User's Manual

Models RD-MV1004/RD-MV1006/RD-MV1008/RD-MV1012/
  RD-MV1024
  RD-MV2040/RD-MV2048

RD-MV1000/RD-MV2000
Communication Interface
Foreword

Thank you for purchasing the RD-MV1000/RD-MV2000 (hereafter referred to as the MV). This Communication Interface User's Manual contains information about the Ethernet and serial interface communication functions. To ensure correct use, please read this manual thoroughly before beginning 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 RD-MV1000/RD-MV2000 manuals. Please read all of them.

- **Electronic Manuals Provided on the Accompanying CD-ROM**

<table>
<thead>
<tr>
<th>Manual Title</th>
<th>Manual No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD-MV1000 First Step Guide</td>
<td>IM RD-MV1000-02E</td>
<td>Explains how to set up the RD-MV1000 for making measurements using the quick settings function. Connection diagrams are also provided to help you with the setup.</td>
</tr>
<tr>
<td>RD-MV2000 First Step Guide</td>
<td>IM RD-MV2000-02E</td>
<td>Explains how to set up the RD-MV2000 for making measurements using the quick settings function. Connection diagrams are also provided to help you with the setup.</td>
</tr>
<tr>
<td>DAQSTANDARD User's Manual</td>
<td>IM 04L41B01-61E</td>
<td>Explains the functions and operating procedures of DAQSTANDARD.</td>
</tr>
</tbody>
</table>

- **Paper Manuals**

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</tr>
<tr>
<td>RD-MV2000 First Step Guide</td>
<td>IM RD-MV2000-02E</td>
<td>This guide is also provided in the CD-ROM.</td>
</tr>
<tr>
<td>RD-MV1000/RD-MV2000 Control of Pollution Caused by the Product</td>
<td>IM RD-MV1000-91C</td>
<td>Provides information about pollution control.</td>
</tr>
</tbody>
</table>

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 Omega dealer.
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Revisions

- 1st Edition: December 2007
How to Use This Manual

The following symbols are used in this manual.

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

**Markings**
The following safety notations are used in this manual.

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

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

**CAUTION** Calls attention 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 used to indicate text that appears on the screen or operation keys. The © symbol indicates key and menu operations.

**Procedural Explanations**
This manual mainly describes the RD-MV1000 procedures. Where procedures differ between the RD-MV2000 and RD-MV1000, the RD-MV2000 procedures are also provided.

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

<table>
<thead>
<tr>
<th>Model Type</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-speed input model</td>
<td>RD-MV1004, RD-MV1008, and RD-MV2008</td>
</tr>
<tr>
<td>Medium-speed input model</td>
<td>RD-MV1006, RD-MV1012, RD-MV1024,</td>
</tr>
</tbody>
</table>
Communication Ports

Rear Panel

RD-MV1000
- Ethernet port
- RS-422/RS-485 port (option)
  A serial port that is provided with the /C3 option.

RD-MV2000
- Ethernet port
  An Ethernet port that comes standard.
- RS-422/RS-485 port (option)
  A serial port that is provided with the /C3 option.

RS-232 port (option)
A serial port provided with the /C2 option.
1.1 Ethernet Interface

This chapter gives an overview of the MV Ethernet communication functions.

Modbus Communications
The MV can connect to a Modbus device and read and write to the device's internal registers. See section 1.3 for details.

Setting/Measurement Server

- You can use this feature to set almost all of the settings that can be configured from the front panel keys. However, you cannot use this feature to turn the power ON/OFF, register users, set the key lock password, or set the connection destination of the FTP client function.
- You can use this feature to transmit the following types of data:
  - Measured, computed\(^1\), and external input data\(^2\)
  - Files in the internal memory or files on an external storage medium
  - Setup information and status byte
  - Logs of operations errors, communications, etc.
  - Alarm summaries and message summaries
  - Relay status information

Measured, computed\(^1\), and external input data\(^2\) data can be transmitted to a PC in binary or ASCII format. Other types of data are transmitted in text format. For a description of data output formats, see chapter 5.

1. /M1 option.
2. RD-MV2000 with the /MC1 option.

- You can use setting mode commands (see sections 4.4 and 4.5), basic setting mode commands (see section 4.6), and output commands (see sections 4.7 and 4.8) with this feature.
- You can use this feature via an Ethernet interface or serial interface (/C2 or /C3 option).
- If you want to use this feature via a serial interface, configure the serial interface according to Chapter 3.

Maintenance/Test Server

- You can use this feature to transmit connection information, network statistics, and other Ethernet communication information from the MV.
- You can use maintenance/test commands (see section 4.11) with this feature.
FTP Server

- You can access the MV from a PC via FTP. You can perform operations such as retrieving directory and file lists and transferring and deleting files from an external storage medium connected to the MV. You can also retrieve directory and file lists and transfer files from the internal memory.
- For the settings necessary to use this feature, see section 2.5.

FTP Client

Automatic File Transfer

- You can use this feature to automatically transfer display, event, report, and snapshot data files that are created in the MV internal memory to an FTP. The result of the transfer is recorded in the FTP log. You can view the FTP log on the MV (see “Log Display” described later) or transmit the log to a PC using commands.

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.
- For the settings necessary to use this feature, see section 2.6.

- FTP Test
  - You can perform an FTP test by transferring a test file from the MV to an FTP server.
  - You can view the result of the FTP test on the FTP log screen.
  - For information on how to use this feature, see section 2.6.
Instrument Information Server

- You can use this feature to output the serial number, model name, and other information about an MV that is connected via an Ethernet network.
- You can use instrument information output commands (see section 4.12) with this feature.

Login

- You can use this feature when accessing the setting/measurement server, maintenance/test server, and FTP server functions via an Ethernet interface.
- For a description of the settings required to use this feature, see the RD-MV1000/RD-MV2000 User's Manual (IM RD-MV1000-01E).
- For the procedure to log into the setting/measurement server or the maintenance/test server, see appendix 3.

User Registration

Users are registered using the MV login feature. There are two user levels: administrator and user.

- **Administrator**
  An administrator has privileges to use all the features of the setting/measurement server, maintenance/test server, and FTP server.

- **User**
  A user has limited privileges to use the features of the setting/measurement server, maintenance/test server, and FTP server. For command limitations, see section 4.2.
  - Setting/measurement server feature limitations
    A user cannot change settings that affect the MV operation. A user can output measured data and setting data.
  - Maintenance/test server feature limitations
    A user cannot disconnect a connection between another PC and the MV. A user can disconnect the connection between the user’s own PC and the MV.
  - FTP server feature limitations
    A user cannot save or delete files on an external storage medium connected to the MV. A user can only load files.

- **Application Timeout**
  This feature drops the connection with the PC if there is no data transfer for a given time. It prevents a PC from being connected to the MV indefinitely which would prohibit other users from making new connections.
Web Server

- The MV screen can be displayed in Microsoft Internet Explorer.
- The following two pages are available:
  - Operator page: You can switch the MV display and change or write messages.
You can set access control (user name and password specified with the login function) for each page.

- The MV screen can be refreshed at a constant interval (approximately 10 s).
- The following information can be displayed.
  - Alarm summary
  - Measured and computed values of all channels
  - Log (message log, error log, etc.)
- For Web server feature settings, see section 2.4.
- For a description of the monitor page and operator page operations, see section 2.4.
E-mail Transmission

E-mail Transmission
The available e-mail types are listed below. The MV can automatically transmit
each e-mail type. You can specify two destination groups and specify one of the two
destination groups for each e-mail type. You can also set a header string for each type.
• Alarm e-mail
  Reports alarm information when an alarm occurs or clears.
• System e-mail
  When the MV recovers from a power failure, it reports the time of the power failure
  and the time of recovery.
  Reports the detection of a memory shortage when it is detected.
  Reports the error code and message when a media error occurs (when an error
  occurs on an external storage medium or when data cannot be stored due to
  insufficient free space on an external storage medium).
  Reports the error code and message when an FTP client error (when data transfer
  fails using the FTP client feature) occurs.
• Scheduled e-mail
  Transmits a message when the specified time is reached. You can use this feature to
to check that the network and e-mail transmission functions are working properly. You
can specify a reference time and e-mail transmission interval for each destination.
• Report e-mail (only on models with the computation function, /M1 option)
  Transmits report results.

You can specify POP before SMTP if authentication is necessary before transmission.
For e-mail transmission settings, see section 2.3.
For e-mail transmission formats, see section 2.3.
For the procedure to start/stop e-mail transmission, see section 2.3.

Example of an e-mail sent at a scheduled time

```
From: MV1000@daqstation.com
Date: Tue, 22 Jan 2008 08:00:45 +0900 (JST)
Subject: Periodic_data
To: user1@daqstation.com, user2@mvadv.co.jp

<table>
<thead>
<tr>
<th>LOOP1</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMPERATURE</td>
<td>Header 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Header 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host name</td>
<td>MV1000</td>
</tr>
<tr>
<td>Time of transmission</td>
<td>01/05 08:00:31</td>
</tr>
</tbody>
</table>
```

E-mail Transmission Test

• You can test e-mail transmission by sending a test mail from the MV to a destination.
• You can view the test result in the e-mail log screen.
• For information on how to use this feature, see section 2.3.
1.1 Ethernet Interface

SNTP Server/Client
The client feature retrieves time information from a specified SNTP server at a specified interval.
The server feature can provide time information to MVs and other devices connected to the same network.

DHCP Client
You can use this feature to automatically obtain an IP address from a DHCP server. You can manually retrieve or release network information.

Other Features

Ethernet Interface Connection Status Check
You can check the Ethernet interface connection status on the MV rear panel or the MV screen.
For a description of the connection status indicators, see section 2.2.

Keepalive (TCP extension feature)
This feature drops the connection if there is no response to a test packet that is periodically transmitted at the TCP level.
For the settings necessary to use this feature, see section 2.2.

Log Display
You can display operation logs on the MV log screen. You can also check logs using communication commands. The Web screen can also display logs (except communication and DHCP logs).
- Error log screen: A log of operation errors
- Communication log screen: A setting/measurement server communication input/output log
- FTP log screen: A log of file transfers carried out using the FTP client feature
- WEB log screen: A Web server operation log
- Mail log screen: A log of e-mail transmissions
- Login log screen: A login/logout log
- SNTP log screen: An SNTP server access log
- DHCP log screen: A DHCP server access log
- Modbus log screen: A Modbus status (master/client operating condition) log
For the procedure to show the log screen and details on the displayed contents, see the RD-MV1000/RD-MV2000 User's Manual (IM RD-MV1000-01E).
For details on the Modbus status log, see section 2.8.
For details on how to output logs using communication commands, see section 5.2. For details on how to show logs on the Web screen, see section 2.4.
1.2 Serial Interface

The MV supports serial communications via the RS-232 and RS-422/RS-485. This chapter gives an overview of the MV serial communication functions.

**Modbus Communications**
- The MV can connect to a Modbus device and read and write to the device’s internal registers. See section 1.3 for details.

**Setting/Measurement Server**
- You can use this feature to set almost all of the settings that can be configured from the MV front panel keys. See section 1.1 for details.
- For the settings necessary to use this feature, see section 3.3.
1.3 Modbus Protocol

Modbus Client/Master

- The MV can connect to a Modbus server or slave device and read and write to the device’s internal registers.
- The MV can handle the data that is read from the registers as communication input data on a computation channel (computation function\(^1\)). The MV can also handle the data on an external input channel.\(^2\)
- The MV can write measured and computed data to the registers.
  1 /M1 option.
  2 RD-MV2000 with the /MC1 option.
- For details on the Modbus function codes that the MV supports, see section 7.3.
- For the settings to use the Modbus client feature, see section 2.9. For the settings to use the Modbus master feature, see sections 3.3, 3.5, and 3.6.

Server Device Connection Example

![Server Device Connection Example](image)

Modbus Server/Slave

- A Modbus client (master) device can connect to an MV, a Modbus server (slave) device, to read the measured, computed,\(^1\) or external input\(^2\) data that is written in the input register or to read or write data to communication input data\(^1\) or to an external input channel\(^2\) through the MV hold register.
  1 /M1 option.
  2 RD-MV2000 with the /MC1 option.
- For details on the Modbus function codes that the MV supports, see section 7.3.
- For the settings to use the Modbus client feature, see section 2.8. For the settings to use the Modbus master feature, see sections 3.3, 3.4, and 3.6.

Example of a Connection with a Modbus Master Device

![Example of a Connection with a Modbus Master Device](image)
Follow the flowchart below to configure Ethernet communication.

Start

Connect the ports

IP address assignment method

Automatically assigned IP address (DHCP)

Fixed IP address

Set the IP address

Set the subnet mask

Set the default gateway

Set the host name (optional)

Set the domain name (optional)

Set the DNS server search order

Set the domain suffix search order

End
2.2 Connecting the MV

Connecting to the Port

Ethernet Port
Connect an Ethernet cable to the Ethernet port on the MV rear panel.

CAUTION
Be sure to connect an Ethernet cable with an FCC-compliant plug. Otherwise, the MV may malfunction.

Connecting to a PC
Connect the MV to a PC via a hub. To make a one-to-one connection, see the figure below. You can connect multiple MVs to a single PC in the same way.
### Setting the IP Address, Host Information, and DNS

**RD-MV1000**
- Press **MENU** and then select **Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > IP address**
- Press **MENU** and then select **MENU tab > Basic setting mode > Menu tab > Communication (Ethernet) > Host settings**
- Press **MENU** and then select **MENU tab > Basic setting mode > Menu tab > Communication (Ethernet) > DNS settings**

**RD-MV2000**
- Press **MENU** and then select **MENU tab > Basic setting mode > Menu tab > Communication (Ethernet) > IP address, Host settings**
- Press **MENU** and then select **Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > DNS settings**

#### IP address settings (DHCP set to Not)

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>IP address</th>
<th>DHCP</th>
<th>Fixed IP address</th>
<th>IP address</th>
<th>Subnet mask</th>
<th>Default gateway</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>192.168.1.10</td>
<td>255.255.255.0</td>
<td>192.168.1.10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>IP address</th>
<th>DHCP</th>
<th>DNS address</th>
<th>Host name register</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use</td>
<td>Use</td>
</tr>
</tbody>
</table>

#### Host name settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Host name</th>
<th>Domain name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>@donstation.com</td>
</tr>
</tbody>
</table>

#### DNS settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Server search order</th>
<th>Primary</th>
<th>Secondary</th>
<th>Domain suffix search order</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>192.168.1.25</td>
<td>192.168.1.30</td>
<td>@donstation.com</td>
<td>bcd.donstation.com</td>
</tr>
</tbody>
</table>

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

When Using a Fixed IP Address

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

- **IP address**
  Set the IP address to be assigned to the MV.

- **Subnet mask**
  Set the subnet mask according to the system or network that the MV belongs to.

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

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

- **Domain name**
  Set the name of the domain that the MV belongs to using up to 64 alphanumeric 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 an IP Address Automatically (DHCP)

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

- **Obtain DNS info**
  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 registration**
  To automatically register the host name to the DNS server, select **Use**.

- **Host name**
  Set the MV host name using up to 64 alphanumeric characters.

- **Domain name**
  Set the name of the domain that the MV belongs to using up to 64 alphanumeric characters. This parameter is valid when Obtain DNS info is set to Not.

- **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.
Requesting/Clearing Network Information through DHCP

You can manually request or release IP address and other network information. This operation applies when DHCP is set to Use. First switch to the network information screen and then execute the request or release (clear) operation.

**Requesting Network Information**

1. Switch to the network information screen.

   - Press FUNC > Network Info

     | Field       | Value            |
     |-------------|------------------|
     | IP address  | 0.0.0.0          |
     | Subnet mask | 0.0.0.0          |
     | Default gateway | 0.0.0.0      |
     | MAC address | 00:00:00:00:00:00 |
     | DNS server  |                 |
     | Primary     | 0.0.0.0          |
     | Secondary   | 0.0.0.0          |
     | Host name   | dev0             |
     | Domain name | destation.com    |

2. Request network information.

   - Press FUNC > Network Info > Request

   - Press FUNC > Network Info

     | Field       | Value            |
     |-------------|------------------|
     | IP address  | 192.168.1.100    |
     | Subnet mask | 255.255.255.0    |
     | Default gateway | 192.168.1.100 |
     | MAC address | 00:00:00:00:00:00 |
     | DNS server  |                 |
     | Primary     | 192.168.1.20     |
     | Secondary   | 192.168.1.30     |
     | Host name   | dev0             |
     | Domain name | destation.com    |

The retrieved network information appears.
Clearing Network Information

1. Switch to the network information screen.
   ◇ Press FUNC > Network info

   ![Network Information Screen]

   - IP address: 192.168.1.100
   - Subnet mask: 255.255.255.0
   - Default gateway: 192.168.1.10
   - MAC address: 00:00:00:00:00:00
   - DNS server: Primary: 192.168.1.20
     Secondary: 192.168.1.30
   - Host name: example
   - Domain name: destination.com

2. Release (clear) the network information.
   ◇ Press FUNC > Network info > Release

   ![Network Information Screen after Release]

   The network information is released.
   - IP address: 0.0.0.0
   - Subnet mask: 0.0.0.0
   - Default gateway: 0.0.0.0
   - MAC address: 00:00:00:00:00:00
   - DNS server: Primary: 0.0.0.0
     Secondary: 0.0.0.0
   - Host name: example
   - Domain name: destination.com

   DISP/ENTER key
Setting the Communication Conditions

RD-MV1000

◊ Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Keep alive, Timeout

RD-MV2000

◊ Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Keep alive, Application time out

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep alive</td>
<td></td>
</tr>
<tr>
<td>Application time out</td>
<td></td>
</tr>
<tr>
<td>On/Off</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td></td>
</tr>
</tbody>
</table>

Setting the Keepalive Feature

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 or Off
  To use the application timeout feature, select On. Otherwise, select Off. If you select On, the Time parameter appears.
  
- Time
  Set the timeout value in the range of 1 to 120 (minutes).

Checking the Communication Status

You can check the Ethernet communication status with the LED lamp that is provided on the MV rear panel Ethernet connector or the Ethernet link that is shown at the upper right of the basic setting screen.
2.3 Sending E-mail Messages

Configuring E-mail Transmission

Configure the server, and set the contents of the e-mail.

- Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > E-Mail

### Basic settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Basic settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SNMP server name: NTP gearation.com</td>
</tr>
<tr>
<td></td>
<td>Port number: 25</td>
</tr>
<tr>
<td></td>
<td>Security: Off</td>
</tr>
</tbody>
</table>

### POP3 Settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>POP3 Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POP3 Server name: POP3gearation.com</td>
</tr>
<tr>
<td></td>
<td>Port number: 110</td>
</tr>
<tr>
<td></td>
<td>Login name:</td>
</tr>
<tr>
<td></td>
<td>Password: ***************</td>
</tr>
</tbody>
</table>

### Alarm settings

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

### Scheduled settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Scheduled settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recipient 1: On, Recipient 2: Off</td>
</tr>
<tr>
<td></td>
<td>Interval: 1h, Interval: 24h</td>
</tr>
<tr>
<td></td>
<td>Ref. Time: 00:00, Ref. Time: 00:00</td>
</tr>
<tr>
<td></td>
<td>Include INST: On</td>
</tr>
<tr>
<td></td>
<td>Include source URL: On</td>
</tr>
<tr>
<td></td>
<td>Subject: Periodic_data</td>
</tr>
<tr>
<td></td>
<td>Header 1:</td>
</tr>
<tr>
<td></td>
<td>Header 2:</td>
</tr>
</tbody>
</table>

### System settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>System settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recipient 1: On, Recipient 2: Off</td>
</tr>
<tr>
<td></td>
<td>Include source URL: On</td>
</tr>
<tr>
<td></td>
<td>Subject: System_warning</td>
</tr>
<tr>
<td></td>
<td>Header 1:</td>
</tr>
<tr>
<td></td>
<td>Header 2:</td>
</tr>
</tbody>
</table>

### Report settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Report settings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recipient 1: On, Recipient 2: Off</td>
</tr>
<tr>
<td></td>
<td>Include source URL: On</td>
</tr>
<tr>
<td></td>
<td>Subject: Report_data</td>
</tr>
<tr>
<td></td>
<td>Header 1:</td>
</tr>
<tr>
<td></td>
<td>Header 2:</td>
</tr>
</tbody>
</table>

### Recipients

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Recipients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recipient 1: gearation.com</td>
</tr>
<tr>
<td></td>
<td>Recipient 2: gearation.com</td>
</tr>
<tr>
<td></td>
<td>Sender: gearation.com</td>
</tr>
</tbody>
</table>
2.3 Sending E-mail Messages

Basic Settings
Specify the SMTP server and POP before SMTP.

- **SMTP server name**
  Enter the host name or IP address of the SMTP server.

- **Port number**
  Unless specified otherwise, set the number to the default value. The default value is 25.

- **Security**
  If you need to use POP before SMTP, set Security to **PbS**.

Recipients
Set the recipient e-mail addresses.

- **Recipient 1 and Recipient 2**
  Enter e-mail addresses. You can enter multiple addresses in each recipient box. Separate each address with a space. You can enter up to 150 characters.

- **Sender**
  Enter the sender e-mail address. You can enter up to 64 characters.

POP3 Settings
If you need to use POP before SMTP, specify the POP3 server.

  ► For the POP3 login procedure, see “Setting the POP3 Server Connection” in this section.

- **POP3 Server name**
  Enter the host name or IP address of the POP3 server.

- **Port number**
  Unless specified otherwise, set the number to the default value. The default value is 110.

- **Login name**
  Enter the POP3 server login name.

- **Password**
  Enter the POP3 server login password. You can enter up to 32 characters.

Alarm Settings
Specify the settings for sending e-mail when alarms occur or clear.

- **Recipient 1 and Recipient 2**
  Specify the recipients. For **Recipient 1 and Recipient 2**, select **On** to send e-mail or **Off** to not send e-mail.

- **Active Alarms**
  Sends an e-mail when an alarm occurs or clears. For alarms 1 to 4, select **On** to send e-mail or **Off** to not send e-mail.

- **Include INST**
  Select **On** to attach instantaneous value data that is acquired at the time of alarm occurrence.

- **Include source URL**
  Select **On** to attach the source URL. You can 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 subject is **Alarm_summary**.

- **Header 1 and Header 2**
  Enter Header 1 and Header 2 using up to 64 characters.
2.3 Sending E-mail Messages

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

- **Recipients**
  Specify the recipients. For **Recipient 1** and **Recipient 2**, select On to send e-mail or Off to not send e-mail.

- **Interval**
  For **Recipient 1** and **Recipient 2**, set the interval for sending e-mail to 1, 2, 3, 4, 6, 8, 12, or 24 hours.

- **Ref.time**
  Enter the time reference for sending e-mail to **Recipient 1** and **Recipient 2** at a specified interval.

- **Include INST, Include source URL, Subject, Header**
  These parameters are the same as those listed under "Alarm Settings." The default subject is **Periodic_data**.

System Settings
Specify the settings for sending e-mail when the MV recovers from a power failure, when there is a memory shortage, and when an error occurs.

- **Recipients**
  Specify the recipients. For **Recipient 1** and **Recipient 2**, select On to send e-mail or Off to not send e-mail.

- **Include source URL, Subject, and Header**
  These parameters are the same as those listed under "Alarm Settings." The default subject is **System_warning**.

Report Settings
Specify the settings for sending e-mail when reports are generated.

- **Recipients**
  Specify the recipients. For **Recipient 1** and **Recipient 2**, select On to send e-mail or Off to not send e-mail.

- **Include source URL, Subject, and Header**
  These parameters are the same as those listed under "Alarm Settings." The default subject is **Report_data**.
Setting the POP3 Server Connection
 Specify the operation for connecting to the POP server.
◦ Press MENU and then select Menu tab > Basic setting mode > Environment tab > Communication > POP3 Details

Send delay [second]
Enter the wait time from POP3 server authentication until transmission. Set a value in the range of 0 to 10 (seconds).

POP3 Login
To send the POP3 server login password without encryption, set POP3 Login to PLAIN.
To send the password with encryption, set POP3 Login to APOP.

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

Enabling/Disabling the E-mail Transmission Function
Enabling the E-mail Transmission Function
◦ Press FUNC and then select E-Mail start
  The e-mail transmission function is enabled.

Disabling the E-mail Transmission Function
◦ Press FUNC and then select E-Mail stop
  The e-mail transmission function is disabled. Unsent e-mail messages are discarded.

E-mail Retransmission
If an e-mail transmission fails, the MV retransmits the message up to three times at 30-s, 1-minute, or 3-minute intervals. If retransmission fails, the MV discards the e-mail message.
2.3 Sending E-mail Messages

E-mail Format

The formats of alarm, scheduled, system, report, and test e-mails are given below. For details on the displayed items that are common to all e-mails, see "Display Items Common to 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>1qCRLF
  <aaa>mo/dd_hh:mi:ssCRLF
  CRLF
  <inst._value>CRLF
  mo/dd_hh:mi:ssCRLF
  ccc...c=ddd...dCRLF
  CRLF
  Access the following URL in order to look at a screen.CRLF
  http://host.domain/CRLF
  CRLF
  ```

  - **ccc...c** Channel number or tag name
    (Up to 16 characters. Channels set to Skip or Off are not transmitted. See section 4.3 for channel numbers.)
  - **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),
    and 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 six characters)
    +OVER: Positive range-out
    -OVER: Negative range-out
    Burnout: Burnout data
    *****: Error data

The MV transmits the channel numbers, alarm types, and alarm statuses for up to 10 events in a single e-mail.
Scheduled E-mail Format

- **Subject**
  Subject: [Periodic Data]

- **Syntax**
  ```
  header1CRLF
  header2CRLF
  CRLF
  Periodic_data.CRLF
  <Host_name>CRLF
  <Time>CRLF
  mo/dd_hh:mm:ssCRLF
  CRLF
  E-mail_message(s)_did_not_reach_intended_recipient(s).CRLF
  ttt...t
  Count=nnCRLF
  mo/dd_hh:mm:ssCRLF
  .........................
  CRLF
  <Inst._value>CRLF
  mo/dd_hh:mm:ssCRLF
  ccc...c-ddd...dCRLF
  .........................
  CRLF
  Access_the_following_URL_in_order_to_look_at_a_screen.CRLF
  http://host.domain/CRLF
  CRLF
  ```

<table>
<thead>
<tr>
<th>ccc...c</th>
<th>Channel number or tag name</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Up to 16 characters. Channels set to Skip or Off are not transmitted. See section 4.3 for channel numbers.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ttt...t</th>
<th>Type of discarded e-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm_summary: Alarm e-mail</td>
<td></td>
</tr>
<tr>
<td>Periodic_data: Scheduled e-mail</td>
<td></td>
</tr>
<tr>
<td>System_warning: System e-mail</td>
<td></td>
</tr>
<tr>
<td>Report_data: Report e-mail</td>
<td></td>
</tr>
</tbody>
</table>

  | nn | Number of discarded e-mails |

<table>
<thead>
<tr>
<th>ddd...d</th>
<th>Measured/computed value (up to 10 digits including the sign and decimal point) + unit (up to six characters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+OVER: Positive range-out</td>
<td></td>
</tr>
<tr>
<td>-OVER: Negative range-out</td>
<td></td>
</tr>
<tr>
<td>Burnout: Burnout data</td>
<td></td>
</tr>
<tr>
<td>*****: Error data</td>
<td></td>
</tr>
</tbody>
</table>

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

System E-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
  CRLF
  <Power_on>mo/dd_hh:mi:ssCRLF
  CRLF
  Access_the_following_URL_in_order_to_look_at_a_screen.CRLF
  http://host.domain/CRLF

System E-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

  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)
2.3 Sending E-mail Messages

System E-mail (Error) Format

- **Subject**
  Subject: [System_warning]

- **Syntax**
  
  
  header1CRLF  
  header2CRLF  
  CRLF  
  Error.CRLF  
  <Host_name>CRLF  
  hostCRLF  
  CRLF  
  mo/dd_hh:mm:ssCRLF  
  ERROR:fffCRLF  
  ..............................  
  "Operation_aborted_because_an_error_was_found_in_media."CRLF  
  CRLF  
  Access_the_following_URL_in_order_to_look_at_a_screen.CRLF  
  http://host.domain/CRLF  
  CRLF

  fff   Error number (200, 201, 211, or 281 to 285)

  The displayed error message varies depending on the error type. For details on
  errors, see the *RD-MV1000/RD-MV2000 User's Manual (IM RD-MV1000-01E)*.

Report E-mail Format

- **Subject**
  Subject: [Report_data]

- **Syntax**
  
  
  header1CRLF  
  header2CRLF  
  CRLF  
  ti_report.CRLF  
  <Host_name>CRLF  
  hostCRLF  
  CRLF  
  mo/dd_hh:mm:ssCRLF  
  <CH>ccc...cCRLF  
  <tp>eee...eCRLF  
  <tp>eee...eCRLF  
  <tp>eee...eCRLF  
  <tp>eee...eCRLF  
  <Unit>uuu...uCRLF  
  ..............................  
  CRLF  
  Access_the_following_URL_in_order_to_look_at_a_screen.CRLF  
  http://host.domain/CRLF  
  CRLF

  ti    Contents of the report e-mail (hourly, daily, weekly, or monthly report)

  ccc...c    Channel number or tag name

  (Up to 16 characters. Channels set to Skip or Off are not transmitted.
  See section 4.3 for channel numbers.)
2.3 Sending E-mail Messages

<table>
<thead>
<tr>
<th>tp</th>
<th>Report content (average, maximum, minimum, instantaneous, and sum. Four out of the five items above are transmitted.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>eee...e</td>
<td>Measured/computed value (up to 10 digits including the sign and decimal point). However, sum values are transmitted as a combination of the sign, mantissa, E, sign, and exponent such as in -3.80000000E+02.</td>
</tr>
<tr>
<td>+OVER:</td>
<td>Positive range-out</td>
</tr>
<tr>
<td>-OVER:</td>
<td>Negative range-out</td>
</tr>
<tr>
<td>Burnout:</td>
<td>Burnout data</td>
</tr>
<tr>
<td>Empty data:</td>
<td>Error data</td>
</tr>
<tr>
<td>uuu...u</td>
<td>Unit (up to six characters)</td>
</tr>
</tbody>
</table>

Test E-mail Format

- **Subject**
  Subject: [Test]

- **Syntax**
  ```
  Test_mail.CRLF
  <Host_name>CRLF
  host.CRLF
  CRLF
  <Time>CRLF
  mo/dd hh:mm:ssCRLF
  CRLF
  <Message>CRLF
  x:msCRLF
  .........................
  CRLF
  
  x  Message number (1 to 10)
  ms  Message content (only specified messages are transmitted.)
  ```

Display Items Common to 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 MV transmits the month, day, hour, minute, and second in the time information in the order specified by the date format set in 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
  ```
2.4 Monitoring the MV on a PC Browser

Configuring the Web Server
From the Basic Setting Mode menu, set the server function and Web page for Ethernet communication.

Setting the Web Server
◊ Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Server

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Server</th>
<th>FTP</th>
<th>Web</th>
<th>SNMP</th>
<th>Modbus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use</td>
<td>Use</td>
<td>Use</td>
<td>Use</td>
<td>Use</td>
</tr>
</tbody>
</table>

◊ Web
Set the Web parameter under Server to **Use** or **Not** (don’t use). If set to Use, Web page parameters appear in the Basic Setting Mode menu.

Port Number
The default value is 80. To change the value:
◊ Press MENU and then select Menu tab > Basic setting mode > Environment tab > Communication > Service port

For the selectable range, see section 7.1.

Setting the Web Page
◊ Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Web page

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Page type</th>
<th>Operator</th>
<th>On/Off</th>
<th>Access control</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operator</td>
<td>On</td>
<td>Off</td>
<td>Use</td>
<td>Use</td>
</tr>
</tbody>
</table>
2.4 Monitoring the MV on a PC Browser

Page Types (displayed screen types)
- Monitor
  Configure the monitor page. The monitor page can display the following items.
  - Alarm summary
  - Measured and computed values of all channels
  - Log (message summary, error log, etc.)
  - For screen examples, see "Monitoring with a Browser" in this section.
- Operator
  Configure the operator page. You can carry out the following operations in addition to the functions available on the monitor page.
  - Switch the MV display by specifying the display type (trend, historical trend, digital, bar graph, or overview). You can also specify the trend and historical trend groups.
  - Control the MV DISP/ENTER key, arrow keys, and HISTORY key.
  - Set and write MV messages.
  - For screen examples, see "Monitoring with a Browser" in this section.

Configuring the Monitor Page
- Setting the page type
  To configure the monitor page, select Monitor.
- Selecting On or 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 settings, see the RD-MV1000/RD-MV200 User’s Manual (IM RD-MV1000-01E).

Configuring the Operator Page
- Setting the page type
  To configure the operator page, select Operator.
- Setting the access control
  This setting is the same as that for the monitor page.
- Selecting whether or not to use command input
  To use the set and write commands for messages, select On. Otherwise, select Off.
Monitoring the MV on a Browser

Setting the URL
Set the URL appropriately according to your network environment. You can access the MV by setting the URL as follows:

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

http: The protocol used to access the server.

Host.name.domain.name: The MV host name and domain name.
You can also use an IP address in place of the host name and domain name.

File.name: The file name of the MV monitor page or operator page.

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 that is in the same domain as the MV, enter the URL in the browser Address box as follows:

http://RD-MV1000.daqstation.com/operator.htm or
http://192.168.1.100/operator.htm

(In this example, we assume that the domain name is daqstation.com, the host name is RD-MV1000, 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 in the Web page setting.

Monitor Page Contents

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

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

Refresh the screen

Automatically refreshes the screen
Turn this ON to automatically refresh the screen.

Log display
Displays each log in a separate window.

Zoom
Changes the zoom rate of the screen.
MV1000: 100% and 200%
MV2000: 50% and 100%

Data list and print page
Displays the information in a separate window.

MV screen image
The displayed information is the same as that shown on the MV.
2.4 Monitoring the MV on a PC Browser

- If the MV is in Setting Mode or Basic Setting Mode, the monitor page cannot be displayed. An error message will appear.
  - For details on modes, see the RD-MV1000/RC-MV2000 User’s Manual (IM RD-MV1000-01E).
- Refreshing the monitor page
  The monitor page can be refreshed automatically or manually.
  - Auto Refresh ON
    The monitor page is refreshed at approximately 10-second intervals.
  - Auto Refresh OFF
    The monitor page is not automatically refreshed. You can refresh the page manually. The page will not be refreshed within approximately 10 seconds for the last refreshing even if you try to refresh the page manually.
- Displaying the log
  You can display 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, select the log you want to display. Click Refresh to refresh the data. The window can display up to 100 messages and 50 added messages.

Log display (example of a message log display)

<table>
<thead>
<tr>
<th>Time</th>
<th>Date</th>
<th>Message</th>
<th>Group</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/01/29</td>
<td>17:15:51</td>
<td>POWER OFF</td>
<td>ALL</td>
<td></td>
</tr>
<tr>
<td>2006/01/19</td>
<td>13:03:06</td>
<td>STOP</td>
<td>ALL</td>
<td></td>
</tr>
<tr>
<td>2006/01/27</td>
<td>17:12:12</td>
<td>BATTERY</td>
<td>ALL</td>
<td></td>
</tr>
<tr>
<td>2006/01/29</td>
<td>13:15:15</td>
<td>OVER VOLTAGE</td>
<td>01</td>
<td>[Communication]</td>
</tr>
<tr>
<td>2006/01/29</td>
<td>12:14:57</td>
<td>BATTERY</td>
<td>ALL</td>
<td></td>
</tr>
<tr>
<td>2006/01/15</td>
<td>10:13:15</td>
<td>POWER OFF</td>
<td>ALL</td>
<td></td>
</tr>
</tbody>
</table>

- Refreshing the alarm summary display and all channel display
  Click Refresh to refresh the data. The alarm summary can display up to 400 alams.

Example of an alarm summary display

<table>
<thead>
<tr>
<th>Time</th>
<th>Date</th>
<th>Channel</th>
<th>Alarm</th>
<th>Alarm Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/01/29</td>
<td>17:29:30</td>
<td>I1</td>
<td>IR</td>
<td></td>
</tr>
<tr>
<td>2006/01/23</td>
<td>17:23:30</td>
<td>I1</td>
<td>LI</td>
<td></td>
</tr>
<tr>
<td>2006/01/23</td>
<td>17:23:30</td>
<td>I1</td>
<td>IL</td>
<td></td>
</tr>
</tbody>
</table>

Example of an all channel display

<table>
<thead>
<tr>
<th>Time</th>
<th>Date</th>
<th>Channel</th>
<th>Alarm status</th>
<th>P+60v</th>
<th>Alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.9331</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.7116</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.5095</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.4484</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.4 Monitoring the MV on a PC Browser

- Data list
  You can easily retrieve files via FTP from the data list link without having to specify the URL. You can also save the data that is being sampled to a file and retrieve the file.
  ► For the procedure, see section 2.5.

- Print page
  You can enter a title and comments in the screen image and print the image.

  **Title box**
  By default, the title box displays the IP address or host name. You can overwrite the default title with your own.

  **Comment input box**
  Enter comments. You can enter more than five lines of comments, but only the first five lines will be printed.
2.4 Monitoring the MV on a PC Browser

- Operator Page Contents

**Displays the alarm summary**

**All channel display**

**Automatically refreshes the screen**

**Zoom**

**Message input**
Opens a separate window for entering a message.

**Data list and print page**
Displays the information in a separate window.

**Selects the trend screen**
Directly selects the group you want to display.

**Selects the historical display**
Directly selects the group you want to display.

**Selects other displays**
Selects the overview display, numeric display, or bar graph display.

**Arrow keys and DISP key**
Performs the same operations as the corresponding keys on the MV.

MV screen image
The displayed information is the same as that shown on the MV.

HISTORY key
Performs the same operation as the corresponding key on the MV.

You can carry out the following operations on the operator page in addition to the operations available on the monitor page.

- Switch between trend, historical trend, digital, bar graph, and overview displays.
  For the trend and historical trend displays, you can switch the MV screen by specifying the group you want to display.

- Control the MV using the DISP/ENTER key, arrow keys, and HISTORY key on the operator page.
  You can carry out the same operations as the DISP/ENTER key, arrow keys, and HISTORY key on the MV.

- Set and write messages
  You can set a message string to MV messages 1 through 10 (up to 32 alphanumeric characters) and, at the same time, write it to the specified group. The existing message is 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 has been successfully completed.

**Message entry example**

![Message entry example](image)

2-22
2.5 Accessing Measured Data Files on the MV from a PC

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

Configuring the FTP Server

- Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Server

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTP</td>
<td>Use</td>
</tr>
<tr>
<td>Web</td>
<td>Use</td>
</tr>
<tr>
<td>SMTP</td>
<td>Use</td>
</tr>
<tr>
<td>Nculus</td>
<td>Use</td>
</tr>
</tbody>
</table>

- FTP
  Set the FTP parameter under Server to Use or Not (don’t use).

Accessing the MV from a PC

You can use the following functions when the FTP server is enabled.

Accessing a Data File from a Web Page

- If the Data File to Be Retrieved Is Already Generated
  1. Click the Data list link.
  2. Click Memory or Media.
  3. Select the file you want to retrieve from the file list.
  4. Drag and drop the file to the desired folder on the PC.

Note

- The Internal memory link is ftp://hostname/MEM0/DATA.
- The External media link is ftp://hostname/DRV0/.
2.5 Accessing Measured Data Files on the MV from a PC

- If the Data File to Be Retrieved Is Being Generated
  1. Click the Data list link.
  2. Click OK for retrieving the most recent data.
     The Confirmation window opens.
  3. Read the information, and click OK.
  4. In the File status window, click Update.
     If the file has been generated, the Final status window opens. If not, the File status window will open. Wait for a little while, and click Update again.
  5. In the Final status window, click Get.
  6. In the File Download window, click Save.

**Note**
- You can retrieve files by carrying out the steps above when the data file contains display data or event data stored in Free mode.
- The file is generated at different times from the specified file save interval.

**Connecting to the MV 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

To retrieve data from the internal memory, drag the files from the /MEM0/DATA folder. To retrieve data from an external storage medium, drag the files from the /DRV0 folder. You can also use an IP address in place of the host name and domain name.

You can also retrieve files easily from the Data list link in the browser window. See section 2.4 for details.

**Login**
If the security feature is enabled, you will be prompted for a login name and password. Enter the login name and password to connect to the server.

**Port Number**
The default value is 21. To change the value:

- Press MENU and then select Menu tab > Basic setting mode > Environment tab > Communication > Service port

For the selectable range, see section 7.1.
2.6 Transferring Data Files from the MV

The MV can automatically transfer display and event data files, report data files, and snapshot data files that are created in the MV internal memory via FTP as the files are created.

Files to Be Transferred via FTP

The MV automatically transfers display and event data files and report data files to the FTP destination at appropriate times.

<table>
<thead>
<tr>
<th>File Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display data file</td>
<td>Automatically transferred at the file save interval.</td>
</tr>
<tr>
<td>Event data file</td>
<td>Automatically transferred each time the specified length of data is recorded.</td>
</tr>
<tr>
<td>Report data file</td>
<td>Automatically transferred when a report file is closed (divided). For example, a data file is transferred once per month if you configure the MV to generate only daily reports.</td>
</tr>
<tr>
<td>Snapshot data file</td>
<td>Automatically transferred when you take a snapshot. * Snapshot data files are transferred regardless of the media storage settings. * Snapshots taken using the FUNC key, the EV2 communication command, the USER key, or the remote control function.</td>
</tr>
</tbody>
</table>

Configuring the FTP Client

1) Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > FTP client

FTP transfer file settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>FTP transfer file</th>
<th>Disp&amp;Event data</th>
<th>Report</th>
<th>Snapshot</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTP server name</td>
<td>FTP_1</td>
<td>On</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Port number</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Login name</td>
<td>user</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Password</td>
<td>**********</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Account</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MDU mode</td>
<td>Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial path</td>
<td>Data</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FTP connection settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>FTP connection</th>
<th>Server name</th>
<th>Port number</th>
<th>Login name</th>
<th>Password</th>
<th>Account</th>
<th>MDU mode</th>
<th>Initial path</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTP server name</td>
<td>FTP_server</td>
<td>FTP_station.com</td>
<td>22</td>
<td>user</td>
<td>**********</td>
<td></td>
<td>Off</td>
<td>Data</td>
</tr>
</tbody>
</table>

Specifying the Files to Be Transferred via FTP

- **Disp&Event Data**
  Select On to automatically transfer display and event data files.

- **Report**
  Select On to automatically transfer report data files.

- **Snapshot**
  Select On to automatically transfer snapshot data files.
2.6 Transferring Data Files from the MV

Setting the FTP Connection Destination
Set the primary and secondary FTP servers, port number, login name, password, account, PASV mode, etc. Consult your network administrator for the correct values.

- **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.

- **Server name**
  Enter the name of the destination FTP server using up to 64 alphanumeric characters.
  - If you are using the DNS, you can set the host name for the server name. For DNS settings, see section 2.2.
  - You can also set the IP address. In this case, the DNS is not required.

- **Port number**
  Enter the port number of the destination FTP server in the range of 1 to 65535. The default value 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. The characters that you enter will be displayed as *****.

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

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

- **Initial path**
  Set the file transfer destination directory 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 MV will abort the file transfer. When the connection recovers, the MV will transfer the data that could not to be transferred along with the new data file. However, because the data that could not be transferred resides in the MV internal memory, the data will be lost if it is overwritten.
Testing the FTP Transfer

You can transfer a test file from the MV to an FTP server.

◊ Press FUNC > FTP test

Items to Check Before Executing This Test

• Connect the Ethernet cable properly. For the connection procedure, see section 2.2.
• Check that the Ethernet interface settings are correct. For the setup procedure, see section 2.2.

Viewing the FTP Test Result

• When you execute an FTP test, the MV transfers a test file named FTP_TEST.TXT to the FTP connection destination initial path directory that you specified in this section.
• You can check the FTP test result on the FTP log (displayed on the MV (see the User’s Manual), displayed on the Web screen (see section 2.4), or transmitted with the FL command (see section 4.8)).
2.7 Synchronizing the Time

The MV time can be synchronized to the time on an SNTP server. You can also configure the MV to run as an SNTP server.

Configuring the SNTP Client

You can configure the SNTP client to synchronize the MV time to an SNTP server.

- Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > SNTP client

- **Use/Not**
  To use the SNTP client function, select Use. Otherwise, select Not. If you select Use, the SNTP client parameters appear.

- **Server name**
  Enter the SNTP server name using up to 64 alphanumerics.
  - If you are using the DNS, you can set the host name for the server name. For DNS settings, see section 2.2.
  - You can also set the IP address. In this case, the DNS is not required.

- **Port number**
  Enter the SNTP server port number 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 using the soft keys. The time is not synchronized if the time difference between the MV 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 that the MV will wait for a response from the SNTP server after making a query to 10, 30, 90 s.

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

Manually Synchronizing the Time

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

- Press FUNC > SNTP
2.7 Synchronizing the Time

Configuring the SNTP Server
You can configure the MV to run as an SNTP server.

◊ Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Server

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th>Use</th>
<th>Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTP</td>
<td>Use</td>
<td></td>
</tr>
<tr>
<td>Web</td>
<td>Use</td>
<td></td>
</tr>
<tr>
<td>SNTP</td>
<td>Use</td>
<td></td>
</tr>
<tr>
<td>nodbus</td>
<td>Use</td>
<td></td>
</tr>
</tbody>
</table>

• SNTP
Set the SNTP parameter under Server to Use or Not (don’t use).
When an SNTP client on the network queries the MV for the time information, the MV returns the time information.

Port Number
The default value is 123. To change the value:
◊ Press MENU and then select Menu tab > Basic setting mode > Environment tab > Communication > Service port
For the selectable range, see section 7.1.
2.8 Reading/Writing the MV Data from Another Device via Modbus

The MV is a Modbus server.
For Modbus specifications, see section 7.3.

Configuring the Modbus Server
You can configure the Modbus server so that another device will be able to read or write the MV data via Modbus.

- **Modbus**
  Set the Modbus parameter under Server to **Use**. If you select **Not** (not use), you will not be able to use the Modbus server function.

- **Port Number**
The default value is 502. To change the value:
  - Press **MENU** and then select **Menu tab** > **Basic setting mode** > **Menu tab** > **Communication (Ethernet)** > **Server**
  - **Communication** > **Service port**
For the selectable range, see section 7.1.

Reading or Writing the MV Data from Another Device
Another device (client device) sends commands to the MV to read data from the MV or write data to the MV.
For the function codes that the MV supports and the MV registers that the client device can access, see "Modbus Server Function" in section 7.3.
2.9 Reading/Writing Data on Another Device from the MV via Modbus

The MV is a Modbus client.
For Modbus specifications, see section 7.3.

Configuring the Modbus Client
You can configure the Modbus client so that the MV will be able to read or write data to another device via Modbus.

- Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Modbus client

### Basic settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read cycle</td>
<td>125ms</td>
</tr>
<tr>
<td>Retry interval</td>
<td>10min</td>
</tr>
</tbody>
</table>

### Destination server settings

<table>
<thead>
<tr>
<th>Server number</th>
<th>Server name</th>
<th>Unit No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.0.0.1</td>
<td>Auto</td>
</tr>
<tr>
<td>2</td>
<td>10.0.0.2</td>
<td>Auto</td>
</tr>
<tr>
<td>3</td>
<td>10.0.0.3</td>
<td>Auto</td>
</tr>
<tr>
<td>4</td>
<td>10.0.0.4</td>
<td>Auto</td>
</tr>
<tr>
<td>5</td>
<td>10.0.0.5</td>
<td>Auto</td>
</tr>
<tr>
<td>6</td>
<td>10.0.0.6</td>
<td>Auto</td>
</tr>
<tr>
<td>7</td>
<td>10.0.0.7</td>
<td>Auto</td>
</tr>
<tr>
<td>8</td>
<td>10.0.0.8</td>
<td>Auto</td>
</tr>
</tbody>
</table>

### Transmission command settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>INT16</td>
</tr>
</tbody>
</table>

### Basic Settings

- **Read cycle**
  Set the read cycle to 125m, 250m, 500m, 1s, 2s, 5s, or 10s.

- **Retry interval**
  Set the interval for retrying the connection when the connection is interrupted for some reason. Select Off, 10s, 20s, 30s, 1min, 2min, 5min, 10min, 20min, 30min, or 1h. If you select Off, the MV will not retry the connection. If communication fails, communication will stop.
2.9 Reading/Writing Data on Another Device from the MV via Modbus

Destination Server Settings
- **Server number**
  Select registration numbers of the server you want to configure from 1 to 16.

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

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

- **Unit**
  If the unit number of the destination server is not necessary, select Auto. If a fixed unit number is necessary, select Fixed. If you select Fixed, the unit number parameter appears.

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

Transmission Command Settings
- **Client command number**
  Select numbers of the transmission commands you want to configure from 1 to 16.

- **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 parameters appear.
  - R: Read the data from the server into external input channels (16-bit signed integer)
  - R-M: Read the data from the server into communication input channels (32-bit floating point)
  - W: Write measurement channel data (16-bit signed integer) to the server
  - W-M: Write computation channel data (32-bit signed integer) to the server
  - R is selectable on the RD-MV2000 when external input channels (I/M1 option) is installed.
  - R-M and W-M are selectable when the computation function (I/M1 option) is installed.

- **First/Last (MV 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 G60, W: 1 to 48, W-M: 101 to 160

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

- **Regi. (server register)**
  Set the server register number.
  Enter an input register in the range of 30001 to 39999 and 30001 to 365536 or a hold register in the range of 40001 to 49999 and 400001 to 465536.
  The register numbers that you can specify vary depending on the command type. See section 7.3 for details.

- **Type**
  The data type.
  Select INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, or FLOAT_L.
  The data type that you can specify vary depending on the command type. See section 7.3 for details.
Examples of Entering Commands

The following are examples of commands when the MV is operating as a Modbus client device. If the MV is operating as a Modbus master device, read the word "client" as "master" and "server" as "slave."

Connection example

<table>
<thead>
<tr>
<th>MVAdvanced (Modbus client)</th>
<th>Instrument A (Modbus server 1)</th>
<th>Instrument B (Modbus server 2)</th>
<th>Instrument C (Modbus server 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Loading Data into Communication Input Channels

The MV reads the data from the server device and enters the data into communication input channels in floating point format.

- **Example 1**
  Read a 16-bit signed integer value from instrument A's register 30001 into C01.

  Communication input data  Instrument A register
  C01   30001  16-bit signed integer

  Command
  
  R-M C01 - C01 ← 1 30001 INT16

- **Example 2**
  Read a 32-bit signed integer value from instrument B's registers 30003 and 30004 (lower bytes and higher bytes) into C03. Specify the smaller register number in the command.

  Communication input data  Instrument B register
  C03   30003  Lower bytes 32-bit signed integer
  30004  Higher bytes

  Command
  
  R-M C03 - C03 ← 2 30003 INT32_L

- **Example 3**
  Read a 16-bit signed integer value from instrument B's registers 30001 and 30002 into C01 and C02. Specify the smaller register number in the command.

  Communication input data  Instrument B register
  C01   30001  16-bit signed integer
  C02   30002  16-bit signed integer

  Command
  
  R-M C01 - C02 ← 2 30001 INT16

- **Example 4**
  Read a 32-bit floating point value from instrument B's registers 30005 and 30006 (lower bytes and higher bytes) into C04. Specify the smaller register number in the command.

  Communication input data  Instrument B register
  C04   30005  Lower bytes 32-bit floating point
  30006  Higher bytes

  Command
  
  R-M C04 - C04 ← 2 30005 FLOAT_L
2.9 Reading/Writing Data on Another Device from the MV via Modbus

Reading Data into External Input Channels (RD-MV2000 only)
The MV reads the data from the server device and enters the data into external input channels in 16-bit signed integer format.

- **Example 1**
  Read a 16-bit unsigned integer value from instrument C’s register 30001 into external input channel 201.

<table>
<thead>
<tr>
<th>External input channel</th>
<th>Instrument C register</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>30001</td>
</tr>
</tbody>
</table>

  Command
  
  \[
  \text{R} \ 201 - 201 \leftarrow 3 \ 30001 \ \text{UINT16}
  \]

- **Example 2**
  Read a 32-bit unsigned integer value from instrument C’s register 32001 and 32002 into external input channel 202. Specify the smaller register number in the command.

<table>
<thead>
<tr>
<th>External input channel</th>
<th>Instrument C register</th>
</tr>
</thead>
<tbody>
<tr>
<td>202</td>
<td>32001</td>
</tr>
<tr>
<td></td>
<td>32002</td>
</tr>
</tbody>
</table>

  Command
  
  \[
  \text{R} \ 202 - 202 \leftarrow 3 \ 32001 \ \text{UINT32} \_ \text{B}
  \]

Writing Measured Values to a Server

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

<table>
<thead>
<tr>
<th>Measurement channel</th>
<th>Instrument A register</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>40001</td>
</tr>
</tbody>
</table>

  Command
  
  \[
  \text{W} \ 001 - 001 \leftarrow 1 \ 40001 \ \text{INT16}
  \]

Writing Computed Values to a Server

- **Example**
  Write the computed value of channel 101 (32-bit signed integer) to instrument A’s 40001 and 40002 registers, lower 16 bits first and then higher 16 bits. Specify the smaller register number in the command.

<table>
<thead>
<tr>
<th>Computation channel</th>
<th>Instrument A register</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>40001</td>
</tr>
<tr>
<td></td>
<td>40002</td>
</tr>
</tbody>
</table>

  Command
  
  \[
  \text{W-R} \ 101 - 101 \leftarrow 1 \ 40001 \ \text{INT32} \_ \text{L}
  \]
Checking the Modbus Operating Status

Displaying the Modbus Operating Status

- Press DISP/ENTER and then select INFORMATION > MODBUS CLIENT

**Note**

To show the MODBUS CLIENT on the display selection menu, you need to change the setting using the menu customize feature. Carry out the following steps.

- Press MENU and then select Menu tab > Menu customize > Display menu
  1. Select INFORMATION > MODBUS CLIENT using the arrow keys.
  2. Press the View soft key.

**Communication conditions**

![Communication conditions diagram]

- **Register numbers**
- **Server device host names or IP addresses**
- **MV channels**

- **Detail code**
- **Status lamp**

- **Cursor used to select a command**
  (Used to resume command transmission from the front panel keys)

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

- **Communication Status**
  The MV displays the communication status using status lamps and detail codes.

<table>
<thead>
<tr>
<th>Status Lamp</th>
<th>Detail Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Good</td>
<td>Communication is operating normally.</td>
</tr>
<tr>
<td>Yellow</td>
<td></td>
<td>Command is readying.</td>
</tr>
<tr>
<td>Orange</td>
<td></td>
<td>Trying to establish a TCP connection.</td>
</tr>
<tr>
<td>Red</td>
<td></td>
<td>Communication is stopped.</td>
</tr>
<tr>
<td>Common to yellow, orange, and red</td>
<td>None</td>
<td>No response from the server device.</td>
</tr>
<tr>
<td></td>
<td>Func</td>
<td>The server device cannot execute the command from the MV.</td>
</tr>
<tr>
<td></td>
<td>Regi</td>
<td>The server device does not have the specified register.</td>
</tr>
<tr>
<td></td>
<td>Err</td>
<td>There is an error in the response data from the server device.</td>
</tr>
<tr>
<td></td>
<td>Link</td>
<td>Ethernet cable is disconnected.</td>
</tr>
<tr>
<td></td>
<td>Host</td>
<td>Unable to resolve the IP address from the host name.</td>
</tr>
<tr>
<td></td>
<td>Cnct</td>
<td>Failed to connect to the server.</td>
</tr>
<tr>
<td></td>
<td>Send</td>
<td>Failed to transmit the command.</td>
</tr>
<tr>
<td></td>
<td>BRKN</td>
<td>Failed to receive the response data or detected a disconnection.</td>
</tr>
<tr>
<td></td>
<td>(Space)</td>
<td>The detail code does not appear until the status is confirmed when communication is started.</td>
</tr>
</tbody>
</table>
2.9 Reading/Writing Data on Another Device from the MV via Modbus

Resuming Command Transmission
Using the front panel keys, you can resume command transmission to a server device whose communication is stopped (red status lamp).
1. Using the up and down arrow keys, select the command assigned to the server device that you want to resume transmission. The message "Push [right arrow] key to refresh" appears.
2. Press the right arrow key. The MV will transmit a command to the specified server.

Data When Communication is Stopped and during Connection Retrials
If command transmission stops such as when the connection is disconnected, the status lamp will turn orange or red, and the communication input data and external input channel data will be error data. For computation channels, the MV displays "+OVER" or "–OVER" according to the settings. The MV displays "******" for external input channels.

Data Dropout
A data dropout occurs when the commands 1 to 16 do not complete within the read cycle (see appendix 2). When a data dropout occurs, the communication input data is held at the previous value. The Modbus operating status display shows a message indicating that a data dropout occurred. If this happens, take measures such as making the read cycle longer or reducing the number of commands. Be sure to confirm that no data dropout occurs on the Modbus status log display.
Function for Automatically Assigning MW100s to the Modbus Client (RD-MV2000 only)

The following setup is carried out from the MV using Omega MW100 Data Acquisition Unit as a Modbus server. If the RD-MV2000 is a Modbus client, MW100s—Modbus servers on the network—can be automatically assigned to the RD-MV2000. This feature is available only on MV2000s with the external input channel function (MC1 option).

Setup Preparation
Configure the MW100s so that they are ready to make measurements (IP address, system construction, range setting, and the like of the MW100s that are going to be automatically assigned). For details, see the MW100 User’s Manual.

Setup Procedure
If the MV IP address is not set, set it before carrying out the procedure below.

1. Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Modbus client > Auto setting.
2. Carefully read the displayed precautions. Select Yes to execute the auto setting. Select No to return to the screen operation.
3. From the list of MW100s that is displayed, select the MW100s to be connected using the up and down arrow keys, and press DISP/ENTER. The selected MW100s are assigned to the external input channels of the MV.

Displays the IP address or host name. Displays the MW100 unit number. The list displays up to 16 units in order from the smallest unit number.

Displays the status of the external input channel assignments.

- No settings: The MW100 is not automatically assigned.
- Not Ready: The MW100 cannot be connected.*

A value: Displays the number of the assigned external input channel
Example: If an MW100 is assigned to external input channels 201 to 220, the status displays 201/220.

To correct the problem, see the MV1000/MV2000 User’s Manual.

Pressing the Call soft key causes "--" to blink for 2 seconds on the 7-segment LED display of the selected MW100.
This feature allows you to check which MW100 is selected if multiple MW100s are connected.
2.9 Reading/Writing Data on Another Device from the MV via Modbus

**Settings**

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

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

- **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 MV 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, the 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 10 channels at a time 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 assigned is greater than the number of available external input channels.

- If the range setting of a MW100 channel is set to "SKIP," the corresponding MV external input channel is set to "OFF."

- If a MW100 unit contains a module that cannot be assigned automatically, only the channels that can be assigned are assigned to the MV external input channels.

- If a new MW100 is added, auto setting is executed again. Because all the settings are cleared, you must execute auto setting again for all MW100s.

- If you are connecting MW100s that can be automatically assigned along with MW100s that cannot be automatically assigned or other Modbus devices, automatically assign the MW100s that can be automatically assigned first and then manually assign the remaining devices.
2.9 Reading/Writing Data on Another Device from the MV via Modbus

**Note**

**About the MW100**
- MW100s that support auto assignment are those with firmware version R2.22 or later.
- MW100 modules that can be automatically assigned 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 Digital Input Module
  - 30-CH, Medium-Speed DCV/TC/DI Input Module
  - 10-CH, Medium-Speed Pulse Input Module
- If there are no assignable channels 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.
- MW100 port number 34324 is used to perform auto setting.
- For details on the MW100 settings, see the MW100 User's Manual.

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

In addition, you can check the status of the connected MW100 on the Modbus status display screen.
2.10 Usage Example of the Modbus Function

This section explains an example of setting two MV1000s that are connected via the Ethernet network, one configured to be a Modbus client and another configured to be a Modbus server. This section refers to the RD-MV1000 configured to be a Modbus server as the RD-MV1000 server and the RD-MV1000 configured to be a Modbus client as the RD-MV1000 client.

System Configuration and Operation

The measurement channels, computation channels, and communication input data shown below will be used. We assume that the Ethernet interface is already configured.

![Diagram of system configuration and operation]

**Measurement channel 1**
Input range: \(-2.000 \text{ to } 2.000 \text{ V}\)

**Modbus service port**
502 (default value)

**Operation**

- The RD-MV1000 client reads the measured value from the RD-MV1000 server channel 1 into communication input channel C01 and displays the value on computation channel 101. The MV displays computation channel 101 in group 1.
- The measured value of RD-MV1000 server channel 1 is transferred to the RD-MV1000 client as an integer in the range of \(-20000 \text{ to } 20000\).
- The RD-MV1000 client displays values in the range of \(-2.000 \text{ to } 2.0000 \text{ V}\) for values in the range of \(-20000 \text{ to } 20000\). The value is linearly scaled using the following equation.

The value on RD-MV1000 client computation channel 101 = Communication input data C01 \times 0.0001
Configuring the RD-MV1000 Server (Modbus server)

Configuring the Modbus Server Function
- Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Server

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus</td>
<td>Use</td>
</tr>
</tbody>
</table>

Port Number
The default value is 502.

Configuring Measurement Channels
- Press MENU and then select Menu tab > Meas channel > Range, Alarm

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>First channel and last channel</td>
<td>1</td>
</tr>
<tr>
<td>Mode</td>
<td>Volt</td>
</tr>
<tr>
<td>Range</td>
<td>2V</td>
</tr>
<tr>
<td>Span_L</td>
<td>-2.0000</td>
</tr>
<tr>
<td>Span_U</td>
<td>2.0000</td>
</tr>
</tbody>
</table>
2.10 Usage Example of the Modbus Function

Configuring the RD-MV1000 Client (Modbus client)
The description below assumes that settings other than destination server settings and commands are at default values.

Registering the Destination Server
The example below describes the settings used to register the RD-MV1000 server to number 1.
The RD-MV1000 server IP address is assumed to be 192.168.1.101.

- Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Modbus client > Modbus server settings

<table>
<thead>
<tr>
<th>Server number</th>
<th>Port</th>
<th>Modbus server name</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>502</td>
<td>192.168.1.101</td>
<td>Auto</td>
</tr>
<tr>
<td>2</td>
<td>502</td>
<td></td>
<td>Auto</td>
</tr>
<tr>
<td>3</td>
<td>502</td>
<td></td>
<td>Auto</td>
</tr>
<tr>
<td>4</td>
<td>502</td>
<td></td>
<td>Auto</td>
</tr>
<tr>
<td>5</td>
<td>502</td>
<td></td>
<td>Auto</td>
</tr>
<tr>
<td>6</td>
<td>502</td>
<td></td>
<td>Auto</td>
</tr>
<tr>
<td>7</td>
<td>502</td>
<td></td>
<td>Auto</td>
</tr>
<tr>
<td>8</td>
<td>502</td>
<td></td>
<td>Auto</td>
</tr>
</tbody>
</table>

Parameter | Setting
---|---
Port | 502
Modbus server name | 192.168.1.101
Unit | Auto

Setting Transmission Commands

- Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Ethernet) > Modbus client > Command settings

<table>
<thead>
<tr>
<th>Command type</th>
<th>First and Last</th>
<th>Server</th>
<th>Regi.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-M</td>
<td>C01</td>
<td>1</td>
<td>30001</td>
<td>INT16</td>
</tr>
</tbody>
</table>

Parameter | Setting
---|---
Command type | R-M
First and Last | C01
Server | 1
Regi. | 30001
Type | INT16
Configuring Computation Channels

Press MENU and then select Menu tab > Math channel > Expression, Alarm

Parameter | Setting
---|---
First and Last | 101
Math | On
Calculation expression | 01+K01
Span Lower | -2.0000
Span Upper | 2.0000
Unit | V

Press MENU and then select Menu tab > Math channel > Constant

Parameter | Setting
---|---
Number of constant | K01
Value | 0.0001

Assigning a Channel to a Group

Press MENU and then select Menu tab > Group set, Trip line

Parameter | Setting
---|---
Group number | 1
On/OFF | On
Group name | GROUP 1
CH set | 101
Trip time | 1, 2, 3, 4

Parameter | Setting
---|---
Group number | 1
On/OFF | On
Group name | GROUP 1
CH set | 101
2.10 Usage Example of the Modbus Function

Starting Computation (RD-MV1000 client)

◊ Press FUNC > Math start

Computation starts, and the status display section shows the math icon.
The value of the RD-MV1000 client's computation channel 101 shown in GROUP 1
varies in sync with the measured value of the RD-MV1000 server's measurement
channel 1.

Checking the Modbus Operating Status (RD-MV1000 client)

Showing the Menu Used to Switch to the Modbus Client Screen
Carry out the procedure below to show INFORMATION > MODBUS CLIENT in the
display selection menu.
◊ Press MENU and then select Menu tab > Menu customize > Display menu

1. Select INFORMATION > MODBUS CLIENT using the arrow keys.
   * Select MODBUS MASTER to use Modbus master via the serial interface.

2. Press the View soft key.
The menu item is enabled and is displayed in white.

3. Press ESC several times to return to the operation screen.

Displaying the Modbus Client Screen

◊ Press DISP/ENTER and then select INFORMATION > MODBUS CLIENT
   * Select INFORMATION > MODBUS MASTER to use Modbus master via the serial
     interface.
3.1 Workflow for Using the Serial Interface

The flow chart below shows the procedure to set RS-232 or RS-422/RS-485 communication. The procedure differs between RS-232 and RS-422/RS-485.

Start

Connect a cable

Set the baud rate

Set the data length

Set the parity

Communication type

RS-422/485

RS-232

Set the handshaking

Set the address

Set the protocol

Configure the Modbus master

Configuration required when the protocol is set to Modbus master

End
3.2 Connecting the MV

Connecting a Cable
Connect a cable to the serial port on the MV rear panel.

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

Connector Pin Arrangement and Signal Names

![Connector Pin Arrangement Diagram]

Pin assignments are shown in the table below.
The table shows the signal names as defined by the RS-232, JIS, and ITU-T standards along with their description.

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

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

Connection
- Signal direction

![Connection Diagram]
3.2 Connecting the MV

- Connection example

**OFF-OFF/XON-XON**

```
PC   MV
SD  3 SD
RD  2 RD
RS  7 RS
CS  8 CS
SG  5 SG
```

**CS-RS (CTS-RTS)**

```
PC   MV
SD  3 SD
RD  2 RD
RS  7 RS
CS  8 CS
SG  5 SG
```

**XON-RS (XON-RTS)**

```
PC   MV
SD  3 SD
RD  2 RD
RS  7 RS
CS  8 CS
SG  5 SG
```

You do not need to wire RS on the PC to CS on the MV. However, we recommend it 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 MV and the PC, you must make sure to choose the same method for both the MV and the PC.

You can choose any of the four methods in the table below for the MV.

**Handshaking Combinations (Yes indicates that it is supported)**

<table>
<thead>
<tr>
<th>Handshaking</th>
<th>Data transmission control (Control used to send data to a computer)</th>
<th>Data Reception Control (Control used to receive data from a computer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Software handshaking</td>
<td>Hardware handshaking</td>
</tr>
<tr>
<td></td>
<td>Stops sending when X-OFF is received. Resumes when X-ON is received.</td>
<td>Stops sending when CS (CTS) is false. Resumes when it is true.</td>
</tr>
<tr>
<td>OFF-OFF</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>XON-XON</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>XON-RS</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CS-RS</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- OFF-OFF
  - Data transmission control
    There is no handshaking between the MV and the PC. The MV treats the "X-OFF" and "X-ON" signals that are received from the PC as data and ignores the CS signal.
  - Data reception control
    There is no handshaking between the MV and the PC. When the received buffer becomes full, the MV discards all of the data that overflows.
    $RS = True$ (fixed).
3.2 Connecting the MV

- **XON-XON**
  - Data transmission control
    Software handshaking is performed between the MV and the PC. When an "X-OFF" code is received while sending data to the PC, the MV stops the data transmission. When the next "X-ON" code is received, the MV resumes transmission. The MV ignores the CS signal that is received from the PC.
  - Data reception control
    Software handshaking is performed between the MV and the PC. When the used area in the received buffer increases to 1537 bytes, the MV sends an "X-OFF" code. When the used area decreases to 511 bytes, the MV 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 MV and the PC. When the used area in the received buffer increases to 1537 bytes, the MV sets "RS=False." When the used area decreases to 511 bytes, the MV sets "RS=True."

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

*Note*
- You must design the PC program so that the received buffer of neither the MV nor the PC does 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.

Terminal assignments are shown in the table below.

<table>
<thead>
<tr>
<th>Signal Name</th>
<th>Signal Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FG (Frame Ground)</td>
<td>The MV case ground.</td>
</tr>
<tr>
<td>SG (Signal Ground)</td>
<td>Signal ground.</td>
</tr>
<tr>
<td>SDB (Send Data B)</td>
<td>Send data B (+)</td>
</tr>
<tr>
<td>SDA (Send Data A)</td>
<td>Send data A (-)</td>
</tr>
<tr>
<td>RDB (Received B)</td>
<td>Receive data B (+)</td>
</tr>
<tr>
<td>RDA (Received A)</td>
<td>Receive data A (-)</td>
</tr>
</tbody>
</table>

Connection
• Connecting a 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 for a four-wire system

Connecting to a Host Device
The figure below illustrates the connection of the MV to a host device. If the port on the host device is RS-232, connect a converter.

Host computer or host device
RS-422/485 port on the MV

Host computer
Host device side
RS-232
Converter
RS-422/485

RS-422/485 port on the MV
### 3.2 Connecting the MV

#### Example of a Connection to the Host Device

The MV can connect to a host device that has an RS-232, RS422, or RS-485 port. If the host device has an RS-232 port, use a converter. See the examples below for typical converter terminals. For details, see the converter manual.

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

There is no problem with connecting a 220-Ω terminator at each end if Omega PLCs or temperature controllers are also connected in the communication line.

- **Four-Wire System**
  - Generally, a four-wire system is used to connect the MV to a host device. In a four-wire system, the transmission and reception lines need to be crossed over.

![Four-Wire System Diagram]

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

- **Two-Wire System**
  - Connect the transmission signals to the reception signals with the same polarity on the RS422/485 terminal block. Only two wires are used to connect to the external device.

![Two-Wire System Diagram]

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

- The way to eliminate noise varies depending on the situation. In the connection example, the
  cable shield is connected only to the MV's ground (one-sided grounding). This is effective
  when there is a difference in the electric potential between the PC's ground and the MV's
  ground, which may be the case with long distance communications. If there is no difference
  in the electric potential between the PC's ground and the MV's ground, connecting the cable
  shield to ground at both ends may be effective (two-sided grounding). In some cases, using
  two-sided grounding with a capacitor connected in series at one end is effective. Consider
  these possibilities to eliminate noise.
- When using the two-wire system (Modbus protocol), the 485 driver must be set to high
  impedance within 3.5 characters after the last data byte that the host PC sends.

**Serial Interface Converter**

We recommend the following converter:

MODEL RC-770X by SYSMEX RA CO., LTD; SI-30FA by LINE EYE; or ML2 by
Omega.

---

**CAUTION**

In converters other than those that we recommend, the FG and SG terminals may
not be isolated. In such case, do not follow the diagram on the previous page (do
not connect anything to the FG and SG terminals). Especially in long distance
communications, the potential difference that occurs may damage the instruments
or may cause communication errors. For converters that do not have the SG
terminal, they can be used without the signal ground. For details, see the converter
manual.

In converters other than those that we recommend, the signal polarities may be reversed
(A/B or +/- indication). In this case, reverse the connection.

In the case of a two-wire system, the host device must control the converter transmission
driver to prevent collisions of transmitted and received data. If you are using one of
the recommended converters, control the transmission driver using the RS (RTS) signal on
the RS-232.

**When the System Contains Instruments That Only Support the RS-422 Interface**

In a four-wire system, up to 32 MVs can connect to a single host device. However, this
may not be possible if the system contains instruments that support only the RS-422
interface.

**When the System Contains Omega Recorders That Only Support the RS-
422 Interface**

Only up to 16 instruments can be connected. Some of the conventional Omega recorders
(HR2400 and μR, for example) only support the RS-422 driver. If the system contains
these recorders, only up to 16 instruments can be connected.

**Note**

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

**Terminator**

In a multidrop connection (including point-to-point connection), connect a terminator to
the MV if the MV is connected to the end of the chain. Do not connect a terminator to a
MV in the middle of the chain. In addition, turn the host device terminator ON (see the
host device manual). If a converter is being used, turn ON its terminator. We recommend
converters with 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.
3.3 Configuring the Serial Interface

- **Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Serial) > Basic settings**

<table>
<thead>
<tr>
<th>Serial</th>
<th>Basic Setting Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud</td>
<td>9600 bps</td>
</tr>
<tr>
<td>Rate</td>
<td>8 bit</td>
</tr>
<tr>
<td>Data</td>
<td>Even</td>
</tr>
<tr>
<td>Length</td>
<td>奇偶性</td>
</tr>
<tr>
<td>Parity</td>
<td>Off:Off</td>
</tr>
<tr>
<td>Handshaking</td>
<td>XON:XON, XON:RS, or CS:RS.</td>
</tr>
<tr>
<td>Address</td>
<td>1</td>
</tr>
<tr>
<td>Protocol</td>
<td>None</td>
</tr>
</tbody>
</table>

**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 to Odd, Even, or None.

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

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

- **Protocol**
  Select Standard for a general purpose communication protocol, Modbus for Modbus slave, and Master-M for Modbus master.
  If you select Modbus master, you must specify Modbus master settings. See section 3.5 for details.

**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 to Odd, Even, or None.

- **Handshaking**
  Do not set.

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

- **Protocol**
  This is the same as with the RS-232.
3.4 Reading/Writing the MV Data from Another Device via Modbus

The MV is a Modbus slave.
For Modbus specifications, see section 7.3.

Configuring the Serial Interface
Set Protocol to Modbus under Serial basic settings. See section 3.3 for details.

Reading or Writing the MV Data from Another Device
Another device (master device) sends commands to the MV to read data from the MV or write data to the MV.
For the function codes that the MV supports and the MV registers that the master device can access, see “Modbus Server Function” in section 7.3.
3.5 Reading/Writing Data on Another Device from the MV via Modbus

The MV is a Modbus master.
For Modbus specifications, see section 7.3.

Configuring the Serial Interface
Set Protocol to Master-M under Serial basic settings. See section 3.3 for details.

Configuring the Modbus Master
- Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Serial) > Modbus master > Basic settings or 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 wait time between commands 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 transmission command type to Off, R, R-M, W, or W-M.
  - R: Read the data from the slave into external input channels (16-bit signed integer)
  - R-M: Read the data from the slave into communication input channels (32-bit floating point)
  - W: Write computation channel data (16-bit signed integer) to the slave
  - W-M: Write computation channel data (32-bit signed integer) to the slave
  R is selectable on the RD-MV2000 when external input channels (MC1 option) is installed.
  R-M and W-M are selectable when the computation function (M1 or PM1 option) is installed.
3.5 Reading/Writing Data on Another Device from the MV via Modbus

- **First/Last (MV 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 slave device address in the range of 1 to 247.

- **Regi.**
  Set the slave register number.
  Enter an input register in the range of 30001 to 39999 and 300001 to 365536 or a hold register in the range of 40001 to 49999 and 400001 to 465536.
  The register numbers that you can specify vary depending on the command type. See section 7.3 for details.

- **Type**
  The data type.
  Select INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, or FLOAT_L.
  The data type that you can specify vary depending on the command type. See section 7.3 for details.

### Example of Entering Commands
See section 2.9.

### Checking the Modbus Operating Status

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

**Note**
To display the MODBUS MASTER on the display selection menu, you need to change the setting using the menu customize feature. Carry out the following steps.
- Press MENU and then select Menu tab > Menu customize > Display menu
  1. Select INFORMATION > MODBUS MASTER using the arrow keys.
  2. Press the View soft key.

![Modbus Operating Status Display](image)

- Communication conditions
- Register numbers
- Slave device addresses
- MV channels
- Detail code
- Status lamp
- Cursor used to select a command (Used to resume command transmission from the front panel keys)
3.5 Reading/Writing Data on Another Device from the MV via Modbus

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

- Communication Status
  The MV displays the communication status using status lamps and detail codes.

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

Resuming Command Transmission
Using the front panel keys, you can resume command transmission to a slave device whose communication is stopped (red status lamp).

1. Using the up and down arrow keys, select the command assigned to the slave device that you want to resume transmission. The message “Push [right arrow] key to refresh” appears.
2. Press the right arrow key. The MV will transmit a command to the specified slave device.

Data during Connection Retries
On a 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, the status lamp will turn red, and the communication input data and external input channel data will be error data. For computation channels, the MV displays “+OVER” or “−OVE” according to the settings. The MV displays “******” for external input channels.

Data Dropout
A data dropout occurs when the commands 1 to 16 do not complete within the read cycle (see appendix 2). When a data dropout occurs, the communication input data is held at the previous value. The Modbus status display shows a message indicating that a data dropout occurred. If this happens, take measures such as making the read cycle longer or reducing the number of commands. Be sure to confirm that no data dropout occurs on the Modbus status log display.
3.6 Usage Example of the Modbus Function

This section explains an example of setting two MV1000s that are connected via the serial interface, one configured to be a Modbus master and another configured to be a Modbus slave. This section refers to the RD-MV1000 configured to be a Modbus master as the RD-MV1000 master and the RD-MV1000 configured to be a Modbus slave as the RD-MV1000 slave.

System Configuration and Operation

The measurement channels, computation channels, and communication input data shown below will be used. We assume that the serial interface is already configured.

![Diagram showing serial communication between MV1000 slave and MV1000 master]

**Measurement channel 1**
- Input range: -2.0000 to 2.0000 V

**Communication input data C01**

**Computation channel 101**
- Input range: -2.0000 to 2.0000 V

**Start the computation**

**Displayed in group 1**

Reads measured data from the MV1000 and displays data on a computation channel (I/M1 or /PM1 option).

**Operation**

- The RD-MV1000 master reads the measured value from the RD-MV1000 slave channel 1 into communication input channel C01 and displays the value on computation channel 101. The MV displays computation channel 101 in group 1.
- The measured value of RD-MV1000 slave channel 1 is transferred to the RD-MV1000 master as an integer in the range of -20000 to 20000.
- The RD-MV1000 master displays values in the range of -2.0000 to 2.0000 V for values in the range of -20000 to 20000. The value is linearly scaled using the following equation.

The value on RD-MV1000 master computation channel 101 = Communication input data C01 × 0.0001
3.6 Usage Example of the Modbus Function

Configuring the RD-MV1000 Slave (Modbus Slave)

Configuring the Modbus Slave

◊ Press MENU and then select Menu tab > Basic setting mode > Menu tab >
Communication (Serial) > Basic settings

<table>
<thead>
<tr>
<th>Basic Setting Mode</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial</td>
<td></td>
</tr>
<tr>
<td>Baud rate</td>
<td>9600 bps</td>
</tr>
<tr>
<td>Data length</td>
<td>8 bit</td>
</tr>
<tr>
<td>Parity</td>
<td>Even</td>
</tr>
<tr>
<td>Handshaking</td>
<td>OFF OFF</td>
</tr>
<tr>
<td>Address</td>
<td>1</td>
</tr>
<tr>
<td>Protocol</td>
<td>Modbus</td>
</tr>
</tbody>
</table>

Parameter  Setting
Address  1
Protocol  Modbus
* Set the communication parameters the same as those of the master device.

Configuring Measurement Channels

◊ Press MENU and then select Menu tab > Meas channel > Range, Alarm

<table>
<thead>
<tr>
<th>Range Mode</th>
<th>Range</th>
<th>Span_L</th>
<th>Span_U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volt</td>
<td>2V</td>
<td>-2.0000</td>
<td>2.0000</td>
</tr>
</tbody>
</table>

Alarm
1 OFF
2 OFF
3 OFF
4 OFF

Parameter  Setting
First channel and last channel  1
Mode  Volt
Range  2V
Span_L  -2.0000
Span_U  2.0000
Configuring the RD-MV1000 Master (Modbus Master)
Set default values for parameters other than those listed below.

Configuring the Modbus Master
◊ Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Serial) > Basic settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial</td>
<td>Baud rate</td>
</tr>
<tr>
<td></td>
<td>38400 bps</td>
</tr>
<tr>
<td></td>
<td>Data Length</td>
</tr>
<tr>
<td></td>
<td>8 bit</td>
</tr>
<tr>
<td></td>
<td>Parity</td>
</tr>
<tr>
<td></td>
<td>Even</td>
</tr>
<tr>
<td></td>
<td>Handshaking</td>
</tr>
<tr>
<td></td>
<td>Off Off</td>
</tr>
<tr>
<td></td>
<td>Address</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Protocol</td>
</tr>
<tr>
<td></td>
<td>Modbus-M</td>
</tr>
</tbody>
</table>

* Set the communication parameters the same as those of the slave device.

Setting Transmission Commands
◊ Press MENU and then select Menu tab > Basic setting mode > Menu tab > Communication (Serial) > Modbus master > Command settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master command</td>
<td>1-0</td>
</tr>
<tr>
<td>type</td>
<td>R-M</td>
</tr>
<tr>
<td>First Last Addr.</td>
<td>C01</td>
</tr>
<tr>
<td>Address</td>
<td>1</td>
</tr>
<tr>
<td>Regi.</td>
<td>30001</td>
</tr>
<tr>
<td>Type</td>
<td>INT16</td>
</tr>
</tbody>
</table>

Configuring Computation Channels
See section 2.10, "Usage Example of the Modbus Function."

Assigning a Channel to a Group
See section 2.10, "Usage Example of the Modbus Function."

Starting Computation
See section 2.10, "Usage Example of the Modbus Function."

Checking the Modbus Operating Status
See section 2.10, "Usage Example of the Modbus Function."
4.1 Command Syntax

Command Syntax
This section describes the MV setting, basic setting, and output command syntax (see sections 4.4 to 4.10). ASCII codes (see appendix 1) are used for the character codes. For the maintenance/test command syntax (see section 4.11) and instrument information output command syntax (see section 4.12), see the corresponding sections or the examples for each command.

![Diagram of command syntax]

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

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

Parameters
- Command parameters.
- Parameters are specified using alphabet characters or numeric values.
- Each parameter is separated by a delimiter (comma).
- A numeric value is specified using an integer.
- If the parameter is a numeric value, the valid range of the value varies depending on the command.
- Spaces before and after a parameter are discarded. (However, spaces are significant in a parameter (unit) specified using an ASCII character string.) In the examples given in this manual, spaces are not used.
- You can omit 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 is fixed for the parameters listed below. If you enter the wrong number of digits, a syntax error will occur.

  - **Date**  
    - YY/MM/DD (eight characters)  
    - **YY**: Enter the lower two digits of the year.  
    - **MM**: Month  
    - **DD**: Day

  - **Time**  
    - HH:MM:SS (eight characters)  
    - **HH**: Hour  
    - **MM**: Minute  
    - **SS**: Second

  - **Channel number**: Three characters
  - **Relay number**: Three characters
4.1 Command Syntax

Query
- A question mark is used to specify a query.
- You can insert a question mark after a command or parameter to query the corresponding command setting. Queries are not allowed on some commands. For the query syntax of each command, see sections 4.4 to 4.7.
  
  **Example 1**  \( SR[p_1]? \)  You can execute \( SR? \) or \( SRp_1? \).

  **Example 2**  \( SA[p_1,p_2]? \)  You can execute \( SA?,SAp_1?, \) and \( SAp_1,p_2? \).

Delimiter
- A comma is used as a delimiter.
- Separate each parameter with a delimiter.

Sub Delimiter
- A semicolon is used as a sub delimiter.
- You can specify up to 10 commands consecutively by separating each command with a sub delimiter. However, you cannot do this with the commands listed below and all queries. Specify them independently.
- Output commands other than \( BO, CS, \) and \( IF \)
- Queries
  - If there are consecutive sub delimiters, they are considered to be one. Sub delimiters at the front and at the end of a command sequence are ignored.
    
    **Example**  \( SR001,VOLT;SR002,VOLT;<\text{terminator}> \) is interpreted as \( SR001,VOLT:SR002,VOLT;<\text{terminator}> \).

Terminator
Use either of the following 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 MV. If you do, an error will occur.
- The total data length from the first character to the terminator must be less than 2048 bytes.
- Commands are not case-sensitive except for user-specified character strings.
- All commands that are listed with sub delimiters are executed even if any of the commands is in error.
- Spaces that are inserted before and after a parameter are ignored. However, if spaces are inserted before a command, after a sub delimiter, or after a query, an error will occur.

Response

The MV returns a response (affirmative/negative response) to a command that is delimited by a terminator. The controller should follow the one command to one response format. If the command-response rule is not observed, the operation is not guaranteed. For the response syntax, see section 5.1.
- RS-422/485 commands (see section 4.9) and instrument information output commands (section 4.12) are exceptions.
### 4.2 A List of Commands

#### Setting Commands

<table>
<thead>
<tr>
<th>Group/Command Name</th>
<th>Function</th>
<th>Execution Mode</th>
<th>Administrator</th>
<th>User</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting</td>
<td></td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-10</td>
</tr>
<tr>
<td>SR</td>
<td>Sets an input range</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-11</td>
</tr>
<tr>
<td>SD</td>
<td>Sets a calculation expression</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-11</td>
</tr>
<tr>
<td>ER</td>
<td>Sets the range of an external input channel</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-11</td>
</tr>
<tr>
<td>TJ</td>
<td>Sets memory sampling</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-11</td>
</tr>
<tr>
<td>SA</td>
<td>Sets an alarm</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-12</td>
</tr>
<tr>
<td>SW</td>
<td>Sets the display update rate and auto-save interval</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-13</td>
</tr>
<tr>
<td>TW</td>
<td>Sets the secondary trend update rate</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-13</td>
</tr>
<tr>
<td>TM</td>
<td>Sets manual sampling</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-13</td>
</tr>
<tr>
<td>TE</td>
<td>Sets sampling conditions of the event data</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-13</td>
</tr>
<tr>
<td>SZ</td>
<td>Sets a zone</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-14</td>
</tr>
<tr>
<td>SP</td>
<td>Sets the partial expanded display</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-14</td>
</tr>
<tr>
<td>ST</td>
<td>Sets a tag</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-14</td>
</tr>
<tr>
<td>SX</td>
<td>Sets a group</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-14</td>
</tr>
<tr>
<td>SL</td>
<td>Sets a trip line</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-14</td>
</tr>
<tr>
<td>SG</td>
<td>Sets a message</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-15</td>
</tr>
<tr>
<td>TH</td>
<td>Sets the data storage directory on an external storage medium</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-15</td>
</tr>
<tr>
<td>TZ</td>
<td>Sets the file header</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-15</td>
</tr>
<tr>
<td>TF</td>
<td>Sets the data file name</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-15</td>
</tr>
<tr>
<td>SD</td>
<td>Sets the date and time</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-15</td>
</tr>
<tr>
<td>TT</td>
<td>Sets the trend display</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-15</td>
</tr>
<tr>
<td>SE</td>
<td>Sets the trend graph line width and the number of grids</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-16</td>
</tr>
<tr>
<td>TB</td>
<td>Sets the bar graph display</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-16</td>
</tr>
<tr>
<td>SB</td>
<td>Sets the bar graph of a channel</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-16</td>
</tr>
<tr>
<td>TN</td>
<td>Sets the scale</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-16</td>
</tr>
<tr>
<td>SV</td>
<td>Sets the moving average of a measurement channel</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-16</td>
</tr>
<tr>
<td>SC</td>
<td>Sets a channel display color</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-16</td>
</tr>
<tr>
<td>TA</td>
<td>Sets an alarm point mark</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-16</td>
</tr>
<tr>
<td>TG</td>
<td>Sets a color scale band</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-16</td>
</tr>
<tr>
<td>SQ</td>
<td>Sets the LCD brightness and screen backlight saver</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-17</td>
</tr>
<tr>
<td>TC</td>
<td>Sets the background color</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-17</td>
</tr>
<tr>
<td>TP</td>
<td>Sets auto group switching</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-17</td>
</tr>
<tr>
<td>TR</td>
<td>Sets auto monitor recovery</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-17</td>
</tr>
<tr>
<td>TQ</td>
<td>Sets a timer</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-17</td>
</tr>
<tr>
<td>TK</td>
<td>Sets a match timer</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-17</td>
</tr>
<tr>
<td>TU</td>
<td>Sets an event action</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-18</td>
</tr>
<tr>
<td>SK</td>
<td>Sets a computation constant</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-18</td>
</tr>
<tr>
<td>SI</td>
<td>Sets rolling average on a computation channel</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-19</td>
</tr>
<tr>
<td>SJ</td>
<td>Sets a TLOG timer</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-19</td>
</tr>
<tr>
<td>TX</td>
<td>Sets the ancillary operation of the start key</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-19</td>
</tr>
<tr>
<td>FR</td>
<td>Sets the FIFO buffer acquisition interval</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-19</td>
</tr>
<tr>
<td>BH</td>
<td>Sets a batch text field</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-20</td>
</tr>
<tr>
<td>EH</td>
<td>Sets a calibration correction</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-20</td>
</tr>
<tr>
<td>BD</td>
<td>Sets an alarm delay</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-20</td>
</tr>
<tr>
<td>SM</td>
<td>Sets the custom menu</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-20</td>
</tr>
<tr>
<td>SY</td>
<td>Sets the 4 panel display</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-22</td>
</tr>
<tr>
<td>TY</td>
<td>Sets the file format</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-23</td>
</tr>
<tr>
<td>NF</td>
<td>Sets the HISTORY key function</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-23</td>
</tr>
</tbody>
</table>

Yes: Command usable
No: Command not usable
4.2 A List of Commands

**Note**

- There are two execution modes on the MV. If you attempt to execute a command in the wrong mode, a syntax error will occur. 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**

A mode in which settings are changed after stopping measurements and computations.

**Operation Mode**

A mode in which commands other than those in Basic Setting Mode are used.

- The administrator and user indications in the table are the user levels that are specified through the Ethernet communication login function. See section 2.1 for details.

<table>
<thead>
<tr>
<th>Group/Command Name</th>
<th>Function</th>
<th>Execution Mode</th>
<th>Administrator</th>
<th>User</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BT</td>
<td>Sets a batch name</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-24</td>
</tr>
<tr>
<td>BU</td>
<td>Sets a batch comment</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-24</td>
</tr>
<tr>
<td>UD</td>
<td>Switches the display</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-24</td>
</tr>
<tr>
<td>PS</td>
<td>Starts/stops measurements</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-25</td>
</tr>
<tr>
<td>AK</td>
<td>Releases the alarm output (alarm acknowledge)</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-25</td>
</tr>
<tr>
<td>EV</td>
<td>Executes manual sample, manual trigger, snapshot,</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-25</td>
</tr>
<tr>
<td></td>
<td>or forced timeout</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CL</td>
<td>Executes manual SNTP</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-25</td>
</tr>
<tr>
<td>CV</td>
<td>Switches the trend update rate</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-25</td>
</tr>
<tr>
<td>MS</td>
<td>Writes a message (displays and writes)</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-25</td>
</tr>
<tr>
<td>BJ</td>
<td>Writes a free message</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-25</td>
</tr>
<tr>
<td>EJ</td>
<td>Changes the login password</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>Yes</td>
<td>4-25</td>
</tr>
<tr>
<td>TL</td>
<td>Starts, stops, resets computation (MATH) or clears the computation dropout status display</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-26</td>
</tr>
<tr>
<td>DS</td>
<td>Switches the execution mode between operation and basic setting</td>
<td>All modes</td>
<td>Yes</td>
<td>No</td>
<td>4-26</td>
</tr>
<tr>
<td>LO</td>
<td>Loads setup data</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-26</td>
</tr>
<tr>
<td>LI</td>
<td>Saves setup data</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-26</td>
</tr>
<tr>
<td>CM</td>
<td>Sets communication input data</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-26</td>
</tr>
<tr>
<td>CE</td>
<td>Enters data in an external input channel</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-26</td>
</tr>
<tr>
<td>EM</td>
<td>Starts/stops the e-mail transmission function</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-27</td>
</tr>
<tr>
<td>CU</td>
<td>Manually recovers Modbus</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-27</td>
</tr>
<tr>
<td>BV</td>
<td>Enters characters*</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-27</td>
</tr>
<tr>
<td>KE</td>
<td>Key operation command</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-27</td>
</tr>
<tr>
<td>YC</td>
<td>Clears measured/computed data and initializes setup data</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-27</td>
</tr>
<tr>
<td>IR</td>
<td>Resets a relative timer</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-27</td>
</tr>
<tr>
<td>MA</td>
<td>Resets a match timer</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-27</td>
</tr>
<tr>
<td>NR</td>
<td>Sets the trend update rate</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-27</td>
</tr>
</tbody>
</table>

* Can only be used in serial communications.

Yes: Command usable  
No: Command not usable
Basic Setting Commands

- To activate the settings that are changed with the basic setting commands, you must save the settings with the YE or XE command. Make sure to save the settings before changing from Basic Setting Mode to Operation Mode. Otherwise, new settings will not take effect.

- The settings that are returned in response to a query in Basic Setting Mode will contain the new settings even if they are not saved. However, the new settings will not take effect until they are saved. To activate the new settings, you must save the settings with the YE or XE command as described earlier. If you clear the settings or change the execution mode from Basic Setting Mode to Operation Mode without saving the settings, the MV will return the original settings in response to a query.

Note

- The settings that are changed with the YA, YK, RU, YQ, YS, YB, YD, WS, and WW commands are activated after saving the new settings with the XE command and then power-cycling the MV.

- Executing the YE or LO command will disconnect communications.

<table>
<thead>
<tr>
<th>Group/Command Name</th>
<th>Function</th>
<th>Execution Mode</th>
<th>Administrator</th>
<th>User</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting</td>
<td></td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-28</td>
</tr>
<tr>
<td>WO</td>
<td>Sets alarm and DO settings</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-28</td>
</tr>
<tr>
<td>WH</td>
<td>Sets an alarm hysteresis</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-28</td>
</tr>
<tr>
<td>XV</td>
<td>Sets the scan interval</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-28</td>
</tr>
<tr>
<td>XB</td>
<td>Sets the burnout detection</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-28</td>
</tr>
<tr>
<td>XJ</td>
<td>Sets an RJC</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-29</td>
</tr>
<tr>
<td>WU</td>
<td>Sets environment settings</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-29</td>
</tr>
<tr>
<td>XM</td>
<td>Sets the memory sample condition</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-31</td>
</tr>
<tr>
<td>RF</td>
<td>Sets the key lock function</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-31</td>
</tr>
<tr>
<td>RN</td>
<td>Sets basic login settings</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-31</td>
</tr>
<tr>
<td>RP</td>
<td>Sets login and user limitations</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-31</td>
</tr>
<tr>
<td>RO</td>
<td>Sets report types and generation times</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-32</td>
</tr>
<tr>
<td>RM</td>
<td>Sets a report channel</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-32</td>
</tr>
<tr>
<td>XG</td>
<td>Sets the time zone</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-32</td>
</tr>
<tr>
<td>XN</td>
<td>Sets the date format</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-33</td>
</tr>
<tr>
<td>YB</td>
<td>Sets host information</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-33</td>
</tr>
<tr>
<td>YD</td>
<td>Sets network settings</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-33</td>
</tr>
<tr>
<td>YA</td>
<td>Sets the IP address, subnet mask, and default gateway</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-33</td>
</tr>
<tr>
<td>YK</td>
<td>Sets the keepalive feature</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-33</td>
</tr>
<tr>
<td>RU</td>
<td>Sets DNS parameters</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-33</td>
</tr>
<tr>
<td>WS</td>
<td>Sets a server</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-33</td>
</tr>
<tr>
<td>WW</td>
<td>Sets the Web homepage</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-34</td>
</tr>
<tr>
<td>YQ</td>
<td>Sets the application timeout</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-34</td>
</tr>
<tr>
<td>YT</td>
<td>Sets the FTP transfer timing</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-34</td>
</tr>
<tr>
<td>YU</td>
<td>Sets the contents to be sent via e-mail</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-34</td>
</tr>
<tr>
<td>YY</td>
<td>Sets e-mail recipient addresses</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-35</td>
</tr>
<tr>
<td>YW</td>
<td>Sets the e-mail sender address</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-35</td>
</tr>
<tr>
<td>YX</td>
<td>Sets the e-mail SNTP server name</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-35</td>
</tr>
<tr>
<td>YJ</td>
<td>Sets a Modbus client destination server</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-35</td>
</tr>
<tr>
<td>YP</td>
<td>Sets basic Modbus client settings</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-36</td>
</tr>
<tr>
<td>YR</td>
<td>Sets a Modbus client transmission command</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-36</td>
</tr>
<tr>
<td>WB</td>
<td>Sets SNTP client settings</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-36</td>
</tr>
<tr>
<td>WC</td>
<td>Sets the SNTP operation when memory start is executed</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-36</td>
</tr>
<tr>
<td>YS</td>
<td>Sets serial interface parameters</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-37</td>
</tr>
</tbody>
</table>
### 4.2 A List of Commands

<table>
<thead>
<tr>
<th>Group/Command Name</th>
<th>Function</th>
<th>Execution Mode</th>
<th>Administrator</th>
<th>User</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Setting (continued)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YL</td>
<td>Sets Modbus master function settings</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-37</td>
</tr>
<tr>
<td>YM</td>
<td>Sets a Modbus master transmission command</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-37</td>
</tr>
<tr>
<td>WR</td>
<td>Sets the instrument information output</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-38</td>
</tr>
<tr>
<td>XE</td>
<td>Activates Basic Setting Mode</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-38</td>
</tr>
<tr>
<td>YE</td>
<td>Activates Basic Setting Mode (cold reset)</td>
<td>Basic Setting Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-39</td>
</tr>
</tbody>
</table>

Yes: Command usable  
No: Command not usable

### Output Commands

<table>
<thead>
<tr>
<th>Group/Command Name</th>
<th>Function</th>
<th>Execution Mode</th>
<th>Administrator</th>
<th>User</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BO</td>
<td>Sets the byte output order</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-39</td>
</tr>
<tr>
<td>CS</td>
<td>Sets the checksum (can be used only during serial communications)</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-39</td>
</tr>
<tr>
<td>IF</td>
<td>Sets the status filter</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-39</td>
</tr>
<tr>
<td>CC</td>
<td>Disconnects the Ethernet connection (can be used only during Ethernet communications)</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-39</td>
</tr>
<tr>
<td>CB</td>
<td>Sets the data output format</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-40</td>
</tr>
<tr>
<td><strong>Setup, measurement, and computed data output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FC</td>
<td>Transmits screen image data</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-40</td>
</tr>
<tr>
<td>FE</td>
<td>Transmits setup data</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-40</td>
</tr>
<tr>
<td>FD</td>
<td>Transmits most recent measured/computed data</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>Yes</td>
<td>4-40</td>
</tr>
<tr>
<td>FF</td>
<td>Transmits FIFO data</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>Yes</td>
<td>4-41</td>
</tr>
<tr>
<td>FL</td>
<td>Transmits a log, alarm summary, or message summary</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-41</td>
</tr>
<tr>
<td>IS</td>
<td>Transmits status information</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-41</td>
</tr>
<tr>
<td>FU</td>
<td>Transmits the user level</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-41</td>
</tr>
<tr>
<td>FA</td>
<td>Transmits instrument information</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-42</td>
</tr>
<tr>
<td>ME</td>
<td>Transmits data stored on an external storage medium or the internal memory (can be used through either Ethernet or serial communications)</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-42</td>
</tr>
<tr>
<td>MO</td>
<td>Manipulates or transmits data stored in the internal memory</td>
<td>Operation Mode</td>
<td>Yes</td>
<td>No</td>
<td>4-42</td>
</tr>
<tr>
<td><strong>RS-422/485 commands</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Esc O</td>
<td>Opens a instrument</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-43</td>
</tr>
<tr>
<td>Esc C</td>
<td>Closes a instrument</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-43</td>
</tr>
<tr>
<td><strong>Common command</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>Transmits instrument information</td>
<td>All modes</td>
<td>Yes</td>
<td>Yes</td>
<td>4-43</td>
</tr>
</tbody>
</table>

Yes: Command usable  
No: Command not usable
### Maintenance/Test Commands (available when using the maintenance/test server function via the Ethernet interface)

<table>
<thead>
<tr>
<th>Command Name</th>
<th>Function</th>
<th>Administrator</th>
<th>User</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>close</td>
<td>Disconnects the connection between other instruments</td>
<td>Yes</td>
<td>No</td>
<td>4-44</td>
</tr>
<tr>
<td>con</td>
<td>Transmits connection information</td>
<td>Yes</td>
<td>Yes</td>
<td>4-44</td>
</tr>
<tr>
<td>eth</td>
<td>Transmits Ethernet statistics</td>
<td>Yes</td>
<td>Yes</td>
<td>4-44</td>
</tr>
<tr>
<td>help</td>
<td>Displays help</td>
<td>Yes</td>
<td>Yes</td>
<td>4-44</td>
</tr>
<tr>
<td>net</td>
<td>Transmits network statistics</td>
<td>Yes</td>
<td>Yes</td>
<td>4-44</td>
</tr>
<tr>
<td>quit</td>
<td>Disconnects the connection to the instrument that is being controlled</td>
<td>Yes</td>
<td>Yes</td>
<td>4-45</td>
</tr>
</tbody>
</table>

Yes: Command usable  
No: Command not usable

### Instrument Information Output Commands (available when using the instrument information server function via the Ethernet interface)

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Function</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>serial</td>
<td>Transmits the serial number</td>
<td>4-45</td>
</tr>
<tr>
<td>host</td>
<td>Transmits the host name</td>
<td>4-45</td>
</tr>
<tr>
<td>ip</td>
<td>Transmits the IP address</td>
<td>4-45</td>
</tr>
</tbody>
</table>
4.3 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.

Examples of Entering Measurement Range Parameters

The span upper and lower limit parameters of the SR command (input range setting command) requires all digits including fractional digits to be set. 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, specify 10000. If you want to set the limit to 0.5000 V, specify 5000.

The table below gives examples.

<table>
<thead>
<tr>
<th>Measurement Range</th>
<th>Input Type Parameter</th>
<th>Selectable Range of Measurement Range</th>
<th>The Range You Want to Set</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLT</td>
<td>20mV</td>
<td>−20.000mV to 20.000mV</td>
<td>−10.000mV to 20.000mV</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>sqrt</td>
<td>2V</td>
<td>−2.0000V to 2.0000V</td>
<td>−2.0000V to 0.5000V</td>
<td>0 to 2000</td>
</tr>
<tr>
<td>TC</td>
<td>R</td>
<td>0.0 to 1760.0</td>
<td>0.0 to 400.0</td>
<td>0 to 4000</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>−200.0 to 1370.0</td>
<td>−200.0 to 1370.0</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>RTD</td>
<td>Level</td>
<td>−200.0 to 600.0</td>
<td>−10.0 to 500.0</td>
<td>0 to 10000</td>
</tr>
<tr>
<td>DI</td>
<td>LEVEL</td>
<td>0 to 1</td>
<td>0 to 1</td>
<td>0 to 1</td>
</tr>
</tbody>
</table>

Measurement Range Parameters

The table below shows the relationship between the input types and range parameters. For the selectable range, see the RD-MV1000/RD-MV2000 User’s Manual (LM RD-MV1000-01E).

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Input Type Parameter</th>
<th>Range</th>
<th>Range Parameter</th>
<th>Required Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC voltage</td>
<td>VOLT</td>
<td>20mV</td>
<td>20mV</td>
<td>/N3</td>
</tr>
<tr>
<td></td>
<td>60mV</td>
<td>60mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200mV</td>
<td>200mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2V</td>
<td>2V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6V</td>
<td>6V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20V</td>
<td>20V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50V</td>
<td>50V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermocouple</td>
<td>TC</td>
<td>R</td>
<td>R</td>
<td>/N3</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>K</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>E</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>J</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>T</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>L</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>U</td>
<td>U</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kp vs Au7Fe</td>
<td>KP</td>
<td></td>
<td>/N3</td>
</tr>
<tr>
<td></td>
<td>PLATINEL</td>
<td>PLATI</td>
<td></td>
<td>/N3</td>
</tr>
<tr>
<td></td>
<td>PR40-20</td>
<td>PR</td>
<td></td>
<td>/N3</td>
</tr>
<tr>
<td></td>
<td>Ni1100(SAMA)</td>
<td>Ni1</td>
<td></td>
<td>/N3</td>
</tr>
<tr>
<td></td>
<td>Ni1100(DIN)</td>
<td>Ni2</td>
<td></td>
<td>/N3</td>
</tr>
<tr>
<td></td>
<td>Ni120</td>
<td>Ni3</td>
<td></td>
<td>/N3</td>
</tr>
<tr>
<td></td>
<td>J263*B</td>
<td>J263</td>
<td></td>
<td>/N3</td>
</tr>
<tr>
<td>RTD</td>
<td>RTD</td>
<td>Pt</td>
<td>Pt</td>
<td>/N3</td>
</tr>
<tr>
<td></td>
<td>JPT</td>
<td>JPT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pt50</td>
<td>Pt50</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ni1100(SAMA)</td>
<td>Ni11</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ni1100(DIN)</td>
<td>Ni12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ni120</td>
<td>Ni13</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>J263*B</td>
<td>J263</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4-8
### 4.3 Setup Parameters

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Input Type Parameter</th>
<th>Range</th>
<th>Range Parameter</th>
<th>Required Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTD</td>
<td>Cu53</td>
<td>Cu100</td>
<td>Cu53</td>
<td>/N3</td>
</tr>
<tr>
<td></td>
<td>Cu10:GE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cu10:L&amp;N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cu10:WEED</td>
<td></td>
<td></td>
<td>/N1</td>
</tr>
<tr>
<td></td>
<td>Cu10:BAILEY</td>
<td></td>
<td></td>
<td>/N1</td>
</tr>
<tr>
<td></td>
<td>Cu10:0.000392at10</td>
<td></td>
<td></td>
<td>/N1</td>
</tr>
<tr>
<td></td>
<td>Cu10:0.000393at10</td>
<td></td>
<td></td>
<td>/N1</td>
</tr>
<tr>
<td></td>
<td>Cu25:0.00425at0</td>
<td></td>
<td></td>
<td>/N1</td>
</tr>
<tr>
<td></td>
<td>Pt25</td>
<td></td>
<td></td>
<td>/N3</td>
</tr>
<tr>
<td>Contact input</td>
<td>DI</td>
<td>Level</td>
<td>LEVEL</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cont</td>
<td>CONT</td>
<td></td>
</tr>
<tr>
<td>1-5V voltage</td>
<td>1-5V</td>
<td>1-5V</td>
<td>1-5V</td>
<td></td>
</tr>
</tbody>
</table>

### Channel Number Notations

The table below lists the channel notations that are used.

<table>
<thead>
<tr>
<th>Channel Type</th>
<th>Model</th>
<th>Channel Notation</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement channel</td>
<td>RD-MV1000</td>
<td>001 to 024</td>
<td>Varies depending on the number of inputs</td>
</tr>
<tr>
<td></td>
<td>RD-MV2000</td>
<td>001 to 048</td>
<td>Varies depending on the number of inputs</td>
</tr>
<tr>
<td>Computation channel</td>
<td>RD-MV1000</td>
<td>101 to 112</td>
<td>High-speed input model</td>
</tr>
<tr>
<td></td>
<td>RD-MV2000</td>
<td>101 to 124</td>
<td>Medium-speed input model</td>
</tr>
<tr>
<td>External input channel</td>
<td>RD-MV1000</td>
<td>101 to 112</td>
<td>High-speed input model</td>
</tr>
<tr>
<td>Manual sample</td>
<td>RD-MV1000</td>
<td>101 to 160</td>
<td>Medium-speed input model</td>
</tr>
<tr>
<td></td>
<td>RD-MV2000</td>
<td>101 to 160</td>
<td>Medium-speed input model</td>
</tr>
<tr>
<td>Report channel</td>
<td>RD-MV1000</td>
<td>R01 to R12</td>
<td>High-speed input model</td>
</tr>
<tr>
<td></td>
<td>RD-MV2000</td>
<td>R01 to R24</td>
<td>Medium-speed input model</td>
</tr>
<tr>
<td></td>
<td>RD-MV2000</td>
<td>R01 to R12</td>
<td>High-speed input model</td>
</tr>
<tr>
<td></td>
<td>RD-MV2000</td>
<td>R01 to R60</td>
<td>Medium-speed input model</td>
</tr>
<tr>
<td>Internal switch</td>
<td>RD-MV1000</td>
<td>S01 to S30</td>
<td></td>
</tr>
<tr>
<td>Output relay</td>
<td>RD-MV1000</td>
<td>I01 to I06</td>
<td>Varies depending on the options</td>
</tr>
<tr>
<td></td>
<td>RD-MV2000</td>
<td>I01 to I06, I11 to I16, I21 to I26, I31 to I36</td>
<td>Varies depending on the options</td>
</tr>
<tr>
<td>Constant</td>
<td>RD-MV1000</td>
<td>K01 to K60</td>
<td></td>
</tr>
<tr>
<td>Communication input channel</td>
<td>RD-MV1000</td>
<td>C01 to C24</td>
<td></td>
</tr>
<tr>
<td>Display group</td>
<td>RD-MV1000</td>
<td>1 to 10</td>
<td></td>
</tr>
<tr>
<td>Display group</td>
<td>RD-MV2000</td>
<td>1 to 36</td>
<td></td>
</tr>
<tr>
<td>Remote control terminal</td>
<td>RD-MV1000</td>
<td>D01 to D08</td>
<td></td>
</tr>
<tr>
<td>Pulse input</td>
<td>RD-MV1000</td>
<td>P01 to P08,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RD-MV2000</td>
<td>G01 to G08</td>
<td></td>
</tr>
<tr>
<td>Flag</td>
<td>RD-MV1000</td>
<td>F01 to F08</td>
<td></td>
</tr>
<tr>
<td>High-speed input model</td>
<td>RD-MV1004, RD-MV1008, RD-MV2008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium-speed input model</td>
<td>RD-MV1006, RD-MV1012, RD-MV1024</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.4 Setting Commands (Setting)

SR__ Sets an input range
To set a channel to skip
Syntax   SR p1,p2<terminator>
p1    Measurement channel number
p2    Setting type (SKIP)
Query   SR{ p1}?
Example  Skip channel 001.
SR001,SKIP

Description  You cannot execute this command while the
MV is measuring, computing, or generating a report.
• A channel set to SKIP is not measured.
• Set parameter p1 according to the table in section 4.3.

To set a channel 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   RTD
      DI    ON/OFF input
p3    Measurement range
p4    Span lower limit
p5    Span upper limit
Query   SR{ p1}?
Example  Set the channel 001 input type to TC type R, the
span lower limit to 0°C, and the span upper limit to
1760.0°C.
SR001,TC,R,0,17600

Description  You cannot execute this command while the
MV is measuring, computing, or generating a report.
• Set parameters p1 and p3 according to the table in section 4.3.
• For parameters p4 and p5, enter a value using 5 digits or less
excluding the decimal point.

To set a channel to difference computation
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   RTD
      DI    ON/OFF input
p4    Measurement range
p5    Span lower limit
p6    Span upper limit
p7    Reference channel number (measurement channel number)
Query   SR{ p1}?

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

Description  You cannot execute this command while the
MV is measuring, computing, or generating a report.
• Set parameters p1 and p4 according to the table in section 4.3.
• For parameters p5 and p6, enter a value using 5 digits or less
excluding the decimal point.

To set a channel 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   RTD
      DI    ON/OFF input
p4    Measurement range
p5    Span lower limit
p6    Span upper limit
p7    Scaling lower limit (−30000 to 30000)
p8    Scaling upper limit (−30000 to 30000)
p9    Scaling decimal place (0 to 4)
p10   Unit (up to six alphanumeric 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,1000,5000,100,500,2,4

Description  You cannot execute this command while the
MV is measuring, computing, or generating a report.
• Set parameters p1 and p3 according to the table in section 4.3.
• For parameters p4 and p5, enter a value using 5 digits or less
excluding the decimal point.
• Set all parameters p7, p8, and p9 or omit all
three parameters.

To set a channel to square root computation
Syntax   SR p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,p11<terminator>
p1    Measurement channel number
p2    Setting type (SQRT)
p3    Measurement range
p4    Span lower limit
p5    Span upper limit
p6    Scaling lower limit (−30000 to 30000)
p7    Scaling upper limit (−30000 to 30000)
4.4 Setting Commands (Setting)

Query
SR[p1:]

Example
Convert the DC voltage measured on channel 301 to a flow rate using the square root computation. 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 10.0 m/s, and the scaling upper limit to 100.0 m/s.
SR001,SQR,T,6,V,1000,5000,100,1000,1,m/3/s

Description
- You cannot execute this command while the MV is measuring, computing, or generating a report.
- Set parameters p1 and p3 according to the table in section 4.3.
- For parameters p4 and p5, set a value using 5 digits or less excluding the decimal point.
- Set all parameters p6, p7, and p8 or omit all three parameters.

To set a channel 1-5V DC 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 (600 to 5200)
p6 Scaling lower limit (~30000 to 30000)
p7 Scaling upper limit (~30000 to 30000)
p8 Scaling decimal place (0 to 4)
p9 Unit (up to six alphanumeric characters)
p10 Low-cut function ON/OFF

Query
SR[p1:]

Example
Set the channel 005 input type to 1-5V, the span lower limit to 1 V, the span upper limit to 5 V, and turn the 1-5V low-cut function ON.
SR005,1-5V,1-5V,1000,5000,1,m/3/s

Description
- You cannot execute this command while the MV is measuring or computing.
- Set parameter p1 according to the table in section 4.3.
- For parameters p4 and p5, set a value using 4 digits or less excluding the decimal point.
- Set all parameters p6, p7, and p8 or omit all three parameters.

SO
Sets a calculation expression
Syntax
SO,p1,p2,p3,p4,p5,p6,p7 <terminator>
p1 Computation channel number
p2 Computation ON/OFF
p3 Calculation expression (up to 120 characters)
p4 Span lower limit (~9999999 to 99999999)

Query
SO[p1:]

Example
Compute the sum of channels 001 and 002 on channel 106. Set the span lower limit to ~100000, the span upper limit to 150000, and the unit to V.
SO106,001+002,100000,150000,4,V

Description
- You can execute this command on models with the /M1 math option.
- You cannot execute this command while the MV is measuring or computing.
- For details on calculation expressions, see section 2.2.
- Set parameter p1 according to the table in section 4.3.
- 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.
- Set all parameters p4, p5, and p6 or omit all three parameters.

ER
Sets the range of an external input channel
Syntax
ER,p1,p2,p3,p4,p5,p6 <terminator>
p1 External input channel number
p2 External input channel ON/OFF
p3 Span lower limit (~30000 to 30000)
p4 Span upper limit (~30000 to 30000)
p5 Decimal place (0 to 4)
p6 Unit (up to six alphanumeric characters)

Query
ER[p1:]

Example
Set the span of external input channel 201 to ~150.00 to 150.00.
201,ON,150000,150000,2

Description
- You can execute this command on models with the /MC1 external input channel option.

TJ
Sets memory sampling
Syntax
TJ,p1,p2 <terminator>
p1 Measurement, computation, or external input channel number
p2 Memory sampling ON/OFF

Query
TJ[p1:]

Example
Save channel 002 to memory.
TJ002,ON

Description
- You can execute a computation channel (or make a query) on models with the /M1 math option. You can specify an external input channel (or make a query) on models with the /MC1 external input channel option.
4.4 Setting Commands (Setting)

**SA** Sets an alarm

**To turn an alarm off**

**Syntax**

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

- **p1**: Measurement, computation, or 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 on channel 010.
  
  ```
  SA010.1,OFF
  ```

**Description**

You can specify a computation channel (or make a query) on models with the /M1 math option.

You can specify an external input channel (or make a query) on models with the /MC1 external input channel option.

**To turn an alarm on**

**Syntax**

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

- **p1**: Measurement, computation, or external input channel number
- **p2**: Alarm number (1 to 4)
- **p3**: Alarm ON/OFF 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

- **p5**: Alarm value

- **p6**: Relay setting
  - **ON**: Relay ON
  - **OFF**: Relay OFF

- **p7**: Relay number when p6 is ON
  - Empty when p6 is OFF

- **p8**: Alarm detection ON/OFF

**Query**

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

**Example**

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

**Description**

- Parameter p3 cannot be set to ON if the input range (SR command) is set to SKIP.
- Parameter p3 cannot be set to ON for a computation channel if computation is OFF (SO command).
- Parameter p3 cannot be set to ON for an external input channel if the channel is OFF (ER command).
- All alarm settings of a channel are turned OFF if
  - The input type is changed (VOLT, TC, etc).
  - The input range is changed.
  - The span and scaling values are changed during scaling display (includes changing the decimal place).

- The computation channel is turned ON/OFF or the calculation expression or the span value is changed on a computation channel.

- If you set p4 to h or l, they are valid only when the measurement range is set to differential computation between channels.

- If you set p4 to R or r, set the interval for the high/low limit on the rate-of-change with the XA command.

- If you set p4 to T or t, set the alarm delay with the SO command.

- Set the p5 alarm value in the following range according to the p4 alarm type or the target channel.
  - High limit, low limit, delay high limit, or delay low limit alarm
  - DC voltage, thermocouple, or RTD input
  - A value in the measurable range
  - Contact input
  - 0 or 1
  - Scaling (1-5V, scaling, or square root)
  - -5 to 105% of span (but, in the range of -30000 to 30000)
  - Difference high limit or difference low limit alarm
    - A value in the measurable range
  - High limit on rate-of-change or low limit on rate-of-change alarm
    - A value greater than equal to the value with the least significant digit set to 1. For example, the alarm value is 0.0001 for the 2V range.

  The maximum alarm value that you can specify is the maximum value in the measurable range (but, in the range of -30000 to 30000). For example, the it is 3.0000 for the 2V range. You can only set the alarm value to 1 for a contact input.

- Computation channel
  - 99999999 to 99999999 (excluding the decimal point. Set using an integer)

- External input channel
  - -30000 to 30000

- An error will occur if p7 is set to a number of a relay that is not installed.

- You can specify a computation channel (or make a query) on models with the /M1 math option.

- For computation channels and external input channels, you can specify only the following alarm types: 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.
4.4 Setting Commands (Setting)

**SW** Sets the display update interval and auto-save interval

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

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

**Query**
```
SW?
```

**Description**
- You cannot execute this command while the MV is measuring.
- The selectable auto interval (p4) varies depending on the display update interval (p3) setting. For details, see the RD-MV1000/RD-MV2000 User’s Manual.
- You can specify the data update interval (p3) 5S and 10S only on high-speed input models (RD-MV1004, RD-MV1008, and RD-MV2008). You can specify 15S on medium-speed input models set to fast sampling mode and high-speed input models.
- Set the data 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 with the XM command (p1 in the XM command set to AUTO).
- Set the trend update interval with the NR command after setting the data update interval and auto save interval with the SW command.
- The data update interval (p3) can only be set to an interval slower than the scan interval. (The scan interval is set using p3 in the XV command.)
- The selectable range of auto save interval (p4) varies depending on the data update interval (p3) setting and the number of channels that is used with the TJ command.

**TE** Sets 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 Starts data acquisition at memory start and stops data acquisition at memory stop.
  - SINGLETRIGGER Acquires data for a specified time once after a trigger occurs and stops.
  - REPEATTRIGGER Acquires data for a specified time after a trigger occurs and waits for the next trigger.
- `p4` Sample time (10MIN, 20MIN, 30MIN, 1H, 2H, 3H, 4H, 6H, 8H, 12H, 1DAY, 2DAY, 3DAY, 5DAY, 7DAY, 10DAY, 14DAY, 31DAY)
- `p5` Pre-trigger length (0, 5, 25, 50, 75, 95, 100) percent
- `p6` Key trigger source ON/OFF
  - Parameters p5 to p6 are valid when p3 is set to SINGLETRIGGER or REPEATTRIGGER.

**Query**
```
TE? p1?
```

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

**Description**
- You cannot specify a sampling rate that is faster than the scan interval.
4.4 Setting Commands (Setting)  

**SZ** Sets a zone  

**Syntax**  

\[ \text{SZ}\,p_1, p_2, p_3 <\text{terminator}> \]  

- \( p_1 \): Measurement, computation, or external input channel number  
- \( p_2 \): Bottom edge of zone (0 to 95) [%]  
- \( p_3 \): Top edge of zone (5 to 100) [%]  

**Query**  

\[ \text{SZ}\,? \]  

**Example**  

Display channel 002 in a 30%-to-50% zone.  

\[ \text{SZ002,30,50} \]  

**Description**  

- You can specify a computation channel (or make a query) on models with the /M1 math option. You can specify an external input channel (or make a query) on models with the /MC1 external input channel option.  
- The width of the waveform display area along the amplitude axis is assumed to be 100%.  
- The zone width must be at least 5%.  
- Set the top edge of the zone to a value greater than the bottom edge of the zone.

**ST** Sets a tag  

**Syntax**  

\[ \text{ST}\,p_1, p_2 <\text{terminator}> \]  

- \( p_1 \): Measurement, computation, or external input channel number  
- \( p_2 \): Tag (up to 16 characters)  

**Query**  

\[ \text{ST}\,? \]  

**Example**  

Set the channel 002 tag to TAG2  

\[ \text{ST002,TAG2} \]  

**Description**  

- For the characters that can be used in a tag, see appendix 1, "ASCII Character Codes." However, you cannot use a semicolon or comma in a tag.  
- You can specify a computation channel (or make a query) on models with the /M1 math option. You can specify an external input channel (or make a query) on models with the /MC1 external input channel option.

**SP** Sets the partial expanded display  

**Syntax**  

\[ \text{SP}\,p_1, p_2, p_3, p_4 <\text{terminator}> \]  

- \( p_1 \): Measurement, computation, or external input channel number  
- \( p_2 \): Partial expanded setting ON/OFF  
- \( p_3 \): Boundary position (1 to 99) [%]  
- \( p_4 \): Boundary value  

**Query**  

\[ \text{SP}\,? \]  

**Example**  

Partially expand the display of channel 001. Set the boundary position to 25% and the boundary value to 1.00 V.  

\[ \text{SP001,ON,25,100} \]  

**Description**  

- You can specify a computation channel (or make a query) on models with the /M1 math option. You can specify an external input channel (or make a query) on models with the /MC1 external input channel option.  
- Parameter \( p_2 \) cannot be set to ON if the input range (SR command) is set to SKIP.  
- Parameter \( p_2 \) cannot be set to ON for a computation channel if computation is OFF (SO command).  
- Parameter \( p_2 \) cannot be set to ON for an external input channel if the channel is OFF (ER command).  
- The range between the span upper and lower limits (scale upper and low limits when scaling is enabled) is assumed to be 100% for parameter \( p_3 \).  
- You can set \( p_4 \) in the range of (span upper limit - 1) to (span lower limit + 1). If scaling is enabled, you can set \( p_4 \) in the range of (scaling upper limit - 1) to (scaling lower limit + 1).  
- The decimal place and the number of digits are set to the same values as the span and scaling settings (see the SR command).

**SX** Sets a group  

**Syntax**  

\[ \text{SX}\,p_1, p_2, p_3 <\text{terminator}> \]  

- \( p_1 \): Group number  
- \( p_2 \): Group name (up to 16 characters)  
- \( p_3 \): Channel configuration  

**Query**  

\[ \text{SX}\,? \]  

**Example**  

Assign channels 001, 003, 004 to 036 to group number 1 and assign GROUP2 for the group name.  

\[ \text{SX1,GROUP2,001.003.004-006} \]  

Assign channels by using a period to separate each channel or a hyphen to specify a range of channels.  

**Description**  

For the characters that can be used in a group name, see appendix 1, "ASCII Character Codes." However, you cannot use a semicolon or comma in a group name.

**SL** Sets a trip line  

**Syntax**  

\[ \text{SL}\,p_1, p_2, p_3, p_4, p_5, p_6 <\text{terminator}> \]  

- \( p_1 \): Group number  
- \( p_2 \): Trip line number (1 to 4)  
- \( p_3 \): Trip line display ON/OFF  
- \( p_4 \): Display position (0 to 100)  
- \( p_5 \): 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)  
- \( p_6 \): Line width (1, 2, 3)  

**Query**  

\[ \text{SL}\,[\,p_1,p_2]?? \]
4.4 Setting Commands (Setting)

**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 width of the waveform display area along the amplitude axis is assumed be 100%.

---

**SG**

**Sets a message**

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

**Query**
SG[ p1]?

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

**Description**
For the characters that can be used in a message, see appendix 1, “ASCII Character Codes.” However, you cannot use a semicolon or comma in a message.

---

**TH**

**Sets the data storage directory on an external storage medium**

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

**Query**
TH ?

**Example**
Save data 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 MV1000DATA.
TZ1, MV1000DATA

---

**TF**

**Sets the data file name**

**Syntax**
TF p1,p2,p3<terminator>
p1 1
p2 Configuration
   BATCH File name specified by the batch function
   DATE User-assigned character string + the date
   SERIAL User-assigned character string + a 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 the user-assigned string MV1DATA followed by a serial number.
TF1, SERIAL, MV1DATA

---

**SD**

**Sets the date and time**

**Syntax**
SD p1,p2<terminator>
p1 Date (YY/MM/DD)
   YY Year (00 to 79)
   MM Month (01 to 12)
   DD Day (01 to 31)
p2 Time (HH:MM:SS)
   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 syntax for p1 and p2 is fixed to eight characters. Use the syntax below. Do not insert spaces; otherwise an error will occur:
p1 = YY/MM/DD (Lower two digits of the year/month/day)
p2 = HH:MM:SS (Hour:minute:second)

---

**TT**

**Sets the trend display**

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

**Query**
TT?

**Example** Set the waveform to horizontal display and the message direction to vertical, and display the waveform by clearing the existing waveform at memory start.
THORIZONTAL, ON, VERTICAL
4.4 Setting Commands (Setting)

**SE** Sets the trend graph line width and the number of grids

**Syntax**

```
SE p1,p2<terminator>
p1  Trend line width (1 to 3) [dot]
p2  Number of grids (4 to 12, AUTO)
```

**Query**

```
SE? 
```

**Example**

Set the trend waveform line width to 1 dot and the number of grids to 10.

```
SE1,10 
```

**TB** Sets the bar graph display

**Syntax**

```
TB p1<terminator>
p1  Bar graph display direction
     HORIZONTAL  
     VERTICAL    
```

**Query**

```
TB? 
```

**Example**

Display the bar graph horizontally.

```
TBHORIZONTAL 
```

**SB** Sets the bar graph of a channel

**Syntax**

```
SB p1,p2,p3<terminator>
p1  Measurement, computation, or 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 channel 002 bar graph to 5, and display the bar graph from the span lower limit (scale lower limit if scaling is enabled).

```
SB002,NORMAL,5 
```

**Description**

You can specify a computation channel (or make a query) on models with the /M1 math option. You can specify an external input channel (or make a query) on models with the /MC1 external input channel option.

**TA** Sets an alarm point mark

**Syntax**

```
TA p1,p2,p3,p4,p5,p6,p7<terminator>
p1  Measurement, computation, or external input channel number
p2  Mark type
     ALARM  Alarm mark
     FIXED  Fixed mark
p3  Scale board display ON/OFF
p4  Alarm level 1 color (see SL (sets a trip line))
p5  Alarm level 2 color (see SL (sets a trip line))
p6  Alarm level 3 color (see SL (sets a trip line))
p7  Alarm level 4 color (see SL (sets a trip line))
```

**Query**

```
TA[ p1 ]? 
```

**Example**

Display alarm marks on the channel 004 scale.

```
TA004,ALARM,ON 
```

**TG** Sets a color scale band

**Syntax**

```
TG p1,p2,p3,p4,p5<terminator>
p1  Measurement, computation, or external input channel number
p2  Area (OFF, IN, OUT)
p3  Display color (see SL (sets a trip line))
p4  Display position lower limit
p5  Display position upper limit
```

**Query**

```
TG[ p1 ]? 
```

**Example**

Set the color scale band range to -1.0000 to 0.50000 V (2 V range) on channel 005, and set the display color to green.

```
TG005,IN,GREEN,-10000,5000 
```
4.4 Setting Commands (Setting)

**SQ**
Sets the LCD brightness and screen backlight saver

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

- **p1** LCD brightness
  - 1-8 RD-MV1000
  - 1-6 RD-MV2000
- **p2** Type of display backlight saver function
  - OFF Disable the saver function
  - DIMMER Dim
  - TIME OFF Turn OFF
- **p3** Time to switch to saver mode
  - 1MIN, 2MIN, 5MIN, 10MIN, 30MIN, 1H
- **p4** Event that causes the MV to return from 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 MV to return from saver mode to pressing of a key.

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

**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 display background to cream.

**TP**
Sets 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.

**TR**
Sets 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.

**TQ**
Sets a timer

**If p2 is set to OFF (no timer)**

**Syntax**
TQ p1, p2<terminator>

- **p1** Timer number (1 to 4)
- **p2** Timer type (OFF)

**If p2 is set to 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)

**If p2 is set to RELATIVE (relative time)**

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

- **p1** Timer number (1 to 4)
- **p2** Timer type (RELATIVE)
- **p3** Time (hh:mm)
  - **hh** Hour (00 to 24)
  - **mm** Minute (00 to 59)
- **p4** Reset at computation start (ON/OFF)

**TK**
Sets a match timer

**If p2 is set to OFF (not use a match timer)**

**Syntax**
TK p1, p2<terminator>

- **p1** Timer number (1 to 4)
- **p2** Timer designation (OFF)

**If p2 is set to DAY (time designation)**

**Syntax**
TK p1, p2, p3, p4<terminator>

- **p1** Timer number (1 to 4)
- **p2** Timer designation (DAY)
- **p3** Day (1 to 28)
- **p4** Time (hh:mm) (00:00 to 23:59)

**If p2 is set to WEEK (day of week/time designation)**

**Syntax**
TK p1, p2, p3, p4<terminator>

- **p1** Timer number (1 to 4)
- **p2** Timer designation (WEEK)
- **p3** Designation of the day of the week (SUN, MON, TUE, WED, THU, FRI, SAT)
- **p4** Time (hh:mm) (00:00 to 23:59)

**TQ**
Sets a timer

**Syntax**
TQ p1, p2<terminator>

- **p1** Timer number (1 to 4)
- **p2** Timer type (OFF)

**If p2 is set to 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)

**If p2 is set to RELATIVE (relative time)**

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

- **p1** Timer number (1 to 4)
- **p2** Timer type (RELATIVE)
- **p3** Time (hh:mm)
  - **hh** Hour (00 to 24)
  - **mm** Minute (00 to 59)
- **p4** Reset at computation start (ON/OFF)
4.4 Setting Commands (Setting)

If p2 is set to 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) (00.00 to 23:59)
- **p5**: Timer operation (SINGLE, REPEAT)

Example: Specify 8:30 on April 28 every year for timer number 3.

Query: `TK{p1}?`  

Example: Specify hour 21 every Thursday for timer number 2.

Query: `TK2,WEEK,THU,21:00,REPEAT`  

**TU** Sets an event action

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

- **p1**: Logic number (1 to 40)
- **p2**: Event type
  - **NONE**
  - **REMO**
  - **USER**
  - **MATCHT**
  - **MATCH**
  - **ALARM**
  - **REMOTE**
  - **SWITCH**
  - **RELAY**
  - **MATCH**
  - **USER**
- **p3**: Event detail
  - **REMOTE**
  - **SWITCH**
  - **RELAY**
  - **MATCH**
  - **USER**
- **p4**: Action type
  - **MEMORYSTART/STOP**
  - **MEMORYSTART**
  - **MEMORYSTOP**
  - **TRIGGER**
  - **ALARMACK**
  - **MATHST**
  - **MATHSTOP**
  - **MATHRESET**
  - **EVENT**
  - **MESSAGE**
  - **SNAPSHOT**
  - **TINEVEN**
  - **DISPLAYRATE**
  - **DISPLAYGROUP**
  - **FLAG**
  - **TIMEJ**
  - **PANELLOAD**

Example: Execute memory start with the remote control input (terminal 1).

Query: `TURMOTE,1,MEMORYSTART`  

Description: Set parameter p3 (relay number, internal switch) according to the table in section 4.3.

**SK** Sets a computation constant

Syntax: `SK p1,p2<terminator>`

- **p1**: Constants number
- **p2**: Constant (−9.99999E+29 to −1.0000E−30, 0, 1.0000E−30 to 9.99999E+29, 5 significant digits)

Query: `SK{p1}?`  

Example: Set constants number K01 to 1.0000E−10.

Example: SEK01,1.0000E−10

Description:  
- You can execute this command on models with the M1 math option.
- You cannot execute this command while the MV is measuring or computing.
- Set parameter p1 according to the table in section 4.3.
4.4 Setting Commands (Setting)

Sets rolling average on a computation channel

Syntax

SI p1, p2, p3, p4<terminator>

p1: Computation channel number
p2: Moving average ON/OFF
p3: Sampling interval (1S, 2S, 3S, 4S, 5S, 6S, 10S, 12S, 15S, 20S, 30S, 1MIN, 2MIN, 3MIN, 4MIN, 5MIN, 6MIN, 10MIN, 12MIN, 15MIN, 20MIN, 30MIN, 1H)

p4: Number of samples (1 to 1500)

Query

SI[ p1]?

Example

Set the computation channel 107 rolling average to ON, the sampling interval to 1 minute, and the number of samples to 20.

SI107, ON, 1MIN, 20

Description

- You can execute this command on models with the /M1 math option.
- If p2 is set to OFF, do not specify p3 or p4.
- Set the sampling interval greater than or equal to the scan interval.

Sets a TLOG timer

Syntax

SJ p1, p2, p3, p4, p5<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

p5: Timer type

TIMES
MATCHTIME

Query

SJ[ p1]?

Example

Set timer 1 to computation channel number 110. Do not convert the unit time and enable the reset function.

SJ110, 1, OFF, ON

Description

- You can execute this command on models with the /M1 math option.
- Set parameter p1 according to the table in section 4.3.
- You cannot execute this command while the MV is computing.
- About p3

Because the sampled data is 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 such case, set p3 to the same unit as that of the physical value being measured.

The integrated value is found according to the following converting equations that depend on the parameter:

OFF: (measured value)

/S: (measured value) × scan interval

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

/H: (measured value) × scan interval/3600

The scan interval unit is seconds.

Sets the ancillary operation of the start key

Syntax

TX p1<terminator>

p1: Computation operation (OFF, START, RESET+START)

Query

TX?

Example

Configure the MV so that the start key also starts computation.

TXSTART

Sets the FIFO buffer acquisition interval

Syntax

FR p1<terminator>

p1: FIFO acquisition interval (25MS, 125MS, 250MS, 500MS, 1S, 2S, 5S)

Query

FR?

Example

Set the FIFO acquisition interval to 1 s.

FR1, 1S

Description

- Set the acquisition interval to a value greater than the scan interval.
- If you set the scan interval to a value greater than the acquisition interval with the XV command or from the screen, the acquisition interval is automatically set equal to the scan interval.
- The MV has a circular FIFO (First In First Out) buffer. The MV acquires measured/computed values to the internal memory at given time intervals after the power is turned ON and transmits the data when a FF command is received. The previous output position is held for each connection. Upon receiving an FF command, the MV transmits the next data and updates the output position. 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 dropouts if the measurement PC reads the data before the ring buffer is overwritten. For the output flow diagram of FIFO data, see appendix 5.
4.4 Setting Commands (Setting)

BH  Sets a batch text field
Syntax  BH p1,p2,p3,p4< terminate >
 p1  1
 p2  Field number (1 to 8)
 p3  Field title (up to 20 characters)
 p4  Field characters (up to 30 characters) Field title (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 1.

EH  Sets a calibration correction
If p2 is set to BEGIN
Syntax  EH p1,p2,p3< terminate >
 p1  Measurement channel number
 p2  Type of operation (BEGIN)
 p3  Number of break points in the calibration segment (OFF, 2 to 16)
OFF  Calibration OFF
 2 to 16  Number of break points
If p2 is set to SET
Syntax  EH p1,p2,p3,p4,p5< terminate >
 p1  Measurement channel number
 p2  Type of operation (SET)
 p3  Break point designation (1 to 16)
 p4  True value of the specified break point
 p5  Measured value of the specified break point
Description  •  Set parameter p1 according to the table in section 4.3.
  •  The selectable range of p4 and p5 varies depending on the current set range.
  •  If set to scale range, the selectable range of p4 and p5 is -30000 to 30000.
  •  Set true value p4 so that the value increases as break point p3 increases.

If p2 is set to END
Syntax  EH p1,p2< terminate >
 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 this command with the type of operation set to BEGIN to specify the number of break points.

BD  Sets an alarm delay
Syntax  BD p1,p2< terminate >
 p1  Measurement, computation, or external input channel number
 p2  Alarm delay (1 to 3600) [s]
Query  BD[ p1 ]?
Example  Set the channel 001 alarm delay to 120 s.
      BD001,120
Description  Set parameter p1 according to the table in section 4.3.

SM  Sets the custom menu
To set the main menu
Syntax  SM p1,p2,p3,p4,p5,p6,p7,p8,p9< terminate >
 p1  Type (DISP_MAIN)
 p2  to p9  Menu items to be displayed
      The menu items are displayed in the specified order.
      Only the specified menu items are displayed.
      TREND
      DIGITAL
      BAR
      OVERVIEW
      INFORMATION
      TRENDHISTORY
      LOG
      4PANEL
      ESC
      EXPAND
      SEPARATOR
Example  Set the first menu item to TREND and the second menu item to TRENDHISTORY.
      SM0DISP_MAIN,TREND,TRENDHISTORY,
Description  •  If you omit parameters p2 and subsequent parameters, all menus items will be hidden.
  •  A command error will occur if you specify the same menu item multiple times.
  •  You can specify up to three separators. If you specify more than three, an error will occur.
  •  You cannot omit parameters by using delimiters (.).
  •  4PANEL is available only on the RD-MV2000.
  •  If you set the first menu item to SEPARATOR, it will be ignored.
4.4 Setting Commands (Setting)

To set a 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 items to be displayed in the submenu
The items are displayed in the specified order.
Only the specified menu items are displayed.

If p2 is TREND [select from the items below]

GROUP1-GROUP36  Group designation
ALL_CHANNEL  All channel display
SCALE  Scale display
DIGITAL  Digital display
MESSAGE_DISP  Message display
TREND_SPACE  Trend space
AUTO  Auto switching
EXPAND
SEPARATOR
FINE_GRID  Fine grid ON/OFF
AUTO_ZONE  Auto zone display/normal display

If p2 is DIGITAL [select from the items below]

GROUP1-GROUP36  Group designation
AUTO  Auto switching
EXPAND
SEPARATOR

If p2 is BAR [select from the items below]

GROUP1-GROUP36  Group designation
AUTO  Auto switching
EXPAND
SEPARATOR

If p2 is TRENDHISTORY [select from the items below]

GROUP1-GROUP36  Group designation
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
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 historical display
TO_HISTORY_D  To historical (display)
TO_HISTORY_E  To historical (event)
TO_OVERVIEW  To overview display
SORT_KEY  Switch the sort key
SORT_ORDER  Switch the sort order
DISP_ITEM  Switch Date/Username
DATA_KIND  Switch the data type
DATE/FILE  Switch Date/Filename
SELECT_SAVE  Select save
REPORT_SAVE  Switch the report channel display
ALL_SAVE  Save manual sample
MANUAL_SAVE  Save report
REPORT  Select a group
REPORT_GROUP1-GROUP4  Select a report group on the FID-MV1000
REPORT_GROUP1-GROUP6  Select a report group on the FID-MV2000

If p2 is LOG [select from the items below]

LOGIN_LOG  Login log
ERROR_LOG  Error log
COMM_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

If p2 is 4PANEL [select from the 5 items below]

4PANEL1-4PANEL4  4 panel designation
SEPARATOR

Example
Display SCALE and DIGITAL for the first and second submenu items under the TREND main menu item.

SM DISP_SUB,TREND,SCALE,DIGITAL
4.4 Setting Commands (Setting)

Description
- Selectable items for p3 and subsequent
parameters vary depend on the p2 setting.
- If you omit parameters p3 and subseqent
parameters, all menus items will be hidden.
- A command error will occur if you specify the
same menu item multiple times.
- You can specify up to three separators. If you
specify more than three, an error will occur.
- You cannot specify EXPAND for LOG and
4PANEL.
- You cannot omit parameters by using
delimiters (,).
- If you execute SM DISP_SUB?, the MV also
transmits submenus of main menu items that
are turned Off.
- If you set the first menu item to SEPARATOR,
it will be ignored.
- The Show/Hide setting for the group
designation parameters, GROUP1 to
GROUP36, and the auto switching parameter,
AUTO, are applied universally to Trend,
Digital, Bar Graph, and Historical Trend. (For
example, if you set AUTO to Hide for Trend
and then set AUTO to Show for Digital, AUTO
will be set to Show for Trend, Digital, Bar
Graph, and Historical Trend.)

To set the function menu

<table>
<thead>
<tr>
<th>p1</th>
<th>Type (FUNC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p2-p28</td>
<td>Menu items to be displayed</td>
</tr>
</tbody>
</table>

The menu items for the functions you select
from below are displayed in the specified order.

Only the specified menu items are displayed.
ALARM_ACK 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_AACK Math data dropout
acknowledge
KEYLOCK Enable/disable key
lock
LOGOUT
PASSWORD_CHANGE
EMAIL_START/STOP
EMAIL_TEST
FTP_TEST

Example
Display FREE MESSAGE and SNAPSHOT for the first and second function menu items.
SMFUNC,FREE_MESSAGE,SNAPSHOT

Description
- A command error will occur if you specify the
same menu item multiple times.
- You cannot specify SEPARATOR.
- You cannot omit parameters by using
delimiters (,).
- You cannot hide LOGOUT, if it is not included
in the parameters, it is displayed as the last
menu item.

Query
SM ?
- To query all menu items
SM DISP_MAIN?
- To query all main menu items
SM DISP_SUB?
- To query all submenu items
SM DISP_SUB,TREND?
- To query the Trend submenu items
SM FUNC?
- To query all function menu items

SY Sets the 4 panel display
Syntax
SY p1,p2,p3,p4,p5,p6,p7,p8,p9,p10,
p1<terminator>

p1 1
p2 Screen number (1 to 4)
p3 Screen group name (up to 16 characters)
p4 Screen 1 type
TREND Trend display
DIGITAL Digital display
BAR Bar graph display
OVERVIEW

SYSP
MEDIA_EJECT Eject the storage
medium
SYSTEM_INFO System information
NETWORK_INFO Network information
TEXT_FIELD Text field display
4PANEL
JUMP_DISPLAY Register the home
display
RATE_CHANGE Display rate 1/display
rate 2
FAVORITE_REGISTER Register as favorite
SAVE_STOP Stop the save
operation
TIMER_RESET
PAUSE_DISPLAY Stop the monitor
LCD_SAVER Backlight saver
MATCH_T_RESET Reset the single
match timer
4.4 Setting Commands (Setting)

**ALARM** Alarm summary
**MESSAGE** Message summary
**MEMORY** Memory summary
**MODBUS-M** Modbus master status display
**MODBUS-C** Modbus client status display
**RELAY** Relay status display
**REPORT** Report display
**COLUMN_BAR** Stacked bar graph

p5 Group number to be displayed on screen 1
p6 Screen 2 type (see p4)
p7 Group number to be displayed on screen 2
p8 Screen 3 type (see p4)
p9 Group number to be displayed on screen 3
p10 Screen 4 type (see p4)
p11 Group number to be displayed on screen 4

Query: SY{p1, [p2]}

**Example** Set screen number 1 as follows:

4 panel name: TEMP

Screen 1: Trend display, group 1
Screen 2: Digital display, group 3
Screen 3: Alarm summary
Screen 4: 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 or COLUMN_BAR is valid only on models with the /M1 MATH option.

**NF** Sets the HISTORY key function

**Syntax** NF p1,p2,p3<terminator>

**p1** Key function

- **HISTORY** Use as a key to move the historical trend display
- **FAVORITE** Use as a favorite key

**p2** Display group number registered in the favorite function
- Valid when p1 is set to FAVORITE
- **SAVED** Displays the screen in the registered group
- **CURRENT** Displays the screen in the current displayed group

**p3** Time axis zoom registered in the favorite function
- Valid when p1 is set to FAVORITE
- **SAVED** Displays the screen using the registered time axis zoom
- **CURRENT** Displays the screen using the current time axis zoom

**Query** NF?

**Example** Use the HISTORY key as a favorite key and display the screen in the current displayed group using the current time axis zoom.

**NF**FAVORITE, CURRENT, CURRENT

**Description** Parameter p2 and p3 settings are valid only when the key function (p1) is set to FAVORITE.

**TY** Sets the file format

**Syntax** TY p1,p2

**p1** File format
- **TEXT** Saves files in text format
- **BINARY** Saves files in binary format

**Query** TY?

**Example** Save files in text format.

**TY** TEXT

**Description**
- You can specify the file format for display data and event data files.
- The ways you can save files whose file format can be specified are auto save, save unsaved data, manual save, and FTP data transfer.
- If you are using a communication command to transmit a data file in the internal memory, it is transmitted in binary format regardless of the file format setting.

- If you are using a communication command to transmit a data file on an external storage medium, it is transmitted in the format that the file is stored on the external storage medium.
- If the MV is operating as an FTP server and you retrieve a data file in the internal memory via FTP, the data will be in binary format regardless of the file format setting. If you are retrieving a data file on an external storage medium, the file will be in the format that the file is stored in the external storage medium.
- If the MV is operating as an FTP client and you retrieve a data file in the internal memory or a data file on an external storage medium via FTP, the MV transmits the file in the specified format.
4.5 Setting Commands (Control)

**BT**

Sets a batch name

**Syntax**

\[
\text{BT p1,p2,p3<terminator>}
\]

- \( p1 \) Batch number (up to 32 alphanumeric characters)
- \( p2 \) Batch number (up to 32 alphanumeric characters)
- \( p3 \) Lot number (up to 8 digits)

**Query**

\[ \text{BT[p1]} \]

**Example**

Set the batch name configuration to batch number PRESSSLINE and lot number 007.

\[ \text{BT1, PRESSSLINE, 007} \]

**BU**

Sets a batch comment

**Syntax**

\[
\text{BU p1,p2,p3<terminator>}
\]

- \( p1 \) Screen switch (2)
- \( p2 \) Screen 1 type (see SY (Sets the four panel display))
- \( p3 \) Screen 2 type (see SY (Sets the four panel display))
- \( p4 \) Group number to be displayed on screen 1
- \( p5 \) Group number to be displayed on screen 2
- \( p6 \) Group number to be displayed on screen 3
- \( p7 \) Group number to be displayed on screen 4

**To change to 4 panel display**

**Syntax**

\[
\text{UD p1,p2,p3,p4,p5,p6,p7,p8,p9<terminator>}
\]

- \( p1 \) Screen switch (2)
- \( p2 \) Screen 1 type (see SY (Sets the four panel display))
- \( p3 \) Screen 2 type (see SY (Sets the four panel display))
- \( p4 \) Group number to be displayed on screen 1
- \( p5 \) Group number to be displayed on screen 2
- \( p6 \) Group number to be displayed on screen 3
- \( p7 \) Group number to be displayed on 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, TREN, 1, TREN, 2, TREN, 3, TREN, 4

**Description**

This setting is valid on the RD-MV2000.

**UD**

Switches the display

To switch back to the display that was shown before you started to change the settings with communication commands

**Syntax**

\[
\text{UD p1<terminator>}
\]

- \( p1 \) Screen switch (0)

**Example**

Switch back to the display that was shown before you started to change the settings with communication commands.

\[ \text{UDD} \]

**To change to one screen display**

**Syntax**

\[
\text{UD p1,p2,p3<terminator>}
\]

- \( p1 \) Screen switch (1)
- \( p2 \) Display item

**TREND**  Trend display
**DIGITAL**  Digital display
**BAR**  Bar graph display
**OVERVIEW**  Overview display
**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 display
**COLUMN_BAR**  Stacked bar graph
- \( p3 \) Group number

**Example**

Set the display to one screen trend display and set the group number to 4.

\[ \text{UD1, TREN, 4} \]

**Description**

- The setting p2=MODBUS-M is valid only if the serial interface protocol is set to MODBUS-M.
- The setting p2=REPORT or CO, L UM, BAR is valid only on models with the /M1 MATH option.

To display the specified 4 panel number

**Syntax**

\[
\text{UD p1,p2<terminator>}
\]

- \( p1 \) Display type (3)
- \( p2 \) 4 panel configuration number

**Example**

Display the specified 4 panel configuration screen 1-4.

**To set the operation screen switching**

**Syntax**

\[
\text{UD p1,p2,p3,p4,p5,p6,p7<terminator>}
\]

- \( p1 \) Screen switch (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

**Example**

Enable the automatic display switching, switch to the group display, set the scale display to ON, and set the digital display to OFF.

\[ \text{UD4, ON, GROUP, ON, OFF} \]
### 4.5 Setting Commands (Control)

#### PS
**Starts/stops measurements**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>PS p1&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>p1: Measurement start/stop</td>
</tr>
<tr>
<td></td>
<td>0: Start</td>
</tr>
<tr>
<td></td>
<td>1: Stop</td>
</tr>
</tbody>
</table>

**Example:**

Start measurement.

**PS0**

**Description:** When the MV starts measuring, it records the display, event, and report data to the internal memory.

#### AK
**Releases the alarm output (alarm acknowledge)**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>AK p1&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1: Alarm acknowledge execution (0)</td>
<td></td>
</tr>
</tbody>
</table>

**Example:**

Release the alarm output (execute alarm acknowledge).

**AK0**

#### EV
**Executes manual sample, manual trigger, snapshot, or forced timeout**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>EV p1&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1: Operation type</td>
<td></td>
</tr>
<tr>
<td>0: Execute manual sampling.</td>
<td></td>
</tr>
<tr>
<td>1: Activate a manual trigger.</td>
<td></td>
</tr>
<tr>
<td>2: Take a snapshot.</td>
<td></td>
</tr>
<tr>
<td>3: Expire the display data timer.</td>
<td></td>
</tr>
<tr>
<td>4: Expire the even data timer.</td>
<td></td>
</tr>
</tbody>
</table>

**Example:**

Execute manual sampling.

**EV1**

**Description:** EV1 is valid only when the key trigger is set to ON with the TE command (sets sampling conditions of the event data). It functions the same as the key trigger.

#### CL
**Executes manual SNTP**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>CL p1&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1: Manual SNTP execution (0)</td>
<td></td>
</tr>
</tbody>
</table>

**Example:**

Synchronize the clock manually.

**CL0**

#### CV
**Switches the trend update rate**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>CV p1&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1: Display rate (0.1)</td>
<td></td>
</tr>
<tr>
<td>0: Switch to the primary trend update rate (standard rate)</td>
<td></td>
</tr>
<tr>
<td>1: Switch to the secondary trend update rate</td>
<td></td>
</tr>
</tbody>
</table>

**Example:**

Change the trend update rate to the secondary trend update rate.

**CV1**

#### MS
**Writes a message (displays and writes)**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>MS p1,p2,p3&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1: Message number (1 to 100)</td>
<td></td>
</tr>
<tr>
<td>p2: Destination where messages will be written</td>
<td></td>
</tr>
<tr>
<td>GROUP Specify a single group</td>
<td></td>
</tr>
<tr>
<td>ALL All groups</td>
<td></td>
</tr>
<tr>
<td>p3: Group number</td>
<td></td>
</tr>
</tbody>
</table>

**Example:**

Write the message number 8 message 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 you omit p2, the message is written to all groups.

#### BJ
**Writes a free message**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>BJ p1,p2,p3,p4&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1: Message number (1 to 10)</td>
<td></td>
</tr>
<tr>
<td>p2: Message (up to 32 characters)</td>
<td></td>
</tr>
<tr>
<td>p3: Destination type where messages will be written</td>
<td></td>
</tr>
<tr>
<td>GROUP Specify a single group</td>
<td></td>
</tr>
<tr>
<td>ALL All groups</td>
<td></td>
</tr>
<tr>
<td>p4: Destination where messages will be written</td>
<td></td>
</tr>
<tr>
<td>If p3 is set to GROUP: Group number</td>
<td></td>
</tr>
</tbody>
</table>

**Example:**

Use message number 3 and write the word "ALARM" to all groups.

**BJ3,ALARM,ALL**

**Description:** If you omit p3, the message is written to all groups.

#### EJ
**Changes the login password**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>EJ p1,p2,p3&lt;terminator&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>p1: Old password (up to eight alphanumeric characters)</td>
<td></td>
</tr>
<tr>
<td>p2: New password (up to eight alphanumeric characters)</td>
<td></td>
</tr>
<tr>
<td>p3: New password (up to eight alphanumeric characters)</td>
<td></td>
</tr>
</tbody>
</table>

**Example:**

Change the old password "PASS001" to the new password "WORD005."

**EJ,PASS001,WORD005,WORD005**
4.5 Setting Commands (Control)

**TL**

Starts, stops, resets computation (MATH) or 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 computation.

**TL0**

**Description**
- You cannot execute this command while setup data is being saved or loaded.
- You can execute this command on models with the /M1 math option.

**DS**

Switches the execution mode between operation and basic setting

**Syntax**

DS p1<terminator>

- p1 Event type
  - 0 Operation Mode
  - 1 Basic Setting Mode

**Example**

Set the mode to Basic Setting Mode.

**DS1**

**Description**
- You cannot set p1 to 1 while the MV is measuring or computing, while the MV is formatting an external storage medium, or while the MV is saving data to an external storage medium.
- You cannot set p1 to 0 while the MV is formatting an external storage medium or while the MV is saving data to an external storage medium.
- To activate the settings that are changed with the basic setting commands, you must save the settings with the XE command. Make sure to save the settings with the XE command before changing from Basic Setting Mode to Operation Mode. Otherwise, new settings will not take effect.
- If you execute the DS command while the screen display is stopped, the monitor will resume.

**LO**

Loads setup data

**Syntax**

LO p1,p2<terminator>

- p1 File name (up to 32 characters)
- p2 Media designation
  - 0 CF slot
  - 1 USB

**Example**

Load setup data from the setup file SETFILE1. (p1 extension).

**LOSETFILE1**

**Description**
- Do not specify the file name extension.
- If you omit p2, the media designation is set to the CF slot.
- This command loads the setup data of both Setting Mode and Basic Setting Mode.
- This command loads the setup data in the root directory of the specified storage medium.
- You cannot execute this command only if an external storage medium is inserted in the drive.
- You cannot execute this command while the MV is memory sampling.
- Because the MV restarts after executing this command, communications will be dropped.

**LI**

Saves setup data

**Syntax**

LI p1<terminator>

- p1 File name (up to 32 characters)
- p2 Media designation
  - 0 CF slot
  - 1 USB

**Example**

Save the setup data of both the setting and basic setting commands to the file SETFILE2 on a CF card.

**LISETFILE2**

**Description**
- Do not specify the file name extension.
- If you omit p2, the media designation is set to the CF slot.
- The .pdl extension is added to the saved file.
- You cannot execute this command only if an external storage medium is inserted in the drive.

**CM**

Sets 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 $-1.000E-30$, 0, and $1.000E-30$ to $9.9999E+29$.
  Five significant digits.

**Query**

**CM?**

**Example**

Set communication input channel C01 to communication input data 1.000E-10.

**CMC01,1.000E-10**

**Description**
You can execute this command on models with the /M1 math option.

**CE**

Enters data in an external input channel

**Syntax**

CE p1,p2<terminator>

- p1 External input channel number
- p2 Data value ($-30000$ to $30000$)

**Query**

**CE{ p1}?**

**Example**

Set external input channel number 440 to 12345.

**CER440,12345**

**Description**
You can execute this command on models with the /MC1 external input channel option.
4.5 Setting Commands (Control)

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.
EM
Description To use the e-mail transmission function, you must set the Ethernet interface, e-mail addresses, and contents to be transmitted.

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

BV Enters characters
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-F7 Soft keys 1 to 7
    ESC ESC key
    MENU MENU key
    FUNC FUNC key
    START START/STOP key
    HISTORY HISTORY key
    USER USER key
    T/DIV T/DIV key
    0-9 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.
KE DISP
Description Operates in the same way as the keys on the MV. For a key sequence, transmit the commands in the same order that you would press the keys on the MV.

YC Clears measured/computed data and initializes setup data
Syntax YC p1<terminator>
  p1 Type of data to be cleared
    0 Clear measured/computed data
    2 Clear measured/computed data
    and initialize setup data
Example

IR Resets the relative timer
Syntax IR p1<terminator>
  p1 Timer number to be reset
  0 All timers
  1-4 Timer number 1 to 4
Example

MA Resets a match timer
Syntax MA p1
  p1 Match timer number to be reset (1 to 4)
Example Reset match timer number 3.
MA3
Description • An error will occur if the timer operation of the
  match timer is set to repeat.
  • Nothing will occur if the single match timer has not expired.

NR Sets the trend update rate
Syntax NR p1,p2<terminator>
  p1 1
  p2 Trend update rate [div] (15S, 30S, 1MIN, 2MIN, 5MIN, 10MIN, 15MIN, 20MIN, 30MIN, 1H, 2H, 4H, 10H)
Query NR[p1,p2]?
Example Set the trend update rate to 5 min/division.
NR1, 5MIN
Description • You cannot set the trend update rate if the
  memory data type is event + display.
  • The logging number is fixed to 1.
  • Set the data update rate and auto save rate first with the SW command and then set the
    trend update rate with the NR command.
4.6 Basic Setting Commands

**WO** Sets alarm and DO settings

**To 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 low limit on the rate-of-change (1 to 32)
p4 Interval for the high limit on the rate-of-change (1 to 32)
p5 Alarm status indicator hold/nonhold
   HOLD
   NONHOLD
```

**To 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-Sxx Specify S01 to Sxx
   xx = (02 to 30)
```

**To 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-Ixx Specify I01 to Ixx
   xx = (02 to 36)
p3 Energize/De-energize the relay
   DE_ENERGIZE
   ENERGIZE
   p4 Relay hold/nonhold
      NONHOLD
      HOLD
      p5 Relay action on ACK
         NORMAL
         RESET
```

**For computation channels**

Syntax

```
WH p1,p2<terminator>
p1 Channel type (MATH)
p2 High and low limit alarm hysteresis (0 to 50)
```

**For external input channels**

Syntax

```
WH p1,p2<terminator>
p1 Channel type (EXTERNAL)
p2 High and low limit alarm hysteresis (0 to 50)
```

**Query** WH[p1]?

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

WHMEASURE, 40, 0

**Description** You can set alarm settings on computation channels on models with the /M1 math option. You can set alarm settings on external input channels on models with the /MC1 external input channel option.

**XV** Sets the scan interval

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.

```
XVNORMAL, 1
```

**Description** The combinations of scan interval modes and scan intervals vary depending on the model. See the RD-MV1000/RD-MV2000 User’s Manual (IM RD-MV1000-01E) for details. You can set p4 to 600Hz when the scan interval is set to fast sampling mode. You can set p4 to 100ms when the scan interval is set to 2s or 5s.

**XB** Sets the burnout detection

Syntax

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

**Query** XB[p1]?

Example

Set the measured result to UP (+over) if a burnout is detected on channel 001.

```
X3001,UP
```

**Description** Set parameter p1 according to the table in section 4.3.
4.6 Basic Setting Commands

**XJ** Sets an RJC

To use the internal compensation circuit

Syntax  
\[ XJ \ p1, p2<\text{terminator}> \]
- \( p1 \): Measurement channel number
- \( p2 \): Reference junction compensation designation (INTERNAL)

Query  
\[ XJ? \]
Example  
Set the channel 001 RJC to the internal compensation circuit.
\[ XJ001, \text{INTERNAL} \]

To use an external RJC

Syntax  
\[ XJ \ p1, p2, p3<\text{terminator}> \]
- \( p1 \): Measurement channel number
- \( p2 \): Reference junction compensation designation (EXTERNAL)
- \( p3 \): External RJC value (-20000 to 20000)

Query  
\[ XJ? \]
Example  
Set the channel 002 RJC to external and set the compensation value to 0 \( \mu \text{V} \).
\[ XJ002, \text{EXTERNAL}, 0 \]

Description  
- Set parameter \( p1 \) according to the table in section 4.3
- The unit of parameter \( p3 \) is \( \mu \text{V} \).

**WU** Sets environment settings

Setup items: GENERAL, BATCH, DISPLAY, MESSAGE, INPUT, ALARM, SECURITY, MEDIA, MATH, REPORT, SERVICE REPORT, DECIMAL POINT, POP3

General environment settings

Syntax  
\[ WU \ p1, p2, p3<\text{terminator}> \]
- \( p1 \): Setting type (GENERAL)
- \( p2 \): Tag/channel number selection
  - \( \text{TAG} \)
  - \( \text{CHANNEL} \): Channel number
- \( p3 \): Language
  - \( \text{ENGLISH} \)
  - \( \text{JAPANESE} \)
  - \( \text{CHINESE} \)
  - \( \text{GERMAN} \)
  - \( \text{FRENCH} \)
  - \( \text{KOREAN} \)

Example  
Select tag display and set the language to English.
\[ WU, \text{GENERAL}, \text{TAG}, \text{ENGLISH} \]

To set the batch function

Syntax  
\[ WU \ p1, p2, p3, p4<\text{terminator}> \]
- \( p1 \): Setting type (BATCH)
- \( p2 \): Batch function ON/OFF
- \( p3 \): Number of lot number digits (OFF, 4, 6, 8)
- \( p4 \): Auto increment ON/OFF

Description  
Parameters \( p3 \) and \( p4 \) are valid only when \( p2 \) is ON.

To set the display

Syntax  
\[ WU \ p1, p2<\text{terminator}> \]
- \( p1 \): Setting type (DISPLAY)
- \( p2 \): Trend type (T-Y)
- \( p3 \): Partial expansion ON/OFF
- \( p4 \): Trend update rate switching ON/OFF

To set message settings

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

To set the input

Syntax  
\[ WU \ p1, p2<\text{terminator}> \]
- \( p1 \): Setting type (INPUT)
- \( p2 \): Detection of values exceeding the scale
  - \( \text{FREE} \): When the measurement range is exceeded
  - \( \text{OVER} \): When \( \pm 105\% \) of the scale is exceeded

To set alarm settings

Syntax  
\[ WU \ p1, p2<\text{terminator}> \]
- \( p1 \): Setting type (ALARM)
- \( p2 \): Alarm suppression function ON/OFF

To set security settings

Syntax  
\[ WU \ p1, p2, p3<\text{terminator}> \]
- \( p1 \): Setting type (SECURITY)
- \( p2 \): Keys
  - \( \text{OFF} \): Disable security
  - \( \text{KEYLOCK} \): Lock the keys
  - \( \text{LOGIN} \): Enable the login function
- \( p3 \): Communication
  - \( \text{OFF} \): Disable security
  - \( \text{LOGIN} \): Enable the login function

Set media settings

Syntax  
\[ WU \ p1, p2, p3<\text{terminator}> \]
- \( p1 \): Setting type (MEDIA)
- \( p2 \): Auto save function ON/OFF
- \( p3 \): Media FIFO ON/OFF

Example  
Use media FIFO.
\[ WU, \text{MEDIA}, \text{ON}, \text{ON} \]

Description: Parameter \( p3 \) is valid only when \( p2 \) is ON.
4.6 Basic Setting Commands

To set computation settings
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
            the computed error
    SKIP   Discard the data that overflowed
    LIMIT  Process the data as follows:
            • High or low limit value in
              the measurement range for
              measurement channels that do
              not use linear scaling
            • High or low limit value in
              the scaled range for measure-
              ment channels that use linear
              scaling
            • High or low limit value
              in the specified span for
              measurement channels
  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

To set report settings
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  Sum value
    INST Instantaneous value
  p3 Report computation type 2
    OFF Disable report computation
    MAX  Maximum value
    MIN  Minimum value
    AVE  Average value
    SUM  Sum value
    INST Instantaneous value
  p4 Report computation type 3
    Same as p3.
  p5 Report computation type 4
    Same as p3.
  p6 Generation of "hourly," "daily," "weekly," and
    "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 (1 to 65535)
  p3 Web service port (1 to 65535)
  p4 SNTP service port (1 to 65535)
  p5 Modbus service port (1 to 65535)
Query  WU [p1]?

To set the decimal type
Syntax  WU p1,p2
  p1 Setting type (DECIMALPOINT)
  p2 Decimal type
    POINT  Set the decimal to a period
    COMMA Set the decimal to a comma
Query  WU [p1]?
Example  Set the decimal to a comma.
WU DECIMALPOINT,COMMA
Description  The specified decimal type is applied to the
following items.

<table>
<thead>
<tr>
<th>Items That the Decimal Type Setting Applies To</th>
<th>Detailed Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>File output</td>
<td>Display data file</td>
</tr>
<tr>
<td></td>
<td>Event data file</td>
</tr>
<tr>
<td></td>
<td>Manual sample file</td>
</tr>
<tr>
<td></td>
<td>Report data file</td>
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<tr>
<td>Display</td>
<td>Trend display (digital display, scale display)</td>
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<tr>
<td></td>
<td>Digital display</td>
</tr>
<tr>
<td></td>
<td>Bar graph display</td>
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<tr>
<td></td>
<td>Overview</td>
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<td>4 panel display</td>
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<td>Report display</td>
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<tr>
<td>Web screen All channel information display</td>
<td></td>
</tr>
<tr>
<td>E-mail Instantaneous data</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Report data</td>
</tr>
</tbody>
</table>

• The specified decimal type is not applied to the following items.

<table>
<thead>
<tr>
<th>Items That the Decimal Type Setting Does Not Apply To</th>
<th>Detailed Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>File output Setup file</td>
<td></td>
</tr>
<tr>
<td>Setup display Spans, scale, and alarm settings for</td>
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<tr>
<td>Computation constant</td>
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<td>Hysteresis value (fixed decimal place)</td>
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<tr>
<td>Communication Command and response syntax for</td>
<td></td>
</tr>
<tr>
<td>communication commands</td>
<td></td>
</tr>
</tbody>
</table>

• The decimal for items that the decimal type setting does not apply to is displayed with a period.

To set POP3 parameters
Syntax  WU p1,p2,p3
  p1 Setting type (POP3)
  p2 Number of seconds until sending e-mail to
    the SMTP server (0 to 10)
  p3 POP3 login method
    PLAIN  Plain password
    APOP  APOP password
4.6 Basic Setting Commands

**XM**
Sets the memory sample condition

**Syntax**
\[ XM \ p1<\text{terminator}>\]
- \( p1 \) 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
\[ XM\text{DISPLAY} \]

**RF**
Sets the key lock function

**p1=KEY**

**Syntax**
\[ RF \ p1,p2,p3,p4,p5,p6,p7<\text{terminator}>\]
- \( p1 \) Type (KEY)
- \( p2 \) START/STOP key (FREE, LOCK)
- \( p3 \) HISTORY key (FREE, LOCK)
- \( p4 \) MENU key (FREE, LOCK)
- \( p5 \) USER key (FREE, LOCK)
- \( p6 \) DISP/ENTER key (FREE, LOCK)
- \( p7 \) T/DIV key (FREE, LOCK)

**p1=FUNC (function keys)**

**Syntax**
\[ RF \ p1,p2,p3,p4,p5,p6,p7,p8<\text{terminator}>\]
- \( p1 \) Type (FUNC)
- \( p2 \) Alarm acknowledge (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**
\[ RF \ p1,p2,p3<\text{terminator}>\]
- \( p1 \) Type (MEDIA)
- \( p2 \) External storage media operation (FREE, LOCK)
- \( p3 \) Load setup (FREE, LOCK)

**Query**
\[ RF[ \ p1] ? \]
**Example**
Lock the MENU key (leave other keys unlocked).
\[ RFKEY,FREE,FREE,LOCK,FREE,FREE,FREE \]

**RN**
Sets basic login settings

**Syntax**
\[ RN \ p1,p2<\text{terminator}>\]
- \( p1 \) Auto logout (OFF, 1MIN, 2MIN, 5MIN, 10MIN)
- \( p2 \) Operation when logged out
  - OFF: Disable the MV operation
  - DISPLAY: Allow only display-related operations

**Query**
\[ RN ? \]
**Example**
Set the auto logout time to 1 minute, and disable the MV operation when logged out.
\[ RN1MIN,OFF \]

**RP**
Sets login and user limitations

**Syntax**
\[ RF \ p1,p2,\cdots<\text{terminator}>\]
- \( p1 \) User limit number (1 to 10)
- \( p2 \) User limit item (KEY, FUNC, MEDIA)

**Description**
Parameters \( p3 \) and subsequent parameters vary depending on the \( p2 \) setting as follows:

**p2=KEY**
- \( p3 \) START/STOP key (FREE, LOCK)
- \( p4 \) HISTORY key (FREE, LOCK)
- \( p5 \) MENU key (FREE, LOCK)
- \( p6 \) USER key (FREE, LOCK)
- \( p7 \) DISP/ENTER key (FREE, LOCK)
- \( p8 \) T/DIV key (FREE, LOCK)

**p2=FUNC (function keys)**
- \( p3 \) Alarm acknowledge (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)**

**Syntax**
\[ RF \ p1,p2,p3<\text{terminator}>\]
- \( p2 \) User limit item (MEDIA)
- \( p3 \) External storage media operation (FREE, LOCK)
- \( p4 \) Load setup (FREE, LOCK)

**Query**
\[ RF[\ p1] ? \]
**Example**
Limit access to the external storage medium and the loading of setup data.
\[ RF\ MEDIA,LOCK,LOCK \]

**Description**
If key lock is enabled, setup data cannot be loaded. You can place limitations on the loading of setup data for users that are logged in.
4.6 Basic Setting Commands

RO   Sets report types and generation times

To specify no report types
Syntax  RO p1<terminator>
   p1 Report type (OFF)
Query  RO?
Example Set the report to none.
   ROOFF
Description You can execute this command on models with the /M1 math option.

To specify hourly, daily, hourly+daily, or daily+monthly reports
Syntax  RO p1,p2,p3<terminator>
   p1 Report type
       HOUR Hourly report
       DAY Daily report
       HOUR+DAY Hourly and daily reports
       DAY+MONTH Daily and monthly reports
   p2 Date of generation (dd)
       dd Day (01 to 28)
   p3 Time of generation (hh)
       hh Hour (00 to 23)
Query  RO?
Example Generate a daily report at hour 9 everyday (parameter p2 "05" in this example) is invalid in this case.
   RODAY,05,09
Description • You can execute this command on models with the /M1 math option.
• Parameter p2 is discarded if it is specified for reports other than monthly and daily reports.

To specify daily+weekly reports
Syntax  RO p1,p2,p3<terminator>
   p1 Report type
   p2 Day of generation (SUN, MON, TUE, WED, THU, FRI, SAT)
   p3 Time of generation (hh)
       hh Hour (00 to 23)
Query  RO?
Example Generate a daily report at hour 9 every day and a weekly report at hour 9 every Tuesday.
   ROAWEK,TUE,09
Description You can execute this command on models with the /M1 math option.

RM   Sets a report channel

To use a report channel
Syntax  RM p1,p2,p3,p4<terminator>
   p1 Report channel number
   p2 Report channel ON/OFF (ON)
   p3 Measurement, computation, or external input channel number to be reported
   p4 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.
       /DAY Convert as though the physical values are integrated in units of days.
Query  RM[ p1]?
Example Use report channel number R01. Set the channel number for generating reports to 001 and convert the units of the summed value to seconds.
   RMR01,ON,001,/S
Description • You can execute this command on models with the /M1 math option.
• Set parameters p1 and p3 according to the table in section 4.3.
• About p4
Because the sampled data is 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 such case, set p4 to the same unit as that of the physical value being measured. The integrated value is found according to the following converting equations that depend on the parameter.
   OFF □ (measured value)
   /S □ (measured value) × scan interval
   /MIN □ (measured value) × scan interval/60
   /HOUR □ (measured value) × scan interval/3600
   /DAY □ (measured value) × scan interval/86400
The scan interval unit is seconds.

XG   Sets the time zone

Syntax  XG p1,p2<terminator>
   p1 Offset time from GMT (−1300 to 1300)
       Upper 2 digits: Hour (00 to 13)
       Lower 2 digits: Minute (00 to 59)
   p2 Time deviation limit (OFF, 10S, 20S, 30S, 1MIN, 2MIN, 3MIN, 4MIN, 5MIN)
4.6 Basic Setting Commands

**Example**
Set the offset time from the GMT to 9 hours ahead and the deviation limit to 30 s.
XGO:900, 30S

**XN**
Sets the date format

**Syntax**
XN pl<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 host information

**Syntax**
YB pl, p2<terminator>
p1 Host name (up to 64 characters)
p2 Domain name (up to 64 characters)

**Query**
YB?

**Example**
Set the host name to RD-MV1000 and the domain name to mvadv.daqstation.com.
YBmv1000, mvadv.daqstation.com

**YD**
Sets network settings

**To not automatically obtain network parameters**

**Syntax**
YD pl, p2, p3<terminator>
p1 Automatic allocation (NOT)

**To automatically obtain network parameters**

**Syntax**
YD pl, p2, p3<terminator>
p1 Automatic allocation (USE)
p2 Obtain DNS info (USE, NOT)
p3 Automatic host name registration (USE, NOT)

**Query**
YD?

**Example**
Set the IP address to auto allocation, get 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 with this command take effect when you save the settings with the XE command and power-cycle the MV.

---

**YK**
Sets the keepalive feature

**Syntax**
YK pl<terminator>
p1 Keepalive ON/OFF

**Query**
YK?

**Example**
Disable keepalive.
YKOFF

**Description**
The settings specified with this command take effect when you save the settings with the XE command and power-cycle the MV.

---

**RU**
Sets DNS parameters

**To set server parameters**

**Syntax**
RU pl, 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)

**Query**
RU [ pl ]?

**Example**
Set domain suffix 1 to rec1.daqstation.com and domain suffix 2 to rec2.daqstation.com.
RUSUFFIX, rec1.daqstation.com, rec2.daqstation.com

---

**WS**
Sets a server

**Syntax**
WS pl, p2<terminator>
p1 Server type (FTP, WEB, MODBUS, SNTP)
p2 Server usage (USE, NOT)

**Query**
WS [ p1 ]?

**Example**
Enable the Web server.
WSWEB, USE
4.6 Basic Setting Commands

**WW** Sets the Web homepage

**Syntax**
WW p1,p2,p3,p4<terminator>

- **p1** Homepage type
  - OPERATOR Operator page
  - MONITOR Monitor page

- **p2** Homepage ON/OFF

- **p3** Authentication
  - OFF No authentication
  - ADMIN Administrator privileges
  - USER User privileges

- **p4** Command input (USE, NOT)

**Query**
ww[ p1 ]?

**Example**
Enable the operator page, disable the authentication, and enable command input.

**Description**
- Parameter p3 and p4 are valid when p2 is ON.
- Parameter p4 is valid when p1 is set to OPERATOR.

**YQ** Sets the application timeout

**To not use the timeout feature**

**Syntax**
YQ p1<terminator>

**Query**
YQ?

**Example**
Disable timeout.

**Description**
The settings specified with this command take effect when you save the settings with the XE command and power-cycle the MV.

**To use the timeout feature**

**Syntax**
YQ p1,p2<terminator>

- **p1** Application timeout (ON)
- **p2** Timeout value [minutes] (1 to 120)

**Query**
YQ?

**Example**
Enable the application timeout and set the timeout value to 3 min.

**Description**
The settings specified with this command take effect when you save the settings with the XE command and power-cycle the MV.

**YT** Sets the FTP transfer timing

**Syntax**
YT p1,p2,p3<terminator>

- **p1** Auto transfer when display and event data files are generated (ON/OFF)
- **p2** Auto transfer when report data files are generated (ON/OFF)
- **p3** Auto transfer when snapshot data files are generated (when snapshot is executed) (ON/OFF)

**Query**
YT?

**Example**
Auto transfer display and event data files. Do not transfer report data files. Do not transfer image data files.

**Description**
If the method to save data to an external storage medium is set to Auto, the MV automatically transfers data files as they are generated. For media storage settings, see the RD-MV1000/RD-MV2000 User’s Manual.

**YU** Sets the contents to be sent via e-mail

**To send 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** Recipient 1 ON/OFF
- **p3** Recipient 2 ON/OFF
- **p4** Alarm transmission of alarm number 1 ON/OFF
- **p5** Alarm transmission of alarm number 2 ON/OFF
- **p6** Alarm transmission of alarm number 3 ON/OFF
- **p7** Alarm transmission of alarm number 4 ON/OFF
- **p8** Include instantaneous data ON/OFF
- **p9** Include source URL ON/OFF
- **p10** Subject (up to 32 alphanumeric 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. Set the subject to “ALM” and header 1 to “LP2.”

**Description**
YUALARM, ON, OFF, ON, ON, ON, ON, ON, ON, ON, ON, OFF, AL M, L P 2

**To send 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** Recipient 1 ON/OFF
- **p3** Interval for sending e-mail to recipient 1 (1H, 2H, 3H, 4H, 6H, 8H, 12H, 24H)
- **p4** Time when e-mail is sent to recipient 1 (00:00 to 23:59)
- **p5** Recipient 2 ON/OFF
- **p6** Interval for sending e-mail to recipient 2 (1H, 2H, 3H, 4H, 6H, 8H, 12H, 24H)
- **p7** Time when e-mail is sent to recipient 2 (00:00 to 23:59)
- **p8** Include instantaneous data ON/OFF
- **p9** Include source URL ON/OFF
- **p10** Subject (up to 32 alphanumeric characters)
- **p11** Header 1 (up to 64 characters)
- **p12** Header 2 (up to 64 characters)

**Query**
YU( p1 )?

**Example**
Send e-mail at 17 hours 15 minutes every day to recipient 1. Do not include instantaneous data but include the source URL. Set the subject to “GOOD” and header 1 to “LP2.”

**Description**
YUTEIME, ON, 24H, 17:15, OFF,, OFF, ON, GOOD, L P 2
4.6 Basic Setting Commands

**To send system notifications**

Syntax

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

- **p1**: Transmitted content (SYSTEM)
- **p2**: Recipient 1 ON/OFF
- **p3**: Recipient 2 ON/OFF
- **p4**: Include source URL ON/OFF
- **p5**: Subject (up to 32 alphanumeric characters)
- **p6**: Header 1 (up to 64 characters)
- **p7**: Header 2 (up to 64 characters)

Query

```
YW? p1?
```

Example

Send system notification e-mail messages including the source URL to recipient 1. Set the subject to “SystemAlert” and header 1 to “LP2.”

```
YUSYSTEM,ON,OFF,ON,SystemAlert,LP2
```

**Description**
- For the contents of system notifications, see section 2.3.
- Report generation notification can be used on models with the /M1 math option.
- For e-mail settings, see section 2.3.

**YX**

Sets the e-mail SMTP server name

Syntax

```
YX p1,p2,p3<terminator>
```

- **p1**: SMTP server name (up to 64 characters)
- **p2**: Port number (0 to 65535)
- **p3**: Authentication
  - OFF: No authentication
  - POPBEFORESMTP: Execute POP Before SMTP

Query

```
YX?
```

Example

Set the SMTP server to “smtp.daqstation.com,” the port number to “25,” and execute POP Before SMTP.

```
YX smtp.daqstation.com,25,POPBEFORESMTP
```

**Description**
- For e-mail settings, see section 2.4.

**YJ**

Sets a Modbus client destination server

Syntax

```
YJ p1,p2,p3,p4,p5<terminator>
```

- **p1**: Server number (1 to 16)
- **p2**: Port number (0 to 65535)
- **p3**: Host name (up to 64 characters)
- **p4**: Unit number registration
  - AUTO: 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 RD-MV2000, the unit number registration to FIXED, and the unit number to 127.

```
YJ3,502,RD-MV2000,FIXED,127
```

**YV**

Sets e-mail recipient addresses

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 “mvuser1@daqstation.com” and “mvuser2@daqstation.com.”

```
YV1,mvuser1@daqstation.com mvuser2@daqstation.com
```

**Description**
- To set multiple recipients, separate each recipient with a space.
- For e-mail settings, see section 2.3.
### 4.6 Basic Setting Commands

#### 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 minutes.
```
YP500MS,10MIN
```

#### YR  Sets a Modbus client transmission command

**Syntax**
```
YR p1, p2, p3...<terminator>
p1  Command number (1 to 16)
p2  Command type (OFF, R, R-M, W, W-M)
```

**Description** Parameters p3 and subsequent parameters vary depending on the p2 setting as follows:

**If p2 is OFF**
There are no parameters after p2.

**If p2 is R [read into external input channels]**
```
p3  First channel (external input channel number)
p4  Last channel (external input channel number)
p5  Server number (1 to 16)
p6  First register number (30001 to 39999, 40001 to 49999, 30001 to 365536, 400001 to 465536)
p7  Register data type (INT16, UINT16, INT32_, B, INT32_L, UINT32_B, UINT32_L)
```

**If p2 is R-M [read into communication input channels]**
```
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, 30001 to 365536, 400001 to 465536)
p7  Register data type (INT16, UINT16, INT32_, B, INT32_L, UINT32_B, UINT32_L, FLOAT_, B, FLOAT_L)
```

**If p2 is W [write measurement channels]**
```
p3  First channel (Measurement channel number)
p4  Last channel (Measurement channel number)
p5  Server number (1 to 16)
p6  First register number (40001 to 49999, 400001 to 465536)
p7  Register data type (INT16, FLOAT_B, FLOAT_L)
```

#### WB  Sets SNTP client settings

**Syntax**
```
WB p1, p2, p3, p4, p5, p6<terminator>
p1  SNTP client function usage (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)
```

**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
```

---

**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 will occur if the valid range of registers indicated in p6 is exceeded.
4.6 Basic Setting Commands

**YS**  Sets serial interface parameters

**Syntax**

\( \texttt{R} \ p_1,p_2,p_3,p_4,p_5,p_6<\text{terminator}> \)

- \( p_1 \) Baud rate (1200, 2400, 4800, 9600, 19200, 38400)
- \( p_2 \) Data length (7, 8)
- \( p_3 \) Parity check (ODD, EVEN, NONE)
- \( p_4 \) Handshaking (OFF:OFF, XON:XON, XON:RS, RS:RS)
- \( p_5 \) RS-422/485 address (01 to 99)
- \( p_6 \) Protocol (NORMAL, MODBUS, MODBUS-M)

**Query**

\( \texttt{RS?} \)

**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.

**Description**

The settings specified with this command take effect when you save the settings with the XE command and power-cycle the MV.

You can execute this command on models with the /C2 or /C3 serial interface option.

**YM**  Sets a Modbus master transmission command

**To not assign a command**

**Syntax**

\( \texttt{YM p_1,p_2<\text{terminator}>} \)

- \( p_1 \) Registration number (1 to 16)
- \( p_2 \) Command ON/OFF (OFF)

**Query**

\( \texttt{YM} \ [p_1]? \)

**Example**

Do not assign a command to command registration number 1.

**YM,OFF**

**To set a command for reading data into external input channels**

**Syntax**

\( \texttt{YM p_1,p_2,p_3,p_4,p_5,p_6,p_7<\text{terminator}>} \)

- \( p_1 \) Registration number (1 to 16)
- \( p_2 \) Command type (R)
- \( p_3 \) First channel number (external input channel number)
- \( p_4 \) Last channel number (external input channel number)
- \( p_5 \) Slave device address (1 to 247)
- \( p_6 \) First register number (30001 to 39999, 40001 to 49999, 30001 to 365535, 40001 to 465535)
- \( p_7 \) Type of data assigned to the register (INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L)

**Query**

\( \texttt{YM} \ [p_1]? \)

**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) on the slave device at address 5 into MV external input channels 201 to 203.

**YM,R,201,203,5,30002,INT32_B**

**To set a command for reading data into communication input channels**

**Syntax**

\( \texttt{YM p_1,p_2,p_3,p_4,p_5,p_6,p_7<\text{terminator}>} \)

- \( p_1 \) Registration number (1 to 16)
- \( p_2 \) Command type (R-M)
- \( p_3 \) First channel number (communication input channel number)
- \( p_4 \) Last channel number (communication input channel number)
- \( p_5 \) Slave device address (1 to 247)
- \( p_6 \) First register number (30001 to 39999, 40001 to 49999, 30001 to 365535, 40001 to 465535)
- \( p_7 \) Type of data assigned to the register (INT16, UINT16, INT32_B, INT32_L, UINT32_B, UINT32_L, FLOAT_B, FLOAT_L)

**Query**

\( \texttt{YM} \ [p_1]? \)

**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) on the slave device at address 5 into MV communication input channels C02 to C05.

**YM,R-M,C02,C05,5,30003,INT32_B**
4.6 Basic Setting Commands

To set a command for writing measurement channels

**Syntax**

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

- **p1**: Registration number (1 to 16)
- **p2**: Command type (W)
- **p3**: First channel 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, FLOAT_B, FLOAT_L)

**Query**

YM[ p1 ]?

**Example**

Register the following command in command registration number 3: Write the measured data of channels 003 to 006 to registers 40003 to 40006 on the slave device at address 7.

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

To set a command for writing computation channels

**Syntax**

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

- **p1**: Registration number (1 to 16)
- **p2**: Command type (W-M)
- **p3**: First channel number (computation channel number)
- **p4**: Last channel number (computation channel number)
- **p5**: Slave device address (1 to 247)
- **p6**: First register number (40001 to 49999, 400001 to 465535)
- **p7**: Type of data assigned to the register (INT16, UINT16, INT32_B, INT32_L, FLOAT_B, FLOAT_L)

**Query**

YM[ p1 ]?

**Example**

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

YM5,W-M,101,105,5,40003,INT16

**Description**

- You can execute this command on models with the IC2 or IC3 serial interface option.
- You can use this command when the serial interface protocol is set to Master. For serial interface settings, see section 2.3.
- The settings specified with this command take effect when you save the settings with the XE command and power-cycle the MV.

To set a command for writing floating type data into Modbus registers

**Syntax**

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

- **p1**: Command number (1 to 16)
- **p2**: Command type
  - W: Write data from measurement channels
  - W-M: Write data from computation channels

**Example**

YM2,W-M,Write data from measurement channels

**Description**

- First channel number
  - Measurement channel number (1 to 48) if p2 is set to W
  - Computation channel number (101 to 124) if p2 is set to W-M

- Last channel number (1 to 48)
  - Measurement channel number (1 to 48) if p2 is set to W
  - Computation channel number (101 to 124) if p2 is set to W-M

- Server number (1 to 16)

- First register number (40001 to 49999, 400001 to 465535)

- Register data type
  - INT16: 16-bit signed integer
  - UINT16: 16-bit unsigned integer
  - INT32_B: 32-bit signed integer (Big Endian)
  - INT32_L: 32-bit signed integer (Little Endian)
  - FLOAT_B: 32-bit floating point (Big Endian)
  - FLOAT_L: 32-bit floating point (Little Endian)

**Example**

Using command number 1, write the data from measurement channels 1 to 16 to the registers at server number 3 starting from register number 40001 in 32-bit floating point format (Big Endian).

YM1,W,1,16,3,40001,FLOAT_B

**Query**

YM[ p1 ]?

**Description**

- The selectable range of the first channel number (p3) and last channel number (p4) varies depending on the model.

**WR**

Sets the instrument information output

**Syntax**

WR p1,p2,p3,p4<terminator>

- **p1**: Memory/Media state ON/OFF
- **p2**: Self diagnosis ON/OFF
- **p3**: Communication error ON/OFF
- **p4**: Memory stop ON/OFF

**Query**

WR[ ]?

**Example**

Output various information.

WRON,ON,ON

**XE**

Activates 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**

To activate the settings that are changed with the basic setting commands, you must save the settings with the XE command. Make sure to save the settings with the XE command before changing from Basic Setting Mode to Operation Mode. Otherwise, new settings will not take effect.
4.6 Basic Setting Commands

**YE**

Activates Basic Setting Mode (cold reset)

**Syntax**

YE pl<terminator>

- **pl** Setting activation
  - **STORE** Start by saving the basic settings
  - **ABORT** Start without saving basic settings

**Example**

Start by saving the basic settings.

YESTORE

---

4.7 Output Commands (Control)

**BO**

Sets the byte output order

**Syntax**

BO pl<terminator>

- **pl** Byte order
  - 0 Transmits the data MSB first.
  - 1 Transmits the data LSB first.

**Query**

BO?

**Example**

Output the data MSB first.

BO0

**Description**

This command applies to the byte order of numeric data for BINARY output.

---

**CS**

Sets the checksum

**Syntax**

CS p1<terminator>

- **p1** Checksum usage
  - 0 Not calculate (value fixed to zero)
  - 1 Calculate

**Query**

CS?

**Example**

Enable (calculate) the checksum.

CS1

**Description**

You can only use this command for 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**

See chapter 6 for details.

---

**CC**

Disconnects the Ethernet connection

**Syntax**

CC p1<terminator>

- **p1** Disconnection (0)

**Example**

Disconnect the connection.

CC0
4.7 Output Commands (Control) / 4.8 Output Commands (Setting/Measured/Computed Data Output)

CB
Sets the data output format
Syntax
CB p1<terminator>
p1 Output format
0 Standard output (including the data of SKIP and OFF channels)
1 Do not output the data of SKIP and OFF channels
Description
- This setting is independent for each connection.
- This command only affects the communication section and has no effect on the front panel settings.
- Valid range of commands

<table>
<thead>
<tr>
<th>Output data</th>
<th>Corresponding command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instantaneous data (binary)</td>
<td>FD1, FF</td>
</tr>
<tr>
<td>Instantaneous data (ASCII)</td>
<td>FD0</td>
</tr>
<tr>
<td>Decimal place and unit information (ASCII)</td>
<td>FE1</td>
</tr>
<tr>
<td>Setup channel information (binary)</td>
<td>FE5</td>
</tr>
<tr>
<td>Configured alarm output (binary)</td>
<td>FE6</td>
</tr>
</tbody>
</table>

Note
Initialization of BO/CS/IF/CB command settings
- For serial communications
  Settings entered using the BO/CS/IF/CB commands revert to their default values when the MV is reset (when the MV is power cycled or the user exits from Basic Setting Mode).
  - Byte output order, checksum, data output format: 0
  - Status filter: 255, 255, 255
  If you reset the MV, specify these settings again.
- For Ethernet communications
  Settings entered using the BO/IF/CB commands revert to their default values when the connection to the MV is dropped. After reconnecting the MV, specify the settings again.

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

FC
Transmits screen image data
Syntax
FC p1<terminator>
p1 GET (Output the screen image data)
Example
Output screen image data from the MV.
FCGET
Description
Captures the current MV screen and transmits the data in PNG format.

FE
Transmits setup data
Syntax
FE p1,p2,p3<terminator>
p1 Output data type
0 Setting commands setup data
1 Decimal place and unit information
2 Basic setting commands setup data
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 setting commands setup data of channels 001 to 005 from the MV.
FE2,001,005
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 4.3.

FD
Transmits most recent measured/computed data
Syntax
FD p1,p2,p3<terminator>
p1 Output data type
0 Output the most recent measured/computed/external input data in ASCII format
1 Output the most recent measured/computed/external input data in binary format
6 Output relay status and internal switch status
p2 First channel number (measurement/computation/external input channel)
p3 Last channel number (measurement/computation/external input channel)
Example
Output from the MV the most recent measured/computed data of channels 001 to 005 in ASCII format.
FD0,001,005
4.8 Output Commands (Setting/Measured/Computed Data Output)

**FF*** Transmits FIFO data

**Syntax**

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

**p1** Operation type
- **GET** Transmit the next block
- **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** RD-MV1004/RD-MV2008/RD-MV1008
- **60** Models with the /MC1 external input channel option

The measured/computed/external input data is less than the specified number of blocks, the MV transmits the available data.

**Example**

- Transmit two blocks of FIFO data from channels 1 to 10.
  - **FF** p001,010,02

**Description**

- The most recent measured/computed data corresponds to the most recent measured/computed data in the internal memory when the MV 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.
- Parameters **p2** and **p3** are valid when **p1** is set to 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 4.3.

**FL*** Transmits a log, alarm summary, or message summary

**Syntax**

```
FL p1,p2<terminator>
```

**p1** Log type
- **COM** Communication
- **FTP** 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
- **1-200** Parameter **p1** is COM or MODBUS
- **1-1000** Parameter **p1** is ALARM
- **1-450** Parameter **p1** is MSG
- **1-50** Parameter **p1** is some type other than those above

**Example**

- Transmit the 10 most recent operation error logs.
  - **FL** p001,10

**Description**

- Transmits the log that is stored in the MV.
- If **p2** is omitted, the MV transmits all written logs.

**IS*** Transmits status information

**Syntax**

```
IS p1<terminator>
```

**p1** Status information output
- **0** Status information 1 to 4
- **1** Status information 1 to 8

**Example**

- Transmit status information 1 to 4.
  - **IS**

**Description**

- The output status can be masked using the status filter (IF command). For details on the status information, see chapter 6.

**FU*** Transmits the user level

**Syntax**

```
FU p1<terminator>
```

**p1** User information output
- **0** Information about the user currently logged in
- **1** Information about the user logged into a general-purpose service

**Example**

- Transmit information about the user logged into a general-purpose service.
  - **FU**
### 4.8 Output Commands (Setting/Measured/Computed Data Output)

**FA**  
**Transmits 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**  
**Transmits data stored on an external storage medium or internal memory**

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

- **p1** Operation type
  - **DIR** Transmit 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** Transmits the subsequent file list after the file list is transmitted by using the DIR command. The number of transmitted lists is the p3 value specified with the DIR command. If you execute this command after all lists have been output, the MV transmits the following data.
    - **EACPRT**
    - **ENCPRRT**
  - **CHKDSK** Checks the disk. Transmits the free space on the external storage medium.

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

- **p3** Maximum number of files from the list to be transmitted (1 to 1000)
  - If omitted, the MV transmits the entire file list in the specified directory.

**Example**  
- Transmit the list of all files in the DRV0 directory.
  - MEDIR,/DRV0/
- Transmit a list of 10 files in the DRV0 directory.
  - MEDIR,/DRV0/10
- Transmit the data in the file 72615100.DAD in the DRV0/DATA0 directory.
  - MGGET,/DRV0/DATA0/72615100.DAD

**Description**  
- Parameter p2 is valid when p1 is set to DIR, GET, DEL, or CHKDSK.
- Parameter p3 is valid when p1 is set to DIR.
- If an error occurs during data transmission, you can retransmit the data by setting p1 to RESEND.

**Path Name Specifications**
- The first level directories are as follows:
  - Path that starts with /MEMO/DATA/  
  - Internal memory
  - Path that starts with /DRV0/ External storage medium
- Path names are case-sensitive.
- You can access files whose name is less than or equal to 48 characters in 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/ anc /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 you specify ab01.*ef1, ab001. ef1 and ab002. ef1 are selected.
  - If you specify ab001.e*1, ab001. ef1 and ab001. ef2 are selected.

**MO**  
**Manipulates or transmits data stored in the internal memory**

**Syntax**  
MO p1,p2,p3<terminator>

- **p1** Operation type
  - **DIR** Data list output
  - **GET** Data output
  - **SIZE** Data size output

- **p2** Output data type
  - **MANUAL** Manually sampled data
  - **REPORT**

- **p3** Specified file name

**Example**  
Transmit report data from the MV.

MO,GET,REPORT

**Description**  
Parameter p3 is valid when p1 is set to GET or SIZE.
4.9 Output Commands (RS-422/485 Commands)

**ESC O**

Opens an instrument

The ASCII code for ESC is 1BH. See appendix 3 for details.

**Syntax**

ESC O p1<terminator>

p1 Instrument address (01 to 99)

**Example**

Open the instrument at address 99, and enable all commands.

ESC 099

**Description**

- Specifies the address of the instrument to communicate with.
- You can only open one instrument.
- When you open an instrument with the ESC O command, another instrument that is currently open is automatically closed.
- When the MV receives this command normally, the MV transmits the data “ESC O
  ■ ■”
- Normally, either CR+LF or LF can be used for the terminator in communication commands. However, the terminator for this command must be set to CR+LF.

**ESC C**

Closes an instrument

The ASCII code for ESC is 1BH. See appendix 3 for details.

**Syntax**

ESC C p1<terminator>

p1 Instrument address (01 to 99)

**Example**

Close the instrument with the address 77.

ESC C77

**Description**

- Releases the connection with the instrument.
- When the MV receives this command normally, the MV transmits the data “ESC C
  ■ ■”
- Normally, either CR+LF or LF can be used for the terminator in communication commands. However, the terminator for this command must be set to CR+LF.

4.10 Output Commands (Special Response Commands)

**I**

Transmits instrument information

**Syntax**

$I<terminator>

**Description**

Transmits the maker, model, serial number, and firmware version in a comma-separated ASCII text with a terminator at the end.

**Example**

Omega, RD-MV1000, 99AA0123, Fl. 01
4.11 Maintenance/Test Commands (available when using the maintenance/test server function via the Ethernet interface)

**close**
Disconnects the connection between other instruments

**Syntax**
close, p1, p2; p3<terminator>
- `p1`: MV port (1 to 65535)
- `p2`: PC IP address (0.0.0.0 to 255.255.255.255)
- `p3`: PC port (0 to 65535)

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

**Description**
You cannot use this command to disconnect a server port. You cannot use this command to disconnect a port of an instrument that is being controlled. Use the quit command for this purpose.

**con**
Transmits connection information

**Syntax**
con<terminator>

**Example**
con

**net**
Transmits network statistics

**Syntax**
net<terminator>

**Example**
net

**help**
Displays help

**Syntax**
help [{pl}<terminator>
- `p1`: Command name

**Example**
help

**EAT**

**Network Status**

- **APP**: Power on time = 08/00/00 12:34:56
- **APP**: disable
- **APP**: gendrops = 0
- **APP**: ftepsdr = 0
- **TCP**: keepalive = 30 s
- **TCP**: connects = 14
- **TCP**: closed = 0
- **TCP**: timeout = 0
- **TCP**: sendtotal = 33
- **TCP**: snbyte = 0
- **TCP**: sendbytes = 0
- **TCP**: recvtotal = 0
- **TCP**: recvbytes = 0
- **DLC**: collision = 0

**TCP**: keepalive
- Keepalive check cycle.

**TCP**: connects
- Total number of connections established.

**TCP**: closed
- Total number of closed connections.

**TCP**: timeout
- Total number of dropped connections due to TCP retransmission timeout. When the transmitted packet is not received, the MV retransmits the packet at given time intervals. If the packet is not received after 14 retransmissions, a timeout occurs, and the MV drops the connection.
TCP: keepdrops
Total number of dropped connections due to TCP keepalive timeout.

TCP: sendtotal
Total number of sent packets.
TCP: sendbyte
Total number of sent bytes.
TCP: sendretransmitpack
Total number of retransmitted packets.
TCP: sendretransmitbyte
Total number of retransmitted bytes.
TCP: recvtotal
Total number of received packets.
TCP: recvbyte
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 a packet simultaneously. The tendency for collisions to occur increases when the network is congested. "16 collisions" refer to 16 consecutive collision incidents.

quit
Disconnects the connection to the instrument that is being controlled

Syntax
quit<terminator>

4.12 Instrument Information Output Commands
(available when using the instrument information server function via the Ethernet interface)

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

| Port number | 34264/udp |
| Data format | ASCII |
| Receive buffer size | 128 |
| Send buffer size | 512 |
| Maximum number of parameters | 32 |

In the command packet, list the parameters for the information you want to query.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>serial</td>
<td>Queries the serial number</td>
</tr>
<tr>
<td>host</td>
<td>Queries the host name. (The host name specifier in section 3.2)</td>
</tr>
<tr>
<td>ip</td>
<td>Queries the IP address. (The IP address specifier in section 3.2)</td>
</tr>
</tbody>
</table>

Example
Query the IP address and host name. (The first box below shows the command packet. The second box shows the response packet.)

```
ip host
```

```
EA
ip = 192.168.111.24
host = MV1000-1
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 exceeding the number of maximum parameters (32) are ignored.
5.1 Response Syntax

The following table shows the types of responses for various commands described in the previous chapter.

The MV returns a response (affirmative/negative response) to a command that is delimited by a terminator. The controller should follow the one command to one response format. If the command-response rule is not observed, the operation is not guaranteed.

<table>
<thead>
<tr>
<th>Commands</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group</td>
</tr>
<tr>
<td>Setting commands</td>
<td>Setting</td>
</tr>
<tr>
<td>Control</td>
<td></td>
</tr>
<tr>
<td>Basic Setting commands</td>
<td>Control</td>
</tr>
<tr>
<td>Output commands</td>
<td>Setup, measured, and computed data output</td>
</tr>
<tr>
<td></td>
<td>RS-422/485</td>
</tr>
<tr>
<td></td>
<td>Special response commands</td>
</tr>
</tbody>
</table>

* For details on the responses of the instrument information server function, see section 5.4.
  For details on responses to special commands, see section 4.10.

**Note**
“CRLF” used in this section denotes carriage return line feed.

Affirmative Response

If a command is processed normally, the MV returns an affirmative response.

- Syntax
  
  `EOCRLF`

- Example
  
  `EO`

Single Negative Response

If a command fails to be processed normally, the MV returns a single negative response.

- Syntax
  
  `EL_nnn_mmm...mCRLF`

  - `nnn` Error number (001 to 999)
  - `mmm...m` Message (variable length, one line)

- Example
  
  `EL 001 "System error"

Multiple Negative Responses

- If there is an error in any of the multiple commands that are separated by sub delimiters, the MV returns multiple negative responses.
- The MV transmits a response for each command that causes an error.
- If there are multiple commands that have errors, the MV transmits negative responses separated by commas.
- The error position numbers are assigned in order to the series of commands. The first command is assigned the number 1.
5.1 Response Syntax

- **Syntax**
  
  - E\_ee:nnnCRLF
    
    (When there is only one error)
  
  - E\_ee:nnn,ee:nnn,\ldots,ee:nnnCRLF
    
    (When there are multiple errors)
  
  ee       Error position (01 to 10)
  nnn      Error number (001 to 999)
  _        Space

- **Example**
  
  E2 02:001

**Text Output**

For information about text data types and data formats, see section 5.2.

- **Syntax**
  
  E\_ACRLF
  
  - - - - - - - - CRLF
  
  :  
  
  - - - - - - - - CRLF
  
  E\_NCRLF

**Binary Output**

**Conceptual Diagram**

- **Binary header** (12 bytes)
  
  - Data length
  
  - Flag
  
  - ID
  
  - Header sum

- **Binary data**

- **Binary footer** (2 bytes)
  
  - Data sum

**EBCRLF**

Indicates that the data is binary.

**Data Length**

The number of bytes in "flag + identifier + header sum + binary data + data sum."

**Header Sum**

The sum value of "data length + flag + identifier."

**Binary Value**

For information about output formats of various data types, see section 5.3.
5.1 Response Syntax

Data SUM

The sum value of the binary data.

Note

The MV transmits the data length in the binary header section according to the byte order that is specified with the BO command.

Flag

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name (Abbreviation)</th>
<th>Flag 0</th>
<th>Flag 1</th>
<th>Meaning of the Flag</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>BO</td>
<td>MSB</td>
<td>LSB</td>
<td>Output byte order</td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>No</td>
<td>Yes</td>
<td>Checksum availability</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>END</td>
<td>Middle</td>
<td>End</td>
<td>In the middle of or at the end of continuous data</td>
</tr>
</tbody>
</table>

- When the BO flag is 0, the MV transmits the high byte first. When the BO flag is 1, the MV transmits the low byte first.
- If checksum is enabled (parameter = 1) using the CS command parameter, a sum value is inserted in the header sum and data sum sections. If checksum is disabled (parameter = 0), a zero is inserted in the header sum and data sum sections. For a sample function that calculates the sum value, see “Calculating the Sum Value” on the next page.
- If the amount of data to be transmitted in response to an ME command is large, the MV may not be able to transmit all the data in one output request (parameter GET). If this happens, the END flag is set to 0. You must request for subsequent data (parameter NEXT) until the END flag becomes 1.
- The bits whose name and flag are indicated as "--" are not used. Their values are undefined.

ID

An ID number indicating the binary data type. The table below indicates the data types and the corresponding output commands. Binary data files that are not indicated in the table below are considered undefined files.

<table>
<thead>
<tr>
<th>ID Number</th>
<th>Binary Data Type</th>
<th>Type</th>
<th>Format</th>
<th>Output Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Undefined file</td>
<td>File (* . *)</td>
<td>-</td>
<td>MR</td>
</tr>
<tr>
<td>1</td>
<td>Instantaneous data</td>
<td>Data</td>
<td>Yes</td>
<td>FF</td>
</tr>
<tr>
<td>2</td>
<td>FIFO data</td>
<td>Data</td>
<td>Yes</td>
<td>FF</td>
</tr>
<tr>
<td>3</td>
<td>Screen data file</td>
<td>File (* . PNG)</td>
<td>-</td>
<td>ME, FC</td>
</tr>
<tr>
<td>4</td>
<td>Display data file (binary)</td>
<td>File (* . DAE)</td>
<td>-</td>
<td>ME</td>
</tr>
<tr>
<td>5</td>
<td>Event data file (binary)</td>
<td>File (* . DAE)</td>
<td>-</td>
<td>ME</td>
</tr>
<tr>
<td>6</td>
<td>Manually sampled file</td>
<td>File (* . DAM)</td>
<td>-</td>
<td>ME, MD</td>
</tr>
<tr>
<td>7</td>
<td>Report file</td>
<td>File (* . DAR)</td>
<td>Yes</td>
<td>ME, MD</td>
</tr>
<tr>
<td>8</td>
<td>Setup data file</td>
<td>File (* . PDL)</td>
<td>No</td>
<td>ME, FE4</td>
</tr>
<tr>
<td>9</td>
<td>Configured channel information output</td>
<td>Data</td>
<td>Yes</td>
<td>FE5</td>
</tr>
<tr>
<td>10</td>
<td>Configured alarm information output</td>
<td>Data</td>
<td>Yes</td>
<td>FE6</td>
</tr>
<tr>
<td>11</td>
<td>Display data file (text)</td>
<td>File (* . TDC)</td>
<td>Yes</td>
<td>MI</td>
</tr>
<tr>
<td>12</td>
<td>Event data file (text)</td>
<td>File (* . TDE)</td>
<td>Yes</td>
<td>MI</td>
</tr>
</tbody>
</table>

Yes: Disclosed. No: Undisclosed. --: Common format.

- The table above shows the different types of binary data.
- There are two binary data types: data and file.

- Data
  - You can transmit measured/computed data by using the FD command.
  - You can transmit FIFO data by using the FF command.
  - The data format is disclosed. See section 5.3 for details.
5.1 Response Syntax

- File
  - Display data (binary), event data (binary), and setup data files can be used on the DXA120 DAQSTANDARD that comes with the package. For details, see the DXA120 DAQSTANDARD User's Manual IM04L41B01-61E.
  - Files in a general format can be opened using commercially-sold software programs.
  - Other files are in text format. You can use any text editor to open these files.

Calculating the Sum Value
If you set the CS command parameter to 1 (enabled), the MV transmits the checksum value only during serial communications. The checksum is used in TCP/IP and is derived according to the following algorithm.

Buffer for Calculating the Sum Value
- The header sum is calculated from the data length, flag, and ID (fixed to 6 bytes).
- The data sum 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) indicated in the figure above are summed as unsigned two-byte integers (unsigned short). If the digit overflows, 1 is added. Finally, the result is bit-wise inverted.

Sample Function
Below is a sample function that determines and returns the sum value. Your program can compare the value returned by the sample function with the header sum of the output binary header section and the data sum of the output binary footer section to see if they are correct.

```c
/*
 * Sum Calculation Function (for a 32-bit CPU)
 * Parameter  buff: Pointer to the head of the data for calculating the sum
 *          len: Length of the data for calculating the sum
 * Returned value: The 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 odd. */
    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++;
}
```
5.1 Response Syntax

```c
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/RS-485 Responses

The following table shows RS-422/RS-485 interface commands and their responses.

<table>
<thead>
<tr>
<th>Command Syntax</th>
<th>Description</th>
<th>Response</th>
</tr>
</thead>
</table>
| ESC Cxx CRLF   | Opens a device | • Response from the device with the specified address ESC Cxx CRLF  
|                |             | • No response if the device with the specified address does not exist |
| ESC Cxx CRLF   | Closes a device | • Response from the device with the specified address ESC Cxx CRLF  
|                |             | • No response if the device with the specified address does not exist |

* Possible reasons for not finding a device with the specified address are: (1) there is an error in the command, (2) the specified address does not match the device address, (3) the device is not turned ON, and (4) the device is not connected via the serial interface.

• The "xx" in the table indicates the device address. Specify the address that is assigned to the device in the range of 01 to 99.
• You can only open one device at any given time.
• If a device is opened with the ESC O command, all commands are enabled on the device.
• If 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 for the terminator in communication commands. However, the terminator for these commands must be set to CR+LF.

**Note**

The ASCII code for ESC is 18H. See appendix 1 for details.
5.2 Text Data Output Format

The table below lists the available text data types. This section will explain each format. The table below indicates the data types and the corresponding output commands.

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Corresponding Output Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting data/basic setting data</td>
<td>FLR0, FLR2</td>
</tr>
<tr>
<td>Decimal place and unit information</td>
<td>FLR1</td>
</tr>
<tr>
<td>Measured, computed, and external input data</td>
<td>FLR0</td>
</tr>
<tr>
<td>Relay and internal switch status</td>
<td>FLR6</td>
</tr>
<tr>
<td>Communication log</td>
<td>FLRCom</td>
</tr>
<tr>
<td>FTP client log</td>
<td>FLRFTPC</td>
</tr>
<tr>
<td>Operation error log</td>
<td>FLRERR</td>
</tr>
<tr>
<td>Login log</td>
<td>FLRLOGIN</td>
</tr>
<tr>
<td>Web operation log</td>
<td>FLRWEB</td>
</tr>
<tr>
<td>E-mail log</td>
<td>FLRMAIL</td>
</tr>
<tr>
<td>SNTP access log</td>
<td>FLRSNTP</td>
</tr>
<tr>
<td>DHCP access log</td>
<td>FLRDHCPS</td>
</tr>
<tr>
<td>Modbus communication log</td>
<td>FLRMDBUS</td>
</tr>
<tr>
<td>Alarm summary</td>
<td>FLRALARM</td>
</tr>
<tr>
<td>Message summary</td>
<td>FLRMSG</td>
</tr>
<tr>
<td>Status information</td>
<td>FLRIS, IS1</td>
</tr>
<tr>
<td>Ethernet information</td>
<td>FLRETP</td>
</tr>
<tr>
<td>File list</td>
<td>FLRMEDIR</td>
</tr>
<tr>
<td>Check disk result</td>
<td>FLRMDISK</td>
</tr>
<tr>
<td>Manually sampled data and report data information</td>
<td>FLRMODIR</td>
</tr>
<tr>
<td>User information</td>
<td>FLRFU, FUL</td>
</tr>
</tbody>
</table>

Note: "CRLF" used in this section denotes carriage return line feed.

Setting Data/Basic Setting Data

- The MV returns the setting/basic setting data in response to an FE command.
- The MV returns the data in order as listed in the table in section 4.2, "A List of Commands." However, the MV does not return the setting data for the following commands.
  - Setting commands (setting)
    - SD and FR commands
  - 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.
- The MV returns multiple lines for some commands (for example, commands that are specified for each channel).

- Syntax
  The MV returns the two-character command name and subsequent parameters in the following syntax.

```
REACRLF
```

```
tttss...sCRLF
```

```
ENCRLF
```
### 5.2 Text Data Output Format

- **tt** Command name (SR, SA, , XA, XI, ...)
- **sas...s** Setting/basic setting data (variable length, one line)

#### Example

EA

SR001, VOLT, 20mV, 0, 20
SR002, VOLT, 20mV, 0, 20

---

#### Decimal Place and Unit Information

- The MV returns decimal place and unit information in response to an FE command.
- You can use the CB command to specify whether or not the MV will return the data of measurement channels set to SKIP and computation channels set to OFF.

#### Syntax

The MV returns the data for each channel in the following syntax.

**EACRLF**

s_ccccuuuuuuu, ppCRLF

---

**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 (six characters, left-justified)

mV_____: mV
V______: V
°C___: °C
xxxxxx: (User-defined character string)

**pp** Decimal place (00 to 04)

No decimal (00000) for 00.
One digit to the right of the decimal (0000.0) for 01.
Two digits to the right of the decimal (000.00) for 02.
Three digits to the right of the decimal (00.000) for 03.
Four digits to the right of the decimal (0.0000) for 04.

---

#### Example

EA

N 001mV ,01
N 002mV ,01

---
5.2 Text Data Output Format

Measured, Computed, and External Input Data

- The MV returns measured, computed, and external input data in response to an FD command.
- You can use the CB command to specify whether or not the MV will return the data of measurement channels set to SKIP and computation channels set to OFF.

- Syntax
  The MV returns the data along with the date and time information for each channel in the following syntax.

```plaintext
EACRLF
DATE_yy/mo/ddCRLF
TIME_hh:mm:ss:mmmCRLF
.................................
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: Overflow
  - E: Error
  - B: Burnout
- `ccc` Channel number (3 digits)
  - 001 to 049: Measurement channel
  - 101 to 160: Computation channel
  - 201 to 440: External input channel
- `aa:aa:aa`
  - `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 (six characters, left-justified)
  - `mV`: mV
  - `V`: V
  - `^C`: °C
  - `xxxxxxx`: (User-defined character string)
- `f`  Sign (+, -)
5.2 Text Data Output Format

Mantissa (00000 to 99999, 5 digits)
- Eight digits for computed data.
- For abnormal data (data status is E) or data whose mantissa or
  exponent exceeds the range (data status is O), the mantissa is set to
  99999 (999999999 for computed data).

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
- The MV does not return data for channels that do not exist (not even the channel number).
- For channels set to skip, the values from the alarm status to exponent will be spaces.

Relay and Internal Switch Status
The MV returns the relay status and internal switch status in response to an FD
command.

• 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 RD-MV1000)
EA
I01-I04:1111--
I11-I16:------
I21-I26:------
I31-I36:------
S01-S30:0000000000000000000000000000000
EN
5.2 Text Data Output Format

Communication Log

- The MV returns the communication log in response to an FL command.
- The MV returns logs of setting/basic setting/output commands and responses. The MV retains a maximum of 200 logs. Logs that exceed 200 are cleared from the oldest ones.

- 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 you transmit multiple commands separated by sub delimiters at once, this flag is set to an asterisk. The MV divides the multiple commands into individual commands and stores a log for each command and a log for each 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 MV returns the data as-is, but in some cases, it returns a special message. The special messages are described 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 is disconnected when transmitting data via the Ethernet interface).
  (Time out): Timeout, keepalive, TCP retransmission, etc.
5.2 Text Data Output Format

E1 nnn: Single negative response (where nnn is the error number)
E2 ee:nnn: Multiple negative response (where ee is the error position and nnn is the error number)

- Example
The following example shows the log that is generated when you transmit "B01: ???: PS0" (multiple commands separated by sub delimiters). The commands are separated and returned in order with the multiple command flag "**" attached.

EA
99/05/11 12:31:11 1 12345678901234567890** > B01
99/05/11 12:31:11 1 12345678901234567890** < EO
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** < EO
EN

FTP Client Log

- The MV returns the FTP client log in response to an FL command.
- The MV retains a maximum of 50 file transfer logs. Logs that exceed 50 are cleared from the oldest ones.

- Syntax

\[
\text{EACRLF}
\]

\[
\text{yy/mo/dd hh:mm:ss nnn xxxxxxxxx k ffffffff ⋯ CRLF}
\]

\[
\text{ENCRLF}
\]

\[
\begin{align*}
\text{yy} & \quad \text{Year (00 to 99)} \\
\text{mo} & \quad \text{Month (01 to 12)} \\
\text{dd} & \quad \text{Day (01 to 31)} \\
\text{hh} & \quad \text{Hour (00 to 23)} \\
\text{mm} & \quad \text{Minute (00 to 59)} \\
\text{ss} & \quad \text{Second (00 to 59)} \\
\text{nnn} & \quad \text{Error code (001 to 999)} \\
\text{xxxxxxxx} & \quad \text{Detailed code (nine characters)} \\
\text{k} & \quad \text{Server type (P, S)} \\
\text{P} & \quad \text{Primary} \\
\text{S} & \quad \text{Secondary} \\
\text{fffffff} & \quad \text{File name (up to 51 characters including the extension)} \\
\text{ } & \quad \text{Space}
\end{align*}
\]

- 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
5.2 Text Data Output Format

**Operation Error Log**

- The MV returns the operation error log in response to an FL command.
- The MV retains a maximum of 50 operation error logs. Logs that exceed 50 are cleared from the oldest ones.
- The MV does not return other communication messages (400 to 999) and status messages (500 to 999).

**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 MV returns the log of users that have logged in and logged out in response to an FL command.
- The MV retains a maximum of 50 login/logout logs. Logs that exceed 50 are cleared from the oldest ones.
- If the power goes down while you are logged in, you will be logged out. In this case, however, this logout will not be recorded in the log.

**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)
<table>
<thead>
<tr>
<th>xx</th>
<th>Returns a login history left-justified.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Login:</td>
<td>Login</td>
</tr>
<tr>
<td>Logout:</td>
<td>Logout</td>
</tr>
<tr>
<td>NewTime:</td>
<td>New time</td>
</tr>
<tr>
<td>TimeChg:</td>
<td>Time change</td>
</tr>
<tr>
<td>PowerOff:</td>
<td>Power Off</td>
</tr>
<tr>
<td>PowerOn:</td>
<td>Power On</td>
</tr>
<tr>
<td>TRevStart:</td>
<td>Start of gradual time adjustment</td>
</tr>
<tr>
<td>TRevEnd:</td>
<td>End of gradual time adjustment</td>
</tr>
<tr>
<td>TimeDST:</td>
<td>Switching of the daylight savings time</td>
</tr>
<tr>
<td>SNTPtimeSet:</td>
<td>Time change by SNTP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>nn</th>
<th>Operation property</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY:</td>
<td>Key operation</td>
</tr>
<tr>
<td>COM:</td>
<td>Communication</td>
</tr>
<tr>
<td>REM:</td>
<td>Remote</td>
</tr>
<tr>
<td>ACT:</td>
<td>Event action</td>
</tr>
<tr>
<td>SYS:</td>
<td>System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>uu</th>
<th>User name (up to 20 characters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space</td>
<td></td>
</tr>
</tbody>
</table>

**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 MV returns the log of operations on the Web screen in response to an FL command.
- The MV retains a maximum of 50 operations. Logs that exceed 50 are cleared from the oldest ones.

**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
  - CREATE: File generation
5.2 Text Data Output Format

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

- **Parameter for each event (see below)**
  - When `fffff = SCREEN`
    - `yy/mm/dd hh:mm:ss ffffff_eee ddd ddd nnnnnnn`Screen type
      - TREND: Trend display
      - DIGIT: Digital display
      - BAR: Bar graph display
      - HIST: Historical trend display
      - OV: Overview display
  - `nnn` Group number (01 to 3f)

  - When `fffff = KEY`
    - `yy/mm/dd hh:mm:ss ffffff_eee kkkkkkCRLF`
      - `kkkk` Type of key that was used
      - DISP: DISP/ENTER key
      - UP: Up key
      - DOWN: Down key
      - LEFT: Left key
      - RIGHT: Right key
      - HIST: HISTORY key

  - When `fffff = MSG`
    - `yy/mm/dd hh:mm:ss ffffff_eee mmmm...mCRLF`
      - `mmmm...m` Message (up to 32 characters)

  - When `fffff = CREATE`
    - `yy/mm/dd hh:mm:ss ffffff_eee kkkkkkkkkkCRLF`
      - `kkkkkkkkkk` File type
        - DisplayFile: Display data file
        - EventFile: Event data file

- **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 MV returns the e-mail transmission log in response to an FL command.
- The MV retains a maximum of 50 operations. Logs that exceed 50 are cleared from the oldest ones.

**Syntax**

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

EACRLF
```

- **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)
- **fffff** 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
```
5.2 Text Data Output Format

SNTP Log

- The MV returns the SNTP log in response to an FL command.
- The MV retains a maximum of 50 accesses to the SNTP server.

- Syntax

EACRLF

yy/mo/dd hh:mm:ss nnn_xxxxxxxxxx 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 number (000 to 999)
xxxxxxxxxx Detailed code (nine 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

-

- 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 MV returns the DHCP log in response to an FL command.
- The MV retains a maximum of 50 accesses to the DHCP server.
- **Syntax**

  ```
  EACRLF
  yy/mo/dd_hh:mm:ss_nnnxxxxxxxxCRLF
  ......................
  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)
  - **xxxxxxxx** Detailed code (nine characters)

  Description given in the table.

  - **Space**

The table below shows the contents of the log for normal operation.

<table>
<thead>
<tr>
<th>Error Number</th>
<th>Detail Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>562</td>
<td>ON</td>
<td>Detected that an Ethernet cable was connected.</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Detected that an Ethernet cable was disconnected.</td>
</tr>
<tr>
<td>563</td>
<td>RENEW</td>
<td>Requesting address renewal to the DHCP server.</td>
</tr>
<tr>
<td></td>
<td>RELEASE</td>
<td>Requesting address release to the DHCP server.</td>
</tr>
<tr>
<td>564</td>
<td>RENEWED</td>
<td>Address renewal complete</td>
</tr>
<tr>
<td></td>
<td>EXTENDED</td>
<td>Address release extension request complete.</td>
</tr>
<tr>
<td></td>
<td>RELEASED</td>
<td>Address release complete</td>
</tr>
<tr>
<td>565</td>
<td>IFCONFIG</td>
<td>IP address configured.</td>
</tr>
<tr>
<td>566</td>
<td>NOREQUEST</td>
<td>Configured not to register the host name.</td>
</tr>
<tr>
<td>567</td>
<td>UPDATE</td>
<td>Registered the host name to the DNS server.</td>
</tr>
<tr>
<td>568</td>
<td>REMOVE</td>
<td>Removed the host name from the DNS server.</td>
</tr>
</tbody>
</table>
### 5.2 Text Data Output Format

The table below shows the contents of the log when an error occurs.

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

- **Example**

EA

01/05/11 12:20:00 563 RENEW
01/05/11 12:20:01 564 RENEWED
01/05/11 12:20:01 566 IPCONFIG
01/05/11 12:21:02 567 UPDATE

EN
Modbus Communication Log

- The MV returns the Modbus communication log in response to an FL command.
- The MV retains a maximum of 50 Modbus communication events.

**Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_c_xxxxxxx_kkkk_nn_dCRLF
```

**Explanation**

- `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)
- `xxxxxx`: Even that occurred (seven characters)
  - DROPOUT: Communication could not keep up, and a dropout occurred.
  - ACTIVE: Activated.
  - READY: Command ready state.
  - CLOSE: Disconnected.
  - HALT: Command halted.
- `kkkk`: Detail (four characters)
  - GOOD: Normal operation
  - NONE: No response from the slave device.
  - FUNC: Received a function error.
  - REG1: 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.
- `nn`: Command number (1 to 16, space)
- `d`: Command type (R, W, space)
  - R: Read
  - W: Write
- Space: At command start

**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
5.2 Text Data Output Format

Alarm Summary

- The MV returns the alarm summary in response to an FL command.
- The MV retains a maximum of 1000 alarm events.
  Alarm events that exceed 1000 are cleared from the oldest ones.

- Syntax

```
EACRLF
yy/mo/dd hh:mm:ss kkk ccc ls nnnnnnnnnCRLF
```

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)

  nnnnnnnn 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
```
5.2 Text Data Output Format

Message Summary

- The MV returns the message summary in response to an FL command.
- The MV retains a maximum of 100 messages. Messages that exceed 100 are cleared from the oldest ones.

**Syntax**

EACRLF

```
yy/mo/dd_hh:mm:ss_mmm..._ggg..._zzz_uuu..._nnn...CRLF
```

EACRLF

- **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 padded when the number of characters is less than 32 characters.)
- **ggg...** Message write destination group (11 characters)
  - **xx,xx,xx,xx:** Displays groups that have message written in, each group separated by a comma (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
```
5.2 Text Data Output Format

### Status Information
- The MV returns the operation status of the recorder in response to an IS command. The output format varies between IS0 and IS1.
- For details on status information, see section 5.2, "The Bit Structure of the Status Information."

#### Output in response to the IS0 command
- **Syntax**
  ```
  EACRLF
  aaa.bbb.ccc.dddCRLF
  ENCRLF
  ```
  ```
  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 in response to the IS1 Command
- **Syntax**
  ```
  EACRLF
  aaa.bbb.ccc.ddd.eee.fff.ggg.hhhCRLF
  ENCRLF
  ```
  ```
  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 using the IS command.
  Status information 1, 2, 5, and 6 are level operation. They are not cleared when read. They are cleared when the causing 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 ignore the event. Status information 1, 2, 5, and 6 hold the event.
  The default filter setting is ON for all bits.
5.2 Text Data Output Format

Ethernet Information

- The MV returns the Ethernet information in response to an FA command.

- **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 MV returns the file list or the file data sizes for the specified directory on the MV's external storage medium in response to the ME command.

- **Syntax**

  EACRLF
  
  yy/mo/dd_hh:mm:ss_ssssssss_fff..._0_xxx...CRLF
  ..................................................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)
  
  The data serial number is included for files in the DATA directory in the internal memory. For other files, the data serial number is spaces.
5.2 Text Data Output Format

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

  EA
  05/02/24 20:07:12  1204 setting.pni
  05/02/24 20:18:36  <DIR> DATA0

- **Example 2**
  File list output of the DATA directory in the internal memory

  EA
  05/02/24 20:07:12  1204 006607_050101_000402.DAD 0 1ABCDEF123
  05/02/24 20:07:12  1204 006608_050101_000403.DAD 0 1234567890123456

**Check Disk Result**

The MV returns the free space on the storage medium in response to an ME command.

- **Syntax**
  
  EA\_CRLF
  
  zzz\ldots\_Kbyte_free\_CRLF
  
  EN\_CRLF

  zzz\ldots  Free space on the storage medium (16 digits)
   \_Space

- **Example**
  
  EA
  
  12345678 Kbyte free
  
  EN
Manually Sampled Data and Report Data Information

The MV returns manually sampled and report data information in response to an MO command.

- **Syntax**

  SACRLF
  s11111...yy/xx/dd_hh:mm:ss_bbbb_fff...
  ENCRLF

  s  Data flag
  Space  Confirmed data
  +:  Data that was overwritten
  *:  Data being added
  11111... File number (10 digits)
  yy  Year (00 to 99)
  mm  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 (four 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  uuuu00005.DAR
  EN
User Information

- The MV returns the user name, user level, and other information in response to an FU command.

- **Syntax**
  
  EACRLF
  
  `p I_uuu...CRLF`  
  
  ENACRLF

  `p`  Login method  
  `E`  Ethernet  
  `S`  RS-232 or RS422/RS485  
  `K`  Login using keys  
  `l`  User level  
  `A`  Administrator  
  `U`  User  
  `uu...`  User name (up to 20 characters)  
  `_`  Space

- **Example 1**
  
  When you send the F90 command, the MV returns only the information about the user himself or herself that is logged in.

  EA
  
  E A admin  
  
  EN

- **Example 2**
  
  When you send the F41 command, the MV returns information about all users logged in through a general-purpose service or through keys.

  EA
  
  K A admin_abc  
  E A admin_def  
  E U user0033  
  E U user0452  
  
  EN
5.3 Binary Data Output Format

This section describes the binary data output format that is disclosed. For information about other binary data, see section 5.1.

- Instantaneous data (measured/computed/external input) and FIFO data
- Configured channel information data
- Configured alarm information data
- Manual sample file
- Report sample file
- Display data (text)
- Event data (text)

The MV returns measured data and computed data using signed 16-bit integer and signed 32-bit integer, respectively. These integers can be understood as physical values by adding a decimal point and unit. The decimal place can be determined using the FE command.

### Examples of Obtaining Physical Values from Binary Data

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

**Note**

"CRLF" used in this section denotes carriage return line feed.
5.3 Binary Data Output Format

Measured/Computed Data and FIFO Data
- The MV returns the measured/computed data in response to an FD command.
- The MV returns the FIFO data in response to an FF command.
- You can use the CB command to specify whether or not the MV will return data of measurement channels set to skip and computation and external input channels set to OFF.
- The ID number of the output format is 1. See “ID” in section 5.1.

Number of Blocks
This is the number of blocks.

Number of Bytes
This is the size of a block in bytes.

Block

<table>
<thead>
<tr>
<th>1 byte</th>
<th>1 byte</th>
<th>1 byte</th>
<th>1 byte</th>
<th>1 byte</th>
<th>1 byte</th>
<th>2 bytes</th>
<th>1 byte</th>
<th>1 byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>Month</td>
<td>Day</td>
<td>Hour</td>
<td>Min</td>
<td>s</td>
<td>ms</td>
<td>(Reserved)*</td>
<td>Flag</td>
</tr>
<tr>
<td>T**</td>
<td>Channel A2A1 A4A3 Measured data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T**</td>
<td>Channel A2A1 A4A3 Computed data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T**</td>
<td>Channel A2A1 A4A3 External input data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 4 bits
** 12 bits

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

- Flag
A description of each flag is given in the table below. The flags are valid for FIFO data output. The flags are undefined for other cases.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>1</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>0</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The bits that have “—” for the flag column are not used. The value is undefined.
5.3 Binary Data Output Format

- Block Member

<table>
<thead>
<tr>
<th>Name</th>
<th>Binary Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>0 to 99</td>
</tr>
<tr>
<td>Month</td>
<td>1 to 12</td>
</tr>
<tr>
<td>Day</td>
<td>1 to 31</td>
</tr>
<tr>
<td>Hour</td>
<td>0 to 23</td>
</tr>
<tr>
<td>Minute</td>
<td>0 to 59</td>
</tr>
<tr>
<td>Second</td>
<td>0 to 59</td>
</tr>
<tr>
<td>Millisecond</td>
<td>0 to 999</td>
</tr>
</tbody>
</table>

(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)

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:

Special Data Values
The measured/computed data takes on the following values under special conditions.

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

The MV returns the number of blocks, the number of bytes, and the measured/computed data according to the byte order specified by the BO command.
5.3 Binary Data Output Format

Configured Channel Information Data

- The MV returns the configured channel information data in response to an FE5 command.
- The ID number of the output format is 25.
- You can use the CB command to specify whether or not the MV will return data of measurement channels set to skip and computation channels set to OFF.
- The figure below indicates the format.

```
1 byte 1 byte 2 bytes 2 bytes 1 byte 1 byte
Version [Reserved] Number of blocks Block size [Reserved] [Reserved]
```

```
Configured channel information block 1
```

```
Configured channel information block n
```

Format Details

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Output Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>Format version</td>
<td>1</td>
</tr>
<tr>
<td>Number of blocks</td>
<td>Number of configured channel information blocks</td>
<td>Up to 345</td>
</tr>
<tr>
<td>Block size</td>
<td>Size of the of configured channel information blocks</td>
<td>72</td>
</tr>
<tr>
<td>Block 1 to n</td>
<td>Configured channel information blocks</td>
<td>Up to 25056 bytes See</td>
</tr>
</tbody>
</table>

* Returned in the byte order specified by the BO command.

Block Details

<table>
<thead>
<tr>
<th>Item</th>
<th>Number of Bytes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel number</td>
<td>2</td>
<td>1 to 440</td>
</tr>
<tr>
<td>Decimal place</td>
<td>1</td>
<td>0 to 4</td>
</tr>
<tr>
<td>(Reserved)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Channel type</td>
<td>4</td>
<td>2H for measurement 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.</td>
</tr>
<tr>
<td>Unit information</td>
<td>8</td>
<td>The terminator is ’0.’</td>
</tr>
<tr>
<td>Tag information</td>
<td>24</td>
<td>The terminator is ’0.’</td>
</tr>
<tr>
<td>Minimum input value</td>
<td>4</td>
<td>Measurement channels: Allowable input range under the current setting</td>
</tr>
<tr>
<td>Maximum input value</td>
<td>4</td>
<td>Computation channels: -99999999, +99999999 (fixed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External input channels: -30000, +30000 (fixed)</td>
</tr>
<tr>
<td>Span lower limit</td>
<td>4</td>
<td>Measurement channels (when scaling is not used): Same value as the MV span setting</td>
</tr>
<tr>
<td>Span upper limit</td>
<td>4</td>
<td>Measurement channels (when scaling is used): Same value as the MV span setting</td>
</tr>
<tr>
<td>Scale lower limit</td>
<td>4</td>
<td>Computation and external input channels: Same value as the span</td>
</tr>
<tr>
<td>Scale upper limit</td>
<td>4</td>
<td>Computation and external input channels: Same value as the span</td>
</tr>
<tr>
<td>FIFO type</td>
<td>2</td>
<td>Indicates the position of its own channel in the FIFO block of one sample. The value starts from zero.</td>
</tr>
<tr>
<td>Area in the FIFO</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>(Reserved)</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

* Returned in the byte order specified by the BO command.
Configured Alarm Information Data

- The MV returns configured alarm information data in response to an FE6 command.
- The ID number of the output format is 26.
- The figure below indicates the format.

```
+-------+-------+-----+-----+-----+-----+
|       |       |     |     |     |     |
| Version| (Reserved) | Number of blocks | Block size | (Reserved) | (Reserved) |
|        |          |                  |            |              |          |
| Configured alarm information block 1 | | | | | |
| ... |
| Configured alarm information block n |
```

**Format Details**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Output Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>Format version</td>
<td>1</td>
</tr>
<tr>
<td>Number of blocks*</td>
<td>Number of configured alarm information blocks</td>
<td>Up to 348</td>
</tr>
<tr>
<td>Block size*</td>
<td>Size of the of configured alarm information blocks</td>
<td>24</td>
</tr>
<tr>
<td>Block 1 to n</td>
<td>Configured alarm information blocks</td>
<td>Up to 8352 bytes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Block Details</td>
</tr>
</tbody>
</table>

* Returned in the byte order specified by the BO command.

**Block Details**

<table>
<thead>
<tr>
<th>Item</th>
<th>Number of Bytes</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel number*</td>
<td>2</td>
<td>1 to 440</td>
</tr>
<tr>
<td>Decimal place</td>
<td>1</td>
<td>0 to 4</td>
</tr>
<tr>
<td>(Reserved)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Alarm type</td>
<td>4</td>
<td>The following settings are entered in order from level 1 to 4. 0: Setting off, 1: H (high limit), 2: L (low limit), 3: h (difference high limit), 4: l (difference low limit), 5: R (high limit on rate-of-change), 6: r (low limit on rate-of-change), 7: T (delay high limit), 8: t (delay low limit)</td>
</tr>
<tr>
<td>Alarm value*</td>
<td>4×4</td>
<td>The alarm values are entered in order from level 1 to 4.</td>
</tr>
</tbody>
</table>

* Returned in the byte order specified by the BO command.

**Manually Sampled Data**

- The MV returns the manually sampled data in response to the ME or MO command.
- The ID number of the output format is 17. See section 5.1 for details.
- For the data format, see the RD-MV1000/RD-MV2000 User’s Manual (IM RD-MV1000-01E).

**Report Data**

- The MV returns the report data in response to the ME or MO command.
- The ID number of the output format is 18. See section 5.1 for details.
- For the data format, see the RD-MV1000/RD-MV2000 User’s Manual (IM RD-MV1000-01E).

**Display Data (Text)**

- The MV returns the display data in response to an ME command.
- The ID number of the output format is 29. See section 5.1 for details.
- For the data format, see the RD-MV1000/RD-MV2000 User’s Manual (IM RD-MV1000-01E).

**Event Data (Text)**

- The MV returns the display data in response to an ME command.
• The ID number of the output format is 30. See section 5.1 for details.
• For the data format, see the *RD-MV1000/RD-MV2000 User's Manual (IM RD-MV1000-01E).*
6.1 Status Information and Filter

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

- You can use the IF command to set the filter.
- When an event described on the following page occurs, the corresponding bit in the condition register is set to 1. The status information is the logical AND of the condition register and the filter.
- You can use the IS command to get the status information. Status information bytes 3, 4, 7, and 8 are cleared when you get the information. Status information bytes 1, 2, 5, and 6 are not. They will remain 1 while the event is occurring.
- If multiple connections are established, you can set a filter for each connection. This allows the status information to be held for each connection.
- An empty bit, indicated as "-", is fixed to 0.
6.2 Status Information Bit Structure

The MV returns the following four status information groups in response to an IS command, which is a status information output request command. For the output format, see “Status Information” in section 5.2, “Text Data Output Format.”

### Status Information 1

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Basic setting</td>
<td>Set to 1 when the MV is in Basic Setting Mode.</td>
</tr>
<tr>
<td>1</td>
<td>Memory sampling</td>
<td>Set to 1 while the MV is acquiring data to the internal memory.</td>
</tr>
<tr>
<td>2</td>
<td>Computing</td>
<td>Set to 1 while the MV is computing.</td>
</tr>
<tr>
<td>3</td>
<td>Alarm activated</td>
<td>Set to 1 while an alarm is active.</td>
</tr>
<tr>
<td>4</td>
<td>Accessing medium</td>
<td>Set to 1 while the MV is saving a display, event, manual sampled, report, or screen image data file to an external storage medium.</td>
</tr>
<tr>
<td>5</td>
<td>E-mail started</td>
<td>Set to 1 while the MV is sending e-mail.</td>
</tr>
<tr>
<td>6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

### Status Information 2

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>Memory end</td>
<td>Set to 1 while the free space in the internal memory or external storage medium is low.</td>
</tr>
<tr>
<td>3</td>
<td>Logged in through keys</td>
<td>Set to 1 while logged in through keys.</td>
</tr>
<tr>
<td>4</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>6</td>
<td>Detecting measurement error</td>
<td>Set to 1 while the A/D converter is detecting an error or burnout.</td>
</tr>
<tr>
<td>7</td>
<td>Detecting communication error</td>
<td>Set to 1 if any command is stopping the communication on the Modbus master or Modbus client.</td>
</tr>
</tbody>
</table>

### Status Information 3

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Measurement dropout</td>
<td>Set to 1 when the MV cannot keep up with measurements.</td>
</tr>
<tr>
<td>1</td>
<td>Decimal place/unit information change</td>
<td>Set to 1 when the decimal place or unit information is changed.</td>
</tr>
<tr>
<td>2</td>
<td>Command error</td>
<td>Set to 1 when there is a command syntax error.</td>
</tr>
<tr>
<td>3</td>
<td>Execution error</td>
<td>Set to 1 when an error occurs while executing a command.</td>
</tr>
<tr>
<td>4</td>
<td>SNTP error when memory start is executed</td>
<td>Set to 1 when the time cannot be adjusted using SNTP when the MV starts memory sampling.</td>
</tr>
<tr>
<td>5</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
# Status Information 4

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A/D conversion complete</td>
<td>Set to 1 when the A/D conversion of a measurement is complete.</td>
</tr>
<tr>
<td>1</td>
<td>Medium access complete</td>
<td>Set to 1 when the MV completes the saving of the display, event, manual sampled, report, or screen image data file to an external storage medium. Set to 1 when the MV successfully completes the saving or loading of setup data.</td>
</tr>
<tr>
<td>2</td>
<td>Report generation complete</td>
<td>Set to 1 when the MV completes a report generation.</td>
</tr>
<tr>
<td>3</td>
<td>Timeout</td>
<td>Set to 1 when the timer expires.</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>6</td>
<td>USER key detection</td>
<td>Set to 1 when the USER key is pressed.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>–</td>
</tr>
</tbody>
</table>

# Status Information 5 to 8

All bits are zeroes.
7.1 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 maximum number of connections, the number of simultaneous uses (number of users that can use a function simultaneously), and the port number for each function.

<table>
<thead>
<tr>
<th>Function</th>
<th>Maximum Number of Connections</th>
<th>Number of Simultaneous Uses</th>
<th>Port number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting/measurement server</td>
<td>3</td>
<td>1 2(^1)</td>
<td>34290/tcp(^2)</td>
</tr>
<tr>
<td>Maintenance/test server</td>
<td>1</td>
<td>1 1(^1)</td>
<td>34261/tcp(^2)</td>
</tr>
<tr>
<td>FTP server</td>
<td>2</td>
<td>2 2(^1)</td>
<td>21/tcp(^3)</td>
</tr>
<tr>
<td>Web server (HTTP)</td>
<td>1</td>
<td>– 80/tcp(^2)</td>
<td></td>
</tr>
<tr>
<td>SNTP server</td>
<td>–</td>
<td>– 123/udp(^2)</td>
<td></td>
</tr>
<tr>
<td>Modbus server</td>
<td>2</td>
<td>– 502/tcp(^2)</td>
<td></td>
</tr>
<tr>
<td>Instrument information server</td>
<td>–</td>
<td>– 34254/udp(^2)</td>
<td></td>
</tr>
</tbody>
</table>

1 Users have limitations. See section 1.1 for details.
2 The port number is fixed.
3 The default port number. You can set a value in the range of 1 to 65535. Use the default port number unless there is a specific reason not to do so.
4 Make sure that each port number is unique.
7.2 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 1200, 2400, 4800, 9600, 19200, or 38400 [bps]
- **Start bit:** 1 (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 (fixed)
- **Hardware handshaking:** Select whether to fix the RS and CS signals to TRUE or to use them for flow control.
- **Software handshaking:** Select whether to use the X-ON and X-OFF signals to control only the transmitted data or both the transmitted and received data.
  - X-ON (ASCII 11H), X-OFF (ASCII 13H)
- **Receive buffer size:** 2047 bytes

**RS-422/485 Specifications**
- **Terminal block type:** 6 terminals, 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 1200, 2400, 4800, 9600, 19200, or 38400 [bps]
- **Start bit:** 1 (fixed)
- **Data length:** Select 7 or 8 bits
- **Parity:** Select odd, even, or none
- **Stop bit:** 1 (fixed)
- **Receive buffer size:** 2047 bytes
- **Escape sequence:** Open and close
- **Electrical characteristics:**
  - FG, SG, SDB, SDA, RDB, and RDA (six terminals)
  - SG, SDB, SDA, RDB, and RDA terminals are functionally isolated from the MV internal circuit.
  - The FG terminal is frame ground.
- **Communication distance:** Up to 1.2 km
- **Terminator:** External: recommended resistance 120 Ω, 1/2 W
7.3 Modbus Protocol Specifications

Modbus Client Function

Basic Operation
- The MV, operating as a Modbus client device, communicates with Modbus servers periodically by sending commands at specified intervals.
- This function is independent of the Modbus master function operating over the serial interface.
- The supported functions are (1) reading data from the input registers and hold registers on a server and (2) writing data into the hold registers on a server.

Modbus Client Specifications
Communication available 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 retries: Select the how long to wait before reconnecting after the connection is dropped due to the expiration of the connection wait time.
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 minute
However, if the IP address has not been obtained from the DHCP server, a communication error results immediately.
Command timeout value: 10 seconds
Server: Register up to 16 servers
Supported functions: The table below contains functions that the MV supports. To use the functions, the server device must also support them.

<table>
<thead>
<tr>
<th>Function Code</th>
<th>Function Description</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Reads the hold register (4xxxx, 4xxxxxx)</td>
<td>The MV reads from the server device hold register into the communication input channel or external input channel.</td>
</tr>
<tr>
<td>4</td>
<td>Reads the input register (3xxxx, 3xxxxx)</td>
<td>The MV reads from the server device input register into the communication input channel or external input channel.</td>
</tr>
<tr>
<td>16</td>
<td>Writes to the hold register (4xxxx, 4xxxxxx)</td>
<td>The MV writes the measured or computed data to the server device hold register.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT16</td>
<td>16-bit signed integer</td>
</tr>
<tr>
<td>UINT16</td>
<td>16-bit unsigned integer</td>
</tr>
<tr>
<td>INT32_B</td>
<td>32-bit signed integer (big endian)</td>
</tr>
<tr>
<td>INT32_L</td>
<td>32-bit signed integer (little endian)</td>
</tr>
<tr>
<td>UINT32_B</td>
<td>32-bit unsigned integer (big endian)</td>
</tr>
<tr>
<td>UINT32_L</td>
<td>32-bit unsigned integer (little endian)</td>
</tr>
<tr>
<td>FLOAT_B</td>
<td>32-bit floating point (big endian)</td>
</tr>
<tr>
<td>FLOAT_L</td>
<td>32-bit floating point (little endian)</td>
</tr>
</tbody>
</table>
7.3 Modbus Protocol Specifications

- **Reading Values into External Input Channels (RD-MV2000 only)**
  - External input channels are an RD-MV2000 option (IMC1).
  - Reads values from the server register into the MV external input channels.
  - The data type of external input channels is 16-bit signed integer.
  - The measurement range and unit are set on the external input channels. The decimal place is determined by the external input channel's span lower settings.

<table>
<thead>
<tr>
<th>MV2000</th>
<th>Server</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access method</strong></td>
<td><strong>Register</strong></td>
</tr>
<tr>
<td>R</td>
<td></td>
</tr>
<tr>
<td><strong>External input data Number: 201 to 440</strong></td>
<td><strong>30001 to 39999</strong></td>
</tr>
<tr>
<td><strong>Data type: 16-bit signed integer</strong></td>
<td><strong>300001 to 365536</strong></td>
</tr>
</tbody>
</table>

External Input Channel Values

The range of external input channel values is −30000 to 30000 after removing the decimal. If a value is outside this range, the value is set to positive or negative range-out.

<table>
<thead>
<tr>
<th>Server Register Value</th>
<th>External Input Channel Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 30000</td>
<td>Positive range-out (7FFFH)</td>
</tr>
<tr>
<td>−30000 to 30000</td>
<td>−30000 to 30000</td>
</tr>
<tr>
<td>Less than −30000</td>
<td>Negative range-out (8001H)</td>
</tr>
</tbody>
</table>

- **Reading Values into Communication Input Channels**
  - Reads values from the server register into the MV communication input channels.
  - Communication input data is an option (IM1 or /PM1).
  - The data type of communication input data is 32-bit floating point.
  - Communication input data can be displayed on a computation channel by writing an expression that contains the data in an MV computation channel (IM1 or /PM1 option). The measurement range and unit are also set on a computation channel.

<table>
<thead>
<tr>
<th>MV1000 and MV2000</th>
<th>Server</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access method</strong></td>
<td><strong>Register</strong></td>
</tr>
<tr>
<td>R-M</td>
<td></td>
</tr>
<tr>
<td><strong>Communication input data Number: C01 to C24 (MV1000)</strong></td>
<td><strong>30001 to 39999</strong></td>
</tr>
<tr>
<td><strong>C01 to C60 (MV2000)</strong></td>
<td><strong>300001 to 365536</strong></td>
</tr>
<tr>
<td><strong>Data type: 32-bit floating point</strong></td>
<td></td>
</tr>
</tbody>
</table>

- **Writing Measured Values of Measurement Channels**
  - Writes measured values of measurement channels to server registers.
  - The data type of measured values is 16-bit signed integer.

<table>
<thead>
<tr>
<th>MV1000 and MV2000</th>
<th>Server</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access method</strong></td>
<td><strong>Register</strong></td>
</tr>
<tr>
<td>W</td>
<td></td>
</tr>
<tr>
<td><strong>Measurement channel Number: 001 to 024 (MV1000)</strong></td>
<td><strong>40001 to 49999</strong></td>
</tr>
<tr>
<td><strong>001 to 048 (MV2000)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Data type: 16-bit signed integer</strong></td>
<td></td>
</tr>
</tbody>
</table>
Specified Data Type and Write Operation

The MV writes the measured values of measurement channels according to the specified data type as follows:

<table>
<thead>
<tr>
<th>Specified Type</th>
<th>Measured Value</th>
<th>Value Written</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT16</td>
<td>Writes all values directly</td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>-Over</code></td>
<td>7F800000H (+∞)</td>
</tr>
<tr>
<td></td>
<td><code>-Over</code></td>
<td>FF800000H (-∞)</td>
</tr>
<tr>
<td>FLOAT_L</td>
<td><code>-Over</code></td>
<td>FF800000H (Nan)</td>
</tr>
<tr>
<td>FLOAT_B</td>
<td><code>-Over</code></td>
<td>FF800000H (Nan)</td>
</tr>
<tr>
<td></td>
<td><code>Skip</code></td>
<td>FF800002H (Nan)</td>
</tr>
<tr>
<td></td>
<td><code>Error</code></td>
<td>FF800004H (Nan)</td>
</tr>
<tr>
<td></td>
<td><code>Undefined data</code></td>
<td>FF800005H (Nan)</td>
</tr>
<tr>
<td></td>
<td><code>Burnout(Up)</code></td>
<td>7F8000008H (Nan)</td>
</tr>
<tr>
<td></td>
<td><code>Burnout(Down)</code></td>
<td>FF800005H (Nan)</td>
</tr>
<tr>
<td>Other values</td>
<td>Writes the value including the decimal place in FLOAT data type.</td>
<td></td>
</tr>
</tbody>
</table>

* For details on values, see section 5.3, "Binary Data Output Format."

- **Writing Computed Values of Computation Channels**
  - The computation function is an option (/M1 or /PM1).
  - Writes computed values of computation channels to server registers.
  - The data type of computed values is 32-bit signed integer.

<table>
<thead>
<tr>
<th>MV1000 and MV2000</th>
<th>Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access method</td>
<td>Register</td>
</tr>
<tr>
<td></td>
<td>Number: 101 to 124 (MV1000)</td>
</tr>
<tr>
<td></td>
<td>101 to 160 (MV2000)</td>
</tr>
<tr>
<td>W-M</td>
<td>Data type: 32-bit signed integer</td>
</tr>
<tr>
<td></td>
<td>40001 to 49999</td>
</tr>
<tr>
<td></td>
<td>400001 to 466536</td>
</tr>
<tr>
<td></td>
<td>INT16, UINT16, INT32_B, INT32_L, FLOAT_B, FLOAT_L</td>
</tr>
</tbody>
</table>

Specified Data Type and Write Operation

The MV writes the computed values of computation channels according to the specified data type as follows:

<table>
<thead>
<tr>
<th>Specified Type</th>
<th>Computed Value</th>
<th>Value Written</th>
</tr>
</thead>
<tbody>
<tr>
<td>INT16</td>
<td>Less than -32768</td>
<td>-32768</td>
</tr>
<tr>
<td></td>
<td>Greater than 32767</td>
<td>32767</td>
</tr>
<tr>
<td></td>
<td><code>-Over</code></td>
<td>32767</td>
</tr>
<tr>
<td></td>
<td><code>Skip</code></td>
<td>-32768</td>
</tr>
<tr>
<td></td>
<td><code>Error</code></td>
<td>-32768</td>
</tr>
<tr>
<td>Other values</td>
<td>Writes the value in INT16 data format.</td>
<td></td>
</tr>
<tr>
<td>UINT16</td>
<td>Less than 0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Greater than 65535</td>
<td>65535</td>
</tr>
<tr>
<td></td>
<td><code>-Over</code></td>
<td>65535</td>
</tr>
<tr>
<td></td>
<td><code>Skip</code></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><code>Error</code></td>
<td>0</td>
</tr>
<tr>
<td>Other values</td>
<td>Writes the value in UINT16 data format.</td>
<td></td>
</tr>
<tr>
<td>INT32_L</td>
<td>Writes all values directly.</td>
<td></td>
</tr>
<tr>
<td>INT32_B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLOAT_L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLOAT_B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>-Over</code></td>
<td>7F800000H (+∞)</td>
</tr>
<tr>
<td></td>
<td><code>-Over</code></td>
<td>FF800000H (-∞)</td>
</tr>
<tr>
<td></td>
<td><code>Skip</code></td>
<td>FF800002H (Nan)</td>
</tr>
<tr>
<td></td>
<td><code>Error</code></td>
<td>FF800004H (Nan)</td>
</tr>
<tr>
<td>Other values</td>
<td>Writes the value including the decimal place in FLOAT data type.</td>
<td></td>
</tr>
</tbody>
</table>

* For details on values, see section 5.3, "Binary Data Output Format."
7.3 Modbus Protocol Specifications

Modbus Server Function

Modbus Server Specifications
Communication available via ModbusTCP
Communication media: Ethernet 10Base-T
Port: 502/tcp (default value)
Command wait timeout: 1 minute. However, the timeout to receive the entire command after starting to receive a command is 10 seconds.
Maximum number of connections: 2
Supported functions: The table below contain functions that the MV supports.

<table>
<thead>
<tr>
<th>Function Code</th>
<th>Function</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Reads the hold register (4xxxx)</td>
<td>The client device reads the communication input data and external input channel data from the MV.</td>
</tr>
<tr>
<td>4</td>
<td>Reads the input register (3xxx)</td>
<td>The client device reads the computed, measured, alarm, and time data from the MV.</td>
</tr>
<tr>
<td>6</td>
<td>Writes once to hold register (4xxxx)</td>
<td>The client device writes data to the communication input channel and external input channel on the MV.</td>
</tr>
<tr>
<td>8</td>
<td>Loopback test</td>
<td>The client device performs a loopback test on the MV.</td>
</tr>
<tr>
<td>16</td>
<td>Writes to hold register (4xxxx)</td>
<td>The client device writes data to the communication input channel and external input channel on the MV.</td>
</tr>
</tbody>
</table>

Register Assignments (shared with the Modbus slave function)

<table>
<thead>
<tr>
<th>Data type</th>
<th>MV input register</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Data type</td>
</tr>
<tr>
<td>Measurement channel</td>
<td>Measured data</td>
</tr>
<tr>
<td></td>
<td>Alarm status</td>
</tr>
<tr>
<td>Computation channel</td>
<td>Computed data</td>
</tr>
<tr>
<td></td>
<td>Alarm status</td>
</tr>
<tr>
<td>External input channel</td>
<td>Measured data</td>
</tr>
<tr>
<td></td>
<td>Alarm status</td>
</tr>
<tr>
<td>Measurement channel</td>
<td>Alarm list</td>
</tr>
<tr>
<td>Computation channel</td>
<td>Alarm list</td>
</tr>
<tr>
<td>External input channel</td>
<td>Alarm list</td>
</tr>
<tr>
<td>Time</td>
<td></td>
</tr>
</tbody>
</table>

Data type            | MV hold register |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Data type</td>
</tr>
<tr>
<td>Communication input data</td>
<td>40001 to 40060</td>
</tr>
<tr>
<td></td>
<td>40301 to 40420</td>
</tr>
<tr>
<td>Measured data of external input channel</td>
<td>41001 to 41240</td>
</tr>
</tbody>
</table>
Input Register (shared with the Modbus slave function)

- Common Items
  - The client device can only read the input registers.
  - The readout data does not include decimal place and unit information. Specify them on the client device.
  - External input channels are an RD-MV2000 option (iMC1).

- Details

<table>
<thead>
<tr>
<th>Input Register</th>
<th>Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>30001</td>
<td>Measured data of measurement channel 001</td>
<td>16-bit signed integer</td>
</tr>
<tr>
<td>30048</td>
<td>Measured data of measurement channel 048</td>
<td></td>
</tr>
</tbody>
</table>
  - There is no decimal place information. |
| 31001          | Alarm status of measurement channel 001 | Bit string |
| 31048          | Alarm status of measurement channel 048 | |
  - Register structure and alarm status values

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

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

Channel 101 example

<table>
<thead>
<tr>
<th>Higher word</th>
<th>Lower word</th>
<th>Computed data of channel 101</th>
</tr>
</thead>
</table>

  - There is no decimal place 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 those of 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 place information. |
  - The data in these registers are the data in the MV external input channels. If linear scaling is enabled, the values are those after linear scaling. |
| 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 those of measurement channels. |
### 7.3 Modbus Protocol Specifications

<table>
<thead>
<tr>
<th>Input Register</th>
<th>Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>36001</td>
<td>List of alarms of measurement channels 001 to 004</td>
<td>Bit string</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36012</td>
<td>List of alarms of measurement channels 045 to 048</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Register structure</td>
<td></td>
</tr>
<tr>
<td></td>
<td><img src="image.png" alt="Figure" /></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indicates the alarm statuses of four channels in a register. Set to 1 when alarm is activated. The figure above is an example of register 36001 (measurement channels 001 to 004).</td>
<td></td>
</tr>
<tr>
<td>36021</td>
<td>List of alarms of computation channels 101 to 104</td>
<td>Bit string</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36035</td>
<td>List of alarms of computation channels 157 to 160</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Register structure: Same as the list of alarms of measurement channels.</td>
<td></td>
</tr>
<tr>
<td>36041</td>
<td>List of alarms of external input channels 201 to 204</td>
<td>Bit string</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36100</td>
<td>List of alarms of external input channels 437 to 440</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Register structure: Same as the list of alarms of measurement channels.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Input registers 36001 to 36100 can be accessed consecutively. All unassigned register bits are read as zeroes.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Register</th>
<th>Data</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>39001</td>
<td>Year</td>
<td>16-bit signed integer</td>
</tr>
<tr>
<td>39002</td>
<td>Month</td>
<td></td>
</tr>
<tr>
<td>39003</td>
<td>Day</td>
<td></td>
</tr>
<tr>
<td>39004</td>
<td>Hour</td>
<td></td>
</tr>
<tr>
<td>39005</td>
<td>Minute</td>
<td></td>
</tr>
<tr>
<td>39006</td>
<td>Second</td>
<td></td>
</tr>
<tr>
<td>39007</td>
<td>Millisecond</td>
<td></td>
</tr>
<tr>
<td>39008</td>
<td>(Reserved)</td>
<td></td>
</tr>
</tbody>
</table>
7.3 Modbus Protocol Specifications

Hold Register (shared with the Modbus slave function)

- **Common Items**
  - The client device can read and write to the hold registers.
  - Communication input data is an option (/M1 or /PM1).
  - External input channels are an RD-MV2000 option (/MC1).

**To Write Data**

- Communication input data can be handled on a computation channel by writing an expression that contains the data in an MV computation channel.
- External input channel data can be handled on an external input channel.

**Details**

<table>
<thead>
<tr>
<th>Hold Register</th>
<th>Data Description</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001</td>
<td>Communication input data C01</td>
<td>16-bit signed integer</td>
</tr>
<tr>
<td>40060</td>
<td>Communication input channel C60</td>
<td></td>
</tr>
</tbody>
</table>

- Precautions to be taken when a client device reads data
  - The MV communication input data is in floating point format, but the data is converted to 16-bit signed integer when the data is read.
- Precautions to be taken when a client device writes data
  - A client device can only write data in 16-bit signed integer format. A client device cannot write a floating point value.

| 40301         | Lower word of communication input data C01 | 32-bit floating point |
| 40302         | Higher word of communication input data C01 |                      |
| 40419         | Lower word of communication input data C60 |                      |
| 40420         | Higher word of communication input data C60 |                      |

- Precautions to be taken when a client device writes data
  - Input range: -9.99999E29 to -1E-30, 0, 1E-30 to 9.99999E29
  - If values outside this range are used on a computation channel, a computation error occurs.

| 41001         | External input channel write register 201 | 16-bit signed integer |
| 41240         | External input channel write register 440 |                      |

- Precautions to be taken when a client device writes data
  - A client device can only write 16-bit signed integer data.
  - The measurement range and unit are set on the external input channels. The decimal place is determined by the external input channel’s span lower settings.

Modbus Error Response (common to Modbus server and Modbus slave)

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Function</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bad function code</td>
<td>Unsupported function request.</td>
</tr>
<tr>
<td>2</td>
<td>Bad register number</td>
<td>Tried to read or write to a register that does not have a corresponding channel.</td>
</tr>
<tr>
<td>3</td>
<td>Bad number of registers</td>
<td>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.</td>
</tr>
</tbody>
</table>

The MV does not return a response in the following cases.
- CRC error
- Errors other than those shown above.
7.3 Modbus Protocol Specifications

Modbus Master Function

Basic Operation
- The MV, operating as a master device, communicates with slave devices periodically by sending commands at specified intervals.
- This function is independent of the Modbus client function operating over the Ethernet interface.
- The supported functions are (1) reading data from the input registers and hold registers on a slave device and (2) writing data into the hold registers on a slave device.

Serial Communication Specifications (same as with the Modbus slave function)
Communication available via ModbusRTU
Communication media: RS-232, RS-422, or RS-485
Control system: No flow control (none only)
Baud rate: Select 1200, 2400, 4800, 9600, 19200, or 38400.
Start bit: 1 (fixed)
Data length: 8 (fixed)
Parity: Select odd, even, or none
Stop bit: 1 (fixed)
Message termination determination: Time equivalent to 48 bits

Modbus Master Specifications
Read cycle: Select the cycle for reading data from other devices from the following:
- 125 ms, 250 ms, 500 ms, 1 s, 2 s, 5 s, and 10 s
Timeout value: Select the timeout value when there is no response from a specified slave after sending a command from the MV:
- 125 ms, 250 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, and 1 min
Retry count: Select the retry count when there is no response from a specified device for a command sent from the MV:
- 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 to send the next command after receiving a response to the previous 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 device communication drivers switch in half-duplex mode.
- If communication does not work properly, increase the wait time.
Command type: R, R-M, W, and W-M
Command setup: 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 registers: Same as the Modbus client function.
Hold register: Same as the Modbus client function.
Access method: Same as the Modbus client function
Supported functions: Same as the Modbus client function.
Data type: Same as the Modbus client function.
### Modbus Slave Function

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial communication</td>
<td>Same as the Modbus master function.</td>
</tr>
<tr>
<td>Slave address</td>
<td>1 to 99</td>
</tr>
<tr>
<td>Supported functions</td>
<td>Same as the Modbus master function.</td>
</tr>
<tr>
<td>Register assignments</td>
<td>Same as the Modbus server function.</td>
</tr>
<tr>
<td>Modbus error response</td>
<td>Same as the Modbus server function.</td>
</tr>
</tbody>
</table>
Appendix 1  ASCII Character Codes

<table>
<thead>
<tr>
<th>Upper 4 bits</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>SP</td>
<td>0</td>
<td>@</td>
<td>P</td>
<td>p</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td>1</td>
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<td>Q</td>
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</tr>
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<td>2</td>
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<td>R</td>
<td>b</td>
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<td></td>
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<td></td>
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<td>C</td>
<td>S</td>
<td>s</td>
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<td>4</td>
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<td>5</td>
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<td>E</td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lower 4 bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
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<td>6</td>
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<td>A</td>
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<td>E</td>
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<td>F</td>
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</tbody>
</table>
Appendix 2  Data Dropout during Modbus Communication

Data Dropout When Operating as a Modbus Client

If the MV tries to issue a command to a server device but has not finished receiving a response to the previous command, the MV will not be able to transmit the next command. This will cause a data dropout. Take appropriate measures to prevent dropouts by referring to the following figures.

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

   ![Diagram showing data dropout when server device response takes a long time]

2. When the connection is dropped because there is no response from the server device

   ![Diagram showing data dropout when connection is dropped]

3. When the communication recovers through connection retry

   ![Diagram showing recovery through connection retry]

   ∙ Status lamp: G Y O R
   ∙ Command from the MV: G
   ∙ Response from the server device: G

   * The first connection retry after the connection is dropped is shorter than the specified interval. The status lamp indications in this example apply when the connection retry function is enabled.
Data Dropout While Operating as a Modbus Master

If the MV tries to issue a command to a slave device but has not finished receiving a response to the previous command, the MV will not be able to transmit the next command. This will cause a data dropout. Take appropriate measures to prevent dropouts by referring to the following figures.

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

   Read cycle

   Slave device 1
   Slave device 2
   Slave device 3
   Data dropout (slaves 2 and 3)
   Data dropout (slave 3)

2. When there is no response from the slave device

   Read cycle

   Slave device 1
   Slave device 2
   Slave device 3
   Data dropout (slaves 2 and 3)

3. When the slave device that is not responding is disconnected (retry count set to 1)

   Read cycle

   Slave device 1
   Slave device 2
   Slave device 3
   Data dropout (slaves 2 and 3)
   Disconnect slave 2
   Data dropout (slaves 2 and 3)

G: Command from the MV
Y: Response from the slave device
R: Status lamp
Appendix 3  Login Procedure

You log into the MV 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, you will be able to use the commands given in chapter 4.

When Using the Ethernet Login Function of the MV

![Flowchart](image)

1. The maximum number of connections cannot be exceeded (see section 7.1).
2. If you try to log in using a wrong password four consecutive times, the connection will be dropped (the number of login retries is three).
3. If you try to log in when the number of simultaneous uses at the administrator or user level is exceeded (see section 7.1) four consecutive times, the connection will be dropped (even if the password is correct).
When Not Using the MV Login Function
Log in as "admin" or "user."
- The user name "admin" is used to log into the MV as an administrator.
- The user name "user" is used to log into the MV as a user.

Connect

No

Within the number of connections?

E1 421

Disconnect

E1 402

Within 2 minutes?

User name

Yes

Entered "quit"?

E1 422

Disconnect

E1 403

Increment retry count

E1 404

Verification match?

No

Within the number of simultaneous uses?

No

Within 3 retries?

No

Login complete

E0

No

Within 3 retries?

Yes

No
Appendix 4  Flowchart of How to Get Files or a File List from an External Storage Medium or Internal Memory

Example of How to Get the File 10101000.DAD
The following flowchart illustrates how to get file 10101000.DAD from the DATA0 directory on an external storage medium.

START

Send the command
MEGET, /DBV0/DATA0/10101000.DAD
(Specify the file name using a full path to get the data.)

Receive response
Binary (see section 5.1)

Is there more data?

YES

Send the command
MENEXT
(Output the subsequent data)

Receive response
Binary (see section 5.1)

Binary header
Binary data
Binary footer

NO

Command
Command description
Received response data

* Bit 0 of the binary header flag
  0: There is more data.
  1: No more data.
Example of How to Get a File List, 10 Files at a Time

The following flowchart illustrates how to get the file list of the DATA0 directory on an external storage medium, 10 files at a time.

START

Send the command

```
MEDIR, /DRV0/DATA0/, 10
```

Command used to get the first file list.
Specify the number of files to get.

Receive response

ASCII (see section 5.2)

File list

Are there more files in the list?*

NO

YES

Send the command

```
MEDIRNEXT
```

Get the subsequent files.

Receive response

ASCII (see section 5.2)

File list

END

* When the number of received files is smaller than the maximum number of files specified by the ME DIR command (10 in this example), you can conclude that there are no more files.
Appendix 5  Flowchart of the FIFO Data Output

FIFO Buffer Overview

The MV has an exclusive internal memory for transmitting measured/computed data. The memory has a FIFO (First-In-First-Out) structure. Measured/computed data is constantly acquired to the internal memory at the specified acquisition interval (FIFO acquisition interval, set with the FR command). By using this function, you will be able to read measured/computed data that has been saved at the specified interval, independent of when the PC reads the measured/computed data.

The following example shows the case when the acquisition interval is 1 s, and the FIFO memory can store data for 8 intervals.

- Measured/Computed Data Acquisition
  - The MV acquires measured/computed data to the internal memory at 1-s intervals.
  - The MV acquires measured/computed data in order to positions 1 through 8. After acquiring to position 8, the MV acquires the next data to position 1.

- Reading the Measured/Computed Data (using the FF GET command)
  The MV transmits the data from the previous read position (RP1) to the most recent acquisition position (WP).
  In this example, more than 2 seconds has elapsed from the previous read operation. Therefore, the MV transmits the data from blocks 5 and 6.

The amount of internal memory allocated for the FIFO buffer (FIFO buffer data size) varies depending on the model.

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<tr>
<th>Model</th>
<th>Data size</th>
</tr>
</thead>
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<tr>
<td>RD-MV1004, RD-MV1008, RD-MV2008</td>
<td>For 1200 intervals (30 s at the fastest acquisition interval of 25 ms)</td>
</tr>
<tr>
<td>RD-MV1006, RD-MV1012, RD-MV1024, RD-MV2010, RD-MV2020, RD-MV2030, RD-MV2040, RD-MV2048</td>
<td>For 240 intervals (30 s at the fastest acquisition interval of 125 ms)</td>
</tr>
<tr>
<td>Models with the external channel input option</td>
<td>For 60 intervals (60 s at the fastest acquisition interval of 1 s)</td>
</tr>
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</table>
## Appendix 6  Network Terminology

### Network Terminology

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<tr>
<th>Term</th>
<th>Explanation</th>
</tr>
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<tr>
<td>IP address</td>
<td>An ID that is assigned to each PC or communication device on an IP network such as the Internet or an intranet. The address is a 32-bit value expressed using four octets in decimal notation (each 0 to 255), each separated by a period as in 211.9.36.148.</td>
</tr>
<tr>
<td>Subnet mask</td>
<td>TCP/IP networks such as the Internet are often divided up into smaller networks called sub networks. The subnet mask is a 32 bit value that specifies the number of bits of the IP address used to identify the network address.</td>
</tr>
<tr>
<td>Default gateway</td>
<td>A representative router or computer that is used when accessing a computer outside its own network. If the access destination IP address does not specify a specific gateway, data is sent to the host designated as the default gateway.</td>
</tr>
<tr>
<td>DNS</td>
<td>An acronym for Domain Name System. A computer that converts the domain name, which is the name of the computer on the Internet, to four octets called the IP address. Each name server contains a mapping table of domain names and IP addresses in the network that the server manages and responds to external inquiries.</td>
</tr>
<tr>
<td>DHCP</td>
<td>An acronym for Dynamic Host Configuration Protocol. It is a protocol that allocates IP address and other settings that a PC needs to connect temporarily to the Internet. The DHCP server provides the information to a computer (client) that accesses the server. If a client finishes the communication, the server withdraws the address and assigns it to another computer.</td>
</tr>
<tr>
<td>HTTP</td>
<td>An acronym for HyperText Transfer Protocol. A protocol used to exchange data between a Web server and a client (Web browser, etc.). HTML documents as well as image, sound, and video files that are linked to them can be exchanged along with formatting information.</td>
</tr>
<tr>
<td>SNTP</td>
<td>An acronym for Simple Network Time Protocol. One of the protocols used to synchronize the computer clock via the TCP/IP network. It is an abbreviated version of NTP. NTP is a protocol that configures time information servers in a hierarchy and synchronizes the clock by exchanging information. SNTP omits the complicated sections of the NTP specifications and specializes in serving clients that query time information.</td>
</tr>
<tr>
<td>SMTP</td>
<td>An acronym for Simple Mail Transfer Protocol. A protocol used to transmit e-mail over the Internet. It is used to exchange mail between servers and used by the client to send mail to the server.</td>
</tr>
<tr>
<td>FTP</td>
<td>An acronym for File Transfer Protocol. A protocol used to transfer files over a TCP/IP network such as the Internet.</td>
</tr>
<tr>
<td>POP3</td>
<td>An acronym for Post Office Protocol version 3. A protocol used to receive mail over the intranet or Internet from a server that stores e-mail.</td>
</tr>
<tr>
<td>POP before SMTP</td>
<td>One of the user authentication methods for e-mail transmission. Access to the SMTP server is granted after a specific POP3 server is accessed first.</td>
</tr>
<tr>
<td>PASV mode</td>
<td>Passive mode of the file transfer protocol FTP (method by which the FTP server notifies the port for making the connection). This mode is required when transferring files across a firewall. Check with your network administrator on whether or not you need to set PASV mode.</td>
</tr>
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