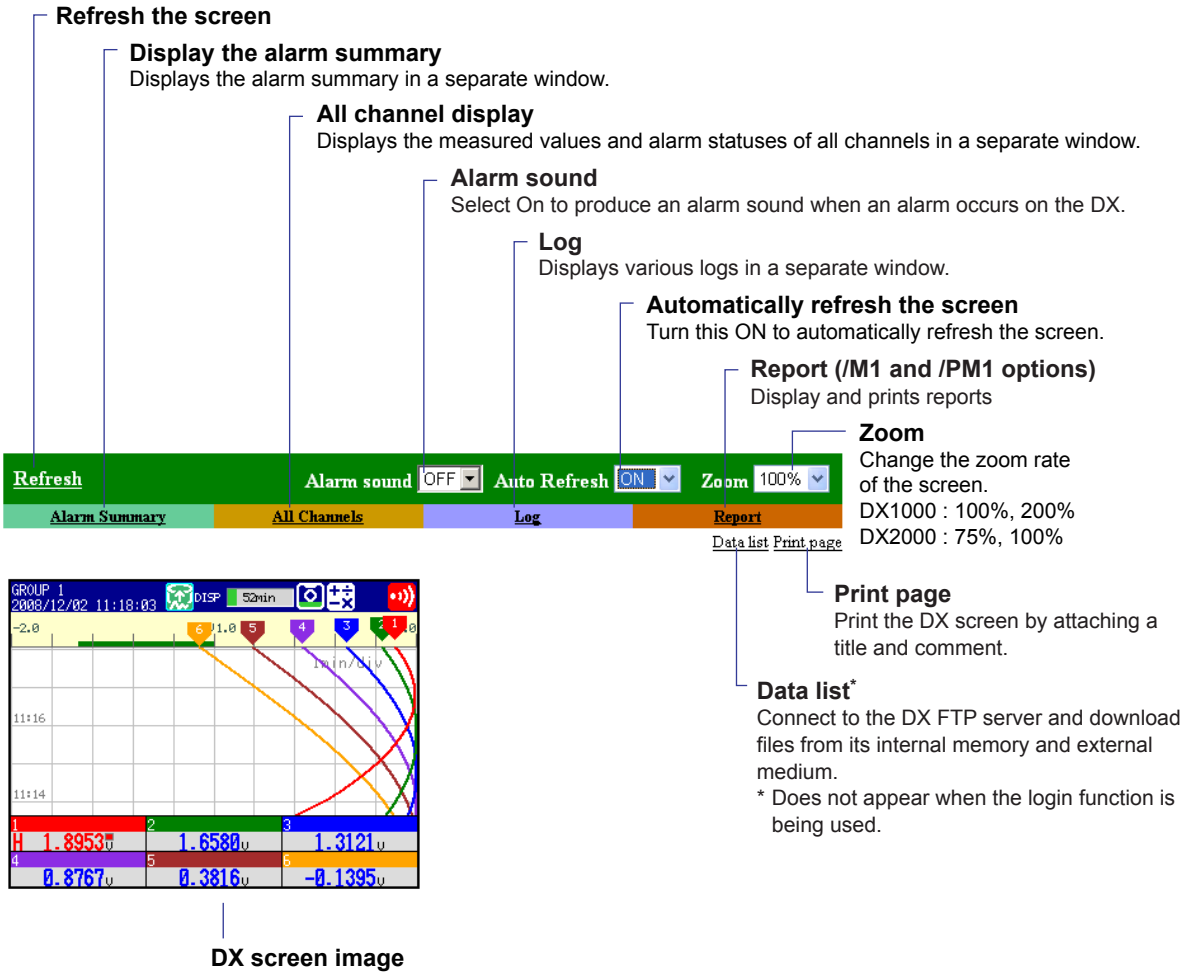
No.	Setting	Description and Reference
1	Communication login (Security > Communication)	To access the DX through a communication interface, you must log in. See section 1.3 in the *Advanced Security Function (/AS1) User's Manual*.
2	Login	Register users whose mode is "Web." See section 1.3 in the *Advanced Security Function (/AS1) User's Manual*.
3	Web page	Set Access control to On in the operator and monitor pages.

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

Contents of the Monitor Page

Note

If the DX 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 different modes, see the *Operation Guide (IM04L41B01-02E or IM04L42B01-02E)*.



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. If 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**.

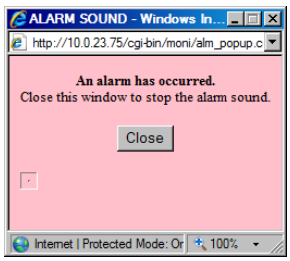
Zoom

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

Sounding and Stopping Alarm Sounds

When an alarm occurs on the DX, the alarm sound popup window appears, and an alarm is sounded.

The alarm can be sounded on a PC that can produce sound. The popup blocking settings of your browser may prevent the alarm sound window from appearing.



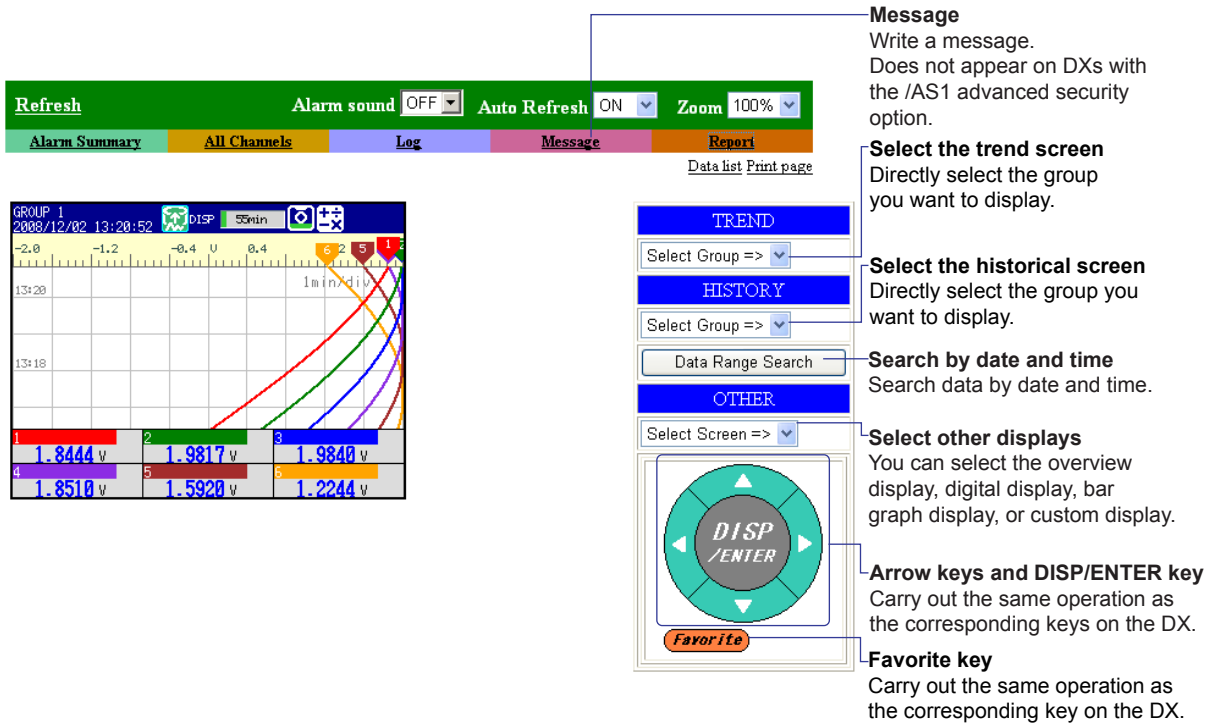
The alarm sound stops when you click Close.

Note

- Alarm Sound Output
  - Alarm detection occurs when the screen is refreshed. The screen can be refreshed through manual refreshing, automatic refreshing, menu operations, and screen operations. We recommend that you enable automatic refreshing when you use the alarm sound.
  - An alarm is sounded when the alarm status in the status display section is red, blinking red, or blinking green (for the meanings of the different alarm statuses, see the *DX1000/DX1000N or DX2000 User's Manual*).
  - Even if you release the alarm on the DX (so that no alarm status is displayed), the alarm will continue to sound on the PC until you stop it.
- Alarm Sound Off
  The DX is not affected when you stop the alarm sound. Stopping the alarm is not equivalent to performing the alarm ACK operation on the DX.
- Alarm Sound Specifications
  The alarm sound is stored in a WAV file on the DX. It cannot be changed.
- When the pages of multiple DXs are being displayed:
  If they are being displayed by the same browser, they all share one alarm sound window.

Contents of the Operator Page

When the multi batch function (/BT2 option) is not in use



Message
Write a message.
Does not appear on DXs with the /AS1 advanced security option.

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

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

Search by date and time
Search data by date and time.

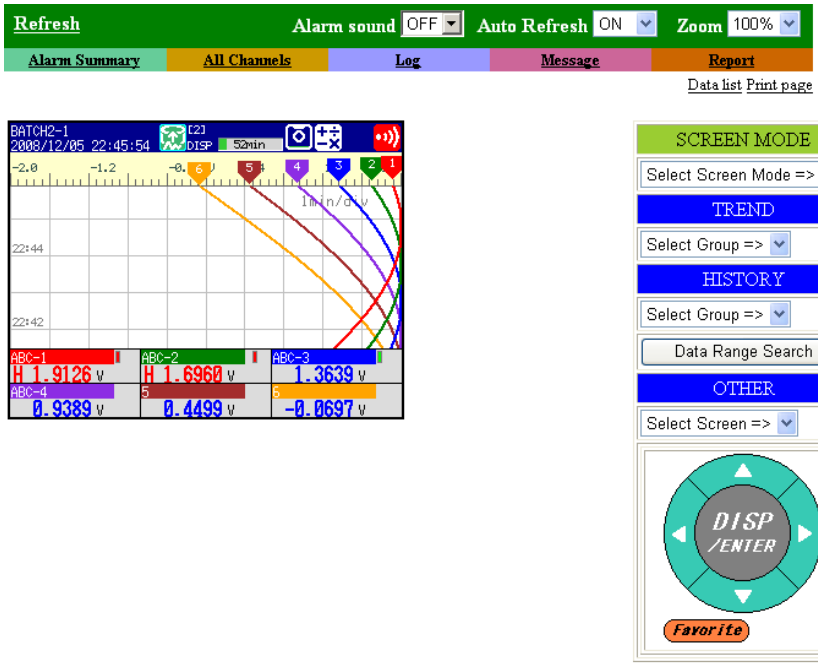
Select other displays
You can select the overview display, digital display, bar graph display, or custom display.

Arrow keys and DISP/ENTER key
Carry out the same operation as the corresponding keys on the DX.

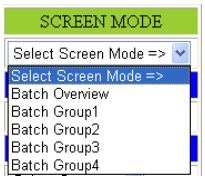
Favorite key
Carry out the same operation as the corresponding key on the DX.

When the multi batch function (/BT2 option) is in use

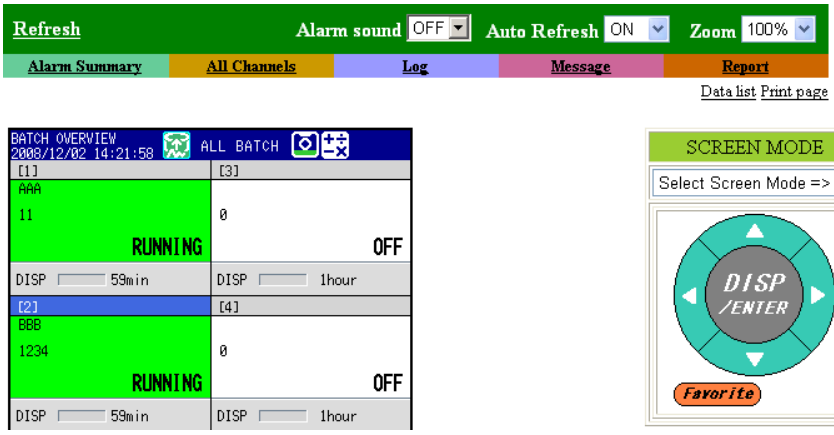
Batch single mode

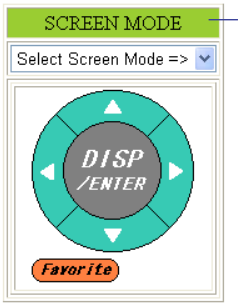


Select the screen mode.
List box

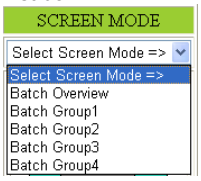


Batch overview mode





Select the screen mode.
List box



Switching the Screen (Operator page only)

- **Screen Mode (Only when the multi batch function (/BT2 option) is in use)**
  From the **Select Screen Mode** list box, select **Batch Overview** (batch overview mode) or **Batch Group#** (batch single mode).

- **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.
  If you are using the multi batch function (/BT2 option) and are displaying the batch single mode screen, you can switch between the screens in the displayed batch group.

- **Other Screens**
  From the **Select Screen** list box, you can switch the screen by specifying digital, bar graph, overview, or custom.
  If you are using the multi batch function (/BT2 option) and are displaying the batch single mode screen, you can switch between the screens in the displayed batch group.

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

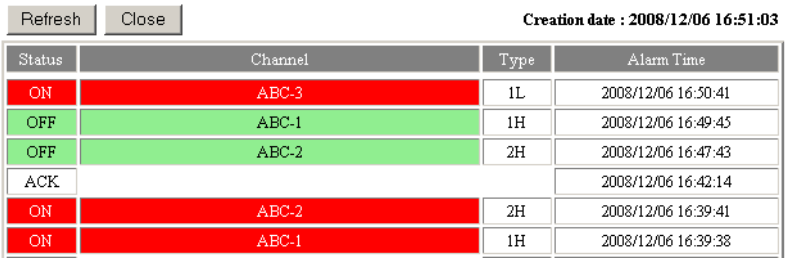
On DXs with the /AS1 advanced security option, you cannot switch the screen when:
- There is a user who has logged in to the DX through key operations.
- There is a user who is connected to the DX setting function through an Ethernet connection.
- There is a user who is executing the LL command through serial communication.

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 DX settings, the Channel column displays channel numbers, tag comments, or tag numbers and tag comments.
- Alarms are displayed using the specified alarm colors.
- When individual alarm acknowledgment is enabled, the channels and alarm levels are displayed.

Alarm summary example (when the multi batch function (/BT2 option) is not in use)

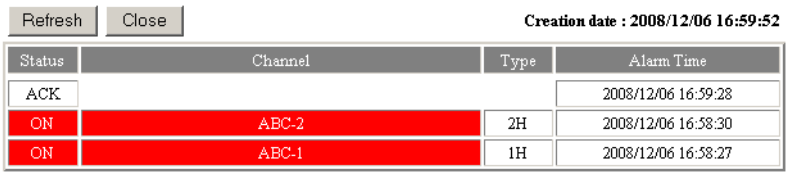

Refresh Close

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

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

Alarm summary example (when the multi batch function (/BT2 option) is in use; release number 3 or later)

Select the batch group from the list box. If you select **All**, the alarm information for every batch group is displayed.


Refresh Close

Creation date : 2008/12/06 16:59:52

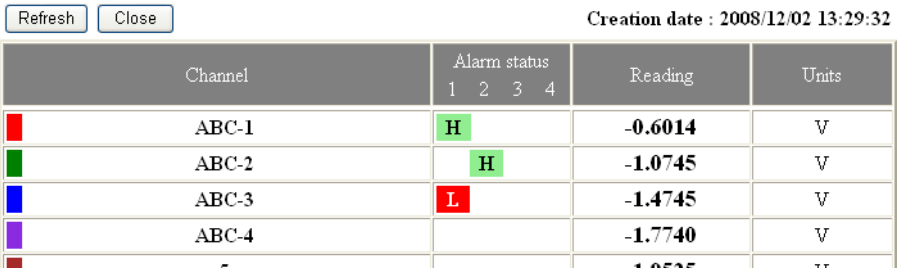
Status	Channel	Type	Alarm Time
ACK			2008/12/06 16:59:28
ON	ABC-2	2H	2008/12/06 16:58:30
ON	ABC-1	1H	2008/12/06 16:58:27

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 DX settings, the Channel column displays channel numbers, tag comments, or tag numbers and tag comments.
- Alarms are displayed using the specified alarm colors.
- If you are using the annunciator function, the alarm display is based on the annunciator sequence. However, the indicators do not blink.
- Channels are not displayed in batch groups even if you are using the multi batch function (/BT2 option).

All channel display example


Refresh Close

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

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

Log

Displays the message summary[*1], error log, FTP log, login log[*2], Web operation log, e-mail log, SNTP log, Modbus log, operation log[*3], and change settings log[*3] 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.
*2 Only on DXs without the /AS1 advanced security option
*3 Only on DXs with the /AS1 advanced security option. Up to 100 operation log items can be displayed.

Message summary example (when the multi batch function (/BT2 option) is not in use)

Refresh Close

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

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

Message summary example (when the multi batch function (/BT2 option) is in use; release number 3 or later)
Displays the batch group that messages were written to.

Refresh Close

Creation date : 2008/12/02 14:30:35

Time	Message	Batch Group	Group	User Name
2008/12/02 14:30:33	start	2	ALL	[Key]
2008/12/02 14:28:49	start	1	ALL	[Key]

Displaying and Printing Report Data (/M1 and /PM1 options; release number 3 or later)

You can display report data in the specified format (layout) and print it.

- **Procedure**
  - Set the report display layout before you carry out this operation. In the layout, set the report title, the report channels to display, and the item names.
  - From the operator or monitor page, open the create web report window, and select the report file and the layout to use.

Report layout example

Daily report

Plant Section 50 Industrial water

Daily report Start time: 2007/03/01 01:00:00

Timeout time	Minimum pump volume [k]	Maximum pump volume [k]	Average pump volume [k]	Integrated pump volume [k]	Flow rate [m3]
03/02 1:00:00					
03/03 1:00:00					
03/04 1:00:00					
03/05 1:00:00					
03/06 1:00:00					
03/07 1:00:00					
03/08 1:00:00					
03/09 1:00:00					
03/10 1:00:00					
03/11 1:00:00					
03/12 1:00:00					
03/13 1:00:00					
03/14 1:00:00					
03/15 1:00:00					
03/16 1:00:00					
03/17 1:00:00					
03/18 1:00:00					
03/19 1:00:00					
03/20 1:00:00					
03/21 1:00:00					
03/22 1:00:00					
03/23 1:00:00					
03/24 1:00:00					
03/25 1:00:00					
03/26 1:00:00					
03/27 1:00:00					
03/28 1:00:00					
03/29 1:00:00					
03/30 1:00:00					
03/31 1:00:00					
04/01 1:00:00					

Please enter comments.

Daily and monthly reports

Plant Section 50 Industrial water

Daily report Start time: 2007/03/01 01:00:00

Timeout time	Minimum pump volume [k]	Maximum pump volume [k]	Average pump volume [k]	Integrated pump volume [k]	Flow rate [m3]
03/02 1:00:00					
03/03 1:00:00					
...	...	...	...	...	...
03/31 1:00:00					
04/01 1:00:00					

Monthly report Start time: 2007/03/01 01:00:00

Timeout time	Minimum pump volume [k]	Maximum pump volume [k]	Average pump volume [k]	Integrated pump volume [k]	Flow rate [m3]
04/01 1:00:00					

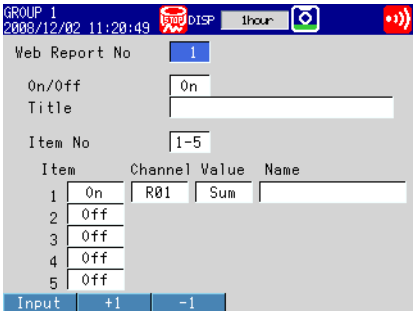
Please enter comments.

- **Setting the Report Layout**

  This item only appears on models with the computation function (/M1 or /PM1 option) when the basic setting items are set as follows:

  - The type of report to create is specified (**Report** > **Basic settings**).
  - Web server is set to **Use** (**Communication (Ethernet)** > **Server** > **Server modes**).
  - The operator or monitor page is set to **On** (**Communication (Ethernet)** > **Web page**).

  ◊ Press **MENU** (to switch to setting mode), and select the **Menu** tab > **Web Report**



Web Report No

You can configure 10 different report layouts. Set the number in the range of 1 to 10.

On/Off

Select **On** to use the layout.

Title

The report title. This title is used to select the layout when displaying reports on the Web browser. Enter the title using up to 64 alphanumeric characters and symbols.

Item No (DX1000 and DX1000N only)

You can set up to 10 items. Select **1-5** or **6-10**.

Item, Channel, Value, and Name

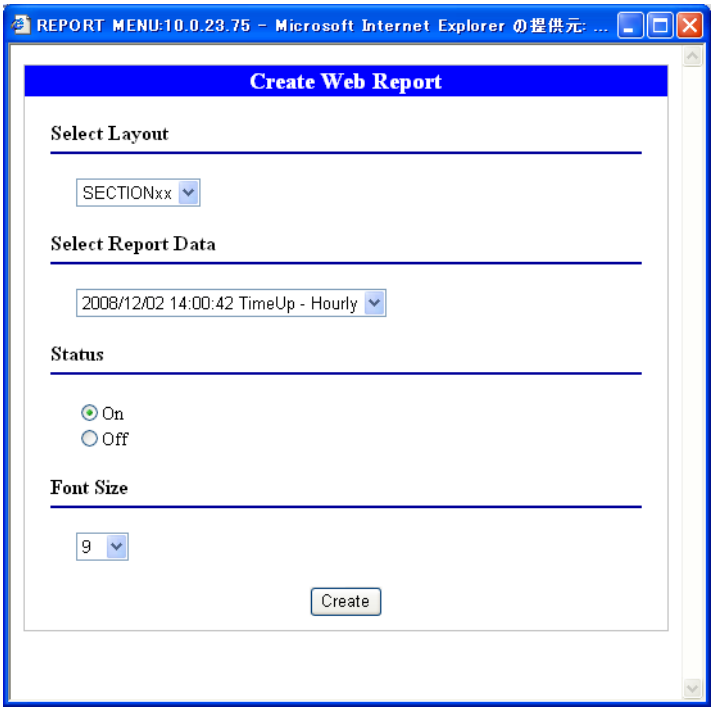
For each item number, set the report channel, computation type, and name to assign to the item.

Enter the name using up to 16 alphanumeric characters and symbols.

For the procedure to configure the report, see section 9.5 in the *DX1000/DX1000N or DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E)*.

- **Displaying a Report**

  1. Click **Report** to open the Create Web Report window.



  2. Select the layout and report data.

  Select Layout

  Select the layout title from the list box.

  Select Report Data

  Select the report data from the list box. The report data is the data in the DX internal memory. The report data is displayed using the date when the report was created and the report value.

  Status

  To display the report data status, select **On**.

Status Indication	Description
	A burnout occurred during the reporting period.
	A measurement or computation error occurred during the reporting period.
	Over range or computation overflow occurred during the reporting period.
	A power failure occurred during the reporting period.
	The time was changed during the reporting period.

  Font Size

  Select a display font size from 6 points to 12 points.

3. Click **Create**.
The report data appears in a separate window.

PLANTxx

Hourly Start Time:2008/12/06 19:04:55

Time Up	PUMP 1[V]	PUMP 2[V]	PUMP 3[V]	PUMP 4[V]	PUMP 5[V]
12/06 20:00:00	6.811100E+00	2.147660E+01	1.1958	4.551670E+01	5.325290E+01
12/06 21:00:00	9.986400E+00	2.073220E+01	1.3666	3.734930E+01	4.208800E+01
12/06 22:00:00	2.719522E+02	3.405181E+02	1.8375	4.049394E+02	3.964047E+02
12/06 23:00:00	3.777920E+01	3.988270E+01	1.9634	3.597750E+01	3.023500E+01

Please enter comments.

- **Printing a Report**
  Title
  You can edit the report title. Click within the report title box, and edit the text using up to 64 characters. The title that you enter here does not affect the DX setting.

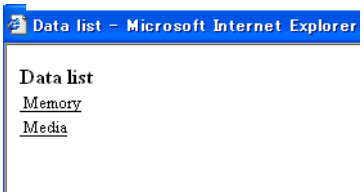
  Comment
  You can enter two lines of comments in the comment text field. Click within the comment text field, and enter text.

  Print
  Print the report from the browser.

Data list (Release number 3 or later)

You can easily retrieve files via FTP using the data list link, without having to specify the URL.

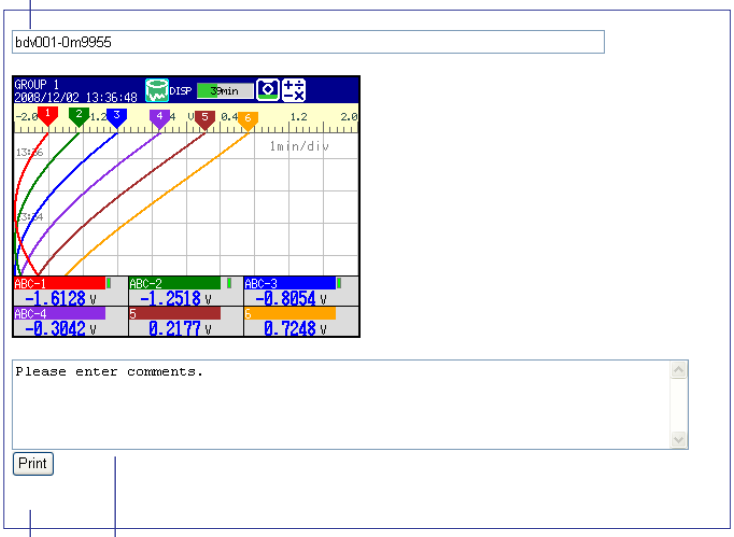
For operating instructions, see section 1.6.



Printing the Screen (Release number 3 or later)

You can print a screen capture with an optional title and comment attached.

Title box
The default title is the IP address or host name.
You can overwrite the default title with your own title.



Comment input box
Enter comments. You can enter more than five lines of comments, but only the first five lines will be printed.

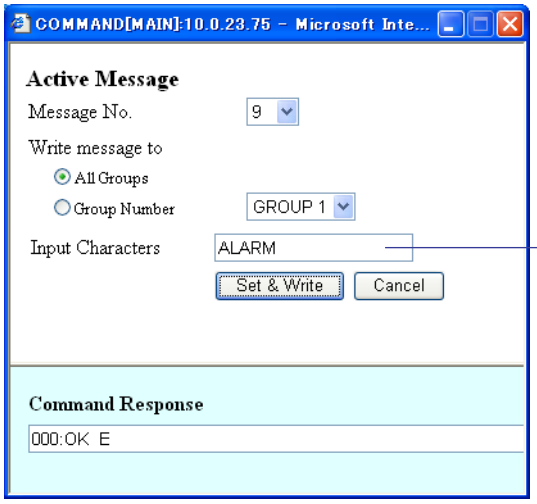
Print button
Opens the print window.

Click **Print** to open the Print window.

Writing Messages (Operator page only)

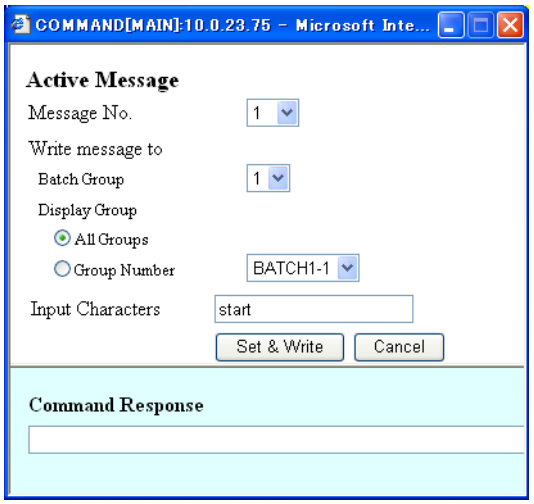
You can assign a text string to one of the DX messages 1 through 10 and write the message to a specified group at the same time. The maximum message length is 32 alphanumeric characters. The current message setting is overwritten. This operation is not available on DXs with the /AS1 advanced security option.

Example of Writing a Message (when the multi batch function (/BT2 option) is not in use)
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.

Example of Writing a Message (when the multi batch function (/BT2 option) is in use)
Use message number 1 and write the message “start” to all display groups in batch group 1. Successful completion of the writing operation is indicated in the Command Response box.



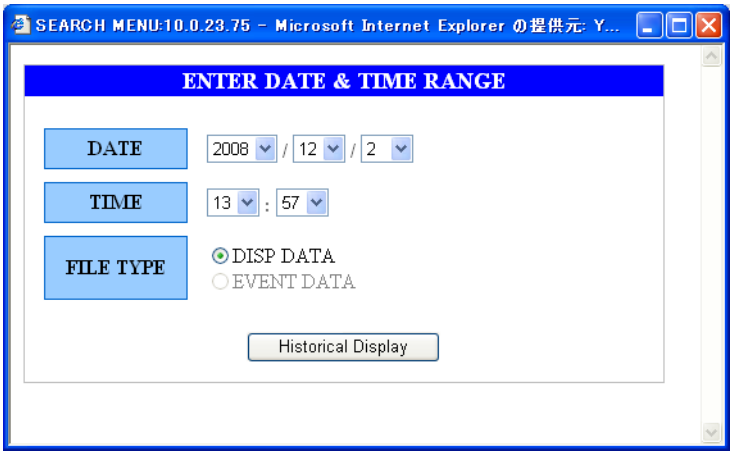
Displaying the Measured Data at the Specified Date and Time (Operator page only; release number 3 or later)

You can search for measured data at the specified date and time and display the results. You can search the display data or event data in the DX internal memory.

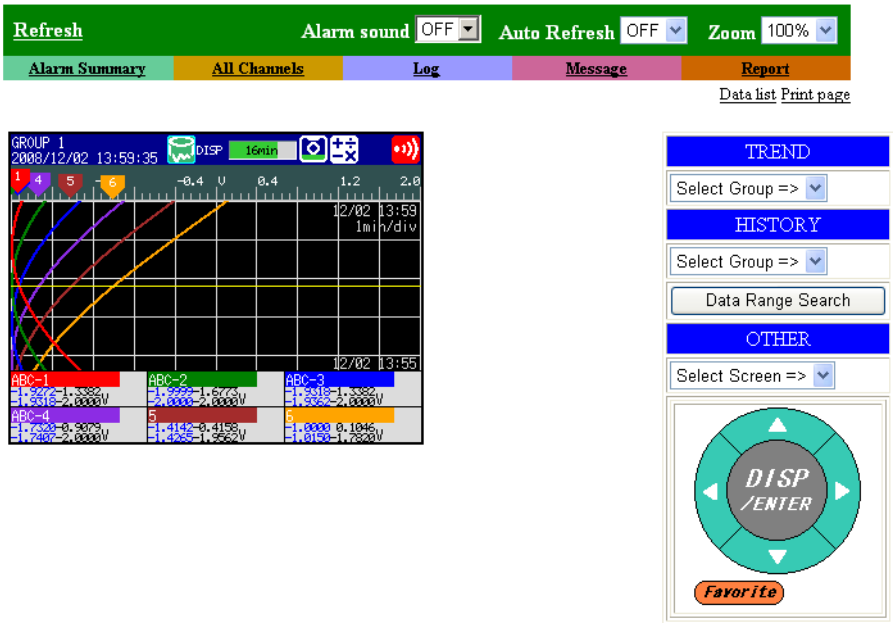
Note

- This function uses the DX function that displays the measured data at the specified date and time.
- You can search the last 10 years of data excluding the data before year 2000.
- For details on the display conditions, see section 4.3 in the *DX1000/DX1000N or DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E)*.

1. Click **Data Range Search** to open the ENTER DATE & TIME RANGE window.
2. Set the date and time of the data recording and the data type.



3. Click **Historical Display**.
   The DX screen switches and the data at the specified date and time appears.



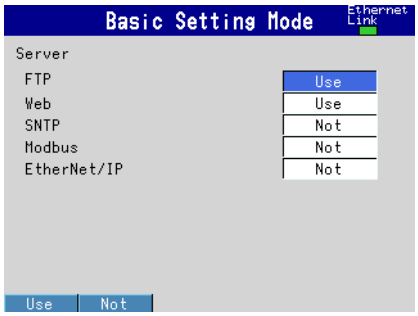
1.6 Accessing the Measurement Data File on the DX from a PC

You can access data files stored on the external storage medium.

Setting the FTP Server

Server Function

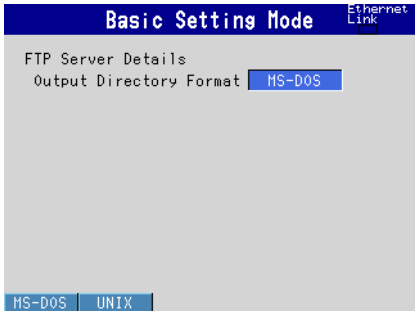
◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Server** > **Server modes**.



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

FTP Server Directory Output Format (Release number 3 or later)

◊ 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**.



- **Directory Output 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 DX via FTP. You can perform operations such as retrieving directory and file lists from the external storage medium of the DX and transferring and deleting files. In addition, you can also retrieve the directory or file list and transfer files in the internal memory.

Accessing Data Files from the Web Browser

1. Click **Data list**.
2. Click **Memory** or **Media**.
3. From the file list, select the files you want to retrieve.

Note

- You can view the files by installing the provided DAQSTANDARD software on the PC and by associating DAQSTANDARD with the files you want it to receive.
- Memory is linked to ftp://hostname/MEM0/DATA.
- Media is linked to ftp://hostname/DRV0/. The external storage medium is the CF card.
- You cannot retrieve data files that are being created.
- The display is not automatically updated. Perform the operation again if necessary.

Connecting from a PC via the FTP

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 (Standard)

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 DX to connect to it. For information about the operations that can be executed, see the explanation in section 1.1, “Login (On DXs without the /AS1 advanced security option).” You cannot perform the operations described under “Accessing Data Files from the Web Browser“ or “Connecting from a PC via the FTP.”

When Using the Login Function on a DX With the /AS1 Advanced Security Option

You can connect to the server using the user name “admin,” “user,” or “anonymous.” The password is optional. You can only perform the operations that can be performed when you log into a DX as “anonymous.” You cannot delete or change the names of files on the server (the DX), nor can you transfer files to the server.

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 Data Files from the DX

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

Files to Be Transferred via FTP

The display or event data files are automatically transferred to the FTP destination described in the next section at appropriate times.

File Type	Description
Display data file	Data files are automatically transferred at each file save interval.
Event data file	Files are automatically transferred when the data length of data is recorded.
Report data file	When the file division mode is Combine† or Separate,† 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. When the mode is Seprt2,† an individual report file is output for each event. † See section 9.5 in the *DX1000/DX1000N or DX2000 User's Manual*.
Snapshot data file	The files are automatically transferred when a snapshot is executed. They are transferred regardless of the media storage setting. * Indicates snapshot using the FUNC key, communication command (EV2 command), USER key, or remote control function.
Setup file and change settings log file when the settings have changed*2	The DX automatically transfers the setup file and change settings log file that are automatically saved to the CF card when the settings are changed.

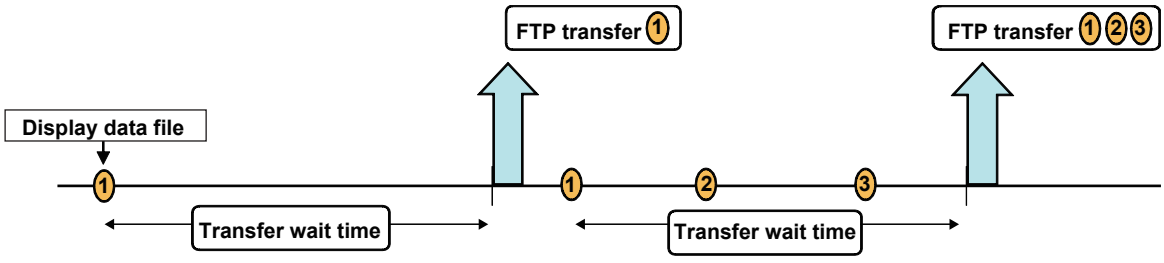
*1 When "FTP transfer at signing" is enabled on a DX with the /AS1 advanced security option, this file is automatically transferred after you sign in. See section 2.1 in the *Advanced Security Function (/AS1) User's Manual*.

*2 Only on DXs with the /AS1 advanced security option

Shifting the Transfer Time (Release number 3 or later)

There may be cases when data cannot be transferred from the DX to the FTP server due to too many simultaneous connections to the FTP server. An example is when multiple files are created and need to be transferred at the same time from multiple DXs. By shifting the transfer time, you can avoid having too many simultaneous connections to the FTP server. The time that display data files, event data files, and report files are transferred can be shifted.

- Even if a new event that requires an FTP transfer occurs while the DX is waiting to transfer the data of the previous event, it does not affect the transfer wait time of the previous event. When the transfer shift time passes, all data files of the same type that have been created (all of the files that have not been transferred) are transferred via FTP. The following figure is an example for display data.
- To avoid accumulating too many files that have not been transferred, we recommend that you set the transfer wait time shorter than the interval at which events that require FTP transfers occur.



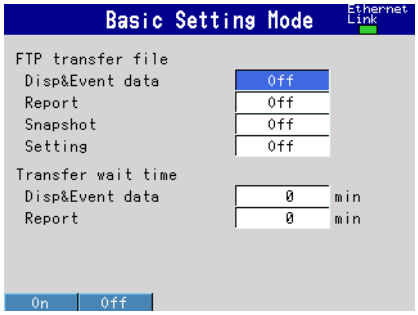
- Even if you turn the power off during FTP transfer wait time, the elapsed time is recorded.
- If you change the FTP transfer time settings during FTP transfer wait time, the data files that are being held are transferred using the previous setting. Subsequent data files are sent according to the new setting.
- If you initialize the DX during FTP transfer wait time (using Clear1, Clear2, or Clear3, Clear 4), the elapsed time is cleared.
- When “FTP transfer at signing” is enabled,*1 changes to the FTP transfer time settings for measured data are invalid.

  *1 See the *Advanced Security Function (/AS1) User’s Manual*.

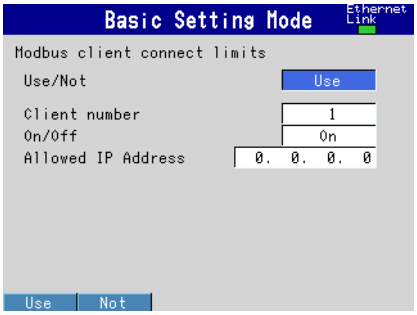
Setting the FTP Client

◊ 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**.

FTP transfer file settings



FTP connection destination settings



Setting the FTP transfer files

- **Display and Event Data**
  Select **On** when automatically transferring display and event data files.
- **Report**
  Select **On** when automatically transferring report data files (including template-based report files).
- **Snapshot**
  Select **On** when automatically transferring snapshot data files.
- **Setting**
  This item is only available on DXs with the /AS1 advanced security option. Select **On** when automatically transferring the setup file and change settings log file that are saved when the settings have changed.

Transfer wait time

- **Disp&Event data**
  Set the time to delay the data transfer to the FTP server in the range of 0 to 120 minutes.
  When “FTP transfer at signing” is enabled on a DX with the /AS1 advanced security option, changes to the FTP transfer time settings are invalid. See section 2.1 in the *Advanced Security Function (/AS1) User’s Manual*.
- **Report**
  Set the time to delay the data transfer to the FTP server in the range of 0 to 120 minutes.

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, and availability of the PASV mode.

- **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 DX 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 DX fails to transfer files to both the primary and secondary FTP servers, the DX aborts the file transfer operation. If the connection to the destination recovers, the DX transfers new data files along with the files that the DX failed to transfer. Note that because the DX transfers data from its internal memory, if the data that the DX failed to transfer is overwritten, it is lost.

Testing the FTP Transfer

You can test whether a test file can be transferred from the DX 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.
- The result of the FTP test can be confirmed by displaying the FTP log (displayed on the DX (see the *DX1000/DX1000N or DX2000 User's Manual*)) or Web screen (see section 1.5) or by outputting the result using the FL command (see section 3.4).

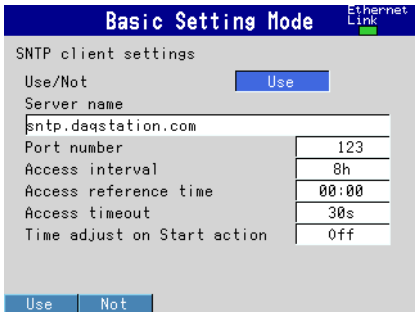
1.8 Synchronizing the Time

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

Setting the SNTP Client

Synchronize the DX 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**.



- **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. The time is not synchronized if the difference in the time between the DX and the server is greater than or equal to 10 minutes.
- **Access reference time**
  Set the reference time for making queries.
- **Access timeout**
  Set the time to wait for the response from the SNTP server when querying the time to 10, 30, 90s.
- **Time adjust on Start action**
  Select **On** to synchronize the time using SNTP when memory start is executed; Otherwise, select **Off**.

Manually Synchronizing the Time

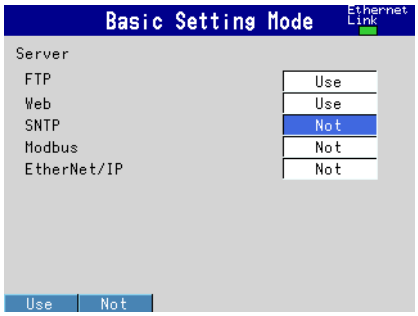
You can synchronize the time at any time by operating the FUNC key. The SNTP client setting must be enabled.

◊ Press **FUNC** and select **SNTP**.

Setting the SNTP Server

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

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



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

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

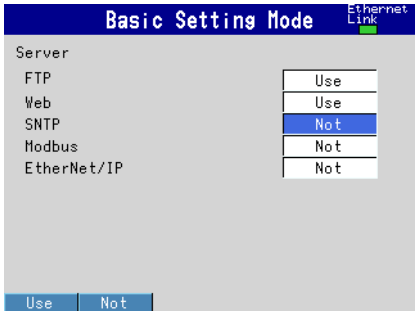
1.9 Using the Modbus Server Function

The DX is used as a Modbus server.
For the Modbus specifications, see section 6.3.

Setting the Modbus Server

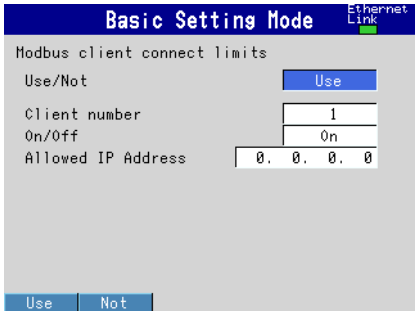
Carry out the steps below to enable another device to read the DX data or write data to the DX using Modbus.

◊ 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 DX Modbus server, select **Use**. Only the IP addresses specified here can connect to the DX Modbus server. To not place a limitation, select **Not**.
- **Client number**
  You can register up to 10 IP addresses. Select the client number from 1 to 10.
- **On/Off**
  To allow connections, select **On**.
- **Allowed IP Address**
  Enter the IP address in the range of 0.0.0.0 to 255.255.255.255. You cannot enter a host name.

Port Number

The default value is 502. To change the setting,

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

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

Reading/Writing the DX Data on Another Device

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

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

Specifying the Register Number

Specify the DX 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 the Modbus Client Function

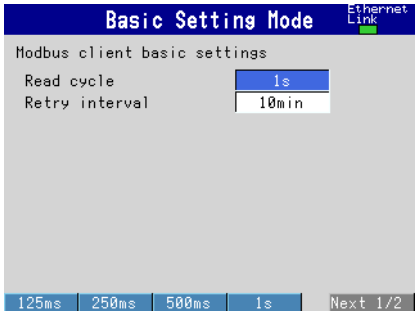
The DX is used as a Modbus client.
For the Modbus specifications, see section 6.3.

Setting the Modbus Client

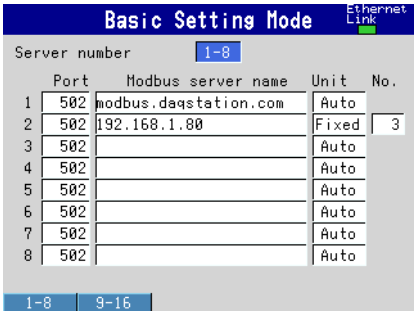
Carry out the steps below to enable the DX to read the data of another device or write data to another device using Modbus.

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

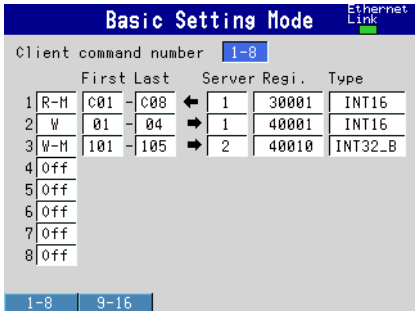
Basic settings



Destination server settings



Transmitted command settings



Basic settings

- **Read cycle**
  Set the read cycle to 125m, 250m, 500m, 1, 2, 5, or 10s.
- **Retry interval**
  Set the interval for retrying the connection when the connection is interrupted for some reason. Select Off, 10, 20, or 30 s, 1, 2, 5, 10, 20, or 30 min, or 1 h. When Off is selected, the connection is not retried. The communication stops if the communication fails.

Destination server settings

- **Server number**
  Select 1 to 16 for the server registration numbers to be configured.
- **Port**
  Enter the port number in the range of 0 to 65535 for the selected server. The default value is 502.
- **Modbus server name**
  Set the destination Modbus server name using up to 64 alphanumeric characters.
  - If the DNS is used, you can set the host name as a server name.
  - You can also set the IP address. In this case, the DNS is not required.

- **Unit**
  Select **Auto** if the unit number of the destination server is not required; Otherwise, select **Fixed**. If you select **Fixed**, the unit number item is displayed.
- **No.**
  Enter a fixed unit number in the range of 0 to 255.

Setting the transmitted commands

- **Client command number**
  Select 1 to 16 for the transmitted command numbers to be configured.
- **Command type**
  Set the command type to Off, R, R-M, W, W-M, or E-M. If you select a command type other than **Off**, the client channel, server number, register, and data type items are displayed.
  - R: Read to the external input channel (16-bit signed integer type) from the server.
  - 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 measurement channel (32-bit signed integer type) to the server.
  - E-M: Read to the communication input data (32-bit floating point type) from the server/write the custom display value to the server (release numbers 4 and later).

  R can be selected on DX2000s with the external input channel (/MC1 option) installed.
  R-M, **W-M**, and **E-M** can be selected on models with the computation function (/M1 or /PM1 option) installed.
- **First/Last (client channels)**
  Enter the first and last channel numbers of input/output. The range of channels that you can enter varies depending on the command type as follows:
  R: 201 to 440, R-M: C01 to C60, W: 1 to 48, W-M: 101 to 160, E-M: C01 to C60
  Only specify one communication input data item in the E-M command. An error will occur if you specify multiple items (e.g., [C01]-[C03]).
- **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 DX by using the “reference number” (such as the number 40001 written above). For example on the Yokogawa UT351 Digital Indicating Controller, the corresponding D-register numbers and reference numbers are listed; use the reference number.

D-Reg. No.	Ref. No.
D0001	40001

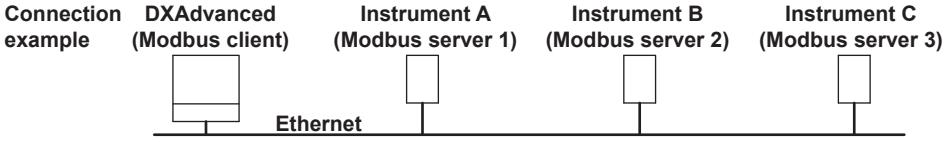
For a server device that calls the register using a “relative number,” add 30001, 300001, 40001, 400001 or a similar number to obtain a reference number.

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

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

Examples of Setting Commands

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

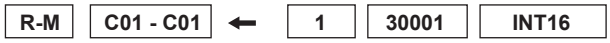


Loading to Communication Input Data

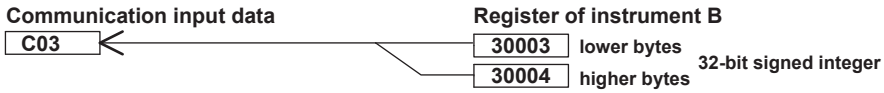
The DX inputs data loaded from the server to communication input data as floating point type data.

- **Example 1**
  Load the value of the 16-bit signed integer assigned to register 30001 of instrument A to C01.

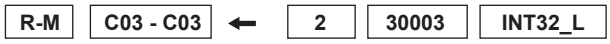
Command setting



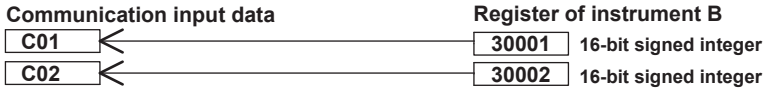
- **Example 2**
  Load the value of the 32-bit signed integer assigned to registers 30003 and 30004 of instrument B to C03. Only the smallest register number need be specified in commands.



Command setting

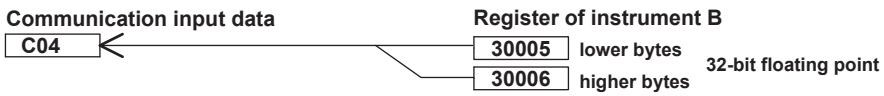


- **Example 3**
  Load the values of the 16-bit signed integers assigned to registers 30001 and 30002 of instrument B to C01 and C02. Only the smallest register number need be specified in commands.

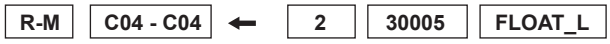


Command setting

- **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.



Command setting



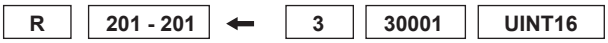
Loading to External Input Channels (DX2000 Only)

The DX inputs the data loaded from the server to the external input channel as a 16-bit signed integer type.

- **Example 1**

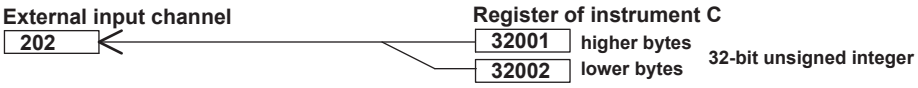
  Load the values of the 16-bit unsigned integers assigned to register 30001 of instrument C to external input channel 201.

  Command setting



- **Example 2**

  Load the values of the 32-bit unsigned integers assigned to registers 32001 and 32002 of instrument C to external input channel 202. Only the smallest register number need be specified in commands.



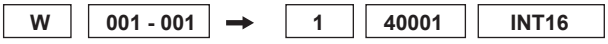
  Command setting

Writing Measured Values to the Server

- **Example**

  Write the measured value (16-bit signed integer) from channel 1 to register 40001 of instrument A.

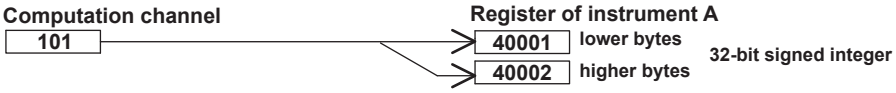
  Command setting



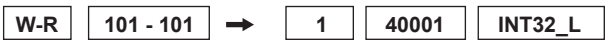
Writing Computed Values to the Server

- **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.



  Command setting

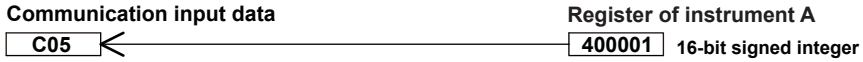


Loading to Communication Input Data and Direct Writing of Values to the Server

- **Example**

  Load the value of the signed 16-bit integer assigned to the hold register (400001) of instrument A to C05. The value of C05 is only written to the hold register (400001) of instrument A when a value write operation is performed from the custom display.

  Normal



  When a value write operation is performed from the custom display

  Command setting

E-M	C05 - C05	—	1	400001	INT16

Checking the Modbus Operating Status

Displaying the Modbus Operating Status

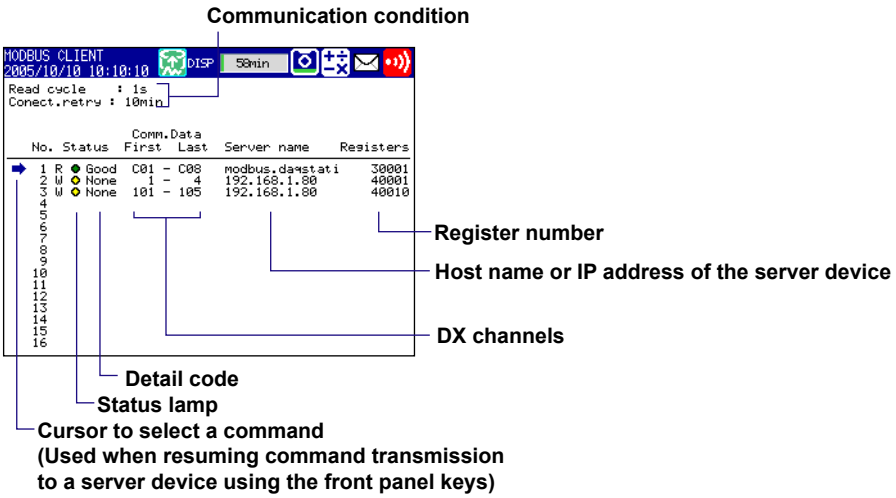
◊ Press **DISP/ENTER** and select **INFORMATION** > **MODBUS CLIENT**.

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 Conditions**

  The Read cycle and Connect.retry settings are displayed.

- **Communication Status**

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

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

Resuming Command Transmission

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

1. Using the up and down arrow keys, select the command corresponding to the server device to which transmission will be resumed. The message “Push [right arrow] key to refresh” appears.
2. Press the right arrow key. The DX 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 and external input channel data are error data. On communication channels, “+OVER” or –OVER is displayed according to the DX settings. “*****” is displayed on external input channels.

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.

Function for Automatically Assigning MW100s to the Modbus Client (DX2000 Only)

The following setup is carried out from the DX using YOKOGAWA's MW100 Data Acquisition Unit as a Modbus server.
If the DX2000 is a Modbus client, MW100s, Modbus servers on the network, can be automatically assigned to the DX2000. This function can be used only on DX2000s with the external input channel function (/MC1 option).

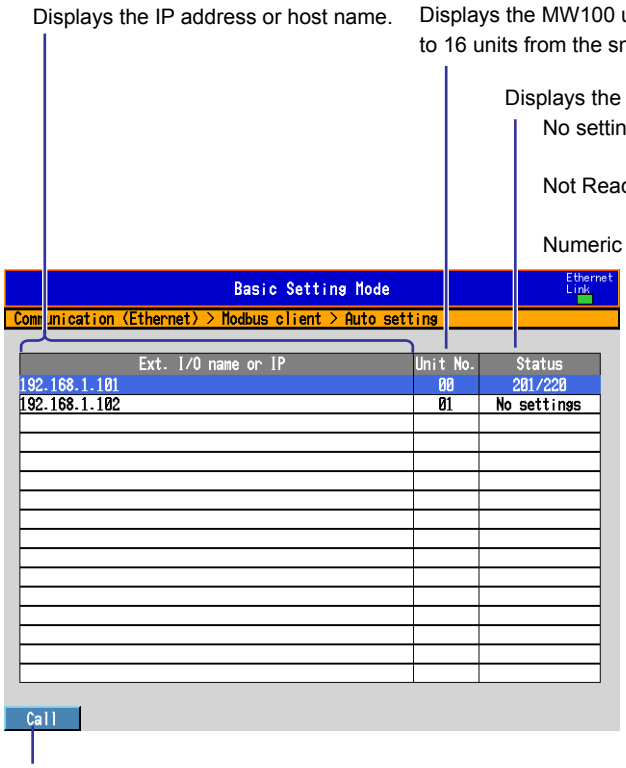
Setup Preparation

Set the MW100s so that measurements can be started (IP address, system construction, range setting, and the like of the MW100s to be automatically assigned). For details, see the user's manual of the MW100.

Setup Procedure

If the IP address of the DX is not set, set it before carrying out the procedure below.

1. 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** > **Auto setting**.
2. Carefully read the displayed precautions.
   Select **Yes** to execute the auto setting. Select **No** to return to the screen operation.
3. From the list of MW100s that is displayed, select the MW100s to be connected using the up and down arrow keys, and press **DISP/ENTER**. The selected MW100s are assigned to the external input channel of the DX.



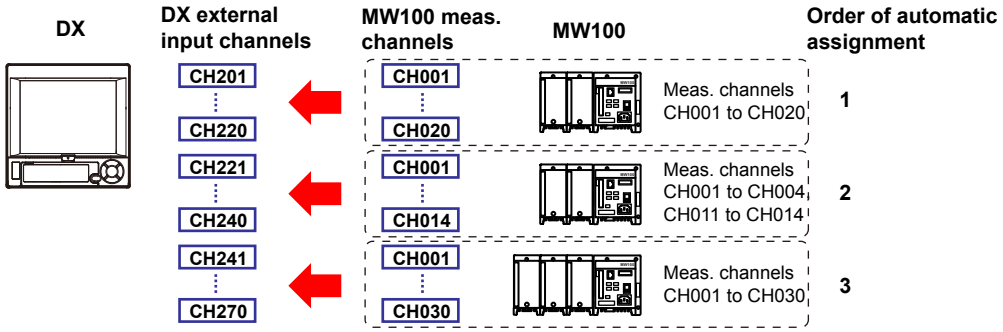
* For the corrective action, see the *DX1000 or DX2000 User's Manual*.

Pressing the **Call** soft key causes "--" to blink on the 7-segment LED display of the selected MW100 for 2 seconds. This allows you to check which MW100 is selected if multiple MW100s are connected.

Setup Items

The MW100 channels are assigned to the external input channels of the DX as follows:

- Channel Number
  The channels of the MW100 selected first are assigned consecutively from external input channel 201. The channels of the MW100 selected next are assigned to the available external input channels from the smallest number. You cannot select the external input channels to be assigned.



- Range Settings
  The range settings of the MW100 (including the span and unit) are set automatically to the external input channels.
  If the span setting of the MW100 range exceeds the span setting range of the DX external input channel (–30000 to 30000), it is set to the span upper limit (30000) or lower limit (–30000).

Specify the settings such as the alarm, tag, and the area display of the color scale band of each channel after the auto setting is complete.

Note

Precautions When Assigning Channels to the External Input Channels

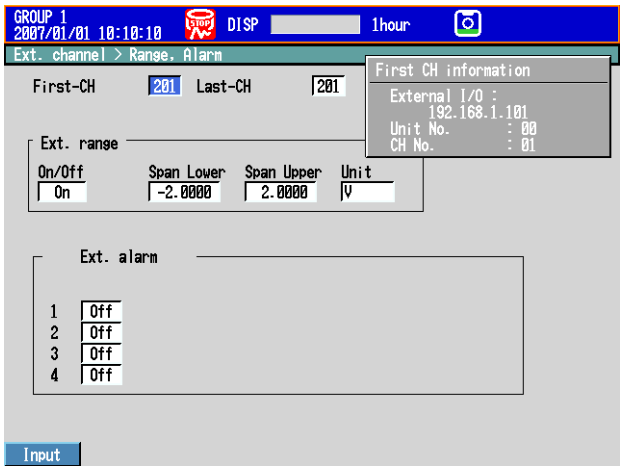
- The MW100 channels are assigned in unit of 10 channels to the external input channels. If the MW100 measurement module consists of less than 10 channels, “OFF” is assigned to the external input channels for the section without channels.
- An error occurs if the number of MW100 channels to be automatically set is greater than the number of available external input channels.
- If the range setting of a MW100 channel is set to “SKIP,” the external input channel of the DX is set to “OFF.”
- If a MW100 unit contains a module that cannot be set automatically, only the channels that can be assigned are assigned to the external input channels of the DX.
- If a new MW100 is added, auto setting is executed again. At this point, all the settings are cleared. Therefore, you must execute the auto setting again for all MW100s.
- If you are connecting MW100s that can be automatically set and MW100s that cannot be automatically set or other Modbus devices, automatically set the MW100s that can be automatically set first and then manually set the connection of the remaining devices.

Note

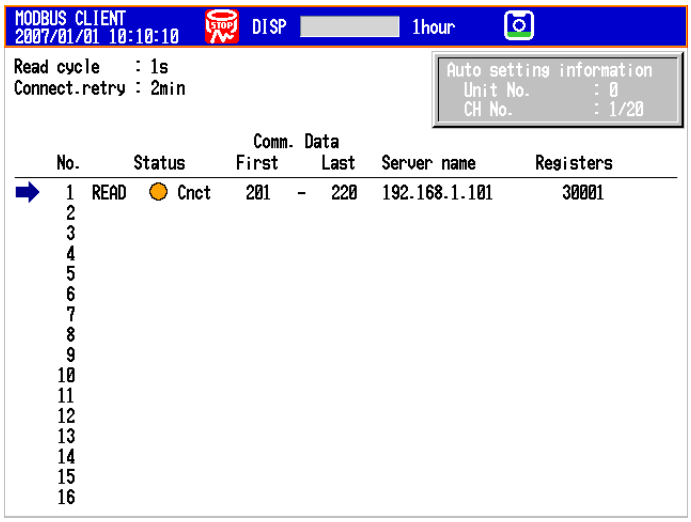
About the MW100

- MW100s that support auto setting are those with firmware version R2.22 or later.
- MW100 modules that can be automatically set are the following input modules. The installable input modules vary depending on the MW100 firmware version.
  4-CH, High-Speed Universal Input Module
  10-CH, Medium-Speed Universal Input Module
  6-CH, Medium-Speed Four-Wire RTD Resistance Input Module
  10-CH, High-speed Input Module
  30-CH, Medium-Speed DCV/TC/DI Input Module
  10-CH, Medium-Speed Pulse Input Module
- If there are no channels to be assigned or the Modbus server setting is OFF, auto setting fails with an error. Check the settings.
- MW100s that are connected through auto setting automatically switches to the measurement mode.
- Port number 34324 of the MW100 is used to perform auto setting.
- For details on the MW100 settings, see the user's manual of the MW100.

The first channel information of the MW100 that is automatically set to the external input channel can be displayed when the cursor is on the first or last channel.



In addition, the status of the connected MW100 can be confirmed on the Modbus status display screen.

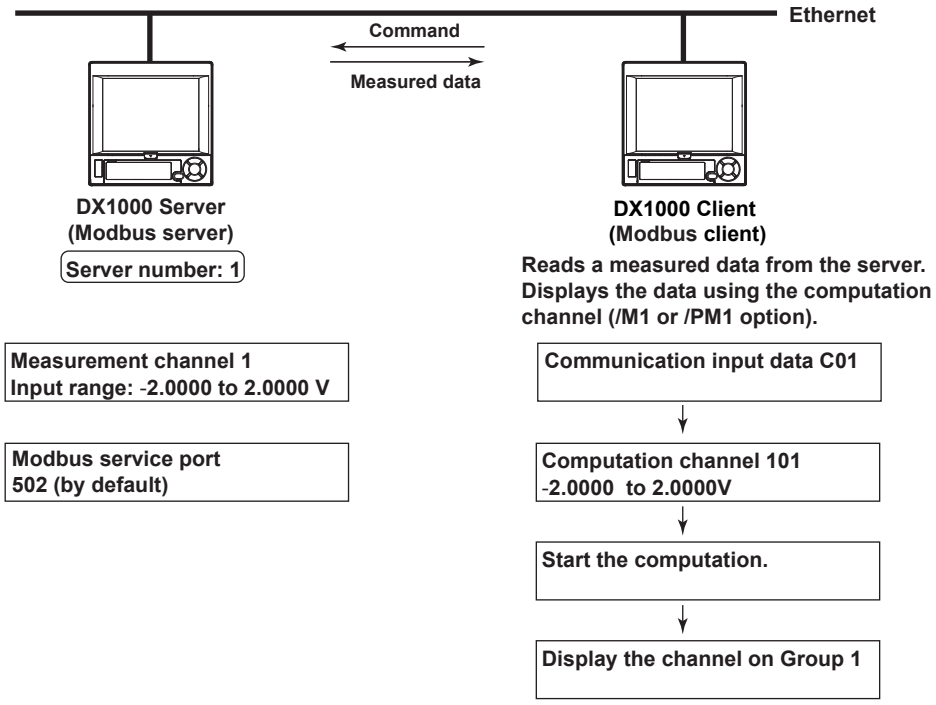


1.11 Usage Example of the Modbus Function

Explains the setting example for both Modbus client and server on DX1000s connected via the Ethernet. This section refers to the DX1000 set to be a Modbus server as DX1000 server and the DX1000 set to be a Modbus client as DX1000 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

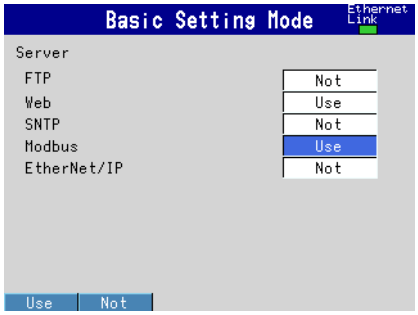
- The DX1000 client reads the measured value of channel 1 on the DX1000 server into the communication input data C01. C01 is displayed on a computation channel 101 by including the data in the equation. The computation channel 101 is assigned to Group1.
- The measured value of channel 1 on the DX1000 server is transferred to the DX1000 client as an integer in the range of –20000 to 20000.
- The DX1000 client displays the read data as –2.0000 to 2.0000 V using the computation channel 101. The following conversion is applied.

  Value on the computation channel 101 of the DX1000 client
  = Communication input data C01 x 0.0001

Settings on the DX1000 Server (Modbus Server)

Setting the Modbus Server Function

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



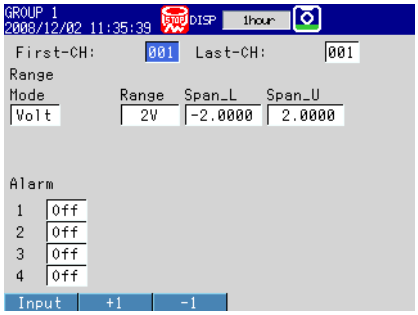
Item	Settings
Modbus	Use

About the Port Number

The port number is 502 by default.

Setting the Measurement Channel

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



Item	Settings
First-CH, Last-CH	1
Mode	Volt
Range	2V
Span_L	–2.0000
Span_U	2.0000

Setting the DX1000 Client (Modbus Client)

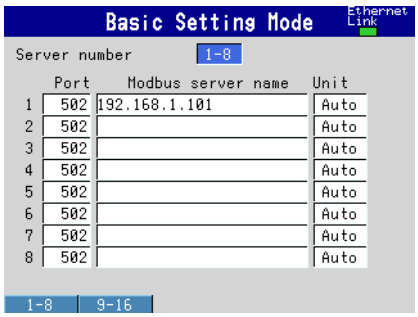
Assumes the settings other than that for the server and the command are left to default values.

Registering the Destination Server

Register the DX1000 server to number 1.

The IP address of the DX1000 server is “190.168.1.101” as an example.

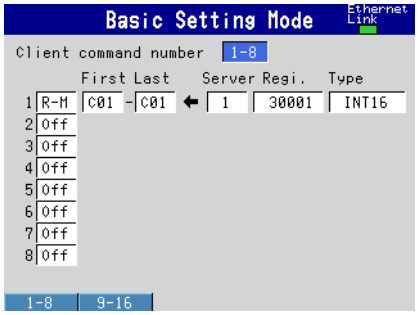
◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Modbus client** > **Modbus server settings**.



Item	Settings
Port	502
Modbus server name	192.168.1.101
Unit	Auto

Setting Command

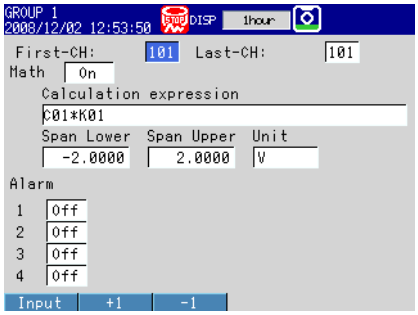
◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Ethernet)** > **Modbus client** > **Command settings**.



Item	Settings
Command type	R-M
First and Last	C01
Server	1
Regi.	30001
Type	INT16

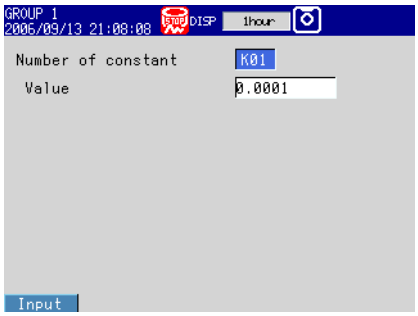
Setting the Computation Channel

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



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

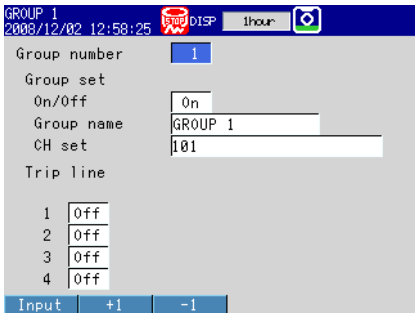
◊ Press **MENU** (to switch to setting mode), and select the **Menu** tab > **Math channel** > **Constant**.



Item	Settings
Number of constant	K01
Value	0.0001

Assigning the channel to a Group

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

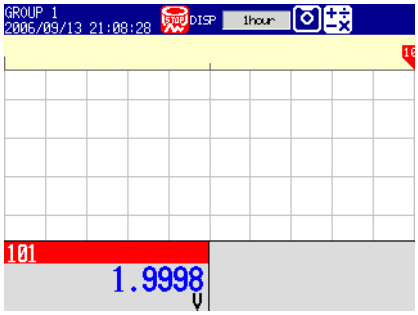


Item	Settings
Group number	1
On/Off	On
Group name	GROUP 1
CH set	101

Starting the Computation (DX1000 Client)

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

The computation starts. A computation icon is displayed on the status display section. The value of the computation channel 101 in the GROUP 1 of the DX1000 client varies in conjunction with the measured value of the measurement channel 1 on the DX1000 server.



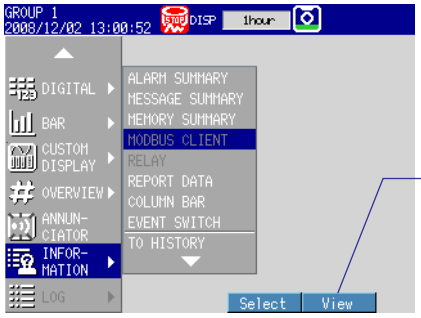
Confirming the Communication Status (DX1000 Client)

Showing a Menu to Switch to the Modbus Client Screen

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

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

1. Select **INFORMATION** > **MODBUS CLIENT** using the arrow keys.
   * Select **INFORMATION > MODBUS MASTER** when you use the Modbus master via the serial communication.
2. Press the **View** soft key.
   The selected item displays in white.



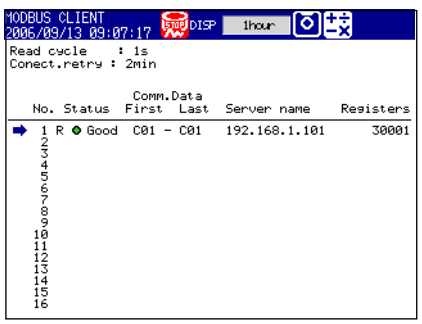
View/Hide soft key
Toggles **View** and **Hide** each time you press the soft key.

3. Press the ESC key 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 DX 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 (Standard)

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

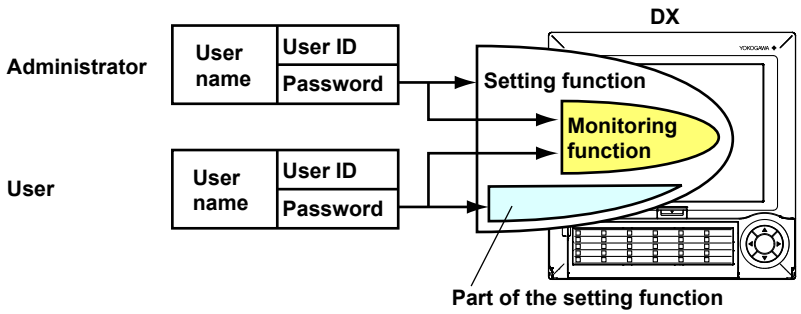
On DXs with the /AS1 Advanced Security Option

When Not Using the Login Function

Access the server using the user name “user.” You can use the monitoring function commands. You cannot access the server using the user name “admin.”

When Using the Login Function

Connect (log in) to the monitoring function or the setting function as a administrator or user who has been registered on the DX.



- **Monitoring Function**
  You can produce measurement and setup data and execute input commands for communication input data and external input channels. Administrators and users can connect to the monitoring function. Users can connect regardless of whether they log in through key operations or serial communication.
- **Setting Function**
  Administrators and users can connect to the setting function. Administrators can execute all the commands. In addition to the monitoring function commands, users can execute some operations, such as the starting and stopping of recording. However, users cannot perform operations that are forbidden by the user privilege settings. For details, see section 3.2.
  When you are using the multi-login function, you can log in to the setting function in the circumstances listed below, but all commands other than the monitoring function commands will result in errors.
  - When a user who has logged in through key operations is in setting mode or basic setting mode.
  - There is a user who is using serial communication to execute a command to enter setting mode.

  When you are not using the multi-login function, you will be unable to log in to the setting function if an administrator or user has logged in to the DX through key operations or if there is a user who is executing the LL command through serial communication.

Logging In

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

This section explains the operations that a user performs on the PC before he or she logs in and how the DX responds to those operations. For information about the flow of login processing, see appendix 2.

Note

- Regardless of the connection types—key login, a setting or monitoring connection to the setting/measurement server, or connection through the LL command using serial communication—two users cannot be logged in with the same name.
- If you try to connect to the DX from a PC when no administrators have been registered, the DX returns the following response:
  E1 402 Select username from 'admin' or 'user'
  - Selecting admin is the same as logging in to the setting function at the administrator level.
  - Selecting user is the same as logging in to the monitoring function at the user level except that you can't use the CM or CE commands.

Logging In Before the Password Has Been Set

Immediately after you register a user on the DX, the default password is used as the login password for that user. When you log in for the first time, you will be prompted to change the password.

1. Specify the host name or IP address of the DX that you want to connect to. Or, specify the port number (34260) of the setting/measurement server.

The DX returns the following message:
E1 406 "Select function from 'setting' or 'monitor'."

2. Enter "setting" to log in to the setting function.

Enter "monitor" to log in to the monitoring function.
The DX returns the following message:
E1 400 "Input username."

3. Enter the user name.
The DX returns the following message:
E1 405 "Input user ID."

4. Enter the user ID.
The DX returns the following message:
E1 401 "Input password."

5. Enter the default password.

User	Default password
Administrator 1 to 5	Admin1 to Admin5
User 1 to 90	User01 to User90

The DX returns the following message:
E1 407 "Password has expired. Please enter a new password."

6. Enter a new password.

Note

- You cannot use the same combination of user ID and password as another user.
- Enter a password that is between 6 and 20 characters in length.
- You cannot register a character string that contains spaces or the word "quit."

The DX returns the following message:
E1 408 “Enter password again for confirmation.”

7. Enter the password that you entered in step 6.
   The DX returns the following message:
   E0
   You are now logged in.

Logging In after the Password Has Been Set

1. Specify the host name or IP address of the DX that you want to connect to. Or, specify the port number (34260) of the setting/measurement server.
   The DX returns the following message:
   E1 406 “Select function from ‘setting’ or ‘monitor’.”

2. Enter “setting” to log in to the setting function.
   Enter “monitor” to log in to the monitoring function.
   The DX returns the following message:
   E1 400 “Input username.”

3. Enter the user name.
   The DX returns the following message:
   E1 405 “Input user ID.”

4. Enter the user ID.
   The DX returns the following message:
   E1 401 “Input password.”

5. Enter the password.
   The DX returns the following message:
   E0
   You are now logged in.

You will need to enter a new password after the current one expires. Follow the directions that appear to enter the new password.

Invalid User

If a user tries to log in with the wrong password consecutively for the number of times specified by the password retry frequency setting, that user is made invalid, and he or she will be unable to log in.

- **Releasing the Invalid User Status**
  The administrator can release the invalid user status. For instructions on how to do this, see the *Advanced Security Function (/AS1) User’s Manual (IM04L41B01-05EN)*.

Error Messages and Dealing with Them

If an error message appears while you are logging in, see chapter 10 in the *DX1000/DX1000N User’s Manual* or chapter 11 in the *DX2000 User’s Manual*.

Sending Commands

Use the dedicated DX commands. The commands that you can use are listed below. For details about the commands, see chapter 3. For information about the responses to the commands, see chapter 4.

Connected Function	Administrator	User
Setting function	All the commands are available.	All the output commands except for ME and MO and some of the control commands are available (operations that are forbidden by the user privilege settings are not available).
Monitoring function	All the output commands except for ME and MO and control commands CM and CE.	

Main Functions and Commands

- **Outputting the Most Recent Measured and Computed Data**

Command	Function
FD	The most recent measured and computed data is output in binary or ASCII format. When the data is output in binary format, only the significands of the measured and computed data are output. To acquire the correct values, you must combine the values output by this command with the decimal place information output by the FE command. Example: A value of 12.345 is output as “12345” in binary format.
BO	When data is output in binary format, this command specifies whether to output the data from the MSB (most significant bit) or from the LSB (least significant bit).
FE	Outputs the decimal place and unit information of the measured and computed data. This command can be used when data is output in binary format.

- **Outputting Measured and Computed Data at a Specific Interval**

  The DX outputs the data from a FIFO buffer (First-In First-Out; see appendix 5).

Command	Function
FF	Outputs the significands of the measured and computed data in binary format. To acquire the correct values, you must combine the values output by this command with the decimal place information output by the FE command. See appendix 5, “Flow Chart of the FIFO Data Output.”
BO	See the explanation for “Outputting the Most Recent Measured and Computed Data.”
FE	See the explanation for “Outputting the Most Recent Measured and Computed Data.”

- **Outputting Status Information**

  For information about status information, see chapter 5.

Command	Function
IS	The status information is output in ASCII format.
IF	A status filter is set.

- **Starting and Stopping Measurement and Computation**

Command	Function
PS	PS0: memory start, PS1: memory stop
TL	TL0: computation start, TL1: computation stop

- **Writing Messages**

Command	Function
MS	Writes a registered character string (message).
BJ	Writes the specified character string (message).

- **Setting the Batch Name**

Command	Function
BT	Sets the batch and lot numbers.

Disconnection

The connection is closed when:

- A command is sent that closes the connection.
  The CC0 command is sent.
- A command that results in the exiting of basic setting mode has been executed.
  If you log in to the setting function and initialize the setup data (EC command), load settings (YO command), or close system mode (YE command), the communication connection is closed, along with other connections.
- The DX disconnects according to its automatic logout and communication timeout settings.
  When you are logged in, if you do not send commands for the specified time indicated below, the DX will automatically log out and close the connection.
  Specified time: The DX auto logout time (see section 2.1 in the *Advanced Security Function (/AS1) User's Manual*) or the communication timeout time (see section 1.3), whichever is shorter.
- There is a communication error.
  The connection is closed when there is a transfer error, a reception error, or when the keepalive function times out (see "Setting/Measurement Server" in section 1.1).

Note

When the connection to the setting function is closed, the DX returns to the operation mode screen, and the user is logged out.

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 (Standard)

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

On DXs with the /AS1 Advanced Security Option

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.

Telnet Operation Example

The example below shows how to perform operations using Telnet on Windows XP. The necessary operations vary depending on the operating environment. Perform the operations that are appropriate for your environment.

Connecting

Type “telnet” in the Windows command prompt, and then press ENTER to start Telnet. If you enter “display,” the Telnet settings are displayed. Configure the settings as indicated below.

- Use local echo
  set localecho
- Send CR and LF by pressing ENTER
  set crlf

Connect to the DX using the “open” command.

open (the DX IP address or host name) 34261

* Put a space between the DX IP address or host name and “34261.”
“34261” is the port number of the maintenance/test server.

The DX returns the following message:
E1 402 “Select username from ‘admin’ or ‘user’.”

Access the server using the user name “admin” or “user.”

Sending Commands

For information about commands, see section 3.2.

Disconnection

The connection is closed when:

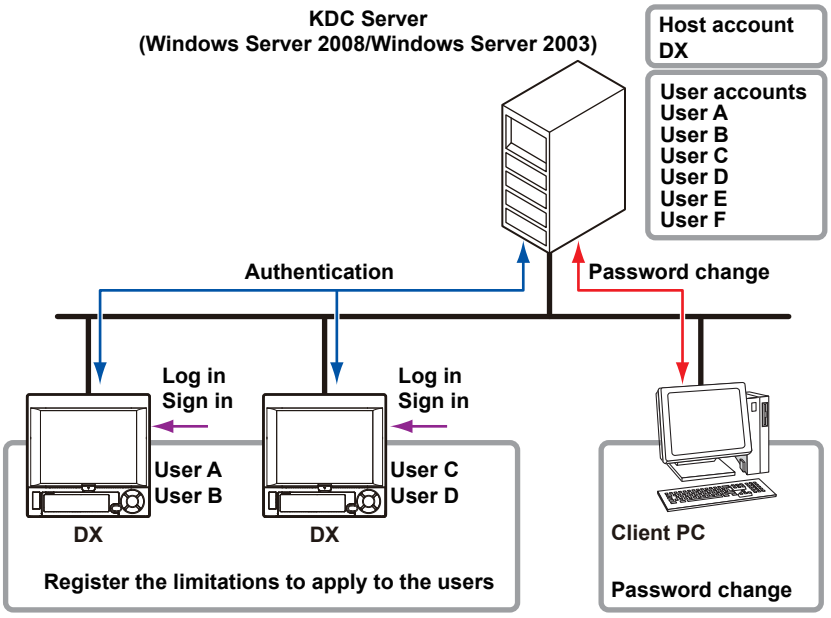
- A command is sent that closes the connection.
  The quit command is sent.
- A communication timeout occurs.
  The DX automatically closes the connection of clients with whom no communication has taken place for 15 minutes.
- There is a communication error.
  The connection is closed when there is a transfer error, a reception error, or when the keepalive function times out (see “Other Functions” in section 1.1).

1.14 Using the Password Management Function (/AS1 option)

Overview

System Configuration

The following figure shows the configuration of the authentication system.



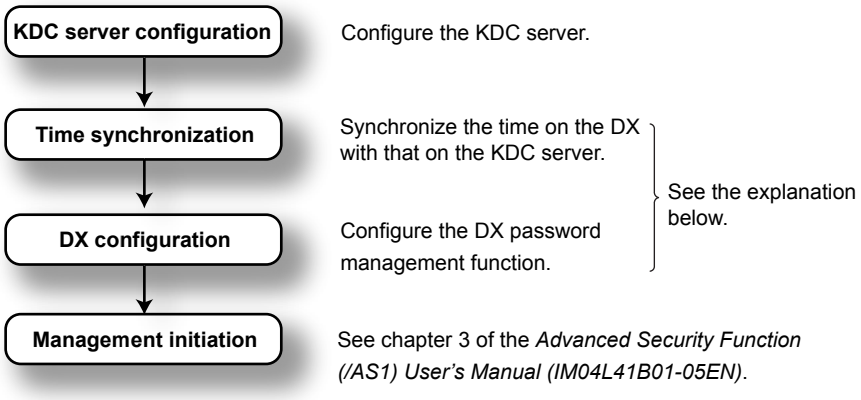
Terminology

- **KDC Server (Key Distribution Center)**
  Manages the DX account (host account) and the user accounts for operating the DX.
- **Encryption Method**
  The method for encrypting the authentication data.
- **Authentication**
  The process by which the DX determines whether or not a user is qualified to operate it.
- **Host Account**
  The DX user account on the KDC server.
- **Host Principal**
  The DX name used on the application.
- **User Account**
  The account of a user who can operate the DX.
- **Mapping**
  The establishment of an association between the host principal and the host account.
- **Realm Name**
  The name of the domain that contains the KDC server and the DX.

Flow of Operation

To use the password management function, you must configure a KDC server and the DX.

First configure the KDC server, and then configure the DX.



Configuring the KDC Server

An example of how to configure a KDC server is provided in this section.

Configuring the DX

- **Set the SNTP Client**
  For the password management function to work, the times on the KDC server and the DX must be synchronized. Configure the DX to always synchronize itself with an SNTP server on the network. For the setup procedure, see section 1.8.

Note

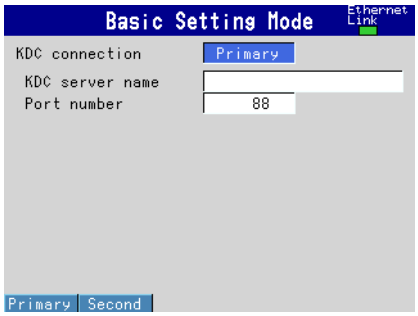
Be sure to set DST (daylight saving time) and the time zone correctly. For the setup procedures for DST and the time zone, see sections 2.1 and 2.2 in the *DX1000/DX1000N or DX2000 User's Manual*.

- **Set the IP Address and DNS**
  See section 1.3 for information about the IP address and DNS settings.
- **Turn the Password Management Function On**
  See section 2.1 in the *Advanced Security Function (/AS1) User's Manual (IM04L41B01-05EN)*.
- **Register Users**
  Specify operation modes, user names, and restrictions for each user. See section 2.1 in the *Advanced Security Function (/AS1) User's Manual (IM04L41B01-05EN)*.
- **Set the Root User Password**
  See section 2.1 in the *Advanced Security Function (/AS1) User's Manual (IM04L41B01-05EN)*.
- **Set the KDC Server to Connect to and the Authentication Key**
  Set the server information, the encryption method, etc. This section will explain how to do this.

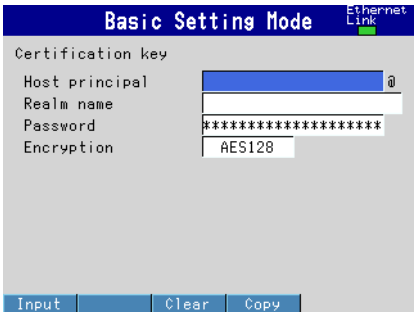
DX Settings (KDC server to connect to and authentication key)

◊ 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)** > **Password management** > **KDC connection**, **Certification key**.

KDC connection



Certification key



KDC Connection

You can specify a primary and a secondary KDC server.

- **KDC server name**
  Enter the KDC server name here using up to 64 alphanumeric characters.
- **Port number**
  You can specify a value from 1 to 65535. If you do not specify a port number, the default port number, which is 88, is used.

Certification Key

- **Host principal**
  The DX account name registered on the KDC server. You can enter up to 20 alphanumeric characters.*1

  *1 You cannot use forward slashes or at signs.
- **Realm name**
  The name of the domain that contains the KDC server and the DX. You can enter up to 64 alphanumeric characters.*2

  *2 You cannot use forward slashes or at signs. Characters are case-sensitive.
- **Password**
  Set the password to use to access the KDC server using up to 20 characters. The password is displayed as "**********."
- **Encryption Method**
  Select an encryption method that the server supports from AES128, AES256, and ARC4. ARC4 (ARCFOUR) is an encryption algorithm that is compatible with RC4.

Note

- The host principal is converted within the DX as shown below.
  host/(host principal)@(realm name)
- Cross-realm authentication (authentication of different domain names) is not supported.

KDC Server Configuration Example

The example below shows how to configure a KDC server. In the example, a Windows Server 2008 KDC server that supports Active Directory management is used on an English OS.

Overview

The necessary Active Directory management steps on Windows Server 2008 are the creation of a host account, property changes, mapping of the host principal to the host account*1, and the creation of a key tab file (this step can be omitted). The conditions are as follows:

Item	Description
Domain name	The name of the domain that you are using
Realm	The name of the realm that you are using*2
Encryption method	AES256
Port number	88
Preauthentication	Enabled

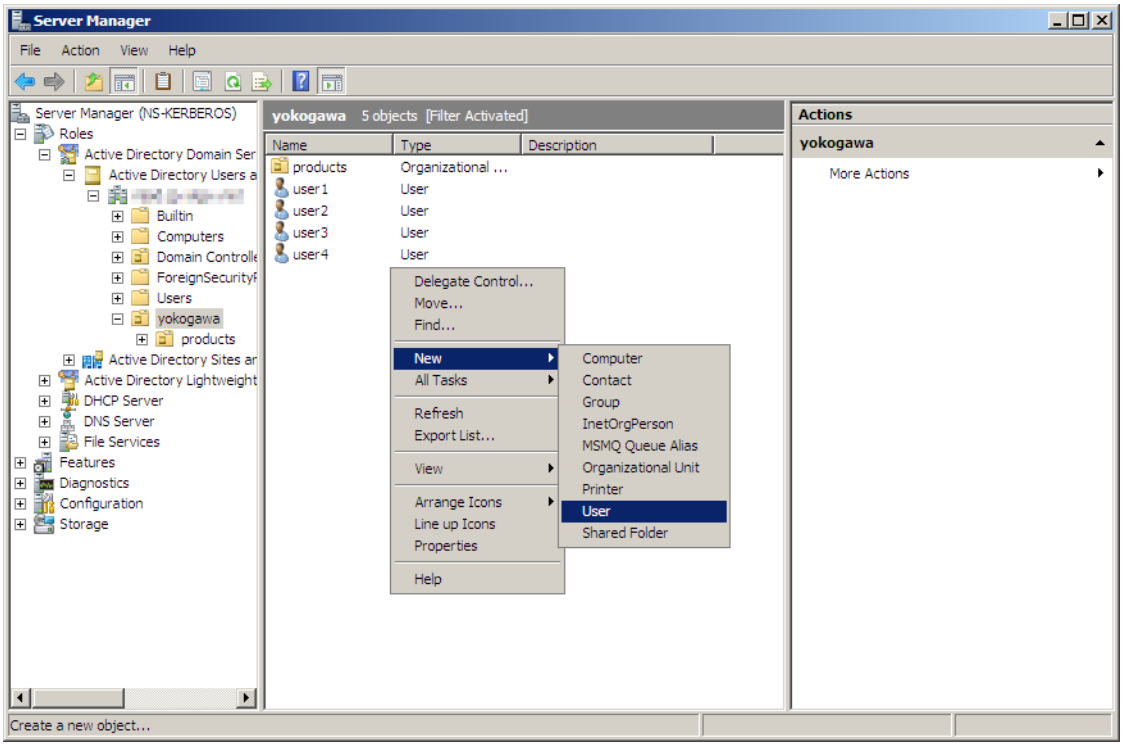
Item	Registered name	Password
Host name	dxadv	record-1

*1 You need to use mapping to use Active Directory to perform user registration on a non-Windows device.

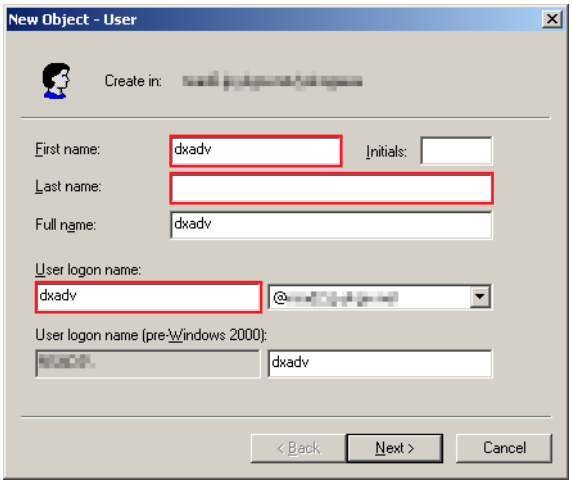
*2 The realm name is the domain name (all caps).

Creating a DX Host Account

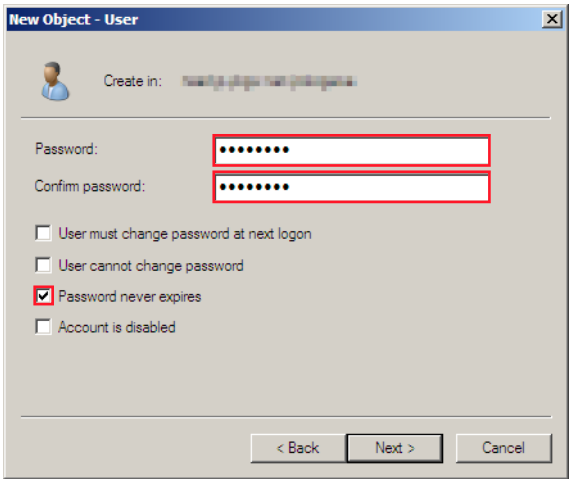
1. Open Server Manager, and select **New** > **User**.



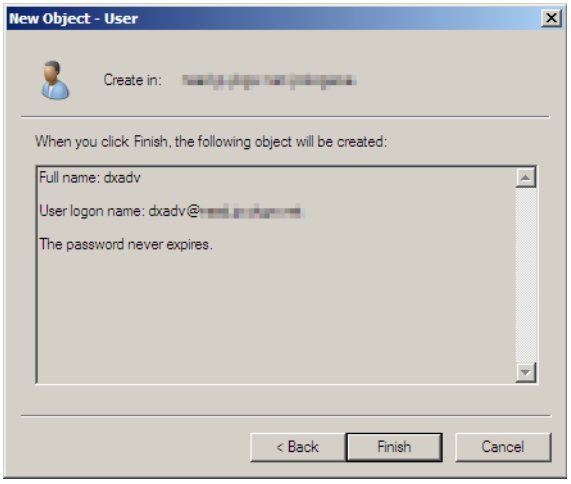
2. Enter dxadv into the First name, Full name, and User logon name boxes.



3. Enter record-1 in the **Password** box. Select the **Password never expires** check box.



4. Click **Finish** to complete the creation of the new account.



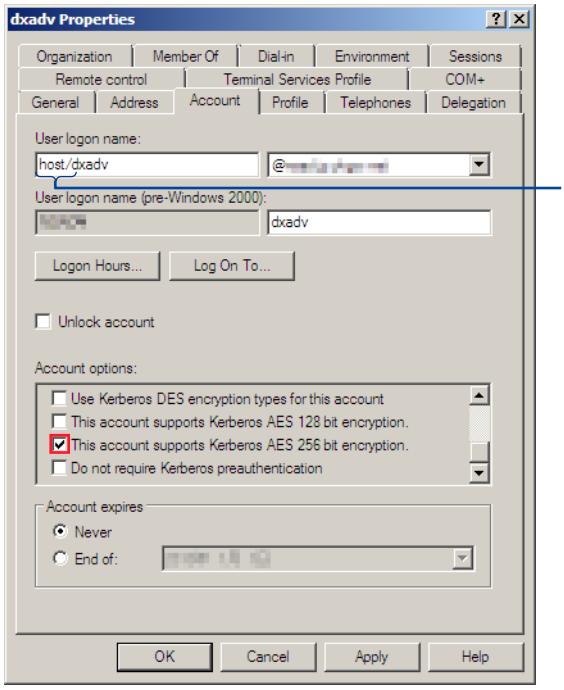
Changing the Properties of the New Account

Select the check boxes listed below. Clear all other check boxes.

This account supports Kerberos AES 256 bit encryption

Password never expires

- The “Password never expires” check box was selected previously in step 3, so it will also be selected in this window.
- If you clear all the encryption method check boxes, RC4 will be used.



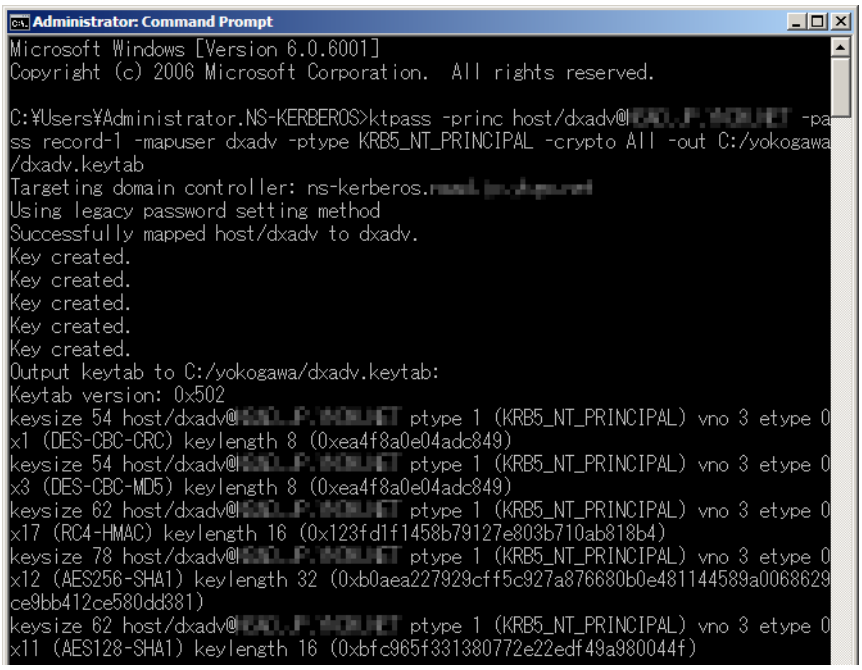
“host” is not attached before mapping. It is attached after mapping is performed successfully.

Mapping the host principal to the host account

Open the command prompt, and execute the following command.

ktpass –princ host/dxadv@(the name of the realm you are using) -pass record-1 –mapuser dxadv –ptype KRB5_NT_PRINCIPAL –crypto All –out C:\yokogawa\dxadv.keytab

The file dxadv.keytab is created in the C:\yokogawa folder.



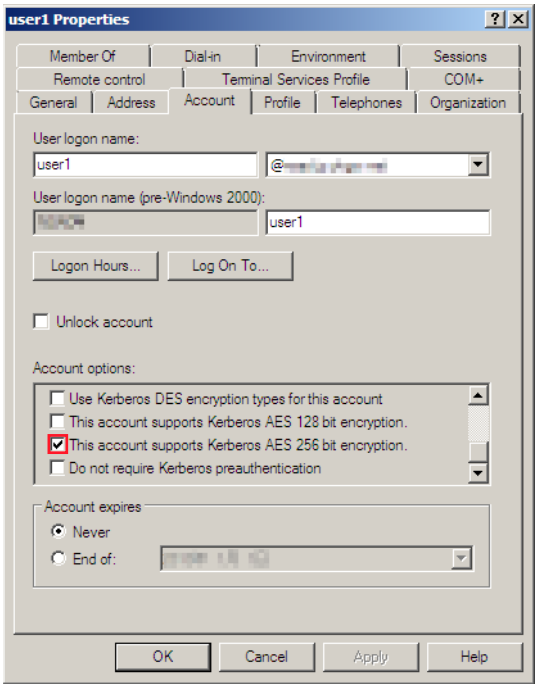
Create an Active Directory User Account and Change Its Properties

Create an Active Directory DX user account. Change the properties of the account to match those of the host.

In this example, select the following check box:

This account supports Kerberos AES 256 bit encryption

Be sure to select the same encryption method as the one used by the DX host account.



About Mapping

Mapping is the establishment of an association between the host principal and the host account. In the example below, the setting “princ” is associated with the setting “mapuser.” The association is accomplished through the use of the ktpass tool.

- Open the command prompt, and execute the ktpass command.

ktpass Settings

Setup Item		Windows Server 2003	Windows Server 2008	Example
princ		host/(host principal)@(realm name)		host/dxadv@EXAMPLE.COM
pass		Password		record-1
crypto	**ARC4**	RC4-HMAC-NT	RC4-HMAC-NT	RC4-HMAC-NT
	AES128		AES128-SHA1	
	AES256		AES256-SHA1	
mapuser		Host account		dxadv
ptype		KRB5_NT_PRINCIPAL		KRB5_NT_PRINCIPAL
out		(Destination folder name)\(file name).keytab		c:\temp\dxadv.keytab

Mapping Example

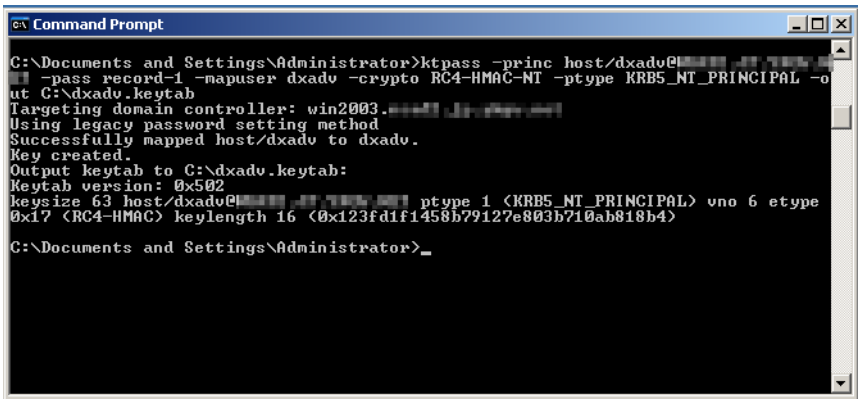
```
ktpass -princ host/dxadv@EXAMPLE.COM -pass record-1 -crypto
RC4-HMAC-NT -mapuser dxadv -ptype KRB5_NT_PRINCIPAL -out c:\
temp\dxadv.keytab
```

Note

- Use the ktpass tool after you install the support tools offered by the server.
- Be sure to make the realm name all caps.
- You can only set crypto to All when using Windows Server 2008.
- Use the same encryption method for the user and host accounts.
- ARC4 (ARCFOUR) is an encryption algorithm that is compatible with RC4.
- The “out” setting can be omitted.

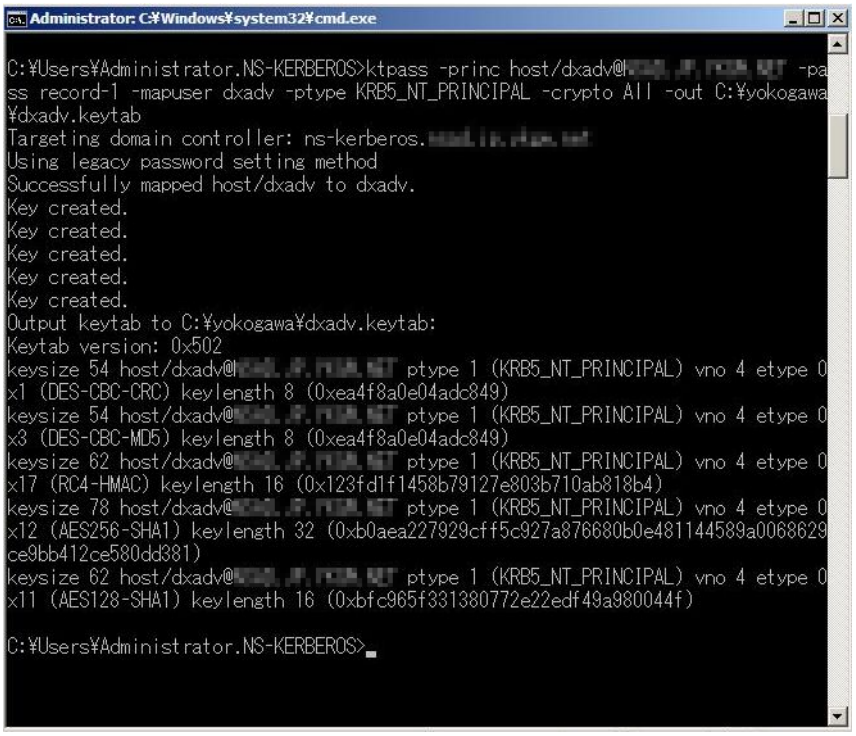
ktpass Execution Example (Windows Server 2003)

This execution example is different from the configuration example.



ktpass Execution Example (Windows Server 2008)

This execution example is different from the configuration example on the previous page.



Settings on the DX

Configure the following settings on the DX. For the setup procedure, see page 1-80.

Item	Setup Items
Host principal	dxadv
Realm name	Specify the realm name.
Password	record-1
Encryption method	AES256
KDC server name	Specify the KDC server name.
Port number	88

Note

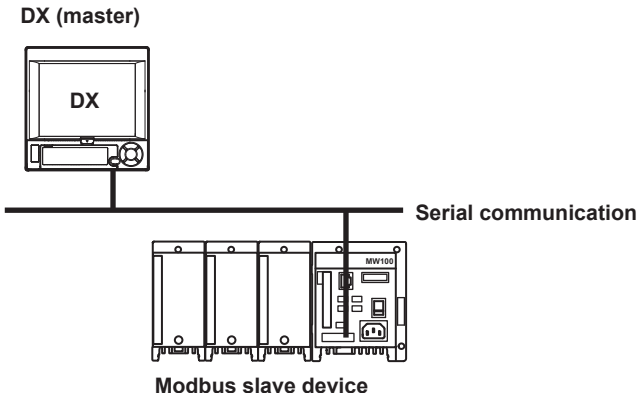
The realm name is the domain name in all caps.

2.1 DX Features

Serial communication can be performed using RS-232 or RS-422/485. Explains the serial communication functions.

Modbus Master

- The DX can connect to a Modbus slave device and read or write to the internal register. The read data can be used as communication input data of the computation function* on a computation channel. The data can also be handled on the external input channel.** The data that can be written to the internal register is measured data and computed data.
  * /M1 or /PM1 option
  ** DX2000 with /MC1 option
- For a description of the settings required to use this function, see section 2.4. For details on the Modbus function codes that the DX supports, see section 6.3.
- For the setting procedure, see sections 2.4, 2.6, and 2.7.

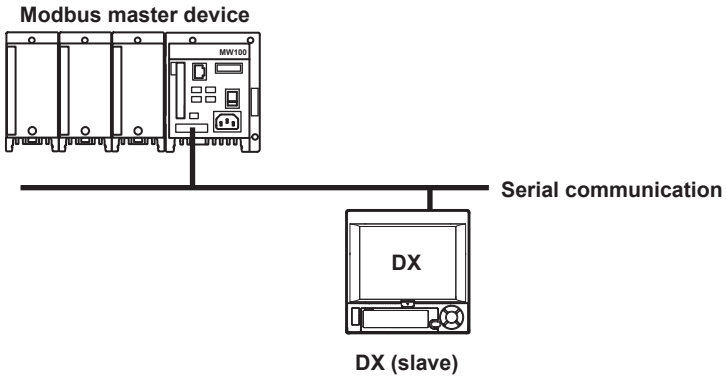


Modbus Slave

- A Modbus master device can carry out the following operations on the DX that is operating as a Modbus slave device.
  - Load data from measurement, computed,* and external input channels** (using the input register)
  - Load communication input data* (using the hold register)
  - Write communication input data* (using the hold register)
  - Write to external input channels* (using the hold register)
  - Start and stop recording, write messages, and perform other similar operations (using the hold register; models with release number 3 or later)
  - Load the recording start/stop condition, message strings, and other types of data (using the hold register; models with release number 3 or later)

  * /M1 and /PM1 options

  ** DX2000 with /MC1 option
- For details on the settings required to use this function and the Modbus function codes that the DX supports, see section 6.3.
- For the setting procedure, see sections 2.4, 2.5, and 2.7.



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.

PROFIBUS-DP (/CP1 option; release number 3 or later)

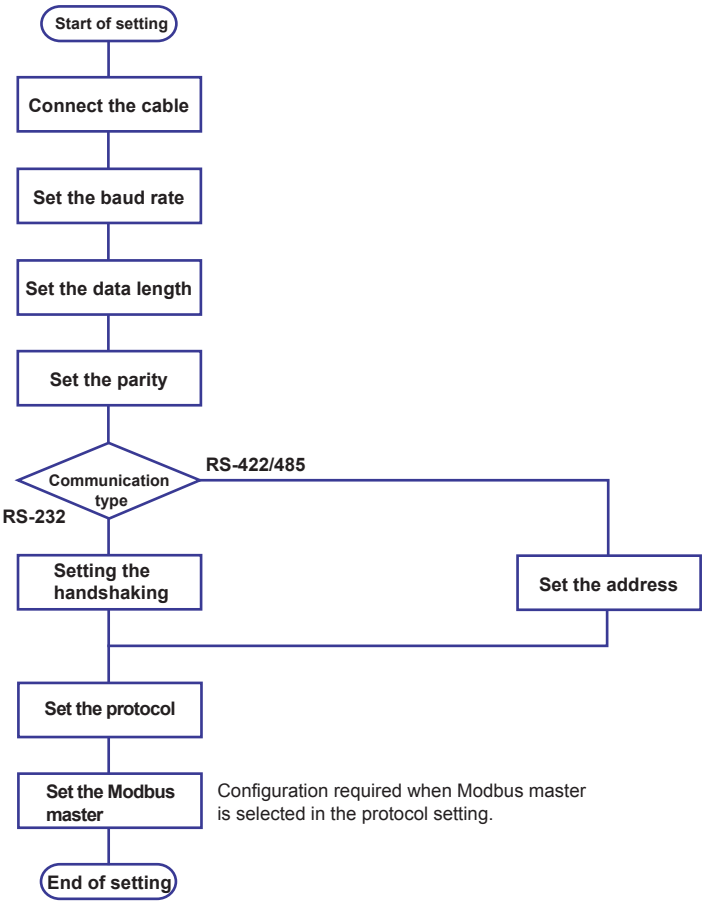
As a PROFIBUS-DP slave device, the DX can:

- Output measured values of measurement channels.
- Output a portion of the computed values of computation channels.
- Enter data to a portion of the communication input data.

For operating instructions, see the *PROFIBUS-DP Communication Interface User's Manual (IM04L41B01-19E)*.

2.2 Flow of Operation When Using the Serial Interface

The flow chart below shows the procedure to set the communication using RS-232 or RS-422/RS-485.
The procedure varies for RS-232 and RS-422/RS-485.



2.3 Connecting the DX

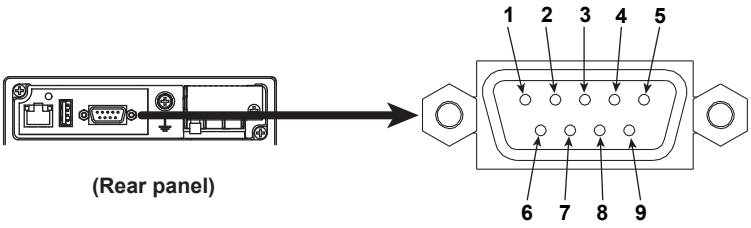
Connecting the cable

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

RS-232 Connection Procedure

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

Connector pin arrangement and signal names



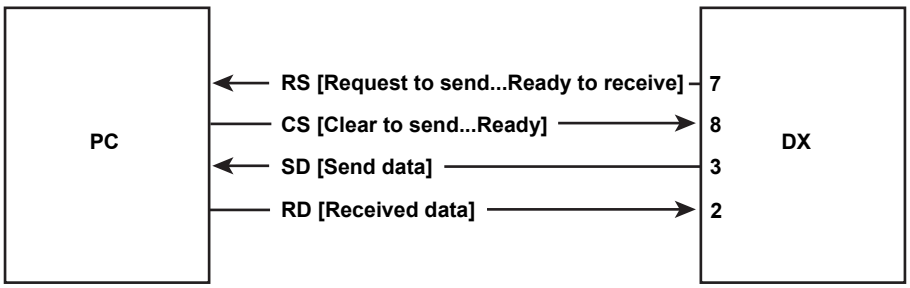
Each pin corresponds to the signal indicated below.
The following table shows the signal name, RS-232 standard, JIS, and ITU-T standard signals.

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

* Pins 1, 4, 6, and 9 are not used.

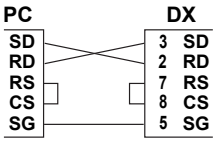
Connection

- Signal direction

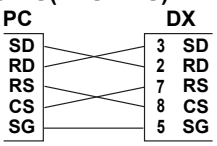


- Connection example

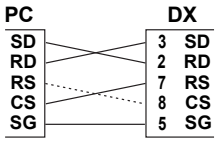
• OFF-OFF/XON-XON



• CS-RS(CTS-RS)



• XON-RS(XON-RTS)



The connection of RS on the PC and CS on the DX 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 DX and the PC, you must make sure that the same method is chosen by both the DX and the PC.

You can choose any of the four methods on the DX in the table below.

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

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

- **OFF-OFF**
  - Data transmission control
    There is no handshaking between the DX 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 DX and the PC. When the received buffer becomes full, all of the data that overflows are discarded.
    RS = True (fixed).

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

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

- **CS-RS**
  - Data transmission control
    Hardware handshaking is performed between the DX and the PC. When the CS signal becomes False while sending data to the PC, the DX stops the data transmission. When the CS signal becomes True, the DX 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.

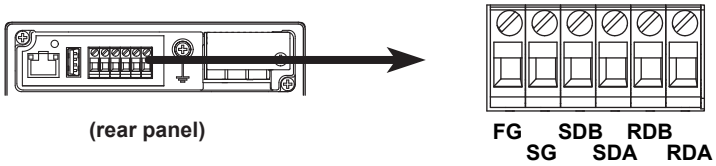
Note

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

RS-422/485 Connection Procedure

Terminal arrangement and signal names

Connect a cable to the clamp terminal.

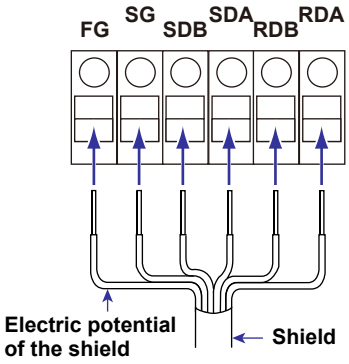


Each terminal corresponds to the signal indicated below.

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

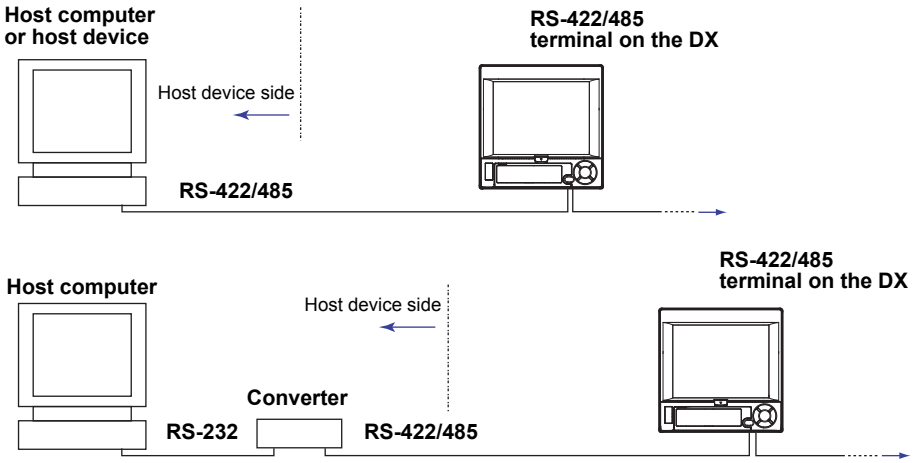
Connection

- Connecting the Cable
  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.
- Connection of a four-wire system



Connecting to the host device

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



Connection example to the host device

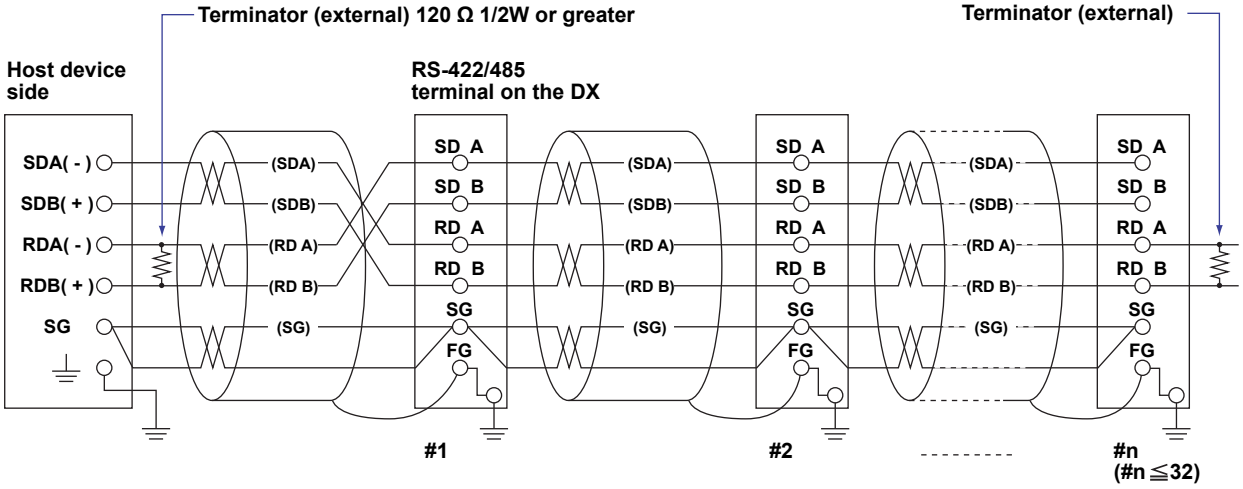
A connection can be made with a host device having a RS-232, RS422, or RS-485 port. In the case of RS-232, a converter is used. See the connection examples below for a typical converter terminal. For details, see the manual that comes with the converter.

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

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

- **Four-wire system**

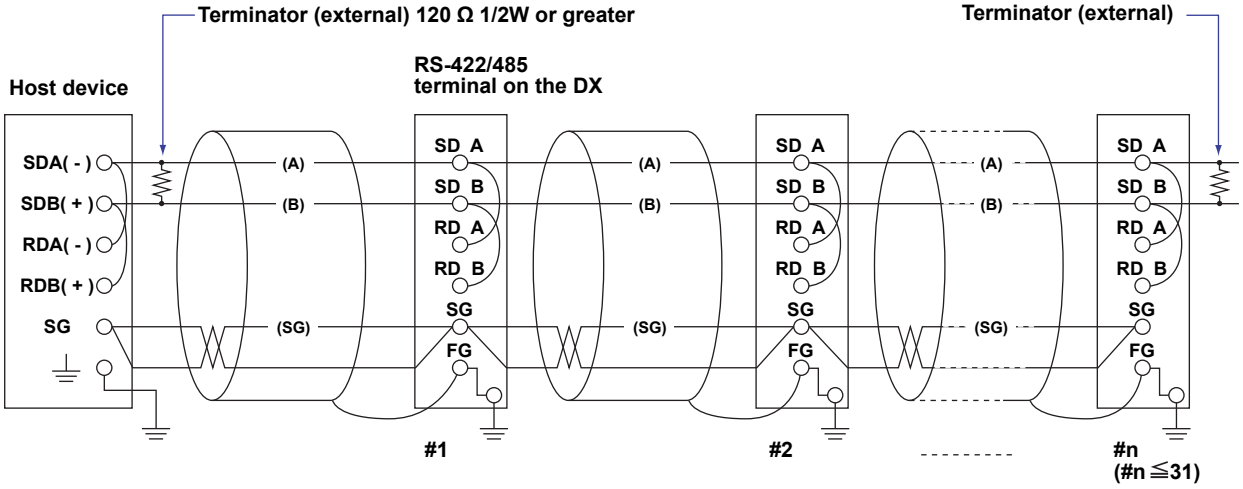
  Generally, a four-wire system is used to connect to a host device. In the case of a four-wire system, the transmission and reception lines need to be crossed over.



Do not connect terminators to #1 through #n-1.

- **Two-wire system**

  Connect the transmission and reception signals with the same polarity on the RS-422/485 terminal block. Only two wires are used to connect to the external device.



Do not connect terminators to #1 through #n-1.

Note

- The method used to eliminate noise varies depending on the situation. In the connection example, the shield of the cable is connected only to the DX's ground (one-sided grounding). This is effective when there is a difference in the electric potential between the computer's ground and the DX'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 DX'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.
- When using the two-wire interface (Modbus protocol), 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 DX 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 using the recommended converter, the driver is controlled using the RS (RTS) signal on the RS-232.

When instruments that support only the RS-422 interface exist in the system

When using the four-wire system, up to 32 DXs can be connected to a single host device. However, this may not be true if instruments that support only the RS-422 interface exist in the system.

When YOKOGAWA's recorders that support only the RS-422 interface exist in the system

The maximum number of connection is 16. Some of YOKOGAWA's conventional recorders (HR2400 and µR, for example) only support the RS-422 driver. In this case, only up to 16 units can be connected.

Note

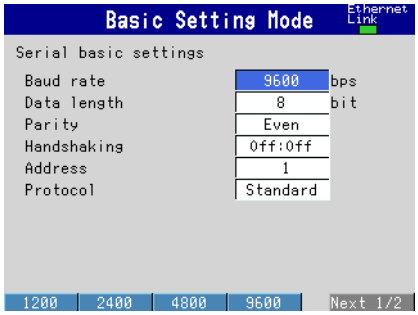
In the RS-422 standard, 10 is the maximum number of connections that are allowed on one port (for a four-wire system).

Terminator

When using a multidrop connection (including a point-to-point connection), connect a terminator to the DX if the DX is connected to the end of the chain. Do not connect a terminator to a DX 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**.



For RS-232

- **Baud rate**
  Select 1200, 2400, 4800, 9600, 19200, or 38400 (bps).
- **Data length**
  Select 7 or 8 (bits). To output the data in binary format, select 8.
- **Parity**
  Set the parity check method to Odd, Even, or None.
- **Handshaking**
  Select Off:Off, XON:XON, XON:RS, or CS:RS.
- **Address**
  For Modbus protocol, enter a value in the range of 1 to 99. For a general purpose communication protocol, this value is not set.
- **Protocol**
  Select [Standard] for a general purpose communication protocol, [Modbus] for Modbus slave, and [Master-M] for Modbus master. On DXs with the /AS1 advanced security option, you can select [Barcode] to use the barcode protocol.
  If Modbus master is selected, Modbus master settings must be entered.

For RS-422/485

- **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 DX 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 DX Data on Another Device

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

2.6 Using the Modbus Master Function

The DX is used as a Modbus master.
For the Modbus specifications, see section 6.3.

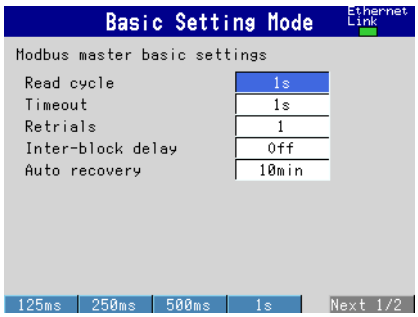
Setting the Serial Communication

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

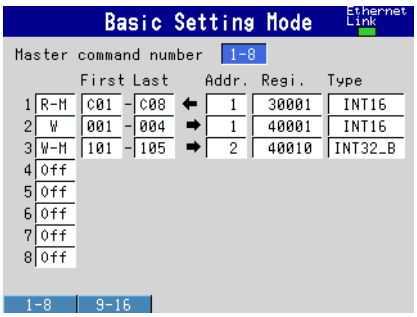
Setting the Modbus Master

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

Basic settings



Command settings



Basic settings

- **Read cycle**
  Set the read cycle to 125ms, 250ms, 500ms, 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 DX waits for a response from the specified slave after the DX 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 DX 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 transmitted command type to Off, R, R-M, W, W-M, or E-M.
  R: Read to the external input channel (16-bit signed integer type) from the slave.
  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 measurement channel (32-bit signed integer type) to the slave.

E-M: Read to the communication input data (32-bit floating point type) from the server/write the custom display value to the server (release numbers 4 and later).

R can be selected on DX2000s with the external input channel (/MC1) installed. **R-M**, **W-M**, and **E-M** can be selected on models with the computation function (/M1 or /PM1) option installed.

- **First/Last (DX's channel numbers)**
  Enter the first and last channel numbers of input/output. The range of channels that you can enter varies depending on the command type as follows:
  R: 201 to 440, R-M: C01 to C60, W: 1 to 48, W-M: 101 to 160, E-M: C01 to C60
- **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, UINT_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 1-36.

Checking the Modbus Operating Status

Displaying the Modbus Operating Status

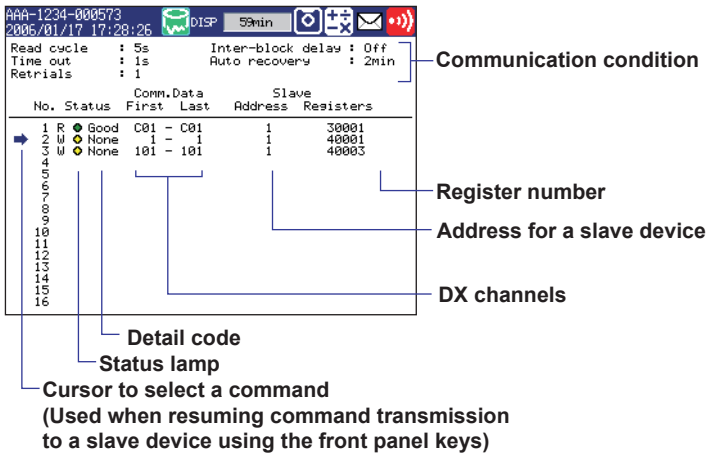
◊ Press **DISP/ENTER** and select **INFORMATION** > **MODBUS MASTER**.

Note

To display the **MODBUS MASTER** on the screen selection menu, you need to change the setting using the menu cutomize function. Operate as follows:

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

1. Select **INFORMATION** > **MODBUS MASTER**.
2. Press the **View** soft key.



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

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

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

Resuming Command Transmission

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

1. Using the up and down arrow keys, select the command corresponding to the slave device to which transmission will be resumed. The message “Push [right arrow] key to refresh” appears.
2. Press the right arrow key. The DX starts command transmission to the specified slave.

Data When Communication Is Stopped and during Connection Retrials

For Modbus master, the communication input data and external input channel data are 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 and external input channel data are error data. On communication channels, “+OVER” or –OVER is displayed according to the DX settings. “*****” is displayed on external input channels.

Data Dropout

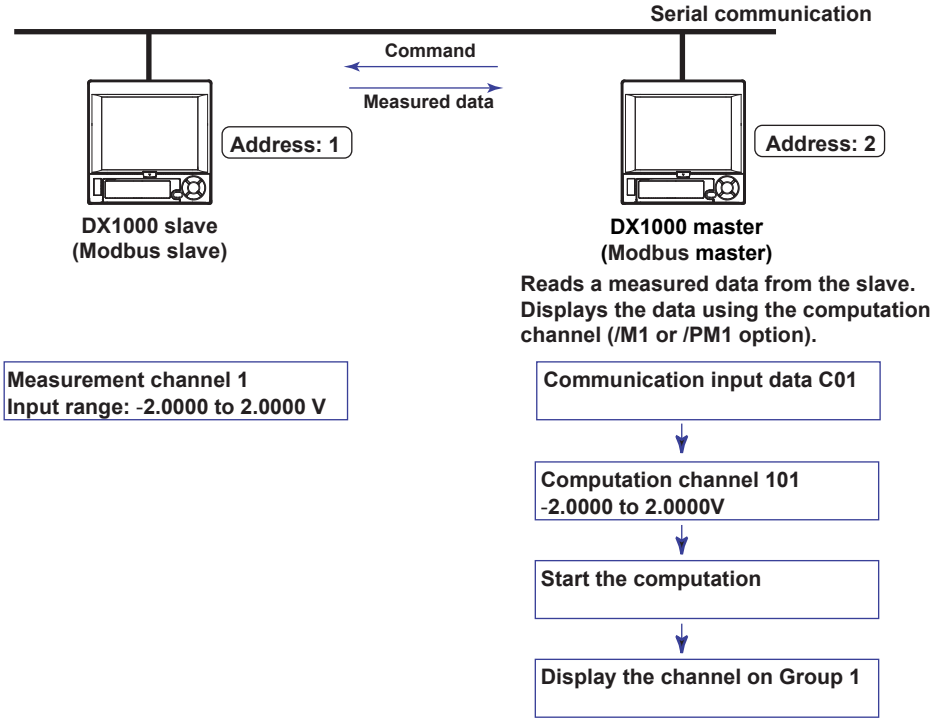
Data drop occurs when the commands from 1 to 16 do not complete within the read cycle (see appendix 1). When a data dropout occurs, the communication input data is held at the previous value. A message indicating the data dropout is also displayed on the Modbus status display. If this happens, take measures 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 DX1000s connected via the serial communication. This section refers to the DX1000 set to be a Modbus master as DX1000 master and the DX1000 set to be a Modbus slave as DX1000 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

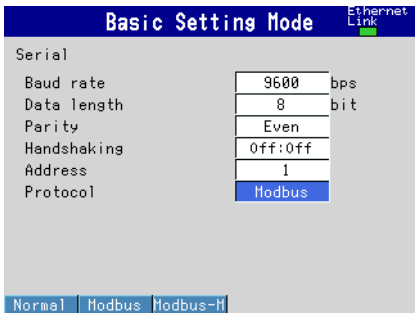
- The DX1000 master reads the measured value of channel 1 on the DX1000 slave into the communication input data C01. C01 is displayed on a computation channel 101 by including the data in the equation. The computation channel 101 is assigned to Group1.
- The measured value of channel 1 on the DX1000 slave is transferred to the DX1000 master as an integer in the range of –20000 to 20000.
- The DX1000 master displays the read data as –2.0000 to 2.0000 V on the computation channel 101. The following conversion is applied.

  Value on the computation channel 101 of the DX master
  = Communication input data C01 x 0.0001

Settings on the DX1000 Slave (Modbus Slave)

Setting the Modbus Slave Function

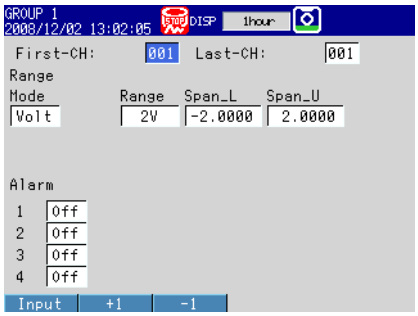
◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Serial)** > **Basic settings**.



Item	Settings
Address	1
Protocol	Modbus

Setting the Measurement Channel

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



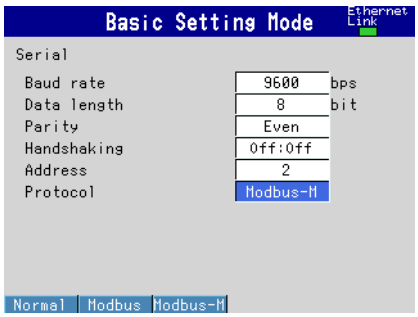
Item	Settings
First-CH, Last-CH	1
Mode	Volt
Range	2V
Span_L	–2.0000
Span_U	2.0000

Setting the DX1000 Master (Modbus Master)

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

Setting the Modbus Master Function

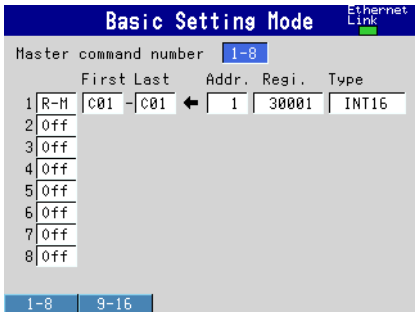
◊ Press **MENU** (to switch to setting mode), hold down **FUNC** for 3 s (to switch to basic setting mode), and select the **Menu** tab > **Communication (Serial)** > **Basic settings**.



Item	Settings
Address	2
Protocol	Modbus-M

Setting Command

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



Item	Settings
Command type	R-M
First and Last	C01
Addr.	1
Regi.	30001
Type	INT16

Setting the Computation Channel

See “Usage Example of the Modbus Function” in section 1.11.

Assigning the channel to a Group

See “Usage Example of the Modbus Function” in section 1.11.

Starting the Computation

See “Usage Example of the Modbus Function” in section 1.11.

Confirming the Communication Status

See “Usage Example of the Modbus Function” in section 1.11.

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 DX and to control it.

Connecting to the DX

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

RS-232

The DX is ready to receive commands as soon as you connect it to the PC.

RS-422A/485

The DX 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 DX at address 1 and then open the DX at address 2, the connection with the DX at address 1 is closed automatically.

When the /AS1 Advanced Security Option Is Not in Use

For the commands that you can use, see section 3.2.

When the /AS1 Advanced Security Option Is in Use

You can perform some commands without logging into the DX. There are other commands that you can only use if you are logged into the DX. For details about the commands, see chapter 3.

Commands That You Can Perform without Logging In (Monitoring function commands)

You can execute some output and control commands.

Group	Command
Control	CM, CE
Output commands (control)	BO, CS, IF, CB
Output commands (setting, measured, and computed data output)	FC, FE, FD, FF, FL, FI, IS, FU, FA
Dedicated commands for RS-422A/485	Esc O, Esc C
Login commands	LL

Commands That You Can Perform after Logging In

To log in, a user must be registered on the DX and have permission to log in through communication commands. The commands that administrators and users can execute are listed in the table below. For details about the commands, see chapter 3. For information about the responses to the commands, see chapter 4.

Group	Command		Administrator	User
Setting commands				
	SY	Sets a four panel display	Yes	Yes
	SD	Sets the date and time	Yes	No
	FR	Sets the interval for acquiring data to the FIFO buffer	Yes	No
Control				
	PS	Starts or stops recording	Yes	Yes
	EV	Executes manual sample, takes a snapshot, or causes a timeout	Yes	Yes
	MS	Writes a message	Yes	Yes
	TL	Starts, stops, resets computation (MATH) or clears the computation dropout status display	Yes	Yes
	IR	Resets a relative timer	Yes	Yes
	AK	Clears alarm output	Yes	Yes
	CV	Switches between normal and secondary trend interval	Yes	Yes
	EM	Starts or stops the e-mail transmission function	Yes	Yes
	CU	Recovers Modbus manually	Yes	Yes
	BJ	Writes a free message	Yes	Yes
	EJ	Changes the login password	Yes	Yes
	BT	Sets a batch name	Yes	Yes
	BU	Sets a batch comment	Yes	Yes
	MH	Sets a batch text field	Yes	Yes
	CL	Executes manual SNTP	Yes	Yes
	LO	Loads setup data for setting mode	Yes	Yes
	MA	Resets a match time timer	Yes	Yes
	UD	Switches the screen	Yes	Yes
	BQ	Locked ACK	Yes	No
	CW	Sets an event switch	Yes	No

Users cannot execute operations (commands) that are not allowed under their user privileges. The correspondence between the commands that can be used and the user privilege settings are indicated in the table below. For information about how to configure the settings using key operations, see section 2.1 in the *Advanced Security Function (/AS1) User's Manual (IM 04L41B01-05EN)*.

User Privilege Settings		**Command**	
Key operations	START	PS0	Memory start
	STOP	PS1	Memory stop
External storage operations	Setup loading	LO	Loads a setup file
Function	Alarm ACK	AK	Alarm acknowledge
	Message and batch	MS	Writes a message
		BJ	Writes a free message
		BT	Sets a batch name
		BU	Sets a batch comment
		MH	Sets a batch text field
	Math	TL	Starts or stops computation
	Data save	EV	Executes manual sampling or causes a timeout
		IR	Resets a relative timer
		MA	Resets a match time timer
		LI	Saves a setup file
	E-mail/FTP	EM	Starts or stops e-mail
		CU	Recovers Modbus manually
	Time settings	CL	Executes manual SNTP
	Screen operations	SY	Sets a four panel display
		CV	Switches between normal and secondary trend interval

LL Command

Use the LL command to log in. In the LL command, specify the user name, user ID, and password. After the LL command, use sub delimiters to make a list of commands. You log into the DX when you execute the command, and you are automatically logged out after the command is executed.

Example Log in as user a (whose user ID is "aaaa" and whose password is "aaaaaa"), start computation, and execute memory start.
LLa,aaaa, aaaaaa;TL0;PS0

Login Limitations

Depending on the key and Ethernet login conditions, there may be limitations when you log into the setting and measurement function using the LL command. You can execute the monitoring function commands regardless of other login conditions. For details, see section 1.3 in the *Advanced Security Function (/AS1) User's Manual (IM 04L41B01-05EN)*.

2.9 Using Barcode Input (/AS1 option)

You can use barcode input to supplement the key input. You can only use barcode input on models with the /AS1 advanced security option.

Settings on the DX

◊ 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**. See section 2.4.

Protocol
Select [Barcode] to use the barcode protocol.

Connecting to the DX

Follow the standard operating procedure for the barcode reader that you are using.

1. Turn off the DX, and connect the barcode reader to the RS-232 interface connector.
2. Turn on the DX.

   The DX is ready to receive commands.

Commands That You Can Use

The commands that you can enter using barcodes are listed in the table below. Users cannot execute operations (commands) that are not allowed under their user privileges. For details about the commands, see chapter 3.

Type	Command		Administrator	User
Dedicated barcode commands				
	KE	Key operations	Yes	Yes
	BV	Enters a string	Yes	Yes
	BP	Supports login	Yes	Yes
Control commands				
	PS	Starts or stops recording	Yes	Yes
	EV	Executes manual sample, takes a snapshot, or causes a timeout	Yes	Yes
	MS	Writes a message	Yes	Yes
	TL	Starts, stops, resets computation (MATH) or clears the computation dropout status display	Yes	Yes
	IR	Resets a relative timer	Yes	Yes
	AK	Clears alarm output	Yes	Yes
	CV	Switches between normal and secondary trend interval	Yes	Yes
	EM	Starts or stops the e-mail transmission function	Yes	Yes
	CU	Recovers Modbus manually	Yes	Yes
	BJ	Writes a free message	Yes	Yes
	EJ	Changes the login password	Yes	Yes
	BT	Sets a batch name	Yes	Yes
	BU	Sets a batch comment	Yes	Yes
	MH	Sets a batch text field	Yes	Yes
	CL	Executes manual SNTP	Yes	Yes
	LO	Loads setup data for setting mode	Yes	Yes
	LI	Saves setup data	Yes	Yes
	MA	Resets a match time timer	Yes	Yes
	UD	Switches the screen	Yes	Yes
	BQ	Locked ACK	Yes	No
	CM	Sets communication input data	Yes	Yes

Type	Command		Administrator	User
	CE	Sets communication input of an external input channel	Yes	Yes
	EC	Clears setup data	Yes	No
	YO	Loads a setup file for basic setting mode	Yes	No
Output commands (control)				
	BO	Sets the byte output order	Yes	Yes
	CS	Sets the checksum	Yes	Yes
	IF	Sets status filters	Yes	Yes
	CB	Sets the data output format	Yes	Yes
Output commands (setting, measured, and computed data output)				
	FC	Outputs screen image data	Yes	Yes
	FE	Outputs setup data	Yes	Yes
	FD	Outputs the most recent measured and computed data	Yes	Yes
	FF	Outputs FIFO data	Yes	Yes
	FL	Outputs a log, alarm summary, or message summary	Yes	Yes
	FI	Outputs an operation log	Yes	Yes
	IS	Outputs status information	Yes	Yes
	FU	Outputs user levels	Yes	Yes
	FA	Outputs internal DX information	Yes	Yes
Dedicated commands for RS-422A/485				
	Esc O	Open	Yes	Yes
	Esc C	Closed	Yes	Yes

Dedicated barcode commands

Command	Function	Description
BV	Enters a string	This command is valid when on the DX screen, the cursor is on an item that you need to specify a string for or when a window for entering a string appears. You cannot use this command to enter passwords.
BP	Supports login	Enters the user name or the user name and user ID for logging in. You have to set the password using key operations.
KE	Key operations	Performs the same operations as pressing a key on the DX.

How to Use

A user who is registered on the DX can use barcodes to supplement key input. Scan the communication commands encoded in bar codes to operate the DX with a barcode reader. You can perform the same operations that you can perform using the DX keys.

Handling of Barcode Input

Barcode input is handled as key input.

Operations

You can only use the following commands when you have logged into the DX using the keys.

The KE and BV commands and all control commands other than CM and CE.

Users cannot execute operations (commands) that are not allowed under their user privileges. See section 2.8 for the correspondence between the commands that can be used and the user privilege settings.

Operation Log

Operations are recorded in the DX operation log. The operator is the user who was logged in using the DX keys.

Barcode Readers

The DX recognizes the following barcode readers:

- Model name: MS9540-RS (RS-232 interface)
  Maker: Metrologic Instruments Inc.
- Model name: LS1902T-RS (RS-232 interface)
  Maker: Symbol Technologies Inc.
  Because only a small number of characters can be specified in the header, the input method may be limited when you use this barcode reader with the DX.

Operation Examples

This section contains operation examples.

Note

In this section, “CRLF” is used to indicate a terminator. For information about terminators, see page 3-2.

Operation Example 1

Logging in with a User Name of ABC2001 and a User ID of 5555

While logged out, enter the command “BP2,ABC2001,5555CRLF” using barcodes. The user name and user ID are entered, and a window for entering the password appears (you have to use the keys to enter the password).

Note

- When you enter commands using bar codes, you can enter them separated or all at once. You can separate commands however you want to. For instance, in example 1, you could scan the data as indicated below:
  “BP2” → “,”→“ABC2001”→“,”→“5555”→“CRLF”
- If you use a barcode reader that automatically attaches a footer and a header to every transmission, set the header to “BP2,” the footer to “CRLF” and scan “ABC2001,5555.”

Operation Example 2

Entering into a Measurement Ready State with a Batch Number of Process1 and a Lot Number of 0031

When recording has not been started, scan the command “BT1,Process1,0031;KESTAR TCRLF” with the barcode reader.

The batch and lot number are set and the start window appears.

Operation Example 3

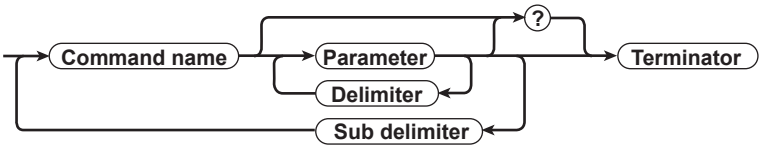
In setting mode, set the file header to “process sample.”

1. In the screen for setting the file header in setting mode, move the cursor to the box for entering a character string.
   After this, if you press the **Input** soft key and display the window for entering a character string, you can still enter a character string with the barcode reader.
2. Use the barcode reader to enter “BV0,process sampleCRLF.”
   The “Header” box is set to “process sample.”

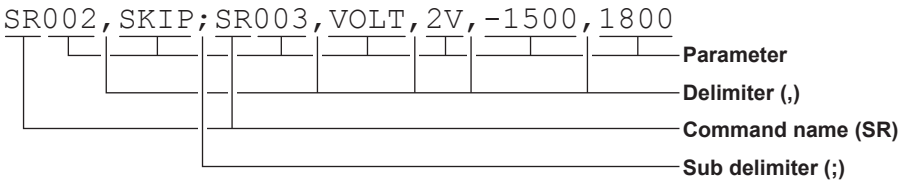
3.1 Command Syntax

Command Syntax

The syntax of the setting/basic setting/output commands (see sections 3.4 to 3.9) of the DX is given below. ASCII codes (see appendix 1) are used for the character codes. For the syntax of the maintenance/test commands (see section 3.10) and instrument information output commands (see section 3.11), see the corresponding sections or the examples for each command.



Command example



Command Name

Defined using two alphabet characters.

Parameters

- Command parameters.
- Set using alphabet characters or numeric values.
- Parameters are separated by delimiters (commas).
- All numeric values are specified using integers.
- When the parameter is a numeric value, the valid range of the value varies depending on the command.
- Spaces around the parameter are discarded. (However, spaces are valid for parameters (units) specified using an ASCII character string.) 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 delimiters occur at the end of the command, those delimiters can be omitted.

  Example SR001,VOLT,,,<terminator> → SR001,VOLT<terminator>
- The number of digits of the parameters below is fixed. If the number is exceeded when entering the command, a syntax error results.
  - Date YY/MM/DD (8 characters)
    YY: Enter the lower two digits of the year.
    MM: Month
    DD: Day
  - Time HH:MM:SS (8 characters)
    HH: Hour
    MM: Minute
    SS: Second
  - Channel number: 3 characters
  - Relay number: 3 characters

Query

- A question mark is used to specify a query.
- By placing a query after a command or parameter, the setting information of the corresponding command can be queried. Some commands cannot execute 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 a delimiter.
- Parameters are separated by delimiters.

Sub Delimiter

- A semicolon is used as a sub delimiter.
- By separating each command with a sub delimiter, up to 10 commands can be specified one after another. However, the following commands and queries cannot be specified one after another. Use them independently.
  - Output commands other than `BO`, `CS`, `IF`, or `CB`
  - `YO` command
  - Query

  * If there are consecutive sub delimiters, they are considered to be single. In addition, sub delimiters at the front and at the end are ignored.

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

Terminator

Use either of the following two characters for 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 DX. If you do, an error will occur.
- The total data length from the first character to the terminator must be less than 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 one of the commands is erroneous.
- 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 occurs.

Response

The DX 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. For the response syntax, see section 4.1.

* Commands dedicated to RS-422/485 (see section 3.9) and instrument information output commands (section 3.11) are exceptions.

3.2 A List of Commands

When the /AS1 Advanced Security Option Is Not in Use

DX Execution Modes

There are two execution modes on the DX. If you attempt to execute a command in a mode that is different from the specification, a syntax error occurs. Use the DS command to switch to the appropriate execution mode, and then execute the command. Query commands can be executed in either mode.

- **Basic setting mode**
  Measurement and computation are stopped, and settings are changed in this mode.
- **Operation mode**
  As a general rule, commands other than those for the basic setting mode described above are used in this mode.

Administrator and User

The administrator and user specifications in the table indicate the user level that is specified using the login function for Ethernet communications.
"Yes" and "No" in the table indicate the following:

Yes: Command usable
No: Command not usable

Setting Commands

Note

If the multi batch function (/BT2 option) is enabled, you cannot use the SR, SO, SK, TJ, SW, TE, SJ, ER,TQ, and TK commands unless all batch recording operations are stopped.

Group	Command Name	Function	Execution Mode	Administrator	User	Page
	SR	Sets an input range	Operation mode	Yes	No	3-19
	SO	Sets a computing equation	Operation mode	Yes	No	3-20
	ER	Sets the range of an external input channel	Operation mode	Yes	No	3-20
	TJ	Sets memory sampling	Operation mode	Yes	No	3-21
	SA	Sets an alarm	Operation mode	Yes	No	3-21
	SW	Sets the trend interval and auto save interval	Operation mode	Yes	No	3-22
	TI	Sets the circular display offset time	Operation mode	Yes	No	3-22
	TO	Sets how the DX operates after one circular display cycle	Operation mode	Yes	No	3-23
	TW	Sets the secondary trend interval	Operation mode	Yes	No	3-23
	TM	Sets manual sampling	Operation mode	Yes	No	3-23
	TE	Sets sampling conditions for event data	Operation mode	Yes	No	3-23
	SZ	Sets a zone	Operation mode	Yes	No	3-23
	SP	Sets a partial expanded display	Operation mode	Yes	No	3-24
	ST	Sets a tag	Operation mode	Yes	No	3-24
	SX	Sets a display group (release number 2 or earlier)	Operation mode	Yes	No	3-24
	SL	Sets a trip line (release number 2 or earlier)	Operation mode	Yes	No	3-24
	NX	Sets a display group (release number 3 or later)	Operation mode	Yes	No	3-25
	NL	Sets a trip line (release number 3 or later)	Operation mode	Yes	No	3-25
	SG	Sets a message	Operation mode	Yes	No	3-25
	TH	Sets the directory on the external storage medium for saving data	Operation mode	Yes	No	3-25
	TZ	Sets a file header	Operation mode	Yes	No	3-26
	TF	Sets a data file name	Operation mode	Yes	No	3-26
	SD	Sets the date and time	Operation mode	Yes	No	3-26
	TD	Sets daylight saving time	Operation mode	Yes	No	3-26
	TT	Sets the trend display	Operation mode	Yes	No	3-26
	SE	Sets the line width and the number of grids to use on the trend graph	Operation mode	Yes	No	3-27
	TB	Sets the bar graph display	Operation mode	Yes	No	3-27
	SB	Sets the bar graph for a channel	Operation mode	Yes	No	3-27

Group	Command Name	Function	Execution Mode	Administrator	User	Page
	TN	Sets a scale	Operation mode	Yes	No	3-27
	SV	Sets a measurement channel's moving average	Operation mode	Yes	No	3-27
	SC	Sets a channel display color	Operation mode	Yes	No	3-27
	TA	Sets an alarm point mark	Operation mode	Yes	No	3-27
	TG	Sets a color scale band	Operation mode	Yes	No	3-28
	SQ	Sets the LCD brightness and the screen backlight saver	Operation mode	Yes	No	3-28
	TC	Sets the background color	Operation mode	Yes	No	3-28
	TP	Sets the automatic switching back to default display	Operation mode	Yes	No	3-28
	NF	Sets the favorite key operation	Operation mode	Yes	No	3-28
	TR	Sets the automatic switching back to default display	Operation mode	Yes	No	3-28
	TQ	Sets a timer	Operation mode	Yes	No	3-28
	TK	Sets a match time timer	Operation mode	Yes	No	3-29
	TU	Sets an event action	Operation mode	Yes	No	3-29
	SK	Sets a constant	Operation mode	Yes	No	3-31
	SI	Sets the rolling average function of a computation channel	Operation mode	Yes	No	3-31
	SJ	Sets a TLOG timer	Operation mode	Yes	No	3-31
	TX	Sets the ancillary operation of the start key	Operation mode	Yes	No	3-32
	BH	Sets a batch text field	Operation mode	Yes	No	3-32
	EH	Sets calibration correction	Operation mode	Yes	No	3-32
	BD	Sets an alarm delay	Operation mode	Yes	No	3-32
	NC	Sets a comment text field	Operation mode	Yes	No	3-33
	NB	Sets a comment text block	Operation mode	Yes	No	3-33
	NW	Sets an annunciator display	Operation mode	Yes	No	3-33
	NG	Sets a Web report layout	Operation mode	Yes	No	3-33
	NH	Sets Web report layout details	Operation mode	Yes	No	3-33
	FR	Sets the interval for acquiring data to the FIFO buffer	Operation mode	Yes	No	3-33
	SY	Sets a four panel display	Operation mode	Yes	No	3-34
	SM	Sets the custom menu	Operation mode	Yes	No	3-34

Control Commands

Group	Command Name	Function	Execution Mode	Administrator	User	Page
	BT	Sets a batch name	Operation mode	Yes	No	3-37
	BU	Sets a batch comment	Operation mode	Yes	No	3-37
	MH	Writes a batch text field	Operation mode	Yes	No	3-37
	UD	Switches the screen	Operation mode	Yes	No	3-37
	PS	Starts or stops recording	Operation mode	Yes	No	3-39
	AK	Clears alarm output (acknowledge alarms)	Operation mode	Yes	No	3-39
	EV	Executes manual sample, generates a manual trigger, takes a snapshot, or causes a timeout	Operation mode	Yes	No	3-39
	CL	Executes manual SNTP	Operation mode	Yes	No	3-39
	CV	Switches between normal and secondary trend interval	Operation mode	Yes	No	3-39
	MS	Writes a message (display and write)	Operation mode	Yes	No	3-40
	BJ	Writes a free message	Operation mode	Yes	No	3-40
	EJ	Changes the login password	Operation mode	Yes	Yes	3-40
	TL	Starts, stops, resets computation (MATH) or clears the computation dropout status display	Operation mode	Yes	No	3-40
	DS	Switches the execution mode between operation and setting	All modes	Yes	No	3-40
	LO	Loads setup data for setting mode	Operation mode	Yes	No	3-41
	LI	Saves setup data	Operation mode	Yes	No	3-41
	CM	Sets communication input data	Operation mode	Yes	No	3-41
	CE	Sets communication input of an external input channel	Operation mode	Yes	No	3-41
	EM	Starts or stops the e-mail transmission function	Operation mode	Yes	No	3-41
	CU	Recovers Modbus manually	Operation mode	Yes	No	3-42
	BV	Enters a string (can only be used during serial communications)	All modes	Yes	No	3-44
	KE	Key operation command	Operation mode	Yes	No	3-44
	YO	Loads a setup file for basic setting mode	Basic setting mode	Yes	No	3-42
	YC	Clears measured and computed data and initializes setup data	Basic setting mode	Yes	No	3-42
	IR	Resets a relative timer	Operation mode	Yes	No	3-42
	MA	Resets a match time timer	Operation mode	Yes	No	3-42
	CW	Sets an event switch	Operation mode	Yes	No	3-42
	LR	Loads custom display screens	Operation mode	Yes	No	3-42
	LW	Saves custom display screens	Operation mode	Yes	No	3-43

Basic Setting Commands

- In order to activate the settings that are changed using the basic setting commands, the settings must be saved using the YE or XE command. Make sure to save the settings before changing from the basic setting mode to the operation mode. Otherwise, new settings will not be activated.
- The settings that are returned in response to a query in basic setting mode contain the new settings even if they are not saved. However, the new settings are not activated unless they are saved. If the settings are cleared or if you change 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 used 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 activated after saving the new settings using the XE command and restarting the DX.
- When you execute the YE or YO command, communication is disconnected. Commands listed after the YO or YE command are ignored.

Group	Command Name	Function	Execution Mode	Administrator	User	Page
	WU	Sets the environment	Basic setting mode	Yes	No	3-45
	WE	Sets calibration management	Basic setting mode	Yes	No	3-47
	WO	Sets alarm and DO settings	Basic setting mode	Yes	No	3-48
	WH	Sets alarm hysteresis	Basic setting mode	Yes	No	3-48
	XV	Sets the scan interval and A/D integral time	Basic setting mode	Yes	No	3-48
	XB	Sets burnout detection	Basic setting mode	Yes	No	3-49
	XJ	Sets RJC	Basic setting mode	Yes	No	3-49
	XM	Sets memory sampling conditions	Basic setting mode	Yes	No	3-49
	XT	Sets the temperature unit	Basic setting mode	Yes	No	3-49
	RF	Sets key lock	Basic setting mode	Yes	No	3-49
	RN	Sets basic key login	Basic setting mode	Yes	No	3-50
	RP	Sets user limitations	Basic setting mode	Yes	No	3-50
	RO	Sets the type of report and when to create reports	Basic setting mode	Yes	No	3-51
	RM	Sets a report channel	Basic setting mode	Yes	No	3-52
	XG	Sets the time zone	Basic setting mode	Yes	No	3-52
	XN	Sets the date format	Basic setting mode	Yes	No	3-52
	YB	Sets host information	Basic setting mode	Yes	No	3-52
	YD	Sets network parameters	Basic setting mode	Yes	No	3-53
	YA	Sets the IP address, subnet mask, and default gateway	Basic setting mode	Yes	No	3-53
	YK	Sets keepalive	Basic setting mode	Yes	No	3-53
	RU	Sets DNS parameters	Basic setting mode	Yes	No	3-53
	WS	Sets a server	Basic setting mode	Yes	No	3-53
	WW	Sets Webpage parameters	Basic setting mode	Yes	No	3-53
	YQ	Sets communication timeout	Basic setting mode	Yes	No	3-53
	YT	Sets FTP transfer timing	Basic setting mode	Yes	No	3-54
	YU	Sets what kind of information to send using e-mail	Basic setting mode	Yes	No	3-54
	YV	Sets an e-mail recipient address	Basic setting mode	Yes	No	3-55
	YW	Sets the e-mail sender address	Basic setting mode	Yes	No	3-55
	YX	Sets the e-mail SNTP server name	Basic setting mode	Yes	No	3-55
	YJ	Sets the Modbus client's destination server	Basic setting mode	Yes	No	3-55
	YP	Sets basic Modbus client settings	Basic setting mode	Yes	No	3-55
	YR	Sets the Modbus client's transmit command	Basic setting mode	Yes	No	3-55
	WB	Sets SNTP client parameters	Basic setting mode	Yes	No	3-56
	WC	Sets the SNTP operation when memory start is executed	Basic setting mode	Yes	No	3-56
	YS	Sets the serial interface	Basic setting mode	Yes	No	3-56

Group	Command Name	Function	Execution Mode	Administrator	User	Page
Setting (continued)						
	YL	Sets the operation of the Modbus master function	Basic setting mode	Yes	No	3-57
	YM	Sets a transmit command of the Modbus master function	Basic setting mode	Yes	No	3-57
	WR	Sets the instrument information output	Basic setting mode	Yes	No	3-58
	WI	Sets the relay operation	Basic setting mode	Yes	No	3-58
	WF	Sets the Modbus connection limitation	Basic setting mode	Yes	No	3-58
	WG	Sets an IP address that is allowed to connect via Modbus	Basic setting mode	Yes	No	3-59
	WJ	Sets the FTP transfer wait time	Basic setting mode	Yes	No	3-59
	WQ	Sets PROFIBUS-DP	Basic setting mode	Yes	No	3-59
	XE	Activates basic settings	Basic setting mode	Yes	No	3-59
	YE	Activates basic settings (cold reset)	Basic setting mode	Yes	No	3-59

Output Commands

Note

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

Group	Command Name	Function	Execution Mode	Administrator	User	Page
Control						
	BO	Sets the byte output order	All modes	Yes	Yes	3-60
	CS	Sets the check sum (can only be used during serial communications)	All modes	Yes	Yes	3-60
	IF	Sets status filters	All modes	Yes	Yes	3-60
	CB	Sets the data output format	All modes	Yes	Yes	3-60
	CC	Disconnects the Ethernet connection (can only be used for Ethernet communications)	All modes	Yes	Yes	3-60
Setup, measurement, and control data output						
	FC	Outputs screen image data	All modes	Yes	Yes	3-61
	FE	Outputs setup data	All modes	Yes	Yes	3-61
	FD	Outputs the most recent measured/computed data	Operation mode	Yes	Yes	3-61
	FF	Outputs FIFO data	Operation mode	Yes	Yes	3-61
	FL	Outputs a log, alarm summary, or message summary	All modes	Yes	Yes	3-62
	IS	Outputs status information	All modes	Yes	Yes	3-62
	FU	Outputs user levels	All modes	Yes	Yes	3-63
	FA	Outputs internal DX information	All modes	Yes	Yes	3-63
	ME	Outputs data stored on the external storage medium and internal memory	Operation mode	Yes	No	3-63
	MO	Outputs the data stored in the internal memory.	Operation mode	Yes	No	3-63
Dedicated commands for RS-422/485						
	Esc O	Opens an instrument	All modes	Yes	Yes	3-64
	Esc C	Closes an instrument	All modes	Yes	Yes	3-64
Common commands among instruments						
	*I	Outputs instrument information	All modes	Yes	Yes	3-65

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

Command Name	Function	Administrator	User	Page
close	Closes another device's connection	Yes	No	3-65
con	Outputs connection information	Yes	Yes	3-65
eth	Outputs Ethernet statistics	Yes	Yes	3-65
help	Outputs help	Yes	Yes	3-66
net	Outputs network statistics	Yes	Yes	3-66
quit	Closes the connection to the instrument that you are operating	Yes	Yes	3-66

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

Parameter Name	Function	Page
serial	Outputs the serial number	3-67
host	Outputs the host name	3-67
ip	Outputs the IP address	3-67

When the /AS1 Advanced Security Option Is in Use

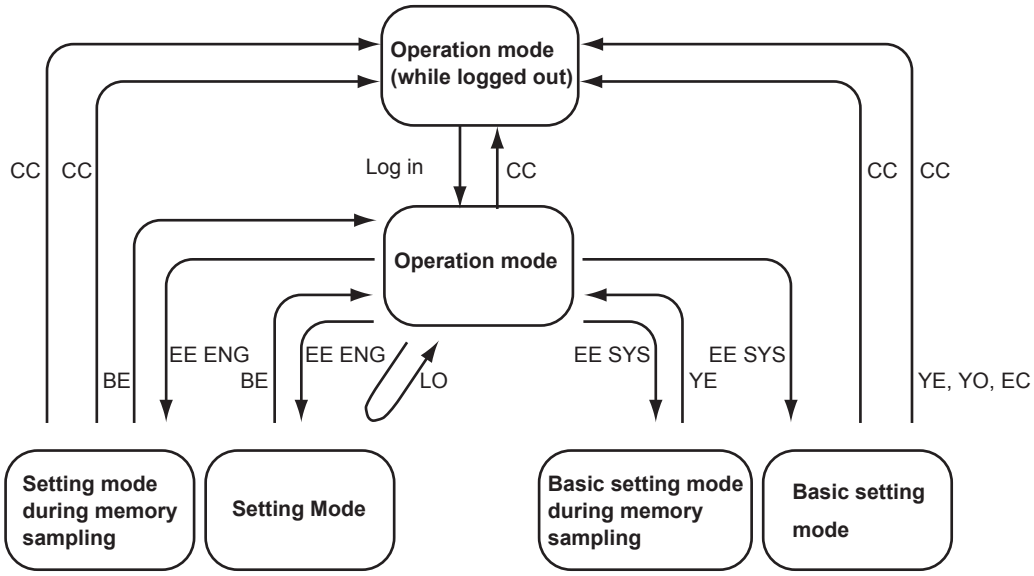
DX Execution Modes

The DX has five execution modes. The modes that each command can be executed in are predetermined. Trying to execute a command in the wrong mode results in a syntax error. Before executing a command, use a mode switching command to switch to the appropriate mode. Queries can be executed in any mode. The letters in parentheses in the titles below are the used to represent the different modes in explanations.

- **Basic Setting Mode (B)**
  Basic setting mode when recording is stopped.
- **Basic Setting Mode during Memory Sampling (b)**
  The basic setting mode that appears during recording.
- **Setting Mode (S)**
  Setting mode when recording is stopped.
- **Setting Mode during Memory Sampling (s)**
  The setting mode that appears during recording.
- **Operation Mode (O)**
  The mode in which operations are performed.

Switching Execution Modes

The figure below indicates the commands that can make the DX switch between different modes and operation modes.



Note

If there is no CF card in the DX, an error will occur when you change the settings and then try to switch to operation mode from basic setting mode, basic setting mode during memory sampling, or setting mode.

Administrators and Users

The distinction between administrators and users indicates the user levels set through the DX Ethernet login function. For details, see section 1.2.
“Yes” and “No” in the table indicate the following:

Yes: The command can be used.
No: The command cannot be used.

Connecting to the Setting Function and Connecting to the Monitoring Function

There are two types of Ethernet connections that can be made to the DX setting/measurement server: connections to the setting function (setting connection) and connections to the monitoring function (monitoring connections). For details, see section 1.12.

Setting Commands (/AS1)

To apply settings that you have changed using the setting commands, you need to save the settings using the BE command.

Command Name	Function	Execution Mode	Setting Connection		Monitor Connection	Page
			Administrator	User		
SR	Sets an input range	S	Yes	No	No	3-19
SO	Sets a computing equation	S	Yes	No	No	3-20
ER	Sets the range of an external input channel	S	Yes	No	No	3-20
TJ	Sets memory sampling	S	Yes	No	No	3-21
SA	Sets an alarm	Ss	Yes	No	No	3-21
SW	Sets the trend interval and auto save interval	S	Yes	No	No	3-22
TI	Sets the circular display offset time	S	Yes	No	No	3-22
TO	Sets how the DX operates after one circular display cycle	S	Yes	No	No	3-23
TW	Sets the secondary trend interval	S	Yes	No	No	3-23
TM	Sets manual sampling	S	Yes	No	No	3-23
TE	Sets sampling conditions for event data	S	Yes	No	No	3-23
SZ	Sets a zone	S	Yes	No	No	3-23
SP	Sets a partial expanded display	S	Yes	No	No	3-24
ST	Sets a tag	S	Yes	No	No	3-24
SX	Sets a display group (release number 2 or earlier)	S	Yes	No	No	3-24
SL	Sets a trip line (release number 2 or earlier)	S	Yes	No	No	3-24
NX	Sets a display group (release number 3 or later)	S	Yes	No	No	3-25
NL	Sets a trip line (release number 3 or later)	S	Yes	No	No	3-25
SG	Sets a message	S	Yes	No	No	3-25
TH	Sets the directory on the external storage medium for saving data	Ss	Yes	No	No	3-25
TZ	Sets a file header	S	Yes	No	No	3-26
TF	Sets a data file name	S	Yes	No	No	3-26
SD	Sets the date and time	OSs	Yes	No	No	3-26
TD	Sets daylight saving time	S	Yes	No	No	3-26
TT	Sets the trend display	S	Yes	No	No	3-26
SE	Sets the line width and the number of grids to use on the trend graph.	S	Yes	No	No	3-27
TB	Sets the bar graph display	S	Yes	No	No	3-27
SB	Sets the bar graph for a channel	S	Yes	No	No	3-27
TN	Sets a scale	S	Yes	No	No	3-27
SV	Sets a measurement channel's moving average	S	Yes	No	No	3-27
SC	Sets a channel display color	S	Yes	No	No	3-27
TA	Sets an alarm point mark	S	Yes	No	No	3-27
TG	Sets a color scale band	S	Yes	No	No	3-28
SQ	Sets the LCD brightness and the screen backlight saver	S	Yes	No	No	3-28
TC	Sets the background color	S	Yes	No	No	3-28
TP	Sets automatic display group switching	S	Yes	No	No	3-28
NF	Sets the favorite key operation.	S	Yes	No	No	3-28
TR	Sets the automatic switching back to default display	S	Yes	No	No	3-28
TQ	Sets a timer	S	Yes	No	No	3-28
TK	Sets a match time timer	S	Yes	No	No	3-29
TU	Sets an event action	S	Yes	No	No	3-29
SK	Sets a constant	S	Yes	No	No	3-31
SI	Sets the rolling average function of a computation channel	S	Yes	No	No	3-31
SJ	Sets a TLOG timer	S	Yes	No	No	3-31
TX	Sets the ancillary operation of the start key	S	Yes	No	No	3-32
BH	Sets a batch text field	S	Yes	No	No	3-32
EH	Sets calibration correction	Ss	Yes	No	No	3-32
BD	Sets an alarm delay	Ss	Yes	No	No	3-32
NC	Sets a comment text field	S	Yes	No	No	3-33
NB	Sets a comment text block	S	Yes	No	No	3-33

Command Name	Function	Execution Mode	Setting Connection		Monitor Connection	Page
			Administrator	User		
NW	Sets an annunciator display	S	Yes	No	No	3-33
NG	Sets a Web report layout	S	Yes	No	No	3-33
NH	Sets Web report layout details	S	Yes	No	No	3-33
FR	Sets the interval for acquiring data to the FIFO buffer	OSsb	Yes	No	No	3-33
SY	Sets a four panel display	OS	Yes	Yes*	No	3-34
SM	Sets the custom menu	S	Yes	No	No	3-34

* Operations are limited by the user privilege settings.

Control Commands (/AS1)

To apply settings that you have changed using the basic setting commands, you need to save the settings using the YE command.

Command Name	Function	Execution Mode	Setting Connection		Monitor Connection	Page
			Administrator	User		
BT	Sets a batch name	O	Yes	Yes*	No	3-37
BU	Sets a batch comment	O	Yes	Yes*	No	3-37
MH	Writes a batch text field	O	Yes	Yes*	No	3-37
UD	Switches the screen	O	Yes	Yes*	No	3-37
PS	Starts or stops recording	O	Yes	Yes*	No	3-39
AK	Clears alarm output (acknowledge alarms)	O	Yes	Yes*	No	3-39
EV	Executes manual sample, takes a snapshot, or causes a timeout	O	Yes	Yes*	No	3-39
CL	Executes manual SNTP	O	Yes	Yes*	No	3-39
CV	Switches between normal and secondary trend interval	O	Yes	Yes*	No	3-39
MS	Writes a message (display and write)	O	Yes	Yes*	No	3-40
BJ	Writes a free message	O	Yes	Yes*	No	3-40
EJ	Changes the login password	O	Yes	Yes	No	3-40
TL	Starts, stops, resets computation (MATH) or clears the computation dropout status display	O	Yes	Yes*	No	3-40
LO	Loads setup data for setting mode	OS	Yes	Yes*	No	3-41
LI	Saves setup data	S	Yes	Yes*	No	3-41
CM	Sets communication input data	OSsb	Yes	Yes	Yes	3-41
CE	Sets communication input of an external input channel	OSsb	Yes	Yes	Yes	3-41
EM	Starts or stops the e-mail transmission function	O	Yes	Yes*	No	3-41
CU	Recovers Modbus manually	O	Yes	Yes*	No	3-42
YO	Loads a setup file for basic setting mode	B	Yes	No	No	3-42
IR	Resets a relative timer	O	Yes	Yes*	No	3-42
MA	Resets a match time timer	O	Yes	Yes*	No	3-42
CW	Sets an event switch	O	Yes	No	No	3-42
LR	Loads custom display screens	S	Yes	No	No	3-42
LW	Saves custom display screens	S	Yes	No	No	3-43
BQ	User locked ACK (/AS1 advanced security option)	O	Yes	No	No	3-43
EC	Clears setup data (and executes a cold reset; /AS1 advanced security option)	B	Yes	No	No	3-43
EE	Switches out of operation mode (/AS1 advanced security option)	O	Yes	No	No	3-44
BE	Returns to operation mode (/AS1 advanced security option)	Ss	Yes	No	No	3-44
Dedicated Barcode Commands (Handled as key input)						
BV	Enters a string (can only be used during serial communication)	ALL	—	—	—	3-44
KE	Performs key operations	OSsb	—	—	—	3-44
BP	Supports login (/AS1 advanced security option)	O	—	—	—	3-44
Dedicated Serial Communication Commands						
LL	Logs in through serial communication (/AS1 advanced security option)	ALL	—	—	—	3-44

* Operations are limited by the user privilege settings.

Basic Setting Commands (/AS1)

- To apply settings that you have changed using the basic setting commands, you need to save the settings using the YE command.
- The settings that are returned in response to a query in basic setting mode contain the new settings even if they are not saved. However, the new settings are not activated unless you save them.
- To configure login items, use the following commands:
  RN, RP, EK, and EL

Note

The connection is closed when you execute the YE command. Commands listed after the YE command are ignored.

Command Name	Function	Execution Mode	Setting Connection		Monitor Connection	Page
			Administrator	User		
WU	Sets the environment	B	Yes	No	No	3-45
WE	Sets calibration management	B	Yes	No	No	3-47
BI	Configures signature settings	B	Yes	No	No	3-47
WO	Sets alarm and DO settings	B	Yes	No	No	3-48
WH	Sets alarm hysteresis	B	Yes	No	No	3-48
XV	Sets the scan interval and A/D integral time	B	Yes	No	No	3-48
XB	Sets burnout detection	B	Yes	No	No	3-49
XJ	Sets RJC	B	Yes	No	No	3-49
XM	Sets memory sampling conditions	B	Yes	No	No	3-49
XT	Sets the temperature unit	B	Yes	No	No	3-49
RN	Sets basic login	B	Yes	No	No	3-50
RP	Sets user limitations	B	Yes	No	No	3-50
EK	Configures administrator settings (/AS1 advanced security option)	Bb	Yes	No	No	3-50
EL	Configures user settings (/AS1 advanced security option)	Bb	Yes	No	No	3-51
WD	Configures authentication server settings (/AS1 advanced security option)	B	Yes	No	No	3-51
RO	Sets the type of report and when to create reports	B	Yes	No	No	3-51
RM	Sets a report channel	B	Yes	No	No	3-52
XG	Sets the time zone	B	Yes	No	No	3-52
XN	Sets the date format	B	Yes	No	No	3-52
YB	Sets host information	B	Yes	No	No	3-52
YD	Sets network parameters	B	Yes	No	No	3-53
YA	Sets the IP address, subnet mask, and default gateway	B	Yes	No	No	3-53
YK	Sets keepalive	B	Yes	No	No	3-53
RU	Sets DNS parameters	B	Yes	No	No	3-53
WS	Sets a server	B	Yes	No	No	3-53
WW	Sets Webpage parameters	B	Yes	No	No	3-53
YQ	Sets communication timeout	B	Yes	No	No	3-53
YT	Sets FTP transfer timing	B	Yes	No	No	3-54
YU	Sets what kind of information to send using e-mail	B	Yes	No	No	3-54
YV	Sets an e-mail recipient address	B	Yes	No	No	3-55
YW	Sets the e-mail sender address	B	Yes	No	No	3-55
YX	Sets the e-mail SMTP server name	B	Yes	No	No	3-55
YJ	Sets the Modbus client's destination server	B	Yes	No	No	3-55
YP	Sets basic Modbus client settings	B	Yes	No	No	3-55
YR	Sets the Modbus client's transmit command	B	Yes	No	No	3-55
WB	Sets SNTP client parameters	B	Yes	No	No	3-56
WC	Sets the SNTP operation when memory start is executed	B	Yes	No	No	3-56
YS	Sets the serial interface	B	Yes	No	No	3-56
YL	Sets the operation of the Modbus master function	B	Yes	No	No	3-57
YM	Sets a transmit command of the Modbus master function	B	Yes	No	No	3-57
WR	Sets the instrument information output	B	Yes	No	No	3-58

Command Name	Function	Execution Mode	Setting Connection		Monitor Connection	Page
WI	Sets the relay operations	B	Yes	No	No	3-58
WF	Sets the Modbus connection limitation	B	Yes	No	No	3-58
WG	Sets an IP address that is allowed to connect via Modbus	B	Yes	No	No	3-59
WJ	Sets the FTP transfer wait time	B	Yes	No	No	3-59
WQ	Sets PROFIBUS-DP	B	Yes	No	No	3-59
YE	Activates basic settings (cold reset)	Bb	Yes	No	No	3-59

Output Commands (/AS1)

Note

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

Command Name	Function	Execution Mode	Setting Connection		Monitor Connection	Page
			Administrator	User		
Control						
BO	Sets the byte output order	ALL	Yes	Yes	Yes	3-60
CS	Sets the check sum (can only be used during serial communication)	ALL	Yes	Yes	Yes	3-60
IF	Sets status filters	ALL	Yes	Yes	Yes	3-60
CB	Sets the data output format	ALL	Yes	Yes	Yes	3-60
CC	Disconnects the Ethernet connection (can only be used for Ethernet communications)	ALL	Yes	Yes	Yes	3-60
Setup, measurement, and computed data output						
FC	Outputs screen image data	ALL	Yes	Yes	Yes	3-61
FE	Outputs setup data	ALL	Yes	Yes	Yes	3-61
FD	Outputs the most recent measured and computed data	OSsb	Yes	Yes	Yes	3-61
FF	Outputs FIFO data	OSsb	Yes	Yes	Yes	3-61
FL	Outputs a log, alarm summary, or message summary	ALL	Yes	Yes	Yes	3-62
FI	Outputs an operation log	ALL	Yes	Yes	Yes	3-62
IS	Outputs status information	ALL	Yes	Yes	Yes	3-62
FU	Outputs user levels	ALL	Yes	Yes	Yes	3-63
FA	Outputs internal DX information	ALL	Yes	Yes	Yes	3-63
ME	Outputs data stored on the external storage medium and internal memory	OSsb	Yes	No	No	3-63
MO	Manages and outputs the data stored in the internal memory	OSsb	Yes	No	No	3-63
Dedicated commands for RS-422/485						
Esc O	Opens an instrument	ALL	Yes	Yes	Yes	3-64
Esc C	Closes an instrument	ALL	Yes	Yes	Yes	3-64
Common commands among instruments						
*I	Outputs instrument information	ALL	Yes	Yes	Yes	3-65

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

The administrator is “admin.” The user is “user.”

Command Name	Function	Administrator	User	Page
close	Closes another device’s connection	No	No	3-65
con	Outputs connection information	Yes	Yes	3-65
eth	Outputs Ethernet statistics	Yes	Yes	3-65
help	Outputs help	Yes	Yes	3-66
net	Outputs network statistics	Yes	Yes	3-66
quit	Closes the connection to the instrument that you are operating	Yes	Yes	3-66

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

Parameter	Function	Page
serial	Outputs the serial number	3-67
host	Outputs the host name	3-67
ip	Outputs the IP address	3-67

3.3 Setup Parameters

The measurement range and setup range of parameters used in a command vary depending on the combination of the command, range, and options.

Parameter Input Example of Measurement Range

The span upper and lower limit parameters of the SR command (input range setting command) requires all digits including those to the right of the decimal to be entered. For example, if you want to set the upper limit to 1.0000 V when the measurement range is -2.0000 V to 2.0000 V, the value is 10000. If you want to set the limit to 0.5000 V, the value is 5000.

The table below gives configuration examples.

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

Measurement Range Parameters

The table below shows the relationship between the input types and range parameters.
For a description of the selectable range, see the *DX1000 or DX2000 User's Manual*.

Input Type	Input Type Parameter	Range	Range Parameter	Required Option
DC Voltage	VOLT	20 mV	20MV	
		60 mV	60MV	
		200 mV	200MV	
		2 V	2V	
		6 V	6V	
		20 V	20V	
		50 V	50V	
Thermocouple	TC	R	R	
		S	S	
		B	B	
		K	K	
		E	E	
		J	J	
		T	T	
		N	N	
		W	W	
		L	L	
		U	U	
		Kp vs Au7Fe	KP	/N3
		PLATINEL	PLATI	/N3
		PR40-20	PR	/N3
		NiNiMo	NIMO	/N3
		WRe	WRE	
		W/WRe26	W/WRE	/N3
		TypeN(AWG14)	N2	/N3
		XK GOST	XK	/N3
RTD	RTD	Pt	PT	
		JPt	JPT	
		Pt50	PT50	/N3
		Ni100(SAMA)	NI1	/N3
		Ni100(DIN)	NI2	/N3
		Ni120	NI3	/N3
		J263*B	J263	/N3
		Cu53	CU53	/N3
		Cu100	CU100	/N3
		Cu10:GE	CU1	/N1
		Cu10:L&N	CU2	/N1
		Cu10:WEED	CU3	/N1
		Cu10:BAILEY	CU4	/N1
		Cu10:0.000392at20	CU5	/N1
		Cu10:0.000393at20	CU6	/N1
		Cu25:0.00425at0	CU25	/N1
		Pt25	PT25	/N3
		Pt100 GOST	Pt100G	/N3
		Cu100 GOST	Cu100G	/N3
		Cu50 GOST	Cu50G	/N3
		Cu10 GOST	Cu10G	/N3
		Pt46 GOST	Pt46G	/N3
		Pt200W(WEED)	Pt200W	/N3
Contact input	DI	Level	LEVEL	
		Cont	CONT	
1-5V voltage	1-5V	1-5V	1-5V	

Channel Number and Other Notations and Valid Ranges

Type	Model	Notation and Valid Range	Notes
Measurement channels	DX1000	001 to 012	Varies depending on the number of inputs
	DX2000	001 to 048	Varies depending on the number of inputs
Computation channels	DX1000	101 to 112	High-speed input model, /M1, /PM1
		101 to 124	Medium-speed input model, /M1, /PM1
	DX2000	101 to 112	High-speed input model, /M1, /PM1
		101 to 160	Medium-speed input model, /M1, /PM1
External input channels	DX1000	---	No setting
	DX2000	201 to 440	/MC1
Manual sample	DX1000	---	No setting
	DX2000	001 to 120	/MC1
Report channels	DX1000	R01 to R12	High-speed input model, /M1, /PM1
		R01 to R24	Medium-speed input model, /M1, /PM1
	DX2000	R01 to R12	High-speed input model, /M1, /PM1
		R01 to R60	Medium-speed input model, /M1, /PM1
Internal switches	DX1000/DX2000	S01 to S30	
Output relays	DX1000	I01 to I06	Varies depending on the /A# option
	DX2000	I01 to I06, I11 to I16, I21 to I26, I31 to I36	
Constants	DX1000/DX2000	K01 to K60	/M1, /PM1
Communication input data	DX1000	C01 to C24	/M1, /PM1
	DX2000	C01 to C60	
Display groups	DX1000	1 to 10	
		1 to 6 when using the multi batch function (/BT2 option)	/BT2
	DX2000	1 to 36	
		1 to 12 when using the multi batch function (/BT2 option)	/BT2
Remote control terminals	DX1000/DX2000	D01 to D08	/R1, /PM1
Pulse inputs	DX1000/DX2000	P01 to P08, Q01 to Q08	/PM1
Flags	DX1000/DX2000	F01 to F08	/M1, /PM1
Batch groups	DX1000/DX2000	1 to (the number of batch groups specified using the WU command)	/BT2
Timers	DX1000/DX2000	1 to 4	/M1, /PM1
		1 to 12 Models with the /BT2 multi batch option	/M1, /PM1, /BT2
Match time timers	DX1000/DX2000	1 to 4	/M1, /PM1
		1 to 12 Models with the /BT2 multi batch option	/M1, /PM1, /BT2
Comment text fields	DX1000	1 to 100	
	DX2000	1 to 200	
Comment text blocks	DX1000	1 to 50	
	DX2000	1 to 100	
Report groups (integral bar graph)	DX1000	1 to 4	/M1, /PM1
	DX2000	1 to 6	
Annunciator display windows	DX1000	1 to 24	
	DX2000	1 to 80	

High-speed input models DX1002, DX1004, DX1002N, DX1004N, DX2004, DX2008
Medium-speed input models DX1006, DX1012, DX1006N, DX1012N
DX2010, DX2020, DX2030, DX2040, DX2048
Multi batch is an option (/BT2 option) for DXs with release number 3 or later.

3.4 Setting Commands

SR Sets a input range

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
- You cannot use this command while recording (memory sampling) or computation is in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- 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` Measurement range
- `p4` Span lower limit
- `p5` Span upper limit

Query `SR[p1]?`

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

Description
- You cannot use this command while recording (memory sampling) or computation is in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- 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` Measurement 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 measurement range to R. Set the span lower limit to 10.0°C and span upper limit to 100.0°C.
```
SR010,DELTA,TC,R,100,1000,001
```

Description
- You cannot use this command while recording (memory sampling) or computation is in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- 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` Measurement 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 measurement range to 6 V, the span lower limit to 1 V, the span upper limit to 5 V, the scaling lower limit to 1.00 A, and the scaling upper limit to 5.00 A.
```
SR002,SCALE,VOLT,6V,1000,5000,100,
500,2,A
```

Description
- You cannot use this command while recording (memory sampling) or computation is in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- Set p1 and p4 by referring to the table in section 3.3.
- For parameters p5 and p6, enter values with five digits or less excluding the decimal point.

- For parameters p7, p8, and p9, either set all three parameters or omit all three parameters.

When Setting Channels to Square Root Computation

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

`p1` Measurement channel number
`p2` Setting type (SQRT)
`p3` Measurement range
`p4` Span lower limit
`p5` Span upper limit
`p6` Scaling lower limit (-30000 to 30000)
`p7` Scaling upper limit (-30000 to 30000)
`p8` Scaling decimal place (0 to 4)
`p9` Unit (up to 6 characters)
`p10` Low-cut function (OFF, ON)
`p11` Low-cut point (0 to 50)

Query `SR[p1]?`

Example Convert the DC voltage measured on channel 001 to an amount of flow using the square root computation. Set the measurement range to 6 V, the span lower limit to 1 V, the span upper limit to 5 V, the scaling lower limit to 10.0 m^3/s, and the scaling upper limit to 100.0 m^3/s.
`SR001,SQRT,6V,1000,5000,100,1000,1,m3/s`

Description
- You cannot use this command while recording (memory sampling) or computation is in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- Set p1 and p3 by referring to the table in section 3.3.
- For parameters p4 and p5, enter values with five digits or less excluding the decimal point.
- For parameters p6, p7, and p8, either set all three parameters or omit all three parameters.

For 1-5V DC Voltage Input

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

`p1` Measurement channel number
`p2` Input type (1-5V)
`p3` Measurement range (1-5V)
`p4` Span lower limit (800 to 5200)
`p5` Span upper limit (800 to 5200)
`p6` Scaling lower limit (-30000 to 30000)
`p7` Scaling upper limit (-30000 to 30000)
`p8` Scaling decimal place (0 to 4)
`p9` Unit (up to 6 characters)
`p10` Low-cut function (ON, OFF)

Query `SR[p1]?`

Example Set the channel 005 input type to 1-5V, the span lower limit to 1 V, the span upper limit to 5 V, and turn the 1-5V low-cut function ON.
`SR005,1-5V,1-5V,1000,5000,,,,,ON`

Description
- You cannot use this command while recording (memory sampling) or computation is in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- 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.

SO Sets a computing equation

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

`p1` Computation channel number
`p2` Computation (ON, OFF)
`p3` Computing equation (up to 120 characters)
`p4` Span lower limit (-9999999 to 99999999)
`p5` Span upper limit (-9999999 to 99999999)
`p6` Span decimal place (0 to 4)
`p7` Unit (up to 6 characters)

Query `SO[p1]?`

Example Compute the sum of channels 001 and 002 using channel 106. Set the span lower limit to -10.0000, the span upper limit to 15.0000, and the unit to V.
`SO106,ON,001+002,-100000,150000,4,V`

Description
- You can use this command on models with the /M1 or /PM1 math option.
- You cannot use this command while recording (memory sampling) or computation is in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- For details on computing equations, see the *DX1000/DX1000N or DX2000 User's Manual*.
- Set p1 by referring to the table in section 3.3.
- For parameters p4 and p5, enter values with seven digits or less, excluding the decimal, for negative numbers and with eight digits or less for positive numbers.
- For parameters p4, p5, and p6, either set all three parameters or omit all three parameters.

ER Sets the range of an external input channel

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

`p1` External input channel number
`p2` External input channel (ON, OFF)
`p3` Span lower limit (-30000 to 30000)
`p4` Span upper limit (-30000 to 30000)
`p5` Decimal place (0 to 4)
`p6` Unit (up to 6 characters)

Query `ER[p1]?`

Example Set the external input channel 201 span to -150.00 to 150.00.
`201,ON,-15000,15000,2`

Description
- You can use this command on models with the /MC1 external input channel option.
- You cannot use this command while recording (memory sampling) in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).

TJ Sets memory sampling

Syntax `TJ p1,p2<terminator>`
- `p1` Measurement, computation, or external input channel number
- `p2` Memory sampling (OFF, ON)

Query `TJ[p1]?`

Example Perform memory sampling on channel 002.
`TJ002,ON`

Description
- You can specify computation channels on models with the /M1 or /PM1 math option. You can specify external input channels on models with the /MC1 external input channel option.
- You cannot use this command while recording (memory sampling) or computation is in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).

SA Sets an alarm

When Not Using Alarms

Syntax `SA p1,p2,p3<terminator>`
- `p1` Measurement, computation, or external input channel number
- `p2` Alarm number (1 to 4)
- `p3` Alarm on/off (OFF)

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

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

Description You can specify computation channels on models with the /M1 or /PM1 math option. You can specify external input channels on models with the /MC1 external input channel option.

When Using Alarms

Syntax `SA p1,p2,p3,p4,p5,p6,p7,p8 <terminator>`
- `p1` Measurement, computation, or external input channel number
- `p2` Alarm number (1 to 4)
- `p3` Alarm on/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

  (Characters are case-sensitive.)
- `p5` Alarm value
- `p6` Relay setting
  - ON Relay setting on
  - OFF Relay setting off
- `p7` Relay number when p6 is set to ON
  Space when p6 is set to OFF
- `p8` Detection of alarm (ON, OFF)

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

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

Description
- For a channel whose input range is set to SKIP (using the SR command), p3 cannot be set to ON.
- For a channel whose computation channel is set to OFF (using the SO command), p3 cannot be set to ON.
- For a channel whose external input channel is set to OFF (ER 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 measurement range is changed.
  - Its span or scaling values are changed during scaling display (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 measurement 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 using the XA command.
- If p4 is set to T or t, set the alarm delay for the delay high/low limit alarm using the BD command.
- Set the p5 alarm value in the following range based on the p4 alarm type or the target channel.
  - Upper, Lower, Delay Upper and Delay Lower alarms
    - DC voltage, thermocouple, or RTD input
      Within in the measurable range of the selected range
    - Contact input
      0 or 1

- Scaling input (1-5V, scaling, and square root)
  –5 to 105% of span (except, within –30000 to 30000)
- Difference high limit and difference low limit alarms
  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 is within the measurable range (except within –30000 to 30000).
  For example, 3.0000 for the 2 V range.
  For contact input, only the value of "1" can be specified.
- Computation channels
  For computation channels –9999999 to 99999999 (excluding the decimal point. Set using an integer.)
- External input channels
  –30000 to 30000

- An error occurs if p7 is set to a number of a relay that is not installed.
- You can specify computation channels on models with the /M1 or /PM1 math option.
- For computation channels and external input channels, the only alarm types that you can specify are H (high limit alarm), L (low limit alarm), T (delay high limit alarm), and t (delay low limit alarm).
- For computation channels, the alarm hysteresis is fixed at zero. Use the XA command to set the alarm hysteresis.

SW Sets the trend interval and auto save interval

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

T-Y Display

`p1` 1
`p2` Waveform type (specify T-Y)
`p3` Trend interval (5S, 10S, 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?`

Description
- You cannot use this command while recording (memory sampling) in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- The selectable auto save intervals (p4) vary depending on the trend interval (p3). For details, see the *DX1000/DX1000N or DX2000 User's Manual*.
- You can only set the trend interval (p3) to 5S and 10S for high-speed input models (DX1002, DX1002N, DX1004, DX1004N, DX2004,and DX2008).
- You can only set the trend interval (p3) on medium-speed models to 15S if fast sampling mode is enabled.
- Set the trend interval (p3) to a value less than the scan interval.
- The p4 setting is valid when the saving method to the external storage medium is set to auto (using the XM command with p1 set to AUTO).

Circular Display

`p1` 1
`p2` Waveform type (CIRCULAR)
`p3` Time length of one cycle (20MIN, 30MIN, 1H, 2H, 6H, 8H, 12H, 16H, 1DAY, 2DAY, 1WEEK, 2WEEK, 4WEEK)
`p4` Auto save interval (10MIN, 20MIN, 30MIN, 1H, 2H, 3H, 4H, 6H, 8H, 12H, 1DAY, 2DAY, 3DAY, 5DAY, 7DAY, 10DAY, 14DAY, 31DAY)

Query `SW?`

Example Set the waveform type to CIRCULAR, the time length of one cycle to 20 minutes, and the auto save interval to 1 hour.
`SW1,CIRCULAR,20MIN,1H`

Description
- You cannot use this command while recording (memory sampling) in progress.
- The selectable auto save intervals (p4) vary depending on the time length of one cycle (p3). For details, see the *DX1000/DX1000N or DX2000 User's Manual*.
- The p4 setting is valid when the saving method to the external storage medium is set to auto (using the XM command with p1 set to AUTO).
- Set the time length of one cycle (p3) to a value less than the scan interval.

TI Sets the circular display offset time

Syntax `TI p1,p2<terminator>`
`p1` 1
`p2` Offset time (OFF, 1H, 2H, 3H, 4H, 5H, 6H, 7H, 8H, 9H, 10H, 11H, 12H, 13H, 14H, 15H, 16H, 17H, 18H, 19H, 20H, 21H, 22H, 23H)

Query `TI[p1]?`

Example Set the offset time to 1 hour.
`TI1,1H`

Description Set the offset time to a value that is lower than the time length of one cycle (set by the SW command).

TO Sets how the DX operates after one circular display cycle

Syntax `TO p1<terminator>`

`p1` Operation after one cycle

`ALLCLEAR` Clears the entire waveform display and starts drawing a new waveform.

`DIVCLEAR` Clears a section of the waveform display and starts drawing a new waveform.

Query `TO?`

Example Set the operation after one cycle to all clear.

```
TOALLCLEAR
```

TW Sets the secondary trend interval

Syntax `TW p1<terminator>`

`p1` Trend interval (5S, 10S, 15S, 30S, 1MIN, 2MIN, 5MIN, 10MIN, 15MIN, 20MIN, 30MIN, 1H, 2H, 4H, 10H)

Query `TW?`

Example Set the interval to 2 minutes.

```
TW2MIN
```

Description
- Set the trend interval (p1) to a value less than the scan interval.
- You can only set the trend interval (p3) to 5S and 10S for high-speed input models (DX1002, DX1002N, DX1004, DX1004N, DX2004,and DX2008).
- You can only set the trend interval (p3) on medium-speed models to 15S if fast sampling mode is enabled.
- You cannot use this command when multi batch /BT2 is enabled.

TM Sets manual sampling

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

`p1` Manual sample number

`p2` Enable or disable (ON or OFF)

`p3` Measurement, computation, or external input channel number

Query `TM[p1]?`

Example Assign measurement channel 002 to manual sample number 001.

```
TM001,ON,002
```

Description
- You can use this command on models with the /MC1 external input channel option.
- You can specify computation channels on models with the /M1 or /PM1 math option.

TE Sets the sampling conditions for event data

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

`p1` 1

`p2` Sample interval (25MS, 125MS, 250MS, 500MS, 1S, 2S, 5S, 10S, 30S, 1MIN, 2MIN, 5MIN, 10MIN, 15MIN, 20MIN, 30MIN)

`p3` Sample mode

`FREE` Starts data acquisition at memory start and stops data acquisition at memory stop.

`SINGLETRIGGER` Acquires data once for a specified time length after the trigger occurs and then stops.

`REPEATTRIGGER` Acquires data for a specified time length after the trigger occurs and then enters the trigger wait condition.

`p4` Sample time length (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 or ON)

Parameters p5 to p6 are valid when p3 is set to SINGLETRIGGER or REPEATTRIGGER.

Query `TE[p1]?`

Example Acquire data at a sampling rate of 125 ms for 10 minutes using single trigger mode.

```
TE1,125MS,SINGLETRIGGER,10MIN
```

Description
- You cannot choose a sample interval that is shorter than the scan interval.
- You cannot use this command while recording (memory sampling) in progress. If you are using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- You cannot set SINGLETRIGGER or REPEATTRIGGER as a sample mode when multi batch /BT2 is enabled.
- On models with the /AS1 advanced security option, you cannot set p3 to SINGLETRIGGER or REPEATTRIGGER.

SZ Sets a zone

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

`p1` Measurement, computation, or external input channel number

`p2` Lower zone boundary position (0 to 95) [%]

`p3` Upper zone boundary position (5 to 100) [%]

Query `SZ[p1]?`

Example Display channel 002 in a zone between 30% and 50%.

```
SZ002,30,50
```

Description
- You can specify computation channels on models with the /M1 or /PM1 math option. You can specify external input channels on models with the /MC1 external input channel option.
- Set the boundary positions as percentages of the entire amplitude axis in the waveform

display area.
- The zone size must be at least 5%.
- Set the upper zone boundary position greater than the lower zone boundary position.

SP Sets a partial expanded display

Syntax `SP p1,p2,p3,p4<terminator>`
- `p1` Measurement, computation, or external input channel number
- `p2` Partial expanded display (ON, OFF)
- `p3` Boundary position (1 to 99) [%]
- `p4` Boundary value

Query `SP[p1]?`

Example Partially expand the display of channel 001. Set the boundary position to 25% and the boundary value to 1.00 V.
`SP001,ON,25,100`

Description
- You can specify computation channels on models with the /M1 or /PM1 math option. You can specify external input channels on models with the /MC1 external input channel 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.
- For a channel whose external input channel is set to OFF (using the ER command), p2 cannot be set to ON.
- Set p3 as a percentage of the range defined by the span upper and lower limits (scale 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 lower limit – 1) to (scaling upper 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 (includes the query) when the partial expanded display function is set to USE (using the XU command).
- You cannot use this command if the partial expanded display range does not exist (for example when the span range is 1).

ST Sets a tag

Syntax `ST p1,p2,p3<terminator>`
- `p1` Measurement, computation, or external input channel number
- `p2` Tag comment (up to 32 characters)
- `p3` Tag number (up to 16 characters)

Query `ST[p1]?`

Example Set the channel 002 tag (tag comment) 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 on models with the /M1 or /PM1 math option. You can specify external input channels on models with the /MC1 external input channel option.
- Parameter p3 is invalid when you are not using the tag number. The DX returns the previous value in response to a query.

SX Sets a display group (release number 2 or earlier)

Syntax `SX p1,p2,p3,p4<terminator>`
- `p1` Display group number
- `p2` Display group (ON, OFF)
- `p3` Display group name (up to 16 characters)
- `p4` Channel configuration

Query `SX[p1]?`

Example Assign channels 001, 003, 004 to 006 to group number 1 and name the group GROUP2.
`SX1,ON,GROUP2,001.003.004-006`
Assign channels by using periods to separate each channel or a hyphen to specify a range of channels.

Description
- For the characters that you can use for group names, see appendix 3, “ASCII Character Codes.” Note that you cannot use semicolons or commas.
- If you are using the multi batch feature /BT2, this command affects batch group 1.
- If you are using the multi batch feature /BT2 and batch group 1 is recording (memory sampling), you cannot use this command.
- Set p1 by referring to the table in section 3.3.

SL Sets a trip line (release number 2 or earlier)

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

Query SL[p1[,p2]]?
Example Display trip line 1 in red at the 10% position of group 1. Set the line width to 1.
SL1,1,ON,10,RED,1
Description
- Set the position as percentages of the entire amplitude axis in the waveform display area.
- If you are using the multi batch feature /BT2, this command affects batch group 1.
- If you are using the multi batch feature /BT2 and batch group 1 is recording (memory sampling), you cannot use this command.
- Set p1 by referring to the table in section 3.3.

NX Sets a display group (release number 3 or later)

Syntax NX p1,p2,p3,p4,p5<terminator>
- p1 Batch group number
  Set the number to 1 if multi batch /BT2 is not in use.
- p2 Display group number
- p3 Enable or disable (ON or OFF)
- p4 Display group name (up to 16 characters)
- p5 Channel configuration

Query NX[p1,[p2]]?
Example Assign channels 001, 003, 004 to 006 to batch group 3's group number 1 and name the group GROUP2.
NX3,1,ON,GROUP2,001.003.004-006
Assign channels by using periods to separate each channel or a hyphen to specify a range of channels.
Description
- For the characters that you can use for group names, see appendix 3, "ASCII Character Codes." Note that you cannot use semicolons or commas.
- If you are using the multi batch feature /BT2, you cannot use this command on a batch group that is recording (memory sampling).
- Set p1 and p2 by referring to the table in section 3.3.

NL Sets a trip line (release number 3 or later)

Syntax NL p1,p2,p3,p4,p5,p6,p7<terminator>
- p1 Batch group number
  Set the number to 1 if multi batch /BT2 is not in use.
- p2 Display group number
- p3 Trip line number (1 to 4)
- p4 Trip line display (ON, OFF)
- p5 Display position (0 to 100) [%]
- p6 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)
- p7 Line width (1, 2, 3)

Query NL[p1,[p2,[,p3]]]?
Example Display trip line 2 in red at the 10% position of batch group 3's display group 1. Set the line width to 1.
NL3,1,2,ON,10,RED,1
Description
- Set the position as percentages of the entire amplitude axis in the waveform display area.
- If you are using the multi batch feature /BT2, this command affects batch group 1.
- If you are using the multi batch feature /BT2, you cannot use this command on a batch group that is recording (memory sampling).
- Set p1 and p2 by referring to the table in section 3.3.

SG Sets a message

Syntax SG p1,p2<terminator>
- p1 Message number (1 to 100)
- p2 Message (up to 32 characters)

Query SG[p1]?
Example Assign character string "MESSAGE1" to message number 2.
SG2,MESSAGE1
Description For the characters that you can use for messages, see appendix 3, "ASCII Character Codes." Note that you cannot use semicolons or commas.

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

Syntax TH p1<terminator>
- p1 Directory name (up to 20 characters)

Query TH ?
Example Select the DATA1 folder on the external storage medium for saving data.
THDATA1

TZ Sets a file header

Syntax `TZ p1,p2<terminator>`

`p1` Batch group number
Set the number to 1 if multi batch /BT2 is not in use.

`p2` File header (up to 50 characters)

Query `TZ[p1]?`

Example Set the batch group 2's header to DX1000DATA.
`TZ2,DX1000DATA`

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

TF Sets a data file name

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

`p1` Batch group number
Set the number to 1 if multi batch /BT2 is not in use.

`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 name (up to 16 characters) (valid when p2 is set to DATE or SERIAL)

Query `TF[p1]?`

Example Set the batch group 2's file name configuration to BATCH and set the user-assigned string to DX1DATA.
`TF2,BATCH,DX1DATA`

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

SD Sets the date and time

Syntax `SD p1,p2<terminator>`

`p1` Date in the YY/MM/DD format (fixed)
- `YY` Year (00 to 79)
- `MM` Month (01 to 12)
- `DD` Day (01 to 31)

`p2` Time in the 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 October 1, 2005.
`SD05/10/01,13:00:00`

Description
- The p1 and p2 format is fixed at eight characters. Use the format 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)
- On a DX whose release number is 3 or earlier
  When you send an SD command, the DX switches to setting mode and sets the date and time.
- On a DX whose release number is 4 or later
  When you send an SD command, the DX sets the date and time without switching to setting mode.

TD Sets daylight saving time

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

`p1` Enable or disable (USE or NOT)

`p2` Daylight saving time start month (JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC)

`p3` Daylight saving time start week (1ST, 2ND, 3RD, 4TH, LAST)

`p4` Daylight saving time start day (SUN, MON, TUE, WED, THU, FRI, SAT)

`p5` Daylight saving time start hour (0 to 23)

`p6` Daylight saving time end month (JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC)

`p7` Daylight saving time end week (1ST, 2ND, 3RD, 4TH, LAST)

`p8` Daylight saving time end day (SUN, MON, TUE, WED, THU, FRI, SAT)

`p9` Daylight saving time end hour (0 to 23)

Query `TD?`

Example Switch to daylight saving (summer) 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 display
- `VERTICAL` Vertical display
- `WIDE` Horizontal wide display
- `SPLIT` Horizontal split display

`p2` Clear waveform at start (ON or OFF)

`p3` Message display direction
- `HORIZONTAL`
- `VERTICAL`

`p4` Scale digits
- `NORMAL` 3-digit display
- `FINE` 4-digit display

`p5` Current value display
- `MARK` Displays using a mark
- `BARGRAPH` Display using a bar graph

For the circular display, only p1=HORIZONTAL is valid.

Query TT?
Example Display waveform horizontally, set the message direction to vertical, and display waveforms by clearing the current waveforms at memory start.
TTHORIZONTAL,ON,VERTICAL
Description When using the /BT2 multi batch option, p2 is fixed at ON.

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

Syntax SE p1,p2<terminator>
p1 Trend line width (1 to 3) [dots]
p2 Number of grids (4 to 12, AUTO)
Query SE?
Example Set the trend waveform line width to 1 dot and the number of grids 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 the bar graph horizontally.
TBHORIZONTAL

SB Sets the bar graph for a channel

Syntax SB p1,p2,p3<terminator>
p1 Measurement, computation, or external input channel number
p2 Bar graph base position
NORMAL Normal (lower limit)
CENTER 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 five, and display the bar graph from the span lower limit (the scale lower limit if scale is enabled).
SB002,NORMAL,5
Description You can specify computation channels on models with the /M1 or /PM1 math option. You can specify external input channels on models with the /MC1 external input channel option.

TN Sets a scale

Syntax TN p1,p2,p3<terminator>
p1 Measurement, computation, or external input channel number
p2 Display position (OFF, 1 to 10)
p3 Number of divisions (4 to 12, C10)
Query TN[p1]?
Example Set the scale position for channel 003 to 2, and 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, computation, or external input channel number
p2 Display color (see SL (sets a trip line))
Query SC[p1]?
Example Set the channel 002 display color to blue.
SC002,BLUE
Description You can specify computation channels on models with the /M1 or /PM1 math option. You can specify external input channels on models with the /MC1 external input channel option.

TA Sets an alarm point mark

Syntax TA p1,p2,p3,p4,p5,p6,p7<terminator>
p1 Measurement, computation, or external input channel number
p2 Mark type
ALARM Alarm mark
FIXED Fixed mark
p3 Scale board (ON, OFF)
p4 Alarm level 1 color (AUTO or 24 colors (see NL; sets a trip line))
AUTO The same color as the alarm color
p5 Alarm level 2 color (AUTO or 24 colors (see NL; sets a trip line))
AUTO The same color as the alarm color
p6 Alarm level 3 color (AUTO or 24 colors (see NL; sets a trip line))
AUTO The same color as the alarm color
p7 Alarm level 4 color (AUTO or 24 colors (see NL; sets a trip line))
AUTO The same color as the alarm color
Query TA[p1]?
Example Display alarm marks on the channel 004 scale.
TA004,ALARM,ON

TG Sets a color scale band

Syntax `TG p1,p2,p3,p4,p5<terminator>`
- `p1` Measurement, computation, or external input channel number
- `p2` Area (OFF, IN, OUT)
- `p3` Color (AUTO or 24 colors (see NL; sets a trip line))
- `p4` Lower display position limit
- `p5` Upper display position limit

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 color to green.
`TG005,IN,GREEN,-10000,5000`

SQ Sets the LCD brightness and the screen backlight saver

Syntax `SQ p1,p2,p3,p4<terminator>`
- `p1` LCD brightness
  - `1 to 8` DX1000
  - `1 to 6` DX2000
- `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 DX switches to saver mode
  `1MIN, 2MIN, 5MIN, 10MIN, 30MIN,1H`
- `p4` Event that causes the DX to return from saver mode
  - `KEY` Pressing of a key
  - `KEY+ALM` Pressing of a key or an alarm occurrence

Query `SQ?`

Example Set the LCD brightness to 2 and the screen backlight saver type to dimmer. Set the amount time of until the DX switches to saver mode to 5 minutes and the event that causes the DX to return from saver mode to pressing of a key.
`SQ2,DIMMER,5MIN,KEY`

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

TC Sets the background color

Syntax `TC p1,p2<terminator>`
- `p1` Screen (WHITE, BLACK)
- `p2` Historical trend screen (WHITE, CREAM, LIGHTGRAY, BLACK)

Query `TC?`

Example Set the screen background to black and the historical trend screen background 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-s intervals.
`TP5S`

NF Sets the favorite key operation

Syntax `NF p1,p2,p3<terminator>`
- `p1` Type of operation
  - `FAVORITE` Operates as a favorite key.
  - `HISTORY` Operates as a key for switching to the historical display.
- `p2` Display group
  - `SAVED` Displays the display group that was selected when you registered the favorite key
  - `CURRENT` Displays the current display group
- `p3` Historical trend time axis zoom
  - `SAVED` Displays the historical trend using the time axis zoom setting that was used when you registered the favorite key
  - `CURRENT` Displays the historical trend using the current time axis zoom setting

Query `NF?`

Example Set the favorite key as a key used to switch to the historical display.
`NF,HISTORY`

Description Parameters p2 and p3 are valid when p1 is set to FAVORITE.

TR Sets the automatic switching back to default display

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 timer)

Syntax `TQ p1,p2,p3,p4<terminator>`
- `p1` Timer number
- `p2` Timer type (ABSOLUTE)
- `p3` Time interval (1MIN to 6MIN, 10MIN, 12MIN, 15MIN, 20MIN, 30MIN, 1H to 4H, 6H, 8H, 12H, 24H)

p4 Reference time (hh; fixed format)
hh Hour (00 to 23)

When p2 is set to RELATIVE (relative timer)

Syntax `TQ p1,p2,p3,p4<terminator>`
p1 Timer number
p2 Timer type (RELATIVE)
p3 Time (hh:mm; fixed format)
hh Hour (00 to 24)
mm Minute (00 to 59)
p4 Reset at computation start (OFF, ON)

Query `TQ[p1]?`

Example Set the timeout value of timer number 1 to 10 hours 30 minutes. Do not reset the timer 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 while recording (memory sampling) in progress. If you are using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- You can set up to 24:00 time when using a relative timer.

TK Sets a match time timer

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

Syntax `TK p1,p2<terminator>`
p1 Timer number
p2 Timer type (OFF)

When p2 is set to DAY

Syntax `TK p1,p2,p3,p4,p5<terminator>`
p1 Timer number
p2 Timer type (DAY)
p3 Day (1 to 28)
p4 Hour (hh:mm; fixed format; 00:00 to 23:59)
p5 Timer operation (SINGLE, REPEAT)
SINGLE Executes the action once when the condition is met.
REPEAT Executes the action at every specified time.

When p2 is set to WEEK

Syntax `TK p1,p2,p3,p4,p5<terminator>`
p1 Timer number
p2 Timer type (WEEK)
p3 Day of week (SUN, MON, TUE, WED, THU, FRI, SAT)
p4 Hour (hh:mm; fixed format; 00:00 to 23:59)
p5 Timer operation (SINGLE, REPEAT)

When p2 is set to MONTH

Syntax `TK p1,p2,p3,p4,p5<terminator>`
p1 Timer number
p2 Timer type (MONTH)
p3 Day (1 to 28)
p4 Hour (hh:mm; fixed format; 00:00 to 23:59)
p5 Timer operation (SINGLE, REPEAT)

When p2 is set to YEAR

Syntax `TK p1,p2,p3,p4,p5,p6<terminator>`
p1 Timer number
p2 Timer type (YEAR)
p3 Month (JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC)
p4 Day (1 to 31; varies depending on the specified month)
p5 Hour (hh:mm; fixed format; 00:00 to 23:59)
p6 Timer operation (SINGLE, REPEAT)

Query `TK[p1]?`

Example Set timer number 2 to expire at hour 21 every Thursday.
`TK2,WEEK,THU,21:00,REPEAT`

Description
- Set p1 by referring to the table in section 3.3.
- You cannot use this command while recording (memory sampling) in progress. If you are using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).

TU Sets an event action

When multi batch /BT2 is not in use

Syntax `TU p1,p2,p3,p4,p5,p6,p7,p8 <terminator>`
p1 Logic number (1 to 40)
p2 Event type

NONE	
REMOTE	
RELAY	Alarm output relay
SWITCH	Internal switch
ALARM	Alarm
TIMER	Timer
MATCHTIMETIMER	Match time
USERKEY	USER key
EVENTLEVELSWITCH	Event level switch
EVENTEDGESWITCH	Event edge switch
RELAY-OFF	Alarm output relay off
SWITCH-OFF	Internal switch off
ALARM-OFF	Alarm off
EVENTLEVELSWITCH-OFF	Event level switch off

p3 Event details

p2=REMOTE	Remote number
p2=RELAY	Relay number
p2=RELAY-OFF	Relay number
p2=SWITCH	Internal switch number
p2=SWITCH-OFF	Internal switch number
p2=TIMER	Timer number

p2=MATCHTIMETIMER
Match time timer number
p2=EVENTLEVELSWITCH
Event level switch number
p2=EVENTLEVELSWITCH-OFF
Event level switch numbe
p2=EVENTEDGESWITCH
Event edge switch number
p2=Other Space

p4 Action type

MEMORYSTART/STOP	
MEMORYSTART	
MEMORYSTOP	
TRIGGER	Event trigger
ALARMACK	Alarm acknowledge
MATHSTART/STOP	
MATHSTART	
MATHSTOP	
MATHRESET	
SAVEDISPLAY	Saves display data to the external storage medium
SAVEEVENT	Saves event data to the external storage medium
MESSAGE	Writes a message
SNAPSHOT	
MANUALSAMPLE	
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
ALARMDISPLAYRESET	Resets the alarm display
COMMENTDISPLAY	Displays the comment screen
FAVORITEDISPLAY	Displays the favorite screen

p5 Action details 2

p4=TIMERRESET	Timer number
p4=DISPLAYGROUPCHANGE	Display group number
p4=FLAG	Flag number
p4=MESSAGE	Message number (1 to 100)
p4=PANELLOAD	Setup file number (1 to 3)
p4=COMMENTDISPLAY	Comment text block number
p4=FAVORITEDISPLAY	
KEY	Presses the favorite key
SELECT	Specifies a registered screen

p6 Action details 3

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

p4=FAVORITEDISPLAY and p5=SELECT
Number of the screen registered to the favorite key (1 to 8)

p7 Action details 4
p4=MESSAGE and p6=SELECT
Display group number

When multi batch /BT2 is in use

Syntax TU p1,p2,p3,p4,p5,p6,p7,p8 <terminator>

p1 Same as when multi batch is not in use
p2 Same as when multi batch is not in use
p3 Same as when multi batch is not in use
p4 Same as when multi batch is not in use
p5 Action details 2
Same as when multi batch is not in use except the following:

p4=MEMORYSTART/STOP, MEMORYSTART, MEMORYSTOP, SAVEDISPLAY, SAVEEVENT, MATHRESET	
ALL	All batch groups
SELECT	A specific batch group
p4=MATHRESET	
ALL	All computation channels
SELECT	A specific batch group

p6 Action details 3

p4=MESSAGE	Method of specifying the destination to write the message
ALL	All display groups in the batch group specified using p8
SELECT	A specific display group in the batch group specified by p8
p4=DISPLAYGROUPCHANGE	Batch group number
p4=MEMORYSTART/STOP, MEMORYSTART, MEMORYSTOP, SAVEDISPLAY, SAVEEVENT, MATHRESET and p5=SELECT	Batch group number
p4=MATHRESET and p5=SELECT	Batch group number

p7 Action details 4

p4=MESSAGE and p6=SELECT	Display group number
p4=MESSAGE and p6=ALL	You can specify any value. The DX returns 1 in response to this query.

p8 Action details 5
p4=MESSAGE
Batch group number

Query TU[p1]?

If there is a parameter whose setting is invalid, the DX responds to queries for that parameter with a fixed value.

- If p4 = MEMORYSTART/STOP, MEMORYSTART, MEMORYSTOP, SAVEDISPLAY, SAVEEVENT, or MATHRESET and p5 is invalid, the DX returns “ALL.”
- If p4 = DISPLAYGROUPCHANGE and p6 is

invalid, the DX returns “1.”
- If p4 = MESSAGE and p7 or p8 is invalid, the DX returns p7 = “1” or p8 = “1.”

Examples are given below.
p1 through p3 are indicated by an ellipsis. The set values of invalid parameters are bolded.
- When the multi batch function is invalid:
  TU...,MEMORYSTART/STOP,**ALL**
  TU...,DISPLAYGROUPCHANGE,2,**1**
  TU...,MESSAGE,5,ALL,**1**,**1**
  TU...,MESSAGE,5,SELECT,10,**1**
- When the multi batch function is valid
  TU...,MESSAGE,5,ALL,**1**,3

Example Execute memory start with the remote control input (terminal 1).
```
TUREMOTE,1,MEMORYSTART
```

Description
- Set various numbers (relay number, internal switch number, etc.) by referring to the table in section 3.3.
- You cannot select some of the p4 (action type) settings depending on the p2 (event type) setting.
- You cannot select some of the p4 (action type) settings depending on other DX settings or depending on the installed options.
- The p4=ALARMDISPLAYRESET setting is valid when the annunciator function is enabled and the annunciator sequence is set to ISA-M.
- Set the batch group number by referring to the table in section 3.3.
- When multi batch /BT2 is in use, p4 is set to MATHRESET, and p5 is set to ALL, the calculated values for all computation channels are reset.
- An event that has “-OFF” attached to it responds to the logical negation of the corresponding event that does not have “-OFF” attached to it. The actions and settings that the event can support are the same as those that the corresponding event that does not have “-OFF” attached to it can support.
- On models with the /AS1 advanced security option, you cannot set p4 to TRIGGER or PANELLOAD.

SK Sets a constant

Syntax
```
SK p1,p2<terminator>
```
`p1` Constant number
`p2` Constant (-9.9999E+29 to -1.0000E-30, 0, 1.0000E-30 to 9.9999E+29, 5 significant digits)

Query
```
SK[p1]?
```

Example Set the constant in constant number K01 to 1.0000E-10.
```
SKK01,1.0000E-10
```

Description
- You can use this command on models with the /M1 or /PM1 math option.
- You cannot use this command while recording (memory sampling) or computation is in progress. When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- Set p1 by referring to the table in section 3.3.

SI Sets the rolling average function of a computation channel

Syntax
```
SI p1,p2,p3,p4<terminator>
```
`p1` Computation channel number
`p2` Moving average (ON, OFF)
`p3` Sampling interval (1S, 2S, 3S, 4S, 5S, 6S, 10S, 12S, 15S, 20S, 30S, 1MIN, 2MIN, 3MIN, 4MIN, 5MIN, 6MIN, 10MIN, 12MIN, 15MIN, 20MIN, 30MIN, 1H)
`p4` Number of samples (1 to 1500)

Query
```
SI[p1]?
```

Example Turn on the rolling average function of computation channel 107, set the sampling interval to 1 minute, and the number of samples to 20.
```
SI107,ON,1MIN,20
```

Description
- You can use this command on models with the /M1 or /PM1 math option.
- Do not set p3 or p4 when p2 is set to OFF.
- Set the sampling interval to a value greater than the scan interval.

SJ Sets a TLOG timer

Syntax
```
SJ p1,p2,p3,p4,p5<terminator>
```
`p1` Computation channel number
`p2` Timer number
`p3` Conversion of the unit of time for TLOG. SUM computation
- `OFF` Do not convert.
- `/S` Converts as though the physical values are integrated in units of seconds.
- `/MIN` Converts as though the physical values are integrated in units of minutes.
- `/H` Converts as though the physical values are integrated in units of hours.

`p4` Reset (ON, OFF)
`p5` Timer type
- `TIMER` Timer
- `MATCHTIMETIMER` Match time timer

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,TIMER
```

Description
- You can use this command on models with the /M1 or /PM1 math option.
- Set parameters p1 and p2 by referring to the table in section 3.3.
- You cannot use this command while computation in progress.
- When using the /BT2 multi batch option, you cannot use this command if any of the batch groups is recording (memory sampling).
- About p3
  Because the DX integrates sampled data over each scan interval, the physical value integrated over a given unit of time may be different from the actual integrated value. This occurs if the unit of time is different from the scan interval. If this occurs, set p3 to the same unit of time as that for the physical value that you are measuring. The DX calculates the integrated value using one the following conversion formulas based on p3.

OFF	Σ(measured value)
/S	Σ(measured value) × scan interval
/MIN	Σ(measured value) × scan interval/60
/HOUR	Σ(measured value) × scan interval/3600

  The scan interval unit is seconds.

TX Sets the ancillary operation of the start key

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

Query `TX?`

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

BH Sets a batch text field

Syntax `BH p1,p2,p3,p4<terminator>`
- `p1` Batch group number
  Set this parameter to 1 when multi batch /BT2 is not in use
- `p2` Field number (1 to 24)
- `p3` Field title (up to 20 characters)
- `p4` Field string (up to 30 characters)

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

Example Register the title “OPERATOR” and the string “DAQSTATION” to batch group 1’s field number 2.
```
BH1,2,OPERATOR,DAQSTATION
```

Description
- If you are using the /BT2 multi batch option, you cannot use this command on a batch group that is recording (memory sampling).
- For the characters that you can use, see appendix 3.
- Set p1 by referring to the table in section 3.3.

EH Sets calibration correction

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 off calibration
  - `2` to `16` Number of break points

When p2 is set to SET

Syntax `EH p1,p2,p3,p4,p5<terminator>`
- `p1` Measurement channel number
- `p2` Type of operation (SET)
- `p3` A specific break point (1 to 16)
- `p4` Input value of the specific break point
- `p5` Output value of the specific break point

Description
- Set p1 by referring to the table in section 3.3.
- The selectable range for p4 and p5 varies depending on the currently specified range.
- When the measurement range is set to scale, the selectable range for p4 and p5 is -30000 to 30000.
- Set input value p4 so that the value increases as break point p3 increases.

When p2 is set to END

Syntax `EH p1,p2<terminator>`
- `p1` Measurement channel number
- `p2` Type of operation (END)

Example Set three break points for CH2.
```
EH002,BEGIN,3
EH002,SET,1,0,1
EH002,SET,2,50,49
EH002,SET,3,100,101
EH002,END
```

Description
- First, use this command with p2 set to BEGIN to specify the number of break points.
- Then, use this command with p2 set to SET to specify the value of each break point.
- Finally, use this command with p2 set to END to finalize the settings.
- The command “EH2?” causes the DX to return the CH2 settings.
- The DX returns the settings in the format shown in the above example.
- You cannot use this command when computation is in progress.

BD Sets an alarm delay

On DXs without the /AS1 Advanced Security Option

Syntax `BD p1,p2<terminator>`
- `p1` Measurement, computation, or external input channel number
- `p2` Alarm delay (1 to 3600)

Query BD[p1]?
Example Set the channel 001 alarm delay to 120 s.
BD001,120
Description • Set p1 by referring to the table in section 3.3.
• The p2 unit is seconds.

On DXs with the /AS1 Advanced Security Option

Syntax BD p1,p2,p3<terminator>
p1 Measurement, computation, or external input channel number
p2 Alarm delay (1 to 3600)
p3 Unit (SEC, HOUR)
Query BD[p1]?
Example Set the channel 001 alarm delay to 2 hours.
BD001,2,HUOR
Description • Set p1 by referring to the table in section 3.3.
• When p3 = HOUR, you can set p2 to a value from 1 to 24.

NC Sets a comment text field

Syntax NC p1,p2<terminator>
p1 Comment text field number
p2 Comment string (up to 32 characters)
Query NC[p1]?
Example Set comment text field 30 to “P1 end.”
NC30,P1 end
Description Set parameter p2 by referring to the table in section 3.3.

NB Sets a comment text block

Syntax NB p1,p2,p3,p4,p5,p6<terminator>
p1 Comment text block number
p2 Comment text field number of line 1
p3 Comment text field number of line 2
p4 Comment text field number of line 3
p5 Comment text field number of line 4
p6 Comment text field number of line 5
Query NB[p1]?
Example Set comment text block 5’s lines 1, 2, and 3 to comment text field 10, 11, and 14, respectively.
NB5,10,11,14
Description Set parameters p1 through p6 by referring to the table in section 3.3.

NW Sets an annunciator display

Syntax NW p1,p2,p3 p4,p5<terminator>
p1 Display window number
p2 On/Off (ON, OFF)
p3 Measurement, computation, or external input channel number
p4 Alarm level (1 to 4, ALL)
p5 Label (comment text block number)
Query NW[p1]?
Example Assign the channel 2’s alarm level 1 alarm to display window 4 and display the comment text block 3 label.
NW4,ON,2,1,3
Description • Set parameters p1 and p5 by referring to the table in section 3.3.
• You cannot use this command when the annunciator mode is set to Off (using the WU command).

NG Sets the Web report layout

Syntax NG p1,p2,p3<terminator>
p1 Report page number (1 to 10)
p2 Creation (ON, OFF)
p3 Report title string (up to 64 characters)
Query NG[p1]?
Example Set the title of report page 2 to “Factory 3.”
NG2,ON,Factory 3
Description • You can use this command on models with the /M1 or /PM1 math option.
• You cannot use this command if:
  • The Web server function is set to Not (using the WS command).
  • The operator and monitor pages are both set to Off (using the WW command).

NH Sets Web report layout details

Syntax NH p1,p2,p3,p4,p5,p6<terminator>
p1 Report page number (1 to 10)
p2 Item number (1 to 10)
p3 Creation (ON, OFF)
p4 Report channel number (R01 to R60)
p5 Value (MIN, MAX, AVE, SUM, INST)
p6 Item name string (up to 16 characters)
Query NH[p1,[p2]]?
Example Assign the title “Average” to report page 2 item 6, and display the average of the measured values for the channel assigned to report channel R07.
NH2,6,R07,AVE,Average
Description • You can use this command on models with the /M1 or /PM1 math option.
• The selectable values for p4 varies depending on the model.
• You cannot use this command if:
  • The Web server function is set to Not (using the WS command).
  • The operator and monitor pages are both set to Off (using the WW command).

FR Sets the interval for acquiring data to the FIFO buffer

Syntax FR p1<terminator>
p1 1 (fixed)
p1 FIFO acquisition interval (25MS, 125MS, 250MS, 500MS, 1S, 2S, 5S)

Query FR?
Example Set the FIFO acquisition interval to 1 s.
FR1,1S
Description • Set the acquisition interval to a value greater than the scan interval.
• If you set the scan interval to a value greater than the acquisition interval using the XV command or from the screen, the acquisition interval is automatically set equal to the scan interval.
• The DX has a circular FIFO (First In First Out) buffer. The DX acquires measured/computed values to the internal memory at predetermined time intervals from the time the power is turned on. The DX outputs the data when you send an FF command. The DX remembers the previous output position for each connection and updates the position when the DX outputs the next set of data when you send another FF command. This scheme compensates for the differences in the processing power of the measurement PCs and the communication delay. It enables data to be retrieved without any dropouts if the measurement PC reads the data before the ring buffer is overwritten. For details on the FIFO data output process, see appendix 5.

SY Sets a four panel display

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

p1 Batch group number
Set this parameter to 1 when multi batch /BT2 is not in use
p2 Screen number (1 to 4)
p3 Screen group name (up to 16 characters)
p4 Screen 1 type

TREND	Trend display
DIGITAL	Digital value display
BAR	Bar graph display
OVERVIEW	Overview
ALARM	Alarm summary
MESSAGE	Message summary
MEMORY	Memory summary
MODBUS-M	Modbus master status display
MODBUS-C	Modbus client status display
RELAY	Relay status display
REPORT	Report display
COLUMN_BAR	Stacked bar graphs
ANNUNCIATOR	Annunciator display
EVENT_SWITCH	Event switch status display

p5 Number of the group to display in screen 1
p6 Screen 2 type (see p4)
p7 Number of the group to display in screen 2
p8 Screen 3 type (see p4)
p9 Number of the group to display in screen 3
p10 Screen 4 type (see p4)
p11 Number of the group to display in screen 4
Query SY[p1,[p2]]?
Example Set screen number 1 as follows:
Four panel name: Temperature
Screen 1: Trend display, group 1
Screen 2: Digital display, group 3
Screen 3: Alarm summary
Screen 4: Overview
SY1,1,Temperature,TREND,1,DIGITAL,3,ALARM,1,OVERVIEW
Description • Parameters p5, p7, p9, and p11 are invalid when the corresponding screen types (p4, p6, p8, and p10) are not set to TREND, DIGITAL, or BAR.
• The setting p4=MODBUS-M is only valid if the serial interface protocol is set to MODBUS-M.
• The setting p4=REPORT or COLUMN_BAR is only valid on models with the math option.
• When multi batch /BT2 is in use, the four panel display can only be displayed in batch single mode. Therefore, you cannot specify the following screens.
Modbus master status display, Modbus client status display, relay status display, report display, stacked bar graph, annunciator display, and event switch status display
• Set p1 by referring to the table in section 3.3.

SM Sets the custom menu

Setting the main menu

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

p1 Type (DISP_MAIN)
p2 to p9 Menu items to display
The DX displays the menu items in the specified order.
The DX does not display menu items that are not specified.

TREND
DIGITAL
BAR
OVERVIEW
INFORMATION
TRENDHISTORY
LOG
4PANEL
ESC
EXPAND
CUSTOM_PANEL
ANNUNCIATOR
SEPARATOR

Example Set the first menu item to TREND and the second menu item to TRENDHISTORY.
`SMDISP_MAIN,TREND,TRENDHISTORY,`

Description
- If parameter p2 and subsequent parameters are omitted, all menus are hidden.
- A command error occurs if you specify the same menu item multiple times.
- You can specify up to three separators. If you specify more than three, an error occurs.
- You cannot omit parameters using delimiters (, ,).
- "4PANEL" is available only on the DX2000.
- You cannot set the first menu item to "SEPARATOR."

Setting the submenu

Syntax `SM p1,p2,p3,....<terminator>`

`p1` Type (DISP_SUB)

`p2` Menu type (TREND, DIGITAL, BAR, TRENDHISTORY, OVERVIEW, INFORMATION, LOG, 4PANEL, CUSTOM_PANEL, ANNUNCIATOR)

`p3` ≥ Submenu items to display

The DX displays the items in the specified order.

The DX does not display menu items that are not specified.

When p2 is set to TREND (select from the items below)

`GROUP1` to `GROUP36`	Display group
`CIRCULAR_KIND`	Circular type
`ALL_CHANNEL`	All channel display
`SCALE`	Scale display
`DIGITAL`	Digital display
`MESSAGE_DISP`	Message display
`TREND_SPACE`	Trend space
`AUTO`	Auto switching
`EXPAND`	Expand
`FINE_GRID`	Fine grid
`AUTO_ZONE`	Auto zone display or normal display
`TAG_PRIORITY`	Tag prioritized display
`SEPARATOR`	

When p2 is set to DIGITAL (select from the items below)

`GROUP1` to `GROUP36`	Display group
`AUTO`	Auto switching
`EXPAND`	Expand
`TAG_PRIORITY`	Tag prioritized display
`SEPARATOR`	

When p2 is set to BAR (select from the items below)

`GROUP1` to `GROUP36`	Display group
`AUTO`	Auto switching
`EXPAND`	Expand
`TAG_PRIORITY`	Tag prioritized display
`SEPARATOR`	

When p2 is set to TRENDHISTORY (select from the items below)

`GROUP1` to `GROUP36`	Display group
`SEPARATOR`	

When p2 is set to OVERVIEW (select from the items below)

`CURSOR`	Cursor display
`TO_ALARM`	Alarm summary
`TO_TREND`	To the trend display
`TO_DIGITAL`	To the digital display
`TO_BAR`	To the bar graph display
`EXPAND`	Expand
`TAG_PRIORITY`	Tag prioritized display
`ALARMACK1`	Individual alarm acknowledgment (level 1)
`ALARMACK2`	Individual alarm acknowledgment (level 2)
`ALARMACK3`	Individual alarm acknowledgment (level 3)
`ALARMACK4`	Individual alarm acknowledgment (level 4)
`SEPARATOR`	

When p2 is set to INFORMATION (select from the items below)

`ALARM`	Alarm summary
`MESSAGE`	Message summary
`MEMORY`	Memory summary
`MODBUS_CLIENT`	ModbusTCP status display
`MODBUS_MASTER`	ModbusRTU status display
`RELAY`	Relay status display
`EVENT_SWITCH`	Event switch status display
`REPORT`	Report display
`TO_HISTORY`	To the historical display
`TO_HISTORY_D`	To historical (display data)
`TO_HISTORY_E`	To historical (event data)
`TO_OVERVIEW`	To the overview display
`SORT_KEY`	Sort key switching
`SORT_ORDER`	Sort order switching
`DISP_ITEM`	Date/user name switching
`DATA_KIND`	Data type switching
`DATE/FILE`	Date/file name switching
`SELECT_SAVE`	Select save
`REPORT_CHANNEL`	Report channel display switching
`ALL_SAVE`	All save
`MANUAL_SAVE`	Save manual samples
`REPORT_SAVE`	Save reports
`EXPAND`	Expand
`DATA_SAVE_MODE`	Data save mode
`COLUMN_BAR`	Stacked bar graph
`COLUMN_BAR_DISP`	Single graph or dual graph
`COLUMN_BAR_SELECT`	Selects bar or group
`REPORT_GROUP1` to `REPORT_GROUP6`	Selects the report group

TAG_PRIORITY Tag prioritized display
DISP_GROUP Group number display
SEPARATOR

When p2 is set to LOG (select from the items below)

LOGIN_LOG Login log
ERROR_LOG Error log
COMMU_LOG Communication log
FTP_LOG FTP log
WEB_LOG Web log
MAIL_LOG E-mail log
SNTP_LOG SNTP log
DHCP_LOG DHCP log
MODBUS_LOG Modbus log
OPERATE_LOG Operation log
SETTING_LOG Change settings log
DISP_ITEM Switches the displayed items
SEPARATOR

When p2 is set to 4PANEL (select from the items below)

4PANEL1 to 4PANEL4 Selects 4-panel
SEPARATOR

When p2 is set to CUSTOM_PANEL (select from the items below)

INTERNAL1 to INTERNAL3
Selects one from internal 1 to 3
EXTERNAL1 to EXTERNAL25
Selects one from external 1 to 25
NEW New

When p2 is set to ANNUNCIATOR (select from the items below)

EXPAND Expand
SEPARATOR

Example Register the following items to the Trend main menu's sub menu: SCALE and DIGITAL.

```
SM DISP_SUB,TREND,SCALE,DIGITAL
```

Description
- Items that you can set for p3 and subsequent parameters vary depending on p2.
- If parameter p3 and subsequent parameters are omitted, all menu items are hidden.
- A command error occurs if you specify the same menu item multiple times.
- You can specify up to three separators. If you specify more than three, an error occurs.
- You cannot specify EXPAND for log and 4-panel.
- You cannot omit parameters using delimiters (, ,).
- The SM DISP_SUB? command causes the DX to return sub menu items whose display is turned off.
- You cannot set the first menu item to "SEPARATOR."
- The display group parameter "GROUP1" to "GROUP36" and the auto switching parameter "AUTO" on/off setting 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 is turned on for the trend, digital, bar graph, and historical trend menus.)
- When p2 is set to ANNUNCIATOR, the DX1000 does not have submenus.
- When p2 is set to INFORMATION, you can only set p3 to DISP_GROUP on the DX1000.
- When p2 is set to OVERVIEW, you can only set p3 to ALARMACK on models with the /AS1 advanced security option.
- When p2 is set to LOG, you can only set p3 to OPERATE_LOG, SETTING_LOG, or DISP_ITEM on models with the /AS1 advanced security option. LOGIN_LOG cannot be specified on models with the /AS1 advanced security option.

Setting the function menu

p1 Type (FUNC)
p2 ≥ Menu items to display

The DX displays the functions that you select from below in the menu in the specified order. The DX does not display menu items that are not specified.

ALARMACK Alarm acknowledge
ALARM_RESET Alarm display reset
MESSAGE
FREE_MESSAGE
MEDIA_EJECT
SNAPSHOT
MANUAL_SAMPLE
TRIGGER Event trigger
SAVE_DISPLAY
SAVE_EVENT
SAVE_STOP
MATH_START/STOP
MATH_RESET
MATH_ACK Computed data dropout acknowledge
EDGE_SWITCH Presses event edge switch
TIMER_RESET
MATCH_T_RESET Resets single match time timer
KEYLOCK Enables or disables key lock
LOGOUT
PASSWORD_CHANGE
RATE_CHANGE Display rate 1 or display rate 2
BATCH
TEXT_FIELD
FAVORITE_REGIST Registers as favorite
4PANEL
JUMP_DISPLAY Registers the screen to return to

SYSTEM_INFO
NETWORK_INFO
SNTP
EMAIL_START/STOP
EMAIL_TEST
FTP_TEST
BUILDER Custom display builder
USRLOCKACK User locked ACK

Example Display FREE MESSAGE and SNAPSHOT in the function menu.
SMFUNC,FREE_MESSAGE,SNAPSHOT

Description
- A command error occurs if you specify the same menu item multiple times.
- You cannot specify “SEPARATOR.”
- You cannot omit parameters using delimiters (, ,).
- You cannot hide “LOGOUT.” If you do not include it in the parameters, it is displayed as the last item.
- You can only set p2 to USRLOCKACK on models with the /AS1 advanced security option.
- You cannot set p2 to TRIGGER or KEYLOCK on models with the /AS1 advanced security option.

Query SM ?
When querying all menus
SM DISP_MAIN?
When querying all main menu items
SM DISP_SUB?
When querying all submenu items
SM DISP_SUB,TREND?
When querying the trend submenu
SM FUNC?
When querying all function menu items

3.5 Control Commands

BT Sets a batch name

Syntax BT p1,p2,p3<terminator>
p1 Batch group number
Set this parameter to 1 when multi batch /BT2 is not in use
p2 Batch number (up to 32 characters)
p3 Lot number (up to 8 digits)

Query BT[p1]?

Example Assign the batch number “PRESS5LINE” and lot number 007 to batch group 1.
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 Batch group number
Set this parameter to 1 when multi batch /BT2 is not in use
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.

MH Writes a Batch Text Field

Syntax MH p1,p2,p3,p4<terminator>
p1 Batch group number
Set this parameter to 1 when multi batch /BT2 is not in use
p2 Field number (1 to 24)
p3 Field title (up to 20 characters)
p4 Field string (up to 30 characters)

Query MH[p1,[p2]]?

Example Set batch group 2 text field 1 title to “Ope” and the string to “DX.”
MH2,1,Ope,DX

Description
- Set p1 by referring to the table in section 3.3.
- This command can only be performed when memory sampling for the specified batch group is not taking place.

UD Switches the screen

To return to the screen that was used before you started using communication commands

Syntax UD p1<terminator>
p1 Screen type (0)

Example Return to the screen that was used before you started using communication commands.
UD0

Description On models with the /AS1 advanced security option, use the BE command to return to operation mode.

To switch to one panel display

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

`p1` Screen type (1)

`p2` Display item

`TREND`	Trend display
`DIGITAL`	Digital display
`BAR`	Bar graph display
`OVERVIEW`	Overview display (alarm indicator)
`ALARM`	Alarm summary display
`MESSAGE`	Message summary display
`MEMORY`	Memory summary display
`MODBUS-M`	Modbus master status display
`MODBUS-C`	Modbus client status display
`RELAY`	Relay status display
`REPORT`	Report display
`HISTRICAL`	Historical trend display
`COLUMN_BAR`	Stacked bar graph
`INTERNAL1` to `INTERNAL3`	Custom display, internal 1 to 3
`EXTERNAL1` to `EXTERNAL25`	Custom display, external 1 to 25
`ANNUNCIATOR`	Annunciator display
`EVENT_SWITCH`	Event switch status display

`p3` Display group number

Example Set the display to one screen trend, and set the number of the group to display in the screen to 4.
`UD1,TREND,4`

Description
- The setting p2=MODBUS-M is only valid if the serial interface protocol is set to MODBUS-M.
- The setting p2=REPORT is only valid on models with the /M1 or /PM1 math option.
- When multi batch /BT2 is in use, there are limitations on the screens that the DX can switch to depending on the screen mode.
  Batch overview mode
  Overview display, Modbus master status display, Modbus client status display, relay status display, report display, stacked bar graph, custom display, annunciator display, and event switch status display
  Batch single mode
  Trend display, digital display, bar graph display, overview display, alarm summary display, message summary display, memory summary display, historical trend display, and custom display
- When multi batch /BT2 is in use, you cannot specify a display group that does not belong to the currently displayed batch group.
- Set parameter p3 by referring to the table in section 3.3.
- The setting p2=ANNUNCIATOR is only valid when the annunciator mode is turned on (by the WU command).

To switch to four panel display

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

`p1` Screen type (2)
`p2` Screen 1 type (see SY; sets a screen group)
`p3` Number of the group to display in screen 1
`p4` Screen 2 type (see SY; sets a screen group)
`p5` Number of the group to display in screen 2
`p6` Screen 3 type (see SY; sets a screen group)
`p7` Number of the group to display in screen 3
`p8` Screen 4 type (see SY; sets a screen group)
`p9` Number of the group to display in screen 4

Example Assign group 1 to screen 1, group 2 to screen 2, group 3 to screen 3, group 4 to screen 4, and set the screen type of all screens to trend.
`UD2,TREND,1,TREND,2,TREND,3,TREND,4`

Description
- You can use this command on the DX2000.
- When multi batch /BT2 is in use, you cannot specify a display group that does not belong to the currently displayed batch group. You cannot use this command in batch overview mode.

To display a specific four panel display

Syntax `UD p1,p2<terminator>`

`p1` Display type (3)
`p2` Four panel configuration number

`0`	Displays the four panel configuration that you specify directly.
`1` to `4`	Displays a four panel configuration that you set using SY (sets a screen group).

Description
- You can use this command on the DX2000.
- When multi batch /BT2 is in use, you cannot use this command in batch overview mode.

To switch the operation screen

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

`p1` Screen type (4)
`p2` Automatic display switching (ON, OFF)
`p3` Switches between all channel display and group display (ALL, GROUP)
`p4` Scale display (ON, OFF)
`p5` Digital display (ON, OFF)
`p6` Message display options

`1`	Normal display
`2`	List display

`p7` Trend space (ON, OFF)
`p8` Auto zone (ON, OFF)
`p9` Fine grid (ON, OFF)

p10 Tag prioritized display (ON, OFF)

Example Enable automatic display switching, switch to the group display, turn on the scale display, and turn off the digital display.

```
UD4,ON,GROUP,ON,OFF
```

Description
- Parameter p2 is valid for the trend, digital, and bar graph displays. Use the SE command to set the switching interval.
- Parameters p3 to p7 are valid for the trend display.
- When multi batch /BT2 is in use, you cannot use this command in batch overview mode.

To switch the operation screen mode

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

p1 Display type (5)

p2 Operation screen mode (COMMON, BATCH)
- COMMON Batch overview mode
- BATCH Batch single mode

p3 Batch group number

Description
- You can use this command when multi batch /BT2 is in use.
- Parameter p3 is valid when p2 is set to BATCH.
- Set parameter p3 by referring to the table in section 3.3.

PS Starts or stops recording

Syntax `PS p1,p2<terminator>`

p1 Recording start or stop
- 0 Start
- 1 Stop

p2 Batch group number
- 0 All groups
- 1, 2, ... Batch group number

Example Start recording.

```
PS0
```

Description
- When you start recording, the DX records display, event, and report data to the internal memory.
- Parameter p2 is valid when multi batch /BT2 is in use. If you omit p2, it is the same as setting p2 to zero.
- When the /AS1 advanced security option is in use and the DX is in setting mode, it will not start recording even if you send a PS0 command.
- Set parameter p2 by referring to the table in section 3.3.

AK Clears alarm output (acknowledge alarms)

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

p1 Executes alarm acknowledge (0)
- 0 Alarm acknowledge
- 1 Individual alarm acknowledgment
- 2 Resets alarm display

p2 Channel number

p3 Alarm level (1 to 4)

Example Clear alarm output (acknowledge alarms).

```
AK0
```

Description
- If you set p1 to 2 when annunciator mode is on and the sequence is not ISA-M, an error occurs.
- If you send this command with p1 set to 2 before acknowledging the alarms, nothing happens.
- Set p2 by referring to the table in section 3.3.
- p2 and p3 are only valid when p1=1. The setting p1=1 is only valid on models with the /AS1 advanced security option.

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

Syntax `EV p1,p2<terminator>`

p1 Type of operation
- 0 Executes manual sampling.
- 1 Generates a manual trigger.
- 2 Takes a snapshot.
- 3 Causes a timeout in display data.
- 4 Causes a timeout in event data.

p2 Batch group number
- 0 All groups
- 1, 2, ... Batch group number

Example Execute manual sampling.

```
EV0
```

Description
- EV1 is only valid when the key trigger is set to ON using the event data sampling condition command (TE command). This command is equivalent to a key trigger.
- When multi batch /BT2 is in use, p2 is valid when p1 is set to 3 or 4. If you omit p2, it is the same as setting p2 to zero.
- Set parameter p2 by referring to the table in section 3.3.

CL Executes manual SNTP

Syntax `CL p1<terminator>`

p1 Executes manual SNTP(0)

Example Synchronize the clock.

```
CL0
```

CV Switches between normal and secondary trend interval

Syntax `CV p1<terminator>`

p1 Trend interval (0, 1)
- 0 Switches to the normal trend interval
- 1 Switches to the secondary trend interval

Example Set the trend interval to the secondary trend interval.
```
CV1
```

MS Writes a message (display and write)

Syntax
```
MS p1,p2,p3,p4<terminator>
```
p1 Message number (1 to 100)
p2 Message write destination
- GROUP A specified display group
- ALL All display groups
  All display groups in the specified batch group number (p4) when multi batch /BT2 is in use

p3 Display group number
The display group number when p2 is set to GROUP
Carries no meaning when p2 is set to ALL
p4 Message write destination batch group number

Example Write the message in message number 8 to display group 1.
```
MS8,GROUP,1
```

Description
- If you omit p2, the message is written to all display groups.
- Parameter p4 is only valid when multi batch /BT2 is in use. When multi batch /BT2 is in use, you cannot omit p4.
- Set parameters p3 and p4 by referring to the table in section 3.3.

BJ Write a free message

Syntax
```
BJ p1,p2,p3,p4,p5<terminator>
```
p1 Message number (1 to 10)
p2 Message (up to 32 characters)
p3 Message write destination
- GROUP A specified display group
- ALL All display groups
  All display groups in the specified batch group number (p5) when multi batch /BT2 is in use

p4 Display group number
The display group number when p2 is set to GROUP
Carries no meaning when p2 is set to ALL
p5 Message write destination batch group number

Example Using message number 3, write the string “ALARM” to all groups.
```
BJ3,ALARM,ALL
```

Description
- If you omit p3, the message is written to all display groups.
- Parameter p5 is only valid when multi batch /BT2 is in use. When multi batch /BT2 is in use, you cannot omit p5.
- Set parameters p3, p4, and p5 by referring to the table in section 3.3.

EJ Changes the login password

Syntax
```
EJ p1,p2,p3<terminator>
```
p1 Old password (see the description)
p2 New password (see the description)
p3 New password (see the description)

Example Change the password from “PASS001” to “WORD005.”
```
EJPASS001,WORD005,WORD005
```

Description
- The password character lengths are indicated below.
  Release numbers 3 and earlier:
  Up to 8 characters
  Release numbers 4 and later:
  Up to 20 characters
  On models with the /AS1 advanced security option: Between 6 and 20 characters
- When you use password management (the WU command) on models with the /AS1 advanced security option, this command is invalid.

TL Starts, stops, resets computation (MATH) or clears the computation dropout status display

Syntax
```
TL p1,p2<terminator>
```
p1 Type of operation
- 0 Start computation
- 1 Stop computation
- 2 Reset computation
- 3 Clear the computation data dropout display

p2 Batch group number
- 0 All computation channels
- 1, 2, ... Batch group number

Example Start computation.
```
TL0
```

Description
- You cannot use this command while the DX is saving or loading setup data.
- You can use this command on models with the /M1 or /PM1 option.
- When multi batch /BT2 is in use, p2 is valid when p1 is set to 2 (reset computation). If you omit p2, it is the same as setting p2 to zero. If p2 is set to zero, the DX resets the values of all computation channels.
- Set parameter p2 by referring to the table in section 3.3.

DS Switches the execution mode between operation and setting

Syntax
```
DS p1<terminator>
```

p1 Mode
- 0 Operation mode
- 1 Basic setting mode

Example Set the mode to basic setting.
```
DS1
```

Description
- You cannot set p1 to 1 when the DX is recording (memory sampling) or computing, is formatting an external storage medium, or is storing data to an external storage medium.
- You cannot set p1 to zero when the DX is formatting an external storage medium or is storing data to an external storage medium.
- To activate the settings you have changed using basic setting commands, you must use the XE command to save the settings. Be sure to use the XE command to save the settings before switching the execution mode back to operation. If you do not save the settings and change the execution mode back to operation, the DX returns to the previous settings.
- This command is invalid on models with the /AS1 advanced security option.

LO Loads setup data for setting mode

Syntax `LO p1,p2<terminator>`

p1 File name (up to 32 characters)

p2 Medium
- 0 CF slot
- 1 USB

Example Load setup data for setting mode from the setup file named SETFILE1.
```
LOSETFILE1
```

Description
- Do not specify the extension when specifying the file name.
- You can set p2 to 1 on models with the /USB1 USB interface option.
- If you omit parameter p2, the medium is set to CF slot.
- You cannot use this command to load setup data for basic setting mode. To load setup data for both setting and basic setting modes, use the YO command.
- You cannot use this command when there is no external storage medium inserted in the DX.

LI Saves setup data

Syntax `LI p1<terminator>`

p1 File name (up to 32 characters)

p2 Medium
- 0 CF slot
- 1 USB

Example Saves setup data for both setting and basic setting modes to a file named SETFILE2 on the CF card.
```
LISETFILE2
```

Description
- Do not specify the extension when specifying the file name.
- You can set p2 to 1 on models with the /USB1 USB interface option.
- If you omit parameter p2, the medium is set to CF slot.
- An extension is attached to the file that you save.
- You cannot use this command when there is no external storage medium inserted in the DX.

CM Sets communication input data

Syntax `CM p1,p2<terminator>`

p1 Communication input datal number

p2 Communication input data
The selectable range is -9.9999E+29 to -1.0000E-30, 0, and 1.0000E-30 to 9.9999E+29.
Five significant digits

Query `CM?`

Example Enter 1.0000E-10 to communication input data C01.
```
CMC01,1.0000E-10
```

Description
- You can use this command on models with the /M1 or /PM1 option.
- On models with the /CP1 PROFIBUS-DP interface option, the communication input data for C01 to C24 (on the DX1000) or for C01 to C32 (on the DX2000) is reserved for PROFIBUS-DP. The client device cannot specify values for this communication input data.

CE Sets communication input of an external input channel

Syntax `CE p1,p2<terminator>`

p1 External input channel number

p2 Data value (-30000 to 30000)

Query `CE[p1]?`

Example Set external input channel number 440 to 12345.
```
CE440,12345
```

Description You can use this command on models with the /MC1 external input channel option.

EM Starts or stops the e-mail transmission function

Syntax `EM p1<terminator>`

p1 Type of operation
- 0 Start
- 1 Stop

Example Start the e-mail transmission function.
```
EM0
```
Description To use the e-mail transmission function, you must configure the Ethernet interface, set e-mail addresses, and enter the contents you want to transmit.

CU Recovers Modbus manually

Syntax `CU p1<terminator>`

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

YO Loads a setup file for basic setting mode

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

`p1` Name of the file to load (up to 32 characters)

`p2` Medium
- `0` CF slot
- `1` USB

`p3` What to load (0 to 2)
- `0` Basic setting mode and setting mode settings
- `1` Basic setting mode settings (except for login settings) and setting mode settings
- `2` Login settings

Example Only load the CONFIG1 login settings from the CF card.
```
YOCONFIG1,0,2
```
Description
- Do not include the extension when specifying the file name.
- You can set p2 to 1 on models with the /USB1 USB interface option.
- If you omit parameter p2, the medium is set to CF slot.
- p3 is only valid on models with the /AS1 advanced security option.
- Omitting p3 is the same as setting it to 0.

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, custom display screen setup data, and log data (“Clear 1” on the DX)
- `1` Setting mode settings, measured and computed data, custom display screen setup data, and log data (“Clear 2” on the DX)
- `2` Measured and computed data, custom display screen setup data, and log data (“Clear 3” on the DX)

Example Perform “Clear 3” on the DX.
```
YC2
```
Description This command is invalid on models with the /AS1 advanced security 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 Reset timer 2.
```
IR2
```
Description Set p1 by referring to the table in section 3.3.

MA Resets a match time timer

Syntax `MA p1<terminator>`

`p1` Number of the timer to reset
- `1, 2, ...` Timer number

Example Reset match time timer 2.
```
MA2
```
Description
- Set p1 by referring to the table in section 3.3.
- This command is valid for expired match time timers whose operation is set to single.

CW Sets an event switch

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

`p1` Type of operation (LEVEL, EDGE)

`p2` Event switch number (1 to 30)

`p3` On/off (OFF, ON)
Parameter p3 is valid when p1 is set to LEVEL.

Example Set event level switch 2 to ON.
```
CWLEVEL,2,ON
```

LR Loads custom display screens

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

`p1` Medium (fixed at 0)
- `0` External CF card

`p2` Screen range (ALL, SELECT)
- `ALL` All screens
  Loads all of the custom display screens that are stored in the specified directory.
- `SELECT` A specific screen
  Loads a specific custom display setup file to the screen that you specify.

When p2 is set to ALL

`p3` Name of the directory to load from (up to 20 characters)

When p2 is set to SELECT

p3 Custom display screen to load into (INTERNAL1 to INTERNAL3 or EXTERNAL 1 to EXTERNAL 25)

p4 Name of the file to load from (up to 32 characters)

- Do not specify the extension.
- The directory to load from is fixed to the root directory.

Example Load the custom display setup file named CD1 from the root directory to INTERNAL2.

```
LR0,SELECT,INTERNAL2,CD1
```

Description
- An error occurs when there is no external storage medium (CF) inserted in the DX or when there is an error in the external storage medium.
- An error occurs if the external storage medium (CF) does not contain the directory or file name that you specify.

LW Saves custom display screens

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

p1 Medium (fixed at 0)

0 External CF card

p2 Screen range (ALL, CLEAR+ALL, SELECT)

ALL All screens
Saves all of the custom display screens that is currently in use to the specified directory.

CLEAR+ALL All screens
Clears all files in the save destination directory, and then saves all of the custom display screens that is currently in use to that directory.

SELSECT A specific screen
Saves a specific custom display screen to a file that you specify. If there is a file with the same name, it is overwritten.

When p2 is set to ALL

p3 Name of the directory to save to (up to 20)

When p2 is set to SELECT

p3 Custom display screen to save (INTERNAL1 to INTERNAL 3, EXTERNAL1 to EXTERNAL 25)

p4 Name of the file to save to (up to 32)

- Do not specify the extension.
- The directory to save to is fixed to the root directory.

Example Save the custom display setup file named INTERNAL3 to a file named CD3 in the root directory.

```
LW0,SELECT,INTERNAL3,CD3
```

Description
- An error occurs when there is no external storage medium (CF) inserted in the DX or when there is an error in the external storage medium.
- An error does not occur even if there is not enough free space on the external storage medium (CF).
- To check whether or not the save operation was successful, check the status byte. For details on the status byte, see section 5.2.

BQ User Locked ACK (/AS1 advanced security option)

Syntax `BQ p1<terminator>`

p1 Executes ACK (0)

Example Execute the User Locked ACK operation.

```
BQ0
```

Description This command is only valid when the user is locked.

EC Clears setup data (and executes a cold reset; /AS1 advanced security option)

Syntax `EC p1<terminator>`

p1 The types of data to be initialized and cleared (0 to 3)

0 Basic setting mode settings, setting mode settings, measured and computed data, custom display screen setup data, and log data
(“Clear 1” on the DX)

1 Setting mode settings, measured and computed data, custom display screen setup data, and log data
(“Clear 2” on the DX)

2 Measured and computed data, custom display screen setup data, and log data
(“Clear 3” on the DX)

3 Basic setting mode settings (except for login settings), setting mode settings, measured and computed data, custom display screen setup data, and log data
(“Clear 4” on the DX)

Example Perform “Clear 1” on the DX.

```
EC0
```

EE Switches out of operation mode (/AS1 advanced security option)

Syntax `EE p1<terminator>`

`p1` Mode switch destination (ENG, SYS)

Memory sampling	ENG	SYS
In progress	Setting mode during memory sampling	Basic setting mode during memory sampling
Stopped	Setting mode	Basic setting mode

Example Switch to setting mode.

```
EEENG
```

BE Returns to operation mode (/AS1 advanced security option)

Syntax `BE p1<terminator>`

`p1` Mode switch operation (END)

Current Mode	END
Setting mode	Returns to operation mode. Creates a setup file.
Setting mode during memory sampling	Returns to operation mode.

BV Enters a string (can only be used during serial communication)

Syntax `BV p1,p2<terminator>`

`p1` 0

`p2` Character string (up to 100 characters)

Example Enter “user123.”

```
BV0,user123
```

Description
- You can use this command to enter character strings when the DX is displaying the character input window.
- On models with the /USB1 USB interface option, this command can be used through the use of USB barcodes.
- On models with the /AS1 advanced security option, this command can only be used through the use of the serial communication barcode protocol or through a USB barcode reader.

KE Performs key operations

Syntax `KE p1<terminator>`

`p1` Key

`F1 to F7`	Soft keys 1 to 7
`ESC`	ESC key
`MENU`	MENU key
`FUNC`	FUNC key
`START`	START key
`STOP`	STOP key
`USER`	USER key
`FAVORITE`	Favorite key
`0 to 9`	Number keys 0 to 9
`MINUS`	The minus key
`DOT`	The decimal point key
`DISP`	The DISP/ENTER key
`UP`	The up arrow key
`DOWN`	The down arrow key
`RIGHT`	The right arrow key
`LEFT`	The left arrow key

Example Press the DISP/ENTER key.

```
KEDISP
```

Description
- This command performs the same operations as pressing the keys on the DX. When you send multiple key operations, send them in the same order that you would perform them on the DX.
- When you perform this command, it is logged on the DX as “KEY.” This command is valid regardless of whether or not the key lock is on.
- On models with the /AS1 advanced security option, this command can only be used through the use of the serial communication barcode protocol or through a USB barcode reader.

BP Supports login (/AS1 advanced security option)

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

`p1` Input type

`1`	User name
`2`	User name and user ID

`p2` User name (up to 20 characters)

`p3` User ID (up to 8 characters)

Example Set the user name to “DX.”

```
BP1,DX
```

Description
- If you execute this command when p1=1, the DX displays the user ID input window.
- If you execute this command when p1=2, the DX displays the password input window.
- p3 is valid when p1=2.
- On models with the /AS1 advanced security option, this command can only be used through the use of the serial communication barcode protocol or through a USB barcode reader.

LL Logs in through serial communication (/AS1 advanced security option)

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

`p1` User name (up to 20 characters)

`p2` User ID (up to 8 characters)
This parameter is meaningless if you are not using a user ID.

`p3` Password (up to 20 characters)

`p4` The new password to use if the current one has expired (up to 20 characters)
This parameter is meaningless if the current password has not yet expired. This parameter can be omitted

p5 Reconfirmation of the new password to use if the current one has expired (up to 20 characters)
This parameter is meaningless if the current password has not yet expired. This parameter can be omitted.

Example Log in as user a (whose user ID is “aaaa” and whose password is “aaaaaa”), start computation, and execute memory start.
`LLa,aaaa, aaaaaa;TL0;PS0`

Description
- This command can be used if the login function has been enabled (by an administrator).
- After the LL command, use sub delimiters to make a list of commands to execute.
- You log into the DX when you execute this command, and you are automatically logged out after the command is executed.
- The LL command communication responses, including those for errors, are the same as those for other commands.

3.6 Basic Setting Commands

WU Sets the environment

Settings `GENERAL, BATCH, DISPLAY, MESSAGE, INPUT, ALARM, SECURITY, MEDIA, MATH, REPORT, SERVICEPORT, DECIMALPOINT, POP3, ALARM_LEVEL, ALARM_ COLOR, TAG, MENU, REMOTE, and FTPSERVER`

General environment settings

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

`p1` Setting type (GENERAL)

`p2` Selects tag or channel number
- `TAG` Tag
- `CHANNEL` Channel number

`p3` Language
- `ENGLISH`
- `JAPANESE`
- `CHINESE`
- `GERMAN`
- `FRENCH`

`p4` Remote control ID (OFF, 0 to 31)

Batch settings

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

`p1` Setting type (BATCH)

`p2` Batch function (OFF, ON, MULTIBATCH)
- OFF Disables the batch function
- ON Enables the batch function
- MULTIBATCH Enables the multi batch function

`p3` Number of lot number digits (OFF, 4, 6, 8)

`p4` Auto increment (ON, OFF)

`p5` Number of batch groups (DX1000: 2 to 6. DX2000: 2 to 12)

Description
- Parameters p3 and p4 are valid when p2 is set to ON.
- Parameters p3, p4, and p5 are valid when p2 is set to MULTIBATCH.

Display settings

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

`p1` Setting type (DISPLAY)

`p2` Trend type
- `T-Y` T-Y display
- `CIRCULAR` Circular display

`p3` Partial expansion(OFF, ON)

`p4` Trend interval switching (OFF, ON)

Description
- Parameters p3 and p4 are valid when p2 is set to T-Y.
- When multi batch is in use, p4 is fixed at OFF.

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 Display group that you specify

p3 Power failure message (OFF, ON)
p4 Message change (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 measurement range is exceeded
- OVER When ±105% of the scale is exceeded

Alarm settings

Syntax WU p1,p2,p3,p4,p5<terminator>
p1 Setting type (ALARM)
p2 Alarm suppression function (OFF, ON)
p3 Annunciator mode (OFF, ON)
p4 Sequence (ISA-A-4, ISA-A, ISA-M)
- ISA-A-4 No lock-in
- ISA-A Lock-in
- ISA-M Double lock-in

p5 Color when no alarms are activated (GREEN, WHITE)

Description Parameters p4 and p5 are valid when p3 is set to ON.

Security settings

Syntax WU p1,p2,p3,p4,p5<terminator>
p1 Setting type (SECURITY)
p2 Key
- OFF Disables security features
- KEYLOCK Locks the keys
- LOGIN Enables the login function

p3 Communication
- OFF Disables security features
- LOGIN Enables the login function

p4 Multi login (ON, OFF)
p5 Password management (ON, OFF)

Description
- p4 and p5 are only valid on models with the /AS1 advanced security option.
- On models with the /AS1 advanced security option, p2 is fixed at LOGIN.

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.

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 computation error
- SKIP Discards the data that overflowed and continues the computation
- LIMIT Process the data as follows:
  - For measurement channels that do not have linear scaling specified, the DX sets the data to the upper or lower limit of the measurement range.
  - For measurement channels that have linear scaling specified, the DX sets the data to the specified scan upper or lower limit.
  - For computation channels, the DX sets the data to the specified span upper or lower limit.

p4 Data when the MAX, MIN, or P-P value overflows
- OVER Computes using the overflow data
- SKIP Discards the data that overflowed and continues the computation

Report settings

Syntax WU p1,p2,p3,p4,p5,p6,p7<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
Same as p3.
p5 Report computation type 4
Same as p3.
p6 Creation of “hourly+daily,” “daily+weekly,”, and “daily+monthly” files
- COMBINE Saves reports to one file.
- SEPARATE Saves reports to separate files.
- SEPARATE2 Saves reports to separate files (DX100/DX200 format).

p7 Report template function (USE, NOT)

Description
- For parameters p2 to p5, you cannot specify the same computation type except OFF.

- When p6 is set to SEPARATE2, p7 can only be set 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)

Decimal point type

Syntax `WU p1,p2<terminator>`
- `p1` Setting type (DECIMALPOINT)
- `p2` Decimal type (POINT, COMMA)
  - `POINT` Uses a period for the decimal point.
  - `COMMA` Uses a comma for the decimal point.

Detailed POP3 settings

Syntax `WU p1,p2,p3<terminator>`
- `p1` Setting type (POP3)
- `p2` Delay after accessing POP3 until transmission (seconds; 0 to 10)
- `p3` POP3 login method (PLAIN, APOP)

Alarm level settings

Syntax `WU p1,p2<terminator>`
- `p1` Setting type (ALARM_LEVEL)
- `p2` Levels (1-2-3-4, 1-4-2-3, 1-4-3-2)

Alarm color settings

Syntax `WU p1,p2,p3,p4,p5<terminator>`
- `p1` Setting type (ALARM_ COLOR)
- `p2` Alarm level 1 color (RED, ORANGE, YELLOW, PINK)
- `p3` Alarm level 2 color (RED, ORANGE, YELLOW, PINK)
- `p4` Alarm level 3 color (RED, ORANGE, YELLOW, PINK)
- `p5` Alarm level 4 color (RED, ORANGE, YELLOW, PINK)

Tag basic setting

Syntax `WU p1,p2<terminator>`
- `p1` Setting type (TAG)
- `p2` Tag number usage (USE, NOT)

Basic setting mode menu display settings

Syntax `WU p1,p2<terminator>`
- `p1` Setting type (MENU)
- `p2` Basic setting mode menu display (ON, OFF)

Remote contact input operation

Syntax `WU p1,p2,p3,p4,p5,p6,p7,p8,p9 <terminator>`
- `p1` Setting type (REMOTE)
- `p2` Remote contact 1 input (N.O, N.C)
  - `N.O` Normally opened
  - `N.C` Normally closed
- `p3` Remote contact 2 input (N.O, N.C)
- `p4` Remote contact 3 input (N.O, N.C)
- `p5` Remote contact 4 input (N.O, N.C)
- `p6` Remote contact 5 input (N.O, N.C)
- `p7` Remote contact 6 input (N.O, N.C)
- `p8` Remote contact 7 input (N.O, N.C)
- `p9` Remote contact 8 input (N.O, N.C)

Description
- Use this command on models with the remote control option.
- On models with the pulse input option, if you use the remote control input terminal as a pulse input terminal, the DX counts the rising pulse edges, independent of the remote control input settings.

Detailed FTP server settings

Syntax `WU p1,p2<terminator>`
- `p1` Setting type (FTPSERVER)
- `p2` Directory output format (MS-DOS, UNIX)
  - `MS-DOS`
  - `UNIX`

Query `WU[p1]?`

Example This is an example for general environment settings. Display tags, display in English, and turn remote control off.
`WUGENERAL,TAG,ENGLISH,OFF`

WE Sets calibration management

Syntax `WE p1,p2,p3<terminator>`
- `p1` Whether or not to use calibration management (USE, NOT)
- `p2` Alarm (days; 1 to 10)
  This setting determines how many days before the specified calibration due date to start displaying notifications.
- `p3` Renotification interval (10min, 30min, 1h, 8h, 24h)

Query `WE?`

Example Use the calibration management function. Start notifications a day before the calibration due date and continue producing notifications every 8 hours afterwards.
`WEUSE,1,8h`

Description
- p2 and p3 are valid when p1 is set to USE.
- You can make settings with this command on models with the /CC1 input calibration option.

BI Configures signature settings (/AS1 advanced security option)

Syntax `BI p1,p2,p3,p4<terminator>`
- `p1` Process type (BATCH, CONTINUE)
- `p2` Signature on the DX (OFF, SIGNIN1, SIGNIN1+2, SIGNIN1+2+3)
- `p3` Signature at batch stop (ON, OFF)
- `p4` FTP transfer at signing (ON, OFF)

Query `BI ?`

Example Set the command so that the process type is BATCH, only signatures 1 and 2 are used on the

DX, the DX switches to the signature window at memory stop, and there is no FTP transfer at signing.

```
BIBATCH,SIGNIN1+2,ON,OFF
```

Description p3 and p4 are valid when p2 is set to SIGNIN1, SIGNIN1+2, or SIGNIN1+2+3.

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 (ON, OFF, ON-1S, ON-2S,)
- `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` Hold/Not hold the alarm status display
  - `HOLD`
  - `NONHOLD`

Description

- If annunciator is set to ON in the alarm environment settings (using WU ALARM), p2 and p5 are fixed to the following values based on the annunciator sequence.

Sequence	p2	p5
ISA-A-4	OFF	NONHOLD
ISA-A	OFF	HOLD
ISA-M	OFF	HOLD

- The meanings of the different p2 options are indicated below.

p2	Duration for which the Reflash Relays Are Deactivated
ON	500 ms
ON-1S	1 s
ON-2S	2 s

Internal switch settings

Syntax `WO p1,p2<terminator>`

- `p1` DO type (SWITCH)
- `p2` AND switch number
  - `NONE` No AND setting
  - `S01` Only specify S01
  - `S01-Sxx` Specify S01 to Sxx where xx = {02 to 30}

Output relay settings

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

- `p1` DO type (RLY)
- `p2` Relay number
  - `NONE` No AND setting
  - `I01` Only specify I01
  - `I01-Ixx` Specify I01 to Ixx where xx = {02 to 36}
- `p3` Energize/De-energize the relay
  - `DE_ENERGIZE`
  - `ENERGIZE`
- `p4` Hold/Not hold the relay
  - `NONHOLD`
  - `HOLD`
- `p5` Relay Action on ACK
  - `NORMAL`
  - `RESET`

Description Set parameter p2 by referring to the table in section 3.3.

If annunciator is set to ON in the alarm environment settings (using WU ALARM), p4 and p5 are fixed to the following values based on the annunciator sequence.

Sequence	p4	p5
ISA-A-4	NONHOLD	RESET
ISA-A	HOLD	RESET
ISA-M	HOLD	RESET

Query `WO[p1]?`

Example Specify no AND operation of the output relays, set the relay action to energize, and release the relay output when the alarm ACK operation is performed regardless of the alarm status.

```
WORLY,NONE,ENERGINE,HOLD,RESET
```

WH Sets alarm hysteresis

Measurement channels

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

- `p1` Channel type (MEASURE)
- `p2` Hysteresis on high and low limit alarms (0 to 50)
- `p3` Hysteresis on difference high and low limit alarms (0 to 50)

Computation channels

Syntax `WH p1,p2<terminator>`

- `p1` Channel type (MATH)
- `p2` Hysteresis on high and low limit alarms (0 to 50)

External input channels

Syntax `WH p1,p2<terminator>`

- `p1` Channel type (EXTERNAL)
- `p2` Hysteresis on high and low limit alarms (0 to 50)

Query `WH[p1]?`

Example Set the high and low limit alarm hysteresis for measurement channels to 4.0%, and the difference high and low limit alarm hysteresis to 0.0%.

```
WHMEASURE,40,0
```

Description You can specify computation channels on models with the /M1 or /PM1 math option. You can specify external input channels on models with the external input channel option.

XV Sets the scan interval and A/D integral time

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

- `p1` 1 (fixed)
- `p2` Scan interval mode
  - `NORMAL`
  - `FAST` Fast sampling

p3 Scan interval (25MS, 125MS, 250MS, 1S, 2S, 5S)
p4 A/D integration time (AUTO, 600Hz, 50Hz, 60Hz, 100ms)

Query XV?

Example Set the scan interval to 1 second in normal mode.
XV1,NORMAL,1S

Description
- The combinations of available scan interval modes and scan intervals vary depending on the model. For details, see the *DX1000/ DX1000N or DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E)*.
- You can set p4 to 600 Hz for fast sampling mode. You can choose 100 ms when the scan interval is set to 2 s or 5 s.
- On models with multi batch /BT2, you can only set p2 to NORMAL and p3 to 1S, 2S, or 5S.

XB Sets burnout detection

Syntax XB p1,p2<terminator>
p1 Measurement channel number
p2 Burnout processing
OFF No processing
UP Sets the computed result to positive overflow.
DOWN Sets the computed result to negative overflow.

Query XB[p1]?

Example Set the measured result to UP (positive overflow) when channel 001 burns out.
XB001,UP

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

XJ Sets RJC

When using the internal compensation circuit

Syntax XJ p1,p2<terminator>
p1 Measurement channel number
p2 RJC mode (INTERNAL)

Query XJ[p1]?

Example Set the channel 001 RJC to internal compensation circuit.
XJ001,INTERNAL

When using an external RJC

Syntax XJ p1,p2,p3<terminator>
p1 Measurement channel number
p2 RJC mode (EXTERNAL)
p3 External RJC value (-20000 to 20000)

Query XJ[p1]?

Example Set the channel 002 RJC to external, and set the compensation value to 0 µV.
XJ002,EXTERNAL,0

Description
- Set p1 by referring to the table in section 3.3.
- The unit of p3 is the µV.

XM Sets memory sampling conditions

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:
- Multi batch /BT2 is in use.
- Trend interval switching is on.
- You are using a DX with the /AS1 advanced security option.

XT Sets the temperature unit

Syntax XT p1<terminator>
p1 Temperature unit (C, F)

Query XT?

Example Set the temperature unit to Celsius.
XTC

RF Sets key lock

When p1 is set to KEY

Syntax RF p1,p2,p3,p4,p5,p6,p7<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)
p7 FAVORITE key (FREE, LOCK)

When p1 set to FUNC (function key)

Syntax RF p1,p2,p3,p4,p5,p6,p7,p8<terminator>
p1 Type (FUNC)
p2 Alarm ACK (FREE, LOCK)
p3 Message/batch key (FREE, LOCK)
p4 Math key (FREE, LOCK)
p5 Data save (FREE, LOCK)
p6 E-mail/FTP (FREE, LOCK)
p7 Time set (FREE, LOCK)
p8 Display Function (FREE, LOCK)

When p1 is set to MEDIA (external storage media)

Syntax RF p1,p2,p3<terminator>
p1 Type (MEDIA)
p2 External storage media operation (FREE, LOCK)
p3 Setup loading operation (FREE, LOCK)

Query RF[p1]?

Example Lock the MENU key (leave other keys unlocked).
RFKEY,FREE,FREE,LOCK,FREE,FREE,FREE

Description This command is invalid on models with the /AS1 advanced security option.

RN Sets basic key login

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

- `p1` Auto logout (OFF, 1MIN, 2MIN, 5MIN, 10MIN)
- `p2` Operation when logged out
  - `OFF` Disables DX operation
  - `DISPLAY` Only enables screen operations
- `p3` Whether or not to use a user ID (USE, NOT)
- `p4` Number of password retries (OFF, 3, 5)

Query `RN?`

Example Set the auto logout time to 1 minute, and disable the DX operation when logged out. Use a user ID. Set the number of password retries to 5.
`RN1MIN,OFF,ON,5`

Description
- p3 and p4 are only valid on models with the /AS1 advanced security option.
- When you use password management (the WU command) on models with the /AS1 advanced security option, p3 is fixed at OFF.

RP Sets user limitations

On DXs without the /AS1 Advanced Security Option

Syntax `RP p1,p2,•••<terminator>`

- `p1` User limitation number (1 to 10)
- `p2` User limitation item (KEY, FUNC, MEDIA)

Description Parameters p3 and subsequent parameters vary depending on the p2 setting as follows:

When p2 is set to KEY

- `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)
- `p8` FAVORITE key (FREE, LOCK)

When p2 set to FUNC (function key)

- `p3` Alarm ACK (FREE, LOCK)
- `p4` Message/batch key (FREE, LOCK)
- `p5` Math key (FREE, LOCK)
- `p6` Data save (FREE, LOCK)
- `p7` E-mail/FTP (FREE, LOCK)
- `p8` Time set (FREE, LOCK)
- `p9` Display Function (FREE, LOCK)

When p2 is set to MEDIA (external storage media)

- `p3` External storage media operation (FREE, LOCK)
- `p4` Setup loading operation (FREE, LOCK)

On DXs with the /AS1 Advanced Security Option

Syntax RP p1,p2,...<terminator>

- `p1` Authority of user number (1 to 10)
- `p2` Authority of user item (KEY, ACTION, MEDIA, SIGNIN)

The parameters after p3 vary depending on how p2 is set as indicated below.

p2=KEY

- `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)
- `p8` FAVORITE key (FREE, LOCK)

p2=ACTION (Functions)

- `p3` Alarm ACK (FREE, LOCK)
- `p4` Message and batch (FREE, LOCK)
- `p5` Computation (FREE, LOCK)
- `p6` Data save (FREE, LOCK)
- `p7` E-mail/FTP (FREE, LOCK)
- `p8` Time operations (FREE, LOCK)
- `p9` Display operations (FREE, LOCK)
- `p10` Calibration settings (FREE, LOCK)

p2=MEDIA (External media)

- `p3` External media operations (FREE, LOCK)
- `p4` Setting load operations (FREE, LOCK)

p2=SIGNIN (Signature permissions)

- `p3` Signature1 (FREE, LOCK)
- `p4` Signature2 (FREE, LOCK)
- `p5` Signature3 (FREE, LOCK)

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

Example Lock the START, STOP, and DISP/ENTER keys.
`RP1,KEY,LOCK,LOCK,,,LOCK`

Description When p2=ACTION, p10 is valid if calibration management (/CC1 option) is enabled.

EK Configures administrator settings (/AS1 advanced security option)

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

- `p1` Registration number (1 to 5)
- `p2` Login method (OFF, KEY, KEY+COMM, WEB)
- `p3` User name (up to 20 characters)
- `p4` User ID (up to 8 characters)
- `p5` Password
- `p6` Period of password validity (OFF, 1MONTH, 3MONTH, 6MONTH)

Query `EK[p1]?`

Password output in response to queries:

Default password	********
Valid password specified by a user	********
Expired password	--------

Example Configure the settings for an administrator who can log in using the DX keys. Set the user name to “A,” the user ID to “0000,” and the period of password validity to 3 months.
`EK1,KEY,A,0000,,3MONTH`

Description
- About user names
  - You cannot specify more than one of the same user name.

- You cannot set the user name to “quit” or all spaces, and you cannot use spaces inside the user name.
- When p2 is set to KEY or KEY+COMM
  - p5 is invalid. Regardless of the setting, the default password is used.
  - When password management is enabled (by the WU command), p4 is invalid (the DX responds to queries with a string of spaces), and p6 is fixed at off.
  - When the user ID is disabled (by the RN command), p4 is invalid (the DX responds to queries with a string of spaces).
- When p2=WEB
  - p4 is invalid (the DX responds to queries with a string of spaces).
  - You can set a password for p5 (6 characters or more).
  - p6 is fixed at OFF.

EL Configures user settings (/AS1 advanced security option)

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

`p1` Registration number (1 to 90)
`p2` Login method (OFF, KEY, COMM, KEY+COMM, WEB)
`p3` User name (up to 20 characters)
`p4` User ID (up to 8 characters)
`p5` Password
`p6` Period of password validity (OFF, 1MONTH, 3MONTH, 6MONTH)
`p7` User privilege setting (OFF or 1 to 10)

Query `EL[p1]?`

Password output in response to queries:

Default password	********
Valid password specified by a user	********
Expired password	--------

Example Configure the settings for a user who can log in using the DX keys and communication commands. Set the user name to “User,” the user ID to “1234,” and the period of password validity to 3 months. Use user privilege setting 1.
`EL1,KEY+COMM,User,1234,,3MONTH,1`

Description
- About user names
  - You cannot specify more than one of the same user name.
  - You cannot set the user name to “quit” or all spaces, and you cannot use spaces inside the user name.
- When p2 is set to KEY, KEY+COMM, or COMM
  - p5 is invalid. Regardless of the setting, the default password is used.
  - When password management is enabled (by the WU command), p4 is invalid (the DX responds to queries with a string of spaces), and p6 is fixed at off.
  - When the user ID is disabled (by the RN command), p4 is invalid (the DX responds to queries with a string of spaces).
- When p2=WEB
  - p4 is invalid (the DX responds to queries with a string of spaces).
  - You can set a password for p5 (6 characters or more).
  - p6 is fixed at OFF.

WD Configures authentication server settings (/AS1 advanced security option)

Syntax WD p1,p2,p3<terminator>
`p1` Priority (PRIMARY, SECONDARY)
`p2` Server name (up to 64 characters)
`p3` Port number (0 to 65535)

Query `WD[p1]?`

Example Set the primary server to WIN111. Use port 88.
`WDPRIMARY,WIN111,88`

Description The settings made by this command are valid when password management is enabled (by the WU command).

RO Sets the type of report and when to create reports

For creating no reports

Syntax `RO p1<terminator>`
`p1` Report type (OFF)

Query `RO?`

Example Create no reports.
`ROOFF`

Description You can use this command on models with the /M1 or /PM1 math option.

For creating hourly, daily, hourly + daily and daily + monthly reports

Syntax `RO p1,p2,p3<terminator>`
`p1` Report type
- `HOUR` Hourly report
- `DAY` Daily report
- `HOUR+DAY` Hourly and daily reports
- `DAY+MONTH` Daily and monthly reports

`p2` Day to create reports (dd; fixed format)
- `dd` Day (01 to 28)

`p3` Hour to create reports (hh; fixed format)
- `hh` Hour (00 to 23)

Query `RO?`

Example Create a daily report at 9 O’clock everyday (parameter p2 (“05” in this example) is invalid in this case).
`RODAY,05,09`

Description
- You can use this command on models with the /M1 or /PM1 math option.
- Parameter p2 is invalid even if it is specified for reports other than monthly and daily reports.

For creating daily + weekly reports

Syntax `RO p1,p2,p3<terminator>`
- `p1` Report type (DAY+WEEK)
- `p2` Day of week to create reports (SUN, MON, TUE, WED, THU, FRI, SAT)
- `p3` Hour to create reports (hh; fixed format)
  - `hh` Hour (00 to 23)

Query `RO?`

Example Create a daily report at 9 O'clock every day and a weekly report at 9 O'clock every Tuesday.
`RODAY+WEEK,TUE,09`

Description You can use this command on models with the /M1 or /PM1 math option.

RM Sets a report channel

When 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
- You can use this command on models with the /M1 or /PM1 math option.
- Set p1 by referring to the table in section 3.3.

When using a report channel

Syntax `RM p1,p2,p3,p4<terminator>`
- `p1` Report channel number
- `p2` Report channel usage (ON)
- `p3` Measurement, computation, or external input channel number on which to report
- `p4` Conversion of the unit of time for integration
  - `OFF` Do not convert.
  - `/S` Converts as though the physical values are integrated in units of seconds.
  - `/MIN` Converts as though the physical values are integrated in units of minutes.
  - `/H` Converts as though the physical values are integrated in units of hours.
  - `/DAY` Converts as though the physical values are integrated in units of days.

Query `RM[p1]?`

Example Use the report channel number R01. Set the channel number 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 or /PM1 math option.
- Set parameters p1 and p3 by referring to the table in section 3.3.
- About p4
  Because the DX integrates sampled data over each scan interval, the physical value integrated over a given unit of time may be different from the actual integrated value. This occurs if the unit of time is different from the scan interval. If this occurs, set p4 to the same unit of time as that for the physical value that you are measuring. The DX calculates the integrated value using one the following conversion formulas based on p3.
  - OFF Σ(measured value)
  - /S Σ(measured value) × scan interval
  - /MIN Σ(measured value) × scan interval/60
  - /HOUR Σ(measured value) × scan interval/3600
  - /DAY Σ(measured value) × scan interval/86400

  The scan interval unit is seconds.

XG Sets the time zone

Syntax `XG p1,p2<terminator>`
- `p1` Offset time from GMT (–1300 to 1300)
  Upper 2 digits: Hour (00 to 13)
  Lower 2 digits: Minute (00 to 59
- `p2` Time deviation limit (OFF, 10S, 20S, 30S, 1MIN, 2MIN, 3MIN, 4MIN, 5MIN)

Example Set the offset time from the GMT to 9 hours ahead and the deviation limit to 30 s.
`XG0900,30S`

XN Sets the date format

Syntax `XN p1,p2<terminator>`
- `p1` Date format (Y/M/D, M/D/Y, D/M/Y, D.M.Y)
- `p2` Starting day of the week on the calendar (SUN, MON)

Query `XN?`

Example Set the date format to Y/M/D. Set the starting day of the week on the calendar to Monday.
`XNY/M/D,MON`

YB Sets host information

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 dx1000 and the domain name to dxadv.daqstation.com.
`YBdx1000,dxadv.daqstation.com`

YD Sets network parameters

When not obtaining network parameters automatically

Syntax `YD p1,p2,p3<terminator>`
- `p1` Automatic retrieval (NOT)

When obtaining 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 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

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

Syntax `YK p1<terminator>`
- `p1` Keepalive (ON, OFF)

Query `YK?`

Example Disable keepalive.
```
YKOFF
```

RU Sets DNS parameters

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.daqstation.com and domain suffix 2 to rec2.daqstation.com.
```
RUSUFFIX,rec1.daqstation.com,rec2.daqstation.com
```

WS Sets a server

Syntax `WS p1,p2<terminator>`
- `p1` Server type (FTP, WEB, MODBUS, SNTP, ETHERNETIP)
- `p2` Server on/off (USE, NOT)

Query `WS[p1]?`

Example Enable the Web server.
```
WSWEB,USE
```

WW Sets Webpage parameters

Syntax `WW p1,p2,p3,p4<terminator>`
- `p1` Webpage type
  - `OPERATOR` Operator page
  - `MONITOR` Monitor page
- `p2` Webpage (ON, OFF)
- `p3` Authentication
  - `OFF` No authentication
  - `ADMIN` Administrator privileges
  - `USER` User privileges
- `p4` Command input on/off (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.
- Parameter p3 is OFF or ADMIN when p1 is set to OPERATOR.
- Parameter p4 is valid when p1 is set to OPERATOR.
- p4 is invalid on models with the /AS1 advanced security option.

YQ Sets communication timeout

When using no timeouts

Syntax `YQ p1<terminator>`
- `p1` Communication timeout (OFF)

Query `YQ?`

Example Disable the communication timer.
```
YQOFF
```

When using timeouts

Syntax `YQ p1,p2<terminator>`
- `p1` Communication timeout (ON)
- `p2` Timeout value in minutes (1 to 120)

Query `YQ?`

Example Enable the communication timer and set the timeout value to 3 minutes.
```
YQON,3
```

YT Sets FTP transfer timing

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

- `p1` Automatically transfer data when display 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 snapshot is executed) (ON, OFF)
- `p4` Transfer data when the DX creates a setup file as a result of setting changes (OFF, ON)

Query `YT?`

Example Automatically transfer display and event data files. Do not transfer report data files. Do not transfer screen image data files. Transfer a setup file when the settings change.
`YTON,OFF,OFF,ON`

Description
- When the method to save data to the external storage medium is set to “Auto,” the DX automatically transfers relevant data files when they are created. For the procedure to save various data files to the storage medium, see the *DX1000/DX1000N or DX2000 User’s Manual*.
- p2 is only valid on models with the /M1 or /PM1 math option.
- p4 is only valid on models with the /AS1 advanced security option.

YU Sets what kind of information to send using e-mail

To send changes in the alarm status

Syntax `YU p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,p11,p12,p13,p14<terminator>`

- `p1` Information to send (ALARM)
- `p2` Recipient 1 (ON, OFF)
- `p3` Recipient 2 (ON, OFF)
- `p4` Whether to send the alarm number 1 status (ON, OFF)
- `p5` Whether to send the alarm number 2 status (ON, OFF)
- `p6` Whether to send the alarm number 3 status (ON, OFF)
- `p7` Whether to send the alarm number 4 status (ON, OFF)
- `p8` Whether to include instantaneous data (ON, OFF)
- `p9` Whether to include source URL (ON, OFF)
- `p10` Subject (up to 32 characters)
- `p11` Header 1 (up to 64 characters)
- `p12` Header 2 (up to 64 characters)
- `p13` Alarm transmission operation
  - `ON+OFF` Send e-mail when alarms occur and when alarms clear
  - `ON` Only send e-mail when alarms occur
- `p14` Whether to include tag number or channel number in the subject (ON, OFF)

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 “DX.” Only send e-mail when alarms occur. Include the tag or channel number in the subject.
`YUALARM,ON,OFF,ON,ON,ON,ON,ON,OFF,ALM,LP2,DX,ON,ON`

To send e-mail at scheduled times

Syntax `YU p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,p11,p12<terminator>`

- `p1` Information to send (TIME)
- `p2` Recipient 1 (ON, OFF)
- `p3` Interval for sending e-mail to recipient 1 (1H, 2H, 3H, 4H, 6H, 8H, 12H, 24H)
- `p4` Time for sending 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 for sending e-mail to recipient 2 (00:00 to 23:59)
- `p8` Whether to include instantaneous data (ON, OFF)
- `p9` Whether to include 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 e-mail at 17 hours 15 minutes every day to recipient 1. 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`

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` Whether to include 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-mail that includes the source URL to recipient 1. Set the subject to “SystemAlert” and header 1 to “LP2.”
`YUSYSTEM,ON,OFF,ON,SystemAlart,LP2`

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 Whether to include 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-mail that includes 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 on system notifications, see section 1.4.
- You can use report generation notification on models with the /M1 or /PM1 math option.
- For details on e-mail settings, see section 1.4.

YV Sets an e-mail recipient address

Syntax YV p1,p2<terminator>
p1 Recipient
1 Recipient 1
2 Recipient 2
p2 Recipient address (up to 150 alphanumeric characters)

Query YV[p1]?

Example Set recipient 1 to “dxuser1@daqstation.com” and “dxuser2@daqstation.com.”
YV1,dxuser1@daqstation.com dxuser2@daqstation.com

Description
- To specify multiple recipients, separate each recipient with a space.
- For details on e-mail settings, see section 1.4.

YW Sets the e-mail sender address

Syntax YW p1<terminator>
p1 Sender address (up to 64 alphanumeric characters)

Query YW?

Example Set the sender address to “dxadv.”
YWdxadv

Description For details on e-mail settings, see section 1.4.

YX Sets the e-mail SMTP server name

Syntax YX p1,p2,p3<terminator>
p1 SMTP server name (up to 64 characters)
p2 Port number (0 to 65535)
p3 Authentication (OFF, POPBEFORESMTP, AUTH)

OFF	Authentication is not used
POPBEFORESMTP	POP before SMTP is used
AUTH	SMTP authentication is used

Query YX?

Example Set the SMTP server to “smtp.daqstation.com” and port number to “25.” Use POP3 authentication.
YX smtp.daqstation.com,25,POPBEFORESMTP

Description For details on e-mail settings, see section 1.4.

YJ Sets the Modbus client’s destination server

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 dx2000, the unit number registration to FIXED, and the unit number to 127.
YJ3,502,dx2000,FIXED,127

YP Sets basic Modbus client settings

Syntax YP p1,p2<terminator>
p1 Read cycle (125MS, 250MS, 500MS, 1S, 2S, 5S, 10S)
p2 Retry interval (OFF, 10S, 20S, 30S,1MIN, 2MIN, 5MIN, 10MIN, 20MIN, 30MIN, 1H)

Query YP?

Example Set the read cycle to 500 ms and the retry (reconnection) interval to 10 min.
YP500MS,10MIN

YR Sets the Modbus client’s transmit command

Syntax YR p1,p2,p3•••<terminator>
p1 Command number (1 to 16)
p2 Command type (OFF, R, R-M, W, W-M)

Description Parameters p3 and subsequent parameters vary depending on the p2 setting as follows:

When p2 is set to OFF
There are no parameters after p2.

When p2 is set to R (read external input channels)
p3 First channel (external input channel number)
p4 Last channel (external input channel 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)

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)

When p2=E-M (Communication input channel data exchange)

p3 First channel (communication input data number)
p4 Last channel (communication input data number)
p4 can only be set to the same value as p3. (Only one register can be loaded per command.)
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, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L)

Query `YR[p1]?`

Example For command number 5, set the command type to W, the first channel to 01, the last channel to 04, the server number to 1, the first register number to 40001, and the register data type to INT16.

```
YR5,W,01,04,1,40001,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 set 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

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

p1 SNTP client function (USE, NOT)
p2 SNTP server name (up to 64 alphanumeric 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, set the server name to sntp.daqstation.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.daqstation.com,123,24H,
12:00,30S
```

WC Sets the SNTP operation when memory start is executed

Syntax `WC p1<terminator>`

p1 Time adjustment using SNTP at memory start (ON, OFF)

Query `WC?`

Example Set the DX so that time is adjusted using SNTP at memory start.

```
WCON
```

Description This command is valid when the SNTP client function is enabled (WB command).

YS Sets the serial interface

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

p1 Baud rate (1200, 2400, 4800, 9600, 19200, 38400)
p2 Data length (7, 8)
p3 Parity check (NONE, ODD, EVEN)
p4 Handshaking (OFF:OFF, XON:XON, XON:RS, CS:RS)
p5 RS-422/485 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, handshaking to OFF: OFF, the RS-422/485 address to 02, and the protocol to NORMAL.
YS9600,8,ODD,OFF:OFF,02,NORMAL

Description
- You can use this command on models with the /C2 or /C3 serial interface option.
- The setting p6=BARCODE is only valid on models with the /AS1 advanced security option.

YL Sets the operation of the Modbus master function

Syntax YL p1,p2,p3,p4,p5<terminator>
- p1 Read cycle (125MS, 250MS, 500MS, 1S, 2S, 5S, 10S)
- p2 Timeout (125MS, 250MS, 500MS, 1S, 2S, 5S, 10S, 1MIN)
- p3 Retrials (OFF, 1 to 5, 10, 20)
- p4 Command wait time (OFF, 5MS, 10MS, 15MS, 45MS, 100MS)
- p5 Auto recovery (OFF, 1MIN, 2MIN, 5MIN, 10MIN, 20MIN, 30MIN, 1H)

Query YL?

Example Set the read cycle to 500 ms, the timeout to 250 ms, the number of retrials to 2, the command wait time to 10 ms, and the automatic return time limit to 5 min.
YL500MS,250MS,2,10MS,5MIN

Description
- You can use this command on models with the /C2 or /C3 serial interface option.
- You can use this command when the serial interface protocol is set to “Master.” For information about the serial interface settings, see section 2.3.

YM Sets a transmit command of the Modbus master function

To not set a command

Syntax YM p1,p2<terminator>
- p1 Registration number (1 to 16)
- p2 Computation usage (OFF)

Query YM[p1]?

Example Do not set command registration number 1.
YM1,OFF

To set a command that reads external input channels

Syntax YM p1,p2,p3,p4,p5,p6,p7<terminator>
- p1 Registration number (1 to 16)
- p2 Command type (R)
- p3 First channel (external input channel number)
- p4 Last channel (external input channel number)
- p5 Slave device address (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)

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 30002 (upper 16 bits) and 30004 (lower 16 bits) in the slave device at address 5 into the DX channels 201 to 203.
YM2,R,201,203,5,30002,INT32_B

To set a command that reads communication input data

Syntax YM p1,p2,p3,p4,p5,p6,p7<terminator>
- p1 Registration number (1 to 16)
- p2 Command type (R-M)
- p3 First channel (communication input data number)
- p4 Last channel (communication input data number)
- p5 Slave device address (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 at address 5 into the DX channels C02 to C05.
YM2,R-M,C02,C05,5,30003,INT32_B

To set a command that writes to measurement channels

Syntax YM p1,p2,p3,p4,p5,p6,p7<terminator>
- p1 Registration number (1 to 16)
- p2 Command type (W)
- p3 First channel (measurement channel number)
- p4 Last channel (measurement channel number)
- p5 Slave device address (1 to 247)
- p6 First register number (40001 to 49999, 400001 to 465535)
- p7 Type of data assigned to the registers (INT16, F LOAT_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 in registers 40003 to 40006 in the slave device at address 7.
YM3,W,003,006,7,40003,INT16

To set a command that writes to computation channels

Syntax YM p1,p2,p3,p4,p5,p6,p7<terminator>
- p1 Registration number (1 to 16)
- p2 Command type (W-M)
- p3 First channel (computation channel number)
- p4 Last channel (computation channel number)
- p5 Slave device address (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)

To set a command for communication input channel data exchange

- p1 Registration number (1 to 16)
- p2 Command type (E-M)
- p3 First channel (communication input data number)
- p4 Last channel (communication input data number)
  p4 can only be set to the same value as p3. (Only one register can be loaded per command.)
- p5 Address of the slave device (1 to 247).
- p6 First register number (40001 to 49999, 400001 to 465536)
- p7 Register data type (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: Write the computed 16-bit signed integer data of channels 101 to 105 to the first register 40003 in the slave device at address 5.
YM2,W-M,101,105,5,40003,INT16

Description
- You can use this command on models with the /C2 or /C3 serial interface option.
- You can use this command when the serial interface protocol is set to “Master.” 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 set 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

Syntax WR p1,p2,p3,p4,p5<terminator>
- p1 Memory and media status (OFF, ON)
- p2 Self diagnosis (OFF, ON)
- p3 Communication errors (OFF, ON)
- p4 Memory stop (OFF, ON)
- p5 Alarms (OFF, ON)

Query WR?

Example Set the DX to transmit various types of information.
WRON,ON,ON,ON,ON

WI Sets the relay operations

On DXs without the /AS1 Advanced Security Option

Syntax WI p1,p2<terminator>
- p1 FAIL relay (Fail, Status)
- p2 Status relay (Fail, Status)
  - Fail FAIL
  - Status Instrument information

Query WI?

Example Output FAIL to the FAIL relay and the instrument information to the status relay.
WIFail,Status

Description This command is valid on models with the /F1 or /F2 option.

On DXs with the /AS1 Advanced Security Option

Syntax WI p1,p2<terminator>
- p1 FAIL relay (Fail, Status, MemorySample, UserLocked, Login)
- p2 Status relay (Fail, Status, MemorySample, UserLocked, Login)
  - Fail FAIL
  - Status Instrument information
  - MemorySsmple Memory sampling
  - UserLocked Invalid user
  - Login Login

Query WI?

Example Output FAIL to the FAIL relay and login information to the status relay.
WIFail,Login

Description This command is valid on models with the /F1 or /F2 option.

WF Sets the Modbus connection limitation

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 via Modbus

Syntax `WG p1,p2<terminator>`
- `p1` Registration number (1 to 10)
- `p2` Whether or not to register (ON, OFF)
- `p3` IP address (0.0.0.0 to 255.255.255.255)

Query `WG[p1]?`

Example Allow connection from 192.168.111.24. Use registration number 1.
```
WG1,ON,192.168.111.24
```

Description This command is valid when the Modbus connection limitation is placed (WF command).

WJ Sets the FTP transfer wait time

Syntax `WJ p1,p2<terminator>`
- `p1` Display data and event data [minutes] (0 to 120)
- `p2` Reports [minutes] (0 to 120)

Query `WJ?`

Example Set the FTP transfer wait time for report data to 30 minutes. Do not set a wait time for display data and event data.
```
WJ0,30
```

WQ Sets PROFIBUS-DP

Syntax `WQ p1<terminator>`
- `p1` Node address (0 to 125)

Query `WQ ?`

Example Set the node address to 121.
```
WQ121
```

Description
- You can use this command on models with the /CP1 PROFIBUS-DP option.

XE Activates basic settings

Syntax `XE p1<terminator>`
- `p1` Whether or not to save settings (STORE, ABORT)

Example Save basic settings.
```
XESTORE
```

Description
- To activate the settings you have changed using basic setting commands, you must use the XE command to save the settings. Be sure to use the XE command to save the settings before switching the execution mode back to operation. If you do not save the settings and change the execution mode back to operation, the DX returns to the previous settings.
- This command is invalid on models with the /AS1 advanced security option.

YE Activates basic settings (cold reset)

Syntax `YE p1<terminator>`
- `p1` Whether or not to activate settings
  - `STORE` Save basic settings and restart
  - `ABORT` Restart without saving basic settings

Example Saves basic settings and restart.
```
YESTORE
```

Description If the settings are changed during memory sampling in basic setting mode, a cold reset is not executed. The login status is sustained.

3.7 Output Commands (Control)

BO Sets the output byte order

Syntax `BO p1<terminator>`

`p1` Byte order

- `0` Outputs data MSB first.
- `1` Outputs data LSB first.

Query `BO?`

Example Output data MSB first.

```
BO0
```

Description This command applies to the byte order of numeric data for BINARY output.

CS Sets the check sum (can only be used during serial communications)

Syntax `CS p1<terminator>`

`p1` Checksum usage

- `0` Do not calculate (value fixed at zero)
- `1` Calculate

Query `CS?`

Example Enable (Calculate) the checksum.

```
CS1
```

Description You can use this command only for serial communications.

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.

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 or OFF

Query `CB?`

Example Set the output format to normal output.

```
CB0
```

Description

- This setting is separate for each connection.
- This command only affects the communication section and does not affect the front panel settings.
- Effective range of commands

Output information	Corresponding command
Instantaneous data output (binary)	FD1, FF
Instantaneous data output (ASCII)	FD0
Decimal place information (ASCII)	FE1
Setup channel information (binary)	FE5
Configured alarm information (binary)	FE6

CC Disconnects the Ethernet connection (can only be used for Ethernet communications)

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 DX (when you turn the DX off and then back on 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 DX, 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 DX. After reconnecting to the DX, 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 DX.

```
FCGET
```

Description The DX captures the currently displayed screen and outputs the data in PNG format.

FE Outputs setup data

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

`p1` Output data type

- `0` Setup data of setting mode
- `1` Decimal place and unit information
- `2` Setup data of basic setting mode
- `4` Setup data file
- `5` Setup channel information output
- `6` Configured alarm information output

`p2` First channel number (measurement, computation, or external input channel)

`p3` Last channel number (measurement, computation, or external input channel)

`p4` Format version (see “Setup Channel Information Output” in “Response Format.”)

- `1` Format for Release number 2 or Earlier (format version 1)
- `2` Format for Release number 3 or later (format version 2)

Example Output the setup data of setting mode for channels 001 to 005 from the DX.

```
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, all channels are specified.
- Set parameters p2 and p3 by referring to the table in section 3.3.
- Parameter p4 is valid when p1 is set to 5. If you omit p4 when it is valid, p4 is set to 1.

FD Outputs the most recent measured/computed data

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

`p1` Output data type

- `0` Most recent measured, computed, and external input data in ASCII format
- `1` Most recent measured, computed, and external input data in binary format
- `6` Relay status and internal switch status
- `7` Event level switch status

`p2` First channel number (measurement, computation, or external input channel)

`p3` Last channel number (measurement, computation, or external input channel)

Example Output the most recent measured and computed data for channels 001 to 005 from the DX in ASCII format.

```
FD0,001,005
```

Description
- The most recent measured and computed data correspond to the most recent measured and computed data in the internal memory when the DX 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, all channels are specified.
- Set parameters p2 and p3 by referring to the table in section 3.3.

FF Outputs FIFO data

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

`p1` Type of operation

- `GET` Output starting with the next block
- `RESEND` Retransmit the previous output
- `RESET` Set the most recent data position (block) to the FIFO buffer read position (block)

`p2` First channel number (measurement, computation, or external input channel)

`p3` Last channel number (measurement, computation, or external input channel)

`p4` Maximum number of blocks to read out

- `1200` DX1002/DX1004/DX2004/DX2008
- `240` DX1006/DX1012/DX2010/DX2020/DX2030/DX2040/DX2048
- `60` Models with the /MC1 external input channel option

If the amount of measured, computed, and external input data is less than the specified number of blocks, the DX sends all of 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 DX sends the specified number of blocks (p4) of FIFO data starting with the next block.

Be sure to read the data within the following buffer period to prevent data dropouts.
- DX1004
  FIFO buffer size
  240 cycles (scan interval)
  Maximum buffer period
  240 × (acquisition interval)
  You cannot resend data if the buffer period elapses.

- Parameters p2 to p4 are valid when p1 is set to GET.
- If you omit p4, all blocks are specified.
- 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 parameters p2 and p3 by referring to the table in section 3.3.

FL Outputs a log, alarm summary, or message summary

Syntax `FL p1,p2,p3<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
`SETTIN`	Change settings log

`p2` Maximum log readout length

`1` to `200`	When p1 is set to COM, MODBUS, or SETTING
`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

`p3` Batch group number

Example Output the 10 most recent operation error logs.
`FLERR,10`

Description
- Outputs the log that is stored in the DX.
- If you omit p2, all written logs are output.
- Parameter p3 is valid when multi batch /BT2 is in use and p1 is set to ALARM or MSG (all other parameters are don't care).
- All logged items are output when you omit p3.
- Set parameter p3 by referring to the table in section 3.3.
- The setting p1=LOGIN is invalid on models with the /AS1 advanced security option.
- The setting p1=SETTING is only valid on models with the /AS1 advanced security option.

FI Outputs an operation log (/AS1 advanced security option)

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

`p1` Output format

`0`	Fixed length
`1`	Details attached

`p2` User name
You can specify multiple user names (up to five) by delimiting them with commas.

`p3` Operations
You can specify multiple operations (up to five) by delimiting them with commas. Specify operations by using the notation that is used in the operation log (see appendix 1 in IM04L41B01-05EN).

`p4` Maximum number of items to output (1 to 100)

Example Output up to 100 items from the log of User1's operations.
`FI0,User1,,100`

Description
- Omitting p2 is the same as specifying all users.
- If you specify more than five users for p2, users from the sixth user onwards are invalid.
- If you enter five colons for p2 without specifying any user names, users from the sixth user onwards are invalid.
- Omitting p3 is the same as specifying all operations.
- If you specify more than five items for p3, items from the sixth item onwards are invalid.
- If you enter five colons for p3 without specifying any items, items from the sixth item onwards are invalid.
- p4 cannot be omitted.
- p3 is not case sensitive. Items that start with the specified characters are output.

Example		
	Error	Specifies all errors
	Error213	Specifies error 213

- If p2 and p3 are both specified, the DX outputs items that match the logical AND of p2 and p3

IS Outputs status information

Syntax `IS p1<terminator>`

`p1` Status information output

`0`	Status information 1 and 4
`1`	Status information 1 and 8

Example Output status information 1 to 4.
`IS0`

Description You can mask the output status using status filters (see the IF command). For details on status information, see chapter 5.

FU Outputs user levels

Syntax `FU p1<terminator>`

`p1` User information output

- `0` Information about the users currently logged in
- `1` Information about the users currently logged into a general-purpose service

Example Output information about the users logged into a general-purpose service.

```
FU1
```

Description This command sends information about users that are connected to the DX.

FA Outputs internal DX information

Syntax `FA p1<terminator>`

`p1` Type of operation

- `IP` Address information that includes the IP address, subnet mask, default gateway, DNS server as well as the host name and domain name

ME Outputs data stored on the external storage medium and internal memory

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

`p1` Type of operation

- `DIR` File list output
- `GET` Output (first time)
- `NEXT` Output (subsequent times). This parameter is used to output the remaining data when the first output operation is not enough to output all of the data.
- `RESEND` Retransmit the previous output
- `DEL` Delete
- `DIRNEXT` Output the subsequent file list after the file list is output using the DIR or LIST command. The number of output lists is the p3 value specified using the DIR command. If you use this command after all lists have been output, the following data is output.
  `EA`*CRLF*
  `EN`*CRLF*
- `CHKDSK` Checks the disk.Outputs information about the free space on the external storage medium.

`p2` Path name (up to 100 characters)
Set the path name using a full path.

`p3` Maximum number of file lists to output (1 to 1000)
If you omit this parameter, the DX outputs the entire file list of the specified directory.

Example
- Output the entire file list of 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.
- The setting p1=DEL is invalid on models with the /AS1 advanced security option.

Path name specifications

- The first level directories point to the following locations.
  Path that starts with /MEM0/DATA/Internal memory
  Path that starts with /DRV0/External storage medium
- Path names are case-sensitive.
- You can access files whose name is less than or equal to 48 characters that are within three directory levels.
- Wild cards have the following limitations.
  - Asterisks can be used in p2 when p1 is set to DIR.
  - If a path ends with a slash, it is equivalent to specifying * for the path.
    Example) /DRV0/DATA0/ and /DRV0/DATA0/* are equivalent.
  - For the file name and for the extension, characters at the asterisk and subsequent characters can be any characters.
    Example) Let us assume that there are five files: ab001.ef1, ab002.ef1, ab001.ef2, ab002.ef2, and ab001.yyy.
    If you specify ab*01.ef1, ab001.ef1 and ab002.ef1 are selected.
    If you specify ab001.e*1, ab001.ef1 and ab001.ef2 are selected.

MO Outputs the data stored in the internal memory

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

`p1` Type of operation

- `DIR` Data list output
- `GET` Data output
- `SIZE` Data size output

p2 Output data type
MANUAL Manual sampled data
REPORT Report
p3 Specified file name

Example Output report data, 000142_080102_004127H_.DAR from the DX.
MOGET,REPORT,000142_080102_004127H_.DAR

Description Parameter p3 is valid when p1 is set to GET or SIZE.

3.9 Output Commands (RS-422/485 Dedicated Commands)

ESC O Opens an instrument

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

Syntax **ESC** O p1<terminator>
p1 Instrument address (01 to 99)

Example Open the instrument at address 99, and enable all commands.
ESC O99

Description
- Specifies 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 DX receives this command successfully, the DX returns "**ESC** O□□".
- Normally, the terminator can be CR+LF or LF for communication commands. However, you must terminate this command with CR+LF.

ESC C Closes an instrument

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

Syntax **ESC** C p1<terminator>
p1 Instrument address (01 to 99)

Example Close the device whose address is 77.
ESC C77

Description
- This command closes the connection to the instrument you are communicating with.
- When the DX receives this command successfully, the DX returns "**ESC** C□□".
- Normally, the terminator can be CR+LF or LF 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 This command sends the maker, model, serial number, and firmware version in a comma-separated ASCII string with a terminator at the end.

Example `YOKOGAWA,DX1000,99AA0123,F1.01`

3.11 Maintenance and Test Commands (Available when using the maintenance/ test server function via Ethernet)

close Closes another device's connection

Syntax `close,p1,p2:p3<terminator>`

`p1` Port on the DX side (1 to 65535)

`p2` IP address on the PC side (0.0.0.0 to 255.255.255.255)

`p3` Port on the PC side (0 to 65535)

Example `close,34159,192.168.111.24:1054`
`E0`

Description You cannot use this command to disconnect a server port. You cannot use this command to disconnect from the DX that you are operating. Use the quit command instead.

con Outputs connection information

Syntax `con<terminator>`

Example

```
con
EA
00/00/00 12:34:56

Active connections

Proto Local Address          Foreign Address      State
TCP    192.168.111. 24:34159 192.168.111. 24:1053 ESTABLISHED
TCP      0.  0.  0.  0:34155   0.  0.  0.  0:   0 LISTEN
TCP      0.  0.  0.  0:34159   0.  0.  0.  0:   0 LISTEN
TCP      0.  0.  0.  0:34150   0.  0.  0.  0:   0 LISTEN
EN
```

`TCP`
Protocol used.

`Local Address`
DX socket address.
Displays "IP address:port number."

`Foreign Address`
Destination socket address
Displays "IP address:port number."

`State`
Connection state.

`ESTABLISHED`
Connection established.

eth Outputs Ethernet statistics

Syntax `eth<terminator>`

Example

```
eth
EA
00/00/00 12:34:56
```

```
Ethernet Statistics
Name  In Pkt  In Err  Out Pkt  Out Err  16 Coll
lo0   0       0       0        0        0
mb0   74      0       64       0        0
EN
```

help Outputs help

Syntax `help [,p1]<terminator>`

`p1` Command name
(close, con, eth, help, net, quit)

Example

```
help
EA
con            - echo connection information
eth            - echo ethernet information
help           - echo help
net            - echo network status
quit           - close this connection
EN
```

net Outputs network statistics

Syntax `net<terminator>`

Example

```
net
EA
00/00/00 12:34:56

Network Status

APP: power on time = 00/00/00 12:34:56
APP: applalive     = disable
APP: genedrops     = 0
APP: diagdrops     = 0
APP: ftpsdrops     = 0
TCP: keepalive     = 30 s
TCP: connects      = 14
TCP: closed        = 0
TCP: timeoutdrop   = 0
TCP: keepdrops     = 0
TCP: sndtotal      = 53
TCP: sndbyte       = 0
TCP: sndrexmitpack = 0
TCP: sndrexmitbyte = 1
TCP: rcvtotal      = 0
TCP: rcvbyte       = 0
DLC: 16 collisions = 0
EN
```

`TCP: keepalive`
Keepalive check cycle

`TCP: connects`
Total number of connections established

`TCP: closed`
Total number of closed connections

`TCP: timeoutdrop`
Total number of closed connections due to TCP retransmission timeout. When the transmitted packet is not received, the DX retransmits the packet at a predetermined time interval. If the packet is not received after 14 retransmissions, a timeout occurs, and the connection is closed.

`TCP: keepdrops`
Total number of closed connections due to TCP keepalive timeout

`TCP: sndtotal`
Total number of transmitted packets

`TCP: sndbyte`
Total number of transmitted bytes

`TCP: sndrexmitpack`
Total number of retransmitted packets

`TCP: sndrexmitbyte`
Total number of retransmitted bytes

`TCP: rcvtotal`
Total number of received packets

`TCP: rcvbyte`
Total number of received bytes

`DLC: 16 collisions`
Number of collisions. A collision occurs when two or more instruments on the network attempt to transmit simultaneously. The tendency for collisions to occur increases when the network is congested. 16 collisions would mean 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 via Ethernet)

The instrument information server function interprets one UDP packet to be one command and returns a single packet (containing DX information) in response to the command.

Port number	34264/udp
Transfer data	ASCII
Receive buffer size	128
Transmit buffer size	512
Maximum number of parameters	32

In the command packet, you arrange the parameters that correspond to information you want to receive.

Parameter	Description
`serial`	Outputs the serial number.
`host`	Outputs the host name (host name that you specified in section 1.3).
`ip`	Outputs the IP address (the IP address that you specified in section 1.3).

Example Query the IP address and host name. (The first frame below contains the command packet. The second frame contains the response packet.)

```
ip host
```

```
EA
ip = 192.168.111.24
host = DX1000-1
EN
```

Description
- Separate each parameter with one or more spaces (space, tab, carriage return, or line feed).
- Parameters are not case sensitive.
- Undefined parameters are ignored.
- Parameters after the 32nd parameter are ignored.

4.1 Response Syntax

The following table shows the types of responses for various commands described in the previous chapter.
The DX returns a response (affirmative/negative response) to a command that is delimited by a single terminator. The controller should follow the one command to one response format. When the command-response rule is not followed, the operation is not guaranteed.

Commands		Response	
	Group	**Affirmation**	**Negation**
Setting commands	Setting	Affirmative response	Single negative response or multiple negative responses
	Control		
Basic Setting commands			
Output commands	Control		
	Setup, measurement, and control data output	ASCII output	
		Binary output	
	RS-422/485 dedicated	Dedicated response	No response
	Special resonse commands	Dedicated response	

* For the responses to the instrument information server function, see section 4.4.
For the responses to special commands, see section 3.10.

Note

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

Affirmative Response

When the command is processed correctly, an affirmative response is returned.

- **Syntax**
  E0*CRLF*
- **Example**
  E0

Single Negative Response

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

- **Syntax**
  E1_nnn_mmm···m*CRLF*
  nnn Error number (001 to 999)
  mmm···m Message (variable length, one line)
  _ Space
- **Example**
  E1 001"System error"

Multiple Negative Responses

- If there is an error in any one of the multiple commands that are separated by sub delimiters, multiple negative responses are returned.
- The response is generated for each erroneous command.
- If there are multiple commands that have errors, the negative responses are separated by commas.
- The error position number is assigned to the series of commands in order starting with "1" assigned to the first command.

- **Syntax**

  E2_ee:nnn*CRLF* (When there is only one error)

  E2_ee:nnn,ee:nnn,···,ee:nnn*CRLF* (When there are multiple errors)

  ee Error position (01 to 10)

  nnn Error number (001 to 999)

  _ Space

- **Example**

  E2 02:001

Text Output

For details on the text data types and their formats, see section 4.2.

- **Syntax**

  EA*CRLF*

  ·····*CRLF*

  :

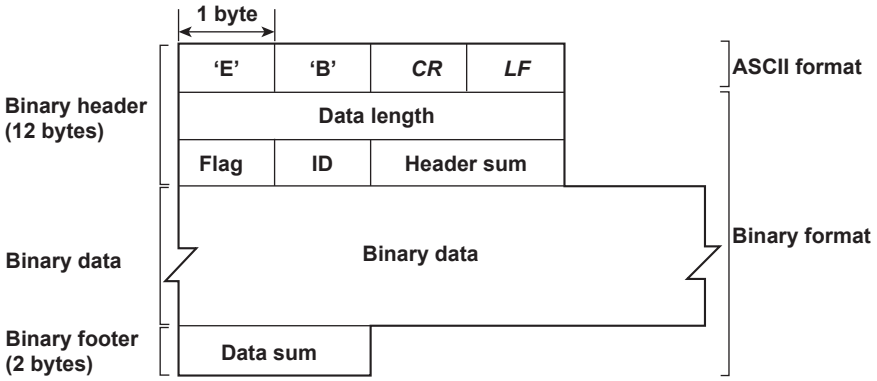
  ·····*CRLF*

  ·····*CRLF*

  EN*CRLF*

Binary Output

Conceptual Diagram



EB*CRLF*

Indicates that the data is binary.

Data Length

The byte value of "flag + identifier + header sum + binary data + data sum."

Header Sum

The sum value of "data length + flag + identifier."

Binary Value

For the output format of various data types, see section 4.3.

Data Sum

The sum value of the binary data.

Note

The data length of the binary header section is output according to the byte order specified with the BO command.

Flag

Bit	Name (Abbreviation)	Flag 0	1	Meaning of the Flag
7	BO	MSB	LSB	Output byte order
6	CS	No	Yes	Existence of a checksum
5	–	–	–	
4	–	–	–	
3	–	–	–	
2	–	–	–	
1	–	–	–	
0	END	Middle	End	In the middle or at the end of the continuous data

- When the BO flag is “0,” the high byte is output first. When the BO flag is “1,” the low byte is output first.
- If the check sum is enabled (parameter = 1) using the CS command parameter, each sum value is inserted in the header sum and data sum sections. If the check sum is disabled (parameter = 0), a zero is inserted in the header sum and data sum sections. For a sample program that calculates the sum value, see “Calculating the sum value” on the next page.
- If the amount of data output in response to a ME/MO command is large, not all the data may be returned in one output request (parameter GET). In this case the END flag becomes 0. You must send output requests (parameter NEXT) to receive the rest of the data until the END flag becomes 1.
- The bits that have “•” for the name and flag are not used. The value is undefined.

ID

An ID number indicating the binary data type. The table below indicates the data types and the corresponding output commands. Binary data that is not indicated in the above table is considered undefined files.

ID Number	Binary Data Type	Type	Format	Output Command
0	Undefined file	file (`*.*`)	–	`ME`
1	Instantaneous data	Data	Yes	`FD`
1	FIFO data	Data	Yes	`FF`
13	Screen data file	File (`*.PNG`)	–	`ME,FC`
15	Display data file	File (`*.DAD`)	No	`ME`
16	Event data file	File (`*.DAE`)	No	`ME`
17	Manual sample file	File (`*.DAM`)	Yes	`ME,MO`
18	Report file	File (`*.DAR`)	Yes	`ME,MO`
19	Setup data file	File (`*.PDL`)	No	`ME,FE4`
25	Setup channel information output	Data	Yes	`FE5`
26	Configured alarm information output	Data	Yes	`FE6`
31	Display data file*1	File (`*.DSD`)	No	`ME`
32	Event data file*1	File (`*.DSE`)	No	`ME`
33	Setup data file*1	File (`*.PEL`)	No	`ME,FE4`
34	Change settings log file*1	File (`*.TXT`)	–	`ME`
35	Report file (for a report template)*2	File (`*.xml`)	–	`ME`

*1 Advanced security (/AS1 option)

*2 Release numbers 4 and later

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.

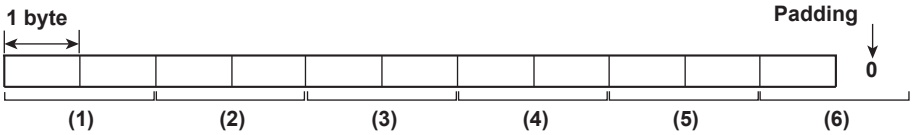
- **File**
  - Display data, event data, and setup data files can be used on the DXA120 DAQSTANDARD Software that comes with the package. For details, see the user's manuals of the DXA120 DAQSTANDARD (IM04L41B01-63EN and IM04L41B01-64EN).
  - Files that are in common formats can be opened using software 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 check sum is the same as that used in the TCP/IP and is derived according to the following algorithm.

Buffer on Which the Sum Value Is Calculated

- For the header sum, it is calculated from "data length + flag + identifier" (fixed to 6 bytes).
- For the data sum, it is calculated from the binary data.



If the data length of the buffer is odd, a zero is padded so that it is even. (1) through (6) are summed as unsigned two-byte integers (unsigned short). If the digit overflows a 1 is added. Finally, the result is bit-wise inverted.

Sample Program

The sum value is determined using the following sample program, and the calculated result is returned. The sum determined by the sample program can be compared with the header sum of the output binary header section and the data sum of the output binary footer section.

```
/*
 * Sum Calculation Function (for a 32-bit CPU)
 *
 * Parameter   buff:  Pointer to the top of the data on which the sum is calculated
 *             len:   Length of the data on which the sum is calculated
 * Returned value:    Calculated sum
 */

int cksum(unsigned char *buff, int len)
{
  unsigned short *p;     /* Pointer to the next two-byte data word in the buffer that is
                            to be summed. */
  unsigned int   csum;   /* Checksum value */
  int i;
  int odd;
  csum = 0;              /* Initialize. */
  odd = len%2;           /* Check whether the number of data points is even. */
  len >>= 1;             /* Determine the number of data points using a "short"
                            data type. */
  p = (unsigned short *)buff;

  for(i=0;i<len;i++)     /* Sum using an unsigned short data type. */
    csum += *p++;
```

```
  if(odd){          /* When the data length is odd */
    union tmp{      /* Pad with a 0, and add to the unsigned short data. */
    unsigned short s;
    unsigned char       c[2];
    }tmp;
    tmp.c[1] = 0;
    tmp.c[0] = *((unsigned char *)p);
    csum += tmp.s;
  }

  if((csum = (csum & 0xffff) + ((csum>>16) & 0xffff)) 0xffff)
                                    /* Add the overflowed digits *
    csum = csum - 0xffff;           /* If the digit overflows again, add a 1. */
  return((~csum) &  0xffff);        /* bit inversion */
}
```


RS-422/485 Dedicated Responses

The following table shows dedicated commands for the RS-422/RS-485 interface and their responses.

Command Syntax	Meaning	Response
ESC Oxx CRLF	Opens the device.	• Response from the device with the specified address *ESC Oxx CRLF* • No response when the device with the specified address does not exist*
ESC Cxx CRLF	Closes the instrument.	• Response from the device with the specified address *ESC Cxx CRLF* • No response when the device with the specified address does not exist*

* 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 ASCII Data

The following types of ASCII data are available. The format for each type is described in this section. The table below indicates the data types and the corresponding output commands.

Data Type	Corresponding Output Command
Setting data/basic setting data	FE0,FE2
Decimal position/unit information	FE1
Measured, computed, and external input data	FD0
Relay status and internal switch status	FD6
Communication log	FLCOM
FTP client log	FLFTPC
Operation error log	FLERR
Login log	FLLOGIN
Operation log (/AS1 option)	FI
Web operation log	FLWEB
E-mail log	FLEMAIL
SNTP access log	FLSNTP
DHCP access log	FLDHCP
Modbus communication log	FLMODBUS
Alarm summary	FLALARM
Message summary	FLMSG
Change settings log (/AS1 option)	FLSETTING
Status information	IS0,IS1
Ethernet information	FAIP
File list	MEDIR
Check disk	MECHKDSK
Manual sampled/report data information	MODIR
User information	FU0,FU1
Event level switch status (Release number 3 or later)	FD7

Note

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

Setting Data/Basic Setting Data

- The FE command is used to output the data.
- The setting/basic setting data is output in the order of the listed commands in the table in section 3.2, "A List of Commands." However, the setting information for the following commands is not output.
  - **Setting commands (setting)**
    SD/FR command
  - **Setting commands (control)**
    All commands from BT to IR
  - **Basic setting commands**
    XE, YO, YE, and YC commands
- The output format of the setting/basic setting data conforms to the syntax of each command.
- Some commands are output in multiple lines. (Example: Commands that are specified for each channel.)
- **Syntax**
  The two-character command name and the subsequent parameters are output in the following syntax.

```
EACRLF
ttsss···sCRLF
..............
ENCRLF
```

tt	Command name (SR, SA···, XA, XI···)
sss···s	Setting/basic setting data (variable length, one line)

- **Example**

```
EA
SR001,VOLT,20mV,0,20
SR002,VOLT,20mV,0,20
.....................
EN
```

Decimal Point Position/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 048: Measurement channel 101 to 160: Computation channel 201 to 440: External input channel
uuuuuu	Unit information (6 characters, left-justified) mV____: mV V_____: V ^C____: °C xxxxxx: (User-defined character string)
pp	Decimal point position (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.
_	Space

- **Example**

```
EA
N 001mV    ,01
N 002mV    ,01
EN
```

Measured, computed, and external input 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.

```
EACRLF
DATE_yy/mo/ddCRLF
TIME_hh:mm:ss.mmmtCRLF
s_ccca1a2a3a4uuuuuufddddddE-ppCRLF
.............................
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)
mmm	Millisecond (000 to 999. A period is placed between seconds and milliseconds.)
t	Reserved (Space.)
s	Data status (N, D, S, O, E, or B) N: Normal D: Differential input S: Skip O: Over E: Error B: Burnout
ccc	Channel number (3 digits) 001 to 048: Measurement channel 101 to 160: Computation channel 201 to 440: External input channel
a1a2a3a4	a1 Alarm status (level 1) a2 Alarm status (level 2) a3 Alarm status (level 3) a4 Alarm status (level 4) (Each status is set to H, L, h, l, R, r, T, t, or space.) ((H: high limit alarm, L: low limit alarm, h: difference high-limit alarm, l: difference low-limit alarm, R: high limit on rate-of-change alarm, r: low limit on rate-of-change alarm, T: delay high limit alarm, t: delay low limit alarm, space: no alarm)
uuuuuu	Unit information (6 characters, left-justified) mV____: mV V_____: V ^C____: °C xxxxxx: (User-defined character string)
f	Sign (+, −)

ddddd Mantissa (00000 to 99999, 5 digits)
- Eight digits for computed data.
- For abnormal data (data status is E) or data of which the mantissa or the exponent exceeds the range (data status is O), the mantissa is set to 99999 (99999999 for computed data).

pp Exponent (00 to 04)

_ Space

- **Example**

```
EA
DATE 99/02/23
TIME 19:56:32.500
N 001h   mV    +12345E-03
N 002    mV    -67890E-01
S 003
EN
```

Note

- Data for non-existing channels are not output (not even the channel number).
- For channels set to skip, output values from alarm status to exponent are spaces.

Relay Status and Internal Switch Status

The FD command is used to output the DO status and internal switch status.

- **Syntax**

```
EACRLF
I01-I06:aaaaaaCRLF
I11-I16:aaaaaaCRLF
I21-I26:aaaaaaCRLF
I31-I36:aaaaaaCRLF
S01-S30:aaa···CRLF
ENCRLF
```

aaa··· Indicates the relay statuses in ascending order by relay number from the left.
- 1: Relay ON
- 0: Relay OFF
- -: Relay not installed

- **Example 1**

When relays I01 to I04 are ON, and I05 and I06 are not installed (for the DX1000).

```
EA
I01-I06:1111--
I11-I16:------
I21-I26:------
I31-I36:------
S01-I30:000000000000000000000000000000
EN
```

Communication Log

- The FL command is used to output the data.
- A log of setting/basic setting/output commands and responses is output. Up to 200 logs are retained. Logs that exceed 200 are cleared from the oldest data.

- **Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_n_uuu···ufd_mmm···mCRLF
.....................................
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)
n	Connection ID. A number used to identify the user that is connected. 0: Serial 1 to 3: Ethernet
uuu···u	User name (up to 20 characters)
f	Multiple command flag Space: Single *: Multiple (If multiple commands are separated by sub delimiters and output at once, "*" is displayed. The multiple commands are divided at each sub delimiter and stored as individual logs (1 log for 1 command and 1 log for 1 response.)
d	Input/Output >: Input <: Output
mmm···m	Message (up to 20 characters) • The communication log contains only the error number and not the error message section. • Normally, the transfer data are transmitted as they are, but in some cases, a special message is output. The special messages are shown below. Reception (Over length): Command length exceeded. (Over number): Number of commands exceeded. (Serial error): Received an error character through serial communications.

Transmission

(ddd byte):	Data output (where ddd is the number of data values)
(Login):	Login
(Logout):	Logout
(Disconnected):	Forced disconnection (occurs when the connection was disconnected when transmitting data using Ethernet).
(Time out):	Timeout, keepalive, TCP retransmission, etc.
E1 nnn:	Single negative response (where nnn is the error number)
E2 ee:nnn:	Multiple negative response (where ee is the error position and nnn is the error number)

_ Space

Advanced security (/AS1 option)

- The parameters of commands whose parameters include the user password (EK, EL, EJ, and LL) are not output.
- Commands performed through the barcode protocol are not logged in the communication log (operations performed through the barcode protocol are logged in the operation log).

- **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
99/05/11 12:31:11 1 12345678901234567890*> BO1
99/05/11 12:31:11 1 12345678901234567890*< E0
99/05/11 12:31:11 1 12345678901234567890*> ???
99/05/11 12:31:11 1 12345678901234567890*< E2 01:124
99/05/11 12:31:11 1 12345678901234567890*> PS0
99/05/11 12:31:11 1 12345678901234567890*< E0
EN
```

FTP Client Log

- The FL command is used to output the data.
- The FTP client log is output. Up to 50 file transfer logs are retained. Logs that exceed 50 are cleared from the oldest data.
- For the meanings of the error codes, see the *DX1000/DX1000N or DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E)*.

- **Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_nnn_xxxxxxxxx_k_ffffffff_···CRLF
·····································
ENCRLF
```

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

- **Example**

```
EA
99/07/26 10:00:00              P display.dsp
99/07/27 10:00:00              P setting.pnl
99/07/28 10:00:00 123 HOSTADDR P trend.png
EN
```

Operation Error Log

- The FL command is used to output the data.
- The operation error log is output. Up to 50 operation error logs are retained. Logs that exceed 50 are cleared from the oldest data.
- Other communication messages (400 to 999) and status messages (500 to 599) are not output.
- For the meanings of the error codes, see the *DX1000/DX1000N or DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E)*.
- **Syntax**

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

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
nnn	Error code (001 to 999)
uuu···u	Error message
_	Space

- **Example**

```
EA
99/05/11 12:20:00 212 Range setting error
99/05/11 12:30:00 217 Media access error
EN
```

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**

```
EACRLF
yy/mo/dd_hh:mm:ss_xxxxxxxxxx_nnn_uuu···uCRLF
·····································
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)

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:	Switching of the daylight savings time
	SNTPtimset:	Time change by SNTP
	CCSetEnd:	Completion of calibration correction
	CCExpire:	Passing of the calibration due date
nnn	Operation property	
	KEY:	Key operation
	COM:	Communication
	REM:	Remote
	ACT:	Event action
	SYS:	System
uuu···u	User name (up to 20 characters)	
_	Space	

- **Example**

```
EA
99/05/11 12:20:00 Login       KEY administrator
99/05/11 12:30:00 Logout      KEY administrator
99/05/11 12:20:00 Login       COM user
99/05/11 12:30:00 Logout      COM user
EN
```

Operation Log (/AS1 option)

- The operation log is output by the FI command.
- An operation history is output. Up to the most recent 100 log items can be output.

- **Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_xxxxxxxxxx_nnn_uuu•••u_ddd•••dCRLF
••••••••••••••••••••••••••••••••••
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (1 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)

xxxxxxxxxx	The operation. It is left justified. See Appendix 1 in the *Advanced Security Function (/AS1) User's Manual (IM04L41B01-05EN)*.	
nnn	Operation type	
	KEY:	Key operation
	COM:	Communication operation (includes serial and Modbus communication)
	REM:	Remote operation
	ACT:	Event action
	SYS:	System operation
uuu•••u	User name (20 characters)	
ddd•••d	Detailed information See Appendix 1 in the *Advanced Security Function (/AS1) User's Manual (IM04L41B01-05EN)*.	
_	Space	

- **Example**

```
    EA
1   99/05/11 12:20:00 AlarmACK   KEY yoshino
2   99/05/11 12:30:00 ChgPasswd  KEY tsuchiya
3   01/06/11 10:00:00 TimeAdj    REM tsuchiya
4   01/06/12 12:30:00 MathStart  KEY uchiyama
5   01/06/13 12:30:00 MathStop   KEY uchiyama
6   01/06/14 12:30:00 Message    KEY uchiyama
7   01/06/15 12:30:00 MathStart  KEY tsuchiya
8   01/06/16 12:30:00 MathStop   KEY tsuchiya
    EN
```

In response to the command "FI0,yoshino:tsuchiya,,10," 1, 2, 3, 7, and 8 are output.
In response to the command "FI0,,MathStart:MathStop,10," 4, 5, 7, and 8 are output.
In response to the command "FI0,,MathStart:MathStop,2," 7 and 8 are output.
In response to the command "FI0,uchiyama,MathStart,10," 4 is output.
In response to the command "FI0,,MathStart,1," 7 is output.

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**

```
EACRLF
yy/mo/dd_hh:mm:ss_ffffff_eee_???···?CRLF
·····································
ENCRLF
```

yy	Year (00 to 99)	
mo	Month (01 to 12)	
dd	Day (01 to 31)	
hh	Hour (00 to 23)	
mm	Minute (00 to 59)	
ss	Second (00 to 59)	
ffffff	Requested operation	
	SCREEN:	Screen change
	KEY:	Key operation
	MSG:	Message assignment/write
	SEARCH:	View data by searching
	BATCH:	Batch switch
eee	Error code when executing the requested operation	
	All spaces:	Success
	001 to 999:	Failure (error code)
???···?	Parameter for each event (see below)	

- When ffffff = SCREEN

```
yy/mo/dd_hh:mm:ss_ffffff_eee_ddddd_nnCRLF
```

ddddd	Screen type	
	TREND:	Trend display
	DIGIT:	Digital display
	BAR:	Bar graph display
	HIST:	Historical trend display
	OV:	Overview display
nn	Group number (01 to 36)	

- When ffffff = KEY

```
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
	FAVOR:	Favorite key

- When ffffff = MSG

```
yy/mo/dd_hh:mm:ss_ffffff_eee_mmm···mCRLF
```

mmm···m Message (up to 32 characters)

- When `ffffff = SEARCH`
  `yy/mo/dd_hh:mm:ss_ffffff_eee_ddddd`*CRLF*
  `ddddd` Data search method
  `TIME:` Time designation
- When `ffffff = BATCH`
  `yy/mo/dd_hh:mm:ss_ffffff_eee_nn`*CRLF*
  `nn` Batch group number (`00` to `12`)
  `00` Batch overview mode screen
  `01` to `12` Batch group number
  `_` Space

- **Example**

```
EA
01/02/11 12:20:00 SCREEN 275 TREND 01
01/02/11 12:21:00 SCREEN     BAR
01/02/11 12:30:00 KEY        UP
01/02/11 12:31:00 KEY        RIGHT
01/02/11 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
.................................
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)	
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
	PASSWD:	Invalid user mail
eee	Error code	
	All spaces:	Success
	001 to 999:	Error code
n	Recipient list	
	1: List 1	
	2: List 2	
	+: List 1 and list 2	
uuu···u	Series of recipient e-mail addresses (up to 30 characters)	
_	Space	

- **Example**

When list 1 is “user1@daqstation.com user2@daqmaster.com” and list 2 is “adv1@daqmaster.com adv2@daqstation.com”

```
EA
01/05/11 12:20:00 ALARM      + user1 user2 adv1 adv2
01/05/11 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**

```
EACRLF
yy/mo/dd_hh:mm:ss_nnn_xxxxxxxxxxCRLF
.....................................
ENCRLF
```

yy	Year (00 to 99)	
mo	Month (01 to 12)	
dd	Day (01 to 31)	
hh	Hour (00 to 23)	
mm	Minute (00 to 59)	
ss	Second (00 to 59)	
nnn	Error number (000 to 999)	
xxxxxxxxxx	Detailed code (9 characters)	
	SUCCESS:	Success
	OVER:	Over the limit
	DORMANT:	Internal processing error
	HOSTNAME:	Failed to look up the host name
	TCPIP:	Internal processing error
	SEND:	Failed to send the request
	TIMEOUT:	A response timeout occurred
	BROKEN:	Packet was corrupt
	LINK:	The data link is disconnected
_	Space	

- **Example**

```
EA
01/05/11 12:20:00      SUCCESS
01/05/11 12:21:00      SUCCESS
01/05/11 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.

Error Number	Detail Code	Description
562	ON	Detected that an Ethernet cable was connected.
	OFF	Detected that an Ethernet cable was disconnected.
563	RENEW	Requesting address renewal to the DHCP server.
	RELEASE	Requesting address release to the DHCP server.
564	RENEWED	Address renewal complete.
	EXTENDED	Address release extension request complete.
	RELEASED	Address release complete.
565	IPCONFIG	IP address configured.
566	NOREQUEST	Configured not to register the host name.
567	UPDATE	Registered the host name to the DNS server.
568	REMOVE	Removed the host name from the DNS server.

The table below shows the contents of the log during erroneous operation.

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

- **Example**

```
EA
01/05/11 12:20:00 563 RENEW
01/05/11 12:20:01 564 RENEWED
01/05/11 12:20:01 565 IPCONFIG
01/05/11 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_xxxxxxx_kkkk_nn_dCRLF
.....................................
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)	
c	Communication type (C or M)	
	C:	Modbus client (Ethernet)
	M:	Modbus master (serial)
xxxxxxx	Even that occurred (7 characters)	
	DROPOUT:	Communication could not keep up and drop out occurred.
	ACTIVE:	Activated.
	READY:	Command ready state.
	CLOSE:	Disconnected.
	HALT:	Command halted.
kkkk	Detail (4 characters)	
	GOOD:	Normal operation
	NONE:	No response from the slave device.
	FUNC:	Received a function error.
	REGI:	Received a register error.
	ERR:	Received a packet error.
	LINK:	Ethernet cable disconnected (Modbus client).
	HOST:	Unable to result the IP address from the host name (Modbus client).
	CNCT:	Failed to connect to the server (Modbus client).
	SEND:	Failed to send the command (Modbus client).
	BRKN:	Failed to receive the command.
	Space	At command start
nn	Command number (1 to 16, space)	
d	Command type (R, W, E, space)	
	R:	Read
	W:	Write
	E:	E-M command
_	Space	

- **Example**

```
EA
01/05/11 12:20:00 C DROPOUT
01/05/11 12:21:00 C READY      NONE 01 R
01/05/11 12:25:00 C HALT       NONE 01 R
EN
```

Alarm Summary

- The FL command is used to output the data.
- The alarm summary is output. Up to 1000 alarm events are retained. Alarm events that exceed 1000 are cleared from the oldest data.
- **Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_kkk_ccc_ls_nnnnnnnnnnCRLF
.....................................
ENCRLF
```

yy/mo/dd hh:mm:ss	Time when the alarm occurred
yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
kkk	Alarm cause
	OFF: Alarm release
	ON: Alarm occurrence
	ACK: Alarm acknowledge
ccc	Measurement, computation, or external input 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.
The channel numbers and alarm levels of individual alarm acknowledgments are logged.

- **Example**

```
EA
01/05/11 12:20:00 ON  001 1L         1
01/05/11 12:30:00 OFF 131 3t         2
01/05/11 12:31:00 OFF *** **         2
01/05/11 12:32:00 ACK                4
EN
```

Message Summary

- The FL command is used to output the data.
- The message summary is output. Up to 100 messages are retained. Messages that exceed 100 are cleared from the oldest log.
- **Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_mmm···_ggg···_zzz_uuu···_nnn···CRLF
·····································
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
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,xx,xx,xx: The groups in which the message is written are delimited by commas and displayed. (Up to four groups)
	ALL: When the multi batch function is not in use: All display groups. When the multi batch function is in use: All display groups in the specified batch group
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
01/05/11 12:20:00 operation-start    01,02,03,04 KEY admin   11
01/05/11 12:20:00 operation-start    01,02       KEY admin   11
01/05/11 12:20:00*0123456789abcdefg  01,02,03,04 KEY admin   12
EN
```

Change Settings Log (/AS1 option)

- The change settings log is output by the FLSETTING command.
- **Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_ffffffff_zzz_uuuuuuuuuuuuuuuuuuuu_xxxxxxxxxx
  CRLF
.....................................
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (1 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)

ffffffff	File name (no extension, 8 characters)
zzz	Operation type
	KEY Key operation
	COM Communication operation
uuu...	User name (20 characters)
xxxxxxxxxx	File serial number (10 characters)
_	Space

- **Example**

```
EA
09/08/12 11:07:00 81211079 KEY Admin678901234567890 1234567890
09/08/12 11:07:00 81211069 KEY Admin678901234567890        123
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, “The Bit Structure of the Status Information.”

Output for the IS0 command

- **Syntax**

EA*CRLF*
aaa.bbb.ccc.ddd*CRLF*
EN*CRLF*

aaa	Status information 1 (000 to 255)
bbb	Status information 2 (000 to 255)
ccc	Status information 3 (000 to 255)
ddd	Status information 4 (000 to 255)

- **Example**

```
EA
000.000.032.000
EN
```

Output for the IS1 Command

- **Syntax**

EA*CRLF*
aaa.bbb.ccc.ddd.eee.fff.ggg.hhh*CRLF*
EN*CRLF*

aaa	Status information 1 (000 to 255)
bbb	Status information 2 (000 to 255)
ccc	Status information 3 (000 to 255)
ddd	Status information 4 (000 to 255)
eee	Status information 5 (000 to 255)
fff	Status information 6 (000 to 255)
ggg	Status information 7 (000 to 255)
hhh	Status information 8 (000 to 255)

- **Example**

```
EA
000.000.032.000.000.000.000.000
EN
```

- Status information 3, 4, 7, and 8 are edge operation. They are cleared when read by the IS command.
- Status information 1, 2, 5, and 6 are level operation. They are not cleared when read. They are cleared when the event clears.
- The status information is made up of bits that correspond to each event. Each bit can be turned ON/OFF with a filter.
- If an event occurs for a bit set to OFF by the filter, status information 3, 4, 7, and 8 discard the event. Status information 1, 2, 5, and 6 hold the event.
- The default filter setting is all ON.

Ethernet Information

- The FA command is used to output the data.

- **Syntax**

```
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)

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**

```
EACRLF
yy/mo/dd_hh:mm:ss_ssssssss_fff•••_n_xxx•••CRLF
.....................................................
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
sssssssss	Data size of the file (_____0 to 99999999) [byte(s)]
fff•••	File name (51 characters including the extension. If it is less than 51, spaces are entered.) If this is a directory, the characters <DIR> are shown at the position displaying the file data size.
n	Batch group number (0, A to H, J to M) 0: No multi batch A to H: Batch group number 1 to 8 J to M: Batch group number 9 to 12
xxx•••	Data serial number (16-digit hexadecimal)
_	Space

The "." and ".." directories are not output.
The batch group number and data serial number are included only for files in the internal memory DATA directory. For all other files, the numbers are empty.

- **Example 1**

File list output of an external storage medium

```
EA
05/02/24 20:07:12       1204 setting.pnl
05/02/24 20:18:36       <DIR> DATA0
EN
```

- **Example 2**

Output of a file list in the DATA directory in the internal memory

```
EA
05/02/24 20:07:12   1204 006607_050101_000402.DAD   0        1ABCDE123
05/02/24 20:07:12   1204 006608_050101_000403.DAD   0 1234567890123456
EN
```

Check Disk

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

- **Syntax**

```
EACRLF
zzz···_Kbyte_freeCRLF
ENCRLF
```

zzz···	Free space on the storage medium (16 digits)
_	Space

- **Example**

```
EA
12345678 Kbyte free
EN
```

Manual Sampled/Report Data Information

The MO command is used to output the data.

- **Syntax**

```
EACRLF
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)
_	Space

When the mode is Seprt2, an individual report file is output for each event. Because of this, the file numbers of the report files saved to the CF card will be different.

- **Example**

```
EA
+        6 05/03/04 00:00:00   20 aaaa30312345.DAR
         7 05/03/05 00:00:00   20 30400005.DAR
         8 05/03/06 00:00:00   20 30500005.DAR
*        9 05/03/06 13:00:00   20 uuuu0005.DAR
EN
```

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 On models with the /AS1 advanced security option, this indicates connection to the setting function.
	e:	Ethernet On models with the /AS1 advanced security option, this indicates connection to the monitoring function.
	S:	RS-232 or RS-422/485
	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, information only on the user himself or herself that is logged in 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
```

Event Level Switch Status (Release number 3 or later)

- The FD command is used to output the event level switch status.

- **Syntax**

```
EACRLF
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaCRLF
ENCRLF
```

aaa...Event level switch status in ascending numerical order.

```
1:ON
0:OFF
```

- **Example**

```
EA
11111111110000000000111111111
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/external input) and FIFO data
- Configured channel information data
- Configured alarm information data
- Manual sample file
- Report sample file

The measured data and computed data are output using signed 16-bit integer and signed 32-bit integer, respectively. These integers can be understood as physical values by adding the decimal point and the unit. The decimal point position can be determined using the FE command.

Typical Examples to Obtain Physical Values from Binary Data

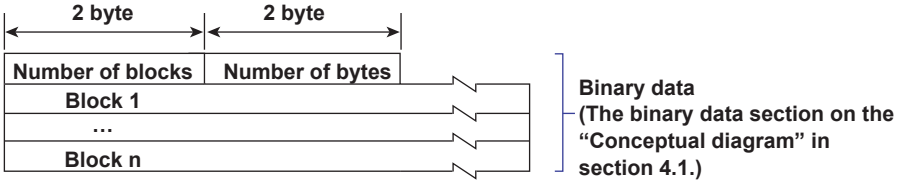
Binary Value	Decimal Position Code	Physical Value (Measured Value)
10000	0	10000
10000	1	1000.0
10000	2	100.00
10000	3	10.000
10000	4	1.0000

Note

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

Measured/Computed Data and FIFO Data

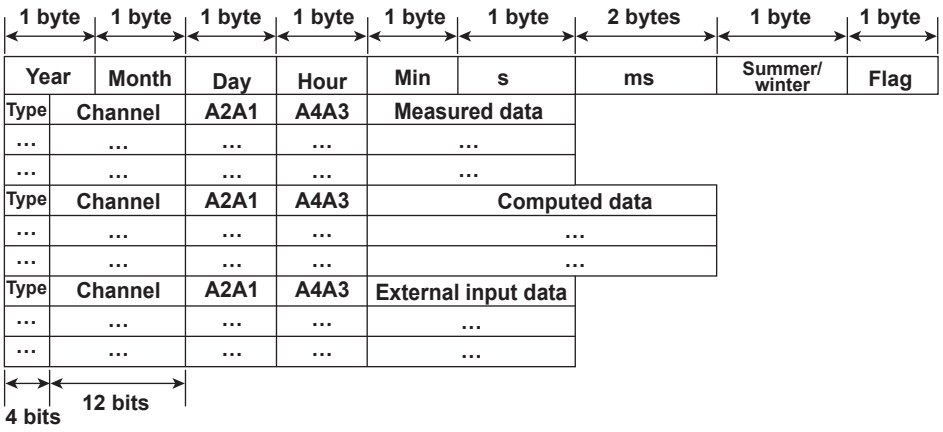
- The FD command is used to output the measured/computed data.
- The FF command is used to output the FIFO data.
- You can use the CB command to specify whether to output the data of measurement channels set to skip and computation or external input channels set to OFF.
- The ID number of the output format is 1. See “ID” in section 4.1.



Number of Blocks
This is the number of blocks.

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

Block



- **Flag**

  The meaning of the each flag is given in the table below. The flags are valid during FIFO data output. The flags are undefined for other cases.

Bit	Flag 0	1	Meaning of the Flag
7	No	Yes	Indicates that the screen snapshot was executed.
6	–	–	
5	–	–	
4	–	–	
3	–	–	
2	No	Yes	Indicates that the decimal position or unit information was changed during measurement.
1	No	Yes	Indicates that the FIFO acquiring interval was changed with the FR command during measurement.
0	No	Yes	Indicates that the internal process took too much time (computation, for example) and that the measurement could not keep up at the specified scan interval.

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

- **Block Member**

Name	Binary Value
Year	0 to 99
Month	1 to 12
Day	1 to 31
Hour	0 to 23
Minute	0 to 59
Second	0 to 59
Millisecond	0 to 999
Summer/winter	0: Winter time, 1: Summer time
Type	0x0: 16-bit integer (measurement channel/external input channel) 0x8: 32-bit integer (computation channel)
Channel	1 to 48, 101 to 160, or 201 to 440
Alarm status* A1 (Bit 0 to 3) A2 (Bit 4 to 7) A3 (Bit 0 to 3) A4 (Bit 4 to 7)	0 to 8
Measured data/external input data	0 to 0xFFFF
Computed data	0 to 0xFFFFFFFF

* A binary value 0 to 8 is entered in the upper and lower 4 bits of a byte (8 bits) for the alarm status. The binary values 0 to 8 correspond to H (high limit alarm), L (low limit alarm), h (difference high-limit alarm), l (difference low-limit alarm), R (high limit on rate-of-change alarm), r (low limit on rate-of-change alarm), T (delay high limit alarm), and t (delay low limit alarm) as follows:
0: no alarm, 1: H, 2: L, 3: h, 4: l, 5: R, 6: r, 7: T, and 8: t.

Special Data Values

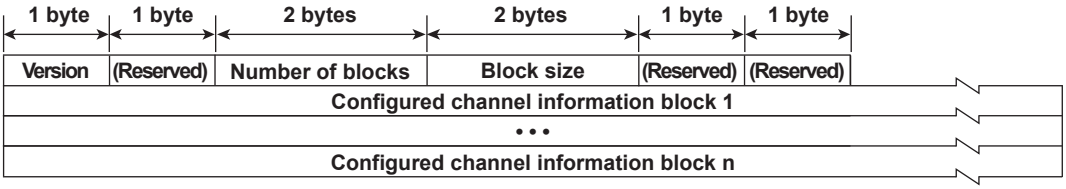
The measured/computed data take on the following values under special conditions.

Special Data Value	Measured Data	Computed Data
+ Over	7FFFH	7FFF7FFFH
– Over	8001H	80018001H
Skip	8002H	80028002H
Error	8004H	80048004H
Undefined	8005H	80058005H
Power failure data	7F7FH	7F7F7F7FH
Burnout (up setting)	7FFAH	7FFF7FFFH
Burnout (down setting)	8006H	80018001H

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

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 for Release Number 2 or Earlier (Format version 1)

- **Format Details**

Item	Description	Output Value
Version	Format version	1
Number of blocks*	Number of configured channel information blocks	Up to 348
Block size*	Configured channel information block size	72 (fixed)
Block 1 to n	Configured channel information blocks	Up to 25056 bytes See Block Details.

* Output in the byte order specified by the BO command.

- **Block Details**

Item	Number of Bytes	Description
Channel number*	2	1 to 440
Decimal place	1	0 to 4
(Reserved)	1	0
Channel type*	4	2H for measurement and external input channels and 4H for computation channels. This value is ORed with 800H when the range mode is DI or 8000H when the range mode is skip.
Unit information	8	The terminator is '\0.'
Tag information	24	You can enter up to 16 characters for the tag comment. The terminator is '\0.'
Minimum input value*	4	Measurement channels: Allowable input range under the current setting Computation channels: –9999999, +99999999 (fixed) External input channels: –30000, +30000 (fixed)
Maximum input value*	4	
Span lower limit*	4	Measurement channels (when scaling is not used): Same value as the DX span setting
Span upper limit*	4	Measurement channels (when scaling is used): Same value as the DX scale setting Computation and external input channels (when scaling is not used): Same value as the DX span setting
Scale lower limit*	4	Measurement channels: Same value as the span
Scale upper limit*	4	Computation and external input channels: Same value as the span
FIFO type*	2	1
Area in the FIFO*	2	Indicates the position of its own channel in the FIFO block of one sample. The value starts from zero.
(Reserved)	4	0

* Output in the byte order specified by the BO command.

Format for Release Number 3 or Later (Format version 2)

- **Format Details**

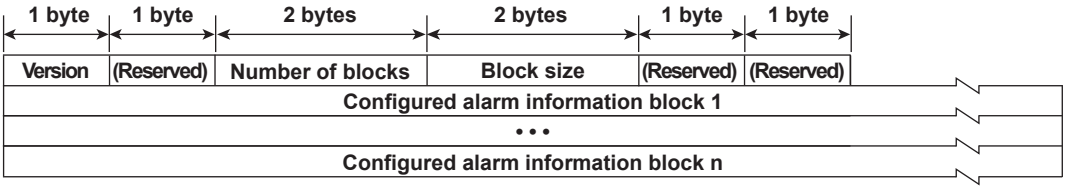
Item	Description	Output Value
Version	Format version	2
Number of blocks	Number of configured channel information blocks	348 maximum
Block size	Configured channel information block size	176 (fixed)
Blocks 1 to n	Configured channel information block	61248 bytes maximum

- **Block Details**

Description	Bytes	Description
Channel number	2	Same as format version 1.
Decimal place	1	Same as format version 1.
(Reserved)	1	Same as format version 1.
Channel type	4	Same as format version 1.
Unit information	8	Same as format version 1.
Tag information	24	You can enter up to 23 characters for the tag comment. The terminator is '\0.'
Minimum input value	4	Same as format version 1.
Maximum input value	4	
Span lower limit	4	Same as format version 1.
Span upper limit	4	
Scale lower limit	4	Same as format version 1.
Scale upper limit	4	
FIFO type	2	Same as format version 1.
Area in the FIFO	2	Same as format version 1.
(Reserved)	4	Same as format version 1.
Tag comment	64	The terminator is '\0.'
Tag number usage, use or not use	1	0: Do not use. 1: Use.
(Reserved)	7	0 (fixed)
Tag No.	32	The terminator is '\0.' If tag number usage is set to zero (do not use): All zeroes.

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.



Format Details

Item	Description	Output Value
Version	Format version	1
Number of blocks*	Number of configured alarm information blocks	Up to 348
Block size*	Size of the of configured alarm information blocks	24
Block 1 to n	Configured alarm information blocks	Up to 8352 bytes See Block Details.

* Output in the byte order specified by the BO command.

Block Details

Item	Number of Bytes	Notes
Channel number*	2	1 to 440
Decimal place	1	0 to 4
(Reserved)	1	0
Alarm type	4	The following settings are entered in order from level 1 to 4. 0: Setting off, 1: H (high limit), 2: L (low limit), 3: h (difference high limit),4: l (difference low limit), 5: R (high limit on rate-of-change), 6: r (low limit on rate-of-change), 7: T (delay high limit), 8: t (delay low limit)
Alarm value*	4×4	The alarm values are entered in order from level 1 to 4.

* 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 *DX1000/DX1000N or DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E)*.

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 *DX1000/DX1000N or DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E)*.

4.4 Output Format of Instrument Information

This section describes the instrument information output format of the instrument information server.

Note

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

Response

The parameters of the packet that are returned as a response are lined up according to the following format.

EA*CRLF*
(Parameter 1)_=_(value of parameter 1)*CRLF*
(Parameter 2)_=_(value of parameter 2)*CRLF*
.....
EN*CRLF*

- The parameter values are output in the order specified by the command parameter.
- The output order of the parameters when `all` is specified is not constant.
- Even if the same parameters are specified numerous times, only the first occurrence is output.
- Lower-case characters are used for the parameters.
- An underscore (_) indicates a space.

The following table shows the parameter types.

Parameter	Output Information
`serial`	Serial number
`host`	Host name
`ip`	IP address

Output Example

Several output examples are indicated below.

Packet Parameter Sent as Commands	Response
Parameters are not case sensitive.	

`ip HoSt`	`EA`
	`ip = 192.168.111.24`
	`host = DX2000`
	`EN`

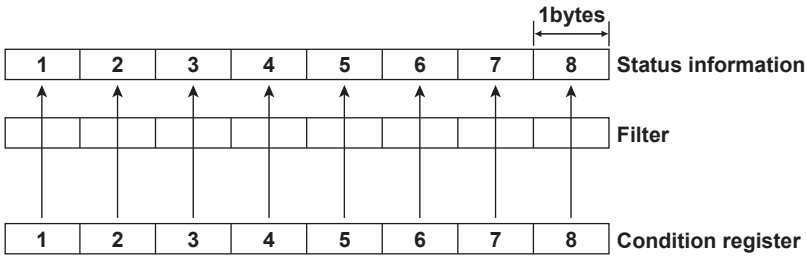
Even if the same parameters are specified numerous times, only the first occurrence is output.	

`host ip host ip host`	`EA`
	`host = DX2000`
	`ip = 192.168.111.24`
	`EN`

Undefined parameters will be ignored.	
(Space)	`EA` `EN`

5.1 Status Information and Filter

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



- 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 ASCII Data.”

Status Information 1

Bit	Name	Description
0	Basic setting	Set to 1 during basic setting mode.
1	Memory sampling	Set to 1 during recording (memory sampling). On models with the multi batch (/BT2 option), this bit is set to 1 if any batch group is recording (memory sampling).
2	Computing	Set to 1 while computation is in progress.
3	Alarm activated	Set to 1 while the alarm is activated.
4	Accessing medium	Set to 1 while the display, event, manual sampled, report, or screen image data file are being saved to the external storage medium.
5	E-mail started	Set to 1 while the e-mail transmission is started
6	Invalid user check operation*1	Set to 1 only during the period when there is an invalid user and the invalid user acknowledge operation has not finished (the period during which the invalid user icon appears on the DX screen).
7	–	–

*1 Advanced security (/AS1 option)

Status Information 2

Bit	Name	Description
0	Setting function communication login*1	Set to 1 while a user is logged in to the DX setting function through Ethernet communication.
1	–	–
2	Memory end	Set to 1 while the free space in the internal memory or external storage medium is low. This is the same as the internal memory and CF card status of the device information output (/F1 or /F2 options; see section 1.9 in the *DX1000/DX1000N or DX2000 User's Manual*).
3	Logged in through keys	Set to 1 while logged in through keys.
4	Login not possible*1	Set to 1 while the multi-login function is not being used and login through key operations, login to the setting function through Ethernet communication, and login through the sending of the LL command through serial communication are not possible, because another user is logged in.
5	–	–
6	Detecting measurement error	Set to 1 while error is being detected in the A/D converter or a burnout is being detected.
7	Detecting communication error	Set to 1 if any command is stopping the communication on the Modbus master or Modbus client.

*1 Advanced security (/AS1 option)

Status Information 3

Bit	Name	Description
0	Measurement dropout	Set to 1 when the measurement process could not keep up.
1	Decimal point/unit information change	Set to 1 when the decimal point/unit information is changed.
2	Command error	Set to 1 when there is a command syntax error.
3	Execution error	Set to 1 when an error occurs during command execution.
4	SNTP error when memory	Set to 1 when the time could not be adjusted using SNTP
5	Custom display setup error	Set to 1 if an error occurs when a custom display setup file is saved or loaded.
6	–	–
7	–	–

Status Information 4

Bit	Name	Description
0	A/D conversion complete	Set to 1 when the A/D conversion of the measurement is complete.
1	Medium access complete	Set to 1 when the display, event, manual sampled, report, or screen image data file are finished being saved to the external storage medium. Set to 1 when setup data is successfully saved or loaded.
2	Report generation complete	Set to 1 when report generation is complete.
3	Timeout	Set to 1 when the timer expires.
4	Custom display setup complete	Set to 1 when the custom display setup is successfully saved or loaded.
5	–	–
6	USER key detection	Set to 1 when the USER key is pressed.
7	–	–

Status Information 5

Bit	Name	Description
0	Batch group #1 memory sampling	Set to 1 during memory sampling.
1	Batch group #2 memory sampling	Same as above
2	Batch group #3 memory sampling	Same as above
3	Batch group #4 memory sampling	Same as above
4	Batch group #5 memory sampling	Same as above
5	Batch group #6 memory sampling	Same as above
6	Batch group #7 memory sampling	Same as above
7	Batch group #8 memory sampling	Same as above

Status Information 6

Bit	Name	Description
0	Batch group #9 memory sampling	Set to 1 during memory sampling.
1	Batch group #10 memory sampling	Same as above
2	Batch group #11 memory sampling	Same as above
3	Batch group #12 memory sampling	Same as above
4	–	–
5	–	–
6	–	–
7	–	–

Status Information 7 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.

Function	Maximum Number of Connections	Number of Simultaneous Uses[*5]		Port Number[*4]
		Administrator	User	
Setting/measurement server	3	1	2[*1]	34260/tcp[*2]
Maintenance/test server	1	1	1[*1]	34261/tcp[*2]
FTP server	2	2	2[*1]	21/tcp[*3]
Web server (HTTP)	1	−	−	80/tcp[*3]
SNTP server	−	−	−	123/udp[*3]
Modbus server	2	−	−	502/tcp[*3]
Instrument information server	−	−	−	34264/udp[*2]
EthereNet/IP				
Explicit message	10	−	−	44818/tcp
EthereNet/IP Explicit messagee	−	−	−	44818/udp
EthereNet/IP Implicit message	−	−	−	2222/udp

*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 Make sure that port number settings are not duplicated.

*5 On models with the /AS1 advanced security option, connections to the setting/measurement server are divided into connections to the setting function and connections to the monitoring function.

Function	Maximum Number of Connections	Number of Simultaneous Uses		Port Number
		Setting Connection	Monitoring Connection	
Setting/measurement server	3	1	2	34260/tcp

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-422/485 Specifications

Terminal block type:	6 point, terminal block, terminal screws: ISO M4/nominal length 6 mm		
Electrical and mechanical specifications:			
	Conforms to EIA-422 (RS-422) 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 DX 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 DX, 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: 125 ms, 250 ms, 500 ms, 1 s, 2 s, 5 s, and 10 s
Connection retry:	Select the reconnection interval after disconnecting the connection after the connection wait time has elapsed from the following: OFF, 10 s, 20 s, 30 s, 1 min, 2 min, 5 min, 10 min, 20 min, 30 min, and 1 h
Connection timeout value:	1 min However, when the IP address is not established with DHCP, a communication error results immediately.
Command timeout value:	10 s
Server:	Set up to 16 servers
Supported functions:	Supported Modbus client functions are as follows: The server device must support these functions.

Function Code	Function	Operation
3	Read the hold register (4XXXX, 4XXXXX)	The DX reads the hold register of the server device into the communication input data or external input channel.
4	Read the input register (3XXXX, 3XXXXX)	The DX reads the input register of the server device into the communication input data or external input channel.
16	Write to the hold register (4XXXX, 4XXXXX)	The DX writes the measured or computed data to the hold register of the server device.

On Models with the PROFIBUS-DP Interface (/CP1 option)

On models with the PROFIBUS-DP interface (/CP1 option), the communication input data for C01 to C24 (on the DX1000) or for C01 to C32 (on the DX2000) is reserved for PROFIBUS-DP. The DX cannot load values into this received data.

Command

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

Symbol	Description
INT16	16-bit signed integer
UINT16	16-bit unsigned integer
INT32_B	32-bit signed integer (higher and lower order)
INT32_L	32-bit signed integer (lower and higher order)
UINT32_B	32-bit unsigned integer (higher and lower order)
UINT32_L	32-bit unsigned integer (lower and higher order)
FLOAT_B	32-bit floating point (higher and lower order)
FLOAT_L	32-bit floating point (lower and higher order)

- **Reading Values into the External Input Channels (DX2000 Only)**
  - External input channels are an option (/MC1).
  - Reads values from the server register into the external input channels of the DX.
  - The data type of external input channels is signed 16-bit integer.
  - The measurement range and unit are set using the external input channels. The decimal point position is determined by the Span_L settings.

DX2000			Server	
Command type	External input channel		Register	Data type
R	Number: 201 to 440 Data type: 16-bit signed integer	← Read	30001 to 39999 300001 to 365536 40001 to 49999 400001 to 465536	INT 16, UINT 16, INT 32_B, INT 32_L, UINT 32_B, UINT 32_L

External Input Channel Values

The range of external input channel values is –30000 to 30000 excluding the decimal. If this range is exceeded, the value is set to +Over or -Over.

Value in the register on the server	Value on the external input channel
More than 30000	+ Over (7FFFH)
-30000 to 30000	-30000 to 30000
Less than -30000	- Over (8001H)

- **Reading Values into Communication Input Data**
  - Reads values from the server register into the communication input data of the DX.
  - Communication input data is an option (/M1, /PM1 option).
  - The data type of the communication input data is 32-bit floating point.
  - Communication input data can be displayed on a computation channel by including the data in the equation of a DX computation channel (/M1, /PM1 option). The measurement range and unit are also set using the computation channel.

DX1000, DX2000			Server	
Command type	Communication input data		Register	Data type
R-M	Number: C01 to C24 (DX1000) C01 to C60 (DX2000) Data type: 32-bit floating point	← Read	30001 to 39999 300001 to 365536 40001 to 49999 400001 to 465536	INT 16, UINT 16, INT 32_B, INT 32_L, UINT 32_B, UINT 32_L, FLOAT_B, FLOAT_L

When the Data Type of the Read Source Server Is Not Floating Point Type

Because the data type of the communication input data is 32-bit floating point, the value never overflows. However, if the absolute value of the data is large for INT32_B, INT32_L, UINT32_B, or UINT32_L, a rounding error may appear. This is because the mantissa of the floating point type is 24 bits.

- **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.
  - The values can be written directly including special data (See “Special Data Values” in section 4.3). Perform data processing on the slave device.

DX1000, DX2000	
Command type	Measurement channel
W	Number: 001 to 012 (DX1000) 001 to 048 (DX2000) Data type: 16 bit signed integer

Write

Server	
Register	Data type
40001 to 49999 400001 to 465536	INT 16 FLOAT_B, FLOAT_L

- **Writing the Computed Values of the Computation Channels**
  - Writes the computed values of the computation channels to the server registers.
  - The computation function is an option (/M1, /PM1 option).
  - The data type of computed values is signed 32-bit integer.

DX1000, DX2000	
Command type	Computation channel
W-M	Number: 101 to 124 (DX1000) 101 to 160 (DX2000) Data type: 32-bit signed integer

Write

Server	
Register	Data type
40001 to 49999 400001 to 465536	INT 16, UINT 16, INT 32_B, INT 32_L FLOAT_B, FLOAT_L

When the Data Type of the Write Destination Server Is Identical (INT32_B or INT32_L)

The values can be written directly including special data (See “Special Data Values” in section 4.3). Perform data processing on the slave device.

When the Data Type of the Write Destination Server Is Different (INT16 or UINT16)

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.

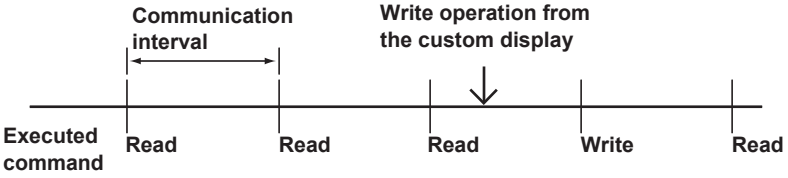
UINT16: A value in the range of 0 to 65535 (excluding the decimal point) can be written. If lower than 0 the value reverts to 0, and if higher than 65535 it reverts to 65535.

Computed value	Data type of the write destination	
	INT16	UINT16
More than 32767	32767	
-32768 to 32767	–32768 to 32767	
Less than -32767	–32768	
More than 65535		65535
0 to 65535		0 to 65535
Less than 0		0

Special values

Computed value	Data type of the write destination	
	INT16	UINT16
+ Over	32767	65535
Burnout (Up)		
- Over	–32768	0
Burnout (Down)		
Skip		
Error		
Undefined		
Power failure data		

- **Loading to Communication Input Data and Direct Writing of Values to the Server**
  - Values from the server register are loaded into the DX communication input data. When you perform the appropriate operation from the custom display, the values are written to the server register.
  - Loading and writing occur in sync with the communication interval.



  - Values are only written to the server when the state of communication is normal (the lamp in the Modbus status display is green), otherwise an error occurs. The DX only attempts to write to the server once. It does not retry after failing.
  - Communication input data is an option (/M1, /PM1 option).
  - 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 a DX computation channel (/M1, /PM1 option). You can also set the measurement range and unit for computation channels.

DX1000, DX2000	
Comman type	Communication input data
E-M	Number: C01 to C24 (DX1000) C01 to C60 (DX2000) Format: 32-bit floating point

Load
Write

Server Device	
Register	Data format
40001 to 49999 400001 to 465536	INT 16, UINT 16, INT 32_B, INT 32_L, UINT 32_B, UINT 32_L, FLOAT_B, FLOAT_L

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.

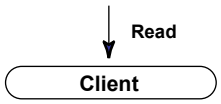
Maximum number of connections: 2

Supported functions: The functions that the DX supports are listed below.

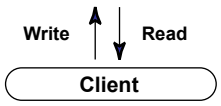
Function Code	Function	Operation
3	Read the hold register (4XXXXX)	The client device reads the communication input data.
4	Read the input register (3XXXXX)	The client device reads the computed, measured, alarm, and time data of the DX.
6	Single write to hold register (4XXXXX)	The client device writes to the communication input data or external input channel of the DX.
8	Loopback test	The client device performs a loopback test of the DX.
16	Write to the hold register (4XXXXX)	The master device writes to the communication input data or external input channel of the DX.

Register assignments (shared with the Modbus slave function)

Data		Input register	
		Number	Data type
Measurement ch.	Measured data	300001 to 300048	16-bit signed integer
	Alarm status	301001 to 301048	Bit string
Computation ch.	Computed data	302001 to 302120	32-bit signed integer
	Alarm status	303001 to 303060	Bit string
External input ch.	Measured data	304001 to 304240	16-bit signed integer
	Alarm status	305001 to 305240	Bit string
Measurement ch.	Alarm list	306001 to 306012	Bit string
Computation ch.	Alarm list	306021 to 306035	Bit string
External input ch.	Alarm list	306041 to 306100	Bit string
Time		309001 to 309008	16-bit signed integer



Data	Hold register	
	Number	Data type
Communication input data	400001 to 400060	16-bit signed integer
	400301 to 400420	32-bit floating point
Measured data on external input ch.	401001 to 401240	16-bit signed integer



On Models with the PROFIBUS-DP Interface (/CP1 option)

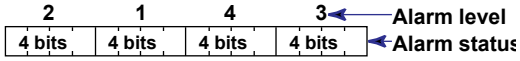
On models with the PROFIBUS-DP interface (/CP1 option), the communication input data for C01 to C24 (on the DX1000) or for C01 to C32 (on the DX2000) is reserved for PROFIBUS-DP. The client device cannot write values to this communication input data.

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.
  - External input channels are DX2000 option (/MC1).
- **Details**

Input Register	Data	Data Type
300001	Measured data of measurement channel 001	16-bit signed integer
|	|	
300048	Measured data of measurement channel 048	
	• There is no decimal position information.	
301001	Alarm status of measurement channel 001	Bit string
|	|	
301048	Alarm status of measurement channel 048	

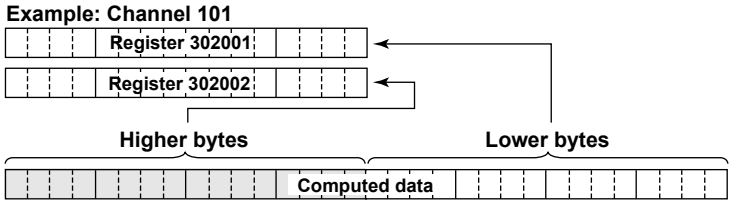
• Register structure and alarm status values



4-bits value	Meaning
0	No alarm
1	High limit alarm
2	Low limit alarm
3	Difference high limit alarm
4	Difference low limit alarm
5	High limit on rate-of-change alarm
6	Low limit on rate-of-change alarm
7	Delay high limit alarm
8	Delay low limit alarm

302001	Lower bytes of the computed data of computation channel 101	32-bit signed integer
302002	Higher bytes of the computed data of computation channel 101	
|	|	
302119	Lower bytes of the computed data of computation channel 160	
302120	Higher bytes of the computed data of computation channel 160	

• Register structure

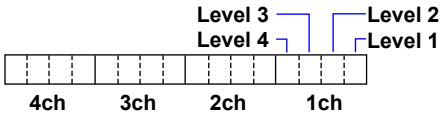


• There is no decimal position information.

303001	Alarm status of computation channel 101	Bit string
|		
303060	Alarm status of computation channel 160	
	• Register structure and alarm status values: Same as the alarm status of the measurement channels.	
304001	Measured data of external input channel 201	16-bit signed integer
|	|	
304240	Measured data of external input channel 440	
	• There is no decimal position information.	
305001	Alarm status of external input channel 201	Bit string
|	|	
305240	Alarm status of external input channel 440	
	• Register structure and alarm status values: Same as the alarm status of the measurement channels.	

Input Register	Data	Data Type
306001	List of alarms of measurement channels 001 to 004	Bit string
|	|	
306012	List of alarms of measurement channels 045 to 048	

- Register structure



Indicates the alarm status of four channels in one register. Set to 1 when alarm is activated.
The figure is an example of register 306001 (measurement channels 001 to 004).

306021	List of alarms of computation channels 101 to 104	Bit string
|	|	
306035	List of alarms of computation channels 157 to 160	

- Register structure: Same as the list of alarms of measurement channels.

306041	List of alarms of external input channels 201 to 204	Bit string
|	|	
306100	List of alarms of external input channels 437 to 440	

- Register structure: Same as the list of alarms of measurement channels.

* Input registers 306001 to 306100 can be accessed consecutively. All unassigned register bits are read as zeroes.

Input Register	Data	Data Type
309001	Year	16-bit signed integer
309002	Month	
309003	Day	
309004	Hour	
309005	Minute	
309006	Second	
309007	Millisecond	
309008	DST	

Hold Register (shared with the Modbus slave function)

- **Common Items**
  - The client device can read and write to the hold registers.
  - Communication input data is an option (/M1, /PM1).
  - External input channels are DX2000 option (/MC1).

  When Writing
  - Communication input data can be handled on a computation channel by including the data in the equation of a DX computation channel.
  - External input channel data can be handled on an external input channel.
  - Details

- **Details**

Hold Register	Data	Data Type
400001 | 400060	Communication input data C01 | Communication input data C60	16-bit signed integer
	• Precautions to be taken when the client device reads the data The communication input data of the DX is floating point type, but the data is converted to signed 16-bit integer when the data is read. • Precautions to be taken when the client device writes the data Only data in signed 16-bit integer type can be written. Floating point values cannot be written.	
400301 400302 | 400419 400420	Lower bytes of communication input data C01 Higher bytes of communication input data C01 | Lower bytes of communication input data C60 Higher bytes of communication input data C60	32-bit floating point
	• 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.	
401001 | 401240	External input channel write register 201 | External input channel write register 440	16-bit signed integer
	• Precautions to be taken when the client device writes the data Only data in signed 16-bit integer type can be written. The measurement range and unit are set using the external input channels. The decimal point position is determined by the Span_L settings.	

Extended Hold Registers (Shared with the Modbus slave function; release number 3 or later)

The following hold registers have been added. You can perform a portion of the operations by writing in the registers. You can write to these registers when a DX with the /AS1 advanced security option is in operation mode.

- Internal switch
- Lot number or lot number for each batch group (when the multi batch function (/BT2 option) is in use)
- Batch number or batch group number for each batch group (when the multi batch function (/BT2 option) is in use)
- Recording (memory sampling) start and stop or recording (memory sampling) start and stop for each batch group (when the multi batch function (/BT2 option) is in use)
- Alarm ACK
- Alarm display reset
- Computation start, computation stop, computation reset, computation dropout ACK, and computation reset for each batch group (when the multi batch function (/BT2 option) is in use)
- Manual sampling, event data sampling start trigger, and snapshot
- Message and free message writing or message and free message writing for each batch group (when the multi batch function (/BT2 option) is in use)
- Event edge switch
- Event level switch

List of Registers

Register	Description	Supplementary Information	Type	Access	Simultaneous Access	
					Write	Read
406061	Internal switch 1	OFF: 0. ON: 1.	INT16	R	–	
406062	Internal switch 2	OFF: 0. ON: 1.	INT16	R	–	
406063	Internal switch 3	OFF: 0. ON: 1.	INT16	R	–	
406064	Internal switch 4	OFF: 0. ON: 1.	INT16	R	–	
406065	Internal switch 5	OFF: 0. ON: 1.	INT16	R	–	
406066	Internal switch 6	OFF: 0. ON: 1.	INT16	R	–	
406067	Internal switch 7	OFF: 0. ON: 1.	INT16	R	–	
406068	Internal switch 8	OFF: 0. ON: 1.	INT16	R	–	
406069	Internal switch 9	OFF: 0. ON: 1.	INT16	R	–	
406070	Internal switch 10	OFF: 0. ON: 1.	INT16	R	–	
406071	Internal switch 11	OFF: 0. ON: 1.	INT16	R	–	
406072	Internal switch 12	OFF: 0. ON: 1.	INT16	R	–	
406073	Internal switch 13	OFF: 0. ON: 1.	INT16	R	–	
406074	Internal switch 14	OFF: 0. ON: 1.	INT16	R	–	
406075	Internal switch 15	OFF: 0. ON: 1.	INT16	R	–	
406076	Internal switch 16	OFF: 0. ON: 1.	INT16	R	–	
406077	Internal switch 17	OFF: 0. ON: 1.	INT16	R	–	
406078	Internal switch 18	OFF: 0. ON: 1.	INT16	R	–	
406079	Internal switch 19	OFF: 0. ON: 1.	INT16	R	–	
406080	Internal switch 20	OFF: 0. ON: 1.	INT16	R	–	
406081	Internal switch 21	OFF: 0. ON: 1.	INT16	R	–	
406082	Internal switch 22	OFF: 0. ON: 1.	INT16	R	–	
406083	Internal switch 23	OFF: 0. ON: 1.	INT16	R	–	
406084	Internal switch 24	OFF: 0. ON: 1.	INT16	R	–	
406085	Internal switch 25	OFF: 0. ON: 1.	INT16	R	–	
406086	Internal switch 26	OFF: 0. ON: 1.	INT16	R	–	
406087	Internal switch 27	OFF: 0. ON: 1.	INT16	R	–	
406088	Internal switch 28	OFF: 0. ON: 1.	INT16	R	–	
406089	Internal switch 29	OFF: 0. ON: 1.	INT16	R	–	
406090	Internal switch 30	OFF: 0. ON: 1.	INT16	R	–	
407833 to 407834	Lot number	Valid range: 0 to 99999999 (When the multi batch function (/BT2 option) is in use, this is the lot number of batch group 1.)	INT32_L	R/W		
407835 to 407851	Batch number	Up to 17 registers (up to 33 characters with '\0' termination). The batch number must be 32 characters or less. (When the multi batch function (/BT2 option) is in use, this is the batch number of batch group 1.)	STR34	R/W		
409503	Memory start or stop	Stop: 0. Start: 1. (When the multi batch function (/BT2 option) is in use, this register controls memory start and stop of batch group 1.)	INT16	R/W		
409504	Alarm acknowledge	Applies to all alarms. <When writing> Execute alarm ACK: 1 (fixed) <When reading (alarm summary)> Alarm off: 0. Alarm illuminated: 1. Alarm blinking (occurring): 2. Alarm blinking (not occurring): 3	INT16	R/W		
409505	Alarm display reset	Execute alarm display reset: 1 (fixed)	INT16	W		
409506	Computation operation	<When writing> Stop: 0. Start: 1. Reset: 2. Computation dropout ACK: 4. (When the multi batch function (/BT2 option) is in use, this register performs computation reset of batch group 1.) <When reading> Stop: 0. Start: 1. (You cannot read this register when the multi batch function (/BT2 option) is in use.)	INT16	R/W		

Register	Description	Supplementary Information	Type	Access	Simultaneous Access	
					Write	Read
409512	Manual sampling start or other action	Manual sampling: 0. Manual trigger: 1. Snapshot: 2.	INT16	W		
410001 to 410002	Batch 1 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410003 to 410020	Batch 1 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410021 to 410050	(Reserved) batch 1	-	-	-		
410051 to 410052	Batch 2 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410053 to 410070	Batch 2 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410071 to 410100	(Reserved) batch 2	-	-	-		
410101 to 410102	Batch 3 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410103 to 410120	Batch 3 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410121 to 410150	(Reserved) batch 3	-	-	-		
410151 to 410152	Batch 4 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410153 to 410170	Batch 4 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410171 to 410200	(Reserved) batch 4	-	-	-		
410201 to 410202	Batch 5 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410203 to 410220	Batch 5 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410221 to 410250	(Reserved) batch 5	-	-	-		
410251 to 410252	Batch 6 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410253 to 410270	Batch 6 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410271 to 410300	(Reserved) batch 6	-	-	-		
410301 to 410302	Batch 7 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410303 to 410320	Batch 7 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410321 to 410350	(Reserved) batch 7	-	-	-		
410351 to 410352	Batch 8 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410353 to 410370	Batch 8 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410371 to 410400	(Reserved) batch 8	-	-	-		

Register	Description	Supplementary Information	Type	Access	Simultaneous Access	
					Write	Read
410401 to 410402	Batch 9 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410403 to 410420	Batch 9 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410421 to 410450	(Reserved) batch 9	-	-	-		
410451 to 410452	Batch 10 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410453 to 410470	Batch 10 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410471 to 410500	(Reserved) batch 10	-	-	-		
410501 to 410502	Batch 11 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410503 to 410520	Batch 11 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410521 to 410550	(Reserved) batch 11	-	-	-		
410551 to 410552	Batch 12 lot number	Valid range: 0 to 99999999	INT32_L	R/W		
410553 to 410570	Batch 12 batch number	Up to 18 registers (up to 35 characters with '\0' termination). The batch number must be 32 characters or less.	STR36	R/W		
410571 to 410600	(Reserved) batch 12	-	-	-		
410601	Preset message writing	Message number (1 to 100)	INT16	W		
410602		Message write destination • When the multi batch function is not in use 0: All groups. 1 to 36: Specified group number. • When the multi batch function is in use 0: All groups of a specified batch number (410603) 1 to 12: Specified group number	INT16	W		
410603		Batch number designation for multi batch: 1 to 12 (Valid only when the multi batch function is available. Any value when the multi batch function is not available)	INT16	W		
410604 to 410610	(Reserved) Preset message	-	-	-		

Register	Description	Supplementary Information	Type	Access	Simultaneous Access	
					Write	Read
410611	Free message writing	Message number (1 to 10)	INT16	W		
410612		Message write destination • When the multi batch function is not in use 0: All groups. 1 to 36: Specified group number. • When the multi batch function is in use 0: All groups of a specified batch number (410613) 1 to 12: Specified group number	INT16	W		
410613		Batch number designation for multi batch: 1 to 12 (Valid only when the multi batch function is available. Any value when the multi batch function is not available)	INT16	W		
410614 to 410631		Free message Up to 18 registers (up to 35 characters with '\0' termination). The message must be 32 characters or less.	STR36	W		
410632 to 410680	(Reserved) Free message	-	-	-		
410681	Batch 1 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410682	Batch 2 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410683	Batch 3 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410684	Batch 4 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410685	Batch 5 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410686	Batch 6 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410687	Batch 7 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410688	Batch 8 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410689	Batch 9 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410690	Batch 10 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410691	Batch 11 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		
410692	Batch 12 memory start and stop	Stop: 0. Start: 1.	INT16	R/W		

Register	Description	Supplementary Information	Type	Access	Simultaneous Access	
					Write	Read
410693	Batch 1 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410694	Batch 2 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410695	Batch 3 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410696	Batch 4 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410697	Batch 5 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410698	Batch 6 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410699	Batch 7 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410700	Batch 8 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410701	Batch 9 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410702	Batch 10 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410703	Batch 11 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410704	Batch 12 computation reset	Execute computation reset: 1 (fixed)	INT16	W		
410705	Event edge switch 1	Execute event edge switch: 1 (fixed)	INT16	W		
410706	Event edge switch 2	Execute event edge switch: 1 (fixed)	INT16	W		
410707	Event edge switch 3	Execute event edge switch: 1 (fixed)	INT16	W		
410708	Event edge switch 4	Execute event edge switch: 1 (fixed)	INT16	W		
410709	Event edge switch 5	Execute event edge switch: 1 (fixed)	INT16	W		
410710	Event edge switch 6	Execute event edge switch: 1 (fixed)	INT16	W		
410711	Event edge switch 7	Execute event edge switch: 1 (fixed)	INT16	W		
410712	Event edge switch 8	Execute event edge switch: 1 (fixed)	INT16	W		
410713	Event edge switch 9	Execute event edge switch: 1 (fixed)	INT16	W		
410714	Event edge switch 10	Execute event edge switch: 1 (fixed)	INT16	W		
410715	Event edge switch 11	Execute event edge switch: 1 (fixed)	INT16	W		
410716	Event edge switch 12	Execute event edge switch: 1 (fixed)	INT16	W		
410717	Event edge switch 13	Execute event edge switch: 1 (fixed)	INT16	W		
410718	Event edge switch 14	Execute event edge switch: 1 (fixed)	INT16	W		
410719	Event edge switch 15	Execute event edge switch: 1 (fixed)	INT16	W		
410720	Event edge switch 16	Execute event edge switch: 1 (fixed)	INT16	W		
410721	Event edge switch 17	Execute event edge switch: 1 (fixed)	INT16	W		
410722	Event edge switch 18	Execute event edge switch: 1 (fixed)	INT16	W		
410723	Event edge switch 19	Execute event edge switch: 1 (fixed)	INT16	W		
410724	Event edge switch 20	Execute event edge switch: 1 (fixed)	INT16	W		
410725	Event edge switch 21	Execute event edge switch: 1 (fixed)	INT16	W		
410726	Event edge switch 22	Execute event edge switch: 1 (fixed)	INT16	W		
410727	Event edge switch 23	Execute event edge switch: 1 (fixed)	INT16	W		
410728	Event edge switch 24	Execute event edge switch: 1 (fixed)	INT16	W		
410729	Event edge switch 25	Execute event edge switch: 1 (fixed)	INT16	W		
410730	Event edge switch 26	Execute event edge switch: 1 (fixed)	INT16	W		
410731	Event edge switch 27	Execute event edge switch: 1 (fixed)	INT16	W		
410732	Event edge switch 28	Execute event edge switch: 1 (fixed)	INT16	W		
410733	Event edge switch 29	Execute event edge switch: 1 (fixed)	INT16	W		
410734	Event edge switch 30	Execute event edge switch: 1 (fixed)	INT16	W		

Register	Description	Supplementary Information	Type	Access	Simultaneous Access	
					Write	Read
410765	Event level switch 1	OFF: 0. ON: 1.	INT16	R/W		
410766	Event level switch 2	OFF: 0. ON: 1.	INT16	R/W		
410767	Event level switch 3	OFF: 0. ON: 1.	INT16	R/W		
410768	Event level switch 4	OFF: 0. ON: 1.	INT16	R/W		
410765	Event level switch 5	OFF: 0. ON: 1.	INT16	R/W		
410770	Event level switch 6	OFF: 0. ON: 1.	INT16	R/W		
410771	Event level switch 7	OFF: 0. ON: 1.	INT16	R/W		
410772	Event level switch 8	OFF: 0. ON: 1.	INT16	R/W		
410773	Event level switch 9	OFF: 0. ON: 1.	INT16	R/W		
410774	Event level switch 10	OFF: 0. ON: 1.	INT16	R/W		
410775	Event level switch 11	OFF: 0. ON: 1.	INT16	R/W		
410776	Event level switch 12	OFF: 0. ON: 1.	INT16	R/W		
410777	Event level switch 13	OFF: 0. ON: 1.	INT16	R/W		
410778	Event level switch 14	OFF: 0. ON: 1.	INT16	R/W		
410779	Event level switch 15	OFF: 0. ON: 1.	INT16	R/W		
410780	Event level switch 16	OFF: 0. ON: 1.	INT16	R/W		
410781	Event level switch 17	OFF: 0. ON: 1.	INT16	R/W		
410782	Event level switch 18	OFF: 0. ON: 1.	INT16	R/W		
410783	Event level switch 19	OFF: 0. ON: 1.	INT16	R/W		
410784	Event level switch 20	OFF: 0. ON: 1.	INT16	R/W		
410785	Event level switch 21	OFF: 0. ON: 1.	INT16	R/W		
410786	Event level switch 22	OFF: 0. ON: 1.	INT16	R/W		
410787	Event level switch 23	OFF: 0. ON: 1.	INT16	R/W		
410788	Event level switch 24	OFF: 0. ON: 1.	INT16	R/W		
410789	Event level switch 25	OFF: 0. ON: 1.	INT16	R/W		
410790	Event level switch 26	OFF: 0. ON: 1.	INT16	R/W		
410791	Event level switch 27	OFF: 0. ON: 1.	INT16	R/W		
410792	Event level switch 28	OFF: 0. ON: 1.	INT16	R/W		
410793	Event level switch 29	OFF: 0. ON: 1.	INT16	R/W		
410794	Event level switch 30	OFF: 0. ON: 1.	INT16	R/W		
410801	Setting function communication login	The value is 1 only when a user has logged into the DX setting function through Ethernet communication. This only applies to DXs with the /AS1 advanced security option.	INT16	R	—	
410802	Key login	The value is 1 when a user has logged into the DX through key operations. This only applies to DXs with the /AS1 advanced security option.	INT16	R	—	
410803	Login not possible	The value is 1 when login through key operations, login to the setting function through Ethernet communication, and login through the sending of the LL command through serial communication are not possible, because another user is logged in. This only applies to DXs with the /AS1 advanced security option.	INT16	R	—	
410804	Individual alarm ACK channel number	Specifies the alarm released by an individual alarm ACK operation. The channel and alarm level are accessed successively. This only applies to DXs with the /AS1 advanced security option.	INT16	W		
410805	Individual alarm acknowledgment alarm level		INT16	W		

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 occurs.

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.

How to Use

Item	Description
Data type STRnn	Registers in which ASCII codes are entered starting with the specified register. It is terminated with a NULL character (\0). The number of characters that can be entered that includes the NULL character is indicated in the nn section. Example of setting the batch number (STR36 type) of batch group 1 to “ABCD” "**" denotes any value.

Register	Value to Write	Hexadecimal Notation
410003	'A"B'	(4142H)
410004	'C"D'	(4344H)
410005	'\0'*	(00**H)
410006 to		
410020	**	(****H)

Write the entire character string using one command.
In the above example, registers 410003 to 410005 must be written using one command.
A zero is read when you read a write-only register.

Lot number	• Access the registers two registers at a time. • You can only access from the first register. • On models without the multi batch function (/BT2 option) or on models with the multi batch function (/BT2 option) but with the multi batch function disabled, if you access a lot number of a batch group, an error occurs.
Batch number	• You can only access from the first register. • On models without the multi batch function (/BT2 option) or on models with the multi batch function (/BT2 option) but with the multi batch function disabled, if you access a batch number of a batch group, an error occurs.
Message	• You can only write from the first register. • A message is written using one command. In other words, write to registers 410601 to 410603 using one command. On models without the multi batch function, you only have to write to registers 410601 and 410602 instead. On models without the multi batch function, the message write destination can be omitted (write only to 410601). If you omit it, the operation is the same as when all groups are specified.
Free message	• You can only write from the first register. • A free message is written using one command. If you omit the free message section, an all-space message is written. On models without the multi batch function, the message write destination and subsequent registers can be omitted (write only to 410611). If you omit them, an all-space message is written to every group. Example: To write the free message "ABCD" to all display groups in batch group number 4 using message number 10, write the values in the following table using one command. "**" denotes any value.

Register	Value to Write	Hexadecimal Notation
410611	10	(000AH)
410612	0	(0000H)
410613	4	(0004H)
410614	'A"B'	(4142H)
410615	'C"D'	(4344H)
410616	'\0'*	(00**H)

Computation reset	On models without the multi batch function (/BT2 option) or on models with the multi batch function (/BT2 option) but with the multi batch function disabled, if you access computation reset of a batch group, an error occurs.

Item	Description

Simultaneous access	• Batch numbers and lot numbers can be written using one command for each batch.
	Example 1: On models without the multi batch function (/BT2 option), you can write to registers 407833 to 407851 using one command.
	Example 2: For batch group 1, you can write to registers 410001 to 410020 using one command.
	Example 3: To set the batch number of batch group 1 to "ABCD" (see the explanation for "Data type STRnn" for details), you can write registers 410001 to 410005 using one command.
	• You cannot simultaneously access batch numbers or lot numbers across multiple batch groups.
	• When reading, you can access the following registers simultaneously.
	  • Internal switches 1 to 30
	  • Memory start/stop for batches 1 to 12
	  • Event level switches 1 to 30

When the Data Type in a Command Differs from the DX Data Type

Every DX data value has a set data type.

If you access the DX using the same data type, all of the data, including special data, are sent to the DX without any change. If you access the DX using a data type that is different from the DX data type, the data type is converted. For details on the conversion rules, see “Communication Considerations” in the *DX1000/DX1000N/DX2000 EtherNet/IP Communication Interface User’s Manual (IM04L41B01-18E)*.

Modbus Error Response (Common to Modbus server and Modbus slave)

The DX returns the following error codes to a client or master device.

Code	Error	Description
1	ILLEGAL FUNCTION Invalid function code	An attempt was made to execute a function that is not supported.
2	ILLEGAL DATA ADDRESS Invalid register number	Failed to access the register.
3	ILLEGAL DATA VALUE Invalid number of registers	When reading, the specified number of registers was less than or equal to zero or greater than or equal to 126. When writing, the specified number of registers was less than or equal to zero or greater than or equal to 124.

7	NEGATIVE ACKNOWLEDGE
	Invalid contents written
		• A lot number that is outside the valid range was entered.
		• Invalid characters (such as ‘¥x1b’) were written in batch number or free message registers.
		• Failed to control the following operations.
		  • Writing messages
		  • Writing free messages
		  • Writing batch numbers and lot numbers

However, no response is returned for the following errors.

- CRC error
- Errors other than those shown above

Modbus Master Function

Basic Operations

- The DX, 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-422, or RS-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: 125, 250, 500 ms, 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 DX 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 DX 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* after receiving a response of a command until sending the next command from the following: OFF, 5, 10, 15, 45, and 100 ms * 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, R-M, W, W-M
Command setting:	Set up to 16 commands
Command items:	Read channel 201 to 440, C01 to C60 Write channel 001 to 048, 101 to 160 (varies depending on the model) Address: 1 to 247 Input register: 30001 to 39999, 300001 to 365535 Hold register: 40001 to 49999, 400001 to 465535
Access method:	Same as the Modbus client.
Supported functions:	Same as the Modbus client.
Data type:	Same as the Modbus client.

Modbus Slave Function

Serial Communication Specifications:
Same as the Modbus Master Function

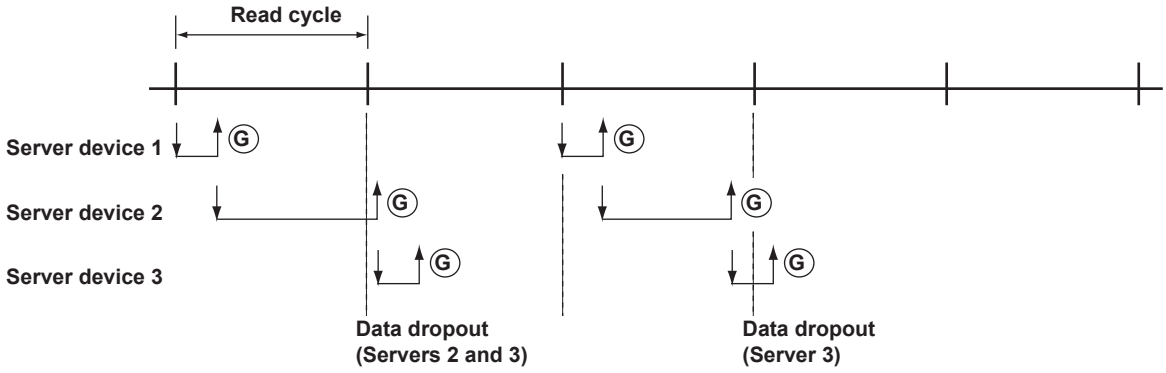
Slave address:	1 to 99.
Supported functions:	Same as the Modbus server.
Register assignments:	Same as the Modbus server.
Modbus error response:	Same as the Modbus server.

Appendix 1 Data Dropout during Modbus Communication

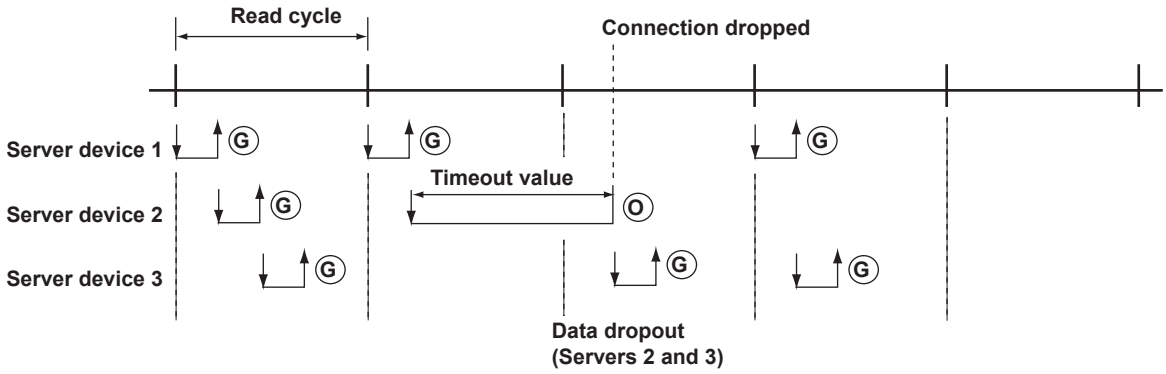
Data Dropout during Modbus Client

If the response to the previous command is not complete when the DX attempts to issue a command to a server device, the DX command cannot issue the command causing a data dropout. Take appropriate measures by referring to the following figures.

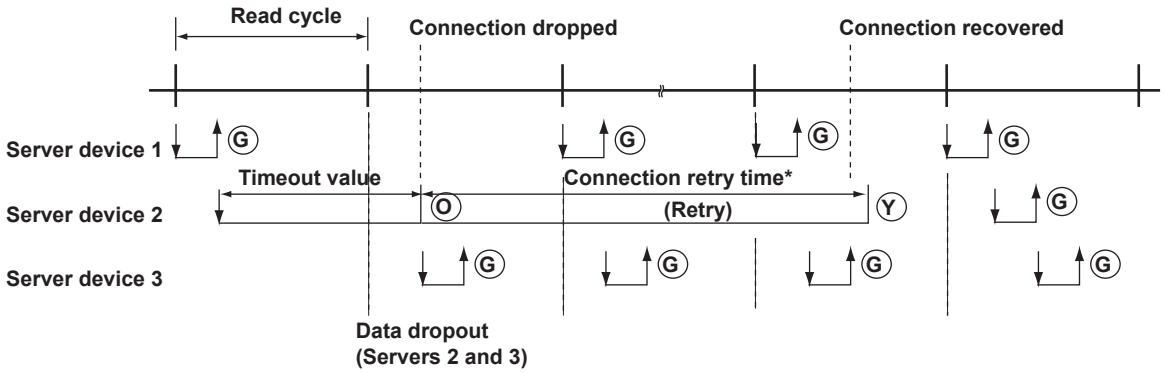
1. When the response from the server device takes a long time



2. When the connection is dropped because there is no response from the server device



3. When the communication recovers by connection retry



G Y O R : Status lamp

: Command from the DX

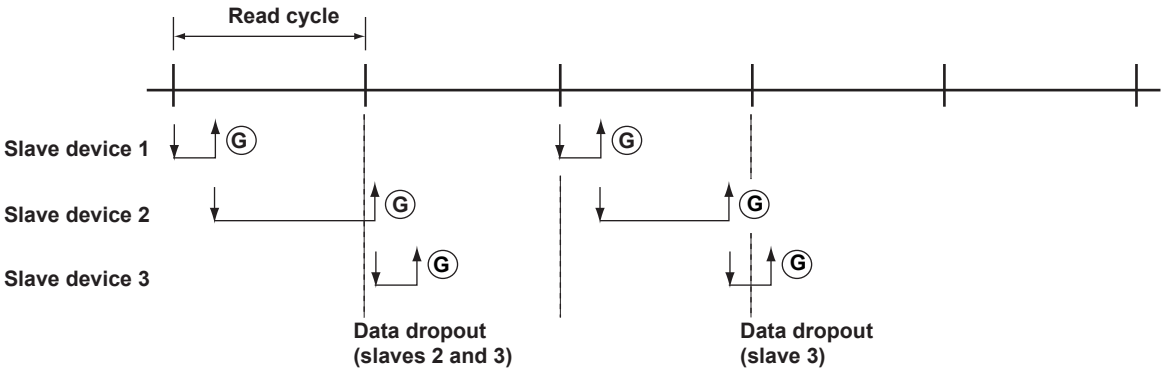
: Response from the server device

* 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.

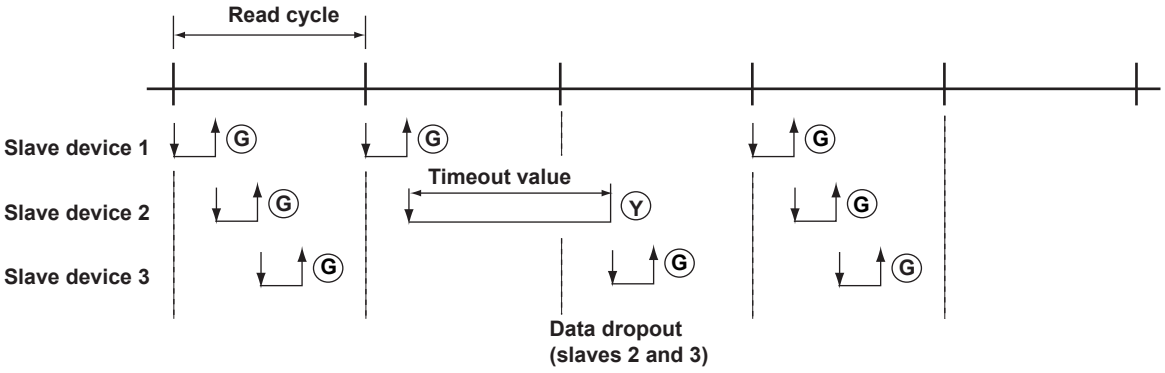
Data Dropout during Modbus Master

If the response to the previous command is not complete when the DX attempts to issue a command to a slave device, the DX command cannot issue the command causing a data dropout. Take appropriate measures by referring to the following figures.

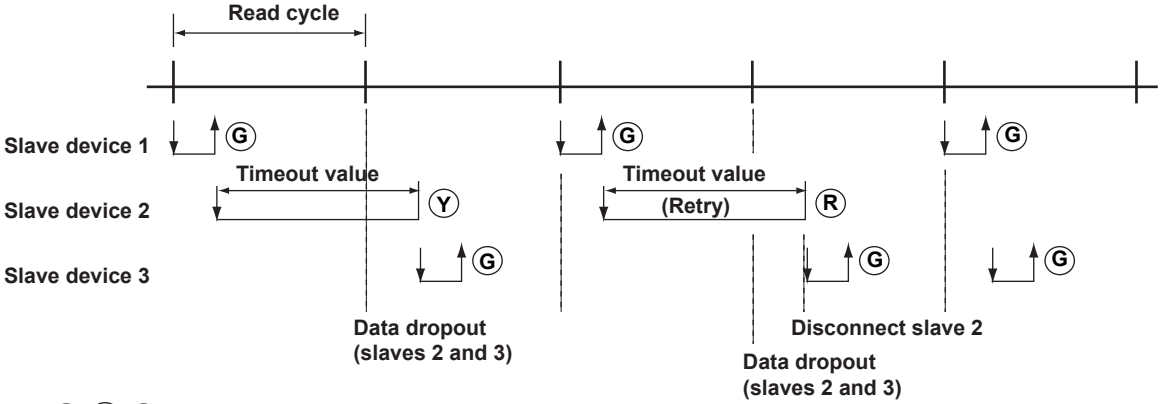
1. When the response from the slave device takes a long time



2. When there is no response from the slave device



3. When the slave device that is not responding is disconnected (retry count is set to 1)



G Y R Status lamp

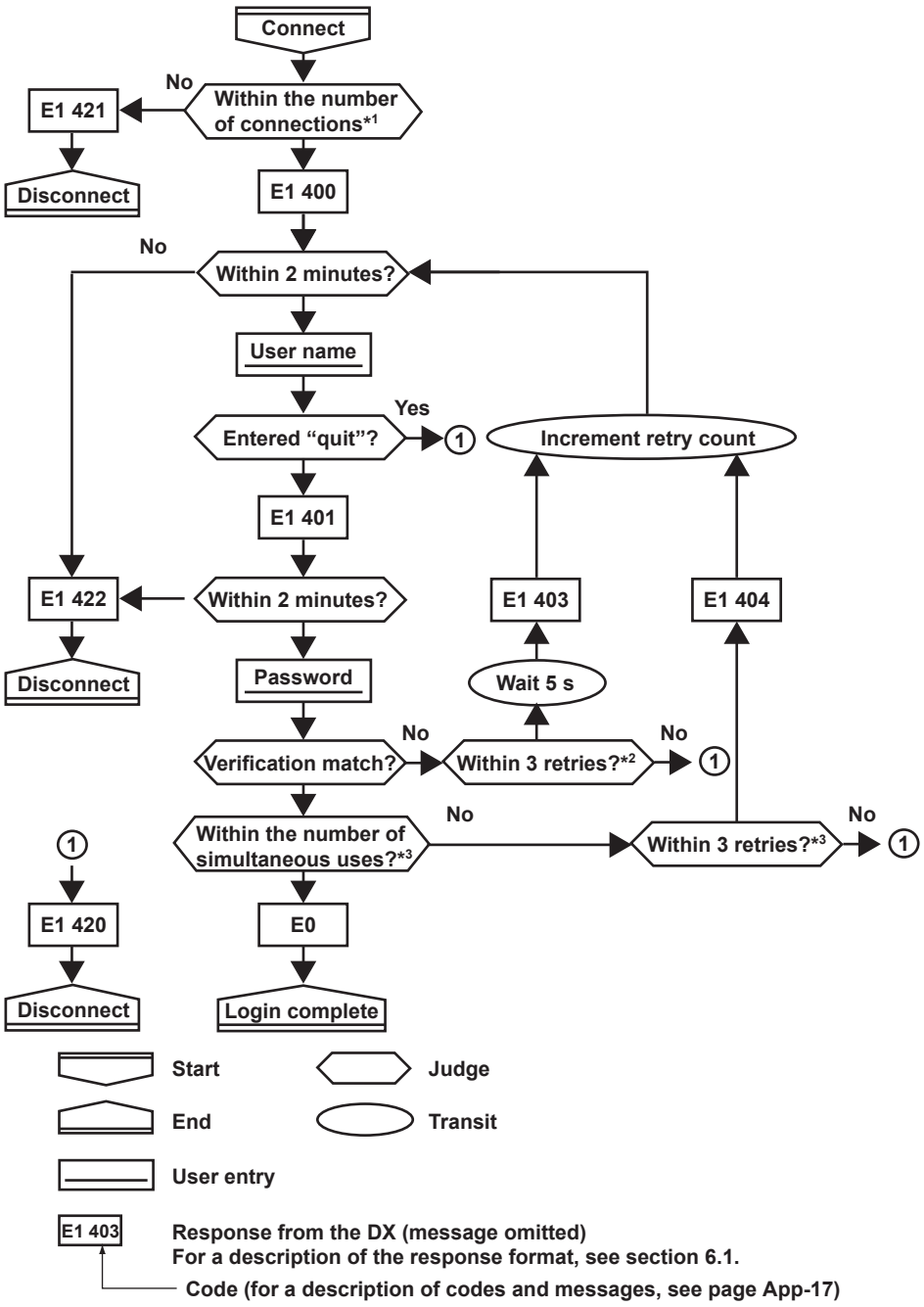
: Command from the DX

: Response from the slave device

Appendix 2 Login Procedure

You log into the DX 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 DX



*1 Connections cannot exceed the maximum number of connections (see section 2.1).

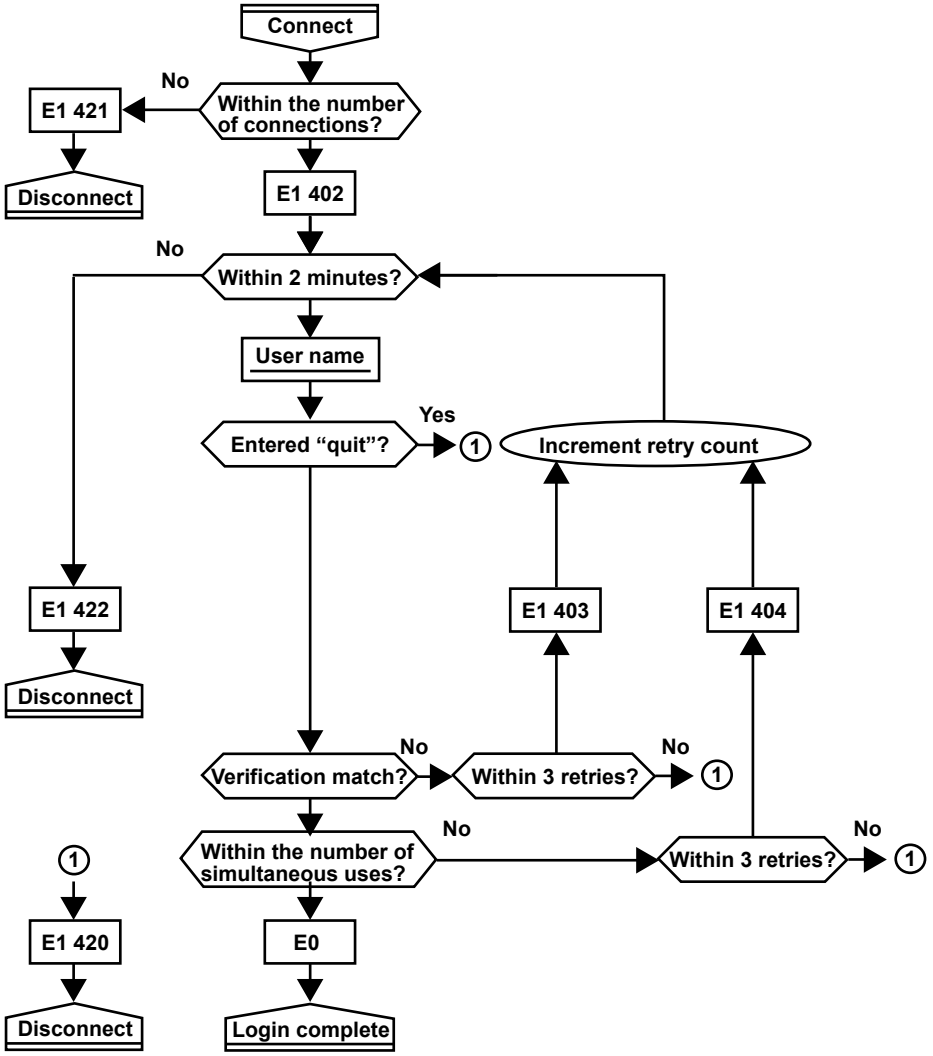
*2 If you try to log in using a wrong password four consecutive times, the communication is dropped (the number of retries for login is three).

*3 If you try to log in causing the number of simultaneous uses at the administrator or user level to be exceeded (see section 2.1) four consecutive times, the communication is dropped (even if the password is correct).

When Not Using the Login Function of the DX

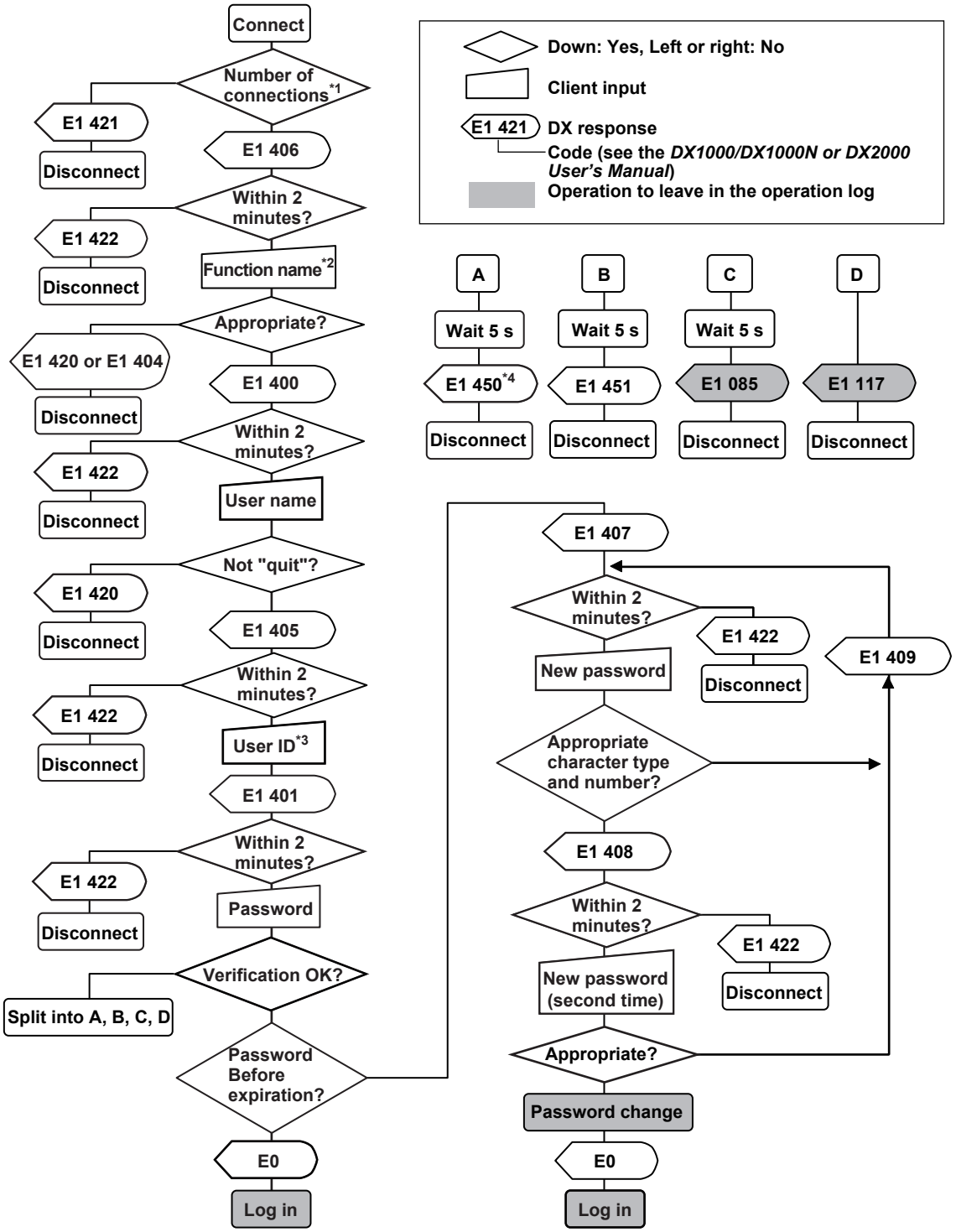
Login as “admin” or “user.”

- The user name “admin” can be used to login to the DX as an administrator.
- The user name “user” can be used to access the DX as a user.



When Using the Login Function on a DX With the /AS1 Advanced Security Option

The following is the flow of the setting/measurement server login operation.



*1 For information about the maximum number of simultaneous connections, see section 6.1.

*2 Function name: Enter "setting" to select the setting function and "monitor" to select the monitoring function.

*3 The user ID is requested even for settings that do not use it, but for these settings, you can enter anything you want to.

*4 If using the password management function (/AS1 option), the following error code is also output.
006, 110, 114, 764, 765, 766, 767, 768, 769, 771, 772, 773, 774, 775

For information on login conditions, see section 1.12. For error codes, see chapter 10 (DX1000/DX1000N) or chapter 11 (DX2000) in the *DX1000/DX1000N or DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E)*.

Appendix 3 ASCII Character Codes

Upper 4 bits

Lower 4 bits	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P		p					À	Ð	à	ð
1				1	A	Q	a	q			¡		Á	Ñ	á	ñ
2				2	B	R	b	r				²	Â	Ò	â	ò
3			#	3	C	S	c	s				³	Ã	Ó	ã	ó
4				4	D	T	d	t					Ä	Ô	ä	ô
5			%	5	E	U	e	u				µ	Å	Õ	å	õ
6			&	6	F	V	f	v					Æ	Ö	æ	ö
7				7	G	W	g	w					Ç	×	ç	÷
8			(	8	H	X	h	x					È	Ø	è	ø
9			)	9	I	Y	i	y					É	Ù	é	ù
A	LF		*	:	J	Z	j	z					Ê	Ú	ê	ú
B		ESC	+	;	K	[	k						Ë	Û	ë	û
C			,		L		l						Ì	Ü	ì	ü
D	CR		-		M	]	m						Í	Ý	í	ý
E			.		N	°	n						Î	Þ	î	þ
F			/	?	O	_	o					¿	Ï	ß	ï	

- The delimiter (,), sub delimiter (;), query symbol (?), and terminator (CR+LF) characters are reserved. You cannot use them as parameter characters.

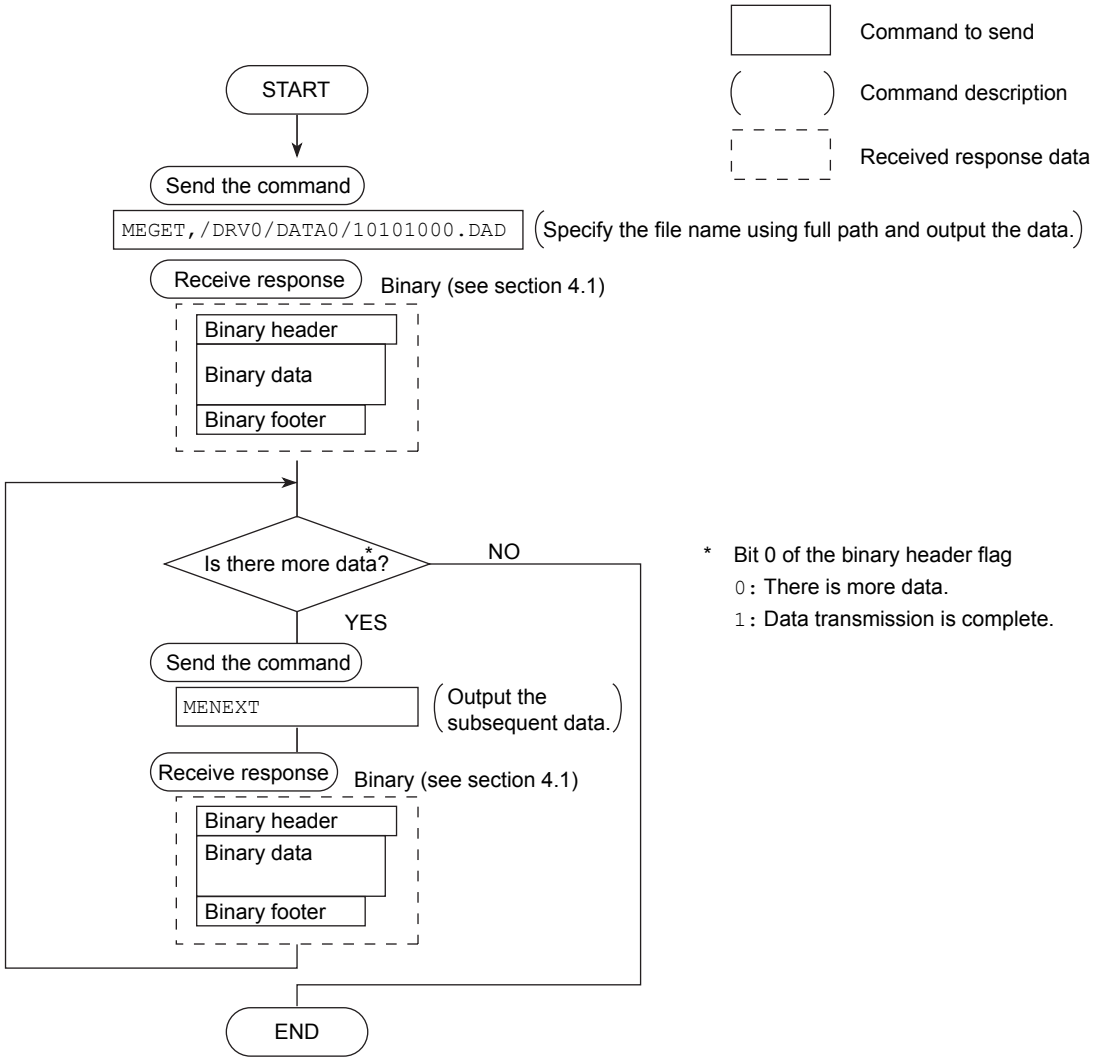
German and French only

Used for		Command
Tag	Tag	ST
Message	Message	SG
Arbitrary message	Message	BJ
Group	Group name	SX
File header	File header	TZ
Batch text field	Field title Field characters	BH
Batch comment	Comment character string	BU
Four panel display	Screen group name	SY
E-mail	Header 1 Header 2	YU

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

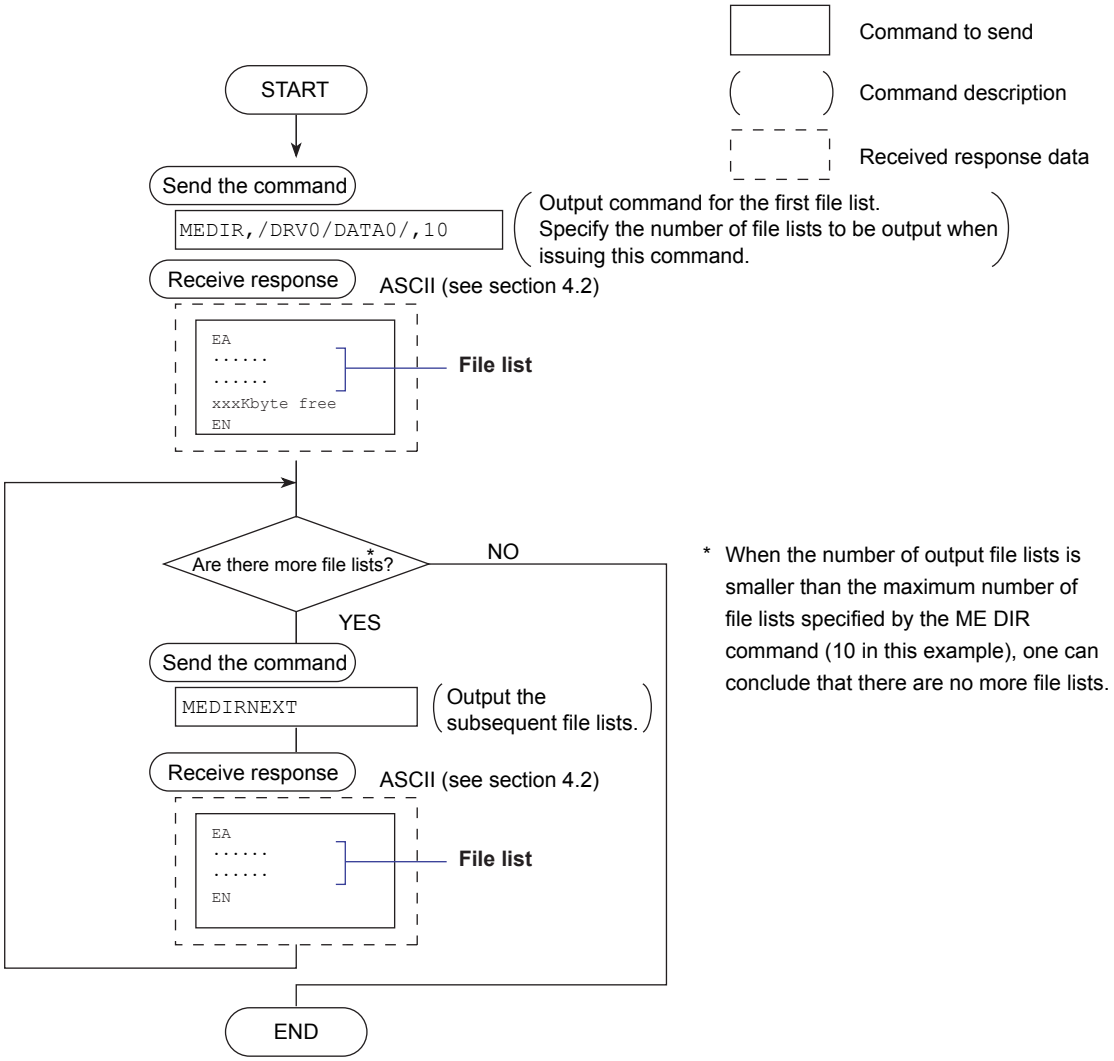
The figure below shows the output flow of the file 10101000.DAD in the DATA0 directory of the external storage medium.



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

Example in Which the File List Is Output 10 Files at a Time

The figure below shows the flow in which the file list in the DATA0 directory of the external storage medium is output 10 files at a time.



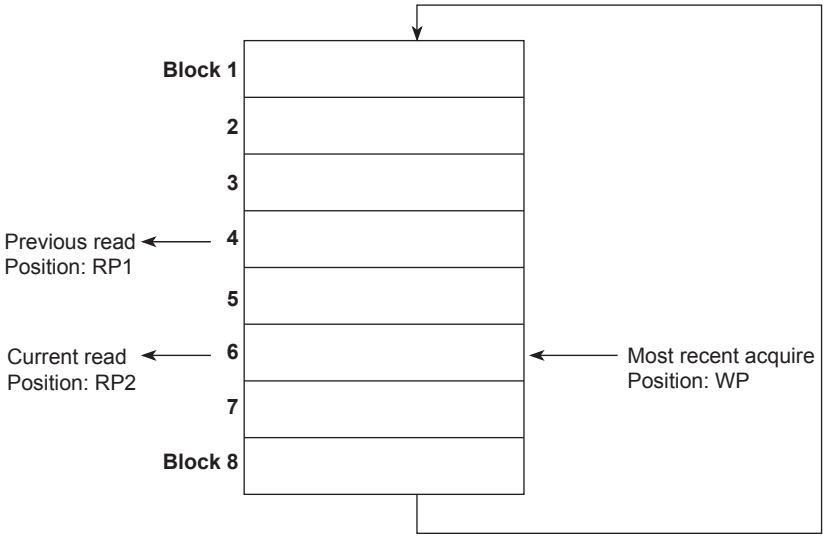
* When the number of output file lists is smaller than the maximum number of file lists specified by the ME DIR command (10 in this example), one can conclude that there are no more file lists.

Appendix 5 Flow Chart of the FIFO Data Output

Overview of the FIFO Buffer

The DX has a dedicated internal memory for outputting measured/computed data. This memory is structured as a FIFO (First-In-First-Out). Measured/computed data are constantly acquired to the internal memory at the specified acquiring interval (FIFO acquiring interval, set with the FR command). By using this function, it is possible to read measured/computed data that have been saved at the specified intervals regardless of the frequency at which the PC periodically reads the measured/computed data.

The following example shows the case when the acquisition interval is 1 s and the capacity of the FIFO memory is for 8 intervals.



- **Acquiring of the Measured/Computed Data**
  - The measured/computed data are acquired to the internal memory at 1 s intervals.
  - Measured/computed data is acquired to positions 1 through 8 in order. After acquiring to position 8, the next data is acquired to position 1.
- **Reading the Measured/Computed Data (FF GET command is used)**
  Outputs the data from the previous read position (RP1) to the most recent acquisition position (WP).
  In this example, more than 2 s has elapsed from the previous read operation. Therefore, data in blocks 5 and 6 are output.

The size of the internal memory reserved for FIFO (FIFO buffer data size) varies depending on the model.

Model	Data size
DX1002, DX1004, DX2004, and DX2008	1200 intervals (30 s at the fastest acquisition interval of 25 ms)
DX1006, DX1012, DX2010, DX2020, DX2030, DX2040, and DX2048	240 intervals (30 s at the fastest acquisition interval of 125 ms)
Models with the external channel input option	60 intervals (60 s at the fastest acquisition interval of 1 s)

Index

Symbol

A

B

C

D

E

F

H

I

K

L

M

O

P

Q

R

S

T

U

V

W

X