User's Manual

DXAdvanced

DX1000/DX1000N/DX2000 Communication Interface

vigilantplant®

YOKOGAWA
Yokogawa Electric Corporation

IM 04L41B01-17E
4th Edition

Foreword

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.

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

Manual Name	Manual No.	Description
DX1000/DX1000N User's Manual	IM 04L41B01-01E	Explains all functions and procedures of the DX1000/DX1000N excluding the communication functions.
DX2000 User's Manual	IM 04L42B01-01E	Explains all functions and procedures of the DX2000 excluding the communication functions.
DX1000/DX1000N/DX2000 Communication Interface User's Manual	IM 04L41B01-17E	Explains the communication functions of DX1000/DX1000N/DX2000 using the Ethernet/serial interface.
DAQSTANDARD User's Manual	IM 04L41B01-61E	Explains the functions and operating procedure of DAQSTANDARD.

- **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.

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.

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Revisions

- 1st edition: December 2005
- 2nd edition: October 2006
- 3rd edition: April 2007
- 4th edition: December 2007

4th Edition : December 2007 (YK)

DX's version and functions described in this manual

The contents of this manual cover the DX with hardware style 2 and firmware release 2.

Edition	DX	Suffix code	Addition and change to functions		Refer to
2	Version 1.11	–	(Added)	German, French, and Chinese as display language	Section 3.6 WU command
		–	(Added)	Modbus client connection retry interval: 10 s, 20 s, and 30 s	Section 1.10
		/P1	(Added)	24 VDC/AC power supply (/P1 option)	Operation Guide
	Version 1.21	/USB1	(Added)	Tab key on the USB keyboard corresponds to arrow keys.	User's Manual
			(Added)	Operations to request and release network information	Section 1.3
		–	(Changed)	Modbus client: Function to connect a server with a unit number is changed.	Section 1.10
		–	(Added)	Modbus client: Connection timeout value	Section 1.10
		–	(Added)	Modbus registers (floating point type for communication input data)	Section 6.3
		–	(Added)	A data output format (Skip or OFF channel data not output)	Section 3.7 CB command
		–	(Changed)	Error messages 105, 221, and 222 are added. Error messages 215, 218, 536 and 536 are changed.	User's Manual
3	Release 2 (Version 2.0x)	–	(Added)	Improvement to the operability on the historical trend display.	User's Manual
		–	(Changed)	Displaying the data in the grid time of the trend display.	User's Manual
		–	(Added)	Improvement to the display group setup operation.	User's Manual
		–	(Added)	Specifying the base position of the bar graph.	User's Manual, Section 3.4 SB command
		–	(Added)	Alarm output relay action when the alarm ACK operation is executed.	User's Manual, WO command
		/M1, /PM1	(Added)	Resetting the computed value during computation.	User's Manual
		–	(Changes)	Naming of the data files.	User's Manual
		–	(Added)	Sorting the files by the update date/time.	User's Manual
		–	(Added)	Constantly retaining the most recent data files in the CF card (media FIFO).	User's Manual, Section 3.6 WU command
		–	(Added)	Progress display when saving all data to the internal memory.	User's Manual
		–	(Changed)	Changing the initial display menu.	User's Manual
		/USB1	(Changed)	Improvement to the data save operation to the USB flash memory.	User's Manual
		/USB1	(Changed)	Retaining the state of the CapsLock and NumLock keys on the USB keyboard.	User's Manual
		/MC1	(Added)	Function for automatically assigning MW100s to the Modbus client.	Section 1.10
		–	(Changed)	Default settings of the Web server function.	Operation Guide
		–	(Added)	Error messages (129, 131, 132, 133, 134, 135, 136, 137, 513, 514, 515, and 516).	User's Manual
	Style 2	–	(Added)	NEMA 4 compliance.	User's Manual
4	Same as edition 3.	–	–	Added explanations. Fixed 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

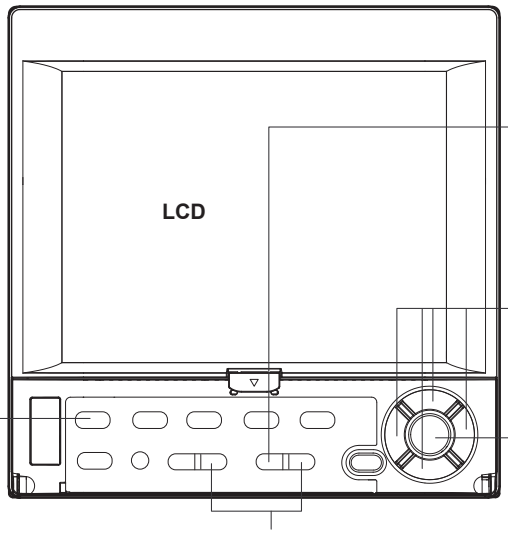
This manual uses the terms high-speed input model and medium-speed input model to distinguish between DX models as follows:

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.

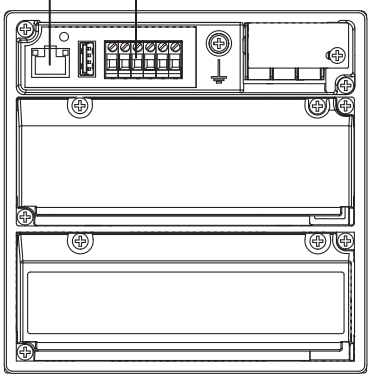
MENU and FUNC keys
Press the MENU key and then hold down the FUNC key for approximately 3 s. The basic setting menu is displayed from which you can to enter the communication setup menus.

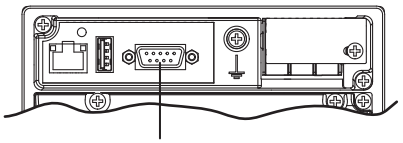
Rear Panel

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.

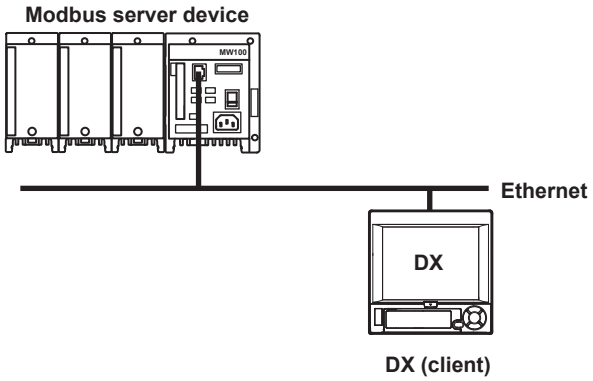
Contents

1.1 DX1000/DX2000 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.

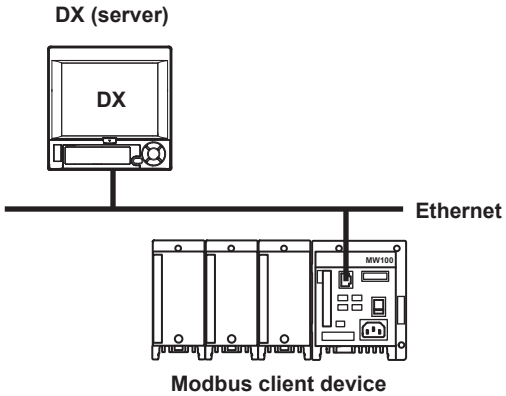
Modbus Client

- 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 option
  ** 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 connect to the DX, the Modbus server device, to read the measured/computed*/external input** data written in the input register or write/read communication input data* and external input channel** through the hold register of the DX.
  * /M1 option
  ** 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 1.9.



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/OFF, register users, set the key lock password, or set the connection destination of the FTP client function.
- The following types of data can be output.
  - Measured, computed*, and external input** 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*, and external input** 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.

  * /M1 option

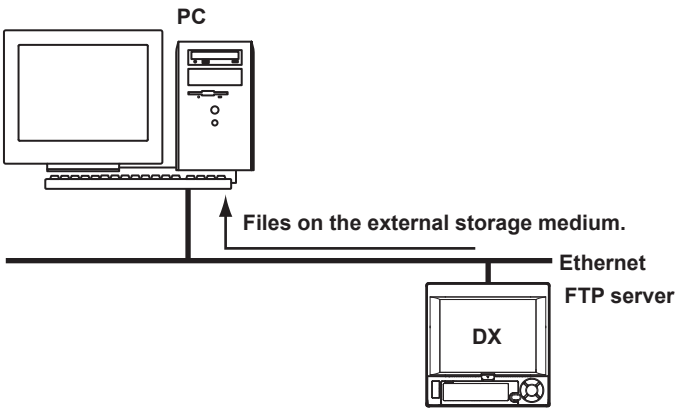
  ** DX2000 with /MC1 option
- The commands that can be used with this function are setting commands (see sections 3.4 and 3.5), basic setting commands (see section 3.6), and output commands (see sections 3.7 and 3.8).
- This function can be used when communicating via the Ethernet interface or the serial interface (option).
- For a description of the settings required to use this function via the serial interface, see chapter 2.

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).

FTP Server

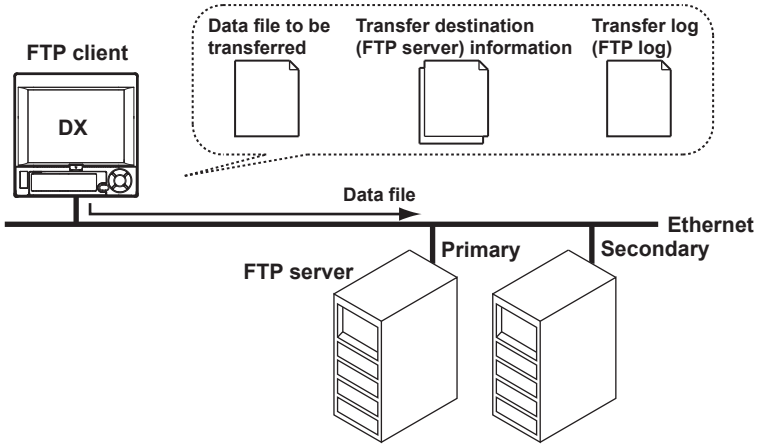
- You can use a PC to access the DX via FTP. You can perform operations such as retrieving directory and file lists from the external storage medium of the DX and transferring and deleting files. In addition, you can also retrieve the directory or file list and transfer files in the internal memory.
- 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, and snapshot data file 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.



  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.

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

- This function can be used only when communicating via the Ethernet interface and 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/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.

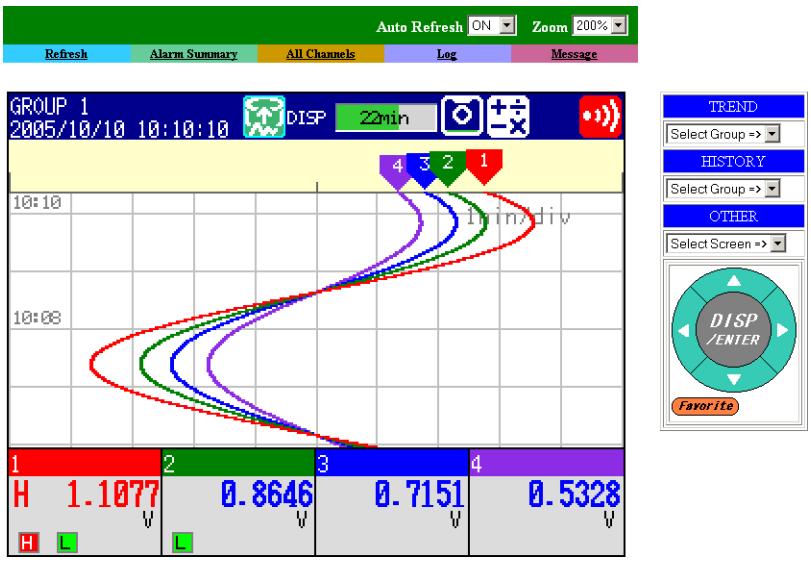
- **Administrator**
  An administrator has privileges to use all the functions of the setting/measurement server, maintenance/test server, and FTP server.
- **User**
  A user has limited privileges to use the setting/measurement server, maintenance/test server, and FTP server. For the limitation on the 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.

- **Application timeout**
  This function drops 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 which would prohibit other users from making new connections for data transfer.

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 30 s).
  - The following information can be displayed.
    - Alarm summary
    - Measured and computed values of all channels
    - Log (message summary, error log, etc.)
- 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

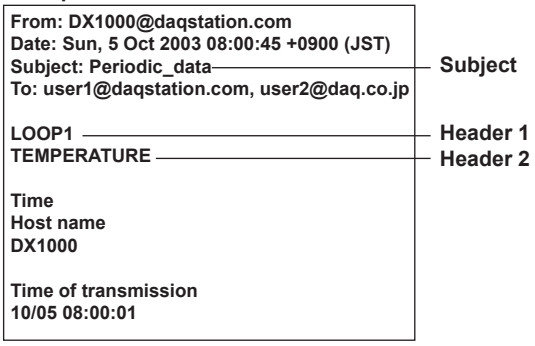
Transmitting e-mail messages

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
  Notifies alarm information when an alarm occurs or releases.
- 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.
- 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 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



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.

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

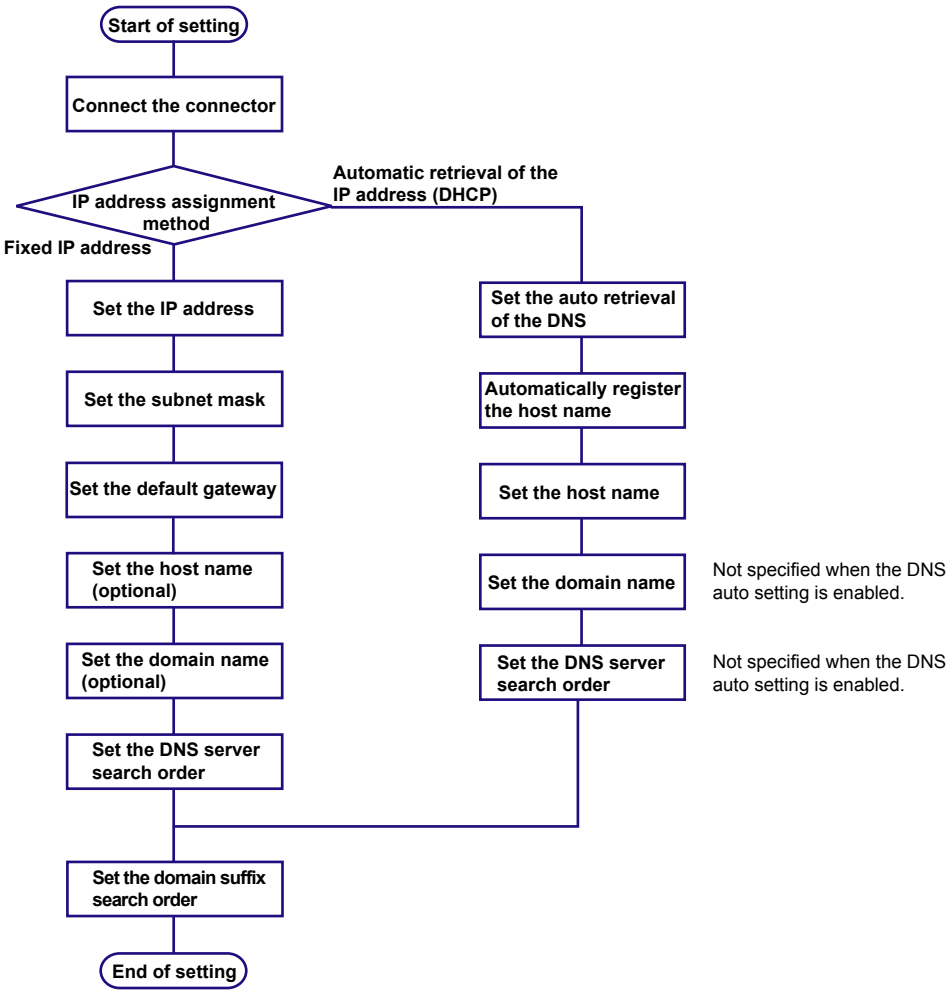
You can display operation logs on the log display. The log can also be confirmed using a communication command. In addition, the Web screen can show the log display (excluding the communication log and DHCP log).

- 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 : Log of login and logout
- 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)

For the operating procedure of the log screen and the details on the displayed contents, see the *DX1000/DX2000 User's Manual (IM04L41B01-01E or IM04L42B01-01E)*. For details on the Modbus status log, see section 1.9.
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.

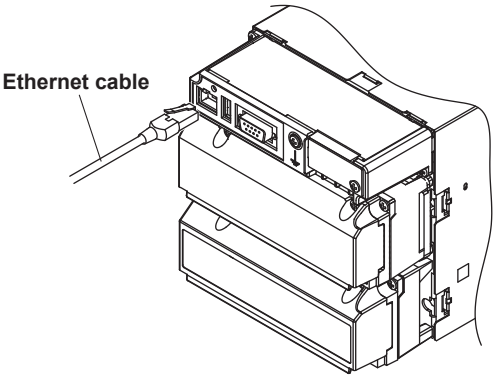


1.3 Connecting the DX

Connecting to the Port

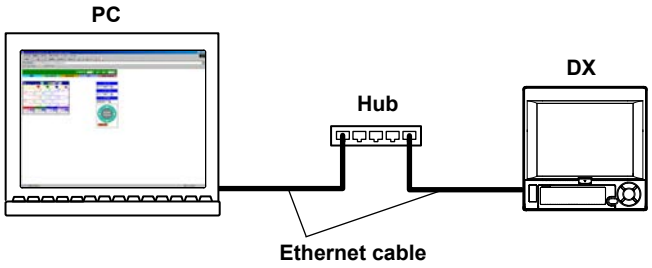
Connector

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



Connecting to the PC

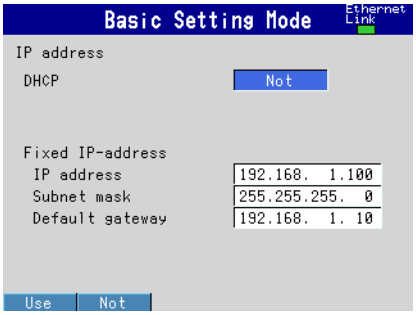
Make the connection via a hub. For a one-to-one connection with a PC, make the connection as shown in the figure below. Multiple DXs can be connected to a single PC in a similar manner.



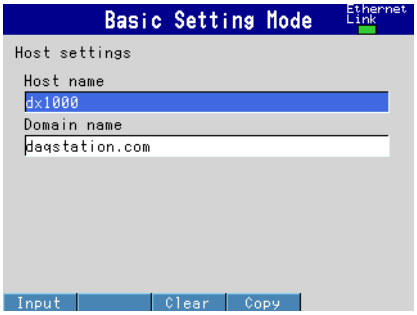
Setting the IP Address and Host Information

- DX1000
  - ◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication(Ethernet)** > **IP address**
  - ◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication(Ethernet)** > **Host Settings**
  - ◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication(Ethernet)** > **DNS Settings**
- DX2000
  - ◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication(Ethernet)** > **IP Address, Host settings**
  - ◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication(Ethernet)** > **DNS Settings**

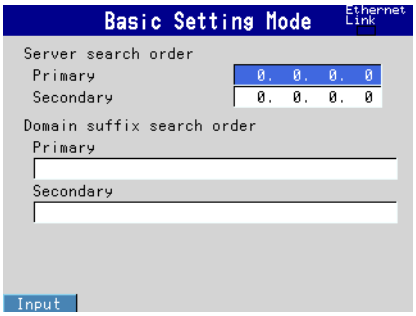
IP address setting



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

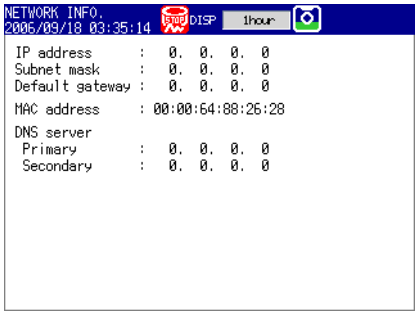
- **DHCP**
  Set DHCP to **Use**.
- **DNS accession**
  To automatically obtain the DNS server address, select **Use**. Otherwise, select **Not**. If you select Not, you must set the server search order.
- **Host-name register**
  To automatically register the host name to the DNS server, select **Use**.
- **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

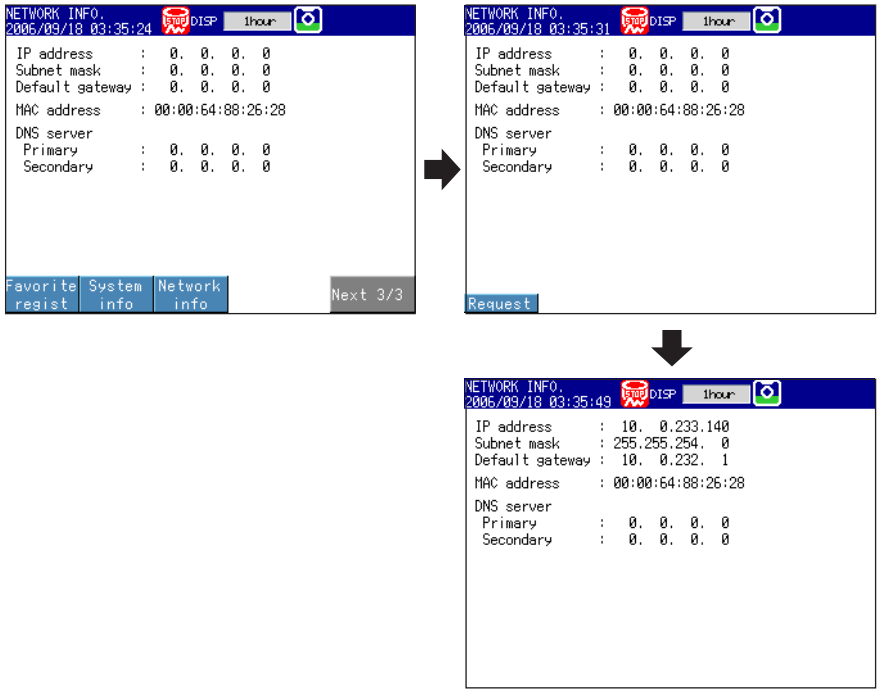
You can manually request or release network information such as the IP address. This operation applies when DHCP is set to Use. Perform the request or release after displaying the network information screen.

Requesting Network Information

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



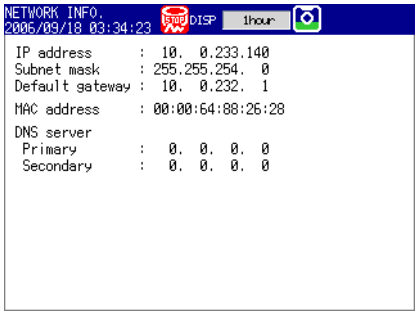
2. Execute the network information request.
   ◊ Press FUNC and select **Network info** > **Request**



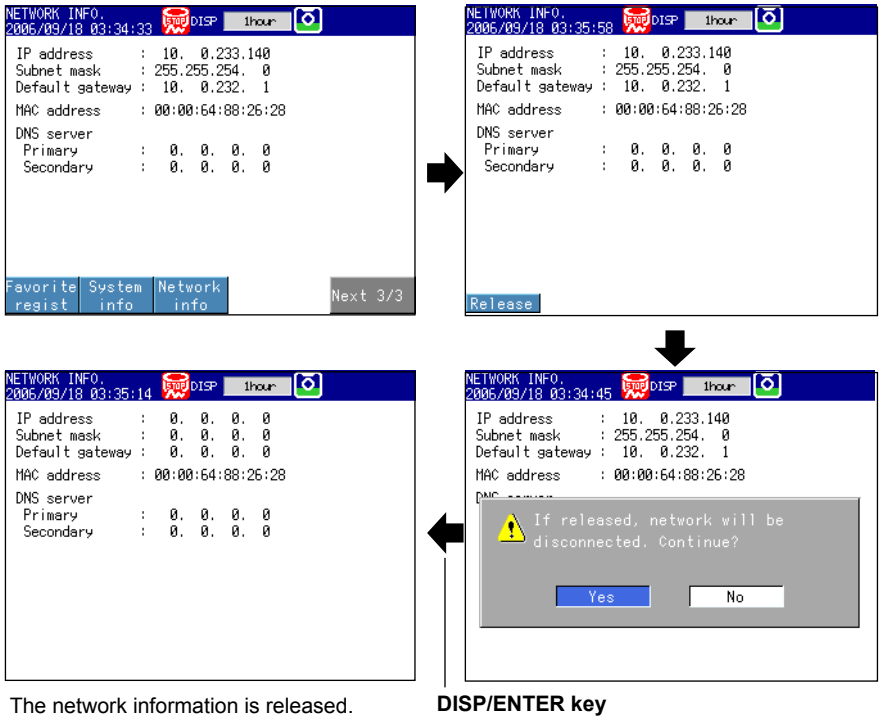
The network information is displayed.

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**

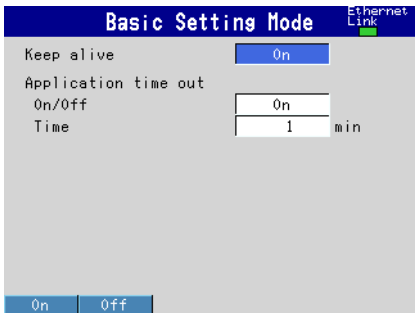


The network information is released.

DISP/ENTER key

Setting the Communication Status

◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **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

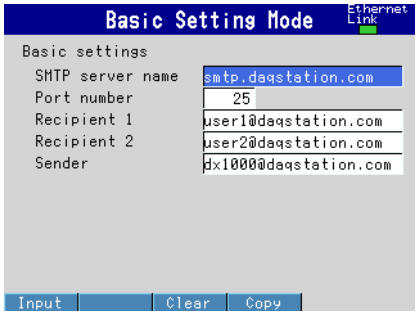
The Ethernet communication status can be confirmed with the LED lamp that is provided on the Ethernet connector on the DX rear panel or the Ethernet link that is shown at the upper right of the basic setting screen.

1.4 Sending E-mail Messages

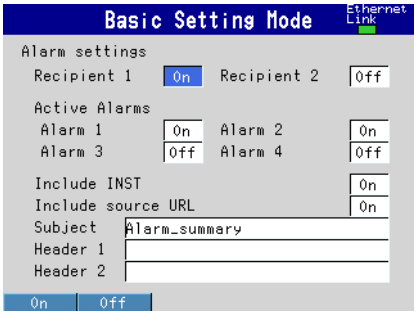
Set the server configuration and the contents of the e-mail transmission.

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

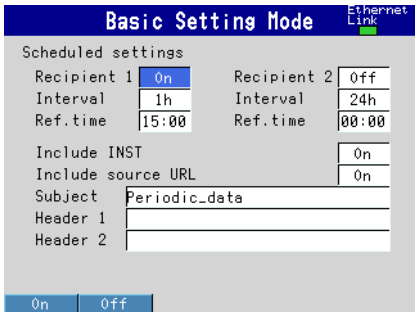
Basic settings



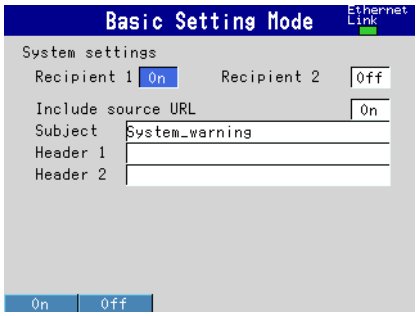
Alarm settings



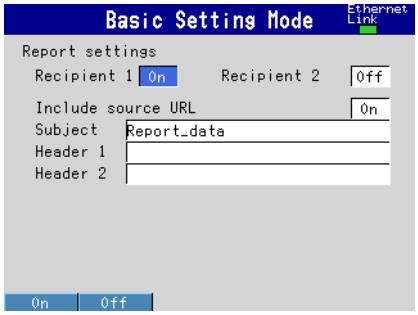
Scheduled settings



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.
- **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.

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 when the alarm occurred.
- **Include source URL**
  Select **On** to attach the source URL. Attach the URL when the Web server is enabled.
- **Subject**
  Enter the subject of the e-mail using up to 32 alphanumeric characters. The default setting is Alarm_summary.
- **Header1 and Header2**
  Enter header 1 and header 2 using up to 64 characters.

Scheduled Settings

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

- **Recipient1 and Recipient2**
  Set the e-mail recipients. For Recipient1 and Recipient2, select **On** to send e-mail or **Off** to not send e-mail.
- **Interval**
  Select the interval for sending e-mail to Recipient1 and Recipient2 from 1, 2, 3, 4, 6, 8, 12, and 24 hours.
- **Ref. time**
  Enter the time used as a reference for sending the e-mail at the specified interval to Recipient1 and Recipient2.
- **Include instantaneous value, Include source URL, Subject, and Header**
  These items are the same as the e-mail that is sent when an alarm occurs. The default subject is Periodic_data.

System Settings

Specify the settings for sending e-mail when the 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.

E-mail Test

◊ Press **FUNC** and select **E-mail test** > **Recipient1** or **Recipient2**
You can send a test e-mail to check the e-mail settings.

Starting/Stopping the E-mail Transmission

Starting the e-mail transmission

◊ Press **FUNC** and select **E-Mail START**
The e-mail transmission function is enabled.

Stopping the e-mail transmission

◊ Press **FUNC** and select **E-Mail STOP**
The e-mail transmission function is disabled. Unsent e-mail messages are cleared.

E-mail retransmission

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

E-mail Format

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

Alarm Notification E-mail Format

- **Subject**
  `Subject:Alarm_Summary`
- **Syntax**

```
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 No. or tag name
(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 channel number, alarm type, and alarm status are transmitted for up to 10 events in a single e-mail.

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 No. or tag name
(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**

```
header1CRLF
header2CRLF
CRLF
Power_failure.CRLF
<Host_name>CRLF
hostCRLF
CRLF
<Power_fail>mo/dd_hh:mi:ssCRLF
<Power_on>mo/dd_hh:mi:ssCRLF
CRLF
Access_the_following_URL_in_order_to_look_at_a_screen.CRLF
http://host.domain/CRLF
CRLF
```

System Mail (Memory Full) Format

- **Subject**

```
Subject:System_warning
```

- **Syntax**

```
header1CRLF
header2CRLF
CRLF
Memory_full.CRLF
<Host_name>CRLF
hostCRLF
CRLF
<Memory_remain>ppp···pMbytesCRLF
<Memory_blocks>bbb/400CRLF
<Media_remain>rrr···rMbytesCRLF
CRLF
Access_the_following_URL_in_order_to_look_at_a_screen.CRLF
http://host.domain/CRLF
CRLF
```

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

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/DX2000 User’s Manual (IM04L41B01-01E or IM04L42B01-01E)*.

Report Mail Format

- **Subject**

  Subject:Report_data

- **Syntax**

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

ti	Contents of the report mail (hourly, daily, weekly, or monthly report)
ccc···c	Channel No. or tag name (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

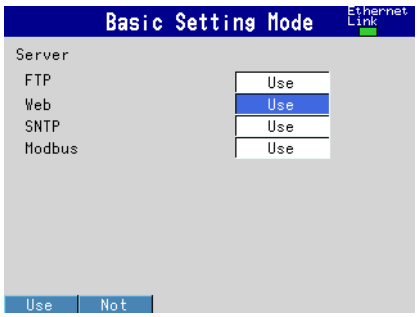
1.5 Monitoring the DX on a PC Browser

Setting the Web Server Function

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

Setting the Web server

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



- **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

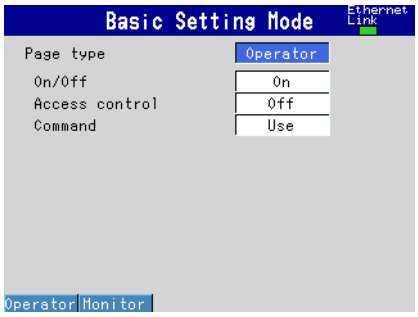
The default value is 80. To change the setting,

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

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

Setting the Web page

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



Page type (type of screen to be displayed)

- Monitor
  Set the monitor page. The following information can be displayed.
  - Alarm summary
  - Measured and computed values of all channels
  - Log (message summary, error log, etc.)
  - 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 display on the DX by specifying the display type (trend, historical trend, digital, bar graph, or overview). In addition, you can specify the group of the trend and historical trend.
  - Operate the DISP/ENTER key, arrow keys, and Favorite key on the DX.
  - Set messages on the DX and write them.
  - For screen examples, see “Monitoring with the Browser” in this section.

Setting the monitor page

- Setting the page type
  To set the monitor page, select **Monitor**.
- Setting On/Off
  To display the monitor page on a browser, select **On**; otherwise, select **Off**.
- Setting the access control
  To use access control, select **On**. You must enter a user name and password to display the monitor page. You must set the security and login in the environmental settings to use this function. For the settings, see the *DX1000/DX2000 User’s Manual (IM04L41B01-01E or IM04L42B01-01E)*.

Setting the operator page

- Setting the page type
  To set the operator page, select **Operator**.
- Setting the access control
  This is the same as the setting on the monitor page.
- Selecting whether to use command input
  To use messages and use write commands, select **On**; Otherwise, select **Off**.

Monitoring with a Browser

Setting the URL

Set the URL appropriately according to the network environment that you are using. You can access the 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:

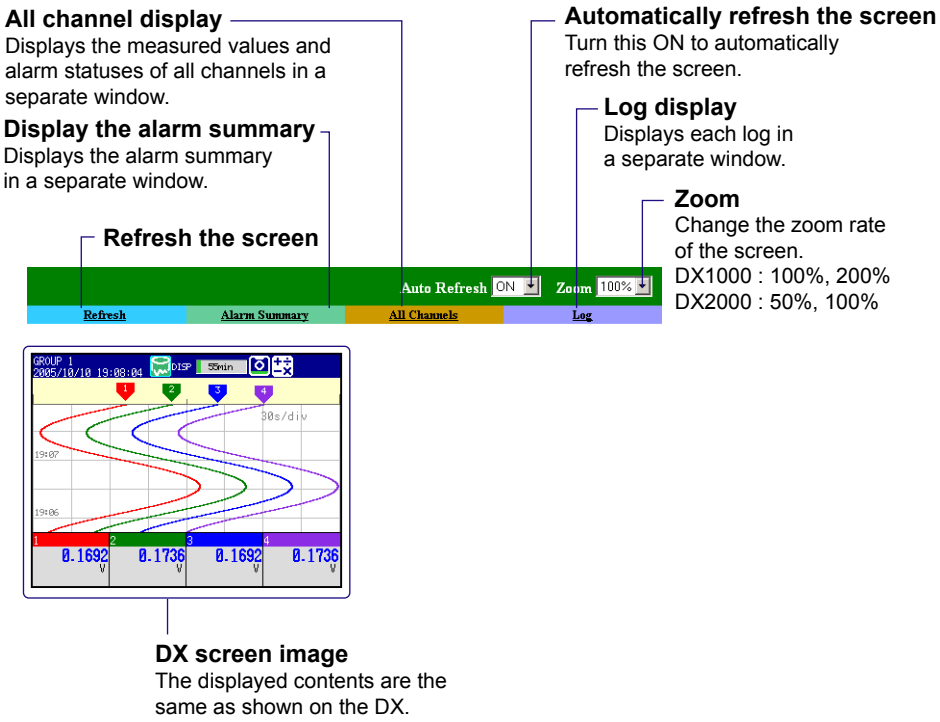
  http://dx1000.adv.daqstation.com/operator.htm or
  http://192.168.1.100/operator.htm

  (In this example, we assume that the domain name is adv.daqstation.com, the host name is dx1000, and the IP address is 192.168.1.100.)

Login

Enter the user name and login password. You do not have to enter these items if access control is set to **Off** on the Web page setting.

- **Contents on the monitor page**



- If the DX is in the setting mode* or basic setting mode*, the monitor page cannot be displayed. An error message is displayed.
  * For a description on the modes, see the *Operation Guide (IM04L41B01-02E/ IM04L42B01-02E)*.
  The "°" set on the DX is displayed as "^" on the Web browser.
- Refreshing the monitor page
  The monitor page can be refreshed automatically or manually.
  - Auto Refresh ON
    The monitor page is refreshed at a refresh rate of approximately 30 s.
  - Auto Refresh OFF
    The monitor page is not automatically refreshed. You can refresh the page manually. Within approximately 30 s of the last refreshing, the page is not refreshed even if you attempt to refresh the page manually.
- Displaying the log
  Displays the message summary, error log, FTP log, login log, Web operation log, e-mail log, SNTP log, and Modbus log in a separate window. From the **Log** list box, select the log you want to display. Click the **Refresh** to refresh the data. Messages can be displayed to 100 pieces and added messages can be displayed to 50 pieces.

Log display (example of a message log display)

Refresh Close Creation date : 2005/10/10 17:18:53

Date	Message	Group	User
2005/10/10 17:18:51	POWER OFF	ALL	[Key]
2005/10/10 14:38:06	STOP	ALL	[Communication]
2005/10/10 13:17:12	DANGER	ALL	[Key]
2005/10/10 13:15:29	HIGH VOLTAGE	01	[Communication]
2005/10/10 12:14:37	BATTERY	ALL	[Key]
2005/10/10 10:13:15	POWER ON	ALL	[Communication]

- Displaying the alarm summary and refreshing the all channel display
  Click the **Refresh** to refresh the data. Alarm summarys can be displayed to 400 pieces.

Example of an alarm summary display

Refresh Close Creation date : 2005/10/10 17:23:32

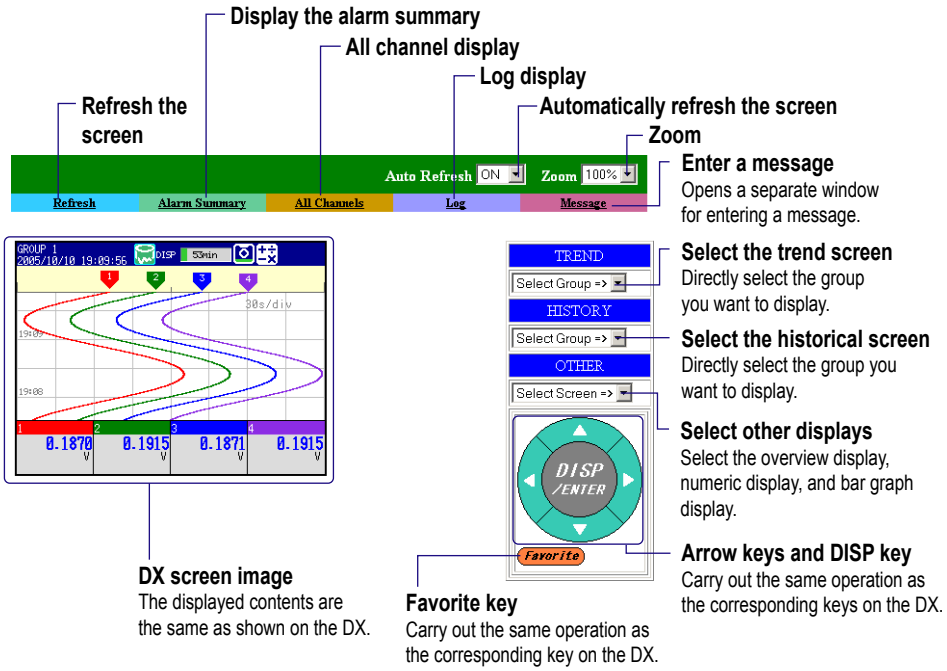
Status	Channel	Type	Alarm Time
OFF	1	1H	2005/10/10 17:23:30
ON	2	1L	2005/10/10 17:23:30
ON	1	2L	2005/10/10 17:23:30

Example of an all channel display

Refresh Close Creation date : 2005/10/10 17:25:12

Channel	Alarm status 1 2 3 4	Reading	Units
1	H L	0.9131	V
2	L	0.7114	V
3		0.5895	V
4		0.4384	V

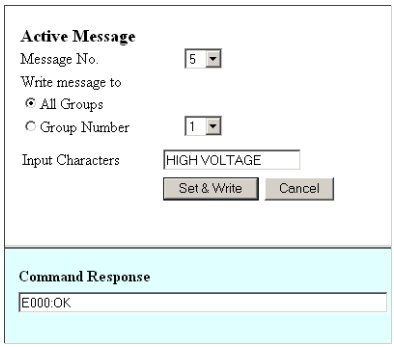
- **Contents of the operator page**



The following operations can be carried out on the operator page in addition to the operations available on the monitor page.

- Switching trend, historical trend, digital, bar graph, and overview displays
  You can switch the screen on the DX by specifying the group that will display the trend, historical trend, digital, bar graph, or overview display.
- Operating the DX using the DISP/ENTER key, arrow keys, and Favorite key on the operator page
  When the DX is in the operation mode, you can carry out the same operations as the DISP/ENTER key, arrow keys, and Favorite key on the DX.
- Setting and writing messages
  You can set message strings for messages 1 through 10 on the DX (up to 32 alphanumeric characters) and, at the same time, write them to the specified group. Existing messages are overwritten. The following figure indicates an example in which the word “ALARM” is written to all groups in message number 9, and the Command Response box shows that the operation was successful.

Message entry example

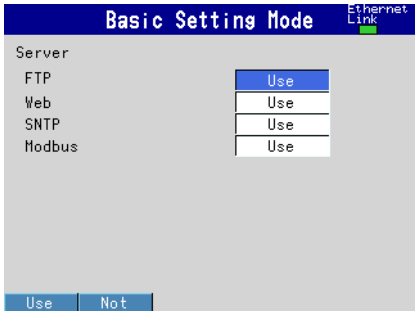


1.6 Accessing the Measurement Data File on the DX from a PC

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

Setting the FTP Server

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



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

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."

Login

If security is enabled, you are prompted to enter the login name and password. Enter the login name and password to establish the connection.

Port Number

The default value is 21. To change the setting,

◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Environment** > **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, and snapshot data 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

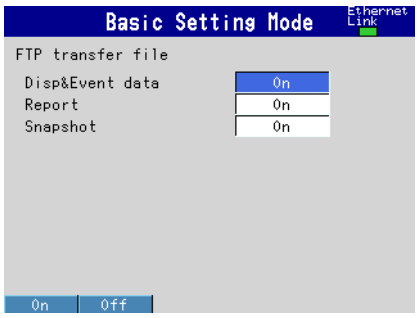
The display or event data files are automatically transferred to the FTP destination described in the next section at appropriate times.

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	Data files are automatically transferred when a report file is closed (or divided). For example, data files are transferred once per month when generating only daily reports.
Snapshot data file	The files are automatically transferred when a snapshot 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.

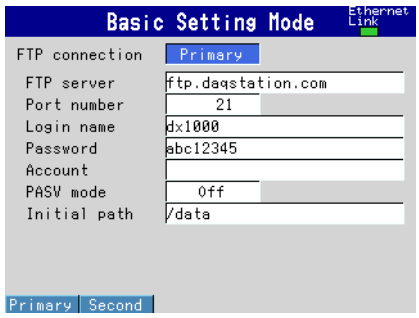
Setting the FTP Client

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

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

Setting the FTP connection destination

Consult your network administrator when setting parameters such as the primary/ secondary FTP servers, port number, login name, password, account, 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

If the file transfer to both primary and secondary destinations fails, the DX aborts the file transfer. When the connection recovers, the DX transfers the data that could not to be transferred in addition to the new data file. However, since the data that is transferred resides in the internal memory of the DX, if the data is overwritten, the data that could not be transferred 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/DX2000 User's Manual*)) or Web screen (see section 1.5) or by outputting the result using the FL command (see section 3.4).

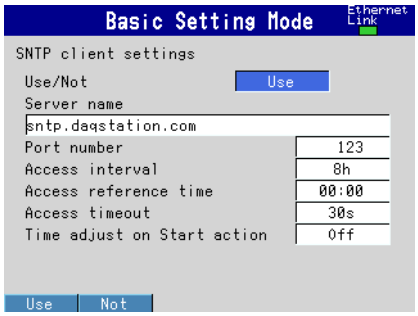
1.8 Synchronizing the Time

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** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **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

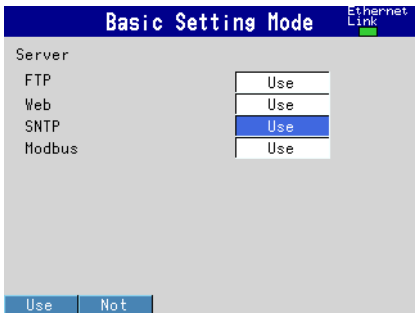
You can synchronize the time at any time by operating the FUNC key. The SNTP client setting must be enabled.

◊ Press **FUNC** and select **SNTP**

Setting the SNTP Server

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

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



- **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** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Environment** > **Service port**

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

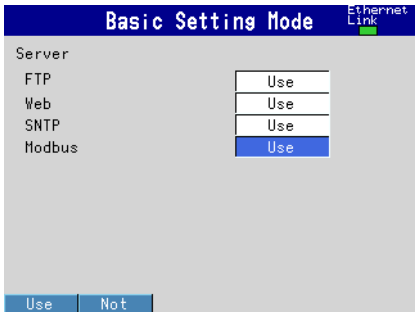
1.9 Using the Modbus Server Function

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** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication(Ethernet)** > **Server**



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

Port Number

The default value is 502. To change the setting,

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

1.10 Using the Modbus Client Function

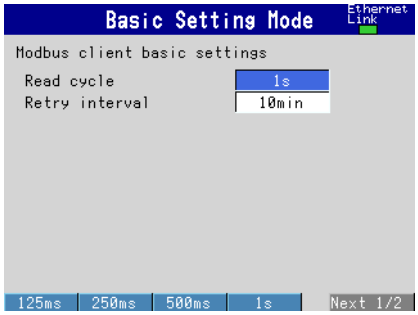
The DX is used as a Modbus client.
For the Modbus specifications, see section 6.3.

Setting the Modbus Client

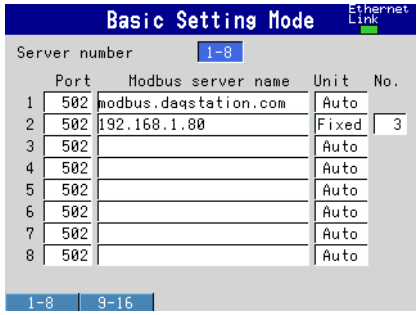
Carry out the steps below to enable the DX to read the data of another device or write data to another device using Modbus.

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

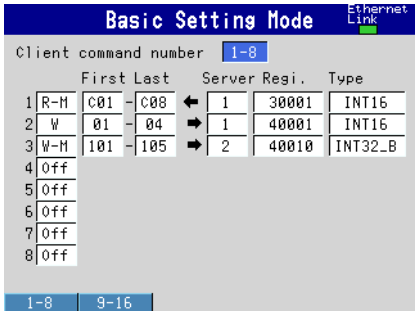
Basic settings



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.

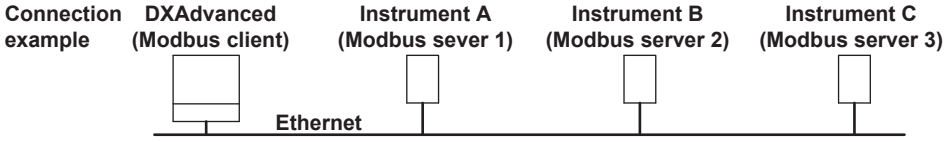
Setting the transmitted commands

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

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

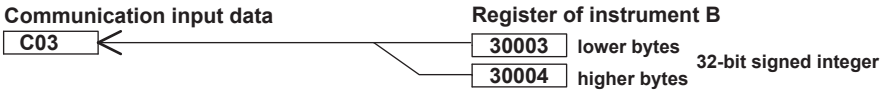
  Load the value of the 16-bit signed integer assigned to register 30001 of instrument A to C01.

  Command setting

R-M	C01 - C01	←	1	30001	INT16

- **Example 2**

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

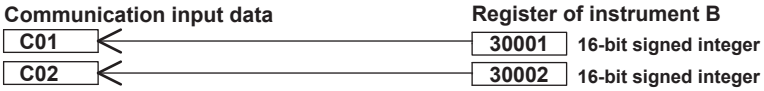


  Command setting

R-M	C03 - C03	←	2	30003	INT32_L

- **Example 3**

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

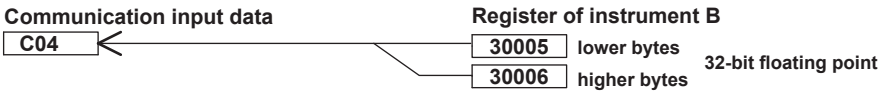


  Command setting

R-M	C01 - C02	←	2	30001	INT16

- **Example 4**

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



  Command setting

R-M	C04 - C04	←	2	30005	FLOAT_L

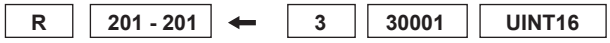
Loading to External Input Channels (DX2000 Only)

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

- **Example 1**

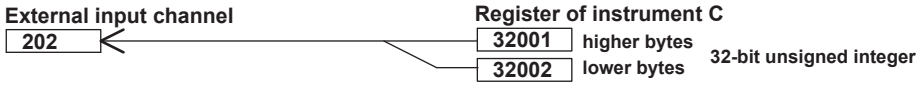
  Load the values of the 16-bit unsigned integers assigned to register 30001 of instrument C to external input channel 201.

  Command setting

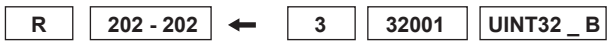


- **Example 2**

  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

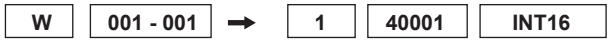


Writing Measured Values to the Server

- **Example**

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

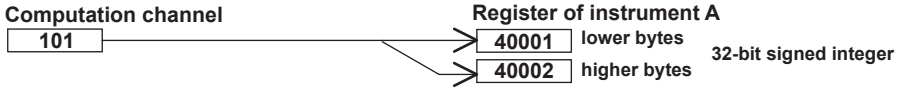
  Command setting



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

Checking the Modbus Operating Status

Displaying the Modbus Operating Status

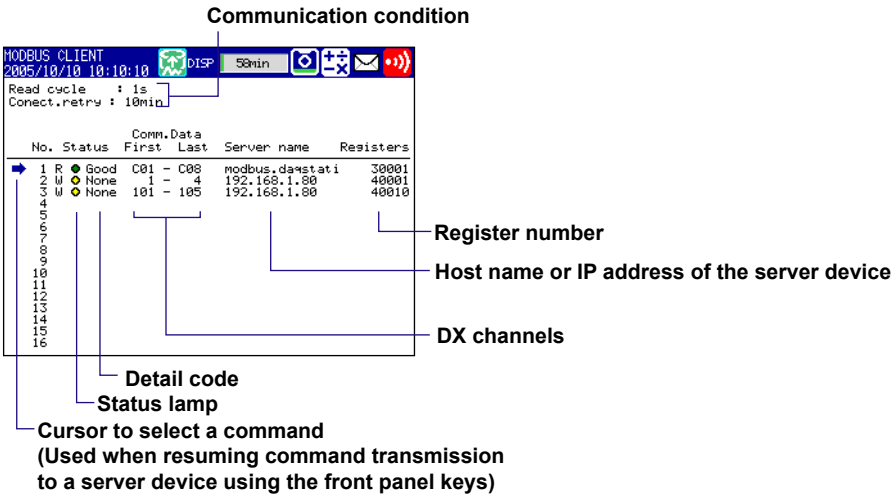
◊ Press **DISP/ENTER** and select **INFORMATION** > **MODBUS CLIENT**

Note

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

◊ Press **MENU** (switch to the setting mode) and select **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).

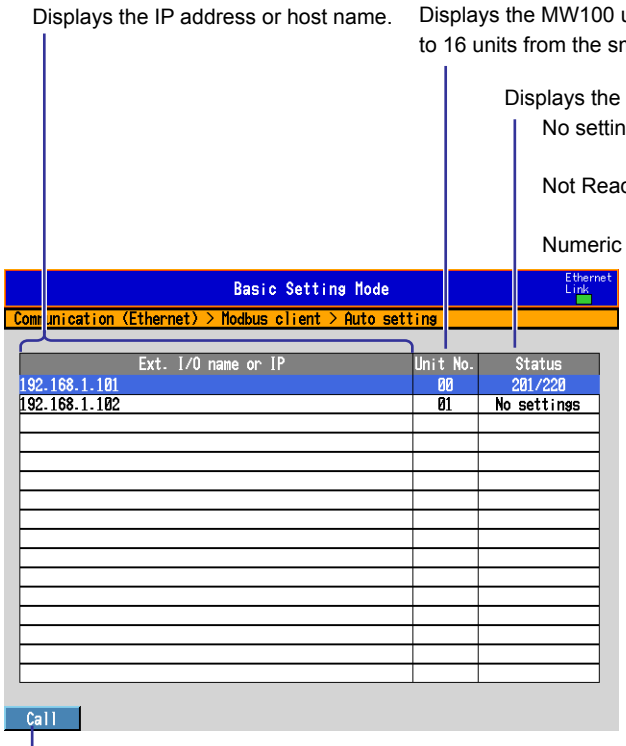
Setup Preparation

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** (switch to the setting mode), hold down the **FUNC** key for 3 s (switch to the basic setting mode), and select **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.



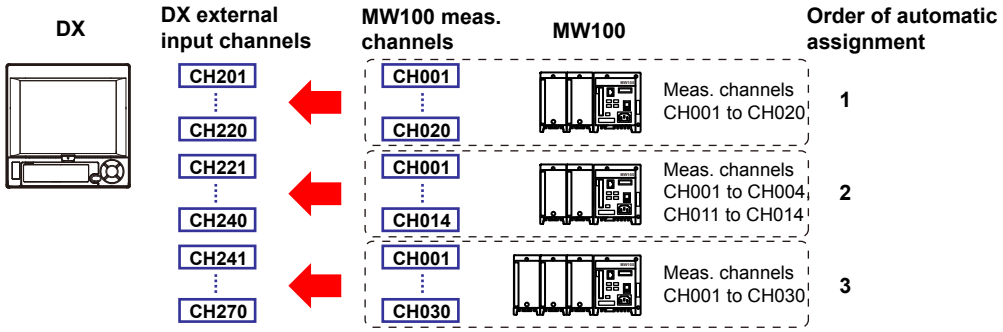
* For the corrective action, see the *DX1000 or DX2000 User's Manual*.

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

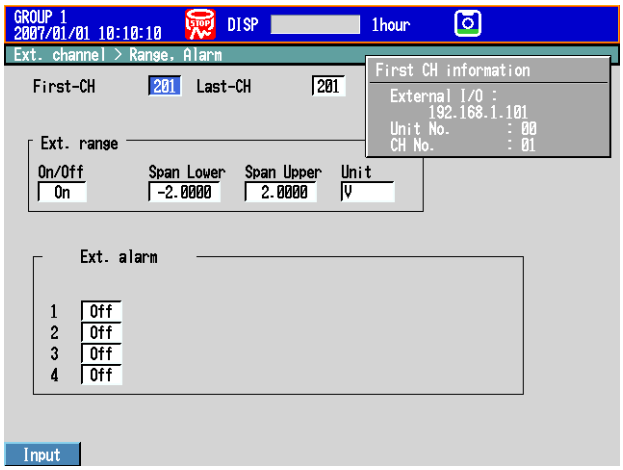
- The MW100 channels are assigned in unit of 10 channels to the external input channels. If the MW100 measurement module consists of less than 10 channels, “OFF” is assigned to the external input channels for the section without channels.
- An error occurs if the number of MW100 channels to be automatically 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

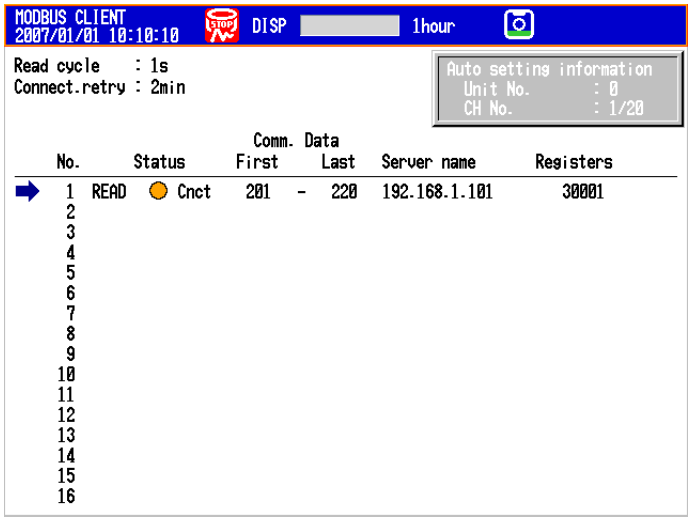
About the MW100

- 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.

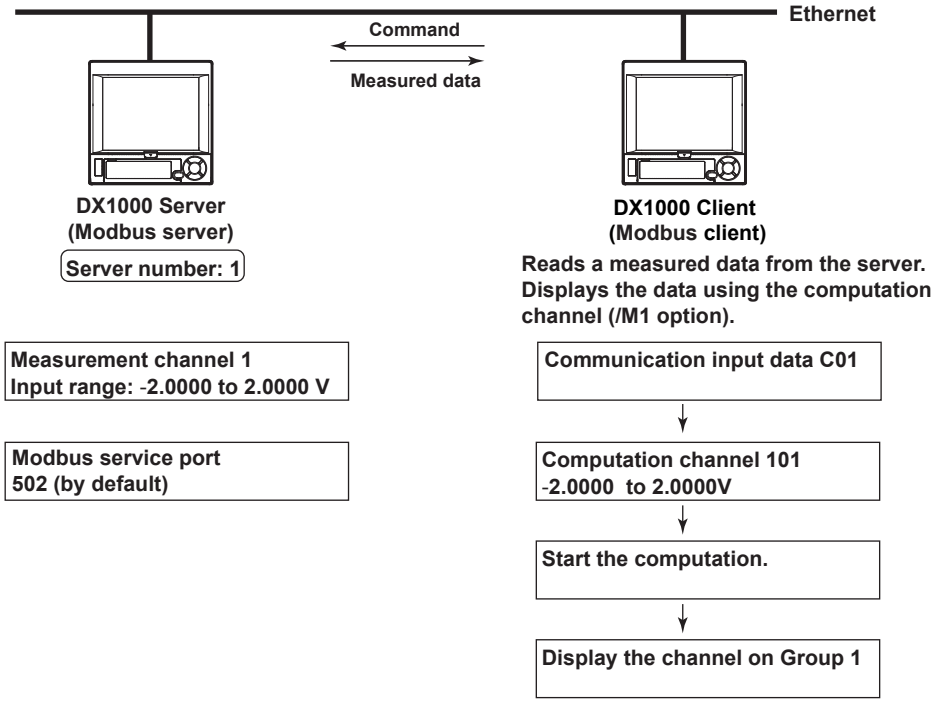


1.11 Usage Example of the Modbus Function

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

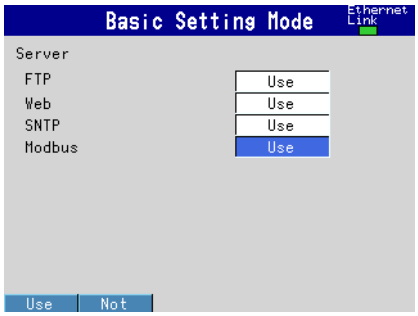
- The DX1000 client reads the measured value of channel 1 on the DX1000 server into the communication input data C01. C01 is displayed on a computation channel 101 by including the data in the equation. The computation channel 101 is assigned to Group1.
- The measured value of channel 1 on the DX1000 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** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication (Ethernet)** > **Server**



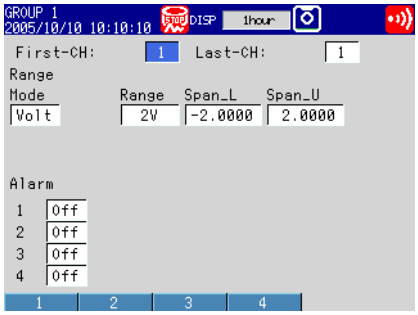
Item	Settings
Modbus	Use

About the Port Number

The port number is 502 by default.

Setting the Measurement Channel

◊ Press **MENU** (switch to the setting mode) and select **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)

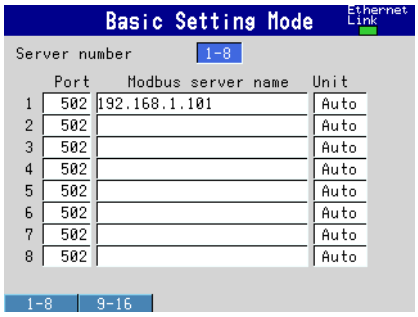
Assumes the settings other than that for the server and the command are left to default values.

Regitering 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.

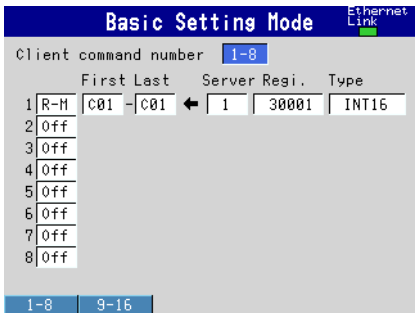
◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication (Ethernet)** > **Modbus client** > **Modbus server settings**



Item	Settings
Port	502
Modbus server name	192.168.1.101
Unit	Auto

Setting Command

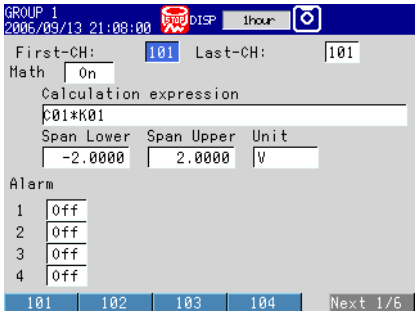
◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication (Ethernet)** > **Modbus client** > **Command settings**



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

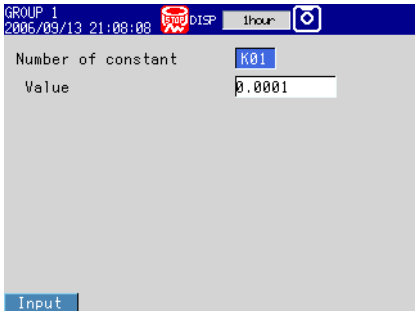
Setting the Computation Channel

◊ Press **MENU** (switch to the setting mode) and select **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

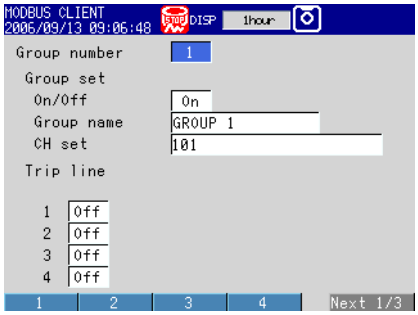
◊ Press **MENU** (switch to the setting mode) and select **Math channel** > **Constant**



Item	Settings
Number of constant	K01
Value	0.0001

Assigning the channel to a Group

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

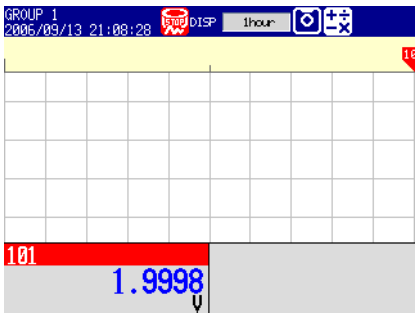


Item	Settings
Group number	1
On/Off	On
Group name	GROUP 1
CH set	101

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)

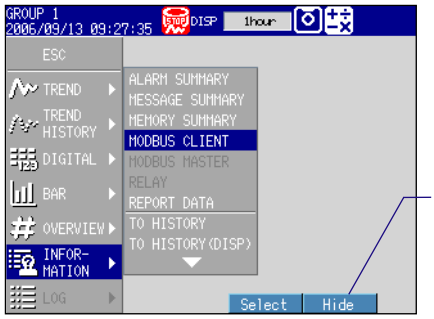
Showing a Menu to Switch to the Modbus Client Screen

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

◊ Press **MENU** (switch to the setting mode) and select **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**

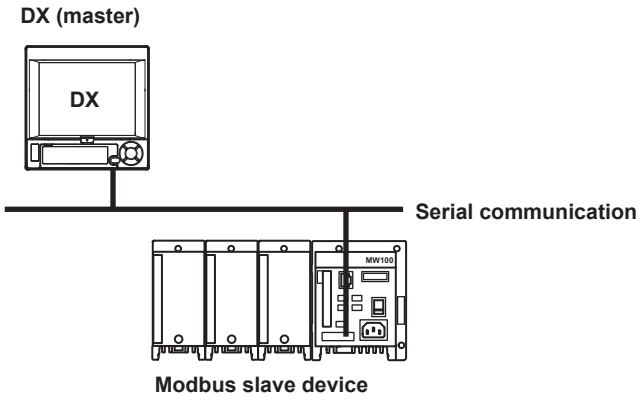
* Select **INFORMATION > MODBUS MASTER** when you use the Modbus master via the serial communication.

2.1 DX1000/DX2000 Features

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

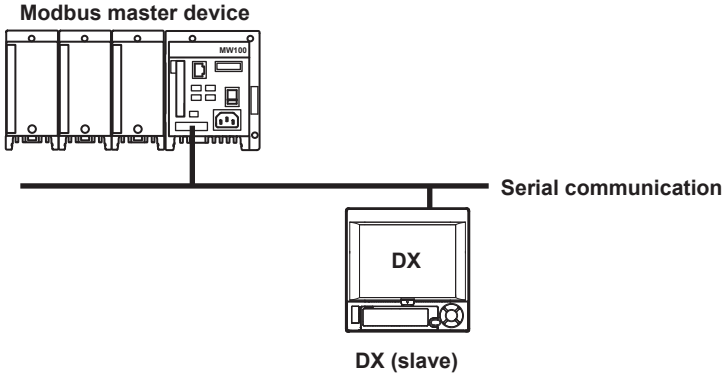
Modbus Master

- 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 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 connect to the DX, the Modbus slave device, to read the measured/computed*/external input** data written in the input register or write/read communication input data* and external input channel** through the hold register of the DX.
  * /M1 option
  ** 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.

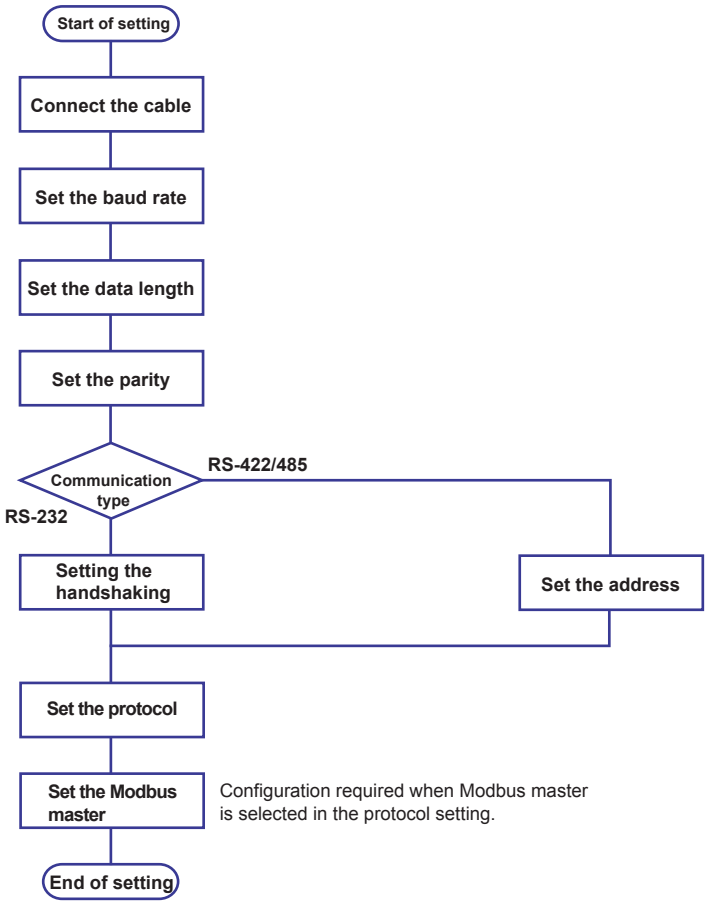


Setting/Measurement Server

- 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 on the settings required to use this function, see section 2.4.

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

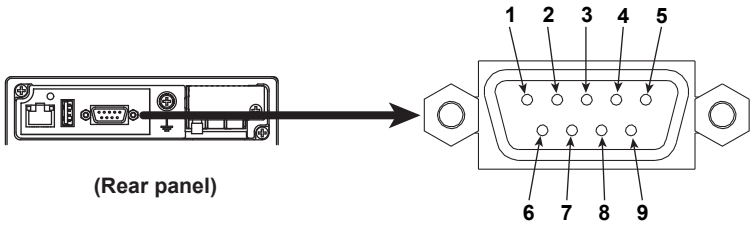
Connecting the cable

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



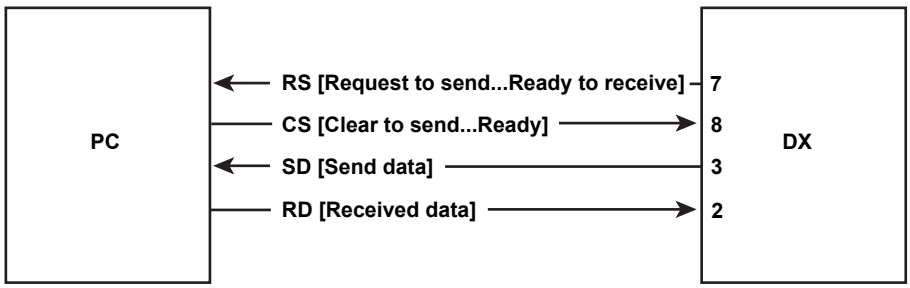
Each pin corresponds to the signal indicated below.
The following table shows the signal name, RS-232 standard, JIS, and ITU-T standard signals.

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.

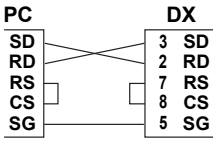
Connection

- Signal direction

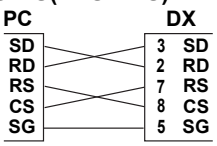


- Connection example

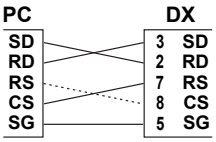
• OFF-OFF/XON-XON



• CS-RS(CTS-RTS)



• 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.

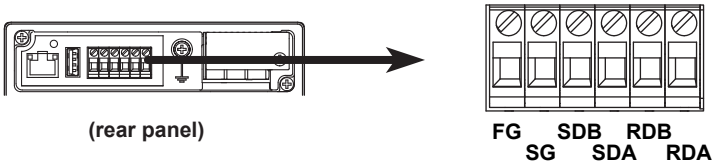
Note

- 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.

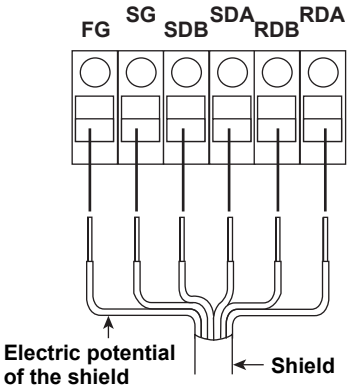


Each terminal corresponds to the signal indicated below.

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 (–).

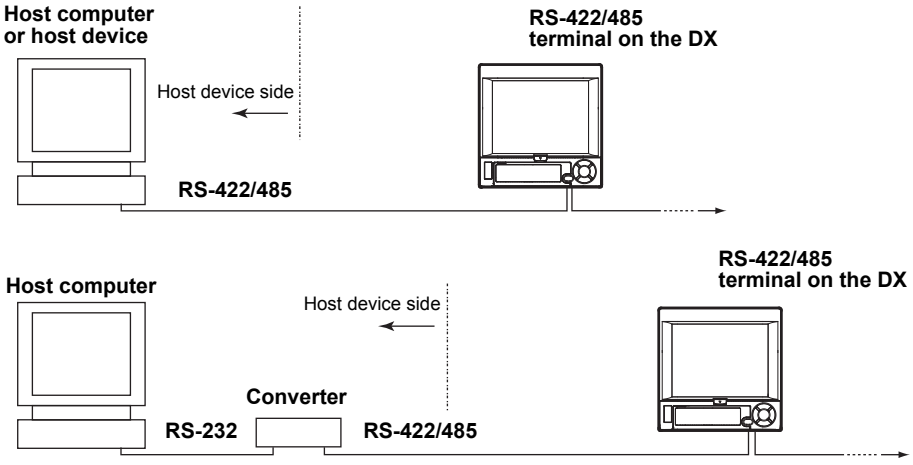
Connection

- 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

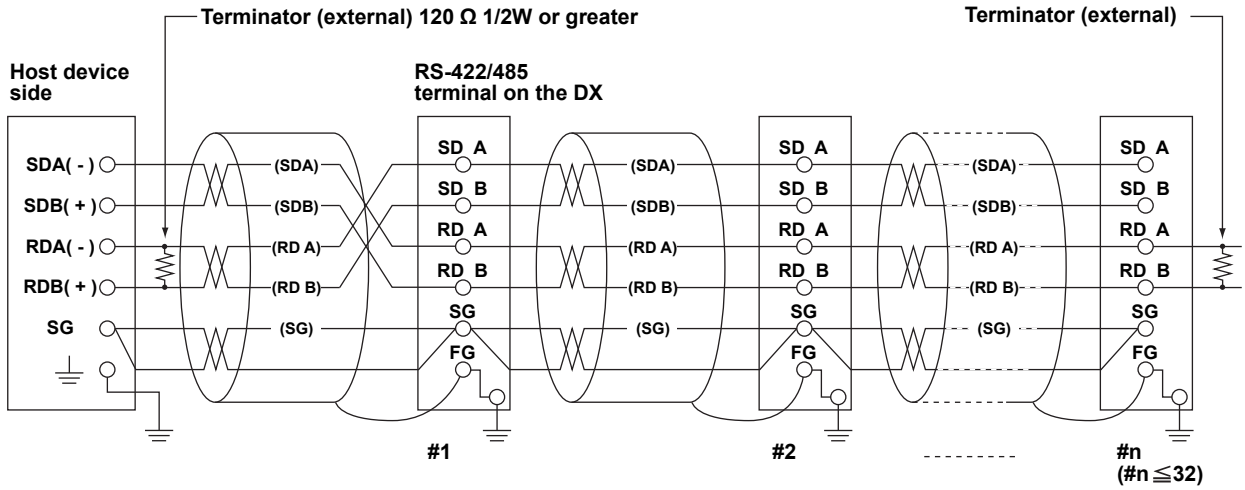
A connection can be made with a host device having a RS-232, RS422, or RS-485 port. In the case of RS-232, a converter is used. See the connection examples below for a typical converter terminal. For details, see the manual that comes with the converter.

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**

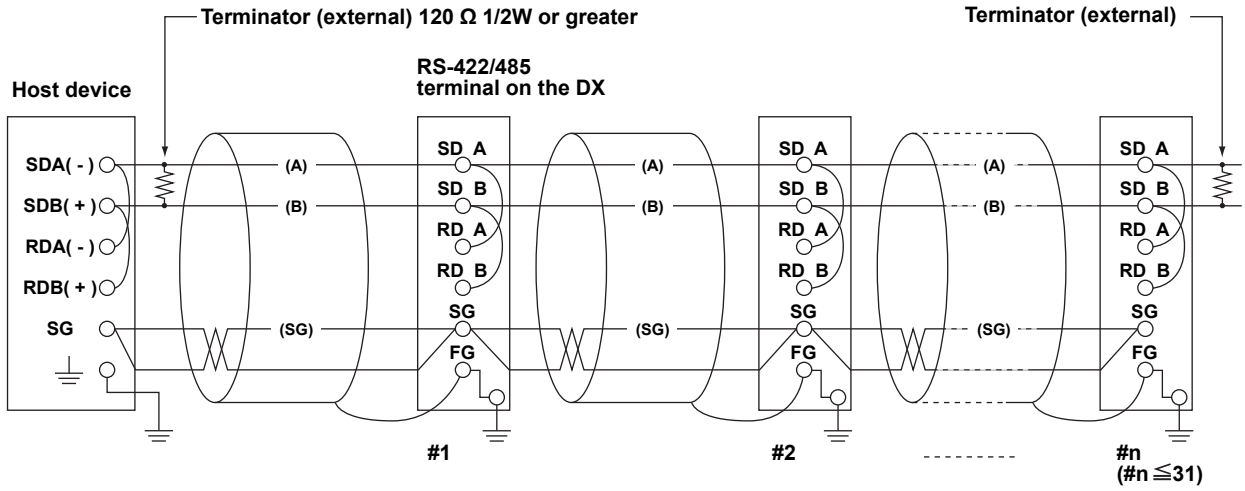
Generally, a four-wire system is used to connect to a host device. In the case of a four-wire system, the transmission and reception lines need to be crossed over.



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

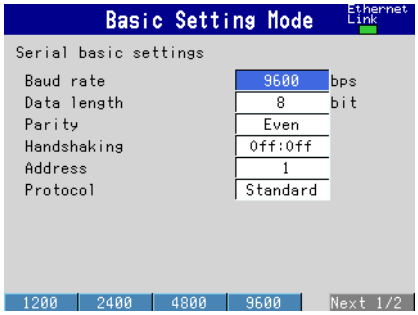
In the RS-422 standard, 10 is the maximum number of connections that are allowed on one port (for a four-wire system).

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** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication (Serial)** > **Basic settings**



For RS-232

- **Baud rate**
  Select 0, 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.
  If Modbus master is selected, Modbus master settings must be entered.

For RS-422/485

- **Baud rate**
  Select 0, 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.
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.

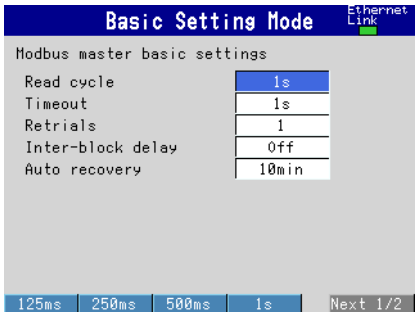
Setting the Serial Communication

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

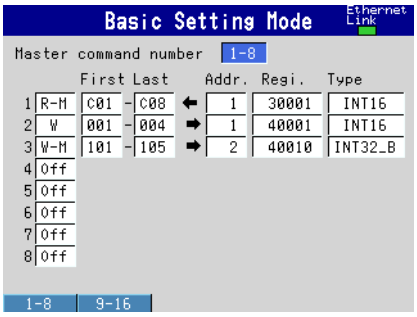
Setting the Modbus Master

◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **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 command timeout value to 125ms, 250ms, 500ms, 1s, 2s, 5s, 10s, or 1min.
- **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 inter-block delay to Off, 5ms, 10ms, 15ms, 45ms, or 100ms.
- **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, or W-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.
  R can be selected on DX2000s with the external input channel (/MC1) installed.
  R-M and **W-M** can be selected on models with the computation function (/M1) 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
- **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

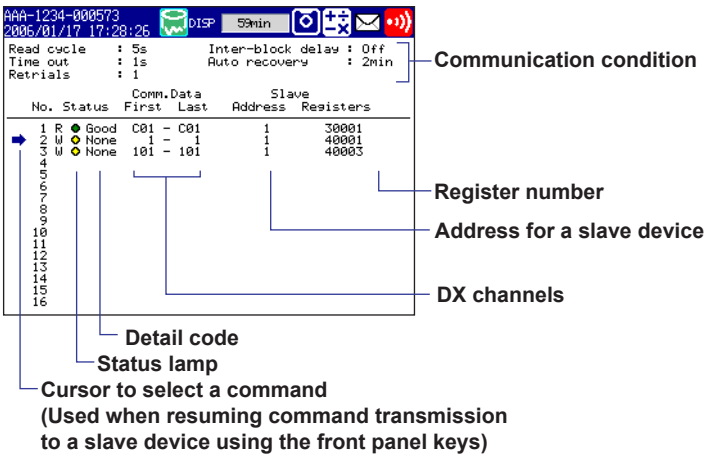
◊ Press **DISP/ENTER** and select **INFORMATION** > **MODBUS MASTER**

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** (switch to the setting mode), and select **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

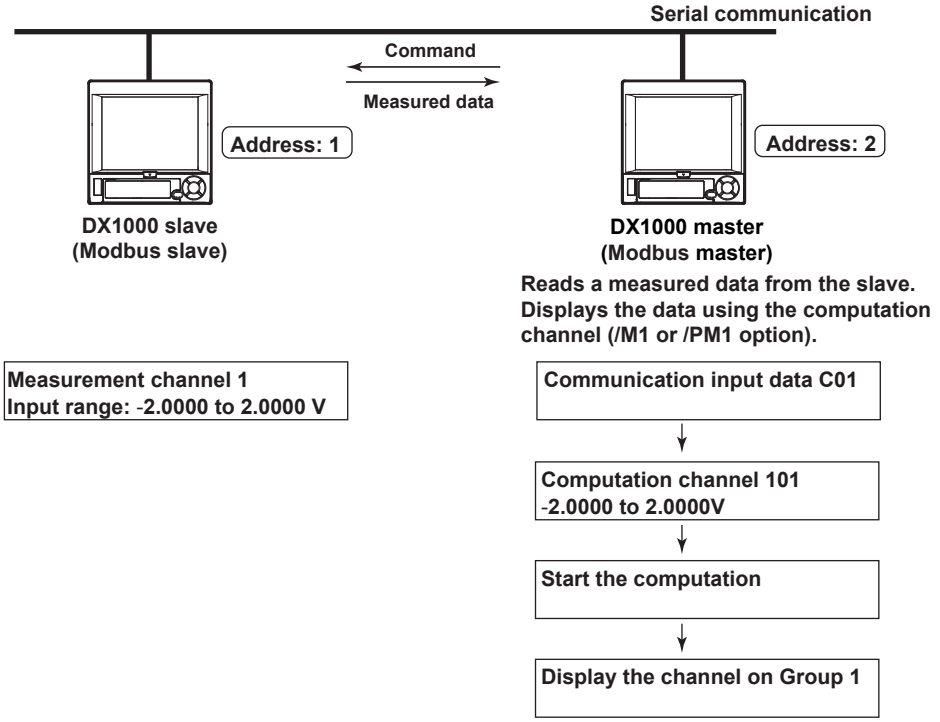
Data drop occurs when the commands from 1 to 16 do not complete within the read cycle (see appendix 1). When a data dropout occurs, the communication input data is held at the previous value. A message indicating the data dropout is also displayed on the Modbus status display. If this happens, take measures 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

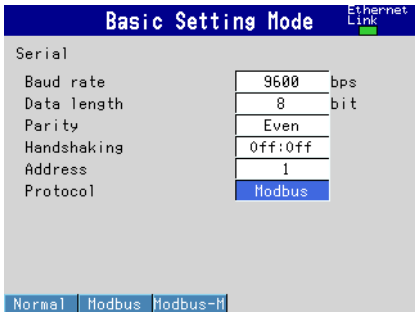
- The DX1000 master reads the measured value of channel 1 on the DX1000 slave into the communication input data C01. C01 is displayed on a computation channel 101 by including the data in the equation. The computation channel 101 is assigned to Group1.
- The measured value of channel 1 on the DX1000 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

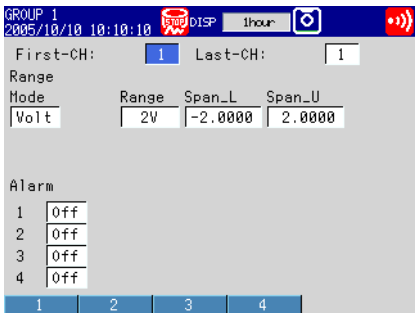
◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication (Serial)** > **Basic settings**



Item	Settings
Address	1
Protocol	Modbus

Setting the Measurement Channel

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



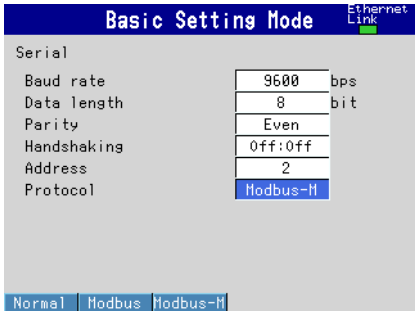
Item	Settings
First-CH, Last-CH	1
Mode	Volt
Range	2V
Span_L	–2.0000
Span_U	2.0000

Setting the DX1000 Master (Modbus Master)

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

Setting the Modbus Master Function

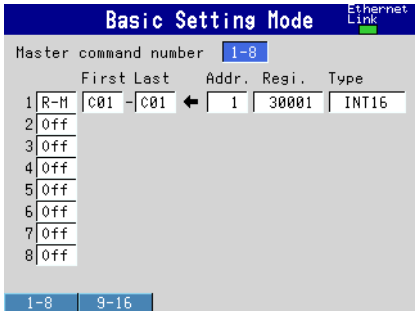
◊ Press **MENU** (switch to the setting mode), hold down **FUNC** for 3 s (switch to the basic setting mode), and select **Communication (Serial)** > **Basic settings**



Item	Settings
Address	2
Protocol	Modbus-M

Setting Command

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

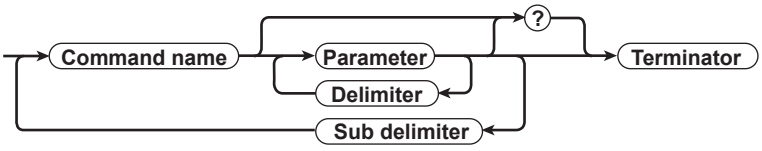
Confirming the Communication Status

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

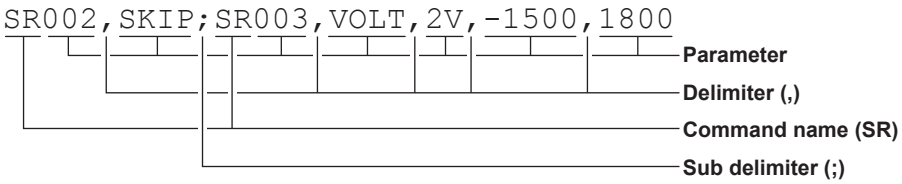
3.1 Command Syntax

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`, and `IF`
  - `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

Setting Commands

Group	Command Name	Function	Execution Mode	Administrator	User	Page
Setting						
	SR	Sets the input range	Operation mode	Yes	No	3-10
	SO	Sets the computing equation	Operation mode	Yes	No	3-11
	ER	Sets the range of the external input channel	Operation mode	Yes	No	3-11
	TJ	Sets the memory sample	Operation mode	Yes	No	3-12
	SA	Sets the alarm	Operation mode	Yes	No	3-12
	SW	Sets the display update rate/auto-save interval	Operation mode	Yes	No	3-13
	TI	Sets the circular display offset time	Operation mode	Yes	No	3-13
	TO	Sets the operation after 1 cycle on the circular display	Operation mode	Yes	No	3-13
	TW	Sets the secondary waveform display update rate	Operation mode	Yes	No	3-14
	TM	Sets manual sampling.	Operation mode	Yes	No	3-14
	TE	Sets the sampling conditions of the event data	Operation mode	Yes	No	3-14
	SZ	Sets the zone	Operation mode	Yes	No	3-14
	SP	Sets the partial expanded display	Operation mode	Yes	No	3-14
	ST	Sets the tag	Operation mode	Yes	No	3-15
	SX	Sets the group	Operation mode	Yes	No	3-15
	SL	Sets the trip line	Operation mode	Yes	No	3-15
	SG	Sets the message	Operation mode	Yes	No	3-15
	TH	Sets the directory of the external storage medium to save the data	Operation mode	Yes	No	3-15
	TZ	Sets the file header	Operation mode	Yes	No	3-15
	TF	Sets the data file name	Operation mode	Yes	No	3-16
	SD	Sets the date and time	Operation mode	Yes	No	3-16
	TD	Sets the daylight savings time	Operation mode	Yes	No	3-16
	TT	Sets the trend display	Operation mode	Yes	No	3-16
	SE	Sets the trend graph	Operation mode	Yes	No	3-16
	TB	Sets the bar graph display	Operation mode	Yes	No	3-16
	SB	Sets the bar graph of each channel	Operation mode	Yes	No	3-17
	TN	Sets the scale	Operation mode	Yes	No	3-17
	SV	Sets the moving average of the measured channel	Operation mode	Yes	No	3-17
	SC	Sets the channel display color	Operation mode	Yes	No	3-17
	TA	Sets the alarm point mark	Operation mode	Yes	No	3-17
	TG	Sets the green band (color scale band)	Operation mode	Yes	No	3-17
	SQ	Sets the LCD brightness and the screen backlight saver	Operation mode	Yes	No	3-17
	TC	Sets the background color	Operation mode	Yes	No	3-18
	TP	Sets the auto group switching	Operation mode	Yes	No	3-18
	TR	Sets the auto monitor recovery	Operation mode	Yes	No	3-18
	TQ	Sets the timer.	Operation mode	Yes	No	3-18
	TK	Sets the match timer	Operation mode	Yes	No	3-18
	TU	Set the event action	Operation mode	Yes	No	3-19
	SK	Sets the computation constant	Operation mode	Yes	No	3-19
	SI	Sets the rolling average of the computation channel	Operation mode	Yes	No	3-19
	SJ	Sets the TLOG timer	Operation mode	Yes	No	3-20
	TX	Sets the ancillary operation of the start key	Operation mode	Yes	No	3-20
	FR	Sets the acquiring interval to the FIFO buffer	Operation mode	Yes	No	3-20
	BH	Sets the batch text field	Operation mode	Yes	No	3-20
	EH	Sets the calibration correction	Operation mode	Yes	No	3-20
	BD	Sets the alarm delay	Operation mode	Yes	No	3-21
	SM	Sets the custom menu	Operation mode	Yes	No	3-21
	SY	Sets the four panel display	Operation mode	Yes	No	3-23

Yes: Command usable
No: Command not usable

Note

- 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.
- The administrator and user specifications in the table indicate the user level that is specified using the login function for Ethernet communications. For details, see section 1.2.

Group	Command Name	Function	Execution Mode	Administrator	User	Page
Control						
	BT	Sets the batch name	Operation mode	Yes	No	3-24
	BU	Sets the batch comment	Operation mode	Yes	No	3-24
	UD	Switches the display	Operation mode	Yes	No	3-24
	PS	Starts/Stops measurements	Operation mode	Yes	No	3-25
	AK	Releases the alarm output (alarm acknowledge)	Operation mode	Yes	No	3-25
	EV	Manual trigger, manual sample, snapshot, and forced timeout	Operation mode	Yes	No	3-25
	CL	Executes manual SNTP	Operation mode	Yes	No	3-25
	CV	Switches the display update rate	Operation mode	Yes	No	3-25
	MS	Writes the message (display and save)	Operation mode	Yes	No	3-25
	BJ	Writes the arbitrary messages	Operation mode	Yes	No	3-25
	EJ	Changes the password of the login function	Operation mode	Yes	Yes	3-25
	TL	Starts/stops/resets computation (MATH) or clears the computation dropout status display	Operation mode	Yes	No	3-25
	DS	Switches the execution mode (operation/basic setting)	All modes	Yes	No	3-26
	LO	Loads the setup data for setting mode	Operation mode	Yes	No	3-26
	LI	Saves the setup data	Operation mode	Yes	No	3-26
	CM	Sets the communication input data	Operation mode	Yes	No	3-26
	CE	Sets the communication input of the external input channel	Operation mode	Yes	No	3-26
	EM	Starts/stops the e-mail transmission function	Operation mode	Yes	No	3-26
	CU	Manually recovers the Modbus	Operation mode	Yes	No	3-27
	BV	Enters characters (usable only during serial communications)	All modes	Yes	No	3-27
	KE	Key operation command	Operation mode	Yes	No	3-27
	IR	Resets the relative timer	Operation mode	Yes	No	3-27

Yes: Command usable
No: Command not usable

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 the basic setting mode will contain the new settings even if they are not saved. However, the new settings will not be activated until they are saved. In order to activate the new settings, the YE or XE command must be issued as described earlier. If the settings are not saved or cleared and the execution mode is changed from the basic setting mode to the operation mode, the settings that are returned in the response to a query will contain the settings that existed before they were changed.

Note

- The settings that are changed using the YA, YK, RU, YQ, YS, YB, YD, WS, and WW commands are activated after saving the new settings using the XE command and rebooting the DX.
- When the YE or YO command executed, the communication is disconnected.

Group	Command Name	Function	Execution Mode	Administrator	User	Page
Setting						
	WO	Sets alarm and DO settings	Basic setting mode	Yes	No	3-28
	WH	Sets the alarm hysteresis	Basic setting mode	Yes	No	3-28
	XV	Sets the scan interval and A/D integral time	Basic setting mode	Yes	No	3-28
	XB	Sets the burn out detection	Basic setting mode	Yes	No	3-28
	XJ	Sets the RJC	Basic setting mode	Yes	No	3-29
	WU	Sets the environment	Basic setting mode	Yes	No	3-29
	XM	Sets the memory sampling conditions	Basic setting mode	Yes	No	3-30
	XT	Sets the temperature unit	Basic setting mode	Yes	No	3-30
	RF	Sets the key lock	Basic setting mode	Yes	No	3-30
	RN	Sets the basic key login	Basic setting mode	Yes	No	3-31
	RP	Sets user limitations	Basic setting mode	Yes	No	3-31
	RO	Sets the report type and generation time	Basic setting mode	Yes	No	3-31
	RM	Sets the report channel	Basic setting mode	Yes	No	3-31
	XG	Sets the time zone	Basic setting mode	Yes	No	3-32
	XN	Sets the date format	Basic setting mode	Yes	No	3-32
	YB	Sets the host information	Basic setting mode	Yes	No	3-32
	YD	Sets the network	Basic setting mode	Yes	No	3-32
	YA	Sets the IP address, subnet mask, and default gateway	Basic setting mode	Yes	No	3-32
	YK	Sets the keepalive	Basic setting mode	Yes	No	3-33
	RU	Sets the DNS	Basic setting mode	Yes	No	3-33
	WS	Sets the server	Basic setting mode	Yes	No	3-33
	WW	Sets the Web homepage	Basic setting mode	Yes	No	3-33
	YQ	Sets the communication timeout	Basic setting mode	Yes	No	3-33
	YT	Sets the FTP transfer timing	Basic setting mode	Yes	No	3-33
	YU	Sets the contents to be sent via e-mail	Basic setting mode	Yes	No	3-34
	YV	Sets the e-mail recipient address	Basic setting mode	Yes	No	3-34
	YW	Sets the e-mail sender address	Basic setting mode	Yes	No	3-35
	YX	Sets the e-mail SNTP server name	Basic setting mode	Yes	No	3-35
	YJ	Sets destination server of the Modbus client	Basic setting mode	Yes	No	3-35
	YP	Sets basic Modbus client settings	Basic setting mode	Yes	No	3-35
	YR	Sets the transmitted command of the Modbus client	Basic setting mode	Yes	No	3-35
	WB	Sets the SNTP client	Basic setting mode	Yes	No	3-36
	WC	Sets the SNTP operation when memory start is executed	Basic setting mode	Yes	No	3-36

Group	Command Name	Function	Execution Mode	Administrator	User	Page
Setting (continued)						
	YS	Sets the serial interface	Basic setting mode	Yes	No	3-36
	YL	Sets the operation of the Modbus master function	Basic setting mode	Yes	No	3-36
	YM	Sets the command of the Modbus master function	Basic setting mode	Yes	No	3-36
	WR	Sets the instrument information output	Basic setting mode	Yes	No	3-37
	XE	Activates the basic setting mode	Basic setting mode	Yes	No	3-38
	YE	Activates the basic setting mode (cold reset)	Basic setting mode	Yes	No	3-38

Yes: Command usable
No: Command not usable

Group	Command Name	Function	Execution Mode	Administrator	User	Page
Control						
	YO	Loads the setup file (for the basic setting mode)	Basic setting mode	Yes	No	3-27
	YC	Clears the setup dataClears the measured/computed data, initializes setup data	Basic setting mode	Yes	No	3-27

Yes: Command usable
No: Command not usable

Output Commands

Group	Command Name	Function	Execution Mode	Administrator	User	Page
Control						
	BO	Sets the byte output order	All modes	Yes	Yes	3-38
	CS	Sets the check sum (usable only during serial communications)	All modes	Yes	Yes	3-38
	IF	Sets the status filter	All modes	Yes	Yes	3-38
	CC	Disconnects an Ethernet connection (usable only during Ethernet communications)	All modes	Yes	Yes	3-38
	CB	Data output format	All modes	Yes	Yes	3-38
Setup, measurement, and control data output						
	FC	Outputs the screen image data	All modes	Yes	Yes	3-39
	FE	Outputs the setup data	All modes	Yes	Yes	3-39
	FD	Outputs the most recent measured/computed data	Operation mode	Yes	Yes	3-39
	FF	Outputs the FIFO data	Operation mode	Yes	Yes	3-40
	FL	Outputs log, alarm summary, and message summary	All modes	Yes	Yes	3-40
	IS	Outputs status information	All modes	Yes	Yes	3-40
	FU	Outputs the user level	All modes	Yes	Yes	3-40
	FA	Outputs the instrument information	All modes	Yes	Yes	3-41
	ME	Outputs the data stored on the external storage medium (usable through either Ethernet or serial communications)	Operation mode	Yes	No	3-41
	MO	Outputs the data stored in the internal memory.	Operation mode	Yes	No	3-41
Dedicated commands for RS-422/485						
	Esc O	Opens the instrument	All modes	Yes	Yes	3-42
	Esc C	Closes the instrument	All modes	Yes	Yes	3-42
Common commands among instruments						
	*I	Outputs the instrument information	All modes	Yes	Yes	3-42

Yes: Command usable
No: Command not usable

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

Command Name	Function	Administrator	User	Page
close	Disconnects the connection between other devices	Yes	No	3-43
con	Outputs connection information	Yes	Yes	3-43
eth	Outputs Ethernet statistical information	Yes	Yes	3-43
help	Outputs help	Yes	Yes	3-43
net	Outputs network statistical information	Yes	Yes	3-43
quit	Disconnects the connection of the instrument being operated	Yes	Yes	3-44

Yes: Command usable
No: Command not usable

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

Parameter Name	Function	Page
serial	Outputs the serial number	3-44
host	Outputs the host name	3-44
ip	Outputs the IP address	3-44

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
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

Setup Type	Input Type Parameter	Range	Range Parameter	Required Option
RTD	RTD	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
Contact input	DI	Level	LEVEL	
		Cont	CONT	
1-5V voltage	1-5V	1-5V	1-5V	

Channel Number Notations

The table below is a list of channel notations that are used.

Channel Type	Model	Channel Notation	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
		101 to 124	Medium-speed input model
	DX2000	101 to 112	High-speed input model
		101 to 160	Medium-speed input model
External input channels	DX1000	—	No setting
	DX2000	201 to 440	with the /MC1 option
Manual sample	DX1000	—	No setting
	DX2000	001 to 120	with the /MC1 option
Report channels	DX1000	R01 to R12	High-speed input model
		R01 to R24	Medium-speed input model
	DX2000	R01 to R12	High-speed input model
		R01 to R60	Medium-speed input model
Internal switch	DX1000	S01 to S30	
	DX2000		
Output relay	DX1000	I01 to I06	
	DX2000	I01 to I06, I11 to I16, I21 to I26, I31 to I36	Varies depending on the options
Constants	DX1000	K01 to K60	
	DX2000		
Communication input channels	DX1000	C01 to C24	
	DX2000	C01 to C60	
Display groups	DX1000	1 to 10	
	DX2000	1 to 36	
Remote control terminals	DX1000	D01 to D08	
	DX2000		
Pulse inputs	DX1000	P01 to P08	
	DX2000	Q01 to Q08	
Flags	DX1000	F01 to F08	
	DX2000		
High-speed input model	DX1002, DX1004, DX1002N, DX1004N, DX2004, DX2008		
Medium-speed input model	DX1006, DX1012, DX1006N, DX1012N, DX2010, DX2020, DX2030, DX2040, DX2048		

3.4 Setting Commands (Setting)

SR Sets the 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
- This command cannot be specified while measurement or computation is in progress.
- Measurements are not made on channels that are set to SKIP.
- Set parameter p1 according 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 input type for channel 001 to TC type R, span lower limit to 0°C, and span upper limit to 1760.0°C.
```
SR001,TC,R,0,17600
```

Description
- This command cannot be specified while measurement or computation is in progress or while a report is being created.
- Set parameters p1 and p3 according to the table in section 3.3.
- For parameters p4 and p5, enter a value using 5 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 setting type of channel 010 to the 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
- This command cannot be specified while measurement or computation is in progress or while a report is being created.
- Set parameters p1 and p4 according to the table in section 3.3.
- For parameters p5 and p6, enter a value using 5 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 point position (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 input 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
- This command cannot be specified while measurement or computation is in progress or while a report is being created.
- Set parameters p1 and p4 according to the table in section 3.3.
- For parameters p5 and p6, enter a value using 5 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<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 point position (0 to 4)
p9 Unit (up to 6 characters)

Query SR[p1]?

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

Description
- This command cannot be specified while measurement or computation is in progress or while a report is being created.
- Set parameters p1 and p3 according to the table in section 3.3.
- For parameters p4 and p5, enter a value using 5 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 point position (0 to 4)
p9 Unit (up to 6 characters)
p10 Low-cut function ON/OFF

Query SR[p1]?

Example Set the input type of channel 005 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
- This command cannot be specified while measurement or computation is in progress.
- Set parameter p1 according to the table in section 3.3.
- For parameters p4 and p5, enter a value using 4 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 the 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 point position (0 to 4)
p7 Unit (up to 6 characters)

Query SO[p1]?

Example Compute the sum of channels 001 and 002 on 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
- This command can be used on models with the /M1 math option.
- This command cannot be specified while measurement or computation is in progress.
- For a description on the computing equations, see the *DX1000/DX2000 User's Manual*.
- Set parameter p1 according to the table in section 3.3.
- For parameters p4 and p5, enter a value using 7 digits or less, excluding the decimal, for negative numbers and 8 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 the 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 point position (0 to 4)
p6 Unit (up to 6 characters)

Query ER[p1]?

Example Set the span of external input channel 201 to -150.00 to 150.00.
ER201,ON,-15000,15000,2

Description This command can be used on models with the /MC1 external input channel option.

TJ Sets the memory sample

Syntax TJ p1,p2<terminator>
- p1 Measurement/computation/external input channel number
- p2 Memory sample ON/OFF

Query TJ[p1]?

Example Save channel 002 to memory.
TJ002,ON

Description Computation channels can be specified (including queries) on models with the /M1 math option. External input channels can be specified (including queries) on models with the /MC1 external input channel option.

SA Sets the alarm

When Not Using the Alarm

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

Query SA[p1[,p2]]?

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

Description Computation channels can be specified (including queries) on models with the /M1 math option. External input channels can be specified (including queries) on models with the /MC1 external input channel option.

When Using the Alarm

Syntax SA p1,p2,p3,p4,p5,p6,p7,p8<terminator>
- p1 Measurement/computation/external input channel number
- p2 Alarm number (1 to 4)
- p3 Alarm ON/OFF state (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 When p6 is ON Relay number
  When p6 is OFF Space
- p8 Detection of alarm (OFF, ON)

Query SA[p1[,p2]]?

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

Description
- When the input range setting (SR command) is set to SKIP, p3 cannot be turned ON.
- When the computation channel setting (SO command) is turned OFF, p3 cannot be turned ON.
- When the external input channel setting (ER command) is turned OFF, p3 cannot be turned ON.
- The alarm settings are all turned OFF for the following cases.
  - When the input type is changed (VOLT, TC, etc).
  - When the input range is changed.
  - When the span and scaling values are changed during scaling display (includes changing the decimal position).)
  - When the computation channel is turned ON/OFF or when the computing equation or the span value is changed on the computation channel.
- 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 time for the delay high/low limit alarm using the BD command.
- Set the alarm value of p5 in the following range according to the alarm type of p4 or the target channel.
  - For Upper, Lower, Delay Upper and Delay Lower Alarms
    - When DC voltage, thermocouple, or RTD is applied
      Value in the measurable range of the selected range
    - For contact input
      0 or 1.
    - For scaling (1-5V, scaling, and square root)
      –5 to 105% of span (except, within –30000 to 30000)
  - For difference high limit and difference low limit alarm
    Value in the measurable range

  - For high limit on rate-of-change and low limit on rate-of-change alarm
    Value greater than or equal to 1 digit. For example, 0.0001 for 2 V range.
    The maximum value is within the measurable range (except within –30000 to 30000). For example, 3.0000 for 2 V range.
    For contact input, only the value 1 can be specified.
  - For computation channels
    –9999999 to 99999999 (excluding the decimal point. Set using an integer.)
  - For external input channels
    –30000 to 30000
- An error occurs if a number of a relay that is not installed is specified in p7.
- Computation channels can be specified (including queries) on models with the /M1 math option.
- For computation channels and external input channels, the only alarm types that can be specified 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 to zero. Use the XA command to set the alarm hysteresis.

SW Sets the display update rate/ auto-save interval

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

For the T-Y Display

`p1` 1
`p2` Waveform type (T-Y)
`p3` Display update rate (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
- This command cannot be specified while measurement is in progress.
- The selectable auto-save interval (p4) varies depending on the display update rate (p3) setting. For details, see the *DX1000/DX2000 User's Manual*.
- The display update rate (p3) of 15S and 30S can be applied to a high-speed input models (DX1002, DX1002N, DX1004, DX1004N, DX2004,and DX2008).
- Set the display update interval (p3) to an interval slower 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 (p1 of the XM command is set to AUTO).

For Circular Display

`p1` 1
`p2` Waveform type (CIRCULAR)
`p3` Time 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 of one cycle to 20 minutes, and the auto-save interval to 1 hour.
`SW1,CIRCULAR,20MIN,1H`

Description
- This command cannot be specified while measurement is in progress.
- The selectable auto-save interval (p4) varies depending on the time of one cycle (p3) setting. For details, see the *DX1000/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 (p1 of the XM command is set to AUTO).
- Set the time of one cycle (p3) to an interval slower than the scan interval.
- A time of one cycle (p3) of 20MIN can only be set on a high-speed input models (DX1002, DX1002N, DX1004, DX1004N, DX2004,and DX2008).

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`

TO Sets the operation after 1 cycle on the circular display

Syntax `TO p1`<terminator>
`p1` Operation at one cycle
`ALLCLEAR` After the waveform display makes a cycle, clear the entire waveform display and start drawing a new waveform.

DIVCLEAR After the waveform display makes a cycle, clear a section of the waveform display and start drawing a new waveform.

Query TO?

Example Set the operation at one cycle to all clear.
TOALLCLEAR

TW Sets the secondary waveform display update rate

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

Query TW?

Example Set the update rate to 2 minutes.
TW2MIN

Description Set the update interval (p1) to an interval slower than the scan interval.

TM Sets manual sampling

Syntax TM p1,p2,p3<terminator>
p1 Manual sampling channel number
p2 Enable/Disable (ON, OFF)
p3 Measurement/computation/external input channel number

Query TM[p1]?

Example Assign measurement channel 002 to manual sampling number 001.
TM001,ON,002

Description
- This command can be used on models with the /MC1 external input channel option.
- Computation channels can be specified on models with the /M1 math option.

TE Sets the sampling conditions of the event data

Syntax TE p1,p2,p3,p4,p5,p6<terminator>
p1 1
p2 Sample rate (25MS, 125MS, 250MS, 500MS, 1S, 2S, 5S, 10S, 30S, 1MIN, 2MIN, 5MIN, 10MIN)
p3 Sample mode
FREE Start the data acquisition at memory start, and stop the data acquisition at memory stop.
SINGLETRIGGER Acquire the data for a specified time once after the trigger is activated and stop.
REPEATTRIGGER Acquire the data for a specified time after the trigger is activated, and enter the trigger-wait condition.
p4 Sample time (10MIN, 20MIN, 30MIN, 1H, 2H, 3H, 4H, 6H, 8H, 12H, 1DAY, 2DAY, 3DAY, 5DAY, 7DAY, 10DAY, 14DAY, 31DAY)
p5 Pretrigger length (0, 5, 25, 50, 75, 95, 100) percent
p6 Enable/disable the Key trigger source (OFF, ON)
Parameters p5 to p6 are valid when p3 is SINGLETRIGGER or REPEATTRIGGER.

Query TE[p1]?

Example Acquire the data at sampling rate of 125-ms for 10 minutes using a single trigger.
TE1,125MS,SINGLETRIGGER,10MIN

Description You cannot specify a sampling rate that is faster than the scan interval.

SZ Sets the zone

Syntax SZ p1,p2,p3<terminator>
p1 Measurement, computation, or external input channel number
p2 Zone lower position (0 to 95) [%]
p3 Zone upper position (5 to 100) [%]

Query SZ[p1]?

Example Display channel 002 in a zone between 30% and 50%.
SZ002,30,50

Description
- Computation channels can be specified (including queries) on models with the /M1 math option. External input channels can be specified (including queries) on models with the /MC1 external input channel option.
- The total display width of the screen in the direction of the amplitude is taken to be 100%.
- The zone width must be at least 5%.
- Set the parameters for the zone upper and lower limits so that the upper limit is greater than the lower limit.

SP Sets the partial expanded display

Syntax SP p1,p2,p3,p4<terminator>
p1 Measurement, computation, or external input channel number
p2 Partial expanded setting 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
- Computation channels can be specified (including queries) on models with the /M1 math option. External input channels can be specified (including queries) on models with the /MC1 external input channel option.
- When the input range setting (SR command) is set to SKIP, p2 cannot be turned ON.
- When the computation channel setting (SO command) is turned OFF, p2 cannot be turned ON.

- When the external input channel setting (ER command) is turned OFF, p3 cannot be turned ON.
- The range of the span upper and lower limits (scale upper and low limits when scale is enabled) is taken to be 100% for parameter p3.
- Parameter p4 can be set in the range (span upper limit – 1) to (span lower limit + 1). If scaling is enabled, the range is (scaling upper limit – 1) to (scaling lower limit + 1).
- The decimal position and the number of digits are set to the same values as the span and scaling settings (see the SR command).
- This command (including a query) can be specified when the partial expanded display function of the XU command is set to USE.
- This command cannot be specified if the partial expanded display range does not exist (when the span width is set to 1, for example).

ST Sets the tag

Syntax `ST p1,p2<terminator>`
`p1` Measurement/computation/external input channel number
`p2` Tag (up to 16 characters)

Query `ST[ p1]?`

Example Set the tag of channel 002 to TAG2.
`ST002,TAG2`

Description
- For the characters that can be used for the tags, see appendix 4, “ASCII Character Codes.” Note that semicolons and commas cannot be used.
- Computation channels can be specified (including queries) on models with the /M1 math option. External input channels can be specified (including queries) on models with the /MC1 external input channel option.

SX Sets the group

Syntax `SX p1,p2,p3<terminator>`
`p1` Group number
`p2` Group name (up to 16 characters)
`p3` Channel configuration

Query `SX[ p1]?`

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

Description For the characters that can be used for the group names, see appendix 4, “ASCII Character Codes.” Note that semicolons and commas cannot be used.

SL Sets the trip line

Syntax `SL p1,p2,p3,p4,p5,p6<terminator>`
`p1` 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 The total display width of the screen in the direction of the amplitude is taken to be 100%.

SG Sets the message

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

Query `SG[ p1]?`

Example Set character string “MESSAGE1” in message number 2.
`SG2,MESSAGE1`

Description For the characters that can be used for the messages, see appendix 1, “ASCII Character Codes.” Note that semicolons and commas cannot be used.

TH Sets the directory of the external slot to save the data

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

Query `TH ?`

Example Save to the DATA1 folder on the external storage medium.
`THDATA1`

TZ Sets the file header

Syntax `TZ p1,p2<terminator>`
`p1` 1
`p2` File header (up to 50 characters)

Query `TZ[ p1]?`

Example Set the header to DX1000DATA.
`TZ1,DX1000DATA`

TF Sets the data file name

Syntax `TF p1,p2,p3`<terminator>
- `p1` 1
- `p2` Configuration
  - `BATCH` File name by the batch function
  - `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 DATE or SERIAL)

Query `TF[ p1]?`

Example Set the file name to serial number and set the user-assigned string to DX1DATA.
```
TF1,SERIAL,DX1DATA
```

SD Sets the date and time

Syntax `SD p1,p2`<terminator>
- `p1` Date (YY/MM/DD) fixed form
  - `YY` Year (00 to 79)
  - `MM` Month (01 to 12)
  - `DD` Day (01 to 31)
- `p2` Time (HH/MM/SS) fixed form
  - `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, October 1, 2005.
```
SD05/10/01,13:00:00
```

Description The form of p1 and p2 is fixed to 8 characters. Use the form given below. Do not enter spaces between the digits; otherwise an error will occur.
p1 = YY/MM/DD (Lower two digits of the year/month/day)
p2 = HH:MM:SS (Hour:minute:second)

TD Sets the daylight savings time

Syntax `TD`
`p1,p2,p3,p4,p5,p6,p7,p8,p9`<terminator>
- `p1` USE/NOT
- `p2` Summer time adjustment month (JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC)
- `p3` Summer time adjustment nth day of the week (for example, the second Monday) (1ST, 2ND, 3RD, 4TH, LAST)
- `p4` Summer time adjustment day of week (SUN, MON, TUE, WED, THU, FRI, SAT)
- `p5` Summer time adjustment hour (0 to 23)
- `p6` Winter time adjustment month (JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC)
- `p7` Winter time adjustment nth day of the week (for example, the second Monday) (1ST, 2ND, 3RD, 4TH, LAST)
- `p8` Winter time adjustment day of week (SUN, MON, TUE, WED, THU, FRI, SAT)
- `p9` Winter time adjustment hour (0 to 23)

Query `TD?`

Example Switch to daylight savings (summer) time on hour 0 on the first Sunday of June, and switch to standard (winter) time on hour 0 on the first Sunday of December.
```
TDUSE,JUN,1ST,SUN,0,DEC,1ST,SUN,0
```

TT Sets the trend display

Syntax `TT p1,p2,p3,p4,p5`<terminator>
- `p1` Display direction of the graph
  - `HORIZONTAL` Horizontal display
  - `VERTICAL` Vertical display
  - `WIDE` Horizontal wide display
  - `SPLIT` Horizontal split display
- `p2` Clear waveform at start (ON/OFF)
- `p3` Display direction of the message
  - `HORIZONTAL`
  - `VERTICAL`
- `p4` Scale digit display
  - `NORMAL` 3-digit display
  - `FINE` 4-digit display
- `p5` Current value display
  - `MARK` Display using a mark
  - `BARGRAPH` Display using a bar graph

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

Query `TT?`

Example Set the waveform to horizontal display, the message direction to vertical, and display the waveform by clearing the existing waveform at memory start.
```
TTHORIZONTAL,ON,VERTICAL
```

SE Sets the trend graph

Syntax `SE p1,p2`<terminator>
- `p1` Line width of the trend (1 to 3) [dot]
- `p2` Number of grids (4 to 12, AUTO)

Query `SE?`

Example Set the line width of the trend waveform to 1 dot and the number of grids to 10.
```
SE1,10
```

TB Sets the bar graph display

Syntax `TB p1`<terminator>
- `p1` Display direction of the bar graph
  - `HORIZONTAL`
  - `VERTICAL`

Query TB?
Example Display the bar graph horizontally.
TBHORIZONTAL

SB Sets the bar graph for each channel

Syntax SB p1,p2,p3<terminator>
p1 Measurement/computation/external input channel number
p2 Base position of the bar graph display
NORMAL Normal (lower limit)
CENTER
LOWER Lower limit
UPPER Upper limit
p3 Number of scale divisions (4 to 12)
Query SB[p1]?
Example Set the number of scale divisions of the bar graph of channel 002 to 5, and display the bar graph from the span lower limit (scale lower limit if scale is enabled).
SB002,NORMAL,5
Description
- Computation channels can be specified (including queries) on models with the /M1 math option. External input channels can be specified (including queries) on models with the /MC1 external input channel option.
- The base position (p2) is valid when the display direction of the bar graph is set to HORIZONTAL. Use the TB command to set the display direction of the bar graph.

TN Sets the scale

Syntax TN p1,p2,p3<terminator>
p1 Measurement/computation/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 of channel 003 to 2, and the number of divisions to 10.
TN003,2,10

SV Sets the moving average of the measured channel

Syntax SV p1,p2,p3<terminator>
p1 Measurement channel number
p2 Moving average OFF/ON
p3 Number of samples for computing the moving average (2 to 400) [times]
Query SV[p1]?
Example Set the number of samples for computing the moving average of channel 002 to 12.
SV002,12

SC Sets the channel display color

Syntax SC p1,p2<terminator>
p1 Measurement/computation/external input channel number
p2 Display color (see SL (sets the trip line))
Query SC[p1]?
Example Set the display color of channel 002 to blue.
SC002,BLUE
Description Computation channels can be specified (including queries) on models with the /M1 math option. External input channels can be specified (including queries) on models with the /MC1 external input channel option.

TA Sets the alarm point mark

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

TG Sets the green band (color scale band)

Syntax TG p1,p2,p3,p4,p5<terminator>
p1 Measurement/computation/external input channel number
p2 Area (OFF, IN, OUT)
p3 Display color (see SL (sets the trip line))
p4 Display position lower limit
p5 Display position upper limit
Query TG[p1]?
Example Set the range between -1.0000 and 0.5000 V (2 V range) on channel 005 as a green band area, and sets the display 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 Type of display backlight saver function
OFF Disable the saver function
DIMMER Dim
TIMEOFF Turn OFF
p3 Time to switch to saver mode
1MIN, 2MIN, 5MIN, 10MIN, 30MIN, 1H
p4 Event that causes the DX to recover from the saver mode
KEY Pressing of a key
KEY+ALARM Pressing of a key or an alarm occurrence

Query SQ?

Example Set the LCD brightness to 2 and the screen backlight saver function to dim. Set the time to switch to saver mode to 5 minutes and the event that causes the DX to recover from the saver mode to pressing of a key.
SQ2,DIMMER,5MIN,KEY

Description If p2 is OFF, p3 and p4 are not specified.

TC Sets the background color

Syntax TC p1,p2<terminator>
p1 Display screen (WHITE, BLACK)
p2 Historical trend display (WHITE, CREAM, LIGHTGRAY, BLACK)

Query TC?

Example Set the display background to black and the historical trend display background to cream.
TCBLACK,CREAM

TP Sets the auto group switching

Syntax TP p1<terminator>
p1 Auto scroll time (5S, 10S, 20S, 30S, 1MIN)

Query TP?

Example Switch the group at 5-s intervals.
TP5S

TR Sets the auto monitor recovery

Syntax TR p1<terminator>
p1 Auto recovery time (OFF, 1MIN, 2MIN, 5MIN, 10MIN, 20MIN, 30MIN, 1H)

Query TR?

Example Set the auto recovery time to 5 minutes.
TR5MIN

TQ Sets the timer

When p2 Is OFF (No Timer)

Syntax TQ p1,p2<terminator>
p1 Timer number (1 to 4)
p2 Timer type (OFF)

When p2 Is ABSOLUTE (Absolute Time)

Syntax TQ p1,p2,p3,p4<terminator>
p1 Timer number (1 to 4)
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 form)
hh Hour (00 to 23)

When p2 Is RELATIVE (Relative Time)

Syntax TQ p1,p2,p3,p4<terminator>
p1 Timer number (1 to 4)
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 time of timer number 1 to 10 hours 30 minutes. Do not reset at start.
TQ1,1,RELATIVE,10:30,OFF

TK Sets the match timer

When p2 Is Set to OFF (Not Use the Match Timer)

Syntax TK p1,p2<terminator>
p1 Timer number (1 to 4)
p2 Timer designation (OFF)

When p2 Is DAY (Time Designation)

Syntax TK p1,p2,p3,p4,p5<terminator>
p1 Timer number (1 to 4)
p2 Timer designation (DAY)
p3 Day (1 to 28)
p4 Time (hh:mm fixed format) (00:00 to 23:59)
p5 Timer operation (SINGLE, REPEAT)

When p1 Is WEEK (Day of Week/Time Designation)

Syntax TK p1,p2,p3,p4,p5<terminator>
p1 Timer number (1 to 4)
p2 Timer designation (WEEK)
p3 Designation of the day of the week to time out the memory (SUN, MON, TUE, WED, THU, FRI, SAT)
p4 Time (hh:mm fixed format) (00:00 to 23:59)
p5 Timer operation (SINGLE, REPEAT)

When p2 Is MONTH (Day/Time Designation)

Syntax TK p1,p2,p3,p4,p5<terminator>
p1 Timer number (1 to 4)
p2 Timer designation (MONTH)
p3 Day (1 to 28)
p4 Time (hh:mm fixed format) (00:00 to 23:59)
p5 Timer operation (SINGLE, REPEAT)

Query TK[p1]?

Example Specify hour 21 every Thursday for timer number 2.
TK2,WEEK,THU,21:00,REPEAT

TU Sets the event action

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

`p1` Logic number (1 to 40)

`p2` Event type

`NONE`	None
`REMOTE`	Remote
`RELAY`	Alarm output relay
`SWITCH`	Internal switch
`ALARM`	Alarm occurrence
`TIMER`	Timer expiry
`MATCHTIMETIMER`	Match time expiry
`USERKEY`	USER key

`p3` Event detail

`p2=REMOTE`	Remote number (1 to 8)
`p2=RELAY`	Relay number
`p2=SWITCH`	Internal switch number
`p2=TIMER`	Timer number (1 to 4)
`p2=MATCHTIMETIMER`	Match timer number (1 to 4)
`p2=Other`	Space

`p4` Operation type

`MEMORYSTART/STOP`	
`MEMORYSTART`	
`MEMORYSTOP`	
`TRIGGER`	Event trigger
`ALARMACK`	Alarm acknowledge
`MATHSTART/STOP`	
`MATHSTART`	
`MATHSTOP`	
`MATHRESET`	
`SAVEDISPLAY`	Save display data to the external storage medium
`SAVEEVENT`	Save event data to the external storage medium
`MESSAGE`	Write the message
`SNAPSHOT`	
`MANUALSAMPLE`	
`TIMERRESET`	Reset the relative timer
`DISPLAYRATE1/2`	Switch the display update rate
`DISPLAYGROUPCHANGE`	Switch the display group
`FLAG`	Raise the flag
`TIMEADJUST`	
`PANELLOAD`	Load the settings

`p5` Event detail 2

`p4=TIMERRESET`	Timer number (1 to 4)
`p4=DISPLAYGROUPCHANGE`	Group number
`p4=FLAG`	Flag number (1 to 8)
`p4=MESSAGE`	Message number (1 to 100)
`p4=PANELLOAD`	Setting file number (1 to 3)

`p6` Event detail 3

`p4=MESSAGE`	Method of specifying the destination to write the message
`ALL`	All display group designation
`SELECT`	Display group designation

`p7` Event detail 4

When p6 is `SELECT` Group number

Some of the p4 items (operation types) cannot be selected depending on p2 (event type).
Some of the p4 items (operation types) cannot be selected depending on the settings or the installation condition of options.

Query `TU[ p1]?`

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

Description Set parameter p3 (relay number, internal switch) according to the table in section 3.3.

SK Sets the computation constant

Syntax `SK p1,p2<terminator>`

`p1` Constants 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 constant 1.0000E-10 for computation constant number K01.
`SKK01,1.0000E-10`

Description
- This command can be used on models with the /M1 math option.
- This command cannot be specified while measurement or computation is in progress.
- Set parameter p1 according to the table in section 3.3.

SI Sets the rolling average of the 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 the rolling average of computation channel 107 ON, set the sampling interval to 1 minute, and the number of samples to 20.
`SI107,ON,1MIN,20`

Description
- This command can be used on models with the /M1 math option.

- If p2 is OFF, p3 and p4 are not specified.
- Set the sampling interval greater than or equal to the scan interval.

SJ Sets the TLOG timer

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

`p1` Computation channel number

`p2` Timer (1 to 4)

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

`OFF`	No conversion.
`/S`	Convert as though the physical values are integrated in units of seconds.
`/MIN`	Convert as though the physical values are integrated in units of minutes.
`/H`	Convert as though the physical values are integrated in units of hours.

`p4` Reset ON/OFF

Query `SJ[ p1]?`

Example Set timer 1 to computation channel number 110. Not convert the unit time and enable the reset operation.

```
SJ110,1,OFF,ON
```

Description
- This command can be used on models with the /M1 math option.
- Set parameter p1 according to the table in section 3.3.
- This command cannot be specified while computation is in progress.
- About p3

  Because the sampled data are integrated over each scan interval, the physical value integrated over a given period may be different from the actual integrated value. This occurs if the given period is not equal to the scan interval. In these cases, set p3 to the unit of the integration time desired. The integrated value is found according to the following conversion equations that depend on the parameter.

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

  The unit of the scan interval 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 is also started.

```
TXSTART
```

FR Sets the interval for acquiring data to the FIFO buffer

Syntax `FR p1,p2<terminator>`

`p1` 1 (fixed)

`p2` 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 the scan interval is set 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 measured/computed values are acquired to the internal memory at predetermined time intervals from the time the power is turned ON, and the data are output when a FF command is received. The previous output position is held for each connection and is updated when the next set of data is output with the FF command. This scheme compensates for the differences in the processing power of the measurement PC and the communication delay. This enables data to be retrieved without any dropouts if the measurement PC reads the data before the ring buffer is overwritten. For the output flow of FIFO data, see appendix 7.

BH Sets the batch text field

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

`p1` 1

`p2` Field number (1 to 8)

`p3` Field title (up to 20 characters)

`p4` Field characters (up to 30 characters)

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

Example Set the title to “OPERATOR” and the text to “DAQSTATION” for field number 2.

```
BH1,2,OPERATOR,DAQSTATION
```

Description For the characters that can be used, see appendix 4.

EH Sets the calibration correction

When p2 Is 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 Calibration OFF
2 to 16 Number of break points

When p2 Is SET

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

Description
- Set parameter p1 according to the table in section 3.3.
- The selectable range of p4 and p5 vary depending on the current range.
- when set to scale range, the selectable range of p4 and p5 is -30000 to 30000.
- Set input value p4 so that the value increases as the break point p3 increases.

When p2 Is END

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

Example Example in which three break points are specified on CH2

```
EH002,BEGIN,3
EH002,SET,1,0,1
EH002,SET,2,50,49
EH002,SET,3,100,101
EH002,END
```

Description
- First, execute the BEGIN operation to specify the number of break points.
- Set the values of the break points using the SET operation for the number of break points specified above.
- Execute the END operation to complete the settings.
- EH2? outputs the CH2 settings.
- The output example is as shown in the example above.
- This command cannot be executed while computation is started.

BD Sets the alarm delay

Syntax BD p1,p2<terminator>
p1 Measurement/computation/external input channel number
p2 Alarm delay (1 to 3600) [s]

Query BD[p1]?

Example Set the alarm delay of channel 001 to 120 s.

```
BD001,120
```

Description Set parameter p1 according to the table in section 3.3.

SM Sets the custom menu

Set the Main Menu

Syntax SM
p1,p2,p3,p4,p5,p6,p7,p8,p9<terminator>
p1 Type (DISP_MAIN)
p2 to p9 Menu to be displayed
Displays the menu in the specified order. Menus that are not specified are not displayed.
TREND
DIGITAL
BAR
OVERVIEW
INFORMATION
TRENDHISTORY
LOG
4PANEL
ESC
SEPARATOR

Example Set the first menu to TREND and the second menu to TRENDHISTORY.

```
SMDISP_MAIN,TREND,TRENDHISTORY,
```

Description
- If parameters p2 and subsequent parameters are omitted, all menus are hidden.
- A command error occurs if you specify the same menu multiple times.
- Up to three separators can be specified. If you specify more than three, an error occurs.
- Parameters cannot be omitted using delimiters (, ,).
- “4PANEL” is available only on the DX2000.
- The SEPARATOR in front is ignored.

Set the Submenu

Syntax SM p1,p2,p3,....<terminator>
p1 Type (DISP_SUB)
p2 Menu type (TREND, DIGITAL, BAR, TRENDHISTORY, OVERVIEW, INFORMATION, LOG, 4PANEL)
p3 and up Menu to be displayed in the submenu
Displays the menu in the specified order. Menus that are not specified are not displayed.
If p2 is TREND [select from the items below]

GROUP1 to GROUP36	Group selection
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
SEPARATOR	Separator

If p2 is DIGITAL [select from the items below]

GROUP1 to GROUP36	Group selection
AUTO	Auto switching
EXPAND	Expand
SEPARATOR	Separator

If p2 is BAR [select from the items below]

GROUP1 to GROUP36	Group selection
AUTO	Auto switching
EXPAND	Expand
SEPARATOR	Separator

If p2 is TRENDHISTORY [select from the items below]

GROUP1 to GROUP36	Group selection
SEPARATOR	Separator

If p2 is OVERVIEW [select from the items below]

CURSOR	Cursor display
TO_ALARM	To alarm summary
TO_TREND	To trend display
TO_DIGITAL	To digital display
TO_BAR	To bar graph display
EXPAND	Expand
SEPARATOR	Separator

If p2 is 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
REPORT	Report display
TO_HISTORY	To the historical display
TO_HISTORY_D	To historical (display)
TO_HISTORY_E	To historical (event)
TO_OVERVIEW	To overview display
SORT_KEY	Sort key switch
SORT_ORDER	Sort order switch
DISP_ITEM	Date/Username switch
DATA_KIND	Switch the report
DATE/FILE	Date/Filename switch
SELECT_SAVE	Select save
REPORT_CHANNEL	Switch the report channel display
ALL_SAVE	All save
MANUAL_SAVE	Save manual sample
REPORT_SAVE	Save report
EXPAND	Expand
SEPARATOR	Separator

If p2 is LOG [select from the items below]

LOGIN_LOG	Login log
ERROR_LOG	Error log
COMMU_LOG	Communication log
FTP_LOG	FTP log
WEB_LOG	Web log
MAIL_LOG	E-mail log
SNTP_LOG	SNTP log
DHCP_LOG	DHCP log
MODBUS_LOG	Modbus log
SEPARATOR	Separator

If p2 is 4PANEL [select from the items below]

4PANEL1 to 4PANEL4	Four panel selection
SEPARATOR	Separator

Example Display SCALE and DIGITAL for the first and second submenus of the trend main menu.

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

Description
- Selectable items for p3 and subsequent parameters are limited by the p2 setting.
- If parameters p3 and subsequent parameters are omitted, all menus are hidden.
- A command error occurs if you specify the same menu multiple times.
- Up to three separators can be specified. If you specify more than three, an error occurs.
- EXPAND cannot be specified in log and four panel.
- Parameters cannot be omitted using delimiters (, ,).
- If SM DISP_SUB? is specified, submenus of main menus that are turned OFF are also output.
- The SEPARATOR in front is ignored.
- The Show/Hide setting for the group selection parameters, “GROUP1” to “GROUP36” and the autoswitching parameter, “AUTO” are applied universally to Trend, Digital, Bar Graph, and Historical Trend. (For example, after setting AUTO to Hide under Trend, if you then set AUTO to Show under Digital, AUTO will be set to Show under Trend, Digital, Bar Graph, and Historical Trend.)

Set the Function Menu

p1	Type (FUNC)
p2 to p24	Menu to be displayed

Displays the menus of the functions selected among the items below in the specified order. Menus that are not specified are not displayed.

ALARMACK	Alarm acknowledge
MESSAGE	
FREE_MESSAGE	
TRIGGER	Event trigger
SAVE_DISPLAY	Save the display data
SAVE_EVENT	Save the event data
MANUAL_SAMPLE	
SNAPSHOT	
BATCH	
MATH_START/STOP	
MATH_RESET	

MATH_ACK	Math data dropout acknowledge
KEYLOCK	Enable/disable key lock
LOGOUT	
PASSWORD_CHANGE	
EMAIL_START/STOP	
EMAIL_TEST	
FTP_TEST	
SNTP	
MEDIA_EJECT	Eject the storage medium
SYSTEM_INFO	System information
NETWORK_INFO	Network information
TEXT_FIELD	Text field display
4PANEL	Four panel
JUMP_DISPLAY	Register the home display
RATE_CHANGE	Display rate 1/display rate 2
FAVORITE_REGIST	Register as favorite
SAVE_STOP	Stop the save operation
TIMER_RESET	Reset the timer

Example Display FREE MESSAGE and SNAPSHOT for the first and second function menus.

```
SMFUNC,FREE_MESSAGE,SNAPSHOT
```

Description
- A command error occurs if you specify the same menu multiple times.
- "SEPARATOR" cannot be specified.
- Parameters cannot be omitted using delimiters (, ,).
- "LOGOUT" cannot be hidden. If it is not included in the parameters, it is displayed at the end.

Query

```
SM ?
```

When querying all menus

```
SM DISP_MAIN?
```

When querying all main menus

```
SM DISP_SUB?
```

When querying all submenus

```
SM DISP_SUB,TREND?
```

When querying the trend submenu

```
SM FUNC?
```

When querying all function menus

SY Sets the four panel display

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

`p1` 1

`p2` Screen number (1 to 4)

`p3` Screen group name (up to 16 characters)

`p4` Screen 1 type (TREND, DIGITAL, BAR, OVERVIEW, ALARM, MESSAGE, MEMORY, MODBUS-M, MODBUS-C, RELAY)

TREND	Trend display
DIGITAL	Digital display
BAR	Bar graph display
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

`p5` Group number to be displayed at screen 1

`p6` Screen 2 type (see p4)

`p7` Group number to be displayed at screen 2

`p8` Screen 3 type (see p4)

`p9` Group number to be displayed at screen 3

`p10` Screen 4 type (see p4)

`p11` Group number to be displayed at screen 4

About the screen group designation (p5, p7, p9, and p11)
- The screen group designation is invalid when the respective screen type (p4, p6, p8, and p10) is not {TREND, DIGITAL, or BAR}.

Query

```
SY[ p1,[ p2]]?
```

Example Set the following to screen number 1.
Four panel name: TEMP
Screen 1: Trend display, group 1
Screen 2: Digital display, group 3
Screen 3: Alarm summary
Screen 4: Overview

```
SY1,1,TEMP,TREND,1,DIGITAL,3,ALARM,
1,OVERVIEW
```

Description
- The group designations (p5, p7, p9, and p11) are valid only if the corresponding display types (p4, p6, p8, and p10) are {TREND, DIGITAL, BAR}.
- The setting p4=MODBUS-M is valid only if the serial interface protocol is set to MODBUS-M.
- The setting p4=REPORT is valid only on models with the /M1 MATH option.

3.5 Setting Commands (Control)

BT Sets the batch name

Syntax BT p1,p2,p3<terminator>
p1 1
p2 Batch number (up to 32 characters)
p3 Lot number (up to 8 digits)

Query BT[p1]?

Example Set the batch name configuration to batch number PRESS5LINE and lot number 007.
BT1,PRESS5LINE,007

BU Sets the batch comment

Syntax BU p1,p2,p3<terminator>
p1 1
p2 Comment number (1 to 3)
p3 Comment character sting (up to 50 characters)

Query BU[p1,[p2]]?

Example Set the comment “THIS_PRODUCT_IS_COMPLETED” in comment number 2.
BU1,2,THIS_PRODUCT_IS_COMPLETED

UD Switches the screen

When Switching the Screen Back to the Screen That Existed before Settings Were Changed Using Communication Commands

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

Example Switch the display back to the display that existed before settings were changed using communication commands.
UD0

When Changing to One Screen Display

Syntax UD p1,p2,p3<terminator>
p1 Screen switching (1)
p2 Display item

TREND	Trend display
DIGITAL	Digital display
BAR	Bar graph display
OVERVIEW	Overview display (Alarm indicator)
ALARM	Alarm summary display
MESSAGE	Message summary display
MEMORY	Memory summary display
MODBUS-M	Modbus master status display
MODBUS-C	Modbus client status display
RELAY	Relay status display
REPORT	Report display
HISTORICAL	Historical trend display

p3 Group number (1 to 4)

Example Set the display to one screen trend and set the number of the group to be displayed to 4.
UD1,TREND,4

Description
- The setting p4=MODBUS-M is valid only if the serial interface protocol is set to MODBUS-M.
- The setting p4=REPORT is valid only on models with the /M1 MATH option.

When Changing to Four Panel Display

Syntax UD
p1,p2,p3,p4,p5,p6,p7,p8,p9<terminator>
p1 Screen switching (2)
p2 Screen 1 type (See SY (Sets the four panel display))
p3 Group number to be displayed at screen 1
p4 Screen 2 type (See SY (Sets the four panel display))
p5 Group number to be displayed at screen 2
p6 Screen 3 type (See SY (Sets the four panel display))
p7 Group number to be displayed at screen 3
p8 Screen 4 type (See SY (Sets the four panel display))
p9 Group number to be displayed at 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 all screen types to trend display.
UD2,TREND,1,TREND,2,TREND,3,TREND,4

Description This setting is valid on the DX2000.

Display the Specified Four Panel Number

Syntax UD p1,p2<terminator>
p1 Display type (3)
p2 Four panel configuration number
- 0 Display the specified four panel configuration screen.
- 1 to 4 Display the four panel configuration specified by SY (Sets the four panel display).

When Setting the Switching of the Operation Screen

Syntax UD p1,p2,p3,p4,p5,p6,p7<terminator>
p1 Screen switching (4)
p2 Automatic display switching ON/OFF
p3 Switch between all channel display and group display (ALL, GROUP)
p4 Scale display ON/OFF
p5 Digital display ON/OFF
p6 Message display method
- 1 Normal display
- 2 List display

p7 Trend space ON/OFF

Example Enable the 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, or bar graph displays. Use the SE command to set the scroll interval.
• Parameters p3 to p7 are valid for the trend display.

PS Starts/Stops measurements

Syntax `PS p1`<terminator>
`p1` Measurement start/stop
`0` Start
`1` Stop

Example Start the measurement.
`PS0`

Description When measurement is started, the display, event, and report data is recorded to the internal memory.

AK Releases the alarm output (alarm acknowledge)

Syntax `AK p1`<terminator>
`p1` Executes alarm acknowledge (0)

Example Release the alarm output (execute alarm acknowledge).
`AK0`

EV Manual sample, manual trigger, snapshot, and forced timeout

Syntax `EV p1`<terminator>
`p1` Operation type
`0` Execute manual sampling.
`1` Activate manual trigger.
`2` Take a snapshot.
`3` Forced timeout of the display data.
`4` Forced timeout of the event data.

Example Execute manual sampling.
`EV1`

Description • EV1 is valid only when the key trigger is set to ON in the memory settings. It is equivalent to a key trigger.

CL Executes manual SNTP

Syntax `CL p1`<terminator>
`p1` Execute manual SNTP (0)

Example Synchronize the clock at an arbitrary time.
`CL0`

CV Switches the display update rate

Syntax `CV p1`<terminator>
`p1` Display rate (0, 1)
`0` Switch to the first rate (standard rate)
`1` Switch to the second rate

Example Change the display update rate to the second rate.
`CV1`

MS Writes the message (display and save)

Syntax `MS p1,p2,p3`<terminator>
`p1` Message number (1 to 100)
`p2` Designation of the destination to write the message
`GROUP` Specify a single group
`ALL` All groups
`p3` Group number

Example Write the message of message number 8 to group 1.
`MS8,GROUP,1`

Description • This command displays the message to the screen and writes the message in the display data and event data.
• If p2 is omitted, the message is written to all groups.

BJ Writes arbitrary messages

Syntax `BJ p1,p2,p3,p4`<terminator>
`p1` Message number (1 to 10)
`p2` Message (up to 32 characters)
`p3` Designation of the destination to write the message
`GROUP` Single group designation
`ALL` All Groups
`p4` Destination to write the message
When p3 is `GROUP`
Group number

Example Use message number 3 and write the word “ALARM” to all groups.
`BJ3,ALARM,ALL`

Description If p3 is omitted, the message is written to all groups.

EJ Changes the password of the login function

Syntax `EJ p1,p2,p3`<terminator>
`p1` Old password (up to 8 characters)
`p2` New password (up to 8 characters)
`p3` New password (up to 8 characters)

Example Change the old password “PASS001” to a new password “WORD005.”
`EJPASS001,WORD005,WORD005`

TL Starts/stops/resets computation (MATH)/clears the computation dropout status display

Syntax `TL p1`<terminator>
`p1` Operation type
`0` Computation start
`1` Computation stop
`2` Computation reset
`3` Clear the computation dropout status display

Example Start the computation.
```
TL0
```
Description
- This command cannot be executed while setup data are being saved or loaded.
- This command can be used on models with the /M1 math option.

DS Switches execution modes (operation/basic setting)

Syntax `DS p1`<terminator>
`p1` Mode type
`0` Operation mode
`1` Basic setting mode

Example Set the mode to basic setting mode.
```
DS1
```
Description
- Parameter p1 cannot be set to 1 while measurement/computation is in progress, while the external storage medium is being formatted, or while data are being saved to the external storage medium.
- Parameter p1 cannot be set to 0 while the external storage medium is being formatted or while data is being saved to the external storage medium.
- In order to activate the settings that are changed using the basic setting commands, the settings must be saved using the XE command. Make sure to save the settings with the XE command before changing from the basic setting mode to the operation mode. Otherwise, new settings will not be activated.

LO Loads the setup data for setting mode

Syntax `LO p1`<terminator>
`p1` File name (up to 32 characters)
`p2` Media designation
`0` CF slot
`1` USB

Example Load the setting data of setting mode from the setup file SETFILE1 (.pdl extension).
```
LOSETFILE1
```
Description
- Do not specify the extension when specifying the file name.
- This command can be used with p2 set to 1 on models with the /USB1 USB interface option.
- If p2 is omitted, the media designation is CF slot.
- This command cannot be used to load the setting data of the basic setting mode. To load the setup data of both setting and basic setting mode, use the YO command.
- This command cannot be executed on models that do not have an external storage device or when a medium is not inserted into the drive.

LI Saves the setting data

Syntax `LI p1`<terminator>
`p1` File name (up to 32 characters)
`p2` Media designation
`0` CF slot
`1` USB

Example Save the setting data of both setting and basic setting commands to the file SETFILE2 on the CF card.
```
LISETFILE2
```
Description
- Do not specify the extension when specifying the file name.
- This command can be used with p2 set to 1 on models with the /USB1 USB interface option.
- If p2 is omitted, the media designation is CF slot.
- A ".pdl" extension is attached to the saved file. This command is equivalent to the YI command.
- This command cannot be executed on models that do not have an external storage device or when a medium is not inserted into the drive.

CM Sets the communication input data

Syntax `CM p1,p2`<terminator>
`p1` Communication input channel 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 Set communication input data 1.0000E-10 to communication input channel C01.
```
CMC01,1.0000E-10
```
Description This command can be used on models with the /M1 math option.

CE Sets the communication input of the external input channel

Syntax `CE p1,p2`<terminator>
`p1` External input channel number
`p2` Setting data (-30000 to 30000)

Query `CE[ p1]?`

Example Set data 12345 to external input channel number 440. `CE440,12345`

Description This command can be used on models with the /MC1 external input channel option.

EM Starts/stops the e-mail transmission function

Syntax `EM p1`<terminator>
`p1` Operation type
`0` Start
`1` Stop

Example Start the e-mail transmission function.
EM0
Description To use the e-mail transmission function, you must set the Ethernet interface, e-mail address, and contents to be transmitted.

CU Manually recovers the Modbus

Syntax CU p1<terminator>
p1 Communication type
0 Modbus client (Ethernet)
1 Modbus master (serial)

BV Enters characters (usable only during serial communications)

Syntax BV p1,p2<terminator>
p1 0
p2 Character string (up to 100 characters)
Example Enter user123.
BV0,user123

KE Key operation command

Syntax KE p1<terminator>
p1 Key type

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 0 to 9 keys
MINUS	Number minus key
DOT	Number decimal key
DISP	DISP/ENTER key
UP	UP arrow key
DOWN	DOWN arrow key
RIGHT	RIGHT arrow key
LEFT	LEFT arrow key

Example Press the DISP/ENTER key.
KEDISP
Description Operates in the same fashion as the key operation on the DX. For consecutive key operations, transmit the commands in the same order as the key operation on the DX.

YO Loads the setting file (for the basic setting mode)

Syntax YO p1,p2<terminator>
p1 Name of the file to be loaded (up to 32 characters)
p2 Media designation
0 CF slot
1 USB
Description • Do not include the extension in the file name.
• This command can be used with p2 set to 1 on models with the /USB1 USB interface option.
• If p2 is omitted, the media designation is CF slot.

YC Clears the measured/computed data, initializes setup data

Syntax YC p1<terminator>
p1 Type of data to be cleared
0 Clear all measured/computed data and initialize the setting data of the setting mode and basic setting mode.
1 Clear measured/computed data and initialize the setting data of the setting mode.
2 Clear measured/computed data.

IR Resets the relative timer

Syntax IR p1<terminator>
p1 Timer number to be reset
0 All timers
1 to 4 Timer number 1 to 4

3.6 Basic Setting Commands

WO Sets alarm and DO settings

Set Alarm and DO Settings

Syntax `WO p1,p2,p3,p4,p5<terminator>`
- `p1` Alarm setting
- `p2` Reflash operation ON/OFF
- `p3` Interval for the high limit on the rate-of-change (1 to 32)
- `p4` Interval for the low limit on the rate-of-change (1 to 32)
- `p5` Hold/Not hold the alarm status display
  - `HOLD`
  - `NONHOLD`

Set the Internal Switch

Syntax `WO p1,p2<terminator>`
- `p1` DO type (SWITCH)
- `p2` AND switch number
  - `NONE` No AND setting
  - `S01` Specify only S01
  - `S01` to `Sxx` Specify S01 to Sxx xx={02 to 30}

Set the Output Relay

Syntax `WO p1,p2,p3,p4,p5<terminator>`
- `p1` DO type (RLY)
- `p2` Relay number
  - `NONE` No AND setting
  - `I01` Specify only I01
  - `I01` to `Ixx` Specify I01 to Ixx 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 according to the table in section 3.3.

Query `WO[ p1]?`

Example No AND operation of the output relay, relay action is 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 the alarm hysteresis

For Measurement Channels

Syntax `WH p1,p2,p3<terminator>`
- `p1` Channel type (MEASURE)
- `p2` Hysteresis of the high and low limit alarms (0 to 50)
- `p3` Hysteresis of the difference high and low limit alarms (0 to 50)

For Computation Channels

Syntax `WH p1,p2<terminator>`
- `p1` Channel type (MATH)
- `p2` Hysteresis of the high and low limit alarms (0 to 50)

For External Input Channels

Syntax `WH p1,p2<terminator>`
- `p1` Channel type (EXTERNAL)
- `p2` Hysteresis of the high and low limit alarms (0 to 50)

Query `WH[ p1]?`

Example Set the high and low limit alarm hysteresis of measurement channels to 4.0%, and the difference high and low limit alarm hysteresis to 0.0%.

```
WHMEASURE,40,0
```

Description Alarm settings on computation channels can be specified on models with the /M1 math option. Alarm settings on external input channels can be specified on models with the /MC1 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` Normal mode
  - `FAST` Fast sampling mode
- `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,1
```

Description The combinations of scan interval mode and the scan intervals vary depending on the model. See the *DX1000/DX2000 User's Manual*.

XB Sets the burn out detection

Syntax `XB p1,p2<terminator>`
- `p1` Measurement channel number
- `p2` Burnout procedure
  - `OFF` Not process
  - `UP` Set the measured result to +over.
  - `DOWN` Set the measured result to –over.

Query XB[p1]?
Example Set the measured result to UP (+ overflow) when channel 001 burns out.
XB001,UP
Description Set parameter p1 according to the table in section 3.3.

XJ Sets the RJC.

When Using the Internal Compensation Circuit

Syntax XJ p1,p2<terminator>
p1 Measurement channel number
p2 Reference junction compensation selection (INTERNAL)
Query XJ[p1]?
Example Set the RJC of channel 001 to the internal compensation circuit.
XJ001,INTERNAL

When Using an External RJC

Syntax XJ p1,p2,p3<terminator>
p1 Measurement channel number
p2 Reference junction compensation selection (EXTERNAL)
p3 External RJC value (-20000 to 20000)
Query XJ[p1]?
Example Set the reference junction compensation of channel 002 to external and set the compensation value to 0 μV.
XJ002,EXTERNAL,0
Description • Set parameter p1 according to the table in section 3.3.
• The unit of parameter p3 is μV.

WU Sets the environment

Setting items GENERAL, BATCH, DISPLAY, MESSAGE,INPUT, ALARM, SECURITY, MEDIA, MATH, REPORT, and SERVICEPORT are available.

Operating Environment

Syntax WU p1,p2,p3,p4<terminator>
p1 Setting type (GENERAL)
p2 Tag name/channel number selection
TAG Tag name
CHANNEL Channel number
p3 Language
ENGLISH
JAPANESE
CHINESE
GERMAN
FRENCH
p4 Remote control ID (OFF, 0 to 31)

Sets the batch function

Syntax WU p1,p2,p3,p4<terminator>
p1 Setting type (BATCH)
p2 Batch function ON/OFF
p3 Number of digits of the lot number (OFF, 4, 6, 8)
p4 Auto increment ON/OFF
Description Parameters p3 and p4 are valid when p2 is ON.

Sets the display

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 Display update rate switching OFF/ON
Description Parameters p3 and p4 are valid when p2 is T-Y.

Sets the message

Syntax WU p1,p2,p3,p4<terminator>
p1 Setting type (MESSAGE)
p2 Method of writing messages from the keys
COMMON Applied to all display groups
SEPARATE Applied to a specified display group
p3 Power failure message OFF/ON
p4 Change message OFF/ON

Set the input

Syntax WU p1,p2<terminator>
p1 Setting type (INPUT)
p2 Detection of values exceeding the scale
FREE When the measurement range is exceeded
OVER When ±105% of the scale is exceeded

Set the alarm

Syntax WU p1,p2<terminator>
p1 Setting type (ALARM)
p2 Alarm suppression function (OFF, ON)

Set the security

Syntax WU p1,p2,p3<terminator>
p1 Setting type (SECURITY)
p2 Keys
OFF Disable the security
KEYLOCK Lock the keys
LOGIN Enable the login function
p3 Communication
OFF Disable the security
LOGIN Enable the login function

Set the media

Syntax WU p1,p2,p3<terminator>
p1 Setting type (MEDIA)
p2 Auto save function OFF/ON
p3 Media FIFO OFF/ON
Example Use media FIFO.
WUMEDIA,ON,ON

Description Parameter p3 is valid when p2 is ON.

Set the computation

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

`p1` Setting type (MATH)

`p2` Display on error

`+OVER`

`-OVER`

`p3` Data when the SUM or AVE value overflows

`ERROR` Set the computed result to computation error

`SKIP` Discard the data that overflowed and continue the computation

`LIMIT` Process the data as follows:

- For measurement channels that do not have linear scaling specified, set the data to the upper or lower limit of the measurement range.
- For measurement channels that have linear scaling specified, set the data to the specified scan upper or lower limit.
- For computation channels, set the data to the specified span upper or lower limit.

`p4` Data when the MAX, MIN, or P-P value overflows

`OVER` Compute using the overflow data

`SKIP` Discard the data that overflowed and continue the computation

Set the report

Syntax `WU p1,p2,p3,p4<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` Disable 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` Output to a single file.

`SEPARATE` Output to separate files.

For parameters p2 to p5, the same computation type cannot be specified except for OFF.

Auto service port

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

`p1` Setting type (SERVICEPORT)

`p2` FTP service port (0 to 65535)

`p3` Web service port (0 to 65535)

`p4` SNTP service port (0 to 65535)

`p5` Modbus service port (0 to 65535)

Query `WU[ p1]?`

Example Set to tag display, English display, and remote control OFF.

```
WUGENERAL,TAG,ENGLISH,OFF
```

XM Sets the 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
```

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 the key lock

p1=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)

p1=FUNC (function keys)

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

`p1` Type (FUNC)

`p2` AlarmACK (FREE, LOCK)

`p3` Message/Batch (FREE, LOCK)

`p4` Math (FREE, LOCK)

`p5` Data save (FREE, LOCK)

`p6` E-mail/FTP (FREE, LOCK)

p7 Time set (FREE, LOCK)
p8 Display Function (FREE, LOCK)

p1=MEDIA (external storage media)

Syntax RF p1,p2<terminator>
p1 Type (MEDIA)
p2 External storage media operation (FREE, LOCK)
Query RF[p1]?
Example Lock the MENU key (leave other keys unlocked).
RFKEY,FREE,FREE,LOCK,FREE,FREE,FREE

RN Sets the basic key login

Syntax RN p1,p2<terminator>
p1 Auto logout (OFF, 1MIN, 2MIN, 5MIN, 10MIN)
p2 Operation when logged out
OFF Disable the DX operation
DISPLAY Only display operations are possible
Query RN?
Example Set the auto logout time to 1 minute, and disable the DX operation when logged out.
RN1MIN,OFF

RP Sets user limitations

Syntax RP p1,p2,•••<terminator>
p1 User limit number (1 to 10)
p2 User limit item (KEY, FUNC, MEDIA)
Description Parameters p3 and subsequent parameters vary depending on the p2 designation as follows:

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=FUNC (function keys)

p3 AlarmACK (FREE, LOCK)
p4 Message/Batch (FREE, LOCK)
p5 Math (FREE, LOCK)
p6 Data save (FREE, LOCK)
p7 E-mail/FTP (FREE, LOCK)
p8 Time set (FREE, LOCK)
p9 Display Function (FREE, LOCK)

p2=MEDIA (external storage media)

p3 External storage media operation (FREE, LOCK)
Query RP[p1,[p2]]?
Example Lock the START, STOP, and DISP/ENTER keys.
RP1,KEY,LOCK,LOCK,,,LOCK

RO Sets the report type and generation time

When the Report Type Is Set to None

Syntax RO p1<terminator>
p1 Report type (OFF)
Query RO?
Example Set the report to none.
ROOFF
Description This command can be used on models with the /M1 math option.

For 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 Hourly and monthly reports
p2 Date of creation (dd) fixed form
dd Day (01 to 28)
p3 Hour of creation (hh) fixed form
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 • This command can be used on models with the /M1 math option.
• Parameter p2 is discarded even if it is specified for reports other than monthly and daily reports.

For Daily+Weekly Reports

Syntax RO p1,p2,p3<terminator>
p1 Report type (DAY+WEEK)
p2 Day of creation (SUN, MON, TUE, WED, THU, FRI, SAT)
p3 Hour of creation (hh) fixed form
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 This command can be used on models with the /M1 math option.

RM Sets the report channel

When not using the report channel

Syntax RM p1,p2<terminator>
p1 Report channel number
p2 Enable/Disable the report channel (OFF)
Query RM[p1]?
Example Disable the channel 001 report channel.
RM001,OFF

Description • This command can be used on models with the /M1 math option.
• Set parameter p1 according to the table in section 3.3.

When Using the Report Channel

Syntax `RM p1,p2,p3,p4<terminator>`
`p1` Report channel number
`p2` Enable/Disable the report channel (ON)
`p3` Measurement, computation, or external input channel number on which to report
`p4` Summation conversion of the waveform on which integration is to be performed
`OFF` No conversion.
`/S` Convert as though the physical values are integrated in units of seconds.
`/MIN` Convert as though the physical values are integrated in units of minutes.
`/H` Convert as though the physical values are integrated in units of hours.
`/DAY` Convert 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 reports are to be made to 001, and the summation conversion of the waveform on which integration is to be performed to unit of seconds.
`RMR01,ON,001,/S`

Description • This command can be used on models with the /M1 math option.
• Set parameters p1 and p3 according to the table in section 3.3.
• About p4
Because the sampled data are integrated over each scan interval, the physical value integrated over a given period may be different from the actual integrated value. This occurs if the given period is not equal to the scan interval. In these cases, set p4 to the unit of the integration time desired. The integrated value is found according to the following conversion equations that depend on the parameter.
OFF Σ (measured value)
/S Σ (measured value) × scan interval
/MIN Σ (measured value) × scan interval/60
/HOUR Σ (measured value) × scan interval/3600
/DAY Σ (measured value) × scan interval/86400
The unit of the scan interval 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<terminator>`
`p1` Date format (Y/M/D, M/D/Y, D/M/Y, D.M.Y)

Query `XN?`

Example Set the date format to Y/M/D.
`XNY/M/D`

YB Sets the 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 the network

When Not Automatically Allocating the IP Address

Syntax `YD p1<terminator>`
`p1` Automatic allocation (NOT)

When Automatically Allocating the IP Address

Syntax `YD p1,p2,p3<terminator>`
`p1` Automatic allocation (USE)
`p2` DNS accession (USE, NOT)
`p3` Host-name register (USE, NOT)

Query `YD?`

Example Set the IP address to auto allocation, retrieve 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`

Description The settings specified by this command and saved using the XE command take effect after the DX is power cycled.

YK Sets the keepalive

Syntax `YK p1`<terminator>
`p1` Enable/Disable keepalive (ON, OFF)
Query `YK?`
Example Disable keepalive.
`YKOFF`
Description The settings specified by this command and saved using the XE command take effect after the DX is power cycled.

RU Sets the DNS

Set the Server

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)

Set the Suffix

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 the server

Syntax `WS p1,p2`<terminator>
`p1` Server type (FTP, WEB, MODBUS, SNTP)
`p2` Enable/Disable the server (USE, NOT)
Query `WS[ p1]?`
Example Enable the Web server.
`WSWEB,USE`

WW Sets the Web homepage

Syntax `WW p1,p2,p3,p4`<terminator>
`p1` Home page type
`OPERATOR` Operator page
`MONITOR` Monitor page
`p2` Enable/Disable the homepage (ON, OFF)
`p3` Enable/Disable authentication
`OFF` No authentication
`ADMIN` Administrator privileges
`USER` User privileges
`p4` Enable/Disable command input (USE, NOT)
Query `WW[ p1]?`
Example Enable the operator page, disable the authentication, and enable command input.
`WWOPERATOR,USE,OFF,USE`
Description Parameters p3 and p4 are valid when p2 is ON.
`Parameter p4 is valid when p1 is set to OPERATOR.`

YQ Sets the communication timeout

When Not Using the Timeout

Syntax `YQ p1`<terminator>
`p1` Enable/Disable communication timeout (OFF)
Query `YQ?`
Example Disable timeout.
`YQOFF`
Description The settings specified by this command and saved using the XE command take effect after the DX is power cycled.

When Using the Timeout

Syntax `YQ p1,p2`<terminator>
`p1` Enable/Disable communication timeout (ON)
`p2` Timeout value [minutes] (1 to 120)
Query `YQ?`
Example Enable the communication timeout and set the timeout value to 3 min.
`YQON,3`
Description The settings specified by this command and saved using the XE command take effect after the DX is power cycled.

YT Sets the FTP transfer timing

Syntax `YT p1,p2,p3`<terminator>
`p1` Auto transfer when display and event data files are created (ON, OFF)
`p2` Auto transfer when report data files are created (ON, OFF)
`p3` Auto transfer when snapshot data files are created (when snapshot is executed) (ON, OFF)
Query `YT?`
Example Auto transfer the display and event data files. Do not transfer the report data file. Do not transfer the image data file.
`YTON,OFF,OFF`
Description When the method to save the data to the external storage medium is set to “Auto,” the data files are automatically transferred when they are created. For the settings to save to the storage medium, see the *DX1000/DX2000 User’s Manual*.

YU Sets the contents to be sent via e-mail

When Sending the Changes in the Alarm Status

Syntax `YU p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,p11,p12`<terminator>
- `p1` Transmitted content (ALARM)
- `p2` Enable/Disable recipient 1 (ON, OFF)
- `p3` Enable/Disable recipient 2 (ON, OFF)
- `p4` Enable/disable alarm transmission of alarm number 1 (ON, OFF)
- `p5` Enable/disable alarm transmission of alarm number 2 (ON, OFF)
- `p6` Enable/disable alarm transmission of alarm number 3 (ON, OFF)
- `p7` Enable/disable alarm transmission of alarm number 4 (ON, OFF)
- `p8` Enable/disable the attachment of instantaneous data (ON, OFF)
- `p9` Enable/disable the attachment of the source URL (ON, OFF)
- `p10` Subject (up to 32 characters)
- `p11` Header 1 (up to 64 characters)
- `p12` Header 2 (up to 64 characters)

Query `YU[ p1]?`

Example Transmit alarms of alarm numbers 1 to 4 including instantaneous data but not including the source URL to recipient 1. The subject is “ALM”, and the header 1 is “LP2.”
```
YUALARM,ON,OFF,ON,ON,ON,ON,OFF,ALM,LP2
```

When Sending E-mail at Scheduled Times

Syntax `YU p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,p11,p12`<terminator>
- `p1` Transmitted content (TIME)
- `p2` Enable/Disable recipient 1 (ON, OFF)
- `p3` Interval for sending e-mail to recipient 1 (1H, 2H, 3H, 4H, 6H, 8H, 12H, 24H)
- `p4` Time when sending e-mail to recipient 1 (00:00 to 23:59)
- `p5` Enable/Disable recipient 2 (ON, OFF)
- `p6` Interval for sending e-mail to recipient 2 (1H, 2H, 3H, 4H, 6H, 8H, 12H, 24H)
- `p7` Time when sending e-mail to recipient 2 (00:00 to 23:59)
- `p8` Enable/disable the attachment of instantaneous data (ON, OFF)
- `p9` Enable/disable the attachment of the source URL (ON, OFF)
- `p10` Subject (up to 32 characters)
- `p11` Header 1 (up to 64 characters)
- `p12` Header 2 (up to 64 characters)

Query `YU[ p1]?`

Example Send e-mail at 17 hours 15 minutes every day to recipient 1. Do not include instantaneous data but include the source URL. The subject is “GOOD”, and the header 1 is “LP2.”
```
YUTIME,ON,24H,17:15,OFF,,,OFF,ON,GOOD,LP2
```

When Sending System Notifications

Syntax `YU p1,p2,p3,p4,p5,p6,p7`<terminator>
- `p1` Transmitted content (SYSTEM)
- `p2` Enable/Disable recipient 1 (ON, OFF)
- `p3` Enable/Disable recipient 2 (ON, OFF)
- `p4` Enable/disable the attachment of the source URL (ON, OFF)
- `p5` Subject (up to 32 characters)
- `p6` Header 1 (up to 64 characters)
- `p7` Header 2 (up to 64 characters)

Query `YU[ p1]?`

Example Send system notification e-mail messages including the source URL to recipient 1. The subject is “SystemAlert”, and the header is “LP2.”
```
YUSYSTEM,ON,OFF,ON,SystemAlart,LP2
```

When sending report generation notifications

Syntax `YU p1,p2,p3,p4,p5,p6,p7`<terminator>
- `p1` Transmitted content (REPORT)
- `p2` Enable/Disable recipient 1 (ON, OFF)
- `p3` Enable/Disable recipient 2 (ON, OFF)
- `p4` Enable/disable the attachment of the source URL (ON, OFF)
- `p5` Subject (up to 32 characters)
- `p6` Header 1 (up to 64 characters)
- `p7` Header 2 (up to 64 characters)

Query `YU[ p1]?`

Example Send report generation notification e-mail messages including the source URL to recipient 1. The subject is “Report”, and the header is “LP2.”
```
YUREPORT,ON,OFF,ON,Report,LP2
```

Description
- For the contents of the system notification, see section 1.4.
- Report generation notification can be used on models with the /M1 math option.
- For details on the settings of e-mail, see section 1.4.

YV Sets the e-mail recipient address

Syntax `YV p1,p2`<terminator>
- `p1` Recipient selection
  - `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 set multiple recipients, separate each recipient with a space.
- For details on the settings of e-mail, 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 the settings of e-mail, see section 1.4.

YX Sets the e-mail SMTP server name

Syntax `YX p1,p2`<terminator>
- `p1` SMTP server name (up to 64 characters)
- `p2` Port number (0 to 65535)

Query `YX?`

Example Set the SMTP server to “smtp.daqstation.com” and port number to “25.”
```
YX smtp.daqstation.com,25
```
Description For details on the settings of e-mail, see section 1.4.

YJ Sets destination server of the Modbus client

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` Not use the unit number
  - `FIXED` Use a fixed unit number
- `p5` Unit number (0 to 255)

Query `YJ[ p1]?`

Example Set the port number of server number 3 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 transmitted command of the Modbus client

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 designation as follows:

When p2 Is OFF

There are no parameters after p2.

When p2 Is R [Read the External Input Channel]
- `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 R-M [Read the Communication Input Channel]
- `p3` First channel (communication input channel number)
- `p4` Last channel (communication 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, F LOAT_B, FLOAT_L)

When p2 Is W [Write to the Measurement Channel]
- `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)

When p2 Is W-M [Write to the Computation Channel]

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)

Query `YR[ p1]?`

Example Set the command type of command number 5 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`

Note

Parameter p3 must be less than or equal to p4.
Parameters p3, p4, and p7 determine the number of registers to be read or written. An error occurs if the valid range of registers of p6 is exceeded.

WB Sets the SNTP client

Syntax `WB p1,p2,p3,p4,p5,p6`<terminator>
p1 Enable/Disable the 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)
`If p1 is NOT, p2 to p6 are invalid.`

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 by SNTP at memory start (ON/OFF)

Query `WC?`

Example Enable the time adjustment by SNTP at memory start.
`WCON`

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
- The settings specified by this command and saved using the XE command take effect after the DX is power cycled.
- This command can be used on models with the /C2 or /C3 serial interface 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 retrials to 2, the command wait time to 10 ms, and the auto recovery time to 5 min.
`YL500MS,250MS,2,10MS,5MIN`

Description
- This command can be used on models with the /C2 or /C3 serial interface option.
- This command is valid when the serial interface protocol is set to “Master.” For the procedure to set the serial interface, see section 4.4.
- The settings specified by this command and saved using the XE command take effect after the DX is power cycled.

YM Sets the transmitted command of the Modbus master function

When Not Setting a Command

Syntax `YM p1,p2`<terminator>
p1 Registration number (1 to 16)
p2 Enable/Disable the command (OFF)

Query YM[p1]?

Example Do not set a command to command registration number 1.

YM1,OFF

When Setting a Read to the External Input Channel

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

- p1 Registration number (1 to 16)
- p2 Command type (R)
- p3 First channel number (external input channel number)
- p4 Last channel number (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 register (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) of the slave device at address 5 into 201 to 203 of the DX.

YM2,R,201,203,5,30002,INT32_B

When Setting a Read to the Communication Input Channel

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

- p1 Registration number (1 to 16)
- p2 Command type (R-M)
- p3 First channel number (communication input channel number)
- p4 Last channel number (communication 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 register (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) of the slave device at address 5 into C02 to C05 of the DX.

YM2,R-M,C02,C05,5,30003,INT32_B

When Setting a Write to the Measurement Channel

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

- p1 Registration number (1 to 16)
- p2 Command type (W)
- p3 First channel number (measurement channel number)
- p4 Last channel number (measurement channel number)
- p5 Slave device address (1 to 247)
- p6 First register number (40001 to 49999, 400001 to 465535)
- p7 Type of data assigned to the register (INT16)

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 of the slave device at address 7.

YM3,W,003,006,7,40003,INT16

When Setting a Write to the Computation Channel

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

- p1 Registration number (1 to 16)
- p2 Command type (W-M)
- p3 First channel number (computation channel number)
- p4 Last channel number (computation channel number)
- p5 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 register (INT16, UINT16, INT32_B, INT32_L)

Query YM[p1]?

Example Register the following command in command registration number 2: Write the computed data of 16-bit signed integer type of channels 101 to 105 to the first register 40003 of the slave device at address 5.

YM2,W-M,101,105,5,40003,INT16

Description
- This command can be used on models with the /C2 or /C3 serial interface option.
- This command is valid when the serial interface protocol is set to “Master.” For the procedure to set the serial interface, see section 2.3.
- The settings specified by this command and saved using the XE command take effect after the DX is power cycled.

WR Sets the instrument information output

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

- p1 Memory/Media state (OFF, ON)
- p2 Self diagnosis (OFF, ON)
- p3 Communication error (OFF, ON)
- p4 Memory stop (OFF, ON)

Query WR?
Example Output various information.
WRON,ON,ON,ON

XE Activates the basic setting mode.

Syntax XE p1<terminator>
p1 Store or discard the settings (STORE, ABORT)
Example Save the setup data of the basic setting commands.
XESTORE
Description In order to activate the settings that are changed using the basic setting commands, the settings must be saved using the XE command. Make sure to save the settings with the XE command before changing from the basic setting mode to the operation mode. Otherwise, new settings will not be activated.

YE Activates the basic setting mode (cold reset).

Syntax YE p1<terminator>
p1 Setting activation
STORE Save the basic settings and start
ABORT Start without saving basic settings
Example Save the basic settings and start.
YESTORE

3.7 Output Commands (Control)

BO Sets the byte output order

Syntax BO p1<terminator>
p1 Byte order
0: Outputs the data MSB first.
1: Outputs the data LSB first.
Query BO?
Example Output the data MSB first.
BO0
Description This command applies to the byte order of numeric data during BINARY output.

CS Sets the check sum (usable only during serial communications)

Syntax CS p1<terminator>
p1 Enable/Disable the checksum
0: Not calculate (value fixed to zero)
1: Calculate
Query CS?
Example Enable (Calculate) the checksum.
CS1
Description Can be used only during serial communications.

IF Sets the status filter

Syntax IF p1,P2<terminator>
p1 Filter value of status information 1 to 4 (0.0.0.0 to 255.255.255.255)
p2 Filter value of status information 5 to 8 (0.0.0.0 to 255.255.255.255)
Query IF?
Example Set the status filter value 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.

CC Disconnects the Ethernet connection (usable only during Ethernet communications)

Syntax CC p1<terminator>
p1 Disconnect the connection (0)
Example Disconnect the connection.
CC0

CB Data output format

Syntax CB p1<terminator>
p1 Output format
0 Standard output (including output of SKIP and OFF channel data)
1 Skip and OFF channel data not output

Description • This setting is independently set for each connection.
• This command only affects the communication section, and has no effect on the main unit setting panel.
• Valid range of commands

Output details	Corresponding command
Instantaneous data (Binary)	FD1, FF
Instantaneous data (ASCII)	FE0
Decimal position information (ASCII)	FE1
Setup channel information (Binary)	FE5
Configured alarm information (Binary)	FE6

Note

Initialization of BO/CS/IF/CB command settings
- **For serial communications**
  Settings entered using the BO/CS/IF/CB commands revert to their initial values when the DX is reset (when the DX is power cycled, or the user exits the basic setting mode).
  • Byte output order, checksum, data output format: 0
  • Status filter: 255.255.255.255
  If you reset the DX, you must restore these settings.
- **For Ethernet communications**
  Settings entered using the BO/IF/CB commands revert to their initial values when the connection to the DX is cut. After reconnecting the DX, you must reenter the settings.

3.8 Output Commands (Setting/Measured/ Computed Data Output)

FC Outputs the screen image data

Syntax `FC p1`<terminator>
`p1` GET (Output the screen image data)

Example Output the screen image data from the DX.
```
FCGET
```

Description Captures the current displayed screen on the DX and outputs the data in PNG format.

FE Outputs the setup data

Syntax `FE p1,p2,p3`<terminator>
`p1` Output data type
- `0` Setup data of setting commands
- `1` Decimal point position and unit information
- `2` Setup data of basic setting commands
- `4` Setup data file
- `5` Setup channel information output
- `6` Alarm information output

`p2` First channel number (measurement/computation/external input channel)
`p3` Last channel number (measurement/computation/external input channel)

Example Output the setup data of setting commands of channels 001 to 005 from the DX.
```
FE0,001,005
```

Description
- Set the first channel number and last channel number parameters so 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. All channels are specified if parameters p2 and p3 are omitted.
- Set parameters p2 and p3 according to the table in section 3.3.

FD Outputs the most recent measured/computed data.

Syntax `FD p1,p2,p3`<terminator>
`p1` Output data type
- `0` Output the most recent measured/computed data in ASCII format
- `1` Output the most recent measured/computed data in binary format
- `6` Relay output status

`p2` First channel number (measurement/computation/external input channel)
`p3` Last channel number (measurement/computation/external input channel)

Example Output the most recent measured/computed data of channels 001 to 005 from the DX in ASCII format.
FD0,001,005

Description
- The most recent measured/computed data corresponds to the most recent measured/computed data in the internal memory when the DX receives the FD command.
- Set the first channel number and last channel number parameters so that the last channel number is greater than or equal to the first channel number.
- The settings of p2 and p3 are valid when p1 = 0 or 1. All channels are specified if parameters p2 and p3 are omitted.
- Set parameters p2 and p3 according to the table in section 3.3.

FF Outputs the FIFO data

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

p1 Operation type

GET	Output the data starting from the next to the previous read position
RESEND	Retransmit the previous output
RESET	Set the most recent data position (block) to the read position of the FIFO buffer (block)

p2 First channel number (measurement/computation/external input channel)

p3 Last channel number (measurement/computation/external input channel)

p4 Maximum number of blocks that are to be loaded

1200	DX1002/DX1004/DX2004/DX2008
240	DX1006/DX1012/DX2010/DX2020/DX2030/DX2040/DX2048
30	Models with the /MC1 external input channel option

If the measured/computed data is less than the specified number of blocks, the available amount of data is transmitted.

Example Output 2 blocks of FIFO data of channels 1 to 10.
FFGET,001,010,2

Description
- The FIFO buffer is a cyclic buffer in which the oldest data is overwritten. Use the FR command to set the acquisition period.
- The specified number of blocks (p4) of FIFO data starting from the next to the previous read position (block) is output.
  Make sure to read the data within the following buffer period to prevent data dropouts.
  - For the DX1004
    FIFO buffer size 240 cycles (scan interval)
    Maximum buffer period
    240 × (acquisition interval)
- Parameters p2 and p4 are valid when p1 is set to GET.
- If p4 is omitted, all the data of all blocks acquired in the FIFO buffer are output.
- Set the first channel number and last channel number parameters so that the last channel number is greater than or equal to the first channel number.
- For the output flow of FIFO data, see appendix 4.
- Set parameters p2 and p3 according to the table in section 3.3.

FL Outputs log, alarm summary, and message summary

Syntax FL p1,p2<terminator>

p1 Log type

COM	Communication
FTPC	FTP client
ERR	Operation error
LOGIN	Login log
WEB	Web operation
EMAIL	E-mail
SNTP	SNTP access log
DHCP	DHCP access log
ALARM	Alarm summary
MSG	Message summary
MODBUS	Modbus communication log

p2 Maximum read length of the log

1 to 200	Parameter p1 is COM or MODBUS
1 to 1000	Parameter p1 is ALARM
1 to 450	Parameter p1 is MSG
1 to 50	When p1 is some type other than the above

Example Output the 10 most recent operation error logs.
FLERR,10

Description
- Outputs the log that is stored in the DX.
- If p2 is omitted, all written logs are output.

IS Outputs status information

Syntax IS p1<terminator>

p1 Status information output

0	Status information 1 to 4
1	Status information 5 to 8

Example Output status information 1 to 4.
IS0

Description The output status can be masked using the status filter (IF command). For details on the status information, see chapter 5.

FU Outputs the user level

Syntax FU p1<terminator>

p1 User information output

0	View the information of the user currently logged in

1 View the information of the user logged into a general-purpose service

Example Output the information of the user logged into a general-purpose service.

```
FU1
```

Description Outputs the information of the user currently connected to the DX.

FA Outputs the instrument information

Syntax `FA p1<terminator>`

p1 Information type

IP Address information including the IP address, subnet mask, default gateway, and DNS server address as well as the host name and domain name

ME Outputs the data stored on the external storage medium

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

p1 Operation type

DIR Output the file list

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 Outputs 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 with the DIR or LIST command. If this command is executed after all lists have been output, only the free space of the storage medium is output.

CHKDSK Checks the disk. Outputs the free space information.

p2 Path name (up to 100 characters)
Specify using a full path.

p3 Maximum number of file lists to be output (1 to 1000)
If omitted, all the file lists in the specified directory are output.

Example
- Output the list of all files in the root directory.
  ```
  MEDIR,/
  ```
- Output 10 files of the file list of the root directory.
  ```
  MEDIR,/,10
  ```
- Output the list of all files in the DATA0 directory.
  ```
  MEDIR,/DATA0/*.*
  ```
- Output the list of all display data files in the DATA0 directory.
  ```
  MEDIR,/DATA0/*.DAD
  ```
- Output the data in the file 72615100.DAD in the DATA0 directory.
  ```
  MEGET,/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 parameter p1 is set to LIST, the ID numbers of the file list to be output are set to all spaces.
- If an error occurs during data transmission, p1 can be set to RESEND to retransmit the data.

Path Name Specifications
- The first level directories are as follows:
  Path that starts with /MEM0/DATA/Internal memory
  Path that starts with /DRV0/CF card
- Path names are case-sensitive.
- Files whose name is less than or equal to 48 characters can be accessed up to three directory levels.
- Wild cards have the following limitations.
  - When parameter p1 is DIR, * can be specified for parameter p2.
  - If the 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 extension, characters starting with * are considered to be arbitrary.
    Example) Let us assume that there are five files: ab001.ef1, ab002.ef1, ab001.ef2, ab002.ef2, and ab001.yyy.
    If ab*01.ef1 is specified, ab001.ef1 and ab002.ef1 are selected.
    If ab001.e* is specified, 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 sample data

REPORT Report

p3 Specified file name

Example Output the report data from the DX.

```
MOGET,REPORT
```

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 the instrument

The ASCII code of **ESC** is 1BH. See appendix 1.

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 with which to communicate.
- Only one instrument can be opened at any given time.
- When an instrument is opened with the ESC O command, any other instrument that is currently open is automatically closed.
- When this command is received correctly, the DX transmits the data "**ESC** O□□".
- Normally, either CR+LF or LF can be used as a terminator for communication commands. However, the terminator for this command must be set to CR+LF.

ESC C Closes the instrument

The ASCII code of **ESC** is 1BH. See appendix 1.

Syntax **ESC** C p1<terminator>

p1 Instrument address (01 to 99)

Example **Close the device whose address is 77.**

ESC C77

Description
- Clears the current connection with the device.
- When this command is received correctly, the DX transmits the data "**ESC** C□□".
- Normally, either CR+LF or LF can be used as a terminator for communication commands. However, the terminator for this command must be set to CR+LF.

3.10 Output Commands (Special Response Commands)

*I Outputs the instrument information

Syntax *I<terminator>

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

close Disconnects the connection between other instruments.

Syntax `close,p1,p2:p3`<terminator>

`p1` Port on the DX side (0 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 This command cannot be used to disconnect a server port. Also, it cannot disconnect the DX being operated. Use the quit command for this purpose.

con Outputs the 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`
The DX's socket address.
Displays "IP address:port number."

`Foreign Address`
The destination socket address.
Displays "IP address:port number."

`State`
Connection state.

`ESTABLISHED`
Connection established.

eth Outputs Ethernet statistical information.

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 statistical information.

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 dropped connections.

`TCP: timeoutdrop`
Total number of dropped connections due to TCP retransmission timeout. When the transmitted packet (the unit of transmitted data) is not received, the packet is automatically retransmitted at a predetermined time interval. If the packet is not received after 14 retransmissions, timeout occurs and the connection is dropped.

`TCP: keepdrops`
Total number of dropped 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 collision incidents. 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 collision incidents.

quit Disconnects the connection of the instrument being operated

Syntax `quit`<terminator>

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

The instrument information server function interprets one UDP packet to be one command and returns a single packet (containing the DX information) in response to the command.

Port number	34264/udp (see section 2.1)
Transfer data	ASCII
Received buffer size	128
Transmit buffer size	512
Maximum number of parameters	32

In the command packet, parameters corresponding to the desired information are placed one after another.

Parameter	Description
`serial`	Outputs the serial number.
`host`	Outputs the host name (specified in section 2.3).
`ip`	Outputs the IP address (specified in section 2.3).

Example Query the IP address and host name. (Of the two frames below, the top frame represents the command packet, and the bottom frame represents 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, line feed).
- Parameters are not case sensitive.
- Undefined parameters are ignored.
- Parameters beyond 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`

ASCII Output

The following types of ASCII data are available. For the data formats, see section 4.2.
Setting data, basic setting data, decimal point position/unit information, measured/computed data, communication log, FTP log, operation error log, login log, Web operation log, e-mail log, alarm summary, message summary, status information, file list, data list, and user level

- **Syntax**

  `EA`*CRLF*

  `···············`*CRLF*

  `:`

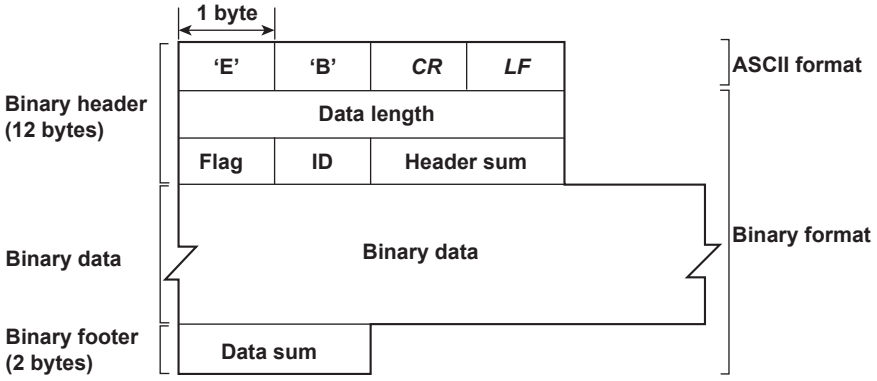
  `···············`*CRLF*

  `···············`*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`

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 *DXA120 DAQSTANDARD User's Manual IM04L41B01-61E*.
  - 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 externa input data	FD0
Relay/internal switch status	FD6
Communication log	FLCOM
FTP client log	FLFTPC
Operation error log	FLERR
Login log	FLLOGIN
Web operation log	FLWEB
E-mail log	FLEMAIL
SNTP access log	FLSNTP
DHCP access log	FLDHCP
Modbus communication log	FLMODBUS
Alarm summary	FLALARM
Message summary	FLMSG
Status information	IS0,IS1
Ethernet status output	FAIP
File list	MEDIR
Check disk	MECHKDSK
Manual sampled/report data information	MODIR
User information	FU0,FU1

Note

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

Setting Data/Basic Setting Data

- The FE command is used to output the data.
- The setting/basic setting data is output in the order of the listed commands in the table in section 3.2, "A List of Commands." However, the setting information for the following commands is not output.
  - **Setting commands (setting)**
    SD/FR command
  - **Setting commands (control)**
    All commands from BT to IR
  - **Basic setting commands**
    XE, YO, YE, and YC commands
- The output format of the setting/basic setting data conforms to the syntax of each command.
- Some commands are output in multiple lines. (Example: Commands that are specified for each channel.)

- **Syntax**
  The two-character command name and the subsequent parameters are output in the following syntax.

```
EACRLF
ttsss···sCRLF
···············
ENCRLF
```

tt	Command name (SR, SA···, 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 externa 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/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-I30:00000000000000000000000000000000
EN
```

Communication Log

- The FL command is used to output the data.
- A log of setting/basic setting/output commands and responses is output. Up to 200 logs are retained. Logs that exceed 200 are cleared from the oldest data.

- **Syntax**

```
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	

- **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/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/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
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
```

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

eee Error code when executing the requested operation
- All spaces: Success
- 001 to 999: Failure (error code)

???···? Parameter for each event (see below)

- When ffffff = SCREEN
  yy/mo/dd_hh:mm:ss_ffffff_eee_ddddd_nn*CRLF*
  - ddddd Screen type
    - TREND: Trend display
    - DIGIT: Digital display
    - BAR: Bar graph display
    - HIST: Historical trend display
    - OV: Overview display
  - nn Group number (01 to 36)
- When ffffff = KEY
  yy/mo/dd_hh:mm:ss_ffffff_eee_kkkkk*CRLF*
  - kkkkk Type of key that was operated
    - DISP: DISP/ENTER key
    - UP: Up key
    - DOWN: Down key
    - LEFT: Left key
    - RIGHT: Right key
    - FAVOR: Favorite key
- When ffffff = MSG
  yy/mo/dd_hh:mm:ss_ffffff_eee_mmm···m*CRLF*
  - mmm···m Message (up to 32 characters)
  - _ Space

- **Example**

```
EA
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
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, space)	
	R:	Read
	W:	Write
_	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.

- **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 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: All groups
zzz	Operation property
	KEY: Key operation
	COM: Communication
	REM: Remote
	ACT: Event action
	SYS: System
uuu···	User name (up to 20 characters)
nnn···	Message sequence number (0 for add messages)
_	Space

- **Example**

```
EA
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
```

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 list and the file data sizes of the specified directory on the DX's external storage medium are output.

- **Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_ssssssss_fff···_0_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.
xxx···	Data serial number (16-digit hexadecimal)
_	Space

The data serial number are included for files in the DATA directory in the internal memory. For all other cases, they are spaces.

- **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

- **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**

  EA*CRLF*
  p_l_uuu･･･*CRLF*
  EN*CRLF*

p	Login method	
	E:	Ethernet
	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
  ```

4.3 Output Format of Binary Data

This section describes the output format of the binary data that is disclosed.
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

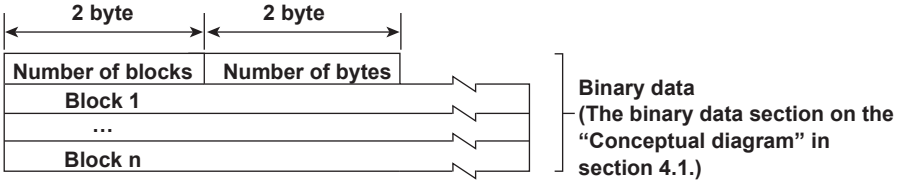
Binary Value	Decimal Position Code	Physical Value (Measured Value)
10000	0	10000
10000	1	1000.0
10000	2	100.00
10000	3	10.000
10000	4	1.0000

Note

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

Measured/Computed Data and FIFO Data

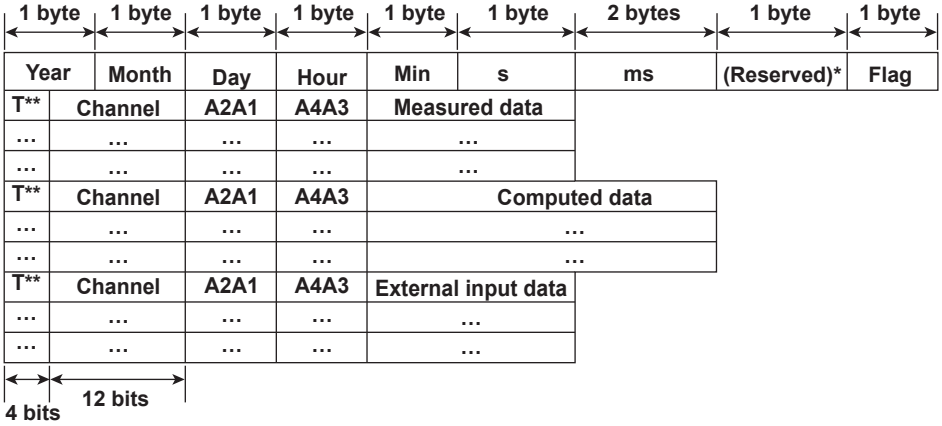
- The FD command is used to output the measured/computed data.
- The FF command is used to output the FIFO data.
- You can use the CB command to specify whether to output the data of measurement channels set to skip and computation or external input channels set to OFF.
- The ID number of the output 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



* The sections indicated as (Reserved) are not used. The value is undefined.
** Abbreviation of “Type” for the purpose of this figure.

- **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	Flag 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
(Reserved)	Undefined
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

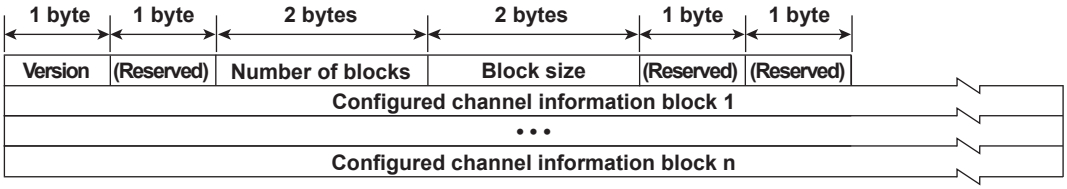
The measured/computed data take on the following values under special conditions.

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 Details

Item	Description	Output Value
Version	Format version	1
Number of blocks*	Number of configured channel information blocks	Up to 348
Block size*	Size of the of configured channel information blocks	72
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.

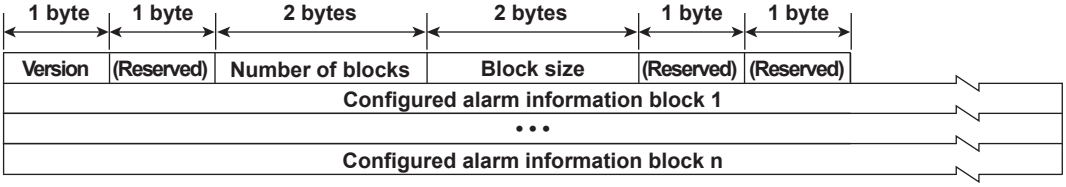
Block Details

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	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.

Configured Alarm Information Data

- The FE6 command is used to output the data.
- The ID number of the output format is 26.
- 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/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/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`

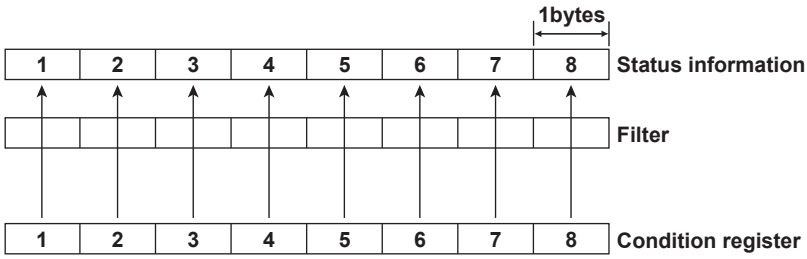
Even if the same parameters are specified numerous times, only the first occurrence is output.	

`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 while data are being acquired to the internal memory.
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	–	–
7	–	–

Status Information 2

Bit	Name	Description
0	–	–
1	–	–
2	Memory end	Set to 1 while the free space in the internal memory or external storage medium is low.
3	Logged in through keys	Set to 1 while logged in through keys.
4	–	–
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.

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 start is executed	Set to 1 when the time could not be adjusted using SNTP when memory start is executed.
5	–	–
6	–	–
7	–	–

Status Information 4

Bit	Name	Description
0	A/D conversion complete	Set to 1 when the A/D conversion of the measurement is complete.
1	Medium access complete	Set to 1 when the display, event, manual sampled, report, or screen image data file are finished being saved to the external storage medium. Set to 1 when setup data is successfully saved or loaded.
2	Report generation complete	Set to 1 when report generation is complete.
3		Timeout Set to 1 when the timer expires.
4	–	–
5	–	–
6	USER key detection	Set to 1 when the USER key is pressed.
7	–	–

Status Information 5 to 8

All bits are zeroes.

6.1 Ethernet Interface Specifications

Basic Specifications

Electrical and mechanical specifications:	Conforms to IEEE 802.3 (Ethernet frames conform to the DIX specification)
Transmission medium type:	10BASE-T
Protocol:	TCP, IP, UDP, ICMP, ARP, FTP, HTTP, SNTP, SMTP

Maximum Number of Connections and Number of Simultaneous Uses

The following table indicates the number of simultaneous uses (number of users that can use the function simultaneously), the maximum number of connections, and the port number for each function.

Function	Maximum Number of Connections	Number of Simultaneous Uses		Port Number*4
		Administrator	User	
Setting/measurement server	3	1	2*1	34260/tcp*2
Maintenance/test server	1	1	1*1	34261/tcp*2
FTP server	2	2	2*1	21/tcp*3
Web server (HTTP)	1	–	–	80/tcp*3
SNTP server	–	–	–	123/udp*3
Modbus server	2	–	–	502/tcp*3
Instrument information server	–	–	–	34264/udp*2

*1 There are user limitations. For details, see section 1.1.
*2 The port numbers are fixed.
*3 The default port number. You can set the value in the range of 1 to 65535. Use the default port number unless there is a special reason not to do so.
*4 Make sure that port number settings are not duplicated.

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.

Command

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

Symbol	Description
INT16	16-bit signed integer
UINT16	16-bit unsigned integer
INT32_B	32-bit signed integer (higher and lower order)
INT32_L	32-bit signed integer (lower and higher order)
UINT32_B	32-bit unsigned integer (higher and lower order)
UINT32_L	32-bit unsigned integer (lower and higher order)
FLOAT_B	32-bit floating point (higher and lower order)
FLOAT_L	32-bit floating point (lower and higher order)

- **Reading Values into 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	
Access method	External input channel Number: 201 to 440 Data type: 16-bit signed integer
R	

Read

Server	
Register	Data type
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	
Access method	Communication input data Number: C01 to C24 (DX1000) C01 to C60 (DX2000) Data type: 32-bit floating point
R-M	

Read

Server	
Register	Data type
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	
Access method	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

- **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	
Access method	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

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		

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

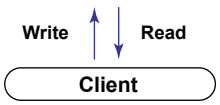
Supported functions: The functions that the DX supports are listed below.

Function Code	Function	Operation
3	Read the hold register (4XXXX)	The client device reads the communication input data.
4	Read the input register (3XXXX)	The client device reads the computed, measured, alarm, and time data of the DX.
6	Single write to hold register	The client device writes to the communication (4XXXX) 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 (4XXXX)	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	30001 to 30048	16-bit signed integer
	Alarm status	31001 to 31048	Bit string
Computation ch.	Computed data	32001 to 32120	32-bit signed integer
	Alarm status	33001 to 33060	Bit string
External input ch.	Measured data	34001 to 34240	16-bit signed integer
	Alarm status	35001 to 35240	Bit string
Measurement ch.	Alarm list	36001 to 36012	Bit string
Computation ch.	Alarm list	36021 to 36035	Bit string
External input ch.	Alarm list	36041 to 36100	Bit string
Time		39001 to 39008	16-bit signed integer

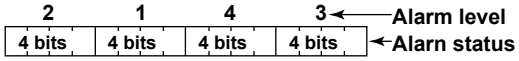
Data	Hold register	
	Number	Data type
Communication input data	40001 to 40060	16-bit signed integer
	40301 to 40420	32-bit floating point
Measured data on external input ch.	41001 to 41240	16-bit signed integer



Input Register (shared with the Modbus slave function)

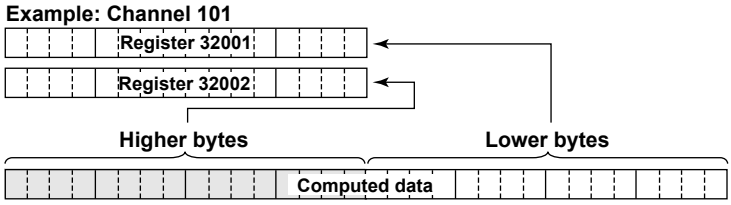
- **Common Items**
  - The client device can only read the input registers.
  - Decimal position and unit are not included. Specify them on the client device.
  - External input channels are DX2000 option (/MC1).
- **Details**

Input Register	Data	Data Type
30001	Measured data of measurement channel 001	16-bit signed integer
|	|	
30048	Measured data of measurement channel 048	
• There is no decimal position information.		
31001	Alarm status of measurement channel 001	Bit string
|	|	
31048	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

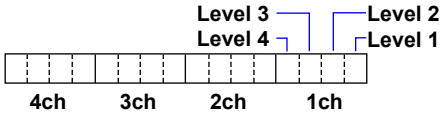
32001	Lower bytes of the computed data of computation channel 101	32-bit signed integer
32002	Higher bytes of the computed data of computation channel 101	
|	|	
32119	Lower bytes of the computed data of computation channel 160	
32120	Higher bytes of the computed data of computation channel 160	
• Register structure		



• There is no decimal position information.		
33001	Alarm status of computation channel 101	Bit string
|		
33060	Alarm status of computation channel 160	
• Register structure and alarm status values: Same as the alarm status of the measurement channels.		
34001	Measured data of external input channel 201	16-bit signed integer
|	|	
34240	Measured data of external input channel 440	
• There is no decimal position information.		
35001	Alarm status of external input channel 201	Bit string
|	|	
35240	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
36001	List of alarms of measurement channels 001 to 004	Bit string
|	|	
36012	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 36001 (measurement channels 001 to 004).

36021	List of alarms of computation channels 101 to 104	Bit string
|	|	
36035	List of alarms of computation channels 157 to 160	

- Register structure: Same as the list of alarms of measurement channels.

36041	List of alarms of external input channels 201 to 204	Bit string
|	|	
36100	List of alarms of external input channels 437 to 440	

- Register structure: Same as the list of alarms of measurement channels.

* Input registers 36001 to 36100 can be accessed consecutively. All unassigned register bits are read as zeroes.

Input Register	Data	Data Type
39001	Year	16-bit signed integer
39002	Month	
39003	Day	
39004	Hour	
39005	Minute	
39006	Second	
39007	Millisecond	
39008	DST	

Hold Register (shared with the Modbus slave function)

- **Common Items**
  - The client device can read and write to the hold registers.
  - Communication input channels are 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
40001 | 40060	Communication input channel C01 | Communication input channel 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.	
40301 40302 | 40419 40420	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.	
41001 | 41240	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.	

Modbus error response (common to Modbus server and Modbus slave)

The DX returns the following error codes to a client or master device.

Code	Function	Operation
1	Bad function code	Unsupported function request.
2	Bad register number	Tried to read or write to the register without a corresponding channel.
3	Bad number of registers	When writing, the specified number of registers is less than or equal to zero or greater than or equal to 124. When reading, the specified number of registers is less than or equal to zero or greater than or equal to 126.

However, no response is returned in the following cases.

- 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

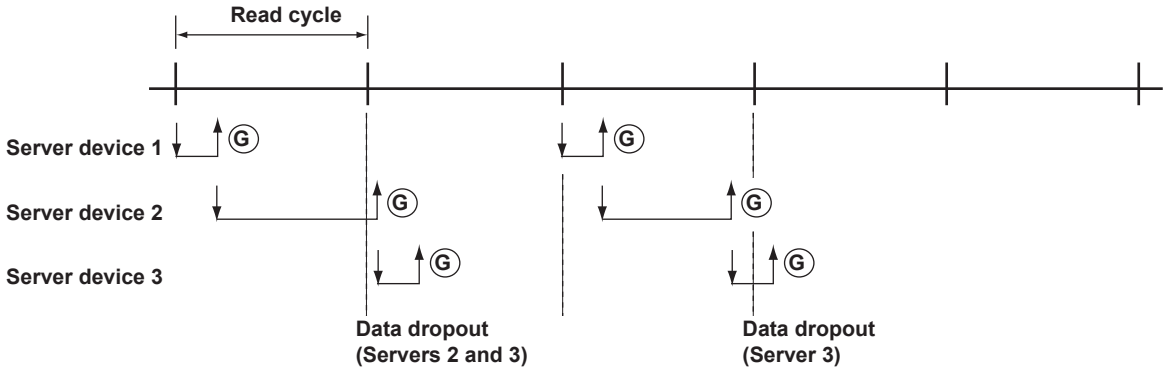
Slave address:	1 to 99.
Supported functions:	Same as the Modbus server.
Register assignments:	Same as the Modbus server.
Modbus error response:	Same as the Modbus server.

Appendix 1 Data Dropout during Modbus Communication

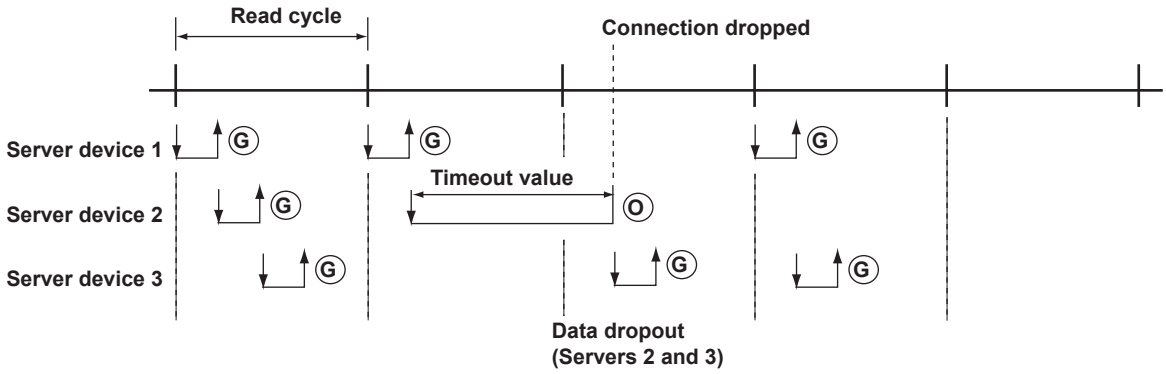
Data Dropout during Modbus Client

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.

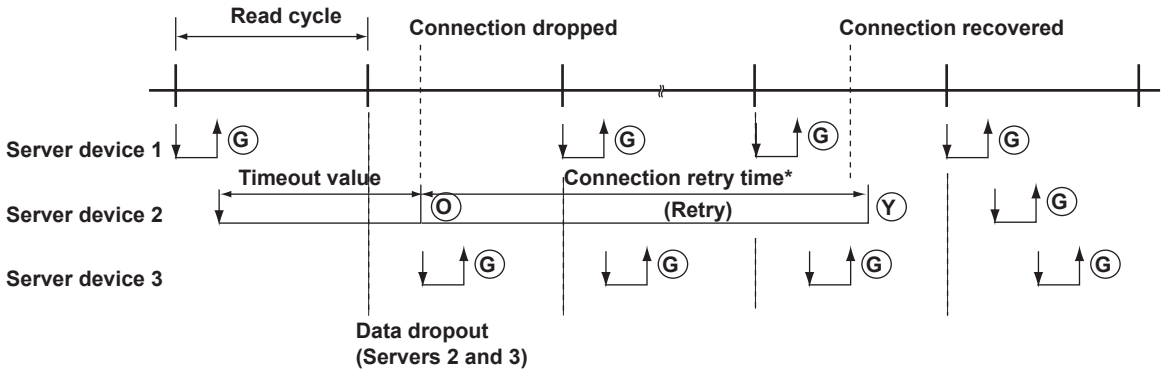
1. When the response from the server device takes a long time



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

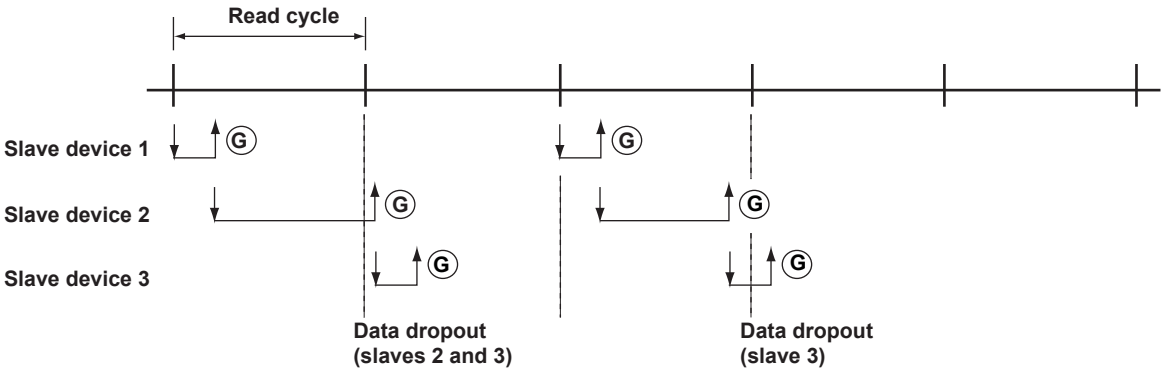
: Response from the server device

* 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.

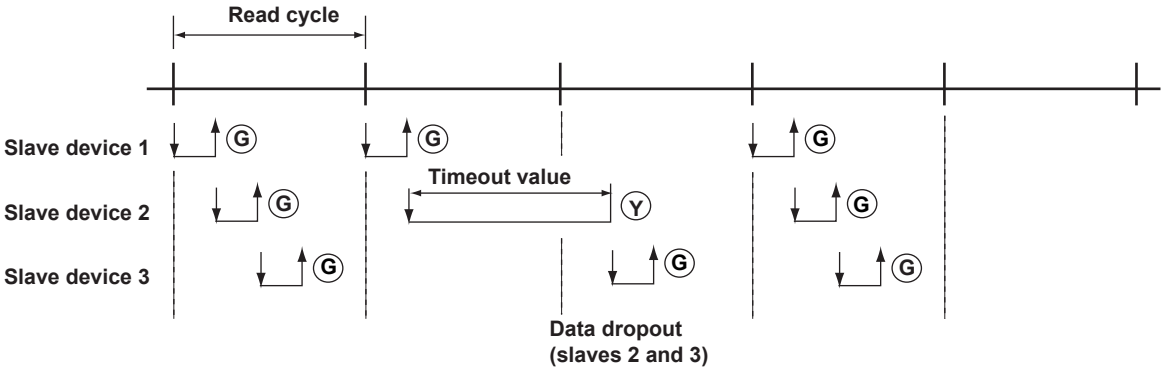
Data Dropout during Modbus Master

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.

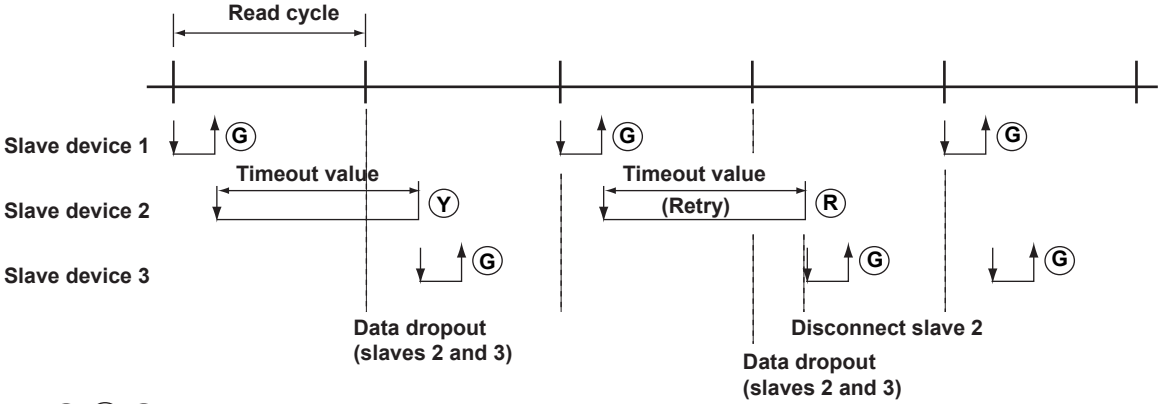
1. When the response from the slave device takes a long time



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

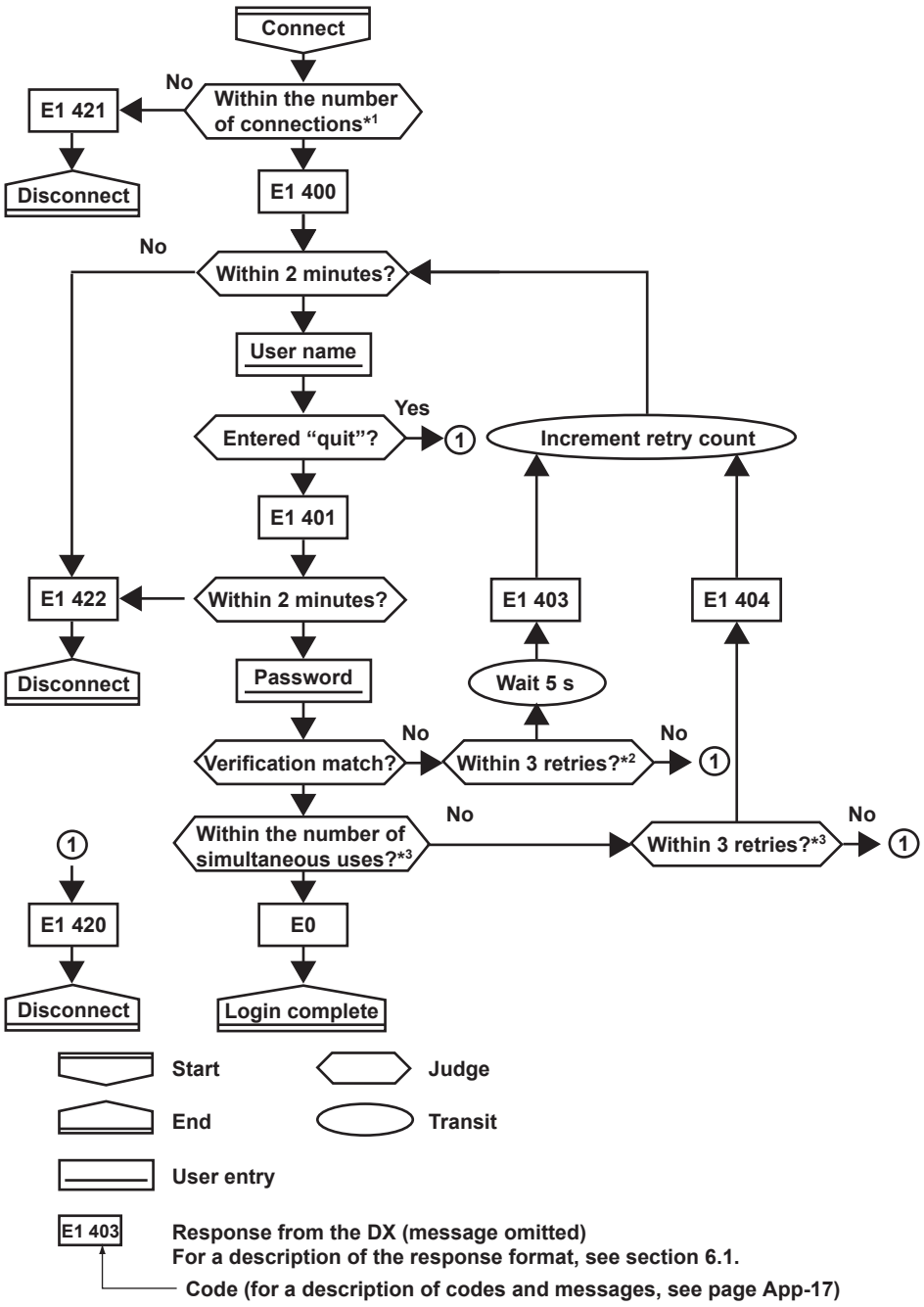
: Command from the DX

: 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 Ethernet Login Function of the DX



*1 Connections cannot exceed the maximum number of connections (see section 2.1).

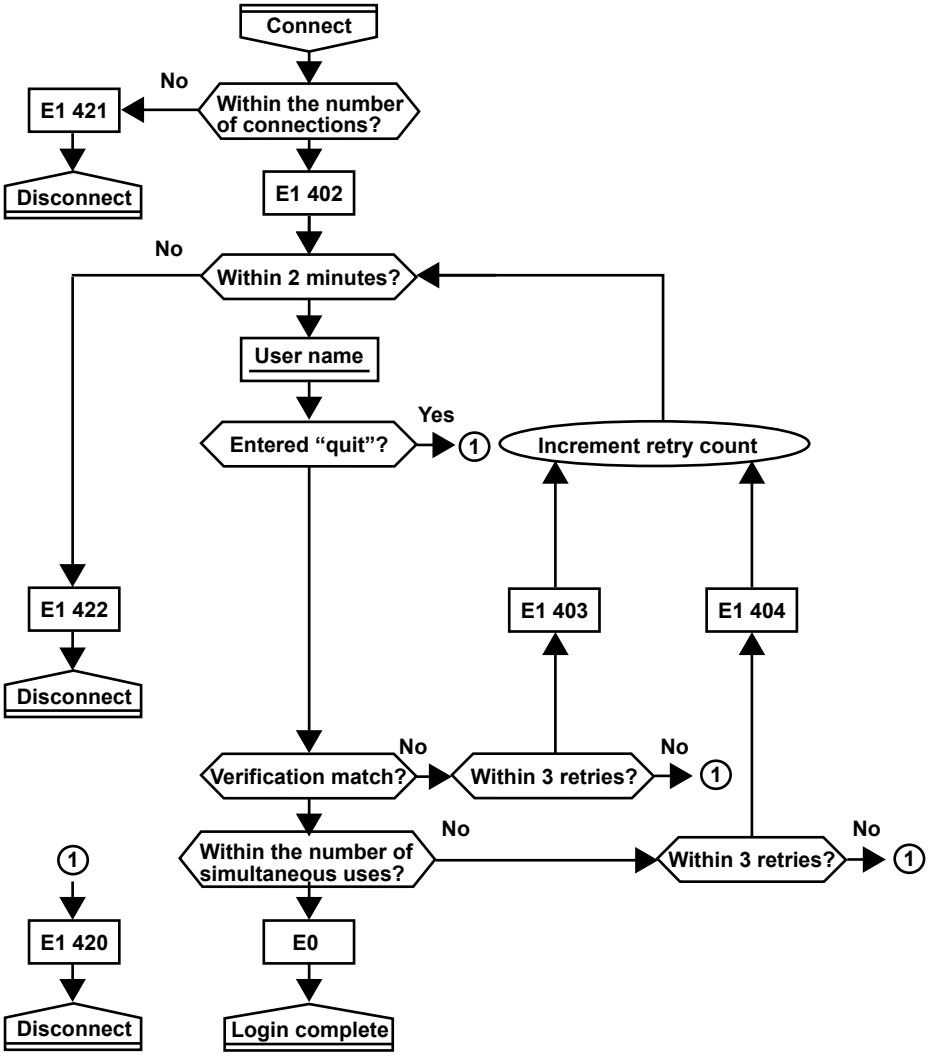
*2 If you try to log in using a wrong password four consecutive times, the communication is dropped (the number of retries for login is three).

*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.



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					Â	Ò	â	ò
3			#	3	C	S	c	s					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	

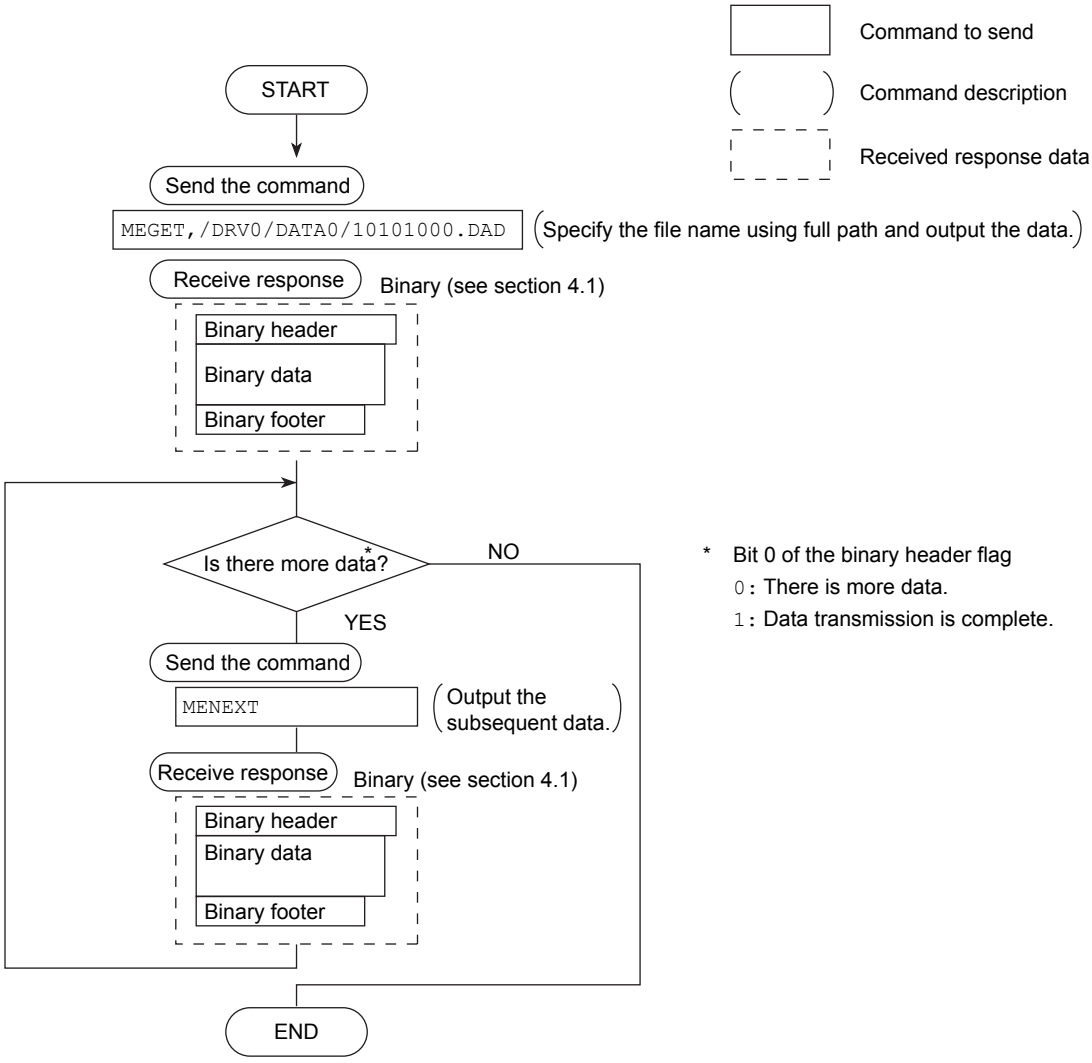
German and French only

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

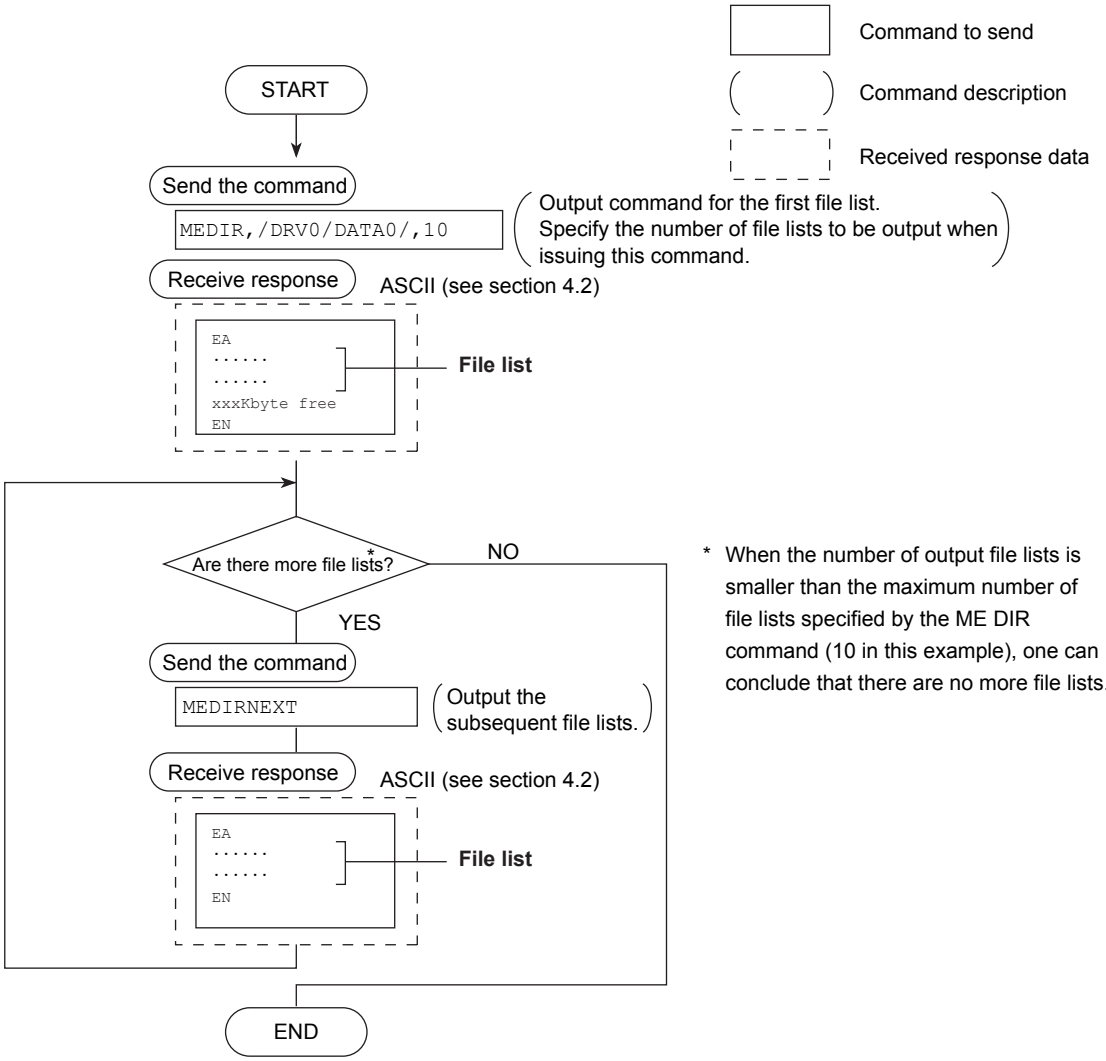
The figure below shows the output flow of the file 10101000.DAD in the DATA0 directory of the external storage medium.



* 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.



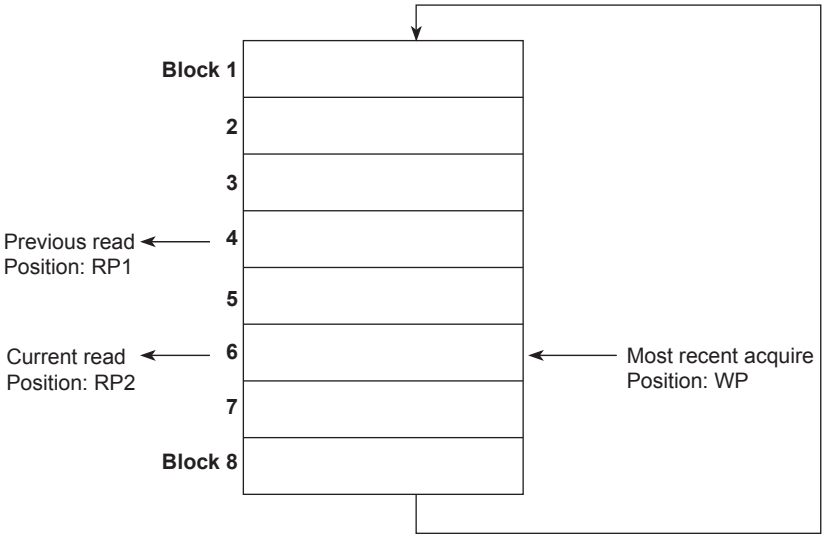
* When the number of output file lists is smaller than the maximum number of file lists specified by the ME DIR command (10 in this example), one can conclude that there are no more file lists.

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

W

X