User's Manual

MW100
Data Acquisition Unit

YOKOGAWA
Yokogawa Electric Corporation

IM MW100-01E
3rd Edition

Foreword

Thank you for purchasing the MW100 Data Acquisition Unit. This user's manual contains useful information about the instrument's functions, installation and wiring procedures, operating procedures, and handling precautions. To ensure correct use, please read this manual thoroughly before beginning operation. The following six manuals relating to the MW100 Data Acquisition Unit are provided in addition to this one. Read them along with this manual. The MW100 Data Acquisition Unit Operation Guide (IM MW100-02E), MW100 Viewer Software User's Manual (IM MW180-01E), and Communication Command Manual (IM MW100-17E) are all available on the MW100 Manual CD-ROM.

Manual Title	Manual No.	Description
MW100 Data Acquisition Unit Operation Guide	IM MW100-02E	Describes concisely the handling of the MW100 Data Acquisition Unit and the basic operations of the MW100 Viewer Software.
MW100 Communication Command Manual	IM MW100-17E	Describes the communication command of the MW100 main module.
Precautions on the Use of the MX100/MW100 Data Acquisition Unit	IM MX100-71E	Summarizes the precautions regarding the use of the MW100 Data Acquisition Unit.
MX100/MW100 Data Acquisition Unit Installation and Connection Guide	IM MX100-72E	Describes concisely the installation procedures and wiring procedures of the MW100 Data Acquisition Unit.
Control of pollution caused by MX100/MW100 products	IM MX100-91C	Describes control of pollution caused by the product.
MW100 Viewer Software User's Manual	IM MW180-01E	Describes the functions and operations of the MW100 Viewer Software that comes standard with the MW100 main module.

Notes

This manual describes the MW100 Data Acquisition Unit, style number "S3." The style number is located on the name plate of the main module (see IM MW100-02E for the location of the name plate).

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA representative, dealer, or sales office.
- Copying or reproducing all or any part of the contents of this manual without the permission of Yokogawa Electric Corporation is strictly prohibited.
- The TCP/IP software of this product and the document concerning the TCP/IP software have been developed/created by YOKOGAWA based on the BSD Networking Software, Release 1 that has been licensed from the University of California at Berkeley.

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Revisions

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2nd Edition: October, 2006
3rd Edition: October, 2007

3rd Edition : October 2007 (YK)

Safety Precautions

About This Manual

- Please pass this manual to the end user.
- Read this manual thoroughly and have a clear understanding of the product before operation.
- This manual explains the functions of the product. It does not guarantee that the product will suit a particular purpose of the user.
- Under absolutely no circumstances may the contents of this manual be transcribed or copied, in part or in whole, without permission.
- The contents of this manual are subject to change without prior notice.
- 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 or omissions, please contact your nearest YOKOGAWA dealer.

Precautions Related to the Protection, Safety, and Alteration of the Product

- The following safety symbols are used on the product and in this manual.

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

Functional ground terminal (do not use this terminal as a protective ground terminal.)

Protective grounding terminal

Alternating current

Direct current

- For the protection and safe use of the product and the system controlled by it, be sure to follow the instructions and precautions on safety that are stated in this manual whenever you handle the product. Take special note that if you handle the product in a manner that violates these instructions, the protection functionality of the product may be damaged or impaired. In such cases, YOKOGAWA does not guarantee the quality, performance, function, and safety of product.
- When installing protection and/or safety circuits such as lightning protection devices and equipment for the product and control system or designing or installing separate protection and/or safety circuits for fool-proof design and fail-safe design of the processes and lines that use the product and the control system, the user should implement these using additional devices and equipment.
- If you are replacing parts or consumable items of the product, make sure to use parts specified by YOKOGAWA.
- This product is not designed or manufactured to be used in critical applications that directly affect or threaten human lives. Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.
- Do not modify this product.

WARNING

Use the Correct Power Supply

Ensure that the source voltage matches the voltage of the power supply before turning ON the power.

Connect the Protective Grounding Terminal

Make sure to connect the protective grounding to prevent electric shock before turning ON the power.

Do Not Impair the Protective Grounding

Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so invalidates the protective functions of the instrument and poses a potential shock hazard.

Do Not Operate with Defective Protective Grounding or Fuse

Do not operate the instrument if the protective earth or fuse might be defective. Make sure to check them before operation.

Do Not Use in the Presence of Flammable Liquids, Vapors, and Dust

Do not use the instrument in the presence of flammable liquids, vapors, and dust. Operation in such environments constitutes a safety hazard.

Do Not Remove Covers

The cover should be removed by YOKOGAWA's qualified personnel only. Opening the cover is dangerous, because some areas inside the instrument have high voltages.

Ground the Instrument before Making External Connections

Connect the protective grounding before connecting to the item under measurement or to an external control unit.

Avoid Damage to the Protective Structure

Operating the instrument in a manner not described in this manual may damage its protective structure.

CAUTION

This instrument is a Class A product. Operation of this instrument in a residential area may cause radio interference, in which case the user is required to take appropriate measures to correct the interference.

Exemption from Responsibility

- YOKOGAWA makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
- YOKOGAWA assumes no liability to any party for any loss or damage, direct or indirect, caused by the user or any unpredictable defect of the product.

Handling Precautions of the Software

- YOKOGAWA makes no warranties regarding the software accompanying this product except those stated in the WARRANTY that is provided separately.
- Use the software on a single PC.
- You must purchase another copy of the software if you are to use the software on another PC.
- Copying the software for any purposes other than backup is strictly prohibited.
- Please store the original media containing the software in a safe place.
- Reverse engineering, such as decompiling of the software, is strictly prohibited.
- No portion of the software supplied by YOKOGAWA may be transferred, exchanged, sublet, or leased for use by any third party without prior permission by YOKOGAWA.

Conventions Used in This Manual

Unit

k	Denotes 1000.
K	Denotes 1024. Examlple: 5 KB (file size)

Safety Markings

The following markings are used in this manual.

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

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

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

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

▶ Indicates a reference.

Meas. Mode Indicates items that require you to switch the mode to Measurement in the procedural explanation of chapter 3.

Setting Mode Indicates items that require you to switch the mode to Setting in the procedural explanation of chapter 3.

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Chapter 4 Troubleshooting and Maintenance

Chapter 5 Specification

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1.1 System Overview

MW100 Data Acquisition Unit

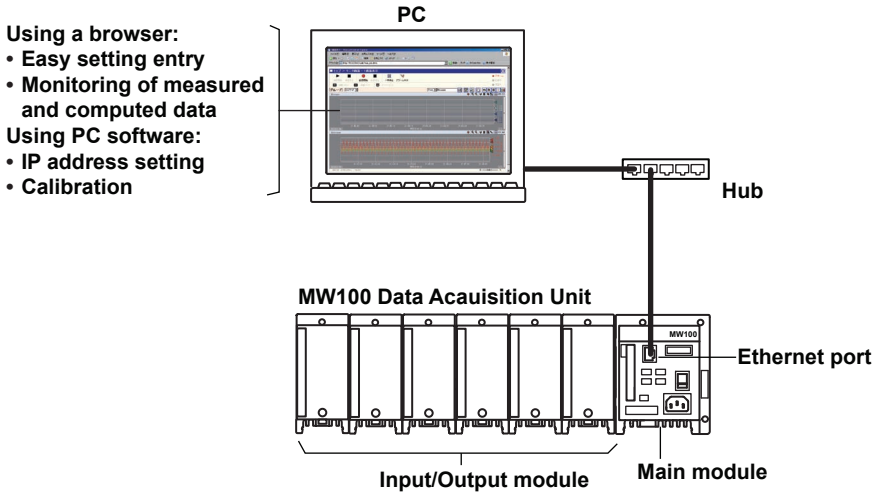
The MW100 Data Acquisition Unit consists of a main module equipped with an Ethernet port, I/O modules for input and output of signals (these are the same as those for the MX100 Data Acquisition Unit), and a base plate on which the first two items are mounted. The main module comes with an HTTP server function, allowing users to easily enter settings, acquire data, and monitor measured data from a PC using a browser. The main module also comes with a Modbus/TCP function that allows multiple units to be connected.

System Configuration

The MW100 Data Acquisition Unit can be flexibly configured for a variety of measuring environments such as a small-scale system that acquires data onsite in a standalone configuration or a system that allows data acquisition of up to 360 channels using the Modbus/TCP function.

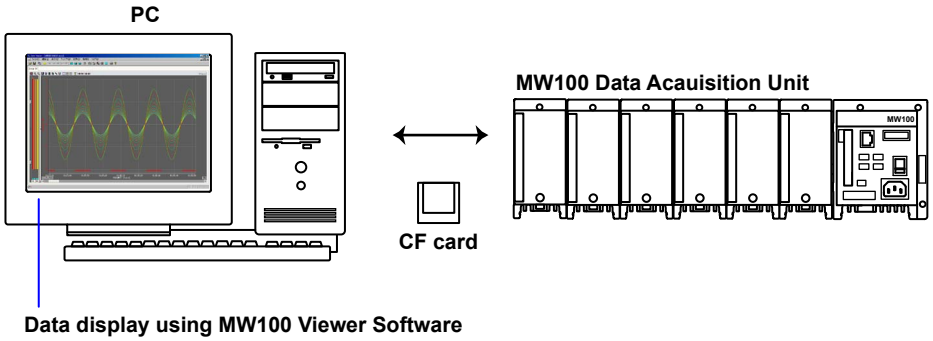
One-to-one Connection with a PC

This is an example of a system for small scale logging, setting the IP address, and other tasks.



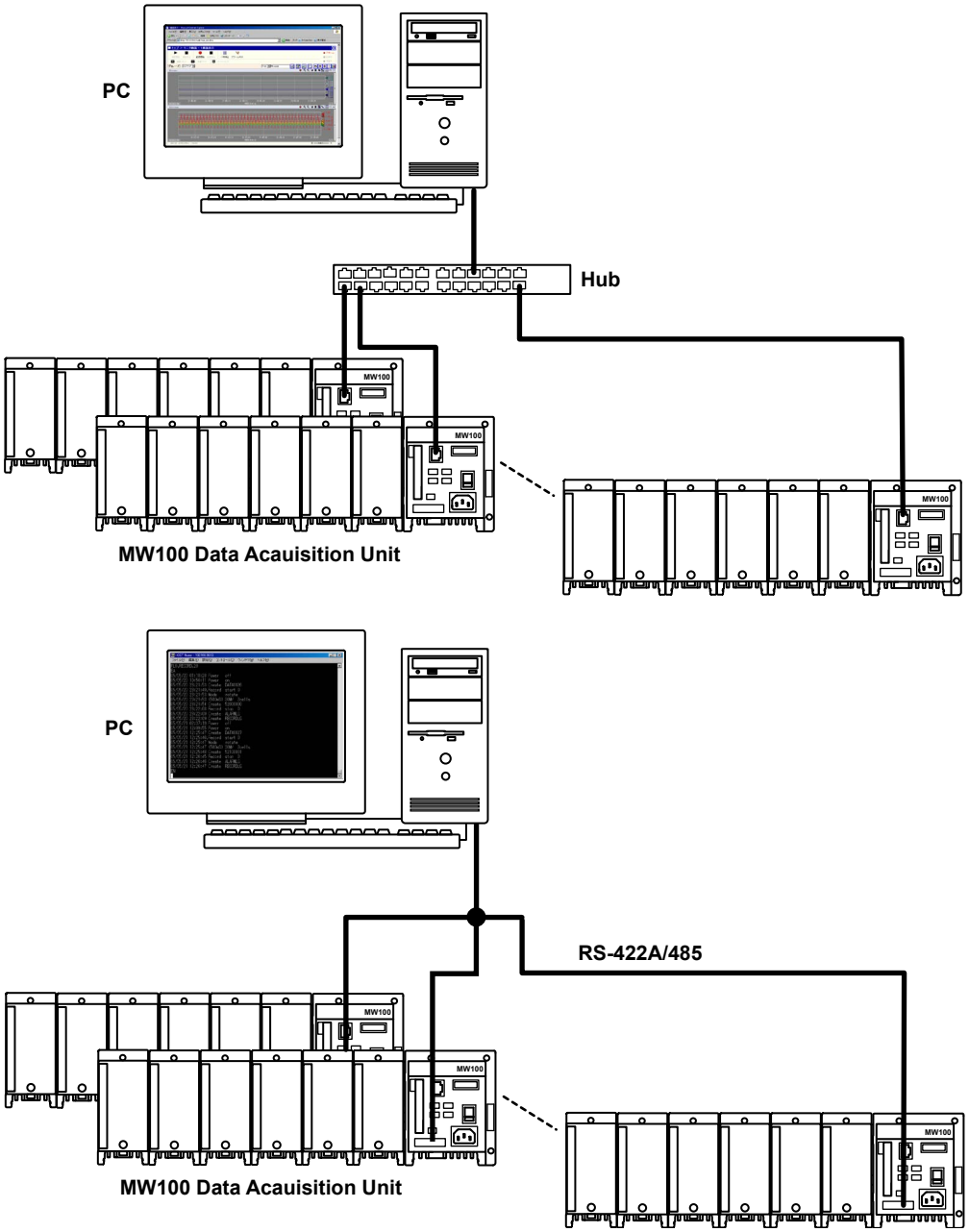
Standalone Configuration

This is an example of configuration for an on-site standalone data acquisition system.



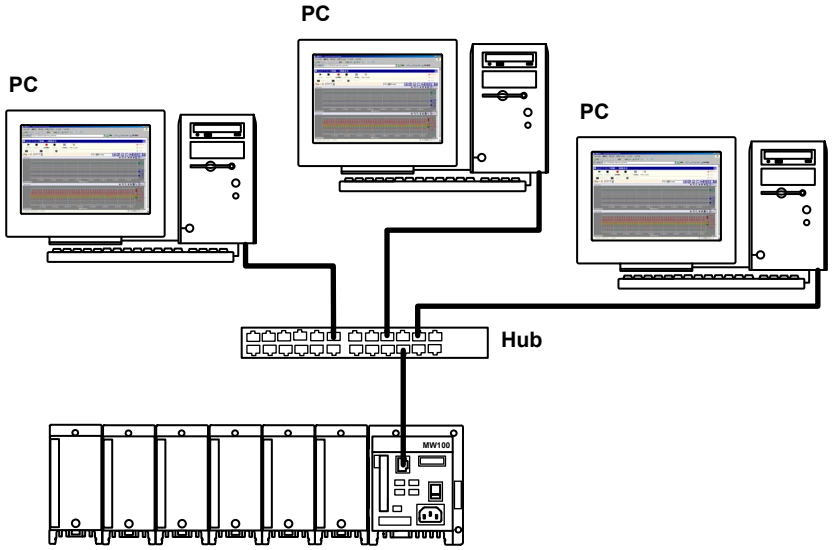
One-to-N Connection with a PC

This is an example of a configuration suitable for relatively large scale data acquisition tasks. Connections can be made via Ethernet or RS-422A/485.



One-to-N Connection with the PC

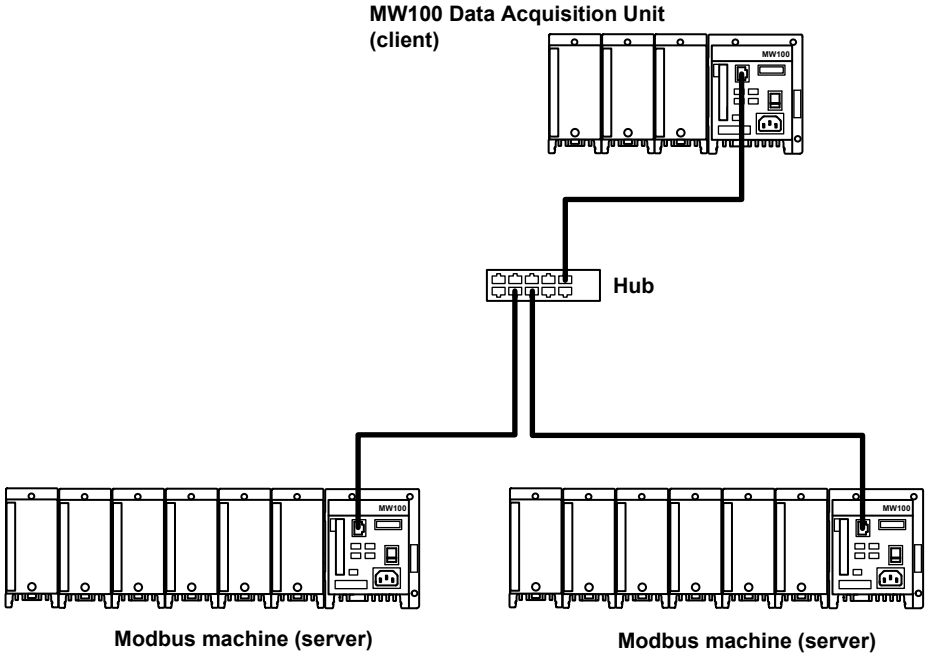
This is an example in which multiple PCs are connected to the MW100 for performing data monitoring.



MW100 Data Acquisition Unit

Connecting to Modbus Devices

This is an example of configuration of a system with connections to Modbus devices.

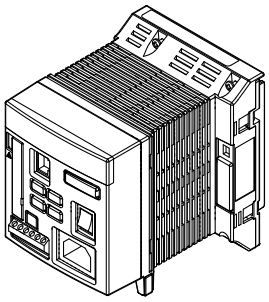


Note

Using the Web monitor or other communciation functions while using the Modbus function may affect the Modbus communication response.

Main Module

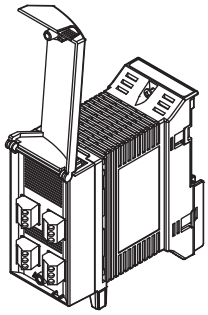
The main module is equipped with power supply connectors, a power switch, Ethernet ports, and other devices facilitating supply of power to and control of the input/output modules, and connection to networks.
It also has Start and Stop keys, meaning that since data can be saved to a CF card, data can be acquired offline. Data acquisition via serial communication is also possible by adding the RS-232 or RS-422A/485 serial communication option.



Input/Output Modules

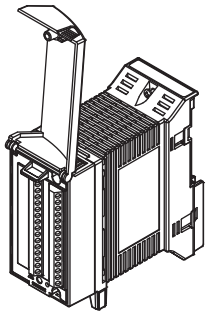
The following thirteen types of modules are available. A screw terminal plate and separately installed screw terminal block (both sold separately) are available as accessories for the 10-CH, Medium Speed Universal Input Module, the 10-CH, Pulse Input Module, and the 10-CH, High Speed Digital Input Module.

4-CH, High-Speed Universal Input Module (MX110-UNV-H04)



- **Minimum measurement interval: 10 ms (except 50 ms for temperature measurement**
- **Maximum number of inputs: 4 inputs**
- **Input types: DC voltage, TC, 3-wire RTD, and DI (LEVEL, non-voltage contact)**

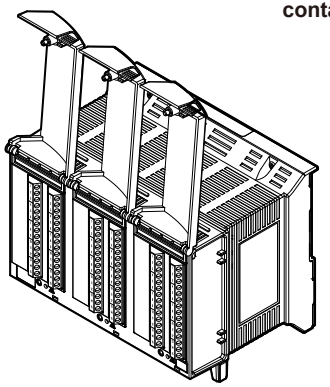
10-CH, Medium-Speed Universal Input Module (MX110-UNV-M10)



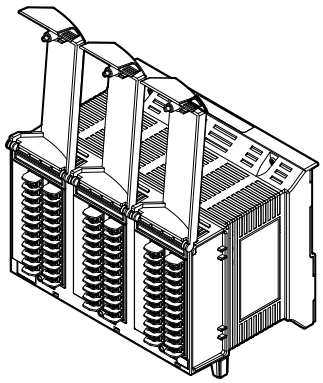
- **Minimum measurement interval: 100 ms**
- **Maximum number of inputs: 10 inputs**
- **Input types: DC voltage, TC, 3-wire RTD, and DI (LEVEL, non-voltage contact)**

30-CH, Medium Speed DCV/TC/DI Input Module (MX110-VTD-L30, MX110-VTD-L30/H3)

- Minimum measurement interval: 500 ms
- Maximum number of inputs: 30 inputs
- Input types: DC voltage, TC, and DI (LEVEL, non-voltage contact)

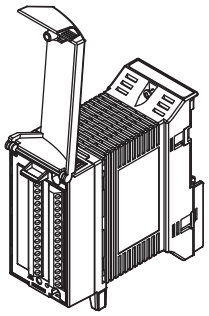


MX110-VTD-L30
(clamp terminals)



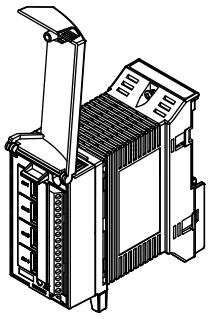
MX110-VTD-L30/H3
(M3 screw terminals)

6-CH, Medium-Speed, Four-Wire RTD Resistance Input Module (MX110-V4R-M06)



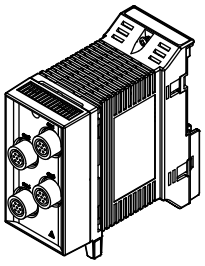
- Minimum measurement interval: 100 ms
- Maximum number of inputs: 6 inputs
- Input types: DC voltage, 4-wire RTD, 4-wire resistance, and DI (LEVEL, non-voltage contact)

4-CH, Medium-Speed Strain Input Module (MX112-B12-M04 and MX112-B35-M04)



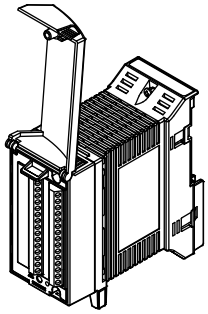
- Minimum measurement interval: 100 ms
- Maximum number of inputs: 4 inputs
- Input system: floating balanced input (isolation between channels)

4-CH, Medium-Speed Strain Input Module (MX112-NDI-M04)



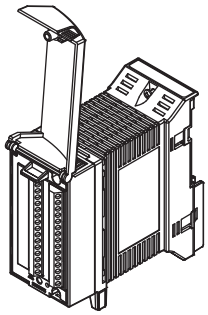
- Minimum measurement interval: 100 ms
- Maximum number of inputs: 4 inputs
- Input system: floating balanced input (non-isolation between channels)

10-CH, Pulse Input Module (MX114-PLS-M10)



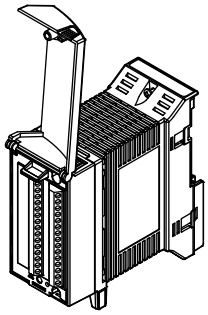
- Minimum measurement interval: 100 ms
- Maximum number of inputs: 10 inputs
- Input types: DI (non-voltage contact, open collector, and 5-V logic)

10-CH, High-Speed Digital Input Module (MX115-D05-H10)



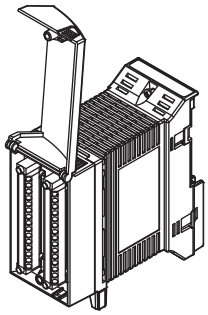
- Minimum measurement interval: 100 ms
- Maximum number of inputs: 10 inputs
- Input types: DI (non-voltage contact, open collector, and 5-V logic)

10-CH, High-Speed Digital Input Module (MX115-D24-H10)



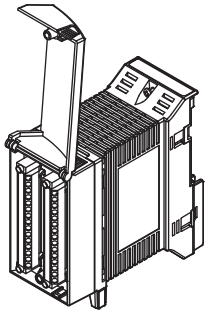
- Minimum measurement interval: 10 ms
- Maximum number of inputs: 10 inputs
- Input types: DI (24-V logic)

8-CH, Medium-Speed Analog Output Module (MX120-VAO-M08)



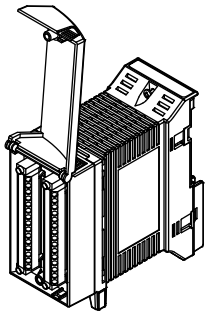
- Output update interval: 100 ms (shortest)
- Maximum number of inputs: 8 outputs
- Output type: DC voltage, DC current

8-CH, Medium-Speed PWM Output Module (MX120-PWM-M08)



- **Output update interval: 100 ms (shortest)**
- **Maximum number of inputs: 8 outputs**
- **Output type: PWM**

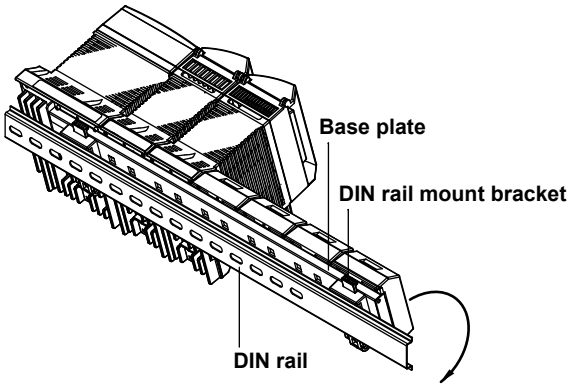
10-CH, Medium-Speed Digital Output Module (MX125-MKC-M10)



- **Output update interval: 100 ms (shortest)**
- **Maximum number of outputs: 10 outputs**
- **Output type: A contact (SPST)**

Base Plate

The base plate is equipped with connectors for connecting the main module and input/output modules. Six different base plates are available to hold from one to six input/output modules. By attaching the DIN rail mounting brackets that came with the product to the base plate, you can rack-mount or panel-mount the MW100 main unit.

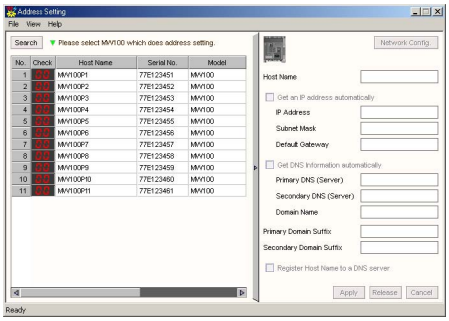


PC Software

The MW100 Data Acquisition Unit comes with the MW100 Viewer software program that allows users to view measured data acquired by the MW100. MW100 Viewer consists of the three software components described below. For a detailed description of the functions of these software components, see the MW100 Viewer software user's manual (IM MW180-01E).

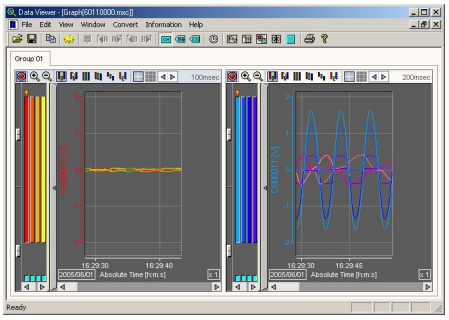
MW100 IP Config Software

Sets the IP address on the MW100. This software is used when setting an IP address for the first time, or if the current IP address needs to be changed.



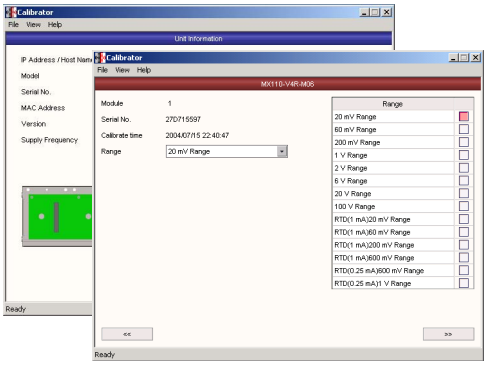
MW100 Viewer

Enables you to (1) display measured, computed, and thinning data that has been stored, (2) read values and perform computation over an area using cursors, and (3) convert the measured and computed data into various file such as Excel.



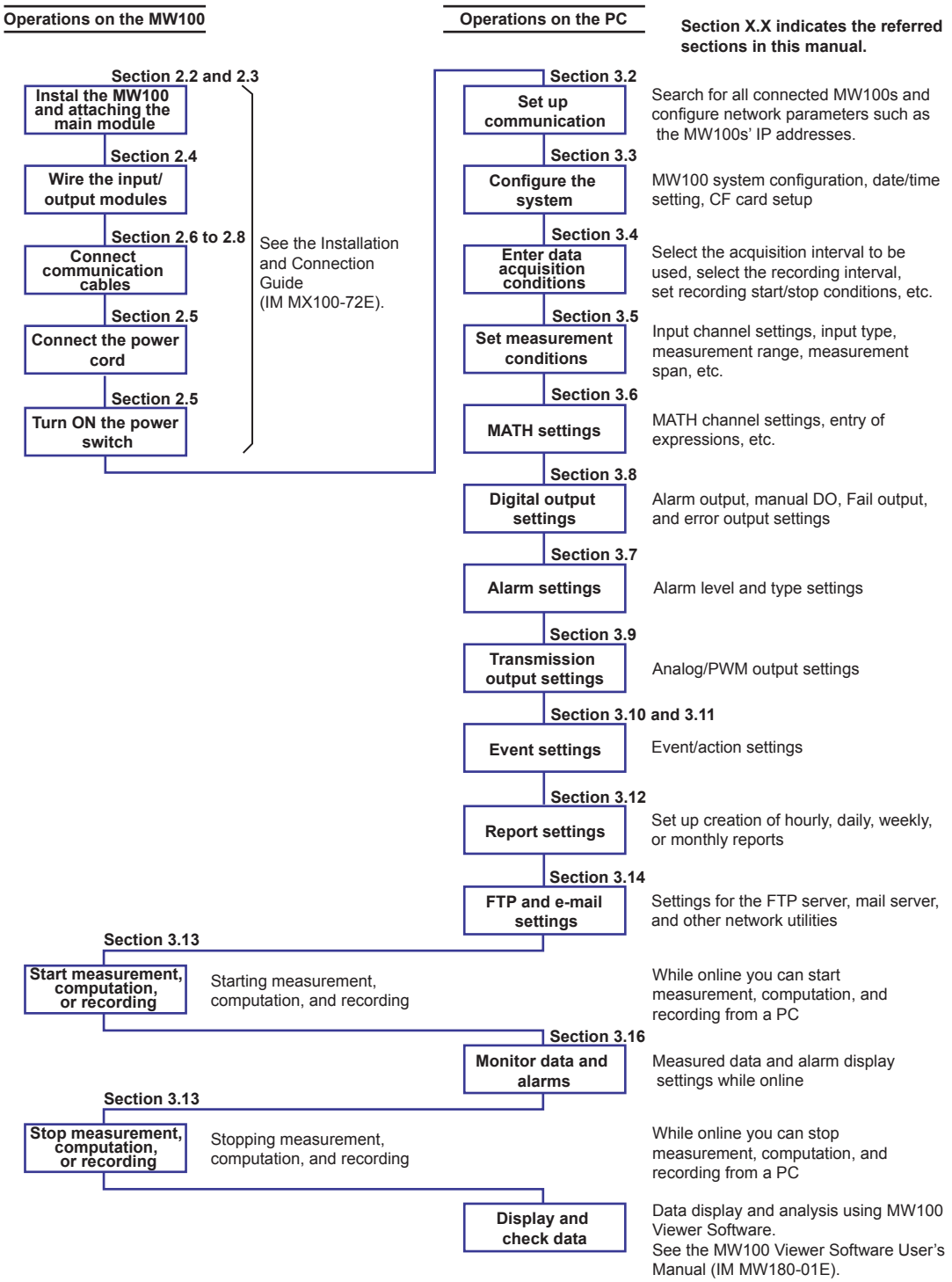
MW100 Calibrator Software

This software is used to calibrate the input/output modules connected to the MW100.



1.2 MW100 Operation Guide

The figure below shows the general flow of operation when the MW100 is installed initially.



1.3 Functions of the Main Module

The main module is the central component of the MW100 Data Acquisition Unit.

Names and Functions of Parts

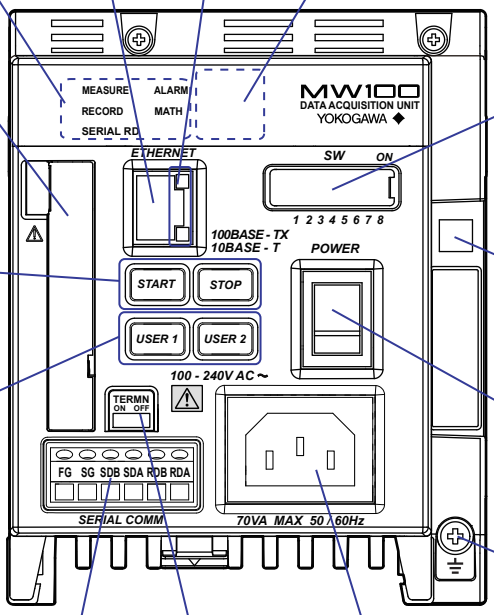
Ethernet port
Used for main unit settings and network connections (see 2.6, “Connecting an Ethernet Cable,” or 3.2, “Connecting to the MW100.”)

Communication status LED
Check the communication status
Top: LINK LED
Illuminates orange when ready for communication
Bottom: ACT LED
Blinks green when packets are sent/received

Status indicator*
The operational status of the instrument is indicated by the illumination of the LED.

7-segment LED
Displays the operational status of the MW100 (see “Displays” in this section, or section 4.1, “7-Segment LED Error Display”).

CF card slot
Insert the CF card to save data and perform other tasks (see section 2.10, “Handling of the CF Card,” or 3.3, “System Settings”).



Dip switch 1
Used to initialize settings, and for other purposes (see, “Switches and Keys” in this section)

Start/Stop keys
Start and stop measurement, computation, and recording (seesection 3.13, “Starting and Stopping Measurement, Computation, and Recording”).

Dip switch 2
Not used.

User function key
Assign functions to the keys (see, “Switches and Keys” in this section)

Power switch
Turns the power to the MW100 main unit ON and OFF

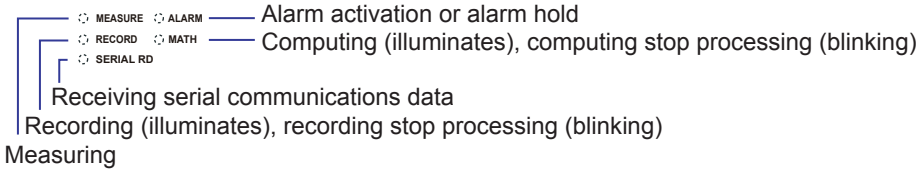
Functional ground terminal

RS-422A/485 connector (/C3 option)
Depending on installed options, the connector may or may not be available, or it may be an RS-232 connector (/C2 option, see section 2.7, “Connecting the RS-422A/485 Interface” or 2.8, “Connecting the RS-232 Interface”),

Power supply inlet
Connect the accessory power supply cord This is listed as a screw terminal in the power supply specifications.

Terminator switch (/C3 option)
Turns the terminator ON and OFF
(see “Connection Procedure” in section 2.7).

***Status indicators**
Illuminate in the following situations. (See section 3.13, “Starting and Stopping Measurement, Computation, and Recording.”)



Switches and Keys

The MW100 has the following switches and keys. Some are included with options.

- Start and Stop keys
- User function key 1
- User function key 2
- Dip switch 1
- Dip switch 2
- Terminator switch (/C3 option)
- Power switch

User Function Keys

Actions set up using the Event/Action function can be executed by pressing the user function keys on the front panel of the MW100.

The keys are assigned as follows by default.

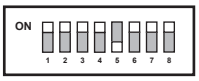
Key	Display	Action
User function key 1	USER1	Write to setting values file
User function key 2	USER2	Load setting values file

Dip Switch 1

Used to initialize the MW100 settings and for other functions.

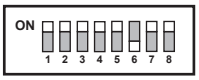
- Normal operation

- Initialization of IP addresses and other settings

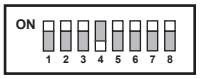


- Fixed IP address (192.168.0.10)

- 10-Mbps half-duplex Ethernet communication



- Firmware update



Main unit

Web

Dip Switch 2

Turn all switches ON for normal operation. If the switches are set differently, the instrument may not function correctly.

Key Lock Function

You can apply a lock to the functions of the Start, Stop, and user function keys. The lock prevents inadvertent execution of functions.

▶ For setting the key lock, see “Status Information and Processing/Operation” in section 3.3.

Connectors

The MW100 can come with the following connectors. The actually-installed connectors depend on the power supply input section specifications and options.

- Ethernet
- RS-422A/485 connector (/C3 option)
- RS-232 connector (/C2 option)
- CF card slot
- Power supply inlet (power supply input section specification: -1M)
- Power supply screw terminals (power supply input section specification: -1W, -2M, -3W)

Displays

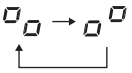
The MW100 indicates its operating conditions with the following displays.

- 7-segment LED
- Status indicators
- Communication status LED

7-Segment LED

Displays the MW100 Data Acquisition Unit's unit number, operation status, end of operation, and errors.

- Unit Number Display
  Unit numbers can be set from 00 to 89. 00 - 89 is displayed.
- Display of the Self-Test Operation on Startup
  When the power is turned ON the setting of dip switch 1 is displayed 00 followed by the operation preparation status 88., and then a self check is performed. While the self check is in progress, the following displays are repeated.



- Key Lock Status
  A key lock function is included for preventing accidental manipulation of the MW100 front panel keys. The key lock status is indicated by a dot at the bottom of the unit number. The example shown is for a unit of number 00.

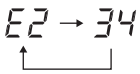
• Keylock release

Unit number

• Keylock

Unit number and dot

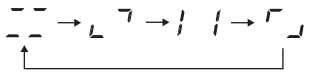
- Operation Error Display
  In error Exxx (where xxx is a three-digit number), the code is divided into two parts which are displayed alternately. In the first part, the letter E appears in the left digit with the hundreds digit of the error code to the right, and the second part consists of the last two digits of the error code.
  Example: Error code E234



  Up to three error codes are saved. You can clear one error that is displayed by pressing the Stop key.

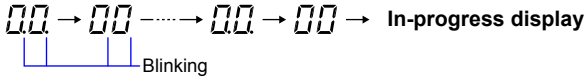
▶ For the contents of error codes and their meanings, see section 4.1, "Errors Displayed on the 7-Segment LED and Corrective Actions."

- In-Progress Display
  The following displays cycle while the CF card is being accessed or while calibration is being performed. Do not remove the CF card while it is being accessed.

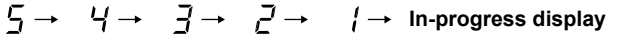


▶ For the handling of the CF card, see “Handling of the CF Card” in section 2.10.
▶ For CF card replacement, see “Saving Data to the CF Card” in this section.

- Access Forewarning to the CF Card
  When saving measured, computed, or thinned data, the dots blink before accessing of the CF card. This indication starts 10 seconds before the access. If you see this indication, quickly finish the insertion or removal of the CF card.



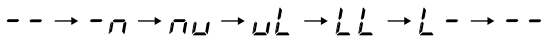
  If you are using the multi interval function, this indication may be shorter than 10 seconds. If the time until the CF card is accessed is less than or equal to 5 s, the time until access is displayed numerically.



▶ For CF card replacement, see “Saving Data to the CF Card” in this section.

  When performing a manual sample, and when saving report data, the dots do not blink before accessing of the CF card.

- Non-execution Display
  If the file division action is not executed, “--nuLL--” is displayed with the characters flowing from right to left as shown below. Check the execution condition of the file division.



Operation Modes and Statuses

The MW100 has a Setting mode in which input ranges and other settings can be entered, and a Measurement mode in which data acquisition is performed. The mode switches depending on the measurement item of the status information.

Mode	Status Info Measurement	Description
Setting mode	Stop	For entering range, system, communication, and display settings
Measurement mode	Start	For data monitoring, computation, and recording

* The instrument must be in measurement mode in order for the status of computation and recording to be Start.

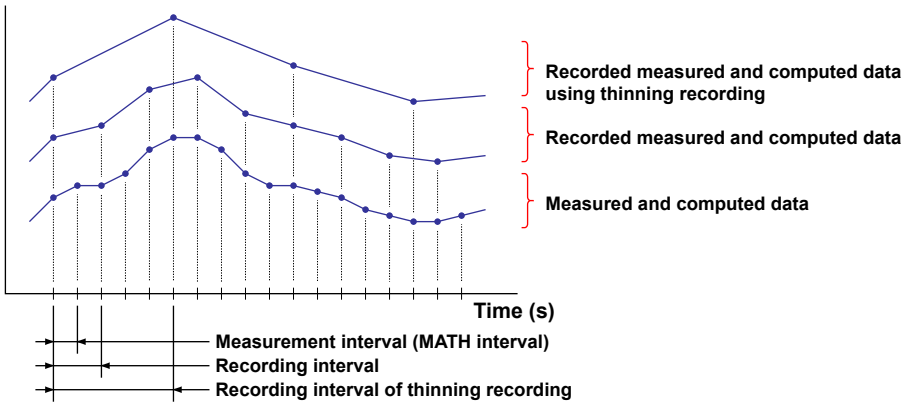
Measurement

Measured data sampled at certain intervals is acquired by the various input modules. Acquired data is stored in internal memory. During recording, acquired data is saved to the CF card according to the settings.
In addition, if an alarm occurs or if the main module receives output commands sent from the PC, the main module generates signal output instructions to the output modules.

Data Sampling

The relationship between the measurement interval and recording interval is as follows: The measured, computed, or thinned data that is recorded at the recording interval is saved to the CF card.

▶ For saving data to the CF card, see “Saving Data to the CF Card” in this section.



Measurement Intervals

- Synchronization between modules
  If set to the same measurement interval, measurements made by input modules in the same acquisition unit are synchronized.
- Synchronization between channels
  On the 4-CH, High-Speed Universal Input Module, the 10-CH, Pulse Input Module, and the 10-CH, High-Speed Digital Input Module, measurement is synchronized between channels.
  On the 10-CH, Medium-Speed Universal Input Module, 30-CH, Medium Speed DCV/TC/DI Input Module, Six-Channel Medium-Speed Four-Wire RTD Resistance Input Module, and 4-CH, Medium-Speed Strain Input Module, measurement is not synchronized between channels since measurement occurs sequentially by channel (it can be said to be synchronized within measurement intervals).

Multi interval

Measurement Groups

Three measurement intervals can be set, and measurement channels can be assigned to each interval. There is a particular order in which measurement intervals can be set to measurement groups.

▶ For a description of setting the measurement interval, see section 3.4, “Setting Acquisition Conditions for Measured/Computed Data.”

Filters

A first-order lag filter is available. You can select a time constant (time until 63.2% of the output value is reached) corresponding to the measurement interval indicated in the equation below.

Time constant = measurement interval × N (where N = 5, 10, 20, 25, 40, 50, or 100)

▶ For details on filters, see section 2.9, “Measures Against Noise on the MW100 Data Acquisition Unit.”

MATH

Differential computation between channels and linear scaling are possible. Linear scaling converts the measured values for a specific purpose (scaled values) using the following equation.

$$\text{Scale value} = \frac{(X - SP_{min}) \times (SC_{max} - SC_{min})}{SP_{max} - SP_{min}} + SC_{min}$$

X: Measured value
SP_{max}: Specified span maximum
SP_{min}: Specified span minimum
SC_{max}: Specified scale maximum
SC_{min}: Specified scale minimum

MATH Types	Notation
Differential computation between channels	Delta
Linear scaling	Scale

Note that the channels included on the 10-CH Pulse Input Module are only available for integration (TLOG.PSUM).

MATH (/M1 Option)

Expressions using measured and computed data as variables can be entered and executed on channels dedicated for computation, and the results can be displayed and saved. Computations are executed every measurement interval (shortest interval is 100 ms).

▶ For details, see section 1.15, “MATH Functions (/M1 Option).”

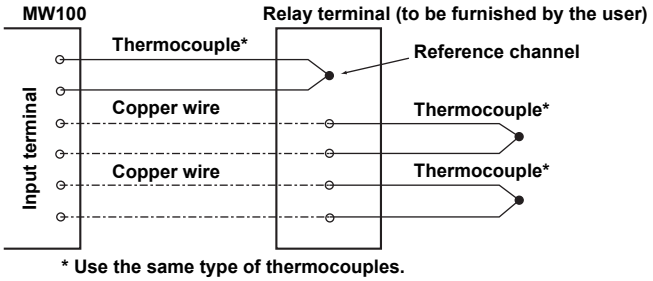
Report Function (/M3 Option)

You can perform statistical computations on measurement or MATH channel data and display and save the results. The types of reports are hourly, daily, weekly, or monthly. Reports can be created using the maximum, minimum, average, integral, and instantaneous values from up to 60 channels.

▶ For details on the report function, see section 1.16, “Report Function (/M3 Option).”

Remote RJC (RRJC)

When the item to be measured is located at a great distance, you can set up relay terminals near the item, measure the temperature difference between the relay terminal and the input terminal of the input module (reference channel) using thermocouples, and use the resultant electromotive force as the reference junction compensation of the temperature measurement. By connecting a copper wire between the relay terminal and input terminal of the input module, and a thermocouple between the DUT and relay terminal, you can measure the temperature of the DUT without the need for a large amount of expensive thermocouples.



Burnout

When the input mode is set to thermocouple (TC), you can set the burnout detection behavior. Measured values become “range over” during detection.

Detection Behavior	Notation
No detection	Off
Measured values fixed at +range over	Up
Measured values fixed at –range over	Down

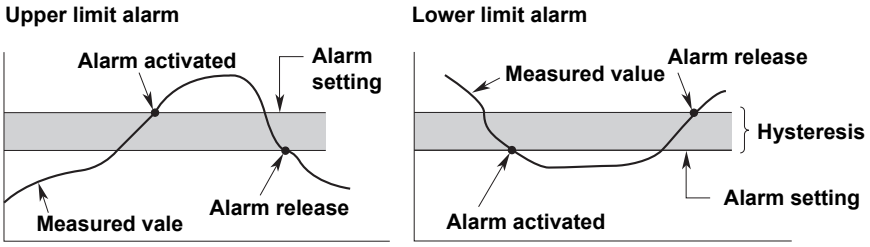
Alarms

The main module compares the measured values against preset alarm values and outputs alarm signals based on the result from the digital output module. The following four types of alarms can be output.

Type	Notation	Actions
Upper limit alarm	H	Generates an alarm when the measured value exceeds the alarm value.
Lower limit alarm	L	Generates an alarm when the measured value falls below the alarm value.
Differential upper limit alarm (during differential computation)	DH	Generates an alarm when the difference between the measured values of two alarms exceeds the alarm value.
Differential lower limit alarm (during differential computation)	DL	Generates an alarm when the difference between the measured values of two alarms falls below the alarm value.
High limit on rate-of-change alarm	RH	Generates and alarm when the rate of change in rising measured values exceeds the alarm value.
Low limit on rate-of-change alarm	RL	Generates and alarm when the rate of change in falling measured values falls below the alarm xvalue.
Delay high limit alarm	tH	Generates an alarm when the measured value remains below the alarm value for the specified time (delay time).
Delay low limit alarm	tL	Generates an alarm when the measured value remains above the alarm value for the specified time (delay time).

Alarm Value Hysteresis

You can set a width (hysteresis) to the values used to activate and release alarms. Alarm hysteresis can prevent frequent activation and release of alarms when the measured value is unstable around the alarm value.

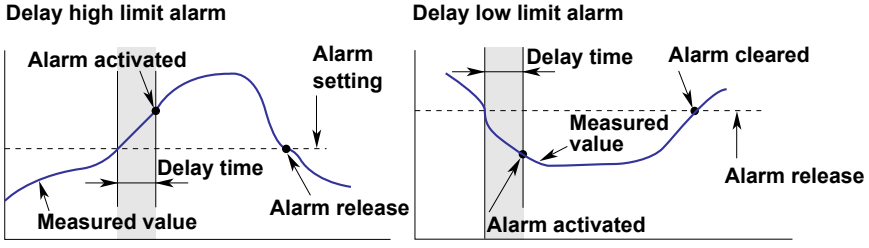


Alarm Output Timing

Alarms occur at each measurement interval based on the alarm settings. However when the measurement interval is 10 or 50 ms, alarms occur at 100 ms intervals based on all of the data.

Delay High Limit Alarm and Delay Low Limit Alarm

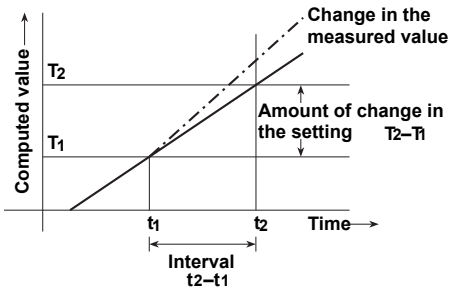
An alarm occurs when the measured value remains below or above the alarm value for the specified time (delay time). You can set the delay time between 1 and 3600 s for each channel. Set the delay to an integer multiple of the measurement or MATH interval.



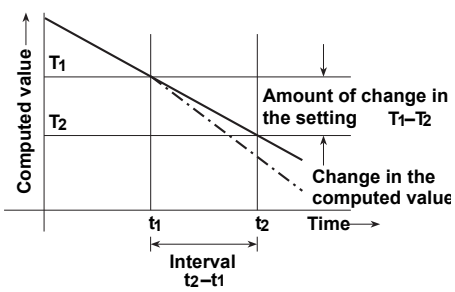
Rate of Change Upper Limit / Lower Limit Alarm

The rate of change of the measured values is checked over the rate-of-change detection interval. An alarm occurs if the rate of change of the measured value in the rising direction exceeds the specified value.

High limit on rate-of-change alarm



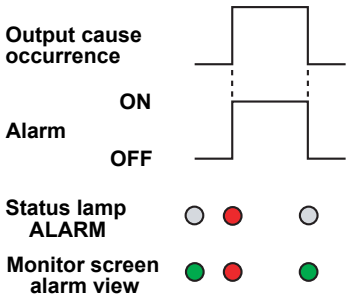
Low limit on rate-of-change alarm



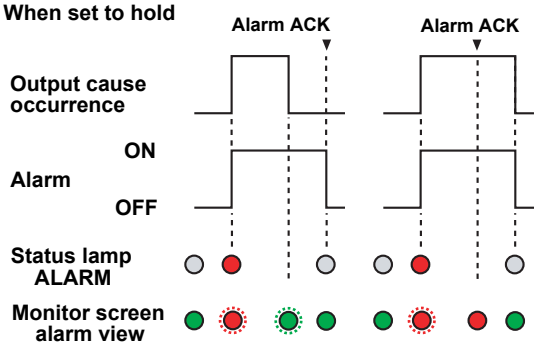
Alarm Hold/Non-Hold

You can select whether, when factors resulting in output cease to exist, alarms are cleared when the output factors are cleared, or alarms are held for their full duration (alarm ACK*).

• When set to non-hold



• When set to hold



* By clicking the Alarm ACK button in the browser's monitoring screen or by sending an equivalent communication command.

Tag Strings

Tag strings can be set for each measurement and MATH channel.
You can select whether to display tag name or channel numbers on all channels.

Messages

Message strings set in advance are written to the monitor screen and message summary per operations of the Event/Action function, communication commands, and buttons on the browser.
Number of messages: 5 (1 to 5)

Free Message

When you enter a message in the browser's monitor screen and press a button during data acquisition or recording, the message is written to the monitor screen and message summary.
If you switch the screen after inputting a message string without writing the message, the input message string reverts to the string prior to the change.
Number of messages: 1 (Free)

Event Action Function

The event action function is used to execute an action such as starting or stopping the recording by detecting an event such as an alarm occurrence or digital input.
By linking the Event function and Action function, you can control the operations of the main unit.

Event Types

The following types of events are available. Some items may not be available depending on the options installed.

Event Type	Notation	Start Specification
Digital input	DI	Channel number
Alarm occurrence	Alarm	
Alarm on specified channel	Alarm Channel	Channel number, alarm level number
Recording start	Memory	
Relay action	Relay	Relay number
Timer event occurrence	Timer	Timer number
Match time event occurrence	Match Time	Match time number
User function key	User Key	Keys number

The following Actions are available. The items that can be set differ according to the events and event detection method.

Action	Notation	Detection Method	
		Edge	Level
Recording start[*1]	Memory Start	○	○
Recording stop[*1]	Memory Stop	○	
Save recorded data in divisions[*1]	Memory Save	○	
Save thinning recording in divisions[*1]	Memory Save(T)	○	
Computation start	MATH Start	○	○
Computation stop	MATH Stop	○	
Clear computation	MATH Clear	○	
Reset computation	MATH Reset	○	
Reset MATH on specified MATH group number (Gr.1-7)	MATH Reset Gr.1 MATH Reset Gr.2 MATH Reset Gr.3 MATH Reset Gr.4 MATH Reset Gr.5 MATH Reset Gr.6 MATH Reset Gr.6	○	
Trigger occurrence on specified number	Trigger1 Trigger2 Trigger3	○	
Alarm ACK	Alarm ACK	○	
Flag	Flag	○	○
Reset timer of specified number (1-6)	Timer 1 Reset Timer 2 Reset Timer 3 Reset Timer 4 Reset Timer 5 Reset Timer 6 Reset	○	

Action	Notation	Detection Method Edge	Level
Write free message	Free Message	○	
Write message on specified number	Message1 Message2 Message3 Message4 Message5	○	
Save specified file*2	File Save	○	
Load specified file*2	File Load	○	
Perform manual sample*1	Manual Sample	○	
Divide manual sample file*1	Manual Divide	○	

*1 Cannot be selected when the event is Recording start.
*2 Cannot be selected when the event is User function key. The name of the target file is fixed to SETTING.PNL.

Event detection methods*

Method	Notation	Description
Edge	Edge	Edge event
Level	Level	Level event

* The following limitations exist on the setting.

- You cannot set the same action type for Edge and Level. The following action types are considered the same.
  Memory Start and Memory Stop
  MATH Start and MATH Stop
  Flag with the same flag number
- You cannot set the same action type for different levels. The following action types are considered the same.
  Memory Start and Memory Stop
  MATH Start and MATH Stop
  Flag with the same flag number

The setting error above occurs when you switch from Setting Mode to Measurement Mode.

Daylight saving time

The internal clock is updated every specified month, week, day, and time.

Timer

The Event/Action function can be started according to timer settings.
The following two timers are available. *1

Type Notation	Description	
Relative Time Timer	Relative	Time up occurs at the specified time interval
Absolute Time Timer	Absolute	Time up occurs at a time interval after a specified reference time*2

*1 Operation upon power failure differs. For details, see “Timer and Match Time” in section 5.2.
*2 Also valid prior to the reference time.

Match Time

The Event/Action function can be started according to the match time setting.
The following three match times are available. *1, *2

Type	Notation	Description
Monthly	Month	Time up occurs every month on specified date and time (hr and min)
Weekly	Week	Time up occurs every every week on the specified day of the week and time (hr and min)
Daily	Day	Time up occurs every day at the specified time (hr and min)

*1 Conditions can be set for no operation. For details, see “Timer and Match Time” in section 5.2.
*2 For information about operation during power failures and time changes, see “Timer and Match Time” in section 5.2.

Measurement, Computation, and Thinning Recording Operations

Recording Start/Stop

You can start or stop recording to the CF card using the Start/Stop key, even action function, communication command, or monitor screen.

Recording Start Action

The operations for starting the recording to the CF card are given below. The recording start action is set to Direct for thinning recording.

Type	Notation	Operation
None	Off	Does not record.
Direct	Direct	Starts recording when recording start is executed.
Trigger	Trigger	Enters the trigger wait mode when recording start is executed. Recording starts when an event occurs.

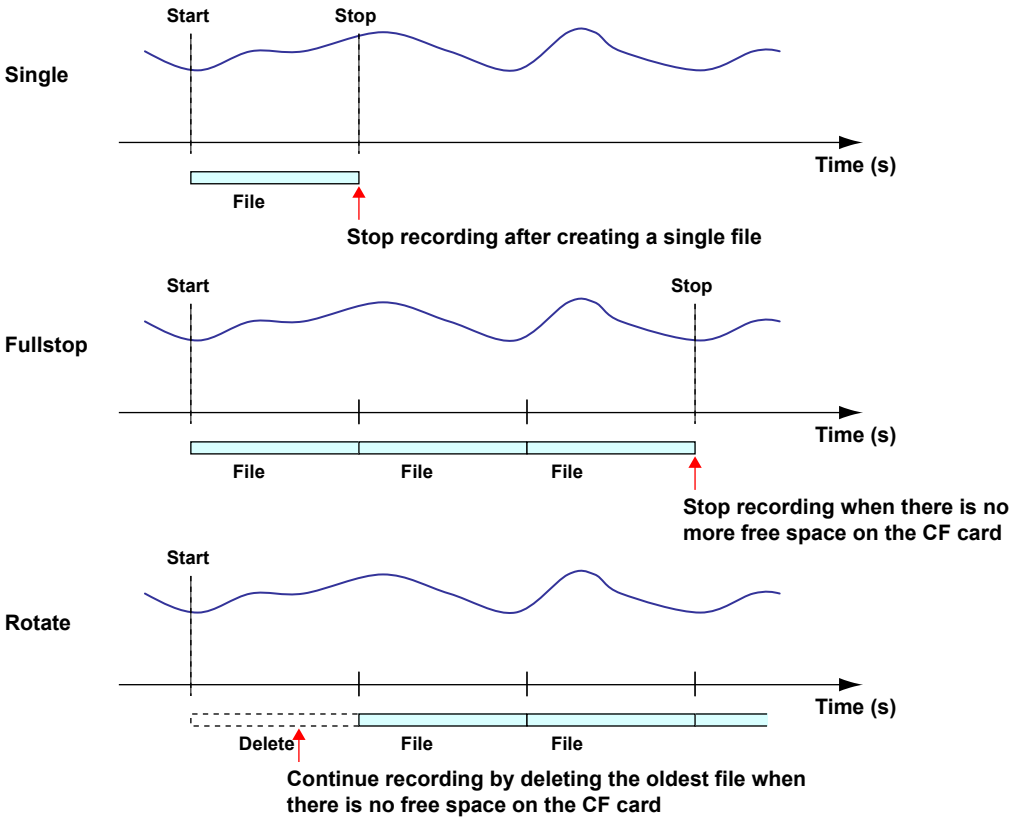
Recording Stop Action

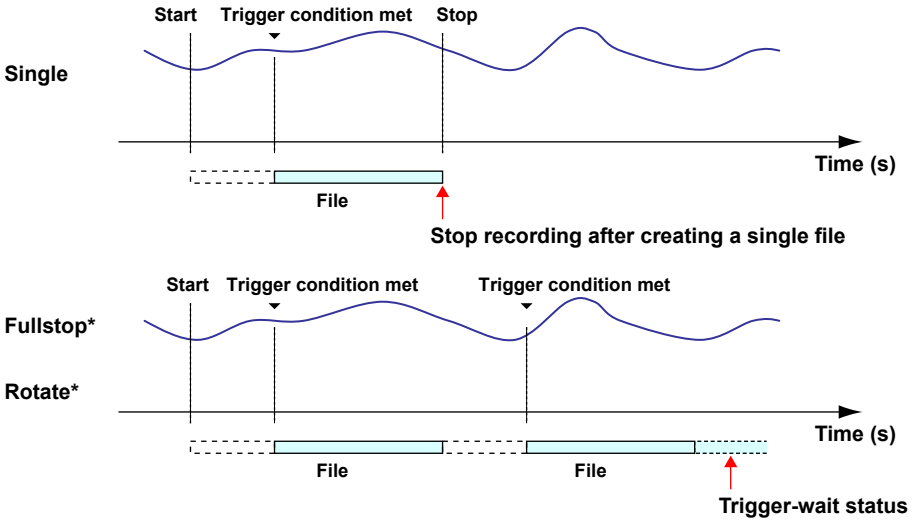
The following three operations are available to stop recording.

Mode	Display	Operation
Single	Single	One file of a specified size is created on the CF card, then recording stops.
Full stop	FullStop	Files of the specified size are created until the capacity of the card is reached, then writing to the card stops.
Rotate	Rotate	Files of the specified size are created until the capacity of the card is reached, then if the capacity is exceeded, new data is written over the oldest data, and the process continues.

Combination of Recording Actions

You can combine the recording start action and the recording stop action to specify the recording method appropriate for your application.

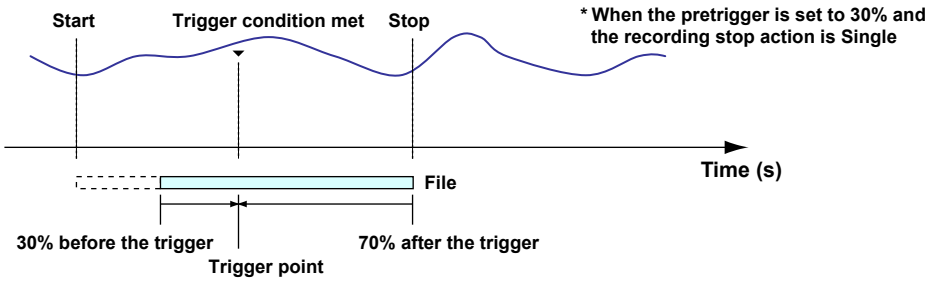




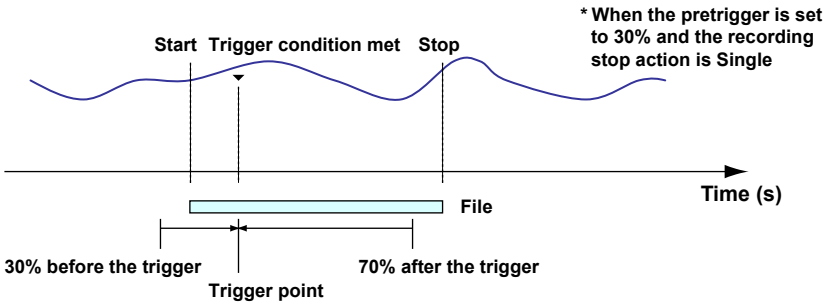
* The condition for stopping the recording when set to Fullstop and the condition for deleting the file when set to Rotate is the same as the condition when the recording start action is set to Direct.

Pretrigger Function

When selecting Trigger, a pre-trigger can be set in units of ten percent of the data length. Writing starts simultaneously with recording, and after a trigger event occurs, the data remaining after removal of the pretrigger data is written.



If the time from when recording is started until the trigger condition is met is shorter than the pretrigger length, data is written until the data length is reached after the trigger condition is met.



Manual Sample Function

When you perform a manual sample, the measured and computed data from specified channels are written to the manual sample file.
When the CF card is inserted, the data is written to the manual sample file each time you perform the manual sample. If the card is not inserted, the data is stored in internal memory and written to the CF card the next time it is inserted.
A manual sample function can be carried out when in Measurement mode.

Performing a Manual Sample

A manual sample can be performed with the following actions.

- By the Event/Action function
- Using icons in the browser's monitor screen
- Through operation in the Status Information screen
- By receiving a communication command

Action	Notation	Operation and Notes
Perform manual sample	Manual Sample	Performs a manual sample and writes to the manual sample file.

Note

A new manual sample cannot be performed while the manual sample file is being written to.

Dividing the Manual Sample File

The manual sample file can be divided with the actions below. However, if division is performed at the same time as a manual sample, priority is given to the manual sample.

- By the Event/Action function
- Through operation in the Status Information screen
- By receiving a communication command

Action	Notation	Operation and Notes
Divide the manual sample file*	Manual Divide	Divides the manual sample file. Dividing the file is useful for summaries when the DUT changes.

* The manual sample file is also divided under the following conditions.

- When the number of sampled data exceeds 100.
- When the set conditions are changed.

Sample Channels

Measurement and MATH channels can be turned ON/OFF individually. Channels set for measurement SKIP and computation OFF are not recorded.

▶ For sample channel settings see "Recording Channel Settings" in section 3.4.

Data Acquisition Timing

When a manual sample is performed, the latest measured and computed data held are written as manual sample data. When using the Multi Interval function, deviations in measurement timing occur due to differences in measurement intervals.
If you perform a manual sample using the Timer or Match Time of the Event/Action function, data can be acquired under the same measurement timing.

Displaying Data

Manual sample data can be displayed in the browser's data view screen (only the latest file can be displayed), or by using the MW100 Viewer Software.

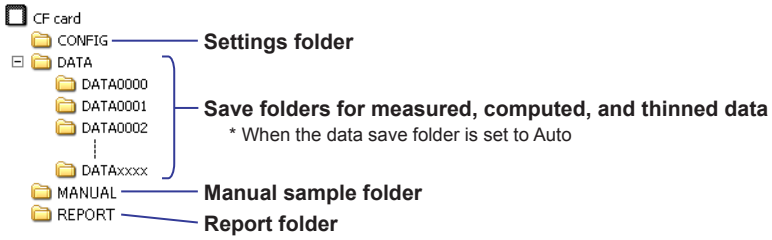
Saving Data to the CF Card

Save Location

Measured data, computed data, thinned data, recording logs, alarm summaries, manual sample data, report data, and settings can be saved on the CF card.

• Folder Structure

The structure of the data save folder is as shown below.



• Folder Name Settings

Select one of the following methods for creating folders for saving measured, computed, and thinned data. Other folder names are fixed.

Type	Folder Name	Description
Auto	DATAnnnn	DATA: Fixed nnnn: Serial number (0000 to 9999)
Partial	xxxxnnnn	xxxx: Any 1 to 4 alphanumeric characters nnnn: Serial number (0000 to 9999), can specify any start number.
Free	xxxxxxxx	xxxxxxxx: Any 1 to 8 alphanumeric characters
Date	mddhhmmn	mddhhmm: Month, day, hour, minute (m: 1 to 9, X (October), Y (November), Z (December) dd: 01 to 31, hh: 00 to 23 mm: 00 to 59) n: serial number (0 to 9, A to Z)

• File Name

This is a list of file names generated by the MW100. A file name other than that of the setting file cannot be specified.

Type		File Name	Save Location	Description
Settings		xxxxxxxx.PNL	CONFIG	xxxxxxxx: Specified when saving (8 characters or fewer)
Measurement	Measurement group 1	mdd1nnnn.MXD	DATAnnnn*1	mdd*2: Month/day (m: 1 to 9, X (October), Y (November), Z (December), dd: 01 to 31) 1 to 3: Measurement groups 1 to 3 M: MATH T: Thinning nnnn: Serial number (0000 to 9999)
	Measurement group 2	mdd2nnnn.MXD		
	Measurement group 3	mdd3nnnn.MXD		
Computation		mddMnnnn.MXD		
Thinning		mddTnnnn.MXD		
Recording log		RECORDLG.TXT	DATAnnnn*1	
Alarm summary		ALARMLG.TXT	DATAnnnn*1	
Manual sample		mddSnnnn.DAM	MANUAL	mdd*2: Month/day (m: 1 to 9, X (October), Y (November), Z (December), dd: 01 to 31) S: Manual sample nnnn: Serial number (0000 to 9999)
Report	Daily	Dyymmddn.DAR	REPORT	D: Daily W: Weekly M: Monthly yymmdd*2: Year/month/day (yy: last two digits of Western calendar, mm: 01 to 12, dd: 01 to 31) n: serial number (0–9, A to Z)
	Weekly	Wyymmddn.DAR		
	Monthly	Myymmddn.DAR		

*1. Created in the DATA folder. When the data save folder is set to Auto.

*2. Date the file is created.

Saving Measured Data and Computed Data

Files can be created for every measurement group. An individual file is created for computed data. For each measurement group, you can select whether or not to perform the save operation.

The table below shows the approximate interval over which data can be saved to the CF card when one measurement interval is used.

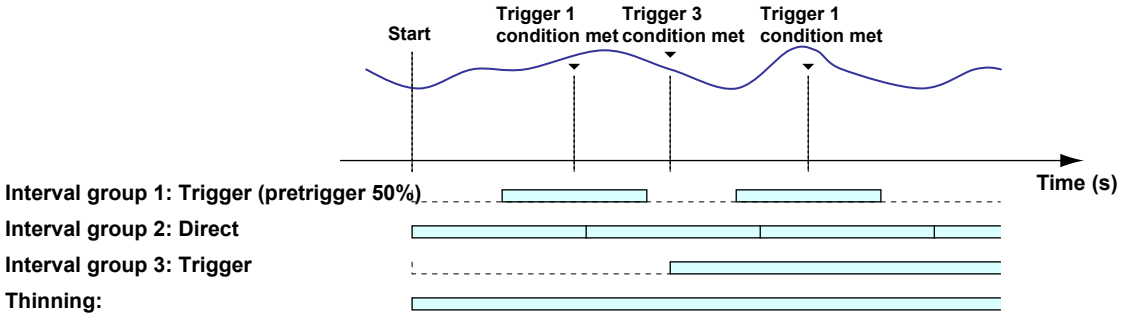
Save Channel	Measurement Interval	Capacity of the CF Card	
		128 MB	512 MB
10 ch	10 ms	8.8 hours	35.3 hours
	100 ms	3.7 days	14.8 days
	1 s	37 days	148 days

Saving Thinned Data

Data is saved at a specified thinning interval. Thinning time:
4, 5, 10, 20, or 30 seconds, or 1, 2, 3, 4, 5, 10, 20, or 30 minutes, or 1 hour.
Select a thinning time from the above choices.

Saving Data at Multi Intervals

The recording operation can be specified for each interval group. Multiple sets of data can be saved simultaneously such as recording an interval around a sudden event while continuously recording long-term changes in the data.



File Division

You can use the Event/Action function, communication commands, or operations in the browser's status information screen to divide the file containing measured, computed, or thinned data at an arbitrary time. After dividing a file, the next file division is enabled 10 minutes later.

Action	Notation	Operation and Notes
Save recorded data in divisions	Memory Save	Divides and saves the measured or computed data file. This action is valid when the recording start action is set to Direct and the recording stop action is set to Fullstop or Rotate.
Save thinning recording in divisions	Memory Save (T)	Divides and saves the thinned data file. This action is valid when the recording stop action is set to Fullstop or Rotate.

File Message

You can enter a file message of up to 120 characters common to the measured and computed data file, and a message for thinned data file. You can view the file message on the MW100 Viewer Software.

Replacing the CF Card While Recording

You can replace the CF card while the recording is in progress. Replace the CF card quickly while the access indicator (in-progress display) to the CF card is not ON. If the time to write the data arrives while you are replacing the CF card, the data for that interval is dropped. You can check the time when data is written using the recording status log in the log information.

The measured, computed, or thinned data files that are divided due to the replacement of the CF card can be joined using the MW100 Viewer Software.

▶ For a description of the CF card access indicator, see “Displays” in this section.

▶ For a description of the time when data is written to the CF card, see appendix 8, “Saving Data to the CF Card.”

Saving Manual Sample Data

Each time you perform a manual sample, the data is written to the manual sample file saved on the CF card.

▶ For details on manual samples: see “Manual Sample Function” in this section.

Saving Report Data (/M3 Option)

Hourly, daily, weekly, and monthly data is written to the daily, weekly, and monthly files saved on the CF card.

▶ For details on reports, see section 1.16, “Report Function (/M3 Option).”

Saving Settings

MW100 setting values can be saved. The contents that are saved are as follows:

- Range, alarm, and MATH related settings
- Media related settings
- Communication related settings
- Other settings

However, when settings are loaded onto the MW100, the IP address, subnet mask, default gateway, host name, and domain name are not loaded.

▶ For details on the saved items, see saved settings in “Recording Structure” in section 5.2.

Format

Initializes the CF Card.

▶ For information on formatting the CF card, see “Formatting the CF Card and Checking the Free Space” in section 3.3.

Communication Specifications

The MW100 can communicate with external devices using its Ethernet or serial communication port.

Login Function

This function ensures that only previously registered users can obtain access when communicating with the MW100.
For instructions, see section 3.2, “Communication Settings.” There are two levels of user access rights as follows:

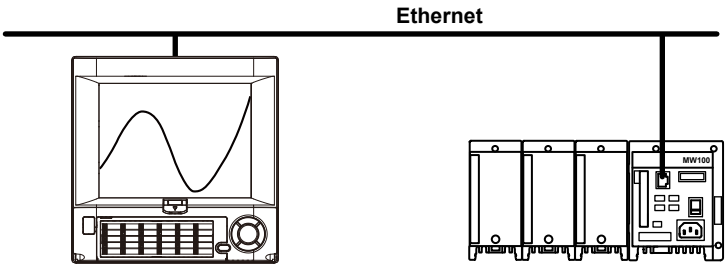
Level	Notation	Description
Administrator privileges	Admin	All functions are available.
User privileges	User	Measured/computed data, manual sample data, report data, settings, log information, alarm summaries, and status information can be obtained. Administrator privileges are required to switch operation modes, start/stop computation and recording, or change settings such as the measurement range.

Ethernet Communication

The MW100 supports the following protocols: FTP, SNTP, DHCP, DNS, HTTP, Modbus/TCP, SMTP, and MW-specific.

- **HTTP Function**
  Web service
  MW100 settings and data can be monitored from a PC using a browser.
  WebDAV function
  A list of files and folders on the HTTP server (MW100) can be retrieved, and files and folders can be copied, moved, or deleted from a PC using a browser.
- **DHCP Client Function**
  The IP address can be automatically obtained from the DHCP server.
- **SNTP Function**
  Acting as a client, the MW can obtain time information from the specified NTP server and SNTP server when the power is turned ON. When acting as the server, the unit can provide time information to other MW100s connected to the network.
- **FTP Function**
  As a client, the MW can send acquired data files to an FTP server. You can set up two send destinations so that even if one server is down, the file can be sent to another server. When acting as the server, you can transfer, delete, and otherwise manipulate files from a PC.
- **E-Mail Function (SMTP)**
  Alarm occurrences and creation of data files can be notified via e-mail. Two recipients locations can be specified.
- **MW100-Specific Protocol**
  You can carry out operations similar to the operations on a browser. For the available commands, see the Communication Command Manual (IM MW100-17E).
- **Modbus Client Function(/M1 option)**
  The MW100 can connect to a Modbus server device and load measured data. Using Modbus commands, the MW100 can load data from the Modbus server at regular intervals. Loaded data are assigned to the communication input channels (C001 to C300) of the MATH function (/M1 option). Up to ten Modbus servers can be registered.

- **Modbus Server Function**
  Modbus clients connect to an MW100 acting as the Modbus Server, and read from or write to its internal registers.
  Measured data and alarm statuses from measurement channels, measured data and alarm statuses from MATH channels, data from communication input channels, and time information are stored in the MW100's registers. Up to four clients can be connected simultaneously.



DX2000 (with the /MC1 option) (Client) **MW100 (Server)**

Using Yokogawa's DX2000 Paperless Recorder (with the /MC1 option), you can easily monitor measured data from the MW100.

E-Mail Function

Notification can be made of alarm occurrences and creation of data files by e-mail. Two recipient locations can be specified. Multiple addresses can be specified for each recipient location.

▶ For details about e-mail contents, see chapter 5, "Specifications."

E-Mail Types

The following types of e-mail can be generated.

E-Mail Type	Operation and Contents of E-Mail
Alarm notification	E-mail is sent when measurement or MATH alarms are activated or cleared. Contents: Channels, levels, and types of alarms that were activated or cleared, instantaneous values of measurement and MATH channels (when selected), transmission request time
Report notification	Sends hourly, daily, weekly, and monthly reports via e-mail. When measurement is started, the report is sent even if recording is stopped. Contents: The hourly, daily, weekly, or monthly (selectable) maximum, minimum, average, integral, or instantaneous values (selectable), report start and stop date/times, and report status
File creation notification	E-mail is sent when a measured, computed, or thinned data file, manual sample file, or report file is created. Contents: Created file name and time of send request
Notification of remaining space on media	E-mail is sent when the remaining time on the CF card is determined to be less than the specified time. Contents: Total and remaining space on CF card, and the time of send request
Notification of power ON	E-mail is sent when the power is turned ON. Contents: Time power was cut and turned ON
System error notification	E-mail is sent when an operation error occurs. Contents: Error number and message, and time of send request
Fixed time report	E-mail is sent every specified time interval. Contents: Instantaneous values of the measurement and MATH channels (when selected) and the time of send request Reference time setting: Set in units of one-minute between 00:00 and 23:59 Time interval: Select 1, 2, 3, 4, 6, 8, 12, or 24 h
Test	E-mail is sent when test is executed. If a mail send request occurs during sending of another message, the request is ignored.

Subject

The e-mail transmission type is added to the subject. A user-specified string can be added to the transmission type in the subject.
The following subject topics are available.

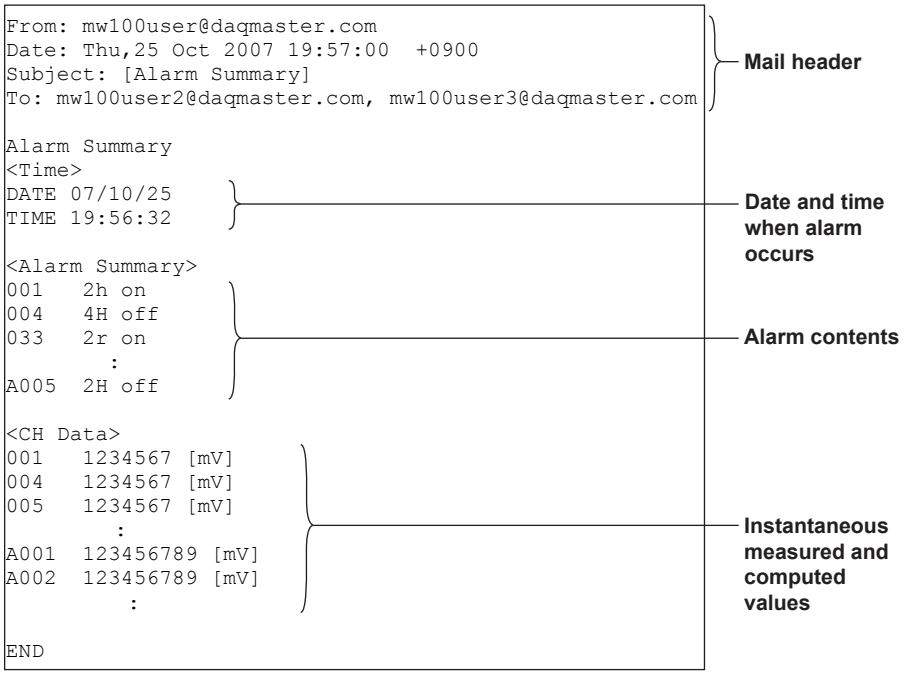
E-Mail Type	Subject
Alarm notification	[Alarm Summary] + user specified string
Report notification	[Report Data] + user specified string
File creation notification	[File End] + user specified string
Notification of remaining space on media	[Media Remain] + user specified string
Notification of power ON	[Power Failure] + user specified string
System error notification	[ERROR] + user specified string
Fixed time report	[Periodic Data] + user specified string
Test	[Test] + user specified string

E-mail Retransmission

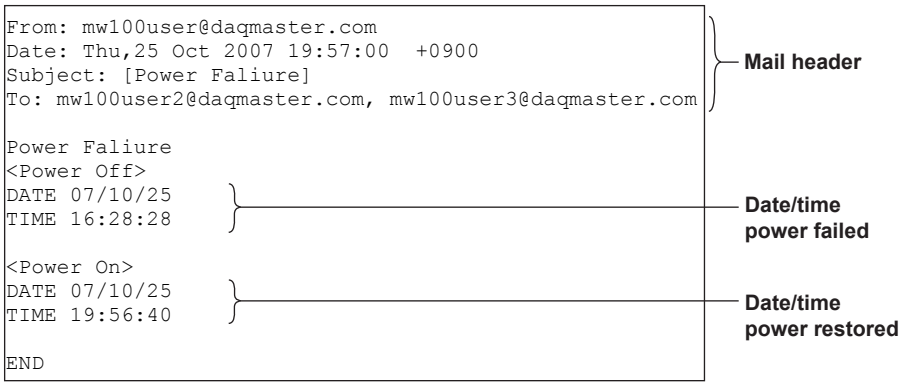
If e-mail transmission fails, it will be retried two more times at about thirty to sixty second intervals.
If retransmission fails twice, the e-mail is deleted without being sent. Retransmission is not performed if the e-mail type is Test.

Example of an E-Mail Transmission

- Alarm notification e-mail



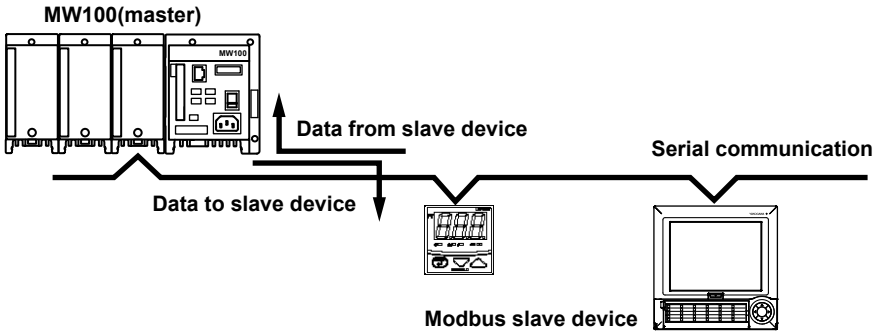
- Power supply ON notification e-mail



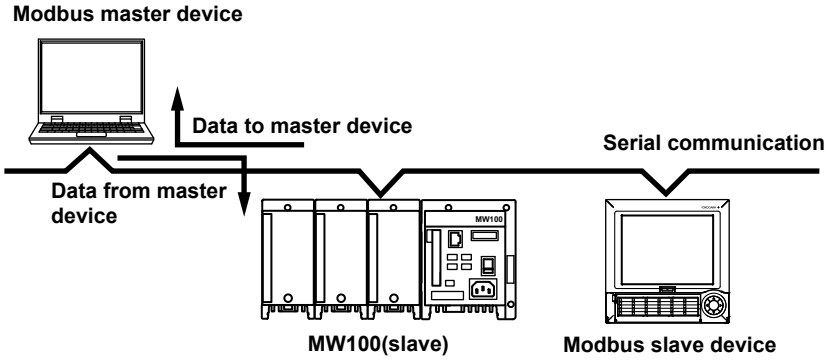
RS-422A/485 Communication (/C3 Option)

In a multi-drop, four-wire configuration, up to thirty-two units can be connected. A dedicated protocol and the ModbusRTU protocol are supported.
Using communication commands, you can send and receive settings, and measured and computed values.

- **Modbus Master Function (/M1 Option)**
  The MW100 can connect to a Modbus slave device and load measured data. The operation is the same as the Modbus client function. Target devices (Modbus slaves) are identified with addresses.



- **Modbus Slave Function**
  Modbus master devices can connect to other MW100s acting as Modbus slaves and read from or write to their internal registers. The MW100 registers are the same as those for the Modbus server function.



▶ For instructions on connections, see section 2.7, “Connecting the RS-422A/485 Interface (/C3 Option).”

RS-232 Communication (/C2 Option)

This is a point-to-point system. A dedicated protocol and the Modbus/RTU protocol are supported.

- Using communication commands, you can send and receive settings, and measured and computed values.
- The MW100 operates as the Modbus master or slave. For information about the operation, see “RS-422A/485 Communications (/C3 Option).”

▶ For instructions on connections, see section 2.8, “Connecting the RS-232 Interface (/C2 Option).”

Log Information

The MW100 operations are recorded in the log. You can view the log using a log file or communication output.

Saving the Recording Log File

While recording is stopped, information related to operation of the CF card and power ON/OFF status is saved in text format to a log file with the name RECORDLG.TXT. For information about log statuses and messages, see the MW100 Communication Command manual (IM MW100-17E).

Information Saved to the Log File

- When power is turned OFF or ON
- When CF card is inserted or ejected
- When CF card is formatted
- Upon recording stop or start, etc.
- File creation or deletion
- Triggers
- Time synchronization
- Errors
- Log saving

Example of a Log File

```
Yokogawa DAQMASTER MW100 <Record Info>
  Date     Time    Status  Message
05/01/01 00:00:01 Power   on
07/10/25 09:58:13 Format  ok
07/10/25 10:00:03 Create  /DATA0033
07/10/25 10:00:00.Record  start 1
07/10/25 10:00:05 Mode    rotate   -T-
07/10/25 10:00:05 (100ms) 1H / 12cells
07/10/25 10:00:05  10CHs     1409KB
07/10/25 10:00:06 Create  X2510100
07/10/25 11:00:15 Create  X2510101
07/10/25 12:00:15 Create  X2510102
07/10/25 12:40:35 Record  stop 1
07/10/25 12:41:25 Create  ALARMLG
07/10/25 12:14:26 Create  RECORDLG
>>
```

Time indicating when settings were initialized*

Time after internal clock is reset*

Recording starts

Data file creation

Recording stops

Newest information

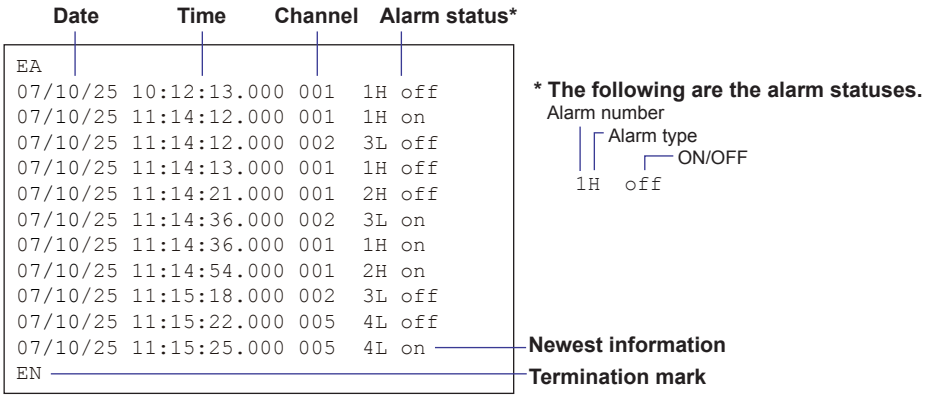
Termination mark

*** When settings are initialized, the MW100 initial time value of 2005/01/01 00:00:00 is set. After than, if the time is reset, the time after the change is recorded.**

Saving Alarm Summaries

When the recording stop action is activated, alarm summary information is saved in text format to a log file named ALARMLG.TXT.

Example of an Alarm Summary



Note

While recording is paused during measurement, if the Stop key is held down, the data acquisition log and alarm summary log are created in the root directory of the CF card.

Log Output

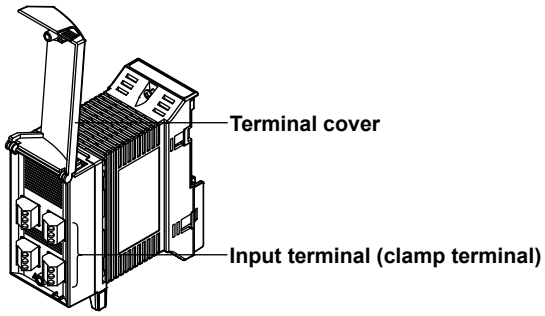
The following logs can be output using communication commands. You can also view the log information using a browser. For information about log statuses and messages, see the MW100 Communication Command manual (IM MW100-17E).

Item	Notation	Request Type
Operation error log	Operation Error Log	Max. number of displayed logs
Alarm summary	Alarm Summary	Max. number of displayed logs
Strain input initial balance result	Strain Input Initial Balance	Display range
Recording log	Recording Log	Max. number of displayed logs
Recording status	Recording Status	Max. number of displayed logs
Message summary	Message Summary	Max. number of displayed logs
Communication log	Communication Log	Max. number of displayed logs
Operation log	Operation Log	Max. number of displayed logs
Computation status	MATH Status	Max. number of displayed logs
Mail client log	SMTP Client Log	Max. number of displayed logs
Time synchronization client log	SNTP Client Log	Max. number of displayed logs
HTTP server log	HTTP Server Log	Max. number of displayed logs
DHCP client log	DHCP Client Log	Max. number of displayed logs
FTP client log	Client Log	Max. number of displayed logs
FTP server log	Server Log	Max. number of displayed logs
Modbus client log	Modbus Client Log	Max. number of displayed logs
Modbus client command status	Modbus Client Command	Display range
Modbus client connection status	Modbus Client Connection	Display range
Modbus master log	Modbus Master Log	Max. number of displayed logs
Modbus master command status	Modbus Master Command	Display range
Modbus master connection status	Modbus Master Connection	Display range
Modbus server log	Modbus Server Log	Max. number of displayed logs
Modbus slave log	Modbus Slave Log	Max. number of displayed logs

▶ For the procedure to view the log information using a browser, see “Log Information” in section 3.15.

1.4 Functions of the 4-CH, High-Speed Universal Input Module

This module allows up to four inputs of DC voltage, thermocouple, 3-wire RTD, or digital input (DI) at a minimum measurement interval of 10 ms.



Measurement Input Types

Measurement Input Type	Notation
Do not measure	SKIP
DC voltage	VOLT
Thermocouple	TC
Resistance temperature detector	RTD
DI	DI
Remote RJC	RRJC

Measurement Range

DC Voltage

Measurement Range	Notation	Rated Measurement Range
20 mV	20 mV	–20.000 to 20.000 mV
60 mV	60 mV	–60.00 to 60.00 mV
200 mV	200 mV	–200.00 to 200.00 mV
2 V	2 V	–2.0000 to 2.0000 V
6 V	6 V	–6.000 to 6.000 V
20 V	20 V	–20.000 to 20.000 V
100 V	100 V	–100.00 to 100.00 V
60 mV (high resolution)	60 mVH	0.000 to 60.000 mV
1 V	1 V	–1.0000 to 1.0000 V
6 V (high resolution)	6 VH	0.0000 to 6.0000 V

Thermocouple

Measurement Range	Notation	Rated Measurement Range
Type-R	R	0.0 to 1760.0°C
Type-S	S	0.0 to 1760.0°C
Type-B	B	0.0 to 1820.0°C
Type-K	K	–200.0 to 1370.0°C
Type-E	E	–200.0 to 800.0°C
Type-J	J	–200.0 to 1100.0°C
Type-T	T	–200.0 to 400.0°C
Type-N	N	0.0 to 1300.0°C
Type-W	W	0.0 to 2315.0°C
Type-L	L	–200.0 to 900.0°C

Thermocouple (cont.)

Measurement Range	Notation	Rated Measurement Range
Type-U	U	–200.0 to 400.0°C
KPvsAu7Fe	KPvsAu7Fe	0.0 to 300.0K
PLATINEL	PLATINEL	0.0 to 1400.0°C
PR40-20	PR40-20	0.0 to 1900.0°C
NiNiMo	NiNiMo	0.0 to 1310.0°C
WRe3-25	WRe3-25	0.0 to 2400.0°C
W/WRe26	WWRe26	0.0 to 2400.0°C
Type-N (AWG14)	N14	0.0 to 1300.0°C
Type-XK GOST	XK	–200.0 to 600.0°C

Resistance Temperature Detector (1 mA)

Measurement Range	Notation	Rated Measurement Range
Pt100	Pt100-1	–200.0 to 600.0°C
JPt100	JPt100-1	–200.0 to 550.0°C
Pt100 (high resolution)	Pt100-1H	–140.00 to 150.00°C
JPt100 (high resolution)	JPt100-1H	–140.00 to 150.00°C
Ni100 SAMA	Ni100SAMA	–200.0 to 250.0°C
Ni100 DIN	Ni100DIN	–60.0 to 180.0°C
Ni120	Ni120	–70.0 to 200.0°C
Pt100 (high noise resistance)	Pt100-1R	–200.0 to 600.0°C
JPt100 (high noise resistance)	JPt100-1R	–200.0 to 550.0°C
Pt100 GOST	Pt100G	–200.0 to 600.0°C

Resistance Temperature Detector (2 mA)

Measurement Range	Notation	Rated Measurement Range
Pt100	Pt100-2	–200.0 to 250.0°C
JPt100	JPt100-2	–200.0 to 250.0°C
Pt100 (high resolution)	Pt100-2H	–140.00 to 150.00°C
JPt100 (high resolution)	JPt100-2H	–140.00 to 150.00°C
Pt50	Pt50	–200.0 to 550.0°C
Cu10 GE	Cu10GE	–200.0 to 300.0°C
Cu10 L&N	Cu10LN	–200.0 to 300.0°C
Cu10 WEED	Cu10WEED	–200.0 to 300.0°C
Cu10 BAILEY	Cu10BAILEY	–200.0 to 300.0°C
J263B	J263B	0.0 to 300.0K
Cu10 at 20°C alpha=0.00392	Cu10a392	–200.0 to 300.0°C
Cu10 at 20°C alpha=0.00393	Cu10a393	–200.0 to 300.0°C
Cu25 at 0°C alpha=0.00425	Cu25	–200.0 to 300.0°C
Cu53 at 0°C alpha=0.00426035	Cu53	–50.0 to 150.0°C
Cu100 at 0°C alpha=0.00425	Cu100	–50.0 to 150.0°C
Pt25 (JPt100 × 1/4)	Pt25	–200.0 to 550.0°C
Cu10 GE (high resolution)	Cu10GEH	–200.0 to 300.0°C
Cu10 L&N (high resolution)	Cu10LNH	–200.0 to 300.0°C
Cu10 WEED (high resolution)	Cu10WEEDH	–200.0 to 300.0°C
Cu10 BAILEY (high resolution)	Cu10BAILEYH	–200.0 to 300.0°C

Resistance Temperature Detector (2 mA, cont.)

Measurement Range	Notation	Rated Measurement Range
Pt100 (high noise resistance)	Pt100-2R	–200.0 to 250.0°C
JPt100 (high noise resistance)	JPt100-2R	–200.0 to 250.0°C
Cu100 GOST	Cu100G	–200.0 to 200.0°C
Cu50 GOST	Cu50G	–200.0 to 200.0°C
Cu10 GOST	Cu10G	–200.0 to 200.0°C

DI

Measurement Range	Notation	Rated Measurement Range
LEVEL	LEVEL	Vth=2.4V
Contact input	CONTACT	100 Ω or less, ON, 10 kΩ or less, OFF

Measurement Interval, Integration Time, and Filter

You can select from the following measurement intervals for this module.

10 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, 60 s

The integral time and types of filters applied vary depending on the measurement interval.

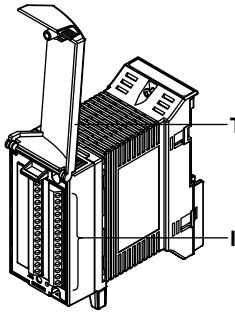
▶ For information on filters, see section 2.9, “Measures Against Noise on the MW100 Data Acquisition Unit.”

Measurement Synchronization

Measurement is synchronized on each channel.

1.5 Functions of the 10-CH, Medium-Speed Universal Input Module

This module allows up to ten inputs of DC voltage, thermocouple, 3-wire RTD, and digital input (DI) at a minimum measurement interval of 100 ms.



Measurement Input Types

Measurement Input Type	Notation
No measurement	SKIP
DC voltage	VOLT
Thermocouple	TC
Resistance temperature detector	RTD
DI	DI
Remote RJC	RRJC

Measurement Range

DC Voltage

Measurement Range	Notation	Rated Measurement Range
20 mV	20 mV	–20.000 to 20.000 mV
60 mV	60 mV	–60.00 to 60.00 mV
200 mV	200 mV	–200.00 to 200.00 mV
2 V	2 V	–2.0000 to 2.0000 V
6 V	6 V	–6.000 to 6.000 V
20 V	20 V	–20.000 to 20.000 V
100 V	100 V	–100.00 to 100.00 V
60 mV (high resolution)	60 mVH	0.000 to 60.000 mV
1 V	1 V	–1.0000 to 1.0000 V
6 V (high resolution)	6 VH	0.0000 to 6.0000 V

Thermocouple

Measurement Range	Notation	Rated Measurement Range
Type-R	R	0.0 to 1760.0°C
Type-S	S	0.0 to 1760.0°C
Type-B	B	0.0 to 1820.0°C
Type-K	K	–200.0 to 1370.0°C
Type-E	E	–200.0 to 800.0°C
Type-J	J	–200.0 to 1100.0°C
Type-T	T	–200.0 to 400.0°C
Type-N	N	0.0 to 1300.0°C
Type-W	W	0.0 to 2315.0°C

Thermocouple (cont.)

Measurement Range	Notation	Rated Measurement Range
Type-L	L	–200.0 to 900.0°C
Type-U	U	–200.0 to 400.0°C
KPvsAu7Fe	KPvsAu7Fe	0.0 to 300.0 K
PLATINEL	PLATINEL	0.0 to 1400.0°C
PR40-20	PR40-20	0.0 to 1900.0°C
NiNiMo	NiNiMo	0.0 to 1310.0°C
WRe3-25	WRe3-25	0.0 to 2400.0°C
W/WRe26	WWRe26	0.0 to 2400.0°C
Type-N (AWG14)	N14	0.0 to 1300.0°C
Type-XK GOST	XK	–200.0 to 600.0°C

Resistance Temperature Detector (1 mA)

Measurement Range	Notation	Rated Measurement Range
Pt100	Pt100-1	–200.0 to 600.0°C
JPt100	JPt100-1	–200.0 to 550.0°C
Pt100 (high resolution)	Pt100-1H	–140.00 to 150.00°C
JPt100 (high resolution)	JPt100-1H	–140.00 to 150.00°C
Ni100 SAMA	Ni100SAMA	–200.0 to 250.0°C
Ni100 DIN	Ni100DIN	–60.0 to 180.0°C
Ni120	Ni120	–70.0 to 200.0°C
Pt50	Pt50	–200.0 to 550.0°C
Cu10 GE	Cu10GE	–200.0 to 300.0°C
Cu10 L&N	Cu10LN	–200.0 to 300.0°C
Cu10 WEED	Cu10WEED	–200.0 to 300.0°C
Cu10 BAILEY	Cu10BAILEY	–200.0 to 300.0°C
J263B	J263B	0.0 to 300.0 K
Cu10 at 20°C alpha=0.00392	Cu10a392	–200.0 to 300.0°C
Cu10 at 20°C alpha=0.00393	Cu10a393	–200.0 to 300.0°C
Cu25 at 0°C alpha=0.00425	Cu25	–200.0 to 300.0°C
Cu53 at 0°C alpha=0.00426035	Cu53	–50.0 to 150.0°C
Cu100 at 0°C alpha=0.00425	Cu100	–50.0 to 150.0°C
Pt25 (JPt100 × 1/4)	Pt25	–200.0 to 550.0°C
Cu10 GE (high resolution)	Cu10GEH	–200.0 to 300.0°C
Cu10 L&N (high resolution)	Cu10LNH	–200.0 to 300.0°C
Cu10 WEED (high resolution)	Cu10WEEDH	–200.0 to 300.0°C
Cu10 BAILEY (high resolution)	Cu10BAILEYH	–200.0 to 300.0°C
Pt100 GOST	Pt100G	–200.0 to 600.0°C
Cu100 GOST	Cu100G	–200.0 to 200.0°C
Cu50 GOST	Cu50G	–200.0 to 200.0°C
Cu10 GOST	Cu10G	–200.0 to 200.0°C

DI

Measurement Range	Notation	Rated Measurement Range
LEVEL	LEVEL	Vth=2.4 V
Contact input	CONTACT	1 kΩ or less, ON, 100 kΩ or less, OFF (shunt capacitance: 0.01 μF or less)

Measurement Interval, Integration Time, and Filter

You can select from the following measurement intervals for this module.

100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, 60 s

The integral time and types of filters applied vary depending on the measurement interval.

▶ For information on filters, see section 2.9, “Measures Against Noise on the MW100 Data Acquisition Unit.”

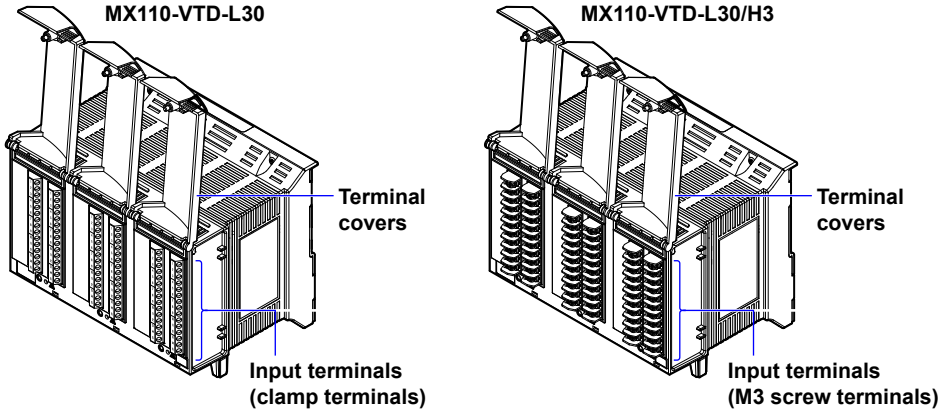
If the measurement interval is 100 ms, burnout detection is performed on one channel during one measurement interval. After measurement starts when in the burnout condition, or after the burnout, burnout detection is disabled for up to ten measurements (approximately one second).

Measurement Synchronization

Since measurement is sequential, measurement on each channel is not synchronized.

1.6 Functions of the 30-CH, Medium-Speed DCV/ TC/DI Input Module

This module allows up to thirty inputs of DC voltage, thermocouple, or digital input (DI) at a shortest measurement interval of 500 ms. It takes up three modules worth of space when attaching to the base plate.



Measurement Input Types

Measurement Input Type	Notation
No measurement	SKIP
DC voltage	VOLT
Thermocouple	TC
DI	DI
Remote RJC	RRJC

Measurement Range

DC Voltage

Measurement Range	Notation	Rated Measurement Range
20 mV	20 mV	–20.000 to 20.000 mV
60 mV	60 mV	–60.00 to 60.00 mV
200 mV	200 mV	–200.00 to 200.00 mV
2 V	2 V	–2.0000 to 2.0000 V
6 V	6 V	–6.000 to 6.000 V
20 V	20 V	–20.000 to 20.000 V
100 V	100 V	–100.00 to 100.00 V
60 mV (high resolution)	60 mVH	0.000 to 60.000 mV
1 V	1 V	–1.0000 to 1.0000 V
6 V (high resolution)	6 VH	0.0000 to 6.0000 V

Thermocouple

Measurement Range	Notation	Rated Measurement Range
Type-R	R	0.0 to 1760.0°C
Type-S	S	0.0 to 1760.0°C
Type-B	B	0.0 to 1820.0°C
Type-K	K	–200.0 to 1370.0°C
Type-E	E	–200.0 to 800.0°C
Type-J	J	–200.0 to 1100.0°C
Type-T	T	–200.0 to 400.0°C

Thermocouple (cont.)

Measurement Range	Notation	Rated Measurement Range
Type-N	N	0.0 to 1300.0°C
Type-W	W	0.0 to 2315.0°C
Type-L	L	–200.0 to 900.0°C
Type-U	U	–200.0 to 400.0°C
KPvsAu7Fe	KPvsAu7Fe	0.0 to 300.0 K
PLATINEL	PLATINEL	0.0 to 1400.0°C
PR40-20	PR40-20	0.0 to 1900.0°C
NiNiMo	NiNiMo	0.0 to 1310.0°C
WRe3-25	WRe3-25	0.0 to 2400.0°C
W/WRe26	WWRe26	0.0 to 2400.0°C
Type-N (AWG14)	N14	0.0 to 1300.0°C
Type-XK GOST	XK	–200.0 to 600.0°C

DI

Measurement Range	Notation	Rated Measurement Range
LEVEL	LEVEL	Vth=2.4 V
Contact input	CONTACT	1 kΩ or less, ON, 100 kΩ or less, OFF (shunt capacitance: 0.01 μF or less)

Measurement Interval, Integration Time, and Filter

You can select from the following measurement intervals for this module.

500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, or 60 s.

The integral time and types of filters applied vary depending on the measurement interval.

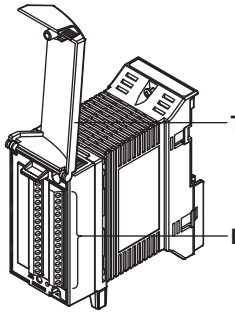
▶ For information on filters, see section 2.9, “Measures Against Noise on the MW100 Data Acquisition Unit.”

Measurement Synchronization

Since measurement is sequential, measurement on each channel is not synchronized.

1.7 Functions of the 6-CH, Medium-Speed Four-Wire RTD Resistance Input Module

This module allows up to six inputs of DC voltage, thermocouple, 4-wire RTD, 4-wire resistance, and digital input (DI) at a minimum measurement interval of 100 ms.



Measurement Input Types

Measurement Input Type	Notation
No measurement	SKIP
DC voltage	VOLT
Resistance temperature detector	RTD
Resistance	OHM
DI	DI

Measurement Range

DC Voltage

Measurement Range	Notation	Rated Measurement Range
20 mV	20 mV	–20.000 to 20.000 mV
60 mV	60 mV	–60.00 to 60.00 mV
200 mV	200 mV	–200.00 to 200.00 mV
2 V	2 V	–2.0000 to 2.0000 V
6 V	6 V	–6.000 to 6.000 V
20 V	20 V	–20.000 to 20.000 V
100 V	100 V	–100.00 to 100.00 V
60 mV (high resolution)	60 mVH	0.000 to 60.000 mV
1 V	1 V	–1.0000 to 1.0000 V
6 V (high resolution)	6 VH	0.0000 to 6.0000 V

Resistance Temperature Detector (1 mA)

Measurement Range	Notation	Rated Measurement Range
Pt100	Pt100-1	–200.0 to 600.0°C
JPt100	JPt100-1	–200.0 to 550.0°C
Pt100 (high resolution)	Pt100-1H	–140.00 to 150.00°C
JPt100 (high resolution)	JPt100-1H	–140.00 to 150.00°C
Ni100 SAMA	Ni100SAMA	–200.0 to 250.0°C
Ni100 DIN	Ni100DIN	–60.0 to 180.0°C
Ni120	Ni120	–70.0 to 200.0°C
Pt50	Pt50	–200.0 to 550.0°C
Cu10 GE	Cu10GE	–200.0 to 300.0°C
Cu10 L&N	Cu10LN	–200.0 to 300.0°C
Cu10 WEED	Cu10WEED	–200.0 to 300.0°C
Cu10 BAILEY	Cu10BAILEY	–200.0 to 300.0°C

Resistance Temperature Detector (1 mA, cont.)

Measurement Range	Notation	Rated Measurement Range
J263B	J263B	0.0 to 300.0K
Cu10 at 20°C alpha=0.00392	Cu10a392	–200.0 to 300.0°C
Cu10 at 20°C alpha=0.00393	Cu10a393	–200.0 to 300.0°C
Cu25 at 0°C alpha=0.00425	Cu25	–200.0 to 300.0°C
Cu53 at 0°C alpha=0.00426035	Cu53	–50.0 to 150.0°C
Cu100 at 0°C alpha=0.00425	Cu100	–50.0 to 150.0°C
Pt25 (JPt100 × 1/4)	Pt25	–200.0 to 550.0°C
Cu10 GE (high resolution)	Cu10GEH	–200.0 to 300.0°C
Cu10 L&N (high resolution)	Cu10LNH	–200.0 to 300.0°C
Cu10 WEED (high resolution)	Cu10WEEDH	–200.0 to 300.0°C
Cu10 BAILEY (high resolution)	Cu10BAILEYH	–200.0 to 300.0°C
Pt100 GOST	Pt100G	–200.0 to 600.0°C
Cu100 GOST	Cu100G	–200.0 to 200.0°C
Cu50 GOST	Cu50G	–200.0 to 200.0°C
Cu10 GOST	Cu10G	–200.0 to 200.0°C

Resistance Temperature Detector (0.25 mA)

Measurement Range	Notation	Rated Measurement Range
Pt500	Pt500	–200.0 to 600.0°C
Pt1000	Pt1000	–200.0 to 600.0°C

Resistance

Measurement Range	Notation	Rated Measurement Range
20 Ω (measured current 1 mA)	20 ohm	0.000 to 20.000 Ω
200 Ω (measured current 1 mA)	200 ohm	0.00 to 200.00 Ω
2 kΩ (measured current 0.25 mA)	2000 ohm	0.0 to 2000.0 Ω

DI

Measurement Range	Notation	Rated Measurement Range
LEVEL	LEVEL	Vth=2.4V
Contact input	CONTACT	1 kΩ or less, ON, 100 kΩ or less, OFF (shunt capacitance: 0.01 μF or less)

Measurement Interval, Integration Time, and Filter

You can select from the following measurement intervals for this module.

100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, 60 s

The integral time and types of filters applied vary depending on the measurement interval.

▶ For information on filters, see section 2.9, “Measures Against Noise on the MW100 Data Acquisition Unit.”

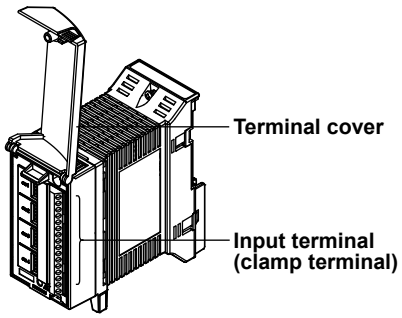
Measurement Synchronization

Since measurement is sequential, measurement on each channel is not synchronized.

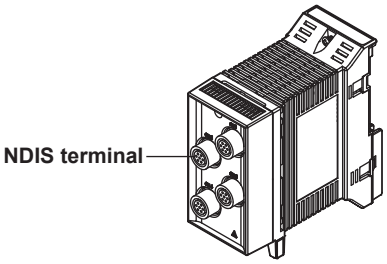
1.8 Functions of the 4-CH, Medium-Speed Strain Input Module

This module allows up to four inputs of measurement from strain gauges and strain gauge type sensors at a minimum measurement interval of 100 ms.

-B12, -B35



-NDI



Measurement Input Types

Measurement Input Type	Notation
No measurement	SKIP
Strain	STR

Measurement Range

Strain Input

Measurement Range Type	Notation	Rated Measurement Range
2000 µSTR	2000 uSTR	–2000.0 to 2000.0 µSTR
20000 µSTR	20000 uSTR	–20000 to 20000 µSTR
200000 µSTR	200000 uSTR	–200000 to 200000 µSTR

Measurement Interval, Integration Time, and Filter

You can select from the following measurement intervals for this module.

100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, 60 s

The integral time and types of filters applied vary depending on the measurement interval.

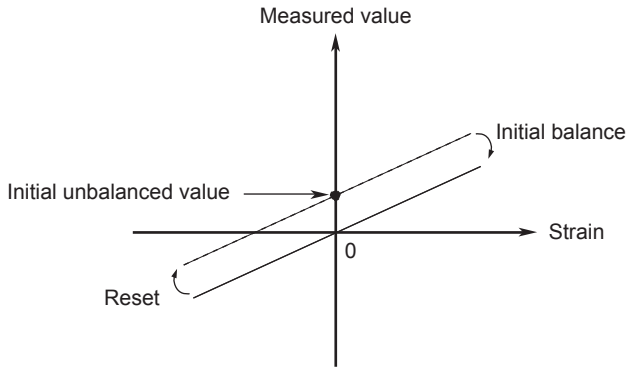
▶ For information on filters, see section 2.9, “Measures Against Noise on the MW100 Data Acquisition Unit.”

Measurement Synchronization

Since measurement is sequential, measurement on each channel is not synchronized.

Initial Balancing (Unbalance Adjustment)

When configuring a bridge circuit with a strain gauge, due to the slight deviation in resistance of the strain gauge, the bridge circuit will not necessarily be balanced even if the strain of the circuit under test is zero, and the measured value may not be zero (the value in such cases is called the *initial unbalanced value*).
Therefore, when taking measurements you must first balance the bridge and if the strain is zero, obtain a measured value of zero. This is called *initial balancing* (setting the initial unbalanced value to zero).



With the MW100, initial balancing is performed in the ±10000 μstrain range.
Initial balance: The value when the command is executed is taken as the initial unbalanced value, and the measured value is set to zero.
Reset: The value set during initial balancing is reset to zero. The initial unbalanced value is used for the measured value as-is.

Note

If the measurement range is changed, the initial balancing is reset.
After a range change, you must redo initial balancing.

Initial Balance Selection Items

Type	Notation	Description
Reset	Reset	Resets the initial balance values.
Execute	Execute Balancing	Executes initial balancing.

Scaling Settings of the Strain Gauge Type Sensor

This is an explanation of scaling settings used to measure physical quantities such as load and length using a strain gauge type sensor.

The basic relational equation is as follows.

1 mV/V = 2000 µSTR (equation 1)

The following gives two examples, one when the rated input and output are known, and one when the calibration coefficient is known. (Hereinafter, µ-strain will be expressed as µSTR).

When the Rated Input and Output Are Known

The following specific example provides an explanation.

- Rated input 200N (set to Y)
- Rated output 0.985 mV/V (set to K)

In this case, if a 200 N load is introduced, an output of 0.985 mV/V results.
From the relationship in equation 1, if 200 N is applied, it means that
an output of: 0.985 mV/V = 0.985 × 2000 = 1970 µSTR is obtained.
In other words, for each 1N, 1970 µSTR/200N = 9.85 µSTR/N of output results.
Therefore, the scaling settings are entered as follows.
When Measuring at 50 to 150 N

Scale minimum: 50 (set to Smin)
Scale maximum: 150 (units: N) (set to Smax)

therefore,

Span minimum: 50 × 9.85 µSTR/N = 492.5 µSTR
Span maximum: 150 × 9.85 = 1477.5 µSTR

would be appropriate settings.
Hence, the measurement range is 2000 µSTR.

Generally, the range is as follows.
Using the symbols explained up to now, after setting the minimum and maximum scale, we can describe the minimum and maximum values of span as:

Min. value of span = [(K(mV/V) × 2000) / Y(unit)] × Smin (µSTR)
Max. value of span = [(K(mV/V) × 2000) / Y(unit)] × Smax (µSTR)

When the Calibration Coefficient is Known

An example using a displacement gauge provides an explanation.

- Rated input 20 mm
- Calibration coefficient 0.003998 mm / (1 µV/V)

Basically, if you can convert the calibration coefficient to the rated output mentioned in "When Rated Input and Rated Output Are Known," the previous equation can be used.

Using equation 1,

1 µV/V = 0.001 mV/V = 0.001 × 2000 µSTR = 2 µSTR

therefore the rated output with this sensor when 20 mm is input would be

20 mm ÷ [0.003998 mm/2 µSTR] = 10005 µSTR

in other words, for 1 mm, an output of:

10005 µSTR / 20 mm = 500.25 µSTR/mm

can be obtained.

Thereafter in the same manner, if you wish to measure with a scale of 2 mm to 15 mm, the settings are

Scale minimum: 2
Scale maximum: 15 (Units: mm)

therefore,

Span minimum: 2 × 500.25 µSTR/mm = 1000.5 µSTR
Span maximum: 15 × 500.25 µSTR = 7503.75 µSTR

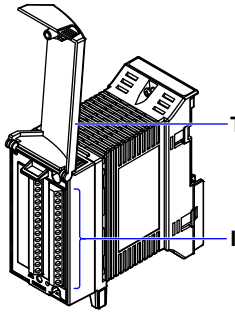
would be appropriate settings.

Since the measurement range is the 20000 µSTR range, the resolution on the MW100 comes to 1 µSTR, so we round to the following:

Span minimum: 1001 µSTR
Span maximum: 7504 µSTR

1.9 Functions of the 10-CH, Pulse Input Module

This module has ten inputs for integration of numbers of pulses.



Measurement Input Types

Measurement Input Type	Notation
No measurement	SKIP
Pulse	PULSE

Measurement Range

Measurement Range Type	Notation	Rated Measuring Range
LEVEL	LEVEL	0 to 30000
Contact input	CONTACT	0 to 30000

Measurement Interval

The pulse integral value each measurement interval is the measured value. When stable pulses are input, the upper limit of numbers of pulses and the measured values are shown below.

Upper Limit of Numbers of Pulses per Measurement Interval

Measurement interval	100 ms	200 ms	500 ms	1 s	2 s	5 s	10 s	20 s	30 s
Upper limit on number of pulses (pulses/s)*1	10000	10000	10000	10000	10000	6000	3000	1500	1000
	10000	10000	10000	10000	10000	5000	2720	1360	900

*1 When using the SNTP time synchronization function, refer to the values on the bottom row.

Measured Values Each Measurement Interval

Measurement interval	Input signal				
	1 pulse/s	10 pulses/s	100 pulses/s	1000 pulses/s	10000 pulses/s
100 ms	0 or 1	1	10	100	1000
200 ms	0 or 1	2	20	200	2000
500 ms	0 or 1	5	50	500	5000
1 s	1	10	100	1000	10000
2 s	2	20	200	2000	20000
5 s	5	50	500	5000	–*2
10 s	10	100	1000	10000	–*2
20 s	20	200	2000	20000	–*2
30 s	30	300	3000	30000*3	–*2
60 s	60	600	6000	–*2	–*2

*2 Exceeds the rated count and therefore measurement is not possible.

*3 When using the SNTP time synchronization function, the values in the upper row are exceeded therefore measurement is not possible.

Note

- When using the SNTP time synchronization function, the spacing between the measurement intervals changes. Thus, the measured value for each measurement interval changes, but this has no effect on the integral value (TLOG.PSUM).
- If you set the measurement interval to something other than 1 s, the measured value cannot be displayed in units of seconds. To display in units of seconds, set the measurement interval to 1 s, or use the MATH function (/M1 option).

Input Range

Maximum speed: 10000 pulses/s
Minimum input pulse width: 40 μs

Input Threshold Level

LEVEL

Counts when changing from 1 V or less to 3 V or more

Contact input

Count upon change from contact open to contact close
Contact open: 100 kΩ or more
Contact close: 100 Ω or less

Filter

Anti-Noise Filter

The integral time and types of filters applied vary depending on the measurement interval.

▶ For information on filters, see section 2.9, “Measures Against Noise on the MW100 Data Acquisition Unit.”

Chattering Filter

Removes chattering of up to 5 ms (can be turned ON/OFF on individual channels)
Turn the chattering filter OFF when measuring on circuits with no chattering.

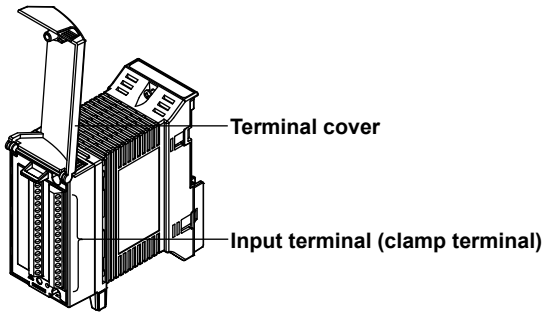
Integration

The measured values from the 10-CH Pulse Input Module are reset every measurement intervals by the pulse integral value of each measurement interval. Continued pulse integration is carried out with the pulse integration (TLOG.PSUM) by the MW100 main module’s integration function.
Even if the MATH function (/M1 option) is not included, channels included on the 10-CH Pulse Input Module are only available for integration (TLOG.PSUM).

MATH Function (/M1 Option)	10-CH Pulse Input Module	MATH Function (See Section 1.15)	Limitation
Yes	None	Available	No
No	Included		Operator: Only TLOG.PSUM() can be used Computation channels: A001 to A060 Broken-line input channel function: Not available Long-duration moving average function: Not available Modbus master function: Not available Modbus client function: Not available
	Not included	Not available	None

1.10 Functions of the 10-CH, High-Speed Digital Input Module

The “-D05” module is equipped with ten inputs for measurement of non-voltage contact, open collector, and 5 V logic inputs at a minimum measurement interval of 10 ms.
The “-D24” module is equipped with ten inputs and measures 24-V logic inputs at a minimum measurement interval of 10 ms.



Measurement Input Types

Measurement Input Type	Notation
No measurement	SKIP
Digital	DI

Measurement Range

DI (MX115-D05)

Measurement Range Type	Notation	Rated Measurement Range
LEVEL	LEVEL	OFF at 1 V or less and ON at 3 V or more
Contact input	CONTACT	100 Ω or less, ON, 100 kΩ or less, OFF

DI (MX115-D24)

Measurement Range Type	Notation	Rated Measurement Range
LEVEL	LEVEL	OFF at 6 V or less and ON at 16 V or more

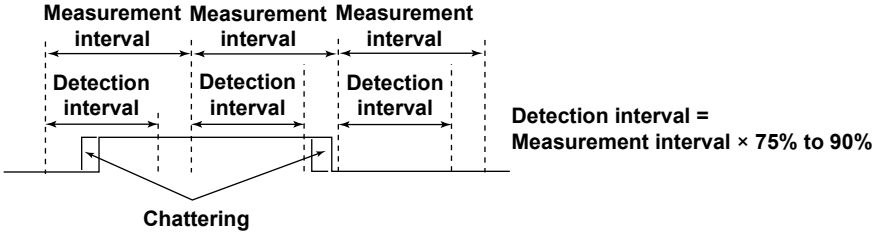
Measurement Interval

Select 10 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, or 60 s.

Filters

The module detects ON/OFF as shown below to prevent the effects of chattering. If the measurement interval is set a value greater than four times the chattering period, measurement is possible by avoiding chattering effects.

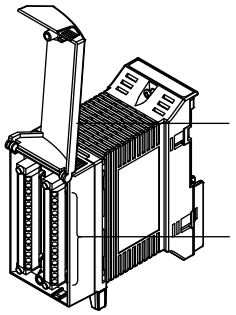
- Measurement interval of 5 s or less: Use the wider of the ON/OFF width of the detection period (approximately 75% to 90% of the measurement interval)



- Measurement interval of 5 s or more: Use the wider of the ON/OFF width of approximately 4.5 s

1.11 Functions of the 8-CH, Medium-Speed Analog Output Module

The module has eight outputs for voltage or current.
An external power source (24 V) is required for current output.
For voltage output only, an external power source is not required.



Output Types

Output Type	Notation
No output	SKIP
Analog output	AO

Output Method

Output Method	Notation	Actions
Transmission output	Trans	Outputs a voltage or current according to the measured or computed data of the input channel specified on the same unit. You can also produce pattern output using the broken line input function.
Arbitrary output	Comm.Input	Outputs specified values based on values sent from the PC.

Output Range

Output Range	Notation	Output range
Voltage	10 V	–10.000 V to 10.000 V
Current	20 mA	0.000 mA to 20.000 mA

Output Update Interval

The output is updated at 100-ms (minimum) intervals. It is not synchronized to the measurement interval.

Operation upon Startup and Errors

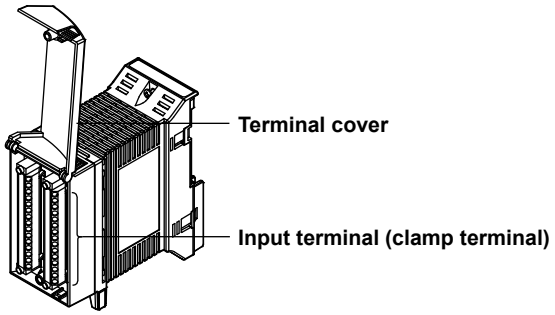
See section 1.13, “Operation of the Eight-Channel Medium-Speed Analog Output Module and the Eight-Channel Medium Speed PWM Output Module.”

Output Operation during Calibration

Calibration Condition	Output Operation
Channels being calibrated	Arbitrary output (output of calibration value)
Non-calibrated channels	Holds the output value (holds the value last output during steady operation (see section 1.13))

1.12 Functions of the 8-CH, Medium-Speed PWM Output Module

This module has eight outputs for pulse wave duty. A certain duty pulse waveform is output according to the specified pulse interval. A pulse interval can be set for each channel.



Output Types

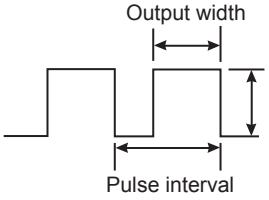
Output Type	Notation
No output	SKIP
PWM Output	PWM

Output Method

Output Method	Notation	Actions
Transmit	TRANS	Outputs a duty pulse waveform according to the measured or computed data of the input channel specified on the same unit. You can also produce pattern output using the broken line input function.
Arbitrary output	COM	Outputs specified data based on the values sent from the PC.

Output Range and Output Waveform

Output range: 0.000 to 100.000%



$$\text{Duty} = \frac{\text{Output width}}{\text{Pulse interval}} \times 100\ [\%]$$

Pulse Interval

1 ms to 300 s (can be set channel by channel)

Range	Notation	Setting Range
1 ms interval setting range	1 ms	1 ms to 30.000 s (can be set in units of 1 ms)
10 ms interval setting range	10 ms	10 ms to 300.00 s (can be set in units of 10 ms)

* The pulse interval can be set by determining the pulse interval coefficient.
The pulse interval coefficient is set from 1 to 30000.
Pulse interval = range × pulse interval coefficient

Output Update Interval

The output is updated at 100-ms (minimum) intervals. It is not synchronized to the measurement interval.

Operation upon Startup and Error Occurrence

See section 1.13, “Operation of the 8-CH Medium-Speed Analog Output Module and the 8-CH Medium Speed PWM Output Module.”

1.13 Operation of the 8-CH Medium-Speed Analog Output Module and the 8-CH Medium Speed PWM Output Module

The following describes the output operation of the analog and PWM output modules.

Output upon Startup and Error Occurrence

Output Selection	Notation	Actions
Hold previous value	Last	Holds the last value output.
Output preset value	Preset	Outputs an arbitrarily specified output value.

Output Format

In the output format below, current (analog output module) or pulse wave duty (PWM output module) is output.

- Transmission output: Outputs analog or PWM according to the measured or computed data from the measurement channel specified on the same unit. All input modules can be specified (but not output modules).
- Arbitrary output: When commands are received from the PC, the instrument outputs analog or PWM signals accordingly.

Once the power is turned ON and the unit is able to perform communication, arbitrary output becomes possible. For transmission output within a unit, after measurement or computation starts, the output values are updated upon transmission output.

Output on Disabled Channels

Type of Disabled Channel	Output
Channels changed from enabled to disabled through setting changes	Holds the last output value when channel was active
Channels invalid upon startup	Output according to settings upon startup

The timing at which changes applied to the output module take effect is according to the events below.

(Ex. When changing settings from transmission output within a unit to arbitrary output, the last value of transmission output within a unit is held until the arbitrary output request is generated.)

Output Operation per Settings and Setting Changes

Condition upon Power ON and Output Operation

Condition When Power Is Turned ON		Output Operation
When Output Settings are Disabled		Operation when power is turned ON
With transmission output within a unit, and reference channels disabled	Before meas. start	Operation when power is turned ON
	Start measurement	Output upon error occurrences
Transmission output within a unit	Before meas start	Operation when power is turned ON
	Start measurement	Transmission output
Arbitrary output	No output request	Operation when power is turned ON
	Output requested	Arbitrary output

Output Operation through Setting Changes (Common)

Setting Changes (Contents)		Output Operation
Setting changes for operation*1	Prev. value held → preset value	Outputs the preset value the on startup next time the power is turned ON
	Preset value → hold prev. value	The last output value from the previous operation is held for the next time the power is turned ON (outputs the output value active when the power was last turned OFF during the previous session)
Setting changes for operation*1	Prev. value held → preset value	Outputs the preset value the upon error occurrence next time an error occurs
	Preset value → hold prev. value	Holds the last output value active before the error occurs for the next time an error occurs.
Preset value setting changes*2		No changes (as above)
Change setting of output ch from Enabled → Disabled		Holds the output value (last output value)

*1 After changing settings, the changes take effect when measurement starts.
*2 Changes are also applied to inactive channels.

Output Operation through Setting Changes (Individually by Output Setting)

Output Setting	Setting Changes (Contents)		Output Operation
Transmission output Within units	Range setting changes	AO: V ↔ mA	Output value held (until the next output event)
		PWM: 1 ms ↔10 ms or interval	
	Operation setting changes	Transmission within units → arbitrary output	
	Span setting changes		
Arbitrary output	Range setting changes	AO: V ↔ mA	Output value held (until the next output event)
		PWM: 1 ms ↔10 ms or interval	
	Operation setting changes	Arbitrary output → transmission within a unit	

When the range settings of a PWM output module are changed, the output value is not held.

Steady Output Operation

Output Operation When Connected for Communication

Communication Connection Status	Output Operation
Normal connection (initial connection after power ON)	Operation when power is turned ON
Communications opened successfully (when communications were cut and restored for the 2nd or more time)	Holds the output value (last output value)
Communication disconnected successfully	Holds the output value (last output value)

Output Operation during Measurement and When Performing Transmission Output

"Transmission output execution ON" in the table is when the transmission output control is ON.
"Transmission output execution OFF" in the table is when the transmission output control is OFF.

Output Setup	Status		Output Operation
Transmission output within unit	Meas. stop → Measurement start		Transmission output start or output value hold (depending on the transmission output execution on/off status on: transmission output starts off: output value held)
	Measuring → Measurement stop		Holds the output value (last output value)
	Measuring	Transmission output execution off → on	Transmission start
		Transmission output execution on → off	Holds output value (last output value)
Arbitrary output	Meas. stop → Measurement start		No effect
	Measuring → Measurement stop		No effect
	Measuring	Transmission output execution off → on	No effect
		Transmission output execution on → off	No effect

Output Operation during an Abnormality and after Recovery from the Abnormality

Output Operation during an Abnormality (by Module)

Abnormal Module	Display	Status	Output Operation
Main module	b□*1	System errors	Operation when power is turned ON
	bF	Dip switches	
	F0	ROM error	
	F1	SRAM error	
	F2	EEPROM error	
	F3	Battery error	
	F4	Ethernet error	
Output modules	U0	Range information error	Operation when power is turned ON or when output value uncertain
	U1	Calibration value error	
	U2	Error during calibration	Internal communication error occurred, resulting in an error recovery event. If the error recovery time is 10 s or more, output is performed per the operation for error occurrence, and then output is executed per the operation for power ON.
	U3	Error in writing the calibration value.	
	U4	Unusable modules	Operation when power is turned ON or when output value uncertain
Input modules	U0	Range information error	Operation when errors occur (transmission between units output only, since the transmission source input channel is illegal*2)
	U1	Calibration value error	
	U4	Unusable modules	

*1 The number corresponding to the error is shown in the □.
*2 Illegal occurs when a module is removed, when a module recognition fails, or when a module malfunctions.

Output Operation during an Abnormality (by Output Setting)

Output Setting	Abnormal Status	Output Operation
Transmission output within units	Referenced input channels are +Over	Outputs a value +5% of the specified span of the output channel*1
	Referenced input channels are –Over	Outputs a value –5% of the specified span of the output channel*1
	Referenced input channel is illegal (input module removed)	Operation upon errors
	Referenced input channel is set to Skip	
	Referenced input channel is Invalid (math error in Differential computation)	
	Internal communication error	Output value held (occurs immediately after an internal communication error, but there is a recovery action*2)
	CPU abnormality	Operation upon errors
Arbitrary output	Internal communication error	Output value held (occurs upon an internal communication error, but there is a recovery action*2)
	CPU abnormality	Operation upon errors

*1 PWM output may not always reach +5% (+Over)/–5%(–Over).

*2 See “Output Operation after Recovery from an Abnormality.”

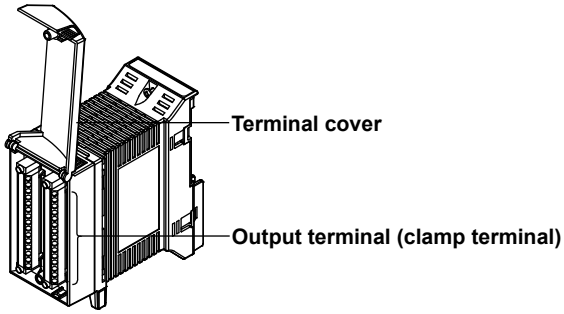
Output Operation after Recovery from an Abnormality (by Output Setting)

Output Setting	Abnormality Recovery	Output Operation
Transmission output within units	Referenced input module recovers (removed input modules are inserted)	Operation upon errors → transmission output
	Referenced input channel changed from Skip to Measurement range	
	Referenced input channel is restored from Invalid (math error in Differential computation) to normal	
	Recover after internal communication error	If the error recovery time is 10 s or more; operation upon error → operation upon power ON→ Transmission output
		If the error recovery time is within 10 s; operation upon startup → transmission output
	CPU abnormality (does not recover)	Operation upon errors
Arbitrary output	Recover after internal communication error	If the error recovery time is 10 s or more; operation upon error → operation upon power ON→ arbitrary output*
		If the error recovery time is within 10 s; operation upon startup → arbitrary output*
	CPU abnormality (does not recover)	Operation upon errors

* Executed by arbitrary output from the PC after recovering from the error.

1.14 Functions of the 10-CH, Medium-Speed Digital Output Module

This module has ten contact signal outputs that are based on alarm output settings and output settings from the PC.



Output Types

The following types (output factors) are available.

Type	Notation	Description
Alarm	Alarm	Measurement and computation channels
Manual	Comm.Input	Manual DO operation (Relay turns ON/OFF depending on the value sent from the PC)
Media	Media	When the remaining space on the CF card reaches the specified time
Fail	Fail	When an abnormality occurs on the CPU of the MW100 main module
Error	Error	When an error is detected on the MW100

Output Update Interval

The output is updated at 100-ms intervals. It is not synchronized to the measurement interval.

Relay Excitation State / Hold Operation

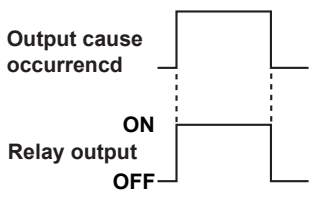
You can select whether or not to energize the output relays upon output. The excitation status selection differs depending on the output type.

Excitation Status	Notation	Description	Available Output Types
Energize	Energize	Energize when relay output is ON	Alarm/Comm.Input/Error/Media
De-energize	De-energize	Not energize when relay output is ON	Alarm/Comm.Input/Fail

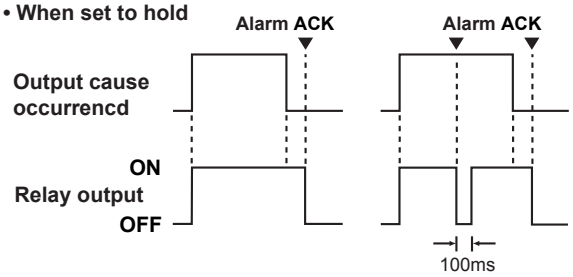
Also, when a condition in which alarm output must be cleared arises, you can select whether to turn output relays OFF (Non-hold), or leave them ON until an output clear command (alarm ACK) appears (Hold).

Hold operation	Notation	Description
Hold	On	Maintains relay output even after relay output is cancelled.
Non-Hold	Off	Does not maintain relay output when relay output is cancelled (normal operation).

• When set to non-hold



• When set to hold



Relay Operation

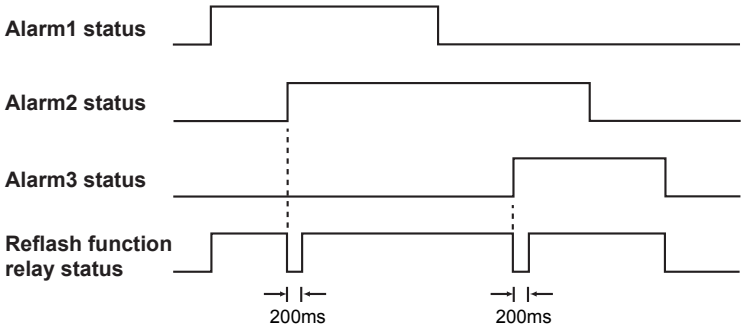
The following types of relay operation are available.

Operation	Description
And	Output ON when all alarms assigned to each alarm output relay activate.
Or	Output ON when one or more alarms assigned to each alarm output relay activate.

Reflash Function

The relay operates after the first alarm. If a second alarm activates, the relay restarts after briefly stopping operation.

- The non-operation period is 200 ms.
- Even if a new alarm occurs during the non-operation, the non-operation time is not extended.
- The number of output relays that can be specified for the reflash function is unlimited.
- When selecting relay output other than alarm output relays, the reflash function specification is disabled.
- You can specify the reflash function when OR is selected for the AND/OR function and Non-Hold is selected for the Hold/Non-Hold function.



1.15 MATH Function (/M1 Option)

Overview of the MATH Function

Results are computed by expressions using constants, operators, and functions. Computed data from computed results can be displayed or recorded (saved). MATH allows you to determine the average/maximum/minimum of a specified channel on a specified date/time, or output events (start/stop record, reset time, etc.) under specified conditions.

Number of MATH Channels

Computation can be performed on sixty channels, and 240 channels can be used for communication input. The maximum number of characters that can be used in an expression is 120 for MATH channels and 8 for communication input channels. Four arithmetic operations and calculation constants can be written to communication input channels in addition to the communication input channel number.

MATH Types

The following types of computations can be performed.

- Basic math
- Logical operations
- Relational operations
- Arithmetic functions
- TLOG functions*
- CLOG functions
- Conditional expressions

* Even if the MATH function (/M1 option) is not included, if the 10-CH Pulse Input Module is installed, only integration (TLOG.PSUM) is available.

Basic Math

Type	Operator	Example	Explanation
Addition	+	001+002	Finds the sum of measured values on channels 001 and 002
Subtraction	–	002–001	Finds the difference in the measured values of channels 001 and 002.
Multiplication	*	003*K01	Multiplies the measured data on channel 003 by constant K01
Division	/	004/K02	Divides the measured data on channel 004 by constant K02
Exponentiation	**	005**006	Raises the measured data of channel 005 to the power of the measured data of channel 006.

Logical Operations

Type	Operator	Example	Explanation
Logical product	AND	001AND002	When channel 001 = 0 and channel 002 = 0, 0 When channel 001 ≠ 0 and channel 002 = 0, 0 When channel 001 = 0 and channel 002 ≠ 0, 0 When channels 001 and 002 ≠ 0, 1
Logical sum	OR	001OR002	When channel 001 = 0 and channel 002 = 0, 0 When channel 001 ≠ 0 and channel 002 = 0, 1 When channel 001 = 0 and channel 002 ≠ 0, 1 When channels 001 and 002 ≠ 0, 1
Exclusive OR	XOR	001XOR002	When channel 001 = 0 and channel 002 = 0, 0 When channel 001 ≠ 0 and channel 002 = 0, 1 When channel 001 = 0 and channel 002 ≠ 0, 1 When channels 001 and 002 ≠ 0, 0
Logical negation	NOT	NOT001	When channel 001 = 0, 1 When channel 001 ≠ 0, 0

Relational Operations

Type	Operators	Example	Explanation
Equal	.EQ.	001.EQ.002	When channel 001 = channel 002, 1 When channel 001 ≠ channel 002, 0
Not equal	.NE.	002.NE.001	When channel 001 ≠ channel 002, 1 When channel 001 = channel 002, 0
Greater than	.GT.	003.GT.K01	When channel 003 > constant K01, 1 When channel 003 ≤ constant K01, 0
Less than	.LT.	004.LT.K10	When channel 004 < constant K10, 1 When channel 004 ≥ constant K10, 0
Greater than or equal to	.GE.	003.GE.K01	When channel 003 ≥ constant K01, 1 When channel 003 < constant K01, 0
Less than or equal to	.LE.	004.LE.K10	When channel 004 ≤ constant K10, 1 When channel 004 > constant K10, 0

Arithmetic Functions

Type	Operators	Example	Explanation
Absolute value	ABS()	ABS(001)	Finds abs val of measured values on ch 001.
Square root	SQR()	SQR(002)	Finds sqr rt of measured values on ch 002.
Common logarithm	LOG()	LOG(003)	Finds common log of measured data on ch 003.
Exponent	EXP()	EXP(005)	Finds e^x where x is the measured data on ch 005.

TLOG Functions*1

The TLOG computation computes the maximum, minimum, maximum-minimum, integral, average, and pulse integral of the specified channel. One function can be used per expression.

Type	Operators	Example	Explanation
Maximum value	TLOG.MAX()	TLOG.MAX(001)	Finds max value of measured values on ch 001.
Minimum value	TLOG.MIN()	TLOG.MIN(002)	Finds min value of measured values on ch 002.
Maximum value to minimum value	TLOG.P-P()	TLOG.P-P(003)	Finds P-P of the measured data on ch 003.
Integral value	TLOG.SUM()	TLOG.SUM(004)	Finds integral val of measured values on ch 004.
Mean value	TLOG.AVE()	TLOG.AVE(005)	Finds the avg value of measured values on ch 005.
Pulse Integration*2	TLOG.PSUM()	TLOG.PSUM(011)	Finds the pulse integral of measured values on ch 011. (integrated number of rising edges)

*1 The channels that can be specified in TLOG functions are the measurement and MATH channels excluding TLOG.PSUM.

*2 The channels that can be specified for a TLOG.PSUM computation are measurement channels of the 10-CH Pulse Input Module (/M1 option not required) or DI channels on modules that accept digital input.

CLOG Functions*

The CLOG computation computes the maximum, minimum, maximum-minimum, integral, and average values of the specified channel group. One function can be used per expression.

Type	Operators	Example	Explanation
Maximum value	CLOG.MAX()	CLOG.MAX(001-010)	Finds max of measured data on ch 001 to 010.
Minimum value	CLOG.MIN()	CLOG.MIN(001.003)	Finds min of measured data on ch 001 and 003.
Maximum value to minimum value	CLOG.P-P()	CLOG.P-P(002-009)	Finds P-P of the measured data on ch 002 to 009.
Mean. value	CLOG.AVE()	CLOG.AVE(011-020)	Finds avg of measured data on ch 011 to 020.

* The channels that can be specified in CLOG functions are the measurement and MATH channels. (The number of channels which can be specified is to ten channels.)

Conditional Expressions

Type	Operators	Explanation
Conditional expressions	[EXPR1?EXPR2:EXPR3]	Execute expression 2 when expression 1 is true, or expression 3 when it is false

Other

Type	Operator	Explanation
Parentheses	( )	Specifies the order of operations

Order of Operations in Expressions

Expressions are hierarchical according to the table below. The operations are listed in the table from top to bottom in order of precedence. These precedences must be taken into account when writing expressions.

Type	Operators
(High precedence)	
Arithmetic, TLOG, and CLOG functions	ABS(), SQR(), LOG(), EXP(), TLOG.MAX(), TLOG.MIN(), TLOG.P-P(), TLOG.SUM(), TLOG.AVE(), TLOG.PSUM() CLOG.MAX(), CLOG.MIN(), CLOG.P-P(), CLOG.AVE()
Conditional expressions	[EXPR1?EXPR2:EXPR3]
Exponentiation	**
Logical negation	NOT
Multiplication and division	*, /
Addition and subtraction	+, –
Relational operation	.GT., .LT., .GE., .LE.
Equivalence	.EQ., .NE.
Logical product	AND
Logical sum, exclusive OR	OR, XOR
(Low precedence)	

Reference channel

The following channels can be referenced for data used in computations.

Type	Channel number	Description
Measurement Channel	001 to 060	Data from measurement channels
Computation channels	A001 to A300	Data from MATH channels (Channels A061 to A300 are used for communication input only.)
Communication input channels	C001 to C300	Numerical values in expressions substituted with communication input
Flag input channels	F01 to F60	Set in expressions as the constant 1 or 0
Calculation constant	K01 to K60	Represented as a fixed constant in expressions
Program channels	P01 to P03	Inputs broken line data into expressions

Flag Input Channels

Can be set in expressions as the constant 1 or 0. Normally 0, but turns to 1 upon occurrence of certain events of the Event/Action function.

For example, given the expression:

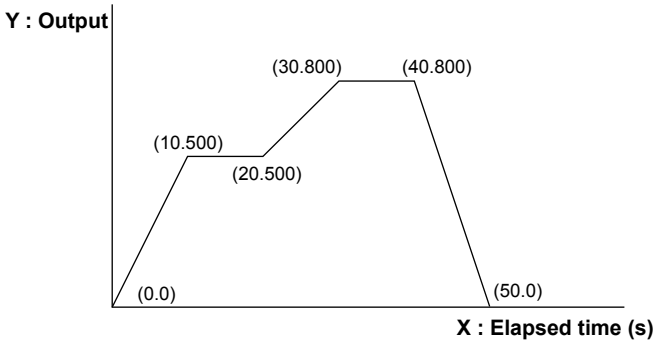
NOTF01 * TLOG.SUM(001)

if the Event action's Edge action is set to FLAG:F01, when the event occurs, F01 becomes 1 and NOTF01 becomes 0, therefore the total of channel 001 is 0.

Program Channels

Up to thirty-two inputs of broken line data can be included in expressions.
Multiple points can be set for the time from the start point and the output value at that point. Specified points are linked with a straight line, the value of Y at the elapsed time X is output. There is Single, in which one cycle is executed, and Repeat in which execution repeats. By specifying a MATH channel to which broken line input is assigned to the reference channel of an analog output channel, you can output arbitrary patterns.

- Example



- Entry Example
  Input of broken line data in the example is as follows.
  (0.0), (10.500), (20.500), (30.800), (40.800), (50.0), (-1.0)
  If there are fewer than thirty-two setting points, a (-1.0) is required to show the end of the points.
- Operation of program channels for the computation operation

Computation Operation	Program channel operation
Computation start	Starts broken line computation from the held elapsed time
Computation stop	Holds the broken line computed value
Computation clear	Resets the elapsed time to 0 and start the broken line computation from the beginning
Computation reset	During self-computation, 0-clear the elapsed time and start the broken line computation

- Operation after Elapsed Time

Mode	Notation	Program channel operation
Single	Single	Holds the broken line computed value of the last point
Repeat	Repeat	Returns to the start point then repeats broken line

Computation Operation

Starting and Stopping Computation

Execution of computation starts and stops according to user commands (Start/Stop key, Event/Action function, or monitor screen settings).

Clearing Computations

Clears all MATH channel data (including MATH alarms) per the Event/Action function, communication commands, or requests from the monitor setting screen.

Resetting Computation

Clears all MATH channel data (including MATH alarms) per the Event/Action function, communication commands, or requests from the monitor setting screen. If this request occurs during a computation, it is executed on the next computation interval and computation starts. Also, if the request occurs while the computation operation is stopped, it is cleared when computation starts.

Group Reset

Clears all MATH channel data (including MATH alarms) per the Event/Action function or requests from communication commands. If this request occurs during a computation, it is executed on the next computation interval and computation starts. Also, if the request occurs while computation is stopped, it is cleared when computation starts.

Math Groups

Specifies multiple channels from among Math channels 1 through 60. Up to seven groups can be set. Math groups are used with group reset.

Math Interval

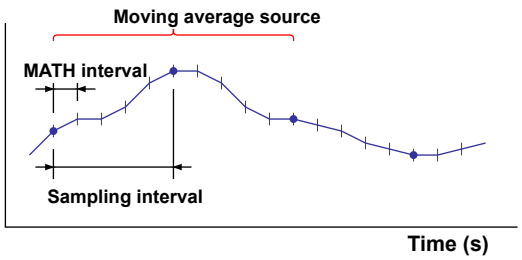
Select one from among the measurement group numbers, and specify a MATH interval. For the MATH interval, select a group having a measurement interval of 100 ms or higher. Computation is performed every MATH interval using the values of the reference channels.

Rolling Average

Determines the rolling average of the computed results on the measurement channel and uses it as the computed result of that channel. The number of samples and the sampling interval can be specified for each computation channel.
The setting ranges are as follows:

Sampling interval: 1 s to 1 hour (23 levels)
Number of samples: 1 to 1500

- Example
  If the MATH interval is 2 s, the sampling interval is 10 s, and the number of samples is 3, the computed data on which rolling average is calculated is as follows:



Set the sampling interval to an integer multiple of the MATH interval. If the sampling interval is shorter than the MATH interval, the sampling interval is matched to the MATH interval.

▶ For details on setting the sampling interval, see “MATH Function Specifications (/M1 Option)” in section 5.2.

Math Span

The upper and lower limits for the display of the monitor screen and other items. The MATH span setting range is as shown below depending on the decimal place. If the computed results fall outside of the MATH span setting range, they are displayed on screen as plus over or minus over data.

Decimal Place	MATH span setting range
0	–9999999 to 99999999
1	–999999.9 to 9999999.9
2	–99999.99 to 999999.99
3	–9999.999 to 99999.999
4	–999.9999 to 9999.9999

Handling Units in Computations

In computations, computed values (measured and computed data) are handled as numbers without units. Also, they are unrelated to the math channel units.
Example:
Expression = 001 + 002 + K01
001 (measurement ch 1) = 20 mV, 002 (measurement ch 2) = 30 V, K01 (math constant) = 10
Given the above, the computed result is 60.

Alarm Level

You can implement alarm actions based on the computed data. Four levels can be set per channel. The alarm types are upper limit, lower limit, delay high limit, and delay low limit. There is no hysteresis function. There is no hysteresis function.

Pulse Integration (TLOG.PSUM)

The input number of pulses is integrated for the measurement channels of the 10-CH Pulse Input Module, or the DI channels of modules that accept digital input.

- **Pulse Integration with the 10-CH Pulse Input Module**
  The number of pulses per measurement interval is integrated on the module. The integration continues with the TLOG.PSUM computation on the main module.
  0 to 10000 pulses/s
- **Pulse Integration with DI Channels**
  The ON/OFF statuses are measured on the module, and the number of changes from OFF to ON are retained.
  The integration continues with the TLOG.PSUM computation on the main module.
  Integration is performed at an interval of 100 ms or more, but pulse integration is performed at the measurement interval of modules that accept digital input (DI).
  - 0 to 40 pulses/s (measurement interval: 10 ms, duty: 50%)
  - 0 to 4 pulses/s (measurement interval: 100 ms, duty: 50%)
  - 0 to 0.8 pulses/s (measurement interval: 500 ms, duty: 50%)

Processing Computed Results with Abnormal Input Values or Overflow Values

You can select the computed result when an error occurs on the reference channel (measurement or MATH channel) of a MATH channel.

▶ For processing of computed results, see “MATH Operation Settings” in section 3.4.

MATH Operation

You can select the computed data when the computed result is an error.

Choice for the Computed Result	Notation
Plus over	+Over
Minus over	–Over

Computation Operation of TLOG.PSUM

You can select the computed data when the computed result of the TLOG.PSUM computation exceeds the MATH span setting range.

Notation	Minimum value*1	Maximum value*1	Description
Over	–9999999	99999999	When the result is less than the minimum value, computation stops as an overflow Computed result: –OVER
			When the maximum value is exceeded, computation stops as an overflow Computed result: +OVER
Rotate	0	99999999	When the minimum value is not reached, computation continues with the next count being the maximum value.
			When the maximum value is exceeded, computation continues with the next count being the minimum value.

*1 The minimum and maximum values vary depending on the decimal place.

▶ For the MATH span setting range, see “MATH Span” in this section

Special Processing of the Computed Result

If a reference channel is a measurement channel or MATH channel, the processing of the computed data differs depending on the selection.

- **Reference channel status**

  The following demonstrates cases in which an abnormal input value or overflow value occurs on the reference channel.

Reference Channel	Status	Description
Measurement channel	Abnormal input value	The module of the target channel is disconnected, or some other abnormality The target channel becomes Skip
	Overflow value	Input value exceeds the measurement range
Computation channel	Abnormal input value	When the computed result on a MATH channel in an expression is an error
	Overflow value	When the computed result on a MATH channel in a TLOG or CLOG expression exceeds the MATH span setting range

- **Special computation processing (excluding TLOG and CLOG computation) for measurement channels**

Reference Channel Status	Notation	Process Description
Abnormal input value	Error	Computed result is an error
	Skip	Continue computation using previous value of channel on which abnormal value was input
Overflow value	Over	Compute using overflow value
	Skip	Continue computation using previous value of channel on which overflow value resulted
	Limit*1	The overflow value is replaced with the upper or lower limit, and computation continues

*1 The lower/upper limit value replaced on the measurement channel differs depending on the computation type.
Measurement channel: Measurement range upper and lower limit
Scaled measurement channel: Upper and lower limit of scaling

- **Special processing for reference channels of TLOG and CLOG computations**

TLOG Computation

Reference Channel Status	Notation	MAX	MIN	P-P	AVE	SUM	PSUM
Abnormal input value	Error	Computed result is an error*3					
	Skip	Current TLOG computation is skipped					
Overflow value	Error	Computed with the overflow value as-is		Computed result is a +OVER*2	Computed result is an error*3		
	Skip				Current TLOG computation is skipped		
	Limit				The overflow value is replaced with the upper or lower limit, and computation continues*4		

CLOG Computation

Reference Channel Status	Notation	MAX	MIN	P-P	AVE
Abnormal input value	Error	Computed result is an error			
	Skip	Computation is carried out without the channel on which the abnormality occurred			
Overflow value	Error	Computed result is an error			
	Skip	Computed with the overflow value as-is			Computation is carried out without the channel on which the overflow occurred
	Limit				The overflow value is replaced with the upper or lower limit, and computation continues*4

*2 If the data is plus over only or minus over only, the computed result is an error
*3 Once an error occurs, computed results continue to be errors until computation is cleared
*4 The lower/upper limit value replaced on the reference channel differs depending on the input type.
Measurement channel: Measurement range upper and lower limit
Scaled measurement channel: Upper and lower limit of scaling
Computation channel: Span upper limit and lower limit

TLOG Time Scale

You can select the sum scale for the TLOG.SUM computation.

IIntegration Units	Notation	Explanation
No time scale	Off	Σ (data)*
Every second	/sec	Σ (data)/(Number of times of computing per second.)
Every minute	/min	Σ (data)/(Number of times of computing per minute.)
Every hour	/hour	Σ (data)/(Number of times of computing per hour.)

* Integration of data every MATH interval

1.16 Report Function (/M3 Option)

The maximum, minimum, average, integral, and instantaneous values of the specified measurement or MATH channels (up to 60 ch) can be written to the following report files.

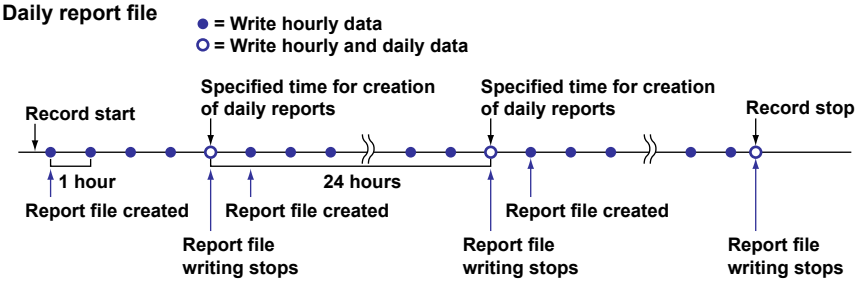
Created File	Report Type	Description
Daily	Hourly + Daily	Report data including 24 hours of hourly data from a specified time + 1 day of report data
Weekly	Daily + Weekly	Report data including 7 days of daily data from a specified time* on a specified day + 1 week of report data
Monthly	Daily + Monthly	Report data including 1 month of daily data from a specified time* on a specified day + 1 month of report data

* The specified time for weekly and monthly reports is the same as the creation time for the daily report files.

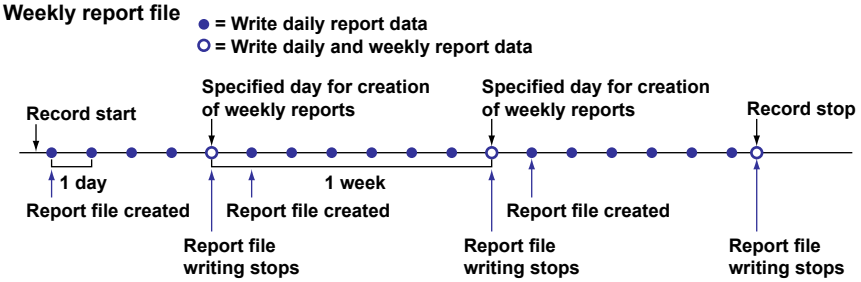
Starting and Stopping the Report Function

- When recording is started, acquisition of report data starts.
- The timing of report file creation, report data writing, and report data writing stop is shown in the figure below.
- If recording is stopped, report data from the last writing of report data to the time recording was stopped is written, and acquisition of report data stops.

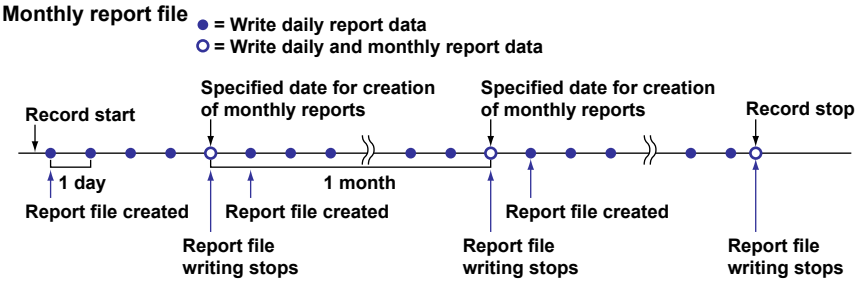
• Daily report file



• Weekly report file



• Monthly report file



Resetting the Average, Maximum, Minimum, and Integral Values

The values are reset when report file writing stops. When recording starts, you can select to reset or not reset the values held in report data.

Report Measurement Interval

The shortest acquisition interval for report data is 100 ms. Even if a channel is specified with a measurement interval shorter than 100 ms, acquisition occurs at 100 ms intervals.

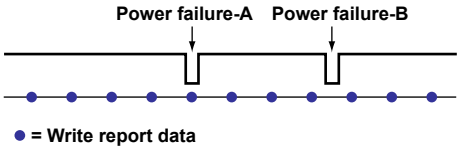
Sum Scale of the Integral Value

You can select the unit time (formula) for the integral value. Unit time and units can be specified for each channel.

Sum Scale	Notation	Description
No time scale	Off	The integral value of the data from each measurement or MATH interval
Every second	/sec	The integral value of data from each measurement or MATH interval ÷ computations per second
Every minute	/min	The integral value of data from each measurement or MATH interval ÷ computations per minute
Every hour	/hour	The integral value of data from each measurement or MATH interval ÷ computations per hour
Daily	/day	The integral value of data from each measurement or MATH interval ÷ computations per day

Operation during Power Failure

When a power failure occurs, data used to create report data will be lacking. The following operation occurs upon recovery from a power failure.



- **When a power failure occurred during the report writing time (power failure-A)**
  The report data is written after the power failure recovers. A mark (Pw) indicating the occurrence of the power failure is added to the report data.
- **When a power failure occurred other than during the report writing time (power failure-B)**
  The acquisition of the report data is restarted after the power failure recovers, and report data is written at the specified time. A mark (Pw) indicating the occurrence of the power failure is added to the report data.

Displaying Report Files

Values and graphs can be displayed in the browser's data view. Also, you can display values with the MW100 Viewer Software.

▶ For information on the browser's data view screen, see the data view under "Explanation of Display Items" in section 3.16.
▶ For information on the MW100 Viewer Software, see the MW100 Viewer Software User's Manual (IM MW180-01E)

Processing Reports with Abnormal Input Values or Overflow Values

You can select how reports are processed when an error occurs on the channel (measurement or MATH channel) for which a report is created.

▶ For report processing during abnormalities, see “Report Operation Settings 1” in section 3.12.

Special Processing of Report Results

- **Status of channel for which the report is created**

  The following demonstrates cases in which an abnormal input value or overflow value occurs on the channel for which the report is created.

Channel Type	Status	Description
Measurement channel	Abnormal input value	The module of the target channel is disconnected, or some other abnormality
	Overflow value	Input value exceeds the measurement range
Computation channel	Overflow value	When the computed result on a MATH channel exceeds the MATH span setting range*1

- **Processing during abnormal input*2**

Report Data Type	Notation	Process Description
Maximum/minimum/ integral/average value	Error	The report data is an error
	Skip	Uses the previous value of the channel on which the abnormal input value occurred

- **Processing during an overflow*3**

Report Data Type	Notation	Process Description
Integral/average value	Error	The report data is an error
	Skip	Uses the previous value on the channel on which the overflow value occurred
	Limit*4	The overflow value is replaced with the upper or lower limit

*1 For the MATH span setting range, see “MATH Span” in section 1.15.

*2 The instantaneous value during abnormal input is 99999999 (decimal place depends on the setting)

*3 The maximum, minimum, and instantaneous values during an overflow are handled as follows.

- +Over: Measurement channel 99999 (decimal place depends on the setting)
  MATH channel 99999999 (decimal place depends on the setting)
- –Over: Measurement channel –99999 (decimal place depends on the setting)
  MATH channel –9999999 (decimal place depends on the setting)

*4 The lower/upper limit value replaced differs depending on the channel’s setting condition.
Measurement channel: Measurement range upper and lower limit
Scaled measurement channel: Upper and lower limit of scaling
Computation channel: Span upper limit and lower limit

2.1 Handling Precautions

This section describes the precautions to be taken when using the MW100. Please read before using this product.

- If you are using this instrument for the first time, make sure to thoroughly read the safety precautions given on pages ii and iii.
- Do not remove the case.
  For internal inspection or adjustment, contact your nearest YOKOGAWA dealer.
- Do not place objects on top of the instrument.
  Never place other instruments or objects containing water on top of the instrument. Doing so can lead to malfunction.
- Take proper care when carrying the instrument.
  First, turn off the DUT and the MW100 and remove all cables including measurement wires and communication cables. Then, remove the power cord from the outlet.
- To prevent internal overheating, do not obstruct the vent holes of the modules.
- This instrument uses many plastic parts. When cleaning, wipe using a dry soft cloth. Do not use volatile chemicals since this might cause discoloring and deformation. Doing so can cause discoloring or deformation.
- Do not bring charged objects near the signal terminals. Doing so can lead to malfunction.
- Do not pour volatile agents on the MW100 or leave it in contact with rubber or PVC products for an extended time. Doing so can lead to malfunction.
- Do not apply shock to the instrument.
- When not in use, make sure to turn OFF the power.
- If there are any symptoms of trouble such as smoke, strange orders, or strange sounds coming from the instrument, immediately turn OFF the power and shut off the power supply. Contact your dealer immediately.
- Handle the power cord correctly.
  Nothing should be placed on top of the power cord. The power cord should also be kept away from any heat sources. When unplugging the power cord from the outlet, never pull by the cord itself. Always hold and pull by the plug. If the cord is damaged, contact your dealer for replacement. When ordering, see page vi for the power cord part number.

2.2 Installation

Installation Location

Install the instrument indoors in the following locations.

- **In temperatures of –20 to 60°C**
  If the ambient temperature is –20 to 40°C, place the instrument in a location where the humidity is 20 to 80% RH. For 40 to 50°C, the humidity should be 10 to 50%. For 50 to 60°C, the humidity should be 5 to 30%. However, no condensation should be present. Also note that the temperature range of certain modules is –20 to 50°C.

  Note

  Condensation may occur if the instrument is moved to another place where the ambient temperature is higher, or if the temperature changes rapidly. Measurement errors can occur when using thermocouple input. In this case, let the instrument adjust to the new environment for at least one hour before using the instrument.

- **Locations where the operating altitude is 2000 m or less**
- **Well-ventilated locations**
  Install the instrument in a well-ventilated location to prevent the temperature inside the instrument from rising.
- **Location where mechanical vibration is small**
  Select a location with small mechanical vibration for installation.
- **Horizontal location**
  Install the instrument on a flat, even surface.

Do not install the instrument in the following places.

- **Dangerous locations where flammable liquids, vapors, or dust is present**
- **In direct sunlight or near heat appliances**
  Select a location with the smallest fluctuation from room temperature (23°C) as possible. Placing the instrument in direct sunlight or near heat appliances can cause adverse effects.
- **Where an excessive amount of soot, steam, humidity, dust, or corrosive gas is present**
  Soot, steam, humidity, dust, and corrosive gas can cause adverse effects on the instrument. Avoid installing the instrument in an environment with a high level of such substances.
- **Near magnetic field sources**
  Install the instrument in a location where the magnetic field is 400 A/m or less. Avoid bringing instruments that produce magnetic fields or magnets near this instrument. Using the instrument near a strong magnetic field source can cause measurement errors.

Installation Procedures

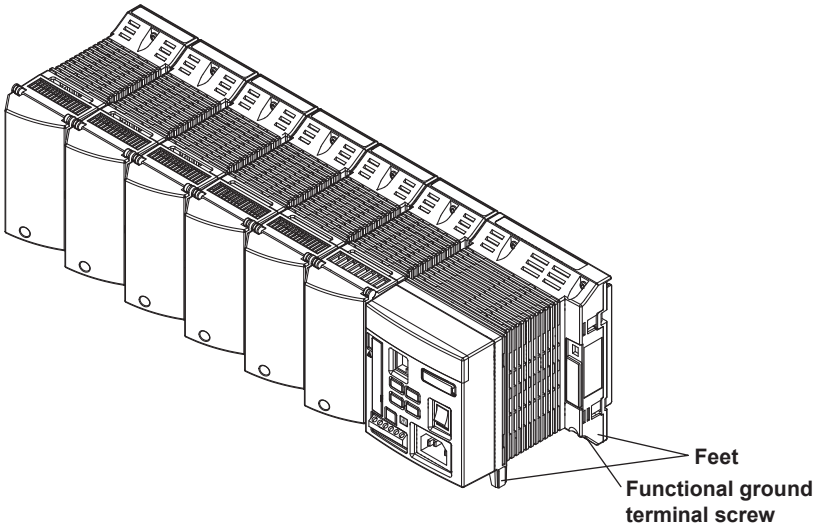
CAUTION

When attaching the instrument to DIN rails, use metal plates at least 2 mm thick in three places to secure the unit and prevent it from falling.

The MW100 Data Acquisition Unit can be used on the desktop, placed on a floor, rack mounted, or panel mounted. In all cases, be sure to install the instrument in a vertical position.

Placing on a Desktop or on the Floor

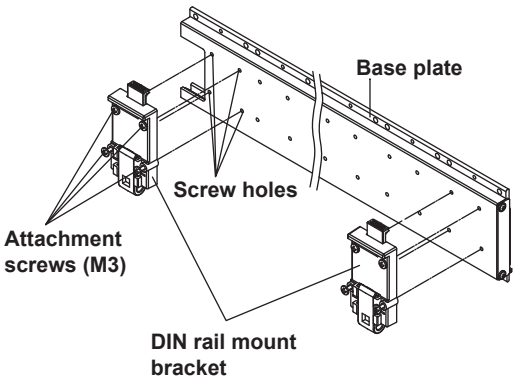
Since each module has feet you can attach the necessary modules to the base plate allowing the unit to be placed vertically. For the procedure for attaching the modules, see the next page.



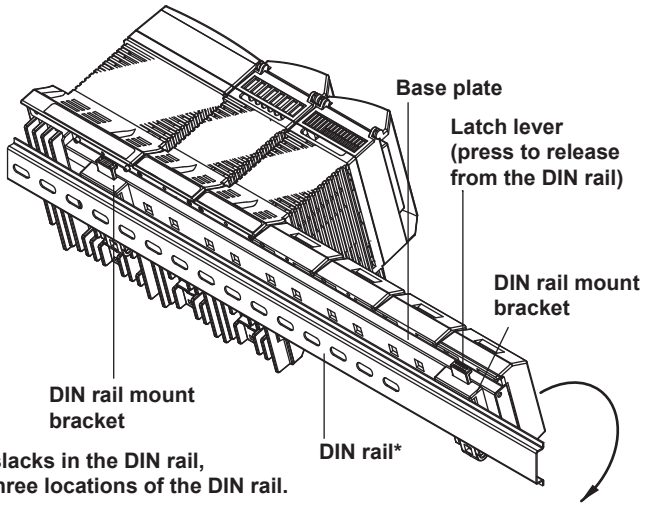
Attaching to DIN Rails

By attaching DIN rail mounting brackets to the base plate as in the figure below, you can rack-mount or panel-mount the MW100 Data Acquisition Unit.

• Attachment of the DIN rail mount bracket to the base plate

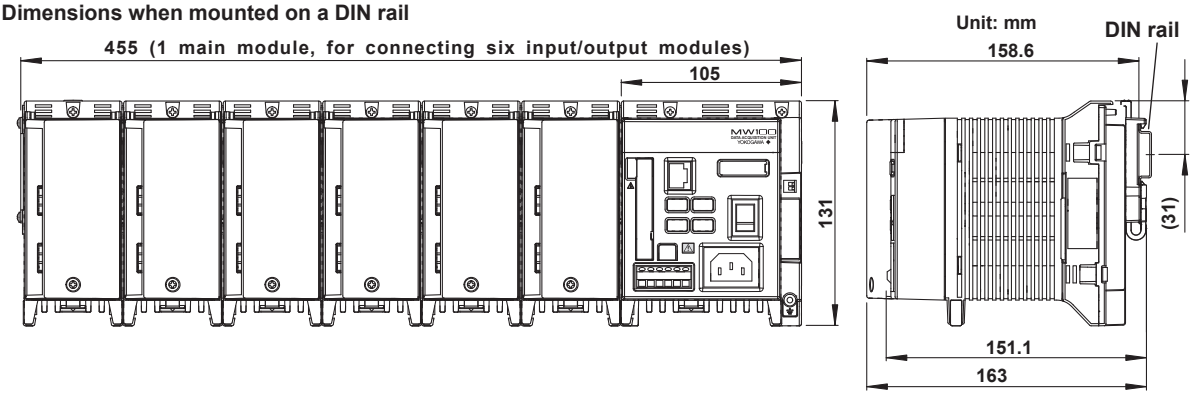


• Attachment of the base plate to the DIN rail



* To prevent slacks in the DIN rail, fix at least three locations of the DIN rail.

• Dimensions when mounted on a DIN rail



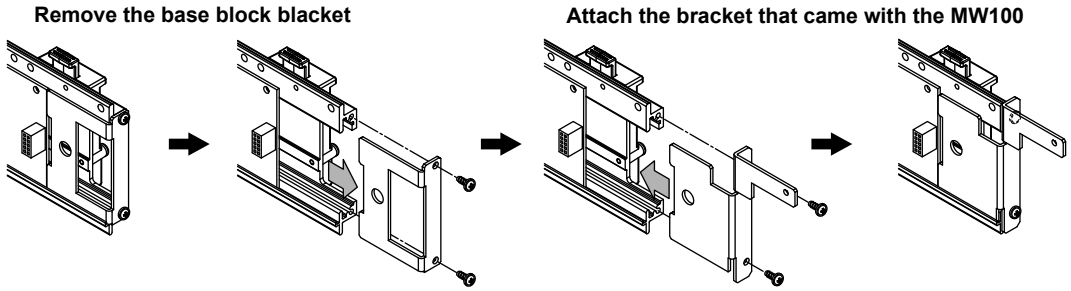
2.3 Attaching the Modules

WARNING

To prevent electric shock and instrument breakdown, do not connect the power supply to the main module when attaching modules.

Preparing the Base Plate

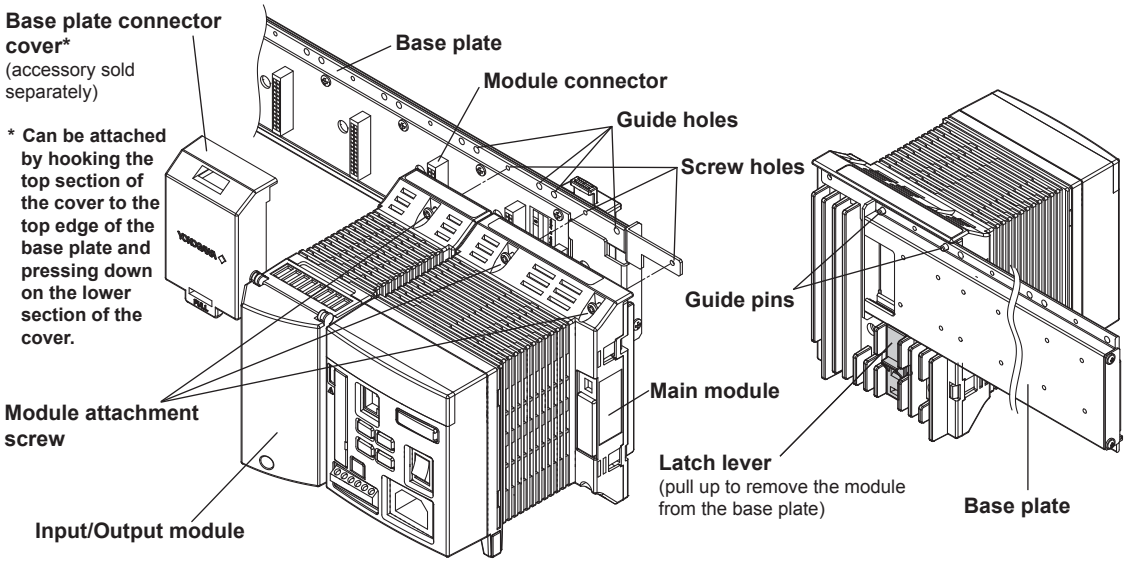
The accessory brackets are attached in order to attach the MW100 main module to the base plate.



Attachment Procedure

1. Check that the power supply is not connected to the main module.
2. Align the connector on the rear panel of the module to the connector at the desired position of the base plate and insert the connector.
   When the connectors are correctly connected, the guide pin on the rear panel of the module is inserted into the guide hole on the base plate. In addition, the module is secured to the base plate with the latch lever locking in place at the bottom section of the base plate.
3. Fasten with two screws at the top of the main module and the 30-CH Medium Speed DCV/TC/DI Input Module, and with one screw (M3) at the top of other input/output modules. The main module can only be attached to the right side of the base plate.

To remove the module, loosen the attachment screw, pull down on the latch lever on the rear panel of the module, and pull the module straight from the base plate.



Attachment Positions and Channel Numbers

Channel numbers are recognized as follows:

- Browser monitor and commands
  Channel numbers within units. Example: CH001
- MW100 Viewer software
  Unit number + Channel number within units. Example: CH01001

Representation of channel numbers: □□ □□□

Channel numbers in a unit (001-060)

Unit number (00-89)

*** The last one digit on a 4-channel module is 1 to 4.**
The last one digit on a 6-channel module is 1 to 6.
The last one digit on a 8-channel module is 1 to 8.

▶ For setting the unit number, see “Other Settings” in section 3.3.

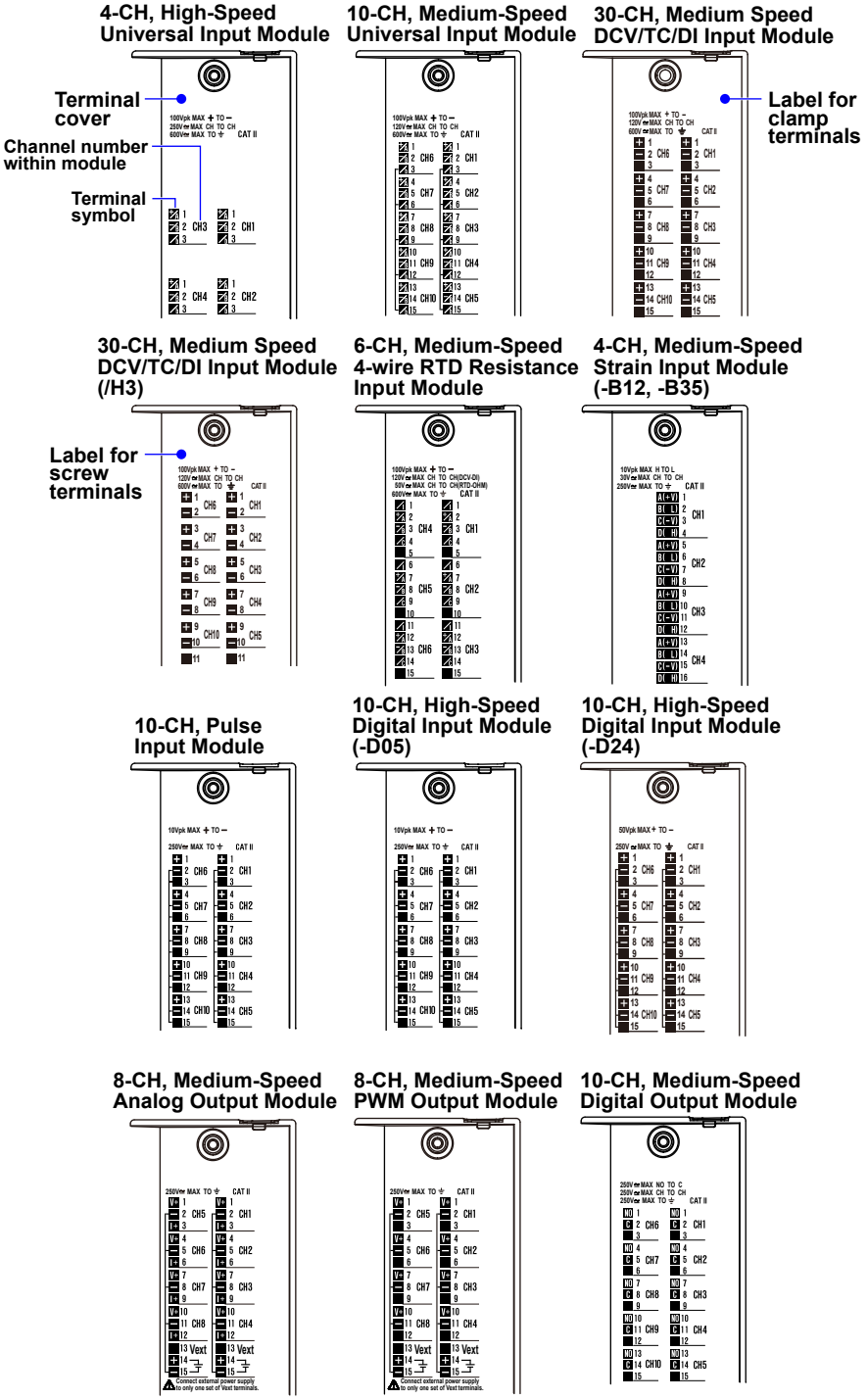
CAUTION

The 30-CH Medium Speed DCV/TC/DI Input Module takes up three modules worth of space when attaching to the base plate. If attached incorrectly, damage or malfunction can result.

2.4 Connecting Signal Wires

Terminal Arrangement Markings on the Terminal Cover

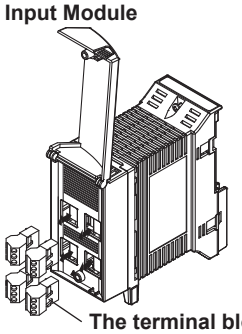
Characters indicating the terminal function and a terminal symbol indicating the type of signal to be input/output to each terminal are written on the back of the terminal cover of each I/O module. For information on wiring of corresponding terminal signals, see the wiring procedures in this section. The 4-CH Medium-Speed Strain Module (-NDI) does not have a terminal cover.



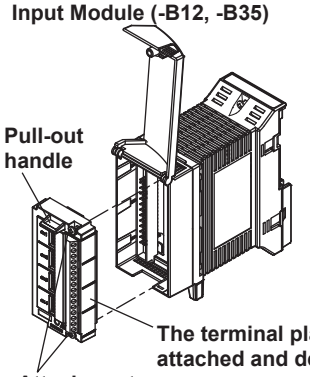
Attaching and Removing the Terminal Block

The I/O terminals can be removed as shown in the figure below.
Also, when the terminal cover is flipped up, you can remove it by forcing it back.

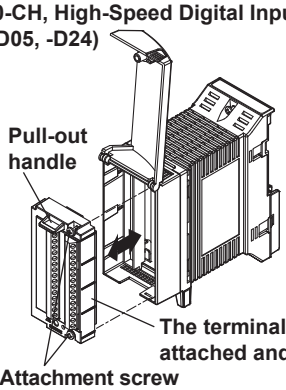
4-CH, High-Speed Universal Input Module



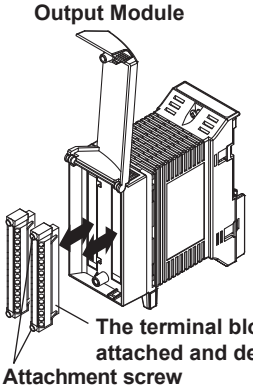
4-CH, Medium-Speed Strain Input Module (-B12, -B35)



10-CH, Medium-Speed Universal Input Module/ 6-CH, Medium-Speed 4-wire RTD Resistance Input Module/ 10-CH, Pulse Input Module/ 10-CH, High-Speed Digital Input Module (-D05, -D24)



8-CH, Medium-Speed Analog Output Module/ 8-CH, PWM Output Module/ 10-CH, Medium-Speed Digital Output Module



Attaching the Plate with Screw Terminal and Plate with Clamp Terminals for Current

A screw terminal plate (model 772080, sold separately) can be attached to the 10-CH Medium Speed Universal Input Module, the 10-CH Pulse Input Module, and the 10-CH, High Speed Digital Input Module. In addition, the dedicated plate with clamp terminals for current (model 772081/772082/772083, sold separately) can be attached to the 10-CH Medium Speed Universal Input Module.

The plate with screw terminal is attached and removed in the same manner as the screw terminal block. Note that the terminal arrangement is different than that of the clamp terminal plate. The proper arrangement is shown on the back of the terminal covers, so be sure to replace the cover along with the terminal plate.

- For the handling of the plate with screw terminal, see “Handling the MX100/MW100 10-CH Plate with Screw Terminal” in IM MX100-77E.
- For the handling of the plate with clamp terminals for current, see MX100/MW100 Setting Up the Plate with Clamp Terminals for Current (772081/772082/772083) (IM MX100-78E.)

Plate with screw terminal

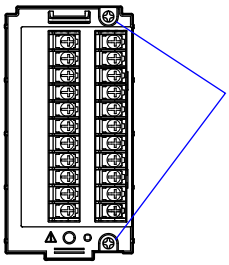
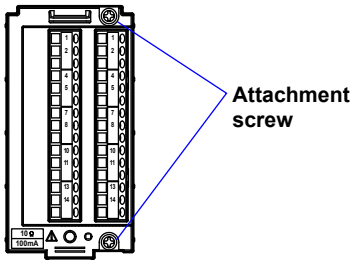


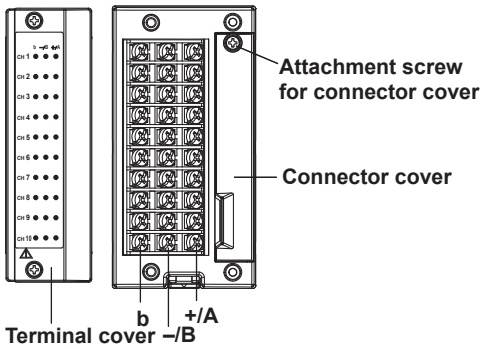
Plate with clamp terminals for current

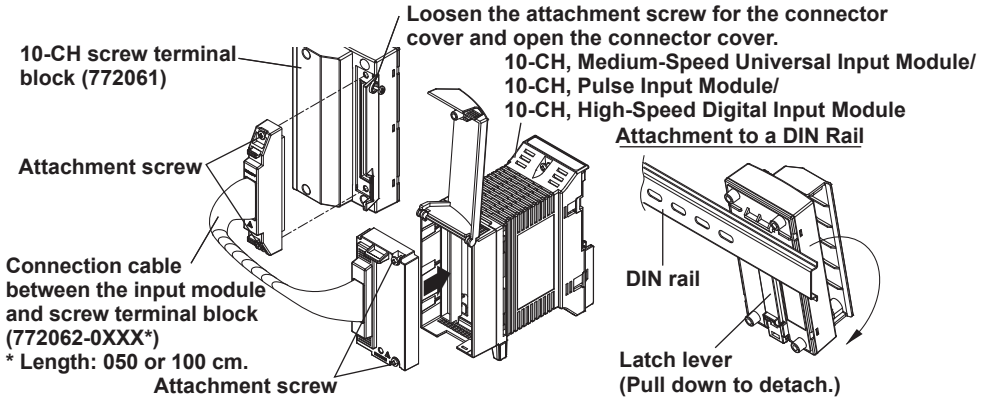


Screw Terminal Block

The 10-CH Medium-Speed Universal Input Module, 10-CH Pulse Input Module, and 10-CH High-Speed Digital Input Module allow you to remove the terminal plate and connect a 10-channel screw terminal block (accessory sold separately, M4 screws) that can be attached to a DIN rail (see the figure below).

10-CH screw terminal block (772061)





General Precautions When Wiring the Input/Output Signal Wires

WARNING

- To prevent the possibility of electric shock when wiring, confirm that the power supply source and signal source are turned OFF. After making the connections, secure the terminal cover and do not touch the terminals with your hands.
- For signal wires on which voltage exceeding 30 VAC / 60 VDC is applied relative to the ground potential or between signals, use reinforced (double) insulation wires. For all other signal wires, use basic insulation wires. For the withstand voltage of insulation wires, see the table below.

Applied Voltage (Vrms or VDC)	Basic Insulation	Double (reinforced) insulation
30 (60 VDC) to 100	620 Vrms	1000 Vrms
101 to 150	840 Vrms	1400 Vrms
151 to 300	1390 Vrms	2300 Vrms
301 to 600	2210 Vrms	3700 Vrms

- To avoid electric shock when removing the terminal plate or block and wiring the terminals, attach the terminal block or plate to the input output module before inputting or outputting signals. Electric shock or fire can result if signals are applied to the terminals if the terminal block is removed from the input/output modules.
- When wiring to screw terminals, use round, insulation coated crimp-on lugs on the terminals (4 mm screws on the screw terminal block, and 3 mm screws on the screw terminals and screw terminal plate) that do not come out when loose.
- To prevent fire, use signal wires of the following temperature ratings.

Module Type	Temp. Rating
Screw terminal block	75°C
Universal input module, DCV/TC/DI input module, 4-wire RTD resistance input module, Strain input module, Pulse input module, Digital input module, Digital output module	80°C
Analog output module, PWM output module	85°C

CAUTION

- If a large pulling force is applied to the input/output signal wires connected to the MW100, the terminal or signal wire may break. To prevent this from happening, secure all the wiring cables to the installation panel.
- Do not apply a voltage exceeding the value indicated below to the input terminals of the universal input modules. Doing so can damage the modules.
  - Maximum input voltage
    Voltage range of 1 VDC or less, TC, RTD, and DI (contact): ± 10 VDC
    Voltage range of 2 VDC or more, and DI (LEVEL): ± 120 VDC
  - Maximum common mode voltage
    Between channels: 250 VACrms (50/60 Hz) (-H04)
    120 VACrms (50/60 Hz) (-M10)
    Input to ground: 600 VACrms (50/60 Hz)
- Do not apply a voltage exceeding the values indicated below to the input terminals of the DCV/TC/DI input module. Doing so can damage the module.
  - Maximum input voltage
    Voltage range of 1 VDC or less, TC, and DI (contact): ± 10 VDC
    Voltage range of 2 VDC or more, and DI (LEVEL): ± 120 VDC
  - Maximum common mode voltage
    Between channels: 120 VACrms (50/60 Hz)
    Input to ground: 600 VACrms (50/60 Hz)
- Do not apply a voltage exceeding the value indicated below to the input terminals of the 4-Wire RTD resistance input module. Doing so can damage the module.
  - Maximum input voltage
    Voltage range of 1 VDC or less, RTD, resistance, and DI (contact): ± 10 VDC
    Voltage range of 2 VDC or more, and DI (LEVEL): ± 120 VDC
  - Maximum common mode voltage
    Between channels: 120 VACrms (50/60 Hz)
    Input to ground: 600 VACrms (50/60 Hz)
- Wiring of the Strain Input Module (-NDI)
  When connecting a bridge head, in order that the empty weight of the cable does not exceed 5 kg, ensure that the cable does not hang down more than 1.5 m (the distance to the floor). If the cable hangs longer than 1.5 m, secure the cable to the installation panel or some other location.
- Do not apply a voltage exceeding the value indicated below to the input terminals of the strain input modules. Doing so can damage the modules.
  - Maximum input voltage: ± 10 VDC
  - Maximum common mode voltage
    Between channels: 30 VACrms (50/60 Hz)
    Input to ground: 250 VACrms (-B12, -B35), 30 VACrms (-NDI) (50/60 Hz)
- Do not apply a voltage exceeding the value indicated below to the input terminals of the pulse input module. Doing so can damage the module.
  - Maximum input voltage: ± 10 VDC
  - Maximum common mode voltage
    Input to ground: 250 VACrms (50/60 Hz)
- When using the pulse input module with contact input, the measured signal becomes easily affected by wiring impedance at high speed. The cable should be approximately 25 m or less when the pulse width is 0.05 ms, or 500 m or less at 0.5 ms. The wiring impedance varies depending on the such things as the cable length, type, and wiring conditions.

- Do not apply a voltage exceeding the value indicated below to the input terminals of the 10-CH, High-Speed Digital Input Module and the output terminals of the 10-CH, Medium-Speed Digital Output Module. Doing so can damage the modules.
  - Maximum input voltage
    10-CH, High-Speed Digital Input Module: ± 10 VDC (-D05), ± 50 VDC (-D24)
    10-CH, Medium-Speed Digital Output Module: ± 250 VAC or 250 VDC
  - Maximum common mode voltage
    Input/output terminal to ground: 250 VACrms (50/60 Hz)
- Do not apply a voltage exceeding the value indicated below to the input terminals of the analog output modules or the PWM output modules. Doing so can damage the modules.
  - Maximum common mode voltage
    Output terminal to ground: 250 VACrms (50/60 Hz)
- This is a measurement category II (IEC61010-1) and overvoltage category II (CSA1N.61010-1) instrument.

Consider the points indicated below to prevent noise from entering the measurement circuit. For information about measures against noise, see section 2.9, "Measures against Noise on the MW100 Data Acquisition Unit."

- Keep the measurement circuit away from the power supply cable (power supply circuit) and ground circuit.
- It is desirable that the object under measurement is not a noise source. However, if this is not avoidable, insulate the object under measurement and the measurement circuit. In addition, ground the object under measurement.
- Shielded wires are effective against noise caused by electrostatic induction. As necessary, connect the shield to the ground terminal of the MW100 (make sure this does not lead to grounding at two points).
- Twisting the measurement circuit wires at short intervals is relatively effective against noise caused by electromagnetic induction.
- The protective earth ground must be connected to low ground resistance (100 Ω or less).

When using the reference junction compensation of the MW100 through thermocouple input, take measures to stabilize the temperature at the terminal section.

- Always close and secure the terminal cover.
- Do not use thick wires with high heat radiation effect (cross-sectional area of 0.5 mm^2 or smaller recommended).
- Keep the ambient temperature consistent. Large temperature fluctuation occurs such as when a fan nearby is turned ON/OFF.

Connecting the input wires in parallel with other instruments may mutually affect the measured values. If you need to make a parallel connection:

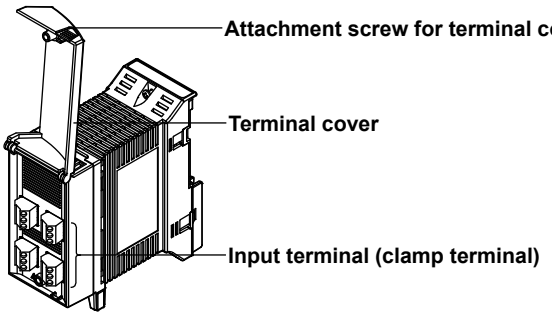
- Turn OFF burnout.
- Ground each instrument at a single common point.
- Do not turn ON/OFF the instrument while measurement is in progress. It may cause adverse affects on the other instrument.

Note that RTDs and resistors cannot be connected in parallel.

Wiring Procedures

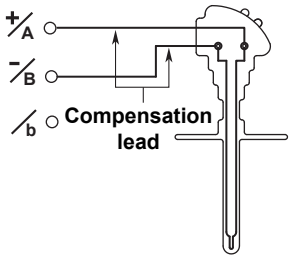
1. Turn OFF the power to the instrument.
2. Loosen the terminal cover attachment screw and lift up the terminal cover.
3. Connect the signal wires to the terminals.
4. Return the terminal cover to the original position and secure it with the screw. The appropriate screw tightening torque is 0.6 N·m.

4-CH, High-Speed Universal Input Module

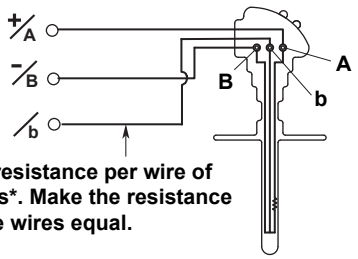


Wiring the Universal Input Module and DCV/TC/DI Input Module

• Thermocouple input



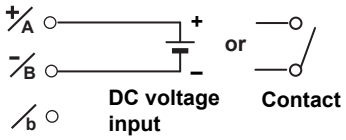
• RTD input



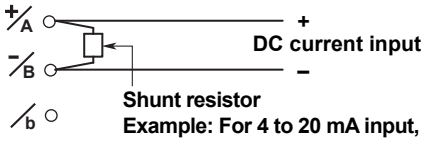
Lead wire resistance per wire of 10 Ω or less*. Make the resistance of the three wires equal.

*** In the case of Pt100Ω. 5 Ω max for Pt50Ω. 1 Ω max. for Cu10Ω.**

• DC voltage input/DI input (contact)



• DC current input



Shunt resistor
Example: For 4 to 20 mA input, shut resistance values should be 250 Ω ± 0.1%.

Terminal type: Clamp, or screw (in the case of M3: -L30/H3)

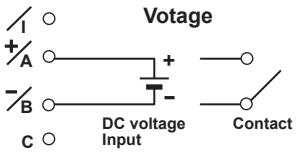
Applicable wire size: For -H04, 0.2 to2.5 mm^2 (AWG24 to12)
For -M10 and -L30 (clamp), 0.14 to 1.5 mm^2 (AWG26 to 16).

Note

- With the 10-CH Medium-Speed Universal Input module, the A and B RTD input terminals are insulated on each channel, but terminal b is shorted internally on all channels.
- Measurement using RTD cannot be performed with the 30-CH Medium Speed DCV/TC/DI Input Module.
- When the plate with screw terminal (model 772080) is connected to the 10-CH Medium-Speed Universal Input Module, the terminal arrangement differs from that of clamp terminals, so wire according to the markings on the terminal cover.

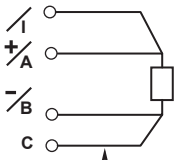
Wiring the 4-Wire RTD Resistance Input Module

• DC voltage input/DI (contact) input



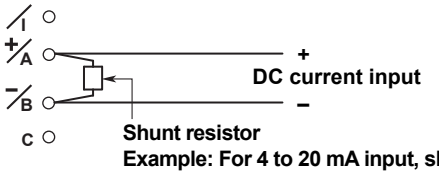
Nothing connected to the I or C terminal

• RTD input, resistance input



Resistance per lead wire of 10 Ω or less

• DC current input

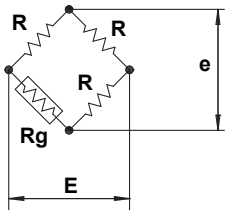


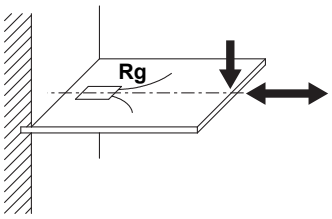
Example: For 4 to 20 mA input, shut resistance values should be 250 Ω ±0.1%.

Terminal type: Clamp
Applicable wire size: 0.14 to 1.5 mm^2 (AWG26 to 16)

Wiring the Strain Input Module

• 1 Gauge Method

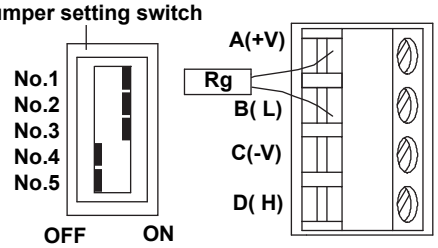




R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge

-B12, -B35

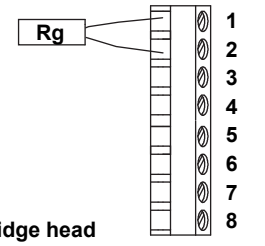
Jumper setting switch



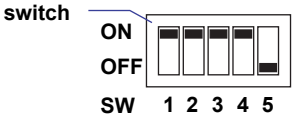
No.1	No.2	No.3	No.4	No.5
ON	ON	ON	OFF	OFF

-NDI

Bridge head (701955 or 701956)

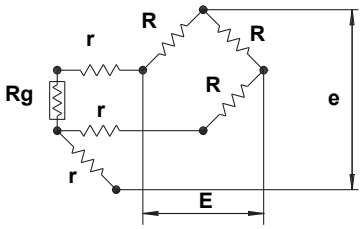


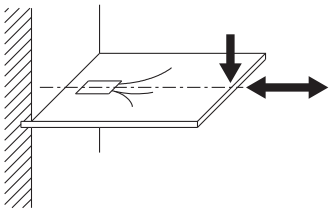
Bridge head switch



SW1	SW2	SW3	SW4	SW5
ON	ON	ON	ON	OFF

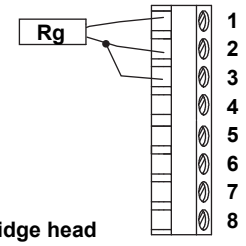
• 1 Gauge 3 Wire Method



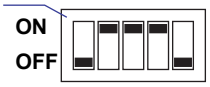


R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge

-NDI Bridge head (701955 or 701956)



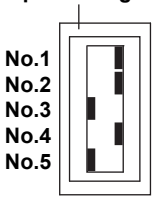
Bridge head switch

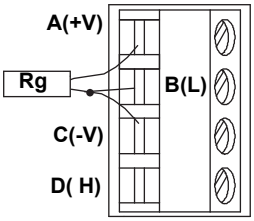


SW1	SW2	SW3	SW4	SW5
OFF	ON	ON	ON	OFF

-B12, -B35

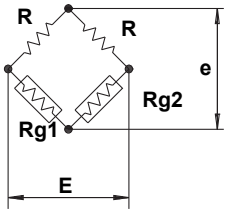
Jumper setting switch

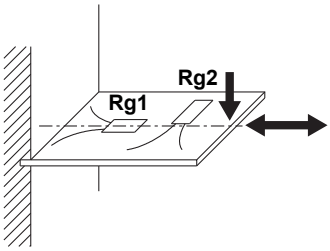




No.1	No.2	No.3	No.4	No.5
ON	ON	OFF	ON	OFF

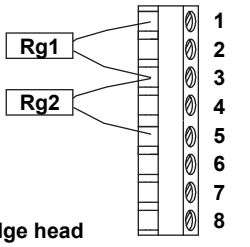
• Adjacent 2 Gauge Method



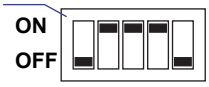


R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge

-NDI Bridge head (701955 or 701956)



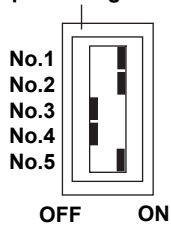
Bridge head switch

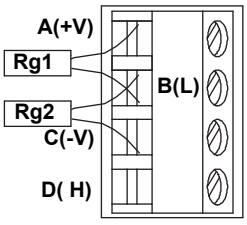


SW1	SW2	SW3	SW4	SW5
OFF	ON	ON	ON	OFF

-B12, -B35

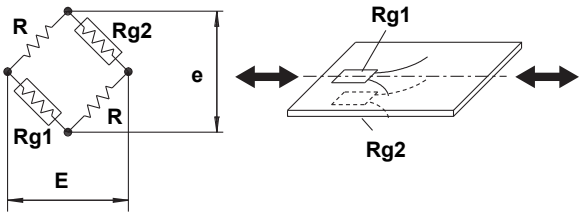
Jumper setting switch





No.1	No.2	No.3	No.4	No.5
ON	ON	OFF	OFF	ON

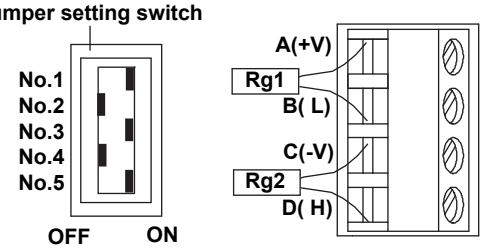
- **Opposing 2 Gauge Method**



R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge

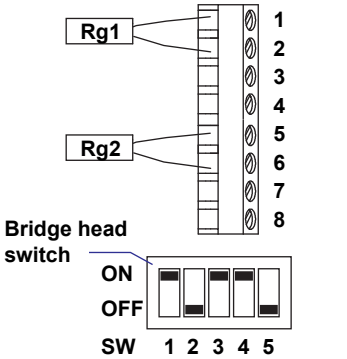
-B12, -B35

Jumper setting switch



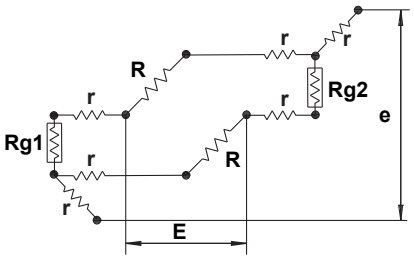
No.1	No.2	No.3	No.4	No.5
ON	OFF	ON	OFF	ON

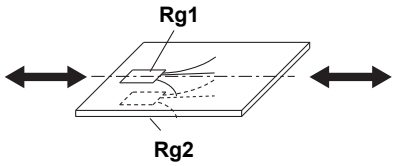
-NDI Bridge head (701955 or 701956)



SW1	SW2	SW3	SW4	SW5
ON	OFF	ON	ON	OFF

- **Opposing 2 Gauge 3 Wire Method**



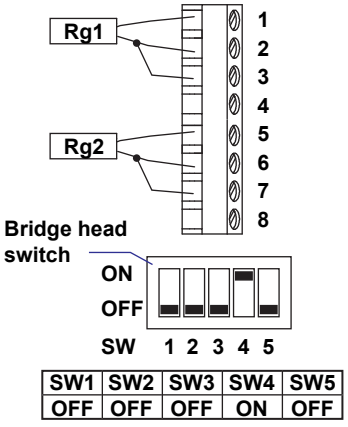


R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge

-B12, -B35

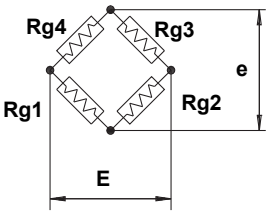
Cannot be connected. Use -NDI.

-NDI Bridge head (701955 or 701956)

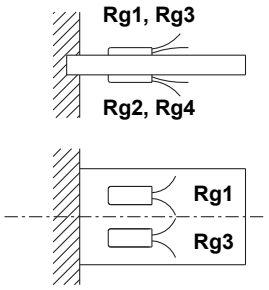


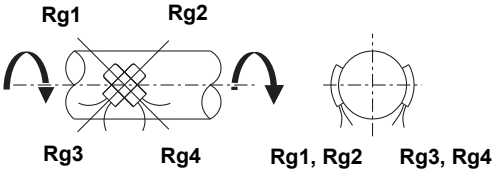
SW1	SW2	SW3	SW4	SW5
OFF	OFF	OFF	ON	OFF

- **4 Gauge Method**



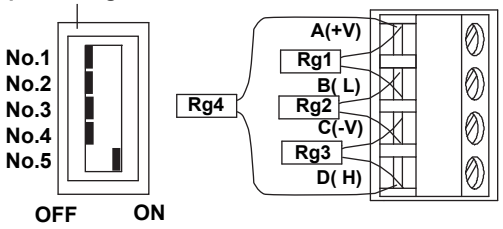
R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge





-B12, -B35

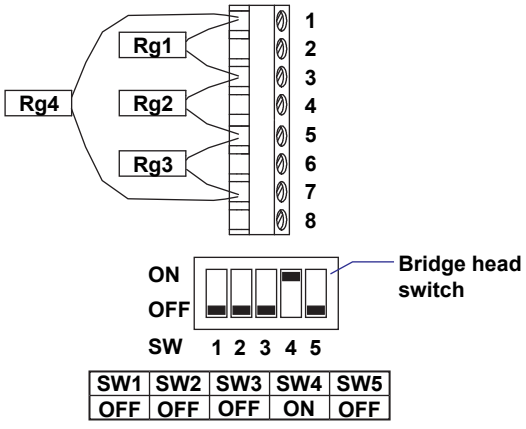
Jumper setting switch



No.1	No.2	No.3	No.4	No.5
OFF	OFF	OFF	OFF	ON

-NDI

Bridge head (701955 or 701956)



SW1	SW2	SW3	SW4	SW5
OFF	OFF	OFF	ON	OFF

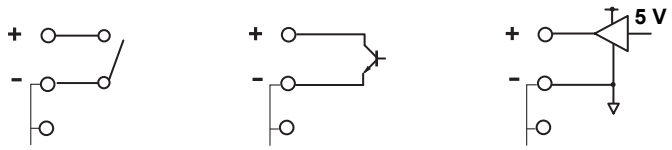
Wiring the Pulse Input Module and Digital Input Module

Note

- With the pulse input module and digital input module, the (–) terminal and unassigned terminals on all channels are shorted internally.
- When the screw terminal plate (model 772080) is connected to the pulse input module and digital input module, the terminal arrangement differs from that of clamp terminals, therefore wire according to the markings on the terminal cover.

Wiring the Pulse Input and Digital Input (-D05)

• Contact input **• Transistor input** **• 5-V logic input**



Main Input Specifications (for Pulse Input and Digital Input (-D05))

Input type: DI (non-voltage contact, open collector, and 5-V logic)

Input format: Pull up at approx. 5 V/approx. 5 kΩ, common potential between channels

Minimum detection pulse width:

Pulse input: 40 μs

Digital input (-D05): Twice the measurement interval or more

Input threshold level:

- Pulse input

  Non-voltage contact or open collector:

  Count upon change from contact open (100 kΩ or more) to contact close (100 Ω or less)

  5-V logic: Count upon change from 1 V or less to 3 V or more
- Digital input (-D05)

  Non-voltage contact or open collector:

  100 Ω or less: ON, 100 kΩ or more: OFF

  5-V logic: OFF at 1 V or less and ON at 3 V or more

Contact/Transistor rating:

Contact with a rating of 15 VDC or greater and 30 mA or greater

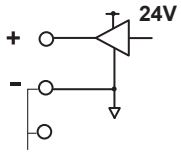
Transistor with a rating of Vce > 15 VDC and Ic > 30 mA

Terminal type: Clamp

Applicable wire size: 0.14 to 1.5 mm^2 (AWG26 to 16)

Wiring Digital Input (-D24)

• 24 V logic input



Main Input Specifications (for Digital Input (-D24))

Input type: DI (24-V logic)

Input format: Common potential between channels

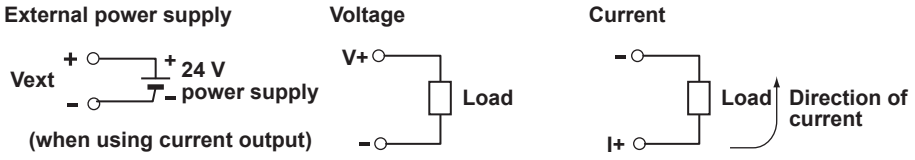
Min. detection pulse width: Twice the sampling interval or more

Input threshold level: 24-V logic: OFF at 6 V or less and ON at 16 V or greater

Terminal type: Clamp

Applicable wire size: 0.14 to 1.5 mm^2 (AWG26 to 16)

Wiring with the Analog Output Module



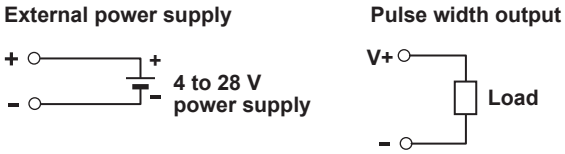
CAUTION

Two power supply terminals are connected internally. Therefore, do not connect a separate external power supply to them. Fire can result.

Main Output Specifications

Terminal type:	Clamp, attached and removed in units of 4 channels
Load impedance:	Voltage 5 kΩ or more
	Current 600 Ω or less.
Applicable wire size:	0.08 to 2.5 mm^2 (AWG28 to 12)

Wiring with the PWM Output Module



CAUTION

Two power supply terminals are connected internally. Therefore, do not connect a separate external power supply to them. Fire can result.

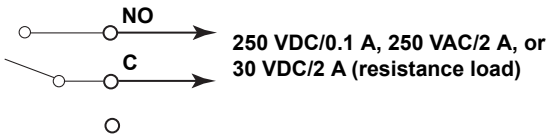
Main Output Specifications

Output capacity: 1A/ch max, however, 4 A or less total for all modules[*1, *2]
Terminal type: Clamp, attached and removed in units of 4 channels
Applicable wire size: 0.08 to 2.5 mm^2 (AWG28 to 12)

*1 A 1A current limit circuit is built in to the output circuit. Once the current limit circuit is ON, the circuit continues to operate unless the external power supply is turned OFF.

*2 This module has a built-in fuse. The built-in fuse protects against fires or abnormal emissions of heat due to load short-circuiting or other abnormalities.

Wiring with the Digital Output Module



Main Output Specifications

Contact mode: A contact (SPST)
Contact capacity: 250 VDC/0.1 A, 250 VAC/2 A, or 30 VDC/2 A (resistance load)
Terminal type: Clamp, attached and removed in units of 5 channels
Applicable wire size: 0.08 to 2.5 mm^2 (AWG28 to 12)

Note

Do not connect anything to the unassigned terminals of the digital output module.

2.5 Connecting the Power Supply and Turning the Power Switch ON and OFF

Connections with the Power Cord (Power Supply/Cord Basic Specification Code -1□*)

* □ is D, F, R, Q, or H.

WARNING

- To prevent the possibility of electric shock when wiring, confirm that the power supply source is turned OFF.
- To prevent shock or fires, only use the power cord supplied by Yokogawa together with the MW100 Data Acquisition Unit.
- Make sure to perform protective earth grounding to prevent electric shock. Connect the MW100 Data Acquisition Unit power cord into a three-prong electrical outlet with a protective grounding terminal. The AC outlet must be of a three-prong type with a protective earth ground terminal.
  Also, do not use the functional ground terminal (see 2.2, “Installation” as a protective ground terminal.
- Do not use an extension cord without protective earth ground. Otherwise, the protection function will be compromised.

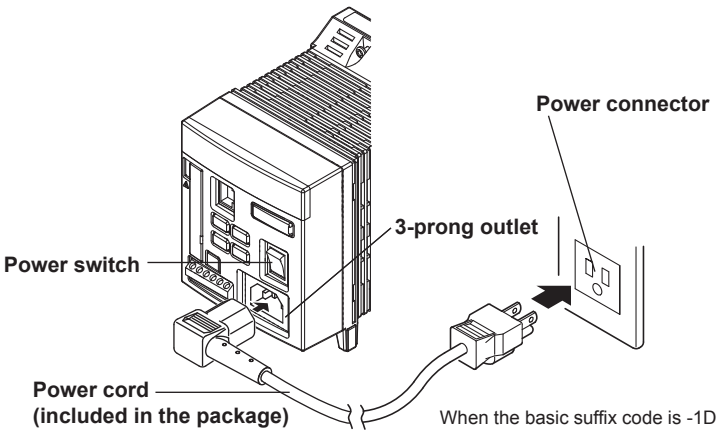
Use a power supply that meets the conditions indicated below.

Item	Specifications
Rated supply voltage	100 to 240 VACrms
Supply voltage range used	AC power supply, 90 to 250 VACrms
Rated supply voltage frequency	50/60 Hz
Allowable line frequency range	50/60 Hz ±2%
Maximum power consumption	Up to approximately 70 VA maximum when six modules are used

Note

Do not use a supply voltage in the range 132 to 180 VAC, as this may have adverse effects on the measurement accuracy.

1. Check that the power switch of the main module is OFF.
2. Connect the accessory power cord plug to the power connector of the MW100 Data Acquisition Unit.
3. (Use the power cord that came with the package.) Connect the plug on the other end of the power cord to the outlet that meets the conditions above. The AC outlet must be of a three-prong type with a protective earth ground terminal.



Wiring the Power Supply Terminal (Power Supply/Cord Basic Specification Code -1W)

WARNING

- Furnish a switch (double-pole type) to separate the unit from the main power supply in the power supply line. Also, include an ON/OFF indicator with the switch as well as a display that acts as a power supply shut down for the instrument.
  Switch specifications
  Steady state current rating: 3 A or more
  Inrush current rating: 100 A or more
  Conforms with IEC60947-1 and -3
- Connect a fuse of 2 A to 15 A to the power supply line.
- Do not insert a switch or fuse on the ground line.

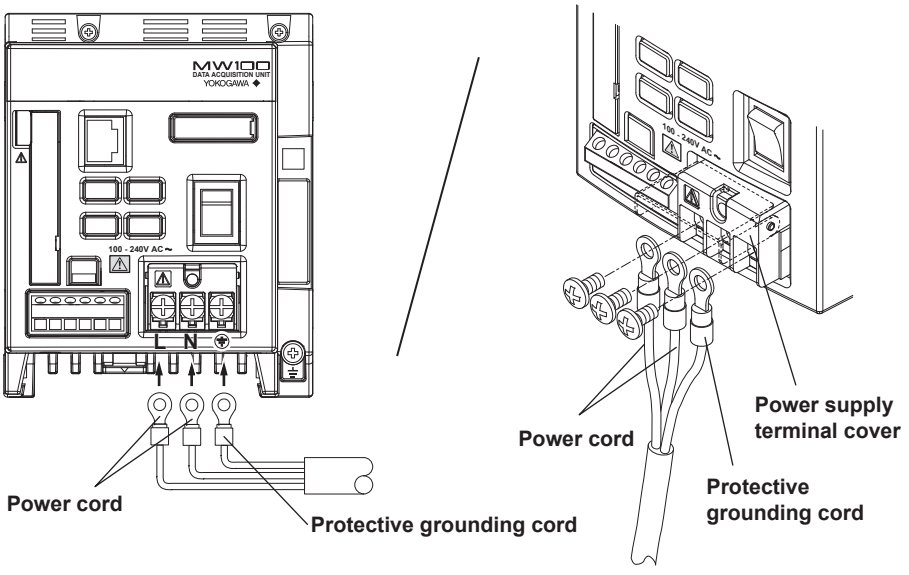
Use a power supply that meets the conditions indicated below.

Item	Specifications
Rated supply voltage	100-240 VACrms
Supply voltage range used	AC power supply, 90 to 250 VACrms
Rated supply voltage frequency	50/60 Hz
Allowable line frequency range	50/60 Hz ±2%
Maximum power consumption	Up to approximately 70 VA maximum when six modules are used

Note

Do not use a supply voltage in the range 132 to 180 VAC, as this may have adverse effects on the measurement accuracy.

1. Check that the power supply and the power switch of the main module is OFF.
2. Loosen the screw fixing the power supply terminal cover of the main module in place and open the power supply terminal cover.
3. Connect the power cord and the protective ground cord to the power supply terminals according to the figure below.
   Use round crimp-on lugs with isolation sleeves (for 4 mm screws) for the power cord and protective ground cord terminals.
4. Close the power supply terminal cover and secure it with the screw.



Wiring the Power Supply Terminal (When the Suffix Code of the Power Supply/Cord Is -2□* or -3W)

* □ is D, F, R, Q, or H.

When using an AC adapter for the power supply

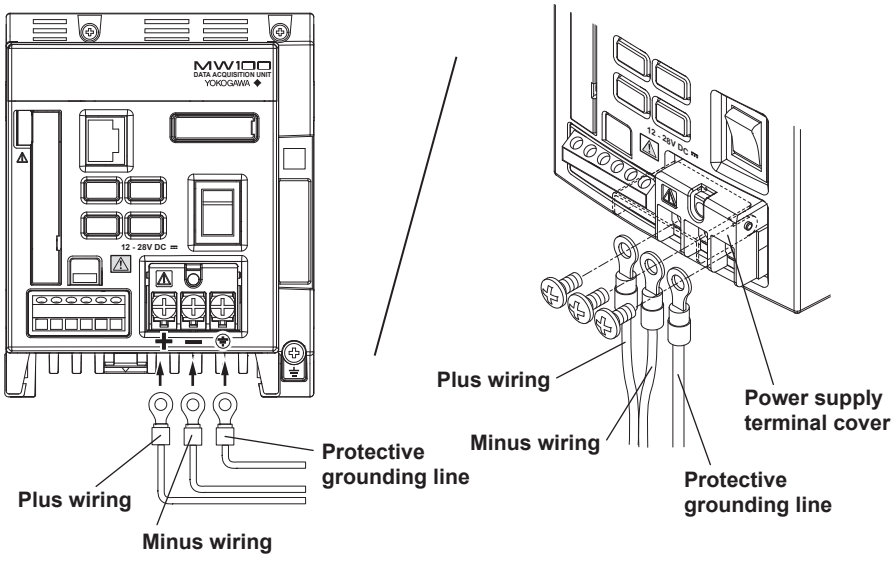
WARNING

- To prevent the possibility of electric shock when wiring, confirm that the power supply source is turned OFF.
- Use the power cord supplied by Yokogawa with the instrument.
- Check that the supply voltage matches the rated voltage of the AC adapter before connecting the power cord.
- During periods of extended non-use, remove the AC adapter's power cord from the AC outlet.
- Do not use an AC adapter (model:772075) other than the one supplied by YOKOGAWA.
- Nothing should be placed on top of the AC adapter power cord. The power cord should also be kept away from any heat sources.
- When unplugging the power cord from the outlet, never pull by the cord itself. Always hold and pull by the plug. If the power cord is damaged, contact your dealer for replacement.

Use a power supply that meets the conditions indicated below.

Item	Specifications
Rated supply voltage	100 to 240 VACrms
Supply voltage range used	AC power supply, 90 to 250 VACrms
Rated supply voltage frequency	50/60 Hz
Allowable line frequency range	50/60 Hz ±2%
Maximum power consumption	Up to approximately 70 VA maximum when six modules are used

1. Check that the power supply and the power switch of the main module is OFF.
2. Loosen the screw fixing the power supply terminal cover of the main module in place and open the power supply terminal cover.
3. Connect the plus (red) and minus (black) wires from the AC adapter and the protective ground wire to the power supply terminal as in the figure below.
4. Close the power supply terminal cover and secure it with the screw.



When Using a DC Power Supply

WARNING

- To prevent the possibility of electric shock when wiring, confirm that the power supply source is turned OFF.
- To avoid electric shock or fire, use electric wires having a cross sectional area of 0.3 mm2 (AWG 22) or more.

1. Check that the power supply and the power switch of the main module is OFF.
2. Loosen the screw fixing the power supply terminal cover of the main module in place and open the power supply terminal cover.
3. Following the wiring diagram (see “When Using an AC Adapter” in this section), wire the plus/minus wires from the DC power supply and the protective grounding wire to the power supply terminal.
4. Close the power supply terminal cover and secure it with the screw.

Use a power supply that meets the conditions indicated below.

Item	Specifications
Rated supply voltage	12 to 28 VDC
Supply voltage range used	DC power supply: 10 to 32 VDC
Maximum power consumption	Up to approximately 35 VA maximum when six modules are used

Turning the Power Switch ON and OFF

Pressing the “I” side of the power switch turns the instrument ON. Pressing the “O” side turns the instrument OFF.
When turned ON, the 7-segment LED (see section 1.3, “Functions of the Main Module” illuminates. When the self check and other processes are complete, the unit number is displayed.

Note

- Before turning the power ON, check that the modules are attached correctly and that the power cord is connected correctly.
- If the 7-segment LED does not illuminate even if the power switch is turned ON, turn OFF the power switch, then check the items below. If the condition does not change when turning ON the power even after checking those items, it is probably a malfunction. Contact your nearest YOKOGAWA dealer for repairs.
  - That the power cord is plugged in properly.
  - That the power supply voltage is within the allowable voltage range specified in this section
- If the 7-segment LED displays something other than a unit number when the power switch is turned ON, see section 4.1, “Error Display on the 7-Segment LED and Corrective Actions” and carry out the specified corrective action. If the displayed information does not change even when you carry out the corrective action, it is probably a malfunction. Contact your nearest YOKOGAWA dealer for repairs.

2.6 Connecting the Ethernet Cable

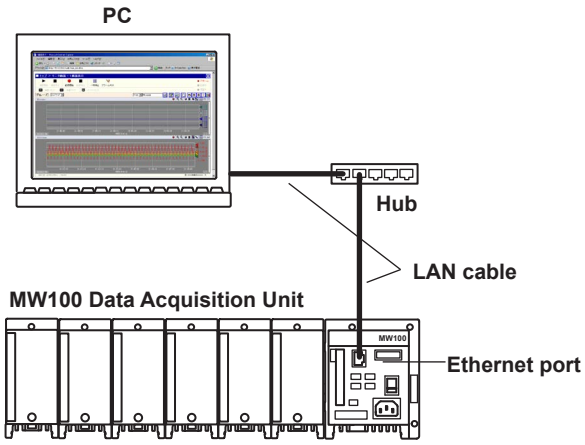
Connection Procedure

Connector

Connect the Ethernet cable to the Ethernet port on the main module.

Connection to the PC

Make the connection via a hub. For a one-to-one connection with a PC, make the connection as shown in the figure below. In the same manner, you can connect multiple MW100 Data Acquisition Units to a single PC.



Checking the Communication Status

You can check the status on the two LEDs at the upper-right and lower-right of the Ethernet port.

▶ For the LED indications, see “Part Names and Functions” in section 1.3.

Changing the Data Rate

The MW100 can be connected to a 10BASE-T/100BASE-TX hub. The data rate can be fixed to 10 Mbps half duplex by setting the dip switch.
To fix the data rate to 10 Mbps half duplex, turn switch 6 of dip switch 1 OFF. To activate the settings, carry out the same procedure as described in “Initializing Settings.”

▶ For a description of the dip switch, see “Switches and Keys” in section 1.3.

Initializing Settings

Use dip switch 1 on the main module to initialize settings including the IP address assigned to the MW100.

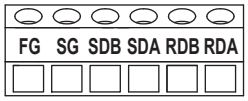
1. Turn OFF the power to the MW100.
2. Check that the switch 5 of dip switch 1 on the main module is OFF.
3. Turn OFF the power to the MW100.
   After the 7-segment LED indicates the power ON self check, “bF” is displayed.
4. Check the status of step 3, then turn the power OFF.
5. Turn switch 5 of dip switch 1 back ON.

   Check that the settings have been initialized using the IP setting software.

▶ For a description of the dip switch, see “Switches and Keys” in section 1.3.
▶ For a description of the indications of the power ON self check, see “Displays” in section 1.3.

2.7 Connecting the RS-422A/485 Interface (/C3 Option)

Terminal Wiring and Signal Names



FG (Frame Ground)	Case grounding for the main unit.
SG (Signal Ground)	The signal ground.
SDB (Send Data B)	Send data B(+).
SDA (Send Data A)	Send data A(–).
RDB (Received Data B)	Received data B(+).
RDA (Received Data A)	Received data A(–).

Connection Procedure

Cables Used

There are two types of cable, a 4-wire and 2-wire cable. Choose a cable depending on the following conditions.

Cable Used	Twisted pair shielded cable 3 × 24 AWG or more (4-wire), 2 × 24 AWG or more (2-wire)
Characteristic impedance	100 Ω
Capacitance	50 pF/m
Cable length	Max 1.2 km*

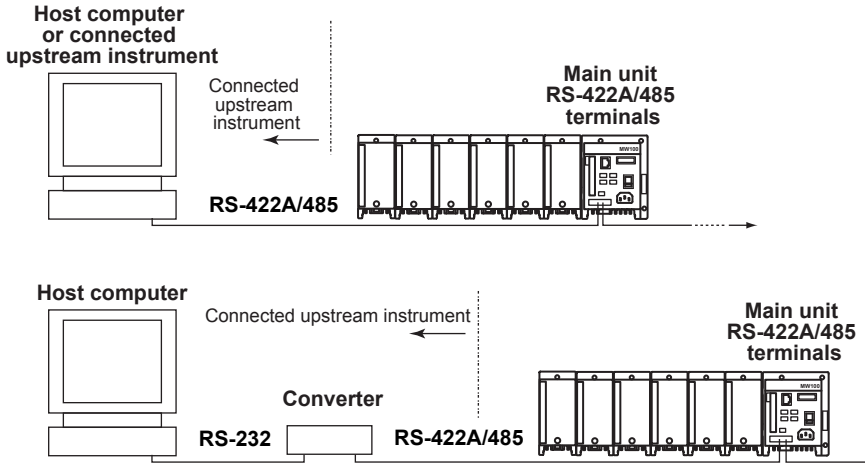
* The transmission distance of the RS-422A/485 interface is not the direct distance, but rather the total cable length (shielded, twisted pair).

WARNING

To prevent electric shock, confirm that the power supply is turned OFF before making connections.

Connections with Upstream Devices

The following figure shows a connection with an upstream device. If the upstream devices use an RS-232 port, connect through a converter.



Example of a Connection with an Upstream Device

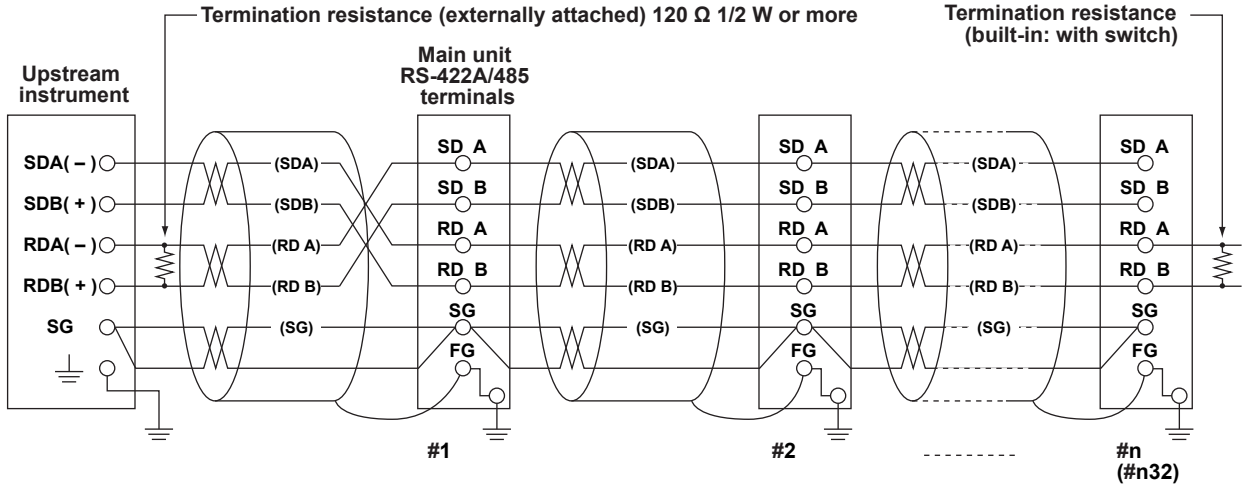
You can connect the MW100 to an upstream device with an RS-232, RS-422A, or RS485 connection port.

For RS-232, use a converter. Refer to the following table for connections to most converter terminals. For details, see the manual that came with the converter.

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

4-Wire

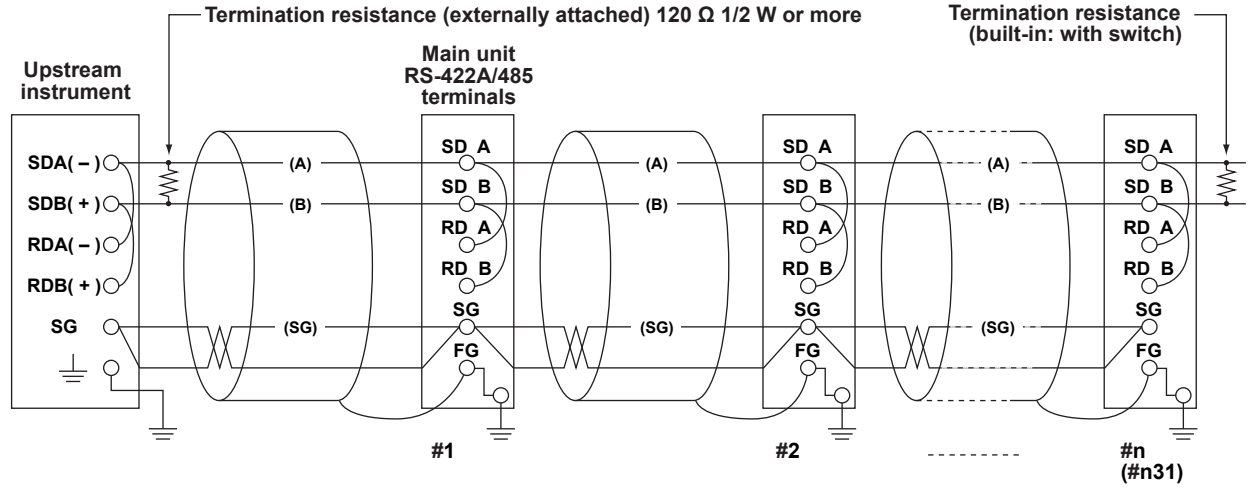
In general, a 4-wire connection is used with upstream devices. For a 4-wire connection, the send and receive wires must be crossed.



Do not connect termination resistance from #1 to #n–1.

2-Wire

On the RS-422A/485 terminal block, connect signals of the same polarity for sending and receiving, and connect only two wires externally.



Do not connect termination resistance from #1 to #n–1.

Note

- The noise rejection method differs depending on the conditions of use. In the connection example, the cable shielding is only connected to the ground of the main unit (one-sided grounding). This method is effective for noise rejection during long distance communications and other processes when there is a difference of potential between the grounding of the computer and that of the main unit. If there is no difference in potential between the PC ground and the main unit ground, it may also be effective to connect to the PC ground as well (two-sided ground). There are also cases where it is effective to use two sided grounding with a capacitor connected in series on one side. Consider the above options when taking measures against noise.
- With the 2-wire configuration (Modbus protocol), after the last data is output from the upstream PC, the 485 driver must be set to high impedance before 3.5 characters.

Serial Interface Converter

The following are recommended models of converters.

LINE EYE/SI-30FA, YOKOGAWA/ML2

CAUTION

Some converters not recommended here have non-insulated FG and SG terminals. When using such converters, do not connect them as shown on the previous page (do not connect anything to the converter's FG ad SG terminals). Especially for long-distance situations, potential differences can arise causing damage to instruments or communication abnormalities. Also, if the converter has no SG terminal, use the converter as-is without connecting signal ground. For details, see the user's manual for the converter.

Some converters not recommended here have reversed signal polarity (A/B or +/– markings). When using such converters, be sure to reverse the connections.

When Using Instruments That Only Support RS-422A

For 4-wire configurations, up to thirty-two MW100s can be connected to a single upstream device. However, if at least one of the devices in the system only supports RS-422A, it may not be possible to connect up to thirty-two units.

When Using Recorders That Only Support Yokogawa RS-422A

The maximum number of units that can be connected in this case is sixteen. Drivers for some conventional Yokogawa recorders (the HR2400, μR series, and other recorders) only support RS-422A. When such recorders are used, only a maximum of sixteen units can be connected.

Note

In the RS-422A standard, up to ten units can be connected to a single port (in 4-wire configurations).

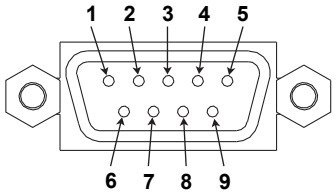
Termination Resistance

This module has built-in termination resistance. When using multi-drop connections (including point-to-point connections), for the outermost unit, turn terminator switch ON. Turn it OFF for units in the middle. Also, turn ON termination resistance for the connected upstream device (see the manual of the upstream device). When using a converter, turn ON its termination resistance. The recommended converters have built-in termination resistance.

2.8 Connecting the RS-232 Interface (/C2 Option)

Connector Pin Assignments and Signal Names

Connector Pin Assignments



Signal Names Corresponding to Connector Pins

The following table shows signal names for the RS-232, JIS, and ITU-T standards.

Pin	Signal Name			Notation	Meaning
	JIS	ITU-T	RS-232		
2	RD	104	BB (RXD)	Receive data	Input signal to the instrument
3	SD	103	BA (TXD)	Transmitted data	Output signal from the instrument
5	SG	102	AB (GND)	Signal ground	The signal ground.
7	RS	105	CA (RTS)	Request to send	The handshaking signal when receiving data from the computer, and output signal from the instrument.
8	CS	106	CB (CTS)	Clear to send	The handshaking signal when receiving data from the computer, and input signal to the instrument.

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

Handshaking

One of the following four methods in the table below can be selected for the instrument.

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

Handshaking method	Data Transmission Control (Control used to send data to a PC)			Data Reception Control (Control used to receive data from a PC)		
	Software handshaking	Hardware handshaking	No handshaking	Software handshaking	Hardware handshaking	No handshaking
	Stops transmission when X-OFF is received. Resume when X-ON is received.	Stops transmission when CB (CTS) is false. Resume when it is true.		Send X-OFF when the received data buffer is 3/4th filled. Send X-ON when the received data buffer becomes 1/4th filled.	Set CA (RTS) to False when the received data buffer is 3/4th filled. Set to True when the received data buffer becomes 1/4th filled.	
OFF-OFF			○			○
XON-XON	○			○		
XON-RS	○				○	
CS-RS		○			○	

OFF-OFF

- Send Data Control
  Handshaking is not performed between the instrument and the computer. “X-OFF” and “X-ON” from the computer are treated as data, and CS is ignored.
- Receive Data Control
  Handshaking is not performed between the instrument and the computer. When the receive buffer of the instrument becomes full, data thereafter is discarded.
  RS = True (fixed)

XON-XON

- Send Data Control
  Software handshaking is not performed between the instrument and the computer. If X-OFF is received from the computer while the instrument is sending data, data sending stops, and restarts when the next X-ON code is received. CS from the computer is ignored.
- Receive Data Control
  Software handshaking is not performed between the instrument and the computer. When the used capacity of the instrument's receive buffer reaches 1537 bytes, an X-OFF code is sent to the computer, and when the buffer reaches 511 byte, the X-ON code is sent.
  RS = True (fixed)

XON-RS

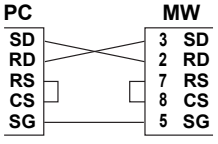
- Send Data Control
  Software handshaking is not performed between the instrument and the computer. If X-OFF is received from the personal computer while the instrument is sending data, data sending stops, and restarts when the next X-ON code is received. CS from the computer is ignored.
- Receive Data Control
  Hardware handshaking is not performed between the instrument and the computer. When the used capacity of the instrument's receive buffer reaches 1537 bytes, RS is set to False, and when the buffer reaches 511 byte, RS is set to True.

CS-RS

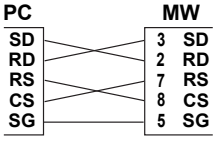
- Send Data Control
  Hardware handshaking is not performed between the instrument and the computer. If CS becomes False while the instrument is sending data, transmission stops and restarts when CS becomes True. X-OFF and X-ON from the computer are treated as data.
- Receive Data Control
  Hardware handshaking is not performed between the instrument and the computer. When the used capacity of the instrument's receive buffer reaches 1537 bytes, RS is set to False, and when the buffer reaches 511 byte, RS is set to True.

Connection Examples

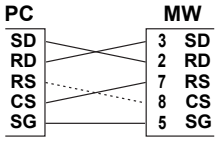
• OFF-OFF/XON-XON



• CS-RS(CTS-RTS)



• XON-RS(XON-RTS)



The RS on the PC side and the CS on the instrument side do not need to be connected for control. However, we recommend that they be connected so that the cable can be connected in either direction.

Note

- A computer program must be created such that the receive buffers of the instrument and computer do not become FULL.
- When selecting XON-XON, output data in ASCII format.

2.9 Measures Against Noise on the MW100 Data Acquisition Unit

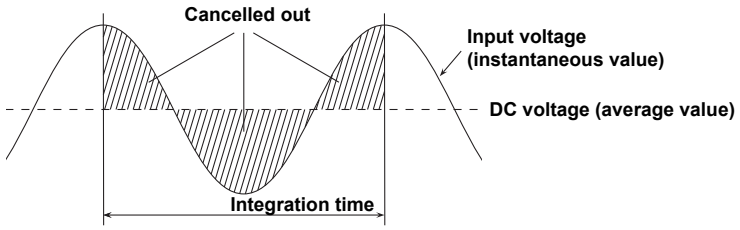
The technical Information described below is available as reference material on measures against noise. For information on obtaining a copy, contact your nearest YOKOGAWA dealer.

- Noise Interference on Recorder (TI 4D5B1-80E)
  Describes the fundamentals concerning noise and its countermeasures in two parts: basic edition and application edition.
- MX100 Performance Specifications (TI 04M08B01-00E)
  This describes in detail the noise rejection characteristics and functions that are unique to the MW100 Data Acquisition Unit.

This section briefly describes the integrating A/D converter and the first-order lag filter that the MW100 Data Acquisition Unit employs as measures against noise.

Integrating A/D Converter

MW100 input modules employ integrating A/D converters for converting the measured analog signals into digital signals. The integrating A/D converter integrates the measured values at the specified time width. If the specified time width matches the period of the signal you wish to reject, the signal is rejected.



For example, if the integration time is 20 ms, signals having frequencies of 50 Hz and integer multiples of 50 Hz can be rejected. Likewise, if the integration time is 16.67 ms, signals having frequencies of 60 Hz and integer multiples of 60 Hz can be rejected. If the integration time is 100 ms, signals having 10 Hz and integer multiples of 10 Hz can be rejected. The commercial power supply is one of the noise sources. By setting these integration times, commercial power noise of 50 Hz or 60 Hz can be eliminated.
On the MW100, the integration time is set as shown below.

4-CH, High-Speed Universal Input Module

Measurement Interval	Integration Time	Rejected Frequencies and Notes
10 ms	1.67 ms	600 Hz and its integer multiples
50 ms	16.67 ms	60 Hz and its integer multiples
	20 ms	50 Hz and its integer multiples
	Auto	Automatically detects the power supply frequency and set 16.67 or 20 ms
100 ms	36.67 ms	50 Hz and 60 Hz and their integer multiples
200 ms		
500 ms	100 ms	10 Hz and its integer multiples
1 s	200 ms	Low-pass filter with Fc = 5 Hz
2, 5,10, 20, 30, 60 s		

* Because the power supply frequency noise is not rejected, measured values may fluctuate particularly in temperature measurements. If this happens, make the measurement interval longer.

6-CH, Medium-Speed 4-wire RTD Resistance Input Module/
10-CH, Middle-Speed Universal Input Module

Measurement Interval	Integration Time	Rejected Frequencies and Notes
100 ms	1.67 ms	600 Hz and its integer multiples*
200 ms		
500 ms	16.67 ms	60 Hz and its integer multiples
	20 ms	50 Hz and its integer multiples
	Auto	Automatically detects the power supply frequency and set 16.6 or 20 ms
1 s	36.67 ms	50 Hz and 60 Hz and their integer multiples
2 s	100 ms	10 Hz and its integer multiples
5, 10, 20, 30, 60 s	200 ms	Low-pass filter with Fc = 5 Hz

* Because the power supply frequency noise is not rejected, measured values may fluctuate particularly for temperature measurements using thermocouples or 20 Ω measurements. If this happens, make the measurement interval longer, or use the 4-CH High-Speed Universal Input Module.

30-CH, Medium-Speed DCV/TC/DI Input Module

Measurement Interval	Integration Time	Rejected Frequencies and Notes
500 ms	1.67 ms	600 Hz and its integer multiples*
1 s	16.67 ms	60 Hz and its integer multiples
	20 ms	50 Hz and its integer multiples
	Auto	Automatically detects the power supply frequency and set 16.67 or 20 ms
2 s	36.67 ms	50 Hz and 60 Hz and their integer multiples
5, 10, 20, 30, 60 s	100 ms	10 Hz and its integer multiples

* Because the power supply frequency noise is not rejected, measured values may fluctuate particularly for temperature measurements using thermocouples. If this happens, make the measurement interval longer, or use the 4-CH High-Speed Universal Input Module or the 10-CH Medium-Speed Universal Input Module.

4-CH, Medium-Speed Strain Input Module

Measurement Interval	Integration Time	Rejected Frequencies and Notes
100 ms	1.67 ms	600 Hz and its integer multiples*
200ms	16.67 ms	60 Hz and its integer multiples
	20 ms	50 Hz and its integer multiples
	Auto	Automatically detects the power supply frequency and set 16.67 or 20 ms
500 ms	36.67 ms	50 Hz and 60 Hz and their integer multiples
1 s	100 ms	10 Hz and its integer multiples
2 s	200 ms	Low-pass filter with Fc = 5 Hz
5, 10, 20, 30,60 s		

* When the measurement interval is 100 ms, measured values may fluctuate since power supply frequency noise is not rejected.
In such cases, set the measurement interval to 200 ms or more.

However, when using the SNTP time synchronization function, the integral times below are used.

6-CH, Medium-Speed 4-wire RTD Resistance Input Module/
10-CH, Middle-Speed Universal Input Module

Measurement Interval	Integration Time	Rejected Frequencies and Notes
100 ms	1.67 ms	600 Hz and its integer multiples*
200 ms		
500 ms	16.67 ms	60 Hz and its integer multiples
	20 ms	50 Hz and its integer multiples
	Auto	Automatically detects the power supply frequency and set 16.6 or 20 ms
1 s	36.67 ms	50 Hz and 60 Hz and their integer multiples
2 s		
5 s	100 ms	10 Hz and its integer multiples
10, 20, 30, 60 s	200 ms	Low-pass filter with Fc = 5 Hz

* Because the power supply frequency noise is not rejected, measured values may fluctuate particularly for temperature measurements using thermocouples. If this happens, make the measurement interval longer, or use the 4-CH High-Speed Universal Input Module.

30-CH Medium Speed DCV/TC/DI Input Module

Measurement Interval	Integration Time	Rejected Frequencies and Notes
500 ms	1.67 ms	600 Hz and its integer multiples*
1, 2 s	16.67 ms	60 Hz and its integer multiples
	20 ms	50 Hz and its integer multiples
	Auto	Automatically detects the power supply frequency and set 16.67 or 20 ms
5 s	36.67 ms	50 Hz and 60 Hz and their integer multiples
10, 20, 30, 60 s	100ms	10 Hz and its integer multiples

* Because the power supply frequency noise is not rejected, measured values may fluctuate particularly for temperature measurements using thermocouples. If this happens, make the measurement interval longer, or use the 4-CH High-Speed Universal Input Module or the 10-CH Medium-Speed Universal Input Module

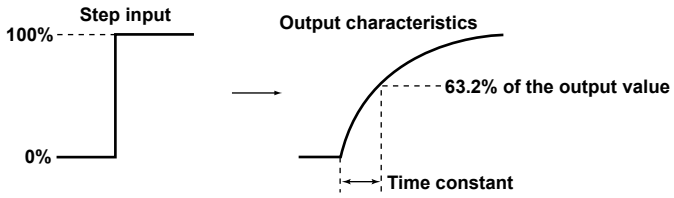
4-CH, Medium-Speed Strain Input Module

Measurement Interval	Integration Time	Rejected Frequencies and Notes
100 ms	1.67 ms	600 Hz and its integer multiples*
200 ms	16.67 ms	60 Hz and its integer multiples
	20 ms	50 Hz and its integer multiples
	Auto	Automatically detects the power supply frequency and set 16.6 or 20 ms
500 ms	36.67 ms	50 Hz and 60 Hz and their integer multiples
1 s	100 ms	10 Hz and its integer multiples
2 s		
5, 10, 20, 30, 60 s	200 ms	Low-pass filter with Fc = 5 Hz

* When the measurement interval is 100 ms, measured values may fluctuate since power supply frequency noise is not rejected.
In such cases, set the measurement interval to 200 ms or more.

First-Order Lag Filter

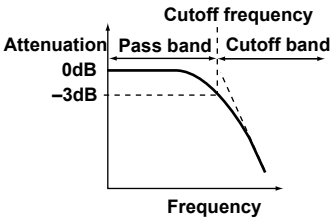
For noise sources other than power supply noise, the MW100 Data Acquisition Unit is equipped with a first-order lag filter having output characteristics indicated in the figure below against step input.
For the filter setting, the time constant is determined by selecting filter coefficient N for the measurement interval.



Filter coefficient = measurement interval x filter coefficient N

Measurement Interval (s)	Selectable Time Constants (s)						
	N=5	N=10	N=20	N=25	N=40	N=50	N=100
0.01	0.05	0.1	0.2	0.25	0.4	0.5	1
0.05	0.25	0.5	1	1.25	2	2.5	5
0.1	0.5	1	2	2.5	4	5	10
0.2	1	2	4	5	8	10	20
0.5	2.5	5	10	12.5	20	25	50
1	5	10	20	25	40	50	100
2	10	20	40	50	80	100	200
5	25	50	100	125	200	250	500
10	50	100	200	250	400	500	1000
20	100	200	400	500	800	1000	2000
30	150	300	600	750	1200	1500	3000
60	300	600	1200	1500	2400	3000	6000

If the first-order lag filter is applied to the input signal, low-pass filter frequency characteristics shown in the figure below are attained.



If the time constant of the first-order lag filter is set long, the cutoff frequency is lowered, and frequency bandwidth that can be rejected is widened. Set an appropriate time constant according to the frequency of the noise you wish to reject.

2.10 Handling of the CF Card

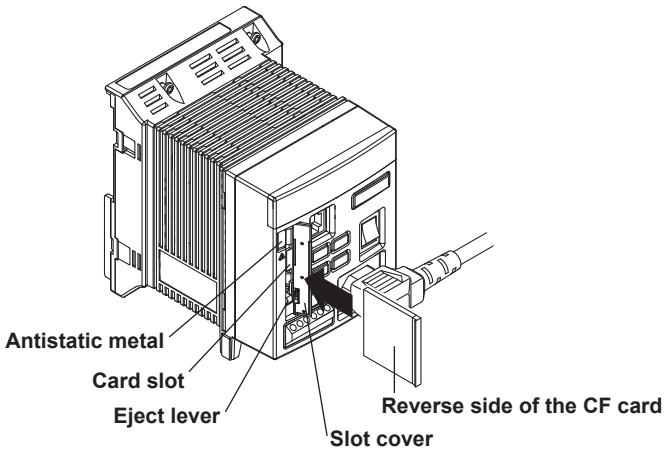
Handling Precautions of the CF Card

Note the following points when using the CF card. For the general handling precautions of the CF card, see the instruction manual that came with the CF card.

- The CF card is a precision electronic device. Do not use or store the CF card in an environment with strong static electricity or an environment where electric noise tends to appear.
- Do not remove the CF card from the card slot while data is being written. Doing so can damage or erase the data.

Inserting the CF Card

When inserting the CF card into the card slot, first touch the antistatic metal, then open the slot cover, and finally insert the card with the back side facing left as in the figure below.



Ejecting the CF Card

Be sure to check that the CF card is not being accessed before ejecting the card from the slot.

To eject the CF card, first open the slot cover while touching the antistatic metal, then push the eject lever. Then, press the eject lever that came out once again, and remove the CF card from the slot.

Note

- If the eject lever is difficult to push with your finger, use the tip of a pen or other pointed object.
- Do not close the slot cover by force when the eject lever is out. Doing so can damage the CF card slot. When not using the eject lever, push the lever in so that the slot cover can be closed.

▶ For CF card replacement while recording is in progress, see “Saving Data to the CF Card” in section 1.3.

3.1 Connection Environment

This section explains the environment in which the MW100 is connected, including requirements for the PC system, browser and plug-in software, and setting screens. This chapter focuses on settings entered with the browser. For information about communication commands, see the Communication Command manual (IM MW100-17E).

PC System Requirements

- **OS (Operating System)**
  Run the system under any of the following operating systems.
  - Windows 2000
  - Windows XP (excluding the 64-bit edition)
  - Windows Vista (excluding the 64-bit edition)
- **PC**
  A PC that runs one of the OS above, and that meets the following CPU and memory requirements.
  - **When Using Windows 2000 or Windows XP**
    CPU: Pentium II, 400 MHz or faster (Pentium III, 1 GHz or faster recommended)
    Memory: 256 MB or more (512 MB or more recommended)
  - **When Using Windows Vista**
    CPU: 32-bit (x86) processor of 1 GHz or more
    Memory: 1 GB or more
- **Hard Disk**
  Free disk space: 50 MB or more (1 GB or more recommended)
  RPM: 7200 rpm or more recommended
- **Input Devices (Mouse, Keyboard, Etc.)**
  A device supported by the OS
- **Monitor**
  - **When Using Windows 2000 or Windows XP**
    A display supported by the OS with 1024 × 768 dot resolution or better and capable of displaying 65535 colors or more.
  - **When Using Windows Vista**
    A video card recommended for the OS, and a display supported by the OS with 1024 × 768 dot resolution or better and capable of displaying 65535 colors or more.
- **Ethernet Port**
  An Ethernet port compatible with the OS (requires 10BASE-T or 100BASE-TX).

Browser

One of the following browser is required for entry of settings on the MW100.

- Internet Explorer 5.0, 5.5, 6.0, 7.0

Installing Java

Java is required for entering settings on the MW100 using a browser.

- **When Using Windows 2000 or Windows XP**
  Java Runtime version 1.4 recommended
- **When Using Windows Vista**
  Java Runtime version 6.0 recommended

Java might not be installed on the following operating systems.
- Windows 2000 SP4 or later
- Windows XP SP2 or later
- Windows Vista

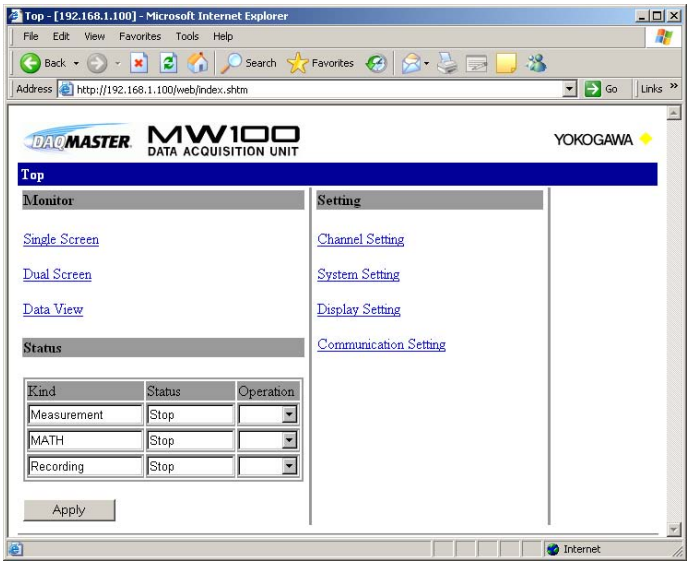
If Java is not installed, you can install it from the MW100 User's Manual CD.
- For Windows 2000, and Windows XP: Java Runtime version 1.4
- For Windows Vista: Java Runtime version 6.0

MW100 Operation Screens

The operation screens of the MW100 main module consist of **Monitor** screens enabling operations in Measurement mode, **Setting** screens that are mainly used in Setting mode, and **Status** screens for mode changes.
When entering settings, the pages for all setting items can be displayed, but there may be settings or items that cannot be entered depending on the installed modules and options.

Top Screen

- **Monitor**
  Single Screen, Dual Screen, and Data View
- **Setting**
  Channel Setting, System Setting, Display Setting, Communication Setting
- **Status**
  Measurement, MATH, and Recording status changes



Single Screen and Dual Screen

Monitor-displays the data from the MW100.

▶ For details on the operation, see section 3.16, “Measured Data Monitor Display/Settings.”

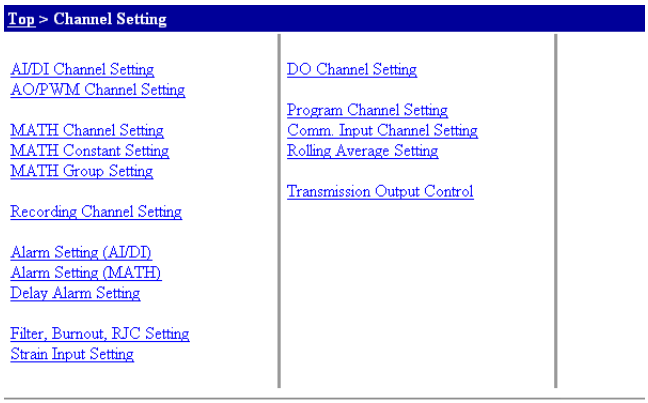
Data View

Displays alarm summaries, manual sample, and reports (digital values, graphs).

▶ For details on the operation, see section 3.16, “Measured Data Monitor Display/Settings.”

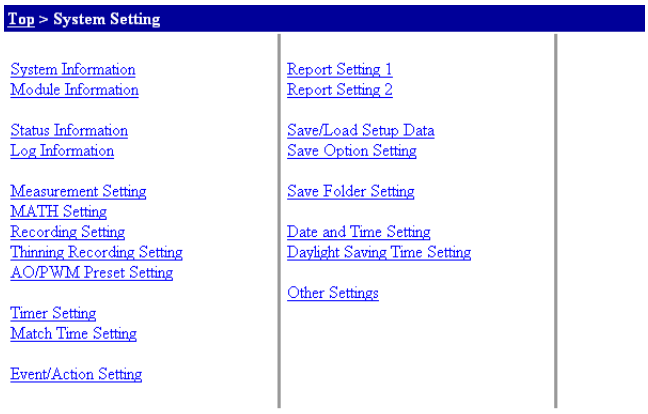
Channel Setting

You can set the measurement range, expressions, and other items.



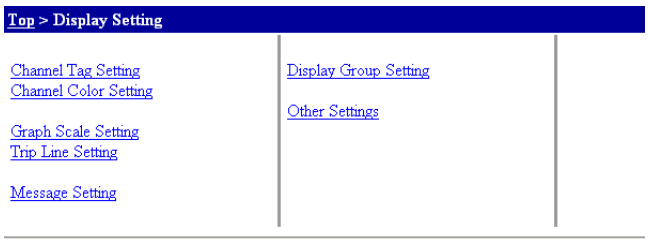
System Setting

You can set the measurement interval, measurement groups, and other items.



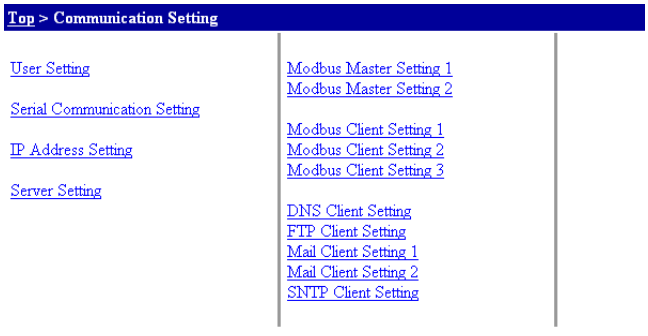
Display Setting

You can set tags, display groups, and other items.



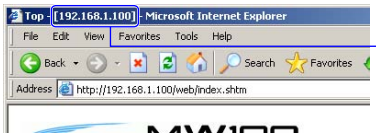
Communication Setting

You can perform user registration and enter FTP/e-mail settings, and other items.



Host Name Display

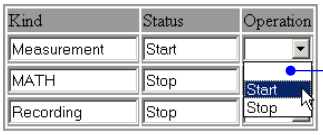
The host name or IP address is shown in brackets on the title bar of the window.



Host name, or IP address
The IP address is displayed if a host name has not been specified.

Switching Modes

The MW100 has a Measurement mode and a Setting mode, and the mode must be changed depending on the operation to be performed.



Switch between Measurement and Setting modes.

▶ For the operating procedure, see section 3.3, “System Settings.”
▶ For a description of the mode transition, see section 3.13, “Starting and Stopping Measurement, Computation, and Recording.”

Meas. Mode

To Single Screen or Dual Screens for the monitor, switch to Measurement mode. Meas. Mode (Measurement Mode) is indicated for items that require you to switch Measurement Mode in the procedural explanation of chapter 3.

Setting Mode

To modify channel settings, system settings, display settings, or communication settings, switch to Setting mode. Setting Mode is indicated for items that require you to switch to Setting Mode in the procedural explanation of chapter 3.

3.2 Communication Settings

Connection to the MW100 can be made using Ethernet or serial communications (optional). Also, when performing communication using the Modbus protocol, Modbus settings are required. When the login function is enabled, connection is made after entering a user name and password.

Note

For details on the network such as the IP address and DNS, check with your network administrator.

If you are performing communications using the Modbus protocol, you must also specify Modbus settings.

Setting Mode

Ethernet Connection

Setting Up Ethernet for the First Time, IP Address Unclear

Ethernet connections are not possible under the factory default settings. You must enter an IP address.

1. After opening an Ethernet connection between the MW100 and PC, run the MW100 Viewer Software CD-ROM or the MW100 IP address setting software installed on the PC.
2. You can select to enter a fixed IP address, or have the address automatically obtained by DHCP. If you select a fixed IP address, enter the IP address, subnet mask, default gateway, and DNS.
3. Skip to the procedures under Connecting to an MW100 with a Specified IP Address (Including DHCP).

▶ For setting procedures on the MW100 Viewer Software, see the MW100 Viewer Software User's Manual (IM MW180-01E)

You can also power up using a fixed IP address and connect to the network.

When Connecting to an MW100 with a Specified IP Address (Including DHCP).

1. Open an Ethernet connection between the MW100 and PC, then start the browser.
2. Enter the host name or IP address of the MW100 in the browser's URL/Address box. The MW100 top page appears. If the login function is set, step 3 is required.

   Ex. 1) IP address is 192.168.1.100

   http://192.168.1.100/

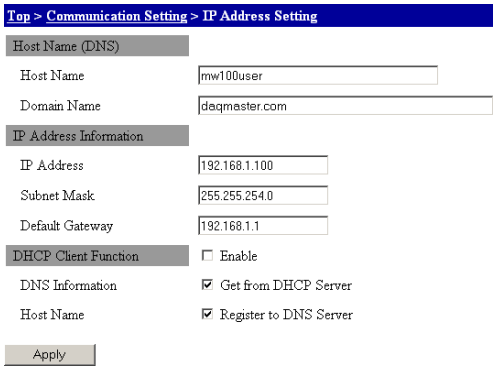
   Ex. 2) Host name is mw100user (requires DNS client settings)

   http://mw100user/
3. Before the top page appears, the **network password entry** screen is displayed. Enter a user name and password and click the OK button.

Changing the IP Address and Connecting

This is used when an IP address has already been set, and the IP address will be changed by browser or DHCP before connecting. To change the IP address, follow steps 1-6 and 10-11. For changes by DHCP, follow steps 1-3 and 7-11.

1. From the **Top** screen, click **Communication Setting** > **IP Address Setting**.



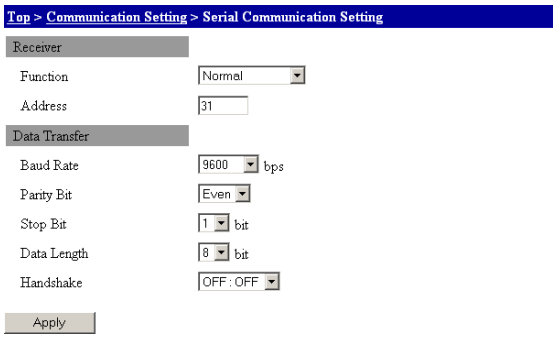
2. Enter a host name in the **Host Name** box under DNS Information. Enter the host name as necessary when you change the IP address.
3. Enter a domain name in the **Domain Name** box under DNS Information. Enter the domain name as necessary when you change the IP address.
4. Enter a fixed IP address in the **IP Address** box under IP Address Information.
5. Enter a subnet address in the **Subnet Mask** box under IP Address Information.
6. Enter a default gateway address in the **Default Gateway** box under IP Address Information.
7. To enable the DHCP client function, select the **DHCP Client Function** check box.
8. To obtain DNS information from the server, select the **DNS Information** check box.
9. To register a host name on the server, select the **Host Name** check box.
10. Click the **Apply** button.
11. Power cycle the MW100. **The setting changes are applied.**

Connecting with Serial Communication (Optional)

You can enter settings using a browser, or with communication commands. The following explains setting entry using a browser.

▶ For information about communication commands, see the Communication Command manual (IM MW100-17E).

1. From the **Top** screen, click **Communication Setting** > **Serial Communication Setting**.



Receiver Settings

2. In the **Function** list, select **Normal** for the MW100-specific protocol, **Modbus Master** for the Modbus protocol master, or **Modbus Slave** for the Modbus protocol slave.
3. Enter an address number in the **Address** box. Select the address in the range of 1 to 32 for the MW100-specific protocol and 1 to 247 for the Modbus slave.

Data Transfer Settings

4. Select a baud rate in the **Baud Rate** list.
5. Select a parity check method in the **Parity Bit** list.
6. Select a number of bits from the **Stop Bit** list.
7. Select a communication data length from the **Data Length** list. Be sure to select 8 bits if you are outputting the data in binary format.
8. Select a handshaking method in the **Handshake** list. This setting is valid only for the RS-232 interface.

▶ For a description of the setup parameters of data transmission, see “Communication” in section 5.2.

9. Click the **Apply** button. The setting changes take effect.

Modbus/RTU Settings

Set the items below to use the Modbus/RTU function.

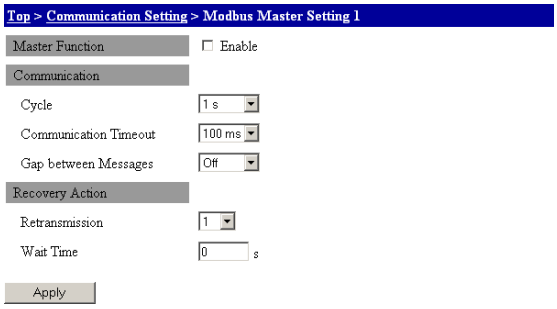
- For Modbus master, set “Modbus Master Setting 1 and 2.”
- For Modbus slave, set “Modbus master settings 1 and 2,” and “Receiver settings.”

  ▶ For a description of setting the receiver, see “Connecting with Serial Communication (Optional)” in this section.

Modbus Master Setting 1

This is for settings regarding the communication condition when using the Modbus Master function.

1. From the **Top** screen, click **Communication Setting** > **Modbus Master Setting 1**.



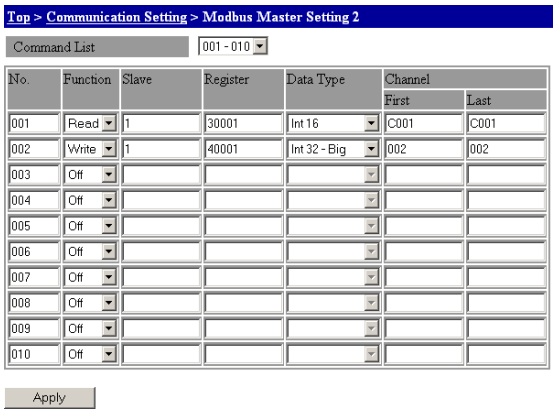
2. Select the **Enable** check box under **Master Function**.
3. Select a communication interval from the **Cycle** list under Communication.
4. Select a timeout time from the **Communication Timeout** list under Communication.
5. In the **Gap between Messages** list under Communication, select a gap time from receiving of the response until the sending of the next command.
6. Select a number of times in the **Retransmission** list under Recovery Action.
7. Enter a recovery wait time in the **Wait Time** box under Recover Action.
8. Click the **Apply** button. The setting changes take effect.

▶ For setting items of the Modbus Master function, see “Modbus Master Function (M1 Option)” under “Modbus Protocol Specifications” in section 5.2

▶ For a description of the communication timeout, see the Communication Command Manual (IM MW100-17E).

Modbus Master Setting 2

1. From the **Top** screen, click **Communication Setting** > **Modbus Master Setting 2**.



2. Select the command number group to be set from the **Command List** list.
3. Select READ/WRITE in the **Function** box.
4. Enter the address of the slave device in the **Slave** box.
5. Enter the numbers of the used registers in the **Register** box. When specifying multiple registers, enter the first register number.
6. Select a data type in the **Data Type** list.
7. Enter the channel numbers used in the **Channel** boxes.
8. Click the **Apply** button. The setting changes take effect.

▶ For details on the registers and data types, see “Modbus Master Function” in “Modbus Protocol Specifications” in section 5.2.

Modbus/TCP Settings

Set the items below to use the Modbus/TCP function. An explanation on the settings is given in the appendix.

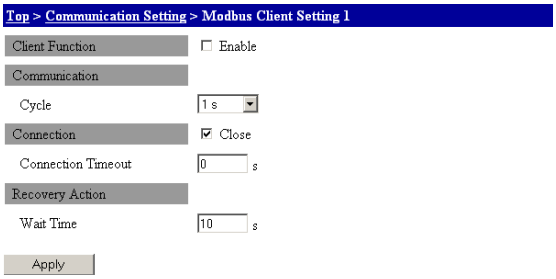
- For Modbus client, set Modbus Client Setting 1 to 3.
- For Modbus server, set the Modbus server to On in the Server Setting.

▶ For a description of the server settings, see “Server Settings” in section 3.14.

Modbus Client Setting 1

This is for settings regarding the communication condition when using the Modbus Client function.

1. From the **Top** screen, click **Communication Setting** > **Modbus Client Setting 1**.



2. Select the **Enable** check box under **Client Function**. After clicking the **Apply** button, the settings are enabled and communication begins.

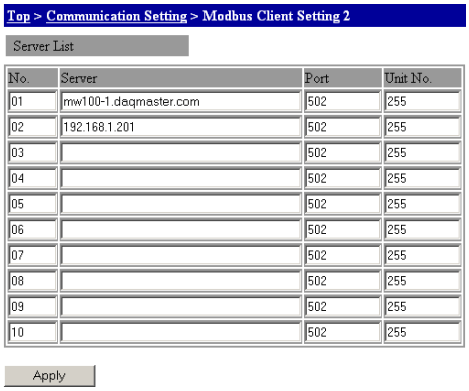
   Clear the **Enable** check box and click the **Apply** button to stop communications.
3. Select a communication interval from the **Cycle** list under **Communication**.
4. If you select the **Close** check box and there is no response from the server, communication is closed after the time entered in **Connection Timeout** elapses.
5. Enter the time until communication is closed in the **Connection Timeout** to box under **Connection**.
6. Enter the time until communications are recovered in the **Wait Time** box under **Recovery Action**.
7. Click the **Apply** button. The setting changes take effect.

▶ For a description of the connection wait time and communication recovery wait time, see “Modbus Client Function” under “Modbus Protocol Specifications” in section 5.2.

Modbus Client Setting 2

Register the server to which commands are sent. Use the number of the registered server for Modbus client setting 3.

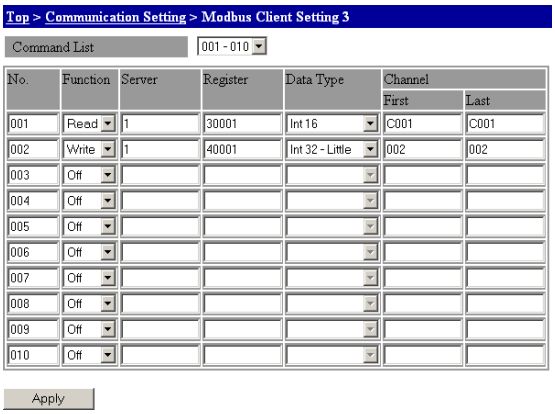
1. From the **Top** screen, click **Communication Setting** > **Modbus Client Setting 2**. The server list is displayed.



2. Enter the server name in the **Server** box.
3. Enter the server port number in the **Port** box.
4. Enter the server unit number in the **Unit No.** box.
5. Click the **Apply** button. The setting changes take effect.

Modbus Client Setting 3

1. From the **Top** screen, click **Communication Setting** > **Modbus Client Setting 3**.



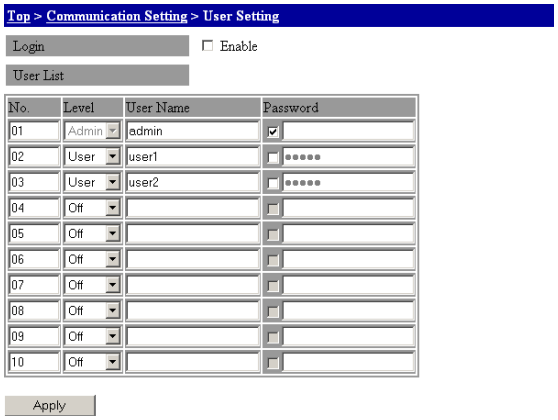
2. Enter settings in the same manner as for **Modbus Master Setting 2**. Enter the server number of the server list in the **Server** box.

▶ For details on the registers and data types, see “Modbus Client Function” under “Modbus Protocol Specifications” in section 5.2.

Login Function and User Settings

Using this function, you can restrict access to previously registered users.

1. From the **Top** screen, click **Communication Setting** > **User Setting**.



Login Function

2. Select the **Enable** check box. This enables the **login function**.

User Settings

3. Select Admin or User in the **Level** list under User List. Only Admin can be selected for list number 01.
4. Enter the user name to set in the **User Name** box under User List.
5. After selecting the **Password** check box under User List, enter the password to be assigned to the user in the **Password** box. If you do not select the check box, you cannot enter the password.
6. Click the **Apply** button. The setting changes take effect.

Note

If you forget the password for the user set to the Admin level, there is no way to recover except initializing the MW100 using dip switch 1. Be sure not to forget the password.

▶ For the initialization procedure using the dip switch, see section 4.6, “System Initialization.”

3.3 System Settings

Setting Mode

System Reconstruction

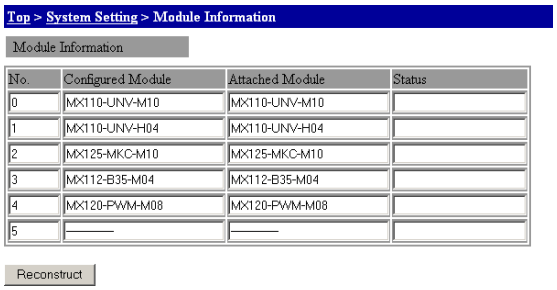
When connecting the MW100 for the first time, or when changing the position of an installed input/output module on the connected MW100, system reconfiguration is performed (to match up with the actual modules). Before reconfiguration, connect to the MW100 to be reconfigured.

Note

Always turn the power to the MW100 OFF before attaching or removing input/output modules.

Setting Module Information

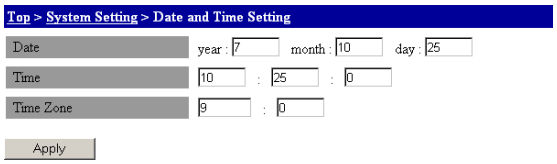
1. From the top page, click **System Setting** > **Module Information**.
2. If the **Configured Module** and **Attached Module** boxes are different, click the **Reconstruct** button to reconfigure the system.



Setting the Date and Time

Sets the date and time on the MW100.

1. From the top page, click **System Setting** > **Date and Time**.



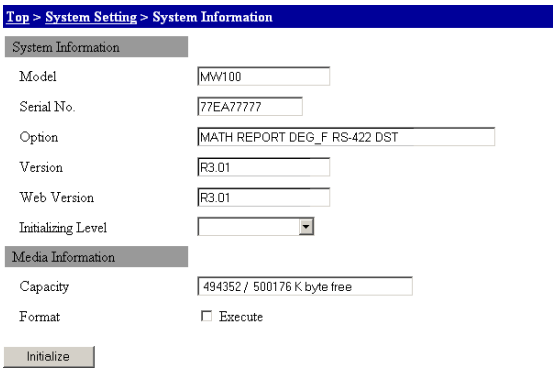
2. Enter the year, month, and date in the **Date** box. Use the last two digits of the Western calendar for the year.
3. Enter the hour, minute, and second in the **Time** box. Time is specified in 24-hour format.
4. Enter the hour and minutes in the **Time Zone** box.
5. Click the **Apply** button. The setting changes take effect.

Viewing and Initializing the System Information

You can view the model name, serial number, installed options, firmware version, and Web software version in the corresponding display boxes.
Also, you can initialize system settings.

System Information

From the top screen, click **System Setting** > **System Information**.



Viewing System Information

Various items are displayed in the system information display area.

Initializing System Information

1. Select the initialization level from the **Initialization Level** list.
2. Click the **Initialize** button to initialize the system settings.

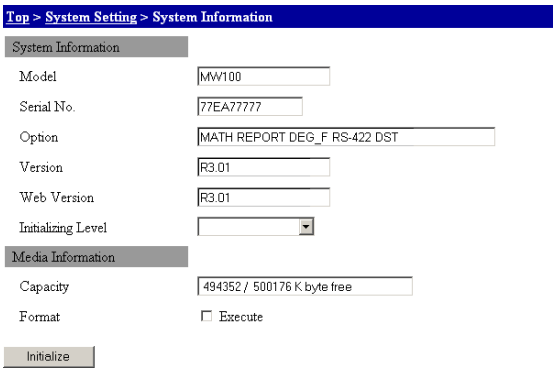
▶ For details, see section 4.6, “System Initialization.”

Formatting the CF Card and Checking the Free Space

You can format the CF card and check the amount of available space on the card.

Media Information

From the top screen, click **System Setting** > **System Information**.



Checking the Free Disk Space

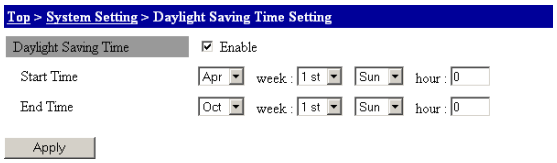
The amount of used and total space is displayed in the **Capacity** box under Media Information.

Formatting

1. Select the **Format** check box under Media Information.
2. Click the **Initialize** button to initialize the CF card.

Daylight saving Time Setting

1. From the top screen, click **System Setting** > **Daylight Saving Time Setting**.

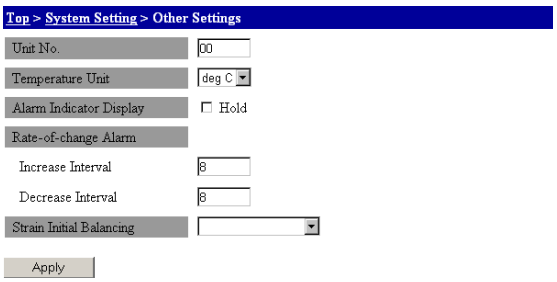


2. Select the **Daylight Saving Time** check box. The Summer time and Winter time function is enabled.
3. Select a starting month, week, and day of the week for the start of Summer time in the **Start Time** box. Enter a start time in the box.
4. Select an ending month, week, and day of the week for the end of Summer time in the **End Time** box. Enter an end time in the box.
5. Click the **Apply** button. The Summer time and Winter time start times are enabled.

Other Settings

This is for entering the MW100 unit number, units of temperature, alarm hold, rate of change interval, and strain initial balance settings.

From the top screen, click **System Setting** > **Other Settings**.



Unit Number

1. Enter a number from 0 to 89 for identifying the MW100 unit in the **Unit No.** box.
2. Click the **Apply** button. This enables the setting changes.

Temperature Unit

1. Select Celsius **deg C** or Fahrenheit **deg F** in the Temperature Unit list.
2. Click the **Apply** button. This enables the setting changes.

Alarm Status Hold

1. If the **Hold** check box is selected, alarms are held.
2. Click the **Apply** button. This enables the setting changes.

▶ For a description of the alarm hold/non-hold, see “Alarms” in section 1.3.

Rate of Change Interval

1. Enter the measurement count that determines the interval in the **Increase Interval** box under **Rate-of-Change Alarm**.
2. Enter the measurement count that determines the interval in the **Decrease Interval** box under **Rate-of-Change Alarm**.
3. Click the **Apply** button. The settings for each item are applied.

▶ For a description of the rate of change interval, see “Alarms” in section 1.3.

Executing Strain Initial Balancing

1. Select the initial balance execution method from the **Strain Initial Balancing** list.
2. Click the **Apply** button. Initial balancing is executed on the channel selected in the strain input settings in the channel settings.

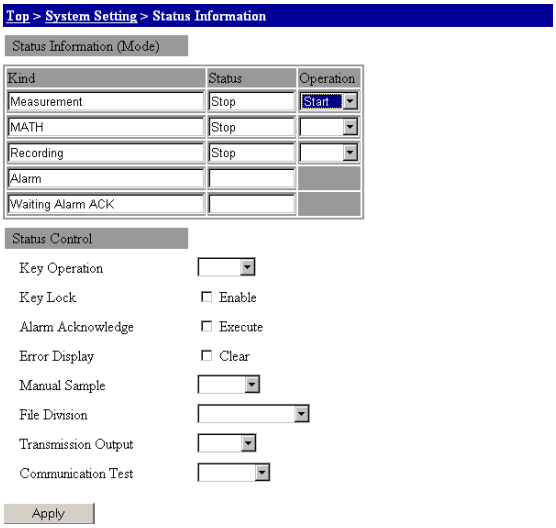
▶ For channel settings when executing strain input initial balance, see “Setting Up and Executing Strain Input Initial Balancing” in section 3.5.

Status Information and Processing/Operation

You can change the MW100 operation mode, operate the main unit keys, and check alarm statuses. The operation described here can also be carried out in measurement mode.

Changing Status Information (Mode)

From the top screen, click **System Setting** > **Status Information**. You can perform the same procedure in the **Status** table in the top screen.



- **Switching between Measurement Mode and Setting Mode**
  1. In the **Operation** box under Measurement, you can select **Start** to switch to Measurement mode, or **Stop** to switch to Setting mode.
  2. Click the **Apply** button. The changed status is displayed in the **Status** display box.

- **Computation Start/Stop**
  1. In the **Operation** box under the MATH item, you can select **Start** to start computation, or **Stop** to stop computation.
  2. Click the **Apply** button. The changed status is displayed in the **Status** display box. You can also start and stop computation from the Monitor screen.

- **Recording Start/Stop**
  1. In the **Operation** box under the Recording item, you can select **Start** to start recording, or **Stop** to stop recording.
  2. Click the **Apply** button. The changed status is displayed in the **Status** display box. You can also start and stop recording from the Monitor screen.

Checking Status Information

When an alarm occurs, Waiting Alarm ACK is displayed in each display box.

Processing and Operation

- **Operating Main Unit Keys**
  1. Select the main unit key you wish to operate from the **Key Operation** list.
  2. Click the **Apply** button. The same operation takes place as if you had pressed the main unit key.

- **Main Unit Key Lock**
  1. Select the Main unit **Key Lock** check box.
  2. Click the **Apply** button.
     The key operation is disabled, and "." is displayed in the lower right of the 7-segment LED on the main unit.

- **Checking the Alarm Status**
  1. Select the **Alarm Acknowledge** check box.
  2. Click the **Apply** button. Alarm ACK executes.

  ▶ For information on alarm ACK, see "Alarms" in section 1.3 and "Relay Excitation State / Hold Operation" in section 1.14.

- **Clearing the Error Display**
  1. Select the **Error Display** check box.
  2. Click the **Apply** button. Clears the error number displayed in the 7-segment LED.

- **Performing a Manual Sample / Dividing Manual Sample Files**
  1. In the **Manual Sample** list, select Sample to perform a manual sample, or Divide to divide the manual sample file.
  2. Click the **Apply** button. The selected action executes.

  ▶ For details on manual sample: see "Manual Sample Function" in section 1.3.
  ▶ For saving manual sample data, see "Saving Data to the CF Card" in section 1.3.

- **Dividing Measured, Computed, and Thinned Data Files**
  1. In the **File Division** list, select Memory Save to divide measured or computed data files, or Memory Save (T) to divide thinned data files.
  2. Click the **Apply** button. File division executes.

  ▶ For information on data file division, see "File Division" under "Saving Data to the CF Card" in section 1.3.

- **Turning Transmission Output ON and OFF**
  1. In the **Transmission Output** list, select ON to perform transmission output.
  2. Click the **Apply** button. Transmission output executes.

- **Execute Communication Test**
  1. Select the item you wish to test from the **Communication Test** list.
  2. Click the **Apply** button. The communication test executes.

  ▶ For a description of the execution of the communication test, see "Communication Test" under "Communication" in section 5.2.

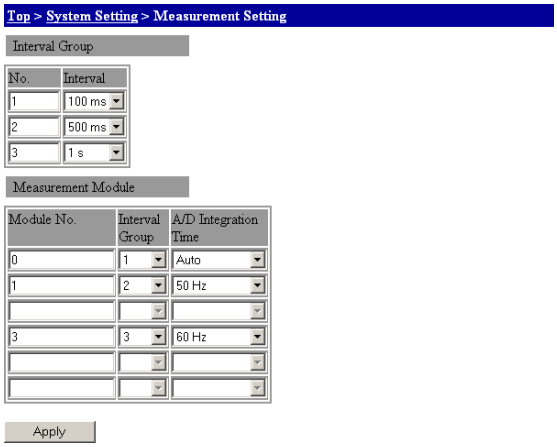
3.4 Setting Acquisition Conditions for Measured/ Computed Data

This is an explanation of measurement settings, MATH settings, recording settings, and thinning settings.

Setting Mode

Measurement Operation Settings

1. From the top screen, click **System Setting** > **Measurement Setting**.



Measurement Group Settings

2. Select the measurement interval from the **Interval** list. Set a measurement interval for each group number.

Measurement Module Settings

Sets the integral time and measurement group assignments for each module.

3. Select the group you wish to assign in the **Interval Group** list.
4. Select an integral time of AUTO, 50 Hz, or 60 Hz in the **A/D Integration Time** list. This setting is enabled from the measurement interval.
5. Click the **Apply** button. The setting changes take effect.

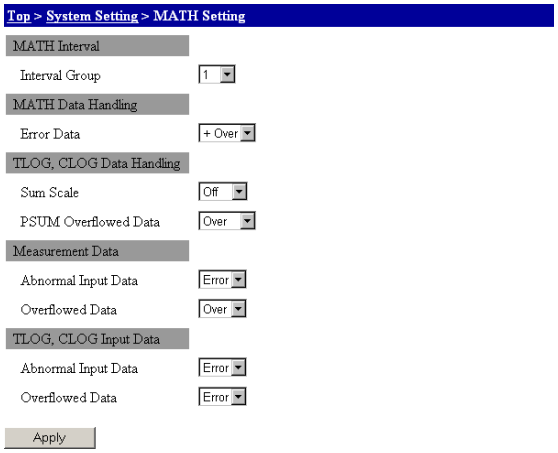
▶ For a description of the measurement interval and integration time that can be specified, see section 2.9, “Measures Against Noise on the MW100 Data Acquisition Unit.”

Note

- The measurement interval that is assigned to the measurement group number is, (interval is short) meas. group1 ≤ meas. group2 ≤ meas. group 3 (interval is long)
- The equivalent of three modules worth of settings are entered for the 30-CH Medium Speed DCV/TC/DI Input Module.
  - Select the same measurement group for the three measurement groups.
  - Select the same integral time for the three A/D integral times.

Computation Operation Settings

From the top screen, click **System Setting** > **MATH Setting**.



MATH Interval Settings

1. In the **Interval Group** list, select the interval group number. The measurement interval is set to the interval assigned to the selected group number.

Note

If multiple interval groups are specifying the same measurement interval, specify the largest number for the interval group number that you select.

MATH Operation Settings

2. Select +Over or –Over in the **Error Data** list.

TLOG and CLOG Computation Operation Settings

3. Select units of integration in the **Sum Scale** list.
4. Select Over (computation stop) or Rotate in the **PSUM Overflowed Data** list.

Measurement Input Settings

5. Select Error (MATH error) or Skip in the **Abnormal Input Data** list.
6. Select Over (handle as an overflow value), Skip, or Limit in the **Overflowed Data** list.

TLOG and CLOG Input Settings

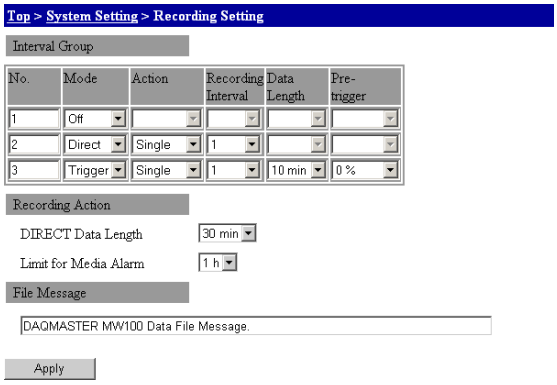
7. Select Error (MATH error) or Skip in the **Abnormal Input Data** list.
8. Select Error (MATH error), Skip, or Limit in the **Overflowed Data** list.

9. Click the **Apply** button. This enables the settings changes.

▶ For processing upon MATH errors, see “Processing Computed Results with Abnormal Input Values or Overflow Values” in section 1.15.

Measurement/Computation Recording Operation Settings

1. From the top screen, click **System Setting** > **Recording Setting**.



Set the recording operation for each measurement group.

2. Select the recording start action in the **Mode** list under Interval Group.
   If you select Direct, steps 3 and 4 are required. If you select Trigger, steps 3 to 6 are required.
3. Select the recording stop action in the **Action** list under Interval Group.
4. Select the recording interval in the **Recording Interval** list under Interval Group.
   The recording interval is set to an integer multiple of the measurement interval. In addition, the selectable recording interval varies depending on the measurement interval assigned to the selected interval group.
5. Select a recording data length from the **Data Length** list under Interval Group.
6. Select a pretrigger length (%) from the **Pre-trigger** list under Interval Group.

▶ For the selectable recording intervals, see “Recording of Measured/Computed Values” under “Recorder Structure” in section 5.2.

Recording Operation Settings

7. Select a recording data length from the **DIRECT Data Length** list. Measurement groups for which the recording start timing is Direct are all set to this.
8. Select the remaining space time in the **Limit for Media Alarm** list. When the specified remaining amount is reached, you can have output such as relay output occur.

▶ For a description of the recording start action, see “Saving Data to the CF Card” in section 1.3.

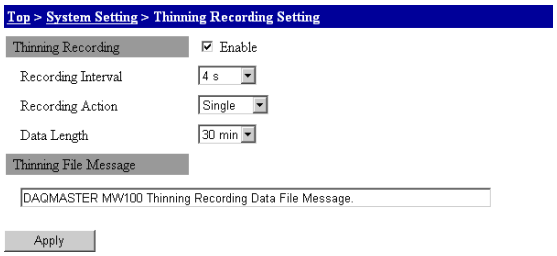
File Message Settings

9. Enter the message to be saved to the measured/computed data file in the File Message box.

10. Click the **Apply** button. The setting changes take effect.

Thinning Operation Settings

1. From the top screen, click **System Setting** > **Thinning Recording Setting**.



Thinning Settings

2. Select the **Enable** check box. Thinning recording is enabled, and you can enter thinning recording settings.

▶ For a description of the recording start action, see “Saving Data to the CF Card” in section 1.3.

Setting the Thinning Interval, Recording Operation, and Recording Data Length

3. Select the thinning time in the **Recording Interval** list. A time shorter than the measurement interval specified for the measurement group cannot be set.
4. Select a recording stop action in the **Recording Action** list.
5. Select a recording data length from the **Data Length** list.

Thinning File Message Settings

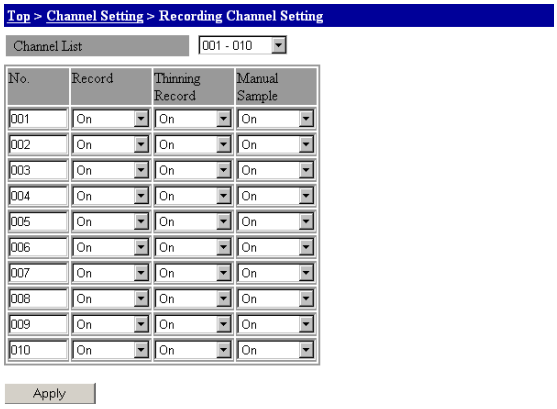
6. Enter the message to be saved to the thinning data file in the Thinning File Message box.

7. Click the **Apply** button. The setting changes take effect.

Recording Channel Settings

You can set the channels to which data is recorded or thinning recorded, and the channels set to manual sample.

1. From the top screen, click **Channel Setting** > **Recording Channel Setting**.



2. Select the channel group you wish to set from the **Channel List** list.

Recording, Thinning Recording, and Manual Sample Settings

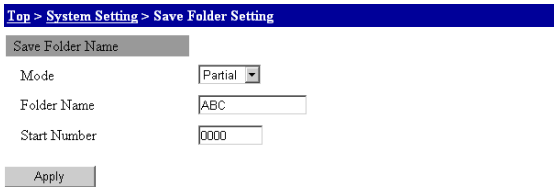
3. Turn On recording in the **Recording** list when recording data.
4. Turn On data thinning in the **Thinning Recording** list when thinning data.
5. Turn On manual sample in the **Manual Sample** list when recording manual sample data.

6. Click the **Apply** button. The setting changes take effect.

Data Save Folder Settings

Specify the method for creating the folder in which measured/computed and thinned data are saved.

1. From the top screen, click **System Setting** > **Save Folder Setting**.



2. Select how to create the folder from the **Mode** list. If you select Partial, carry out steps 3 and 4. If you select Free, carry out step 3.
3. Enter the folder name in the **Folder Name** box. An error occurs if you set Mode to Partial and Free and you do not enter the folder name.
4. Enter the start number in the **Start Number** box to specify the start number.
   The number displayed when moving to the data save folder setting screen is the number created next time. (If you move to the setting screen while the recording is in progress, the number that is being created is displayed.)
5. Click the **Apply** button. The setting changes take effect.

▶ For a description of folder mode, see “Saving Data to the CF Card” in section 1.3.

3.5 Setting Measurement Conditions (Measurement Channel Settings)

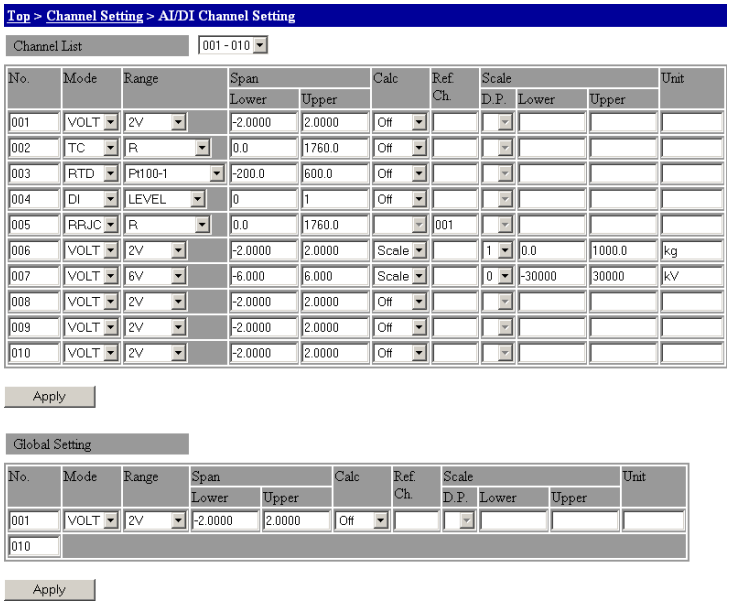
Setting Mode

Measurement Channel Settings

You can set the input type, range, span, and computation (linear scaling and differential computation between channels).
The selectable input type, range, and other settings can differ depending on the module. For details, see the explanation of the functions of individual modules in chapter 1, “Explanation of Functions,” or chapter 5, “Specifications.”

Setting the Input Range

1. From the top screen, click **Channel Setting** > **AI/DI Channel Setting**.



2. Select the channel group you wish to set from the **Channel List** list.

Setting the Input Mode

3. Select the input type from the **Mode** list.

Setting the Measurement Range

4. Select the measurement range from the **Range** list.

Setting the Measurement Span

Determines the actual measurement range from the measurable range.

5. Enter the lower and upper limit of Span in the **Lower** or **Upper** boxes under **Span**.

Remote RJC (RRJC) Reference Channel Setting

This is required when RRJC is selected for the input type.

6. Enter the remote RJC reference channel number in the **Ref. Ch.** box.

7. Click the **Apply** button. The setting changes take effect.

Computation Settings

Specify computation settings to perform linear scaling or differential computation between channels.

1. From the top screen, click **System Setting** > **AI/DI Channel Setting**.
2. In the **Calc** list, select Scale for linear scaling or Delta for differential computation between channels.

- **Linear Scaling Settings**

Set this item when linearly scaling the measured values.

3. Enter the lower or upper limit of scale in the **Lower** or **Upper** box under **Scale**.
4. Select the decimal place from the **D.P.** list under **Scale**.
5. Enter the scale conversion value in the **Unit** box.

- **Settings of Differential Computation between Channels**

6. Enter the reference channel number in the **Reference** box.

7. Click the **Apply** button. The setting changes take effect.

Global Channel Settings

If the setting items of channels are the same, the settings of the first channel can be applied collectively to the specified range. The setting range of channels is 001 to 060. Be sure to meet the following conditions for the specified range.

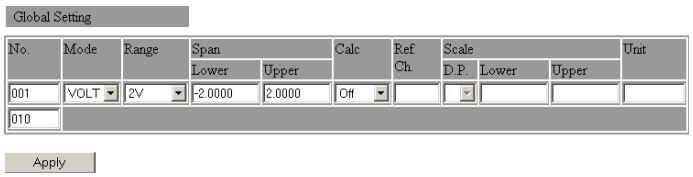
- The first channel number is a channel number of an input module.
- The last channel number is greater than the first channel number.
- At least one of the channel numbers from an input module is included.
- The channels between the first and the last channel numbers are input modules that have been recognized by the system.

If the modules below are connected, you can set 001 to 016 but not 001-028, because they contain output modules. However, if the input range is set to TC in 001-016, setting is not possible, because Four-Wire RTD Resistance Input Module channels cannot be set.

001-004 4-CH, High-Speed Universal Input Module
011-016 6-CH, Medium-Speed Four-Wire RTD Resistance Input Module
021-028 8-CH, Medium-Speed PWM Output Module

Procedure

1. Enter the first and last channel numbers of the modules you want to set collectively. (The figure below is an example in which channels 001 to 004 are set collectively.)



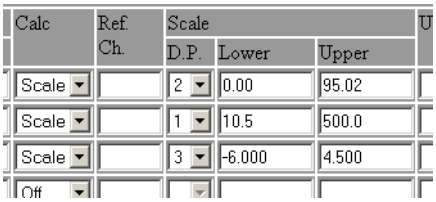
2. The first number is set to the default value. Change the setting.
3. Click the **Apply** button. The settings are applied to the specified range of channels.

Scale Input Methods

After selecting the number of digits after the decimal point for the upper or lower limit value from the list, enter
the number you wish to set in the input box. If the number of digits after the decimal place set in the input box is
larger than the specified number of digits, it will be rounded. (For example, if the decimal place is set to 2 and
you enter a value of 95.006, it will be rounded to 95.00.)

Desired Scale	Decimal Point Position	Number Input
0.00 to 100.00	2	Lower limit: 0 Upper limit: 10000
10.0 to 500.0	1	Lower limit: 100 Upper limit: 5000
–6.000 to 4.500	3	Lower limit: –6000 Upper limit: 4500

Example of a filled in screen.



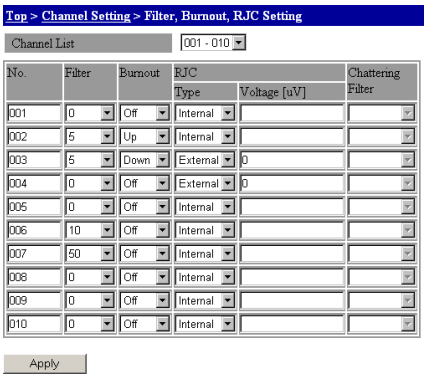
Filter, Thermocouple, and Chattering Filter Settings

You can set filters, burnout, reference junction compensation, and chattering filters for measurement channels.

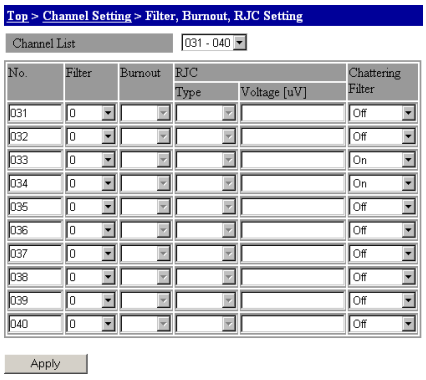
- Burnout and reference junction compensation are valid when the input type is set to thermocouple (TC).
  Depending on the input module, settings can be entered even when the input type is not thermocouple (TC), but this has no effect on measurement because the burnout and reference junction compensation do not function.
- The chattering filter can be set on channels included on the 10-CH Pulse Input Module.
- A filter coefficient cannot be set with the 10-CH, High-Speed Digital Input Module.

From the top screen, click **Channel Setting** > **Filter, Burnout, RJC Setting** under the Top item.

Example of thermocouple input



Example of pulse input



Setting the Filter Coefficient

1. Select a coefficient in the **Filter** list.
2. Click the **Apply** button. The setting changes take effect.

▶ For information on filter coefficients, see “First-Order Lag Filter” in section 2.9.

Setting the Burnout

1. Select the direction in which the measured value is set off the range when a burnout detection occurs from the **Burnout** list.
2. Click the **Apply** button. The setting changes take effect.

▶ For a description of the burnout detection behavior, see “Burnout” in section 1.3.

Reference Junction Compensation

1. Select the type of reference junction compensation in the **Type** box under **RJC**.
2. Enter a reference junction compensation voltage in the **Voltage[uV]** box. Set when reference junction compensation is set to External.
3. Click the **Apply** button. The setting changes take effect.

▶ For the setting range of the RJC, see “RJC” in section 5.2.

Chattering Filter Settings

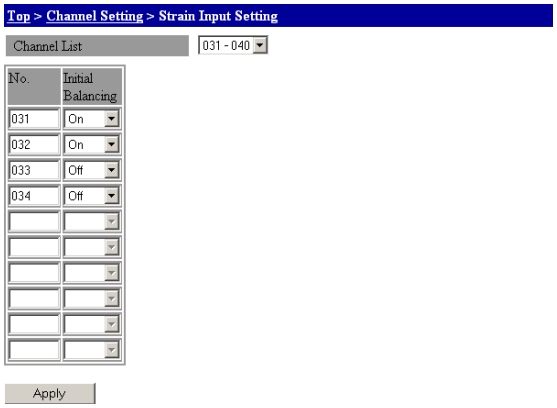
1. In the **Chattering Filter** list, turn ON the channels on which to apply the chattering filter.
2. Click the **Apply** button. This enables the settings changes.

▶ For information on the chattering filter, see “Filter” in section 1.9.

Setting Up and Executing Strain Input Initial Balancing

If the measurement channel is strain input, you can enter settings for executing initial balancing. This setting is allowed even if the measurement channel is something other than strain input, but has no effect in that case.

1. From the top screen, click **Channel Settings** > **Strain Input Setting**.



2. Select the channel group you wish to set from the **Channel List** list.
3. Turn **On** the channel on which you wish to perform initial balancing in the **Initial Balancing** list.
4. Click the **Apply** button to finalize.
5. Execute the **Initial Balancing** item under Other Settings in the system settings.

▶ For execution of initial balancing, see processing and operation under “Other Settings” in section 3.3.

▶ For a description of initial balancing, see “Initial Balancing (Unbalance Adjustment)” in section 1.8.

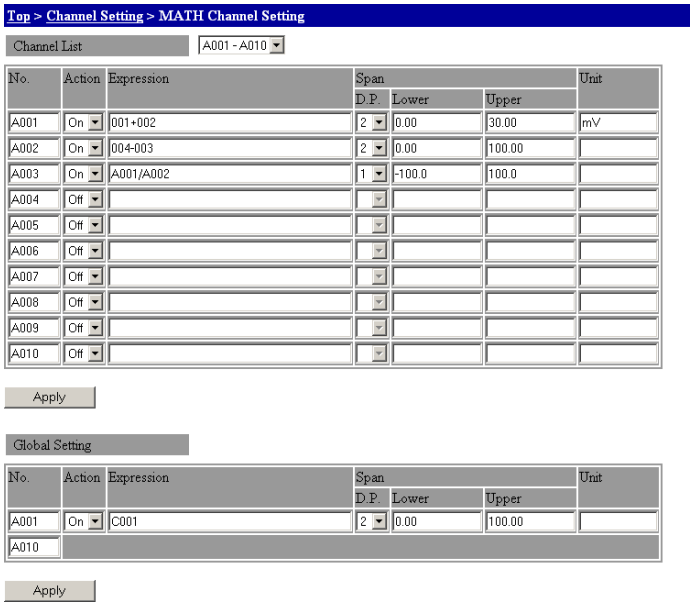
3.6 MATH Settings (MATH Channel Settingsand the /M1 Option)

You can set the MATH operation, expressions, MATH span, MATH coefficients, and MATH groups. This section also explains settings for program channels and communication input data.
Even if the MATH function (/M1 option) is not included, channels included on the 10-CH Pulse Input Module are only available for integration (TLOG.PSUM).

Setting Mode

Entering Expressions

1. From the top screen, click **Channel Setting** > **MATH Channel Setting**.



2. Select the channel group you wish to set from the **Channel List** list.

Setting the MATH Operation

3. Turn ON the MATH channels to be used in the **Action** list.

Entering Expressions

4. Enter an expression in the **Formula** box.

▶ For information about expressions, see section 1.15, “MATH Functions (/M1 Option).”

Setting the MATH Span

The method to enter the span value is the same as the method to enter the scale of a measurement channel.

5. Enter the lower or upper limit of the MATH span in the **Lower** or **Upper** box under **Span**.
6. Select the decimal place from the **D.P.** list under **Span**.
7. Enter the scale conversion value in the **Unit** box.

▶ For the procedure to enter the scale, see “Setting the Scale” in section 3.5.

8. Click the **Apply** button. The setting changes take effect.

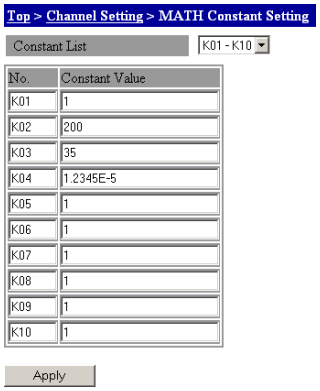
Global Expression Setting

If the expression to be assigned to the MATH channels is the same, you can collectively apply the settings of the first channels to the specified range of channels. The range for specifying the expression is A001 to A300. Set the last number greater than the first number.
The operating procedure is the same as the global setting the measurement channels.

▶ For a description of the global setting of channels, see “Global Channel Settings” in section 3.5.

Setting MATH Constants

1. From the top screen, click **Channel Setting** > **MATH Constant Setting**.

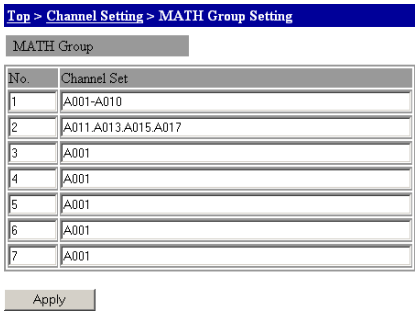


2. Select the constant group you wish to set from the **Constant List** list.
3. Enter a constant in the **Constant List** list.
4. Click the **Apply** button. The setting changes take effect.

▶ For a description of the MATH constants, see section 1.15, “MATH Function (/M1 Option)” and “MATH Function Specifications (/M1 Option)” in section 5.2.

Setting MATH Groups

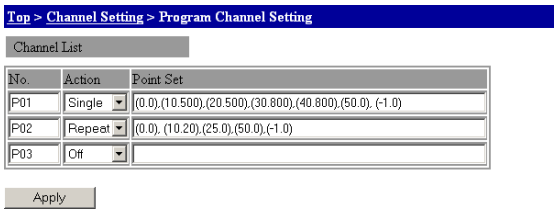
1. From the top screen, click **Channel Setting** > **MATH Group Settings**.



2. Enter the channel numbers to be grouped in the **Channel Set** box.
   Specify channel numbers by delimiting them with dots as in A001.A003.A006, or specify a range as in A004-A008.
3. Click the **Apply** button. The setting changes take effect.

Program Channel Settings

1. From the top screen, click **Channel Setting** > **Program Channel Setting**.

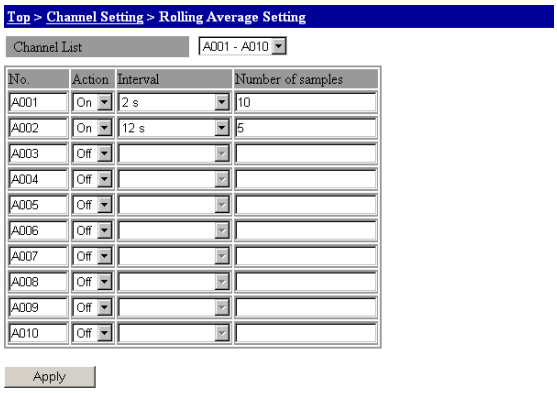


2. Select Single or Repeat in the **Action** box for the program channel number you wish to use.
3. Enter the elapsed time and setting value in the **Point Set** box.
4. Click the **Apply** button. The setting changes take effect.

▶ For a description of the syntax of broken line data, see “Reference Channels” in section 1.15.
▶ For a description of the broken line data, see appendix 7, “Using the Broken Line Data.”

Rolling Average Settings

1. From the top screen, click **Channel Settings** > **Rolling Average Setting** under the Top item.



2. Select the channel group you wish to set from the **Channel List** list.
3. In the **Action** list, select On to enable the long term moving average, or Off to disable it.
4. Select the sampling interval from the **Interval** list.
   Set a multiple of the MATH interval.
5. Enter the number of samples for the moving average in the **Number of samples** box.
6. Click the **Apply** button. This enables the settings changes.

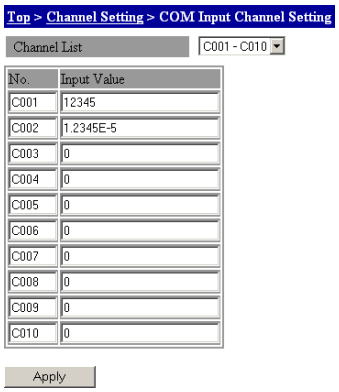
▶ For information on rolling averages see “Rolling Average” in section 1.15.

Setting Mode

Meas. Mode

Communication Input Data Settings

1. From the top screen, click **Channel Settings** > **COM Input Channel Setting**.



2. Select the channel group you wish to set from the **Channel List** list.
3. Enter the communication input data value in the **Input Value** box. For the range of available communication input values, see chapter 5, “Specifications.”
4. Click the **Apply** button. The setting changes take effect.

▶ For the range of communication input data values, see “MATH Function Specifications (/M1 Option)” in section 5.2.

3.7 Setting Alarms

You can set the alarm type, alarm value, hysteresis, and output operation. Only the alarm value can be changed while the recording is in progress.

▶ For a description of alarm types, see “Alarms” in section 1.3.

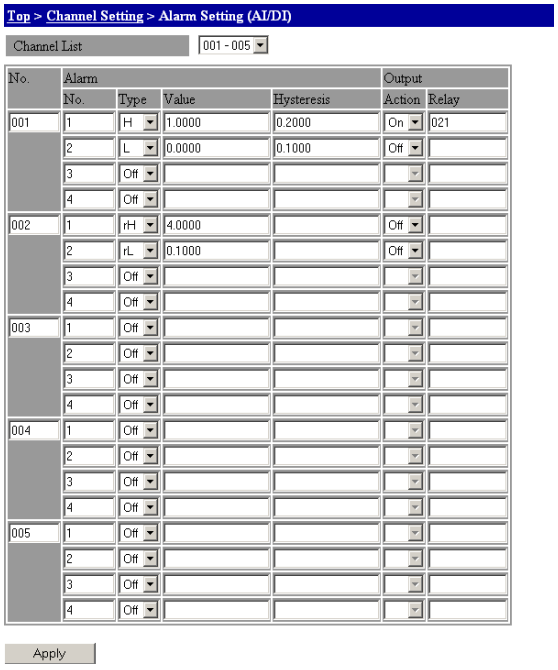
Setting Mode

Meas. Mode

Alarm Setting (AI/DI)

You can set measurement channel alarms.

1. From the top screen, click **Channel Setting** > **Alarm Setting (AI/DI)**.



2. Select the channel group you wish to set from the **Channel List** list.

Alarm Settings

3. Select the alarm type from the **Level** list.
   To use the high (rH) or low (rL) limit on rate-of-change alarm, you must set the rate-of-change interval.
   To use the delay high (tH) or low (tL) limit alarm, you must set the delay alarm.
4. Enter an alarm value in the **Value** box.
5. Enter a hysteresis value in the **Hysteresis** box.

▶ For the procedure to set the rate-of-change interval, see “Other Settings” in section 3.3.
▶ For the procedure to set the delay alarm, see “Delay Alarm Setting” in this section.

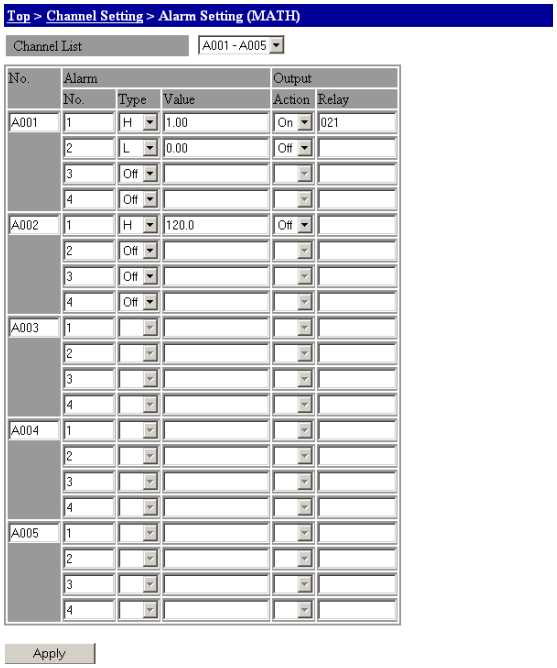
Output Settings

6. Turn output On/Off in the **Action** box.
7. Enter an alarm output channel in the **Relay** box.
8. Click the **Apply** button. The setting changes take effect.

Alarm Setting (MATH)

You can set MATH channel alarms.

1. From the top screen, click **Channel Setting** > **Alarm Setting (MATH)**.

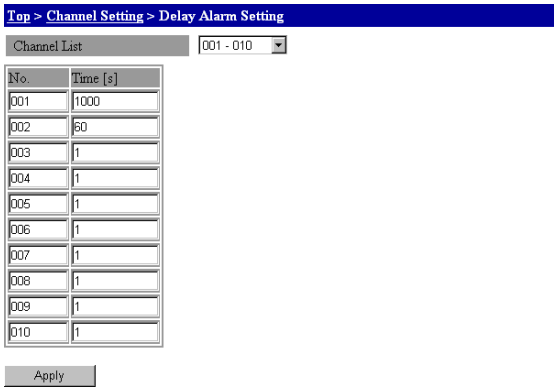


2. Below, enter settings in the same manner as with measurement alarms. With MATH alarms, there is no hysteresis setting.

Delay Alarm Setting

Set the delay time for using the delay alarm.

1. From the top screen, click **Channel Setting** > **Delay Alarm Setting**.



2. In the **Channel List** list, select the channels you want to set.
3. Enter the delay time in the range of 1 to 3600 (s) in the **Time** box of the channel number you want to set. Set the time so that it is an integer multiple of the measurement or MATH interval.
4. Click the **Apply** button. The setting changes take effect.

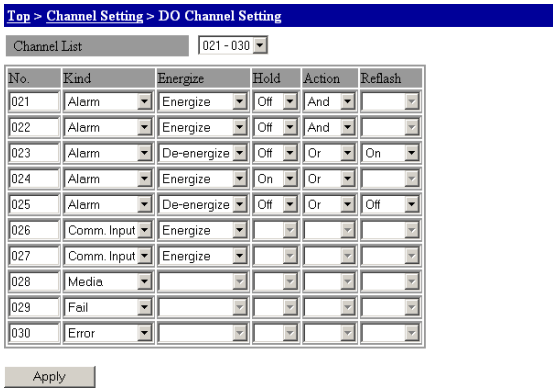
3.8 Digital Output Settings

Setting Mode

Relay Settings

You can set the operation type, excitation status, hold, operation, and reflash.

1. From the top screen, click **Channel Setting** > **DO Channel Setting**.



2. Select the channel group you wish to set from the Channel List list.

Relay Output Factor Settings

3. Select Relay output factor from the **Type** box.
   If you select Alarm, you must set Energize/De-energize, hold, operation, and re-alarm. If you select Comm.Input (Manual DO), you must set Energize/De-energize.

Energize Setting

4. Select Energize or De-energize in the **Energize** list.

   ▶ For a description of energize and de-energize, see “Relay Excitation State/Hold Operation” in section 1.14.

Hold, Action, and Reflash Settings

5. To set the relay status to Hold in the **Hold** list, select On.
6. Select a relay operation condition in the **Action** list.
7. Select Off in the **Reflash** list to perform the reflash function.

   ▶ For a description of the reflash alarm, see “Reflash Function” in section 1.14.

8. Click the **Apply** button. The setting changes take effect.

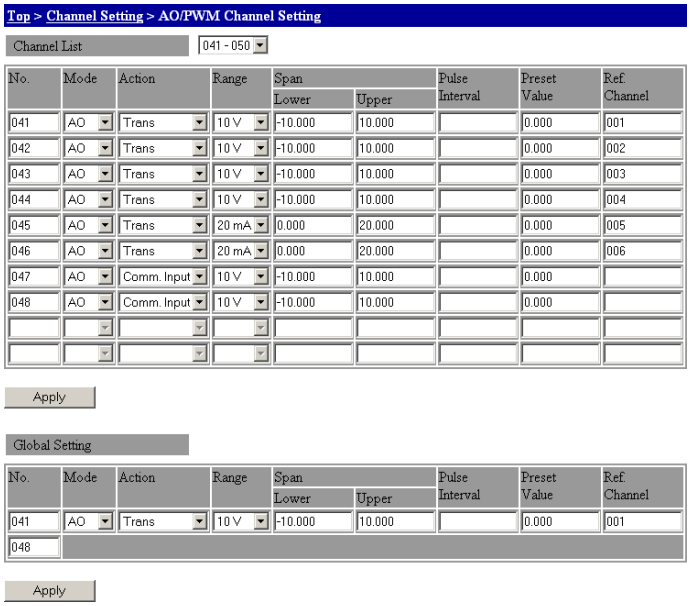
3.9 Analog/PWM Output Settings

Setting Mode

Output Range Settings (Analog Output)

You can set the output type, action, range, span, preset value, and reference channel.

1. From the top screen, click **Channel Setting** > **AO/PWM Channel Setting**.



2. Select the channel group you wish to set from the **Channel List** list.

Output Types

3. In the **Mode** box, select AO to output or SKIP to not output.

Output Action Setting

4. Select Trans (transmission output) or Comm.Input (arbitrary output) in the **Action** box.

Output Range Settings

5. Select 10 V (voltage output) or 20 mA (current output) in the **Range** box.

Span Setting

Select the actual output range from the allowed output range.

6. Enter the lower limit of span in the **Lower** box under **Span**. Also, enter the upper limit value in the **Upper** box.

Preset Value

7. In the **Preset Value** box, enter a preset value for the output operation when turning on the power or when an error occurs. When a preset value is selected in the output operation settings, the specified value is output.

▶ For the procedure to set the output operation, see “Output Operation Settings” in this section.
▶ For a description of preset values, see “Output upon Startup and Error Occurrence” in section 1.13.

Reference Channel Settings

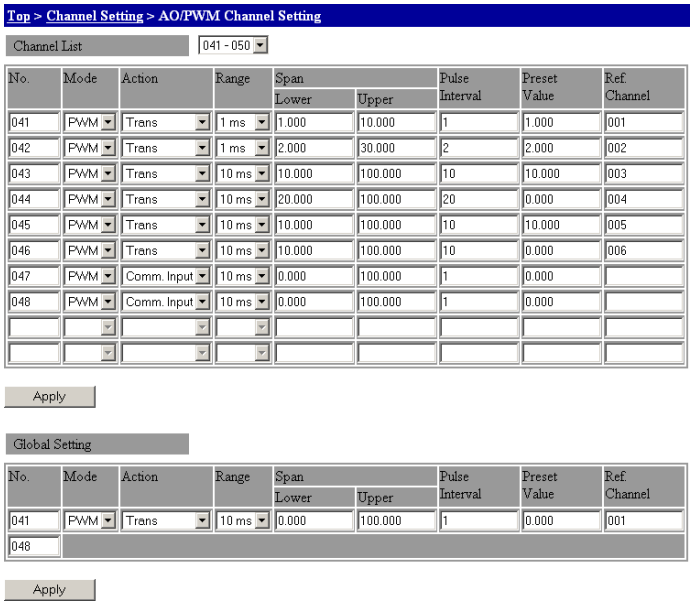
This is set if TRANS is selected for the output action.

8. Enter an input channel or MATH channel for transmission output in the **Reference Channel** box.
9. Click the **Apply** button. The setting changes take effect.

Output Range Settings (PWM Output)

You can set the output type, action, range, span, pulse interval, preset value, and reference channel.

1. From the top screen, click **Channel Setting** > **AO/PWM Channel Setting**.



2. In the **Channel List** list, select the channels you want to set.

Output Type

In the **Mode** box, select PWM to output or SKIP to not output.

Output Action Settings

Select Trans (transmission output) or Comm.Input (arbitrary output) in the **Action** box.

Setting the Pulse Resolution

5. Select the pulse resolution in the **Range** box.

Span Setting

Select the actual output range from the allowed output range.

6. Enter the lower limit of span in the **Lower** box under **Span**. Also, enter the upper limit value in the **Upper** box.

Pulse Interval

7. In the **Pulse Interval** box, enter a coefficient that determines the pulse interval.

▶ For a description of the pulse interval coefficient, see “Pulse Interval” in section 1.12.

Preset Value

8. In the **Preset Value** box, enter a preset value for the output operation when turning on the power or when an error occurs. When a preset value is selected in the output operation settings, the specified value is output.

▶ For the procedure to set the output operation, see “Output Operation Settings” in this section.
▶ For a description of preset values, see “Output upon Startup and Error Occurrence” in section 1.13.

Reference Channel Settings

This is set if Trans is selected for the output method.

9. Enter an input channel or MATH channel for transmission output in the **Ref. Channel** box.

10. Click the **Apply** button. The setting changes take effect.

Global Channel Settings

If the setting items of channels are the same, the settings of the first channel can be applied collectively to the specified range. The setting range of channels is 001 to 060. The specified range of channels must be analog output modules only or PWM output modules only.

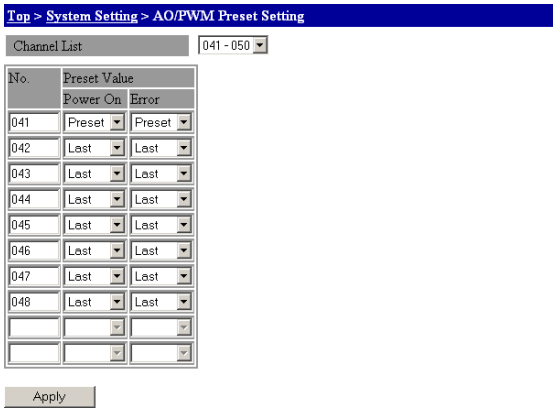
▶ For a description of the global setting of channels, see “Global Channel Settings” in section 3.5.

Output Operation Settings

You can set the operation upon power ON and when an error occurs.

▶ For a description of the behavior at power-on and error occurrence, see “Output upon Startup and Error Occurrence” in section 1.13.

1. From the top screen, click **System Setting** > **AO/PWM Preset Setting**.



2. Select the channel group you wish to set from the **Channel List** list.

Setting the Power ON Operation

3. Select Last or Preset in the **Power ON** list under **Preset Value**.
   When Preset is selected, the specified value is output in the output range setting screen.

Setting the Operation upon Error Occurrence

4. Select Last or Preset in the **Error** list under **Preset Value**.
   When Preset is selected, the specified value is output in the output range setting screen.

5. Click the **Apply** button. The setting changes take effect.

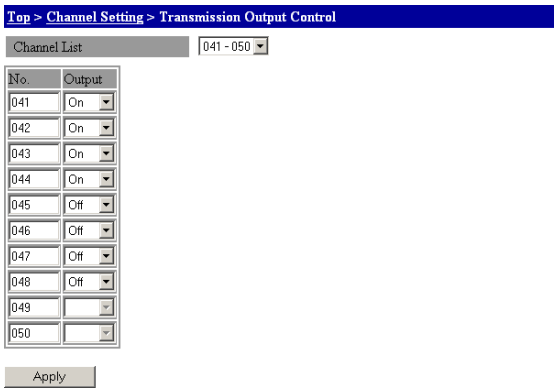
Meas. Mode

Transmission Output Control

Turning Transmission Output On and Off for Analog Output/PWM Output

This is set if Trans is selected for the output action in the output range settings.

1. From the top screen, click **Channel Setting** > **Transmission Output Control**.



2. Select the channel group you wish to set from the **Channel List** list.
3. Select On or Off in the **Output** list of the channel number you wish to set.
4. Click the **Apply** button. Starts transmission output on channels set to On.

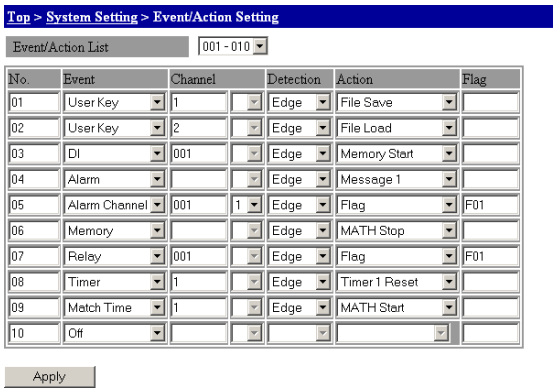
3.10 Event/Action Settings

By linking the Event function and Action function, you can control the operations of the MW100.

▶ For setting examples of event action, see appendix 3, “Using the Event Action.”

Setting Mode

1. From the top screen, click **System Setting** > **Event/Action Setting**.



2. Select the number group of the Event / Action you wish to set from the list.

Selecting the Event Type

3. Select the event (event function) type in the **Event** list of the number you wish to set. Depending on this setting, the **Channel** box may become enabled, meaning that the settings in steps 2 and 3 are required.
4. In the **Channel** box, enter the number (channel number, relay number, etc.) for the event selected in the event type selection in step 1.
5. If the event type is Alarm Channel, select the alarm level number for the event in the **Channel** box.

Selecting the Event Detection Method

6. Select the event detection method from the **Detection** list. The action (action function) that can be selected varies depending on the item selected for the detection method.

▶ For the event types, see “Event Action Function” in section 1.3.

Selecting the Action Type

7. Select the action (Action function) type from the **Action** list. If Flag is selected for the action, the **Flag** box is enabled, meaning that the setting in step 8 is required.
8. Enter a flag number in the **Flag** box.

▶ For the action types, see “Event Action Function” in section 1.3.

9. Click the **Apply** button. The setting changes take effect.

3.11 Timer and Match Time Settings

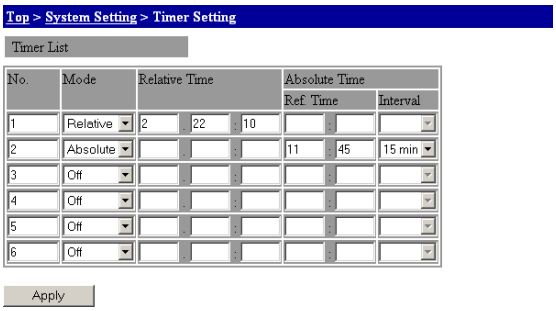
The time up action function can be controlled through the specified time interval and time.

▶ For a description of the timer and match time, see “Timer” or “Match Time” in section 1.3.

Setting Mode

Timer Settings

From the top screen, click **System Setting** > **Timer Setting**.



Relative Time Timer

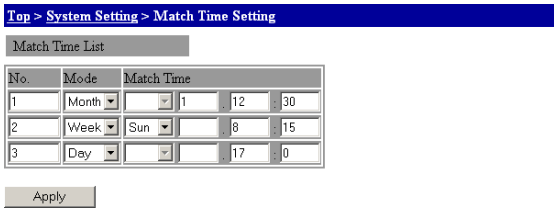
1. Select Relative in the **Mode** list.
2. Enter the desired time interval in the **Relative Time** boxes. The **day**, **hour**, and **minute** are arranged in order from the left.
3. Click the **Apply** button. The setting changes take effect.

Absolute Time Timer

1. Select Absolute in the **Mode** list.
2. Enter the desired reference time in the **Ref. Time** boxes under Absolute Time. The **hour** and **minute** are in order from the left in the box.
3. Select the time interval you wish to set in the **Interval** list under Absolute Time. **M** and **H** indicate the minute and hour respectively.
4. Click the **Apply** button. The setting changes take effect.

Setting the Match Time

From the top screen, click **System Setting** > **Match Time Setting**.



Monthly Timeup

1. Select Month in the **Mode** list.
2. Enter the desired date and time in the **Time** list. The **day**, **hour**, and **minute** are arranged in order from the left.
3. Click the **Apply** button. The setting changes take effect.

Weekly Timeup

1. Select Week in the **Mode** list.
2. Select a day of the week from the **Time** list, and enter the desired time in the **Time** box. Enter the **hour** and **minute** in the second and third box from the left, respectively.
3. Click the **Apply** button. The setting changes take effect.

Weekly Timeup

1. Select Day in the **Mode** list.
2. Enter the desired time in the **Time** box. Enter the **hour** and **minute** in the second and third box from the left, respectively.
3. Click the **Apply** button. The setting changes take effect.

3.12 Report Settings (/M3 Option)

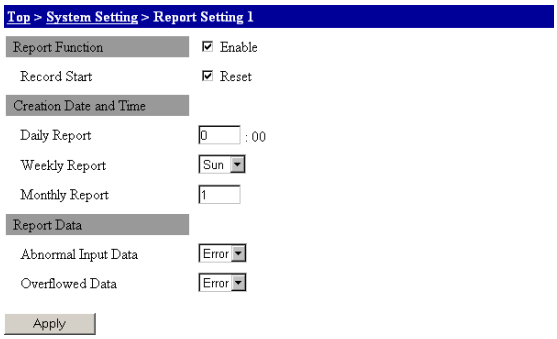
You can enter settings for creating report files.

▶ For details on the report function, see section 1.16, “Report Function (/M3 Option).”

Setting Mode

Report Operation Settings 1

1. From the top screen, click **System Setting** > **Report Setting 1** under the Top item.



Enabling and Disabling the Report Function

2. Select the **Report Function** check box. The report function is enabled, and you can enter settings for the report function.

Resetting When Recording Starts

3. Select the **Record Start** check box. When recording starts, the Maximum, Minimum, Average, and Integral values are reset.

Report File Creation Time Setting

4. Enter the time to update the daily file in the **Daily Report** box.
   Time is specified in 24-hour format. The creation time for weekly and monthly report files is the same as the creation time for the daily report files.
5. Select the day of the week to create the weekly report file in the **Weekly Report** list.
6. Enter the date on which to create the monthly report file in the **Monthly Report** box.
   The date is specified in the range from 1 to 28 days.

Abnormal Input Processing Setting

7. Select Error or Skip in the **Abnormal Input Data** list for Report Data.

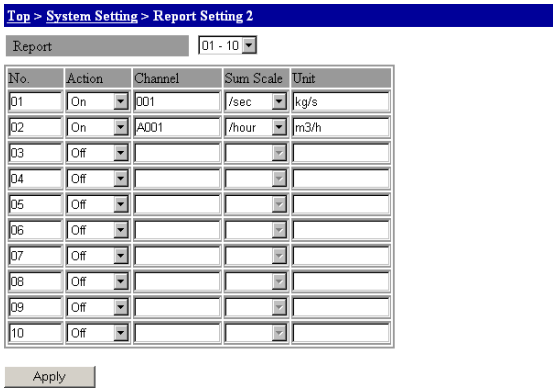
Overflow Processing Setting

8. Select Error, Skip, or Limit in the **Overflow Data** list for Report Data.
9. Click the **Apply** button. This enables the settings changes.

▶ For processing upon abnormal input or overflows, see “Processing Reports with Abnormal Input Values or Overflow Values” in section 1.16.

Report Operation Settings 2

1. From the top screen, click **System Setting** > **Report Setting** 2 under the Top item.



2. Select the number of the group for which you wish to set the **Report** from the list.

Setting Channels for Creating Reports

3. Select ON in the **Action** list of the number you wish to set.
4. Enter the channel numbers used to create reports in the **Channel** boxes.

Setting the Sum Scale and Display Units

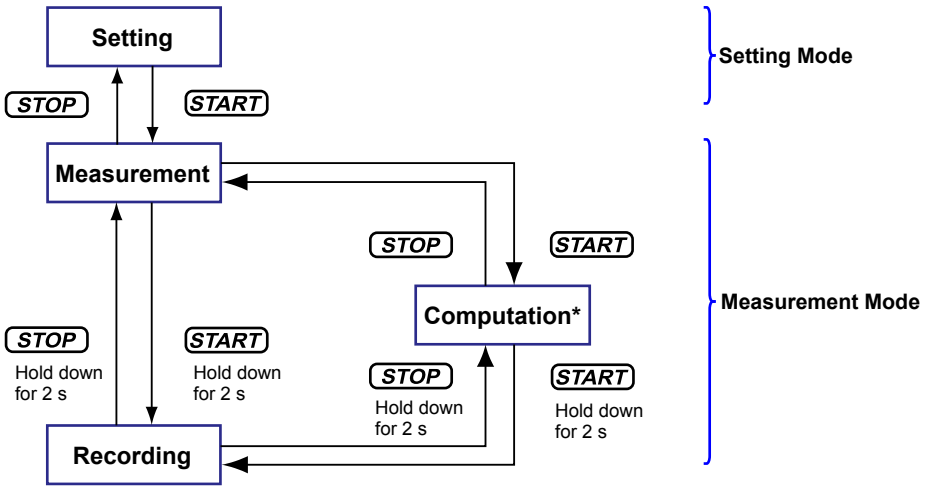
5. Select the unit time from the **Sum Scale** list.

▶ For the unit time, see “Sum Scale of the Integral Value” in section 1.16.

6. Enter the units for displaying the integral value in the **Unit** box.
7. Click the **Apply** button. This enables the settings changes.

3.13 Starting and Stopping Measurement, Computation, and Recording

This is an explanation of the procedure for starting and stopping measurement, computation, and recording. These operations can be performed by pressing keys on the MW100 main module, or from a browser.
The state transition diagram of the MW100 is given below.



* On models with the /M1 option
or when the 10-CH Pulse Input Module is installed

Starting and Stopping Measurement

Using Main Module Keys

- **Starting Measurement**
  While measurement is stopped, briefly press the **START** key. Measurement starts and the unit switches to Measurement mode.
- **Stopping Measurement**
  While recording and computation are stopped, briefly press the **STOP** key. Measurement stops and the unit switches to Setting mode.

Using a Browser

- **Starting Measurement**
  In the **Status** table in the top screen, select **Start** from the **Operation** list under the Measurement item. Measurement starts and the unit switches to Measurement mode.
- **Stopping Measurement**
  In the **Status** table in the top screen, select **Stop** from the **Operation** list under the Measurement item. Measurement stops and the unit switches to Setting mode.

Starting and Stopping Computation

This operation is available when the MATH function (/M1 option) is included, or when the 10-CH Pulse Input Module is installed. You can use the function when MATH channels are set.

Using Main Module Keys

- **Computation Start**
  While recording is stopped, and during measurement, briefly press the **START** key. Computation starts.
- **Computation Stop**
  During computation, and while recording is stopped, briefly press the **STOP** key. Computation stops.

Using a Browser (in the Setting Screen)

The main module can be switched to Measurement mode. This is done while recording is stopped.

- **Starting Computation**
  In the **Status** table in the top screen, select Start from the **Operation** list of the MATH item. Computation starts.
- **Stopping Computation**
  In the **Status** table in the top screen, select Stop from the **Operation** list of the MATH item. Computation stops.

You can also start or stop the computation from the Monitor screen.

▶ For the procedure to start or stop the computation in the Monitor screen, see section 3.16, “Measured Data Monitor Display/Settings.”

Starting and Stopping Recording

Using Main Module Keys

- **Starting Recording**
  During measurement, hold down the **START** key for two or more seconds. Recording starts.
- **Stopping Recording**
  During recording, hold down the **STOP** key for two or more seconds. Recording stops.

Using a Browser (in the Setting Screen)

The main module can be switched to Measurement mode.

- **Starting Recording**
  In the **Status** table in the top screen, select Start from the **Operation** list of the Recording item. Recording starts.
- **Stopping Recording**
  In the **Status** table in the top screen, select Stop from the **Operation** list of the Recording item. Recording stops.

You can also start or stop the recording from the Monitor screen.

▶ For the procedure to start or stop the recording in the Monitor screen, see section 3.16, “Measured Data Monitor Display/Settings.”

Checking the Operating Status of the MW100 Using the Status Indicators

You can confirm the operational status of the MW100 by viewing the status indicators on the front panel.

MEASURE

Behavior	Color	Indication
Off	--	Setting mode
On	Green	Measurement mode

RECORD

Behavior	Color	Indication
Turning Off	--	Recording stopped
On	Green	Recording
Blinking	Green	Transitioning from recording to recording stop

ALARM

Behavior	Color	Indication
Turning Off	--	No alarm
On	Red	Alarm active or alarm hold

MATH

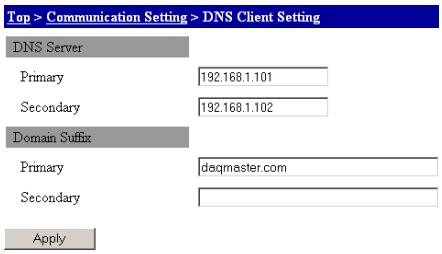
Behavior	Color	Indication
Turning Off	--	Computation stopped
On	Green	Computing
Blinking	Green	Transitioning from computing to computing stopped

3.14 Network Utility Settings

Setting Mode

DNS Client Settings

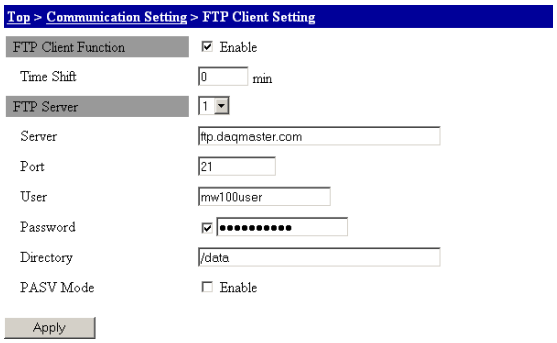
1. From the top screen, click **Communication Setting** > **DNS Client Setting**.



2. In the **Primary** and **Secondary** boxes under DNS Server, enter the IP addresses of the respective DNS servers.
3. In the **Primary** and **Secondary** boxes under Domain Suffix, enter the domain name.
4. Click the **Apply** button. The setting changes take effect.

FTP Client Settings

1. From the top screen, click **Communication Setting** > **FTP Client Setting**.



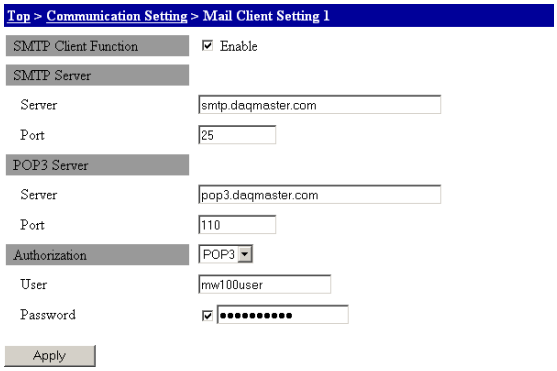
2. Select the **Client function** check box to enable the function.
3. Enter the delay (in minutes) from file creation to file transmission start in the **Time Shift** box.
   Set the delay time shorter than the recording data length.
4. Select the number of the destination to be set in the **Destination** list.
   You can set up to two destinations. Number 1 is primary and number 2 is secondary.
5. Enter the FTP server name in the **Server Name** box.
6. Enter the FTP server port number in the **Port Number** box.
7. Enter the user name of the FTP server in the **User Name** box.
8. Select the **Password** check box, and then enter the user password in the **Password** box.
   If you do not select the check box, you cannot enter the password.
9. Enter the folder to be accessed when opening a connection in the **Directory** box.
10. You can select the **PASV Mode** check box to use FTP passive (PASV) mode.
11. Click the **Apply** button. The setting changes take effect.

Mail Client Settings

These settings configure the e-mail function. The setting screen contains mail client setting 1 and mail client setting 2.

Mail Client Setting 1

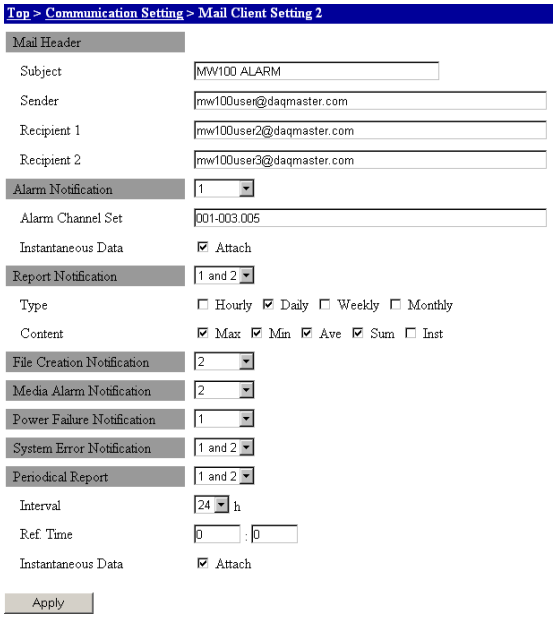
1. From the top screen, click **Communication Setting** > **Mail Client Setting 1**.



2. Select the **SMTP Client Function** check box. This enables e-mail transmission.
3. Enter the name of the SMTP server in the **Server Name** box under **SMTP Server**.
4. Enter the SMTP server port number in the **Port** box under **SMTP Server**.
5. Enter the name of the POP3 server in the **Server** box under **POP3 Server**.
6. Enter the POP3 server port number in the **Port** box under **POP3 Server**.
7. To require authorization (POP before SMTP) when sending e-mail, select **POP3** in the **User Authorization** list. This enables entry of the **User Authorization** items.
8. Enter the name for logging into the POP3 server in the **User** box under **User Authorization**.
9. Select the **Password** check box under **Authentication**, and then enter the password for accessing the POP3 server in the **Password** box.
   If you do not select the check box, you cannot enter the password.
10. Click the **Apply** button. The setting changes take effect.

Mail Client Setting 2

1. From the top screen, click **Communication Setting** > **Mail Client Setting 2**.



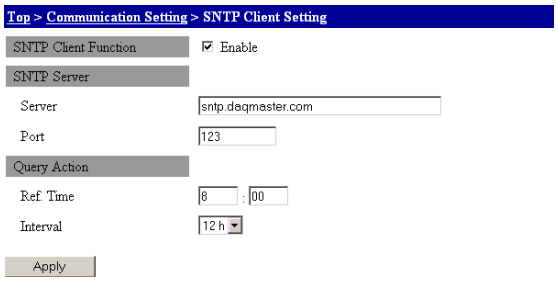
2. Enter the subject of the e-mail in the **Subject** box under **Mail Header**. Up to thirty-two alphanumeric characters can be input.
3. Enter the sender mail address in the **Sender** box.
4. Enter the recipient address in the **Recipient 1** box. Enter the address for **Recipient 2** in the same manner. You can specify multiple addresses for each recipient. Separate each address with a space. You do not have to set both recipients. Use up to 150 alphanumeric characters.
5. To set up alarm notification, select an address for alarm notification in the **Alarm Notification** list. 1 and 2 sends notification to both recipient 1 and 2.
6. Enter an alarm notification channel in the **Alarm Channel Set** box under **Alarm Notification**. To add instantaneous values, select the Instantaneous **Data** check box. Specify channel numbers by delimiting them with dots as in 001.003.005, or specify a range as in 004-008.
7. To attach instantaneous values, select the **Instantaneous Data** check box.
8. For notification of reports, select a destination address for notification in the **Report Notification** list.
   1 and 2 sends notification to both recipient 1 and 2.
9. Select the check boxes corresponding to the **Type** of reports for which to send notification under Report Notification.
10. Select the **Content** check box corresponding to the type of data with which to send notification under Report Notification.
11. To set up notification of data file creation, select a notification address in the **File Creation Notification** list.
12. In the same manner as in step 7, set **Media Alarm Notification** , **Power Failure Notification** , and **System Error Notification**.
13. To set up Periodic Report notification, select an address for notification in the **Periodic Report** list.
14. Select transmission interval time from the **Interval** box under **Periodic Report**.

15. Enter a reference time for the send interval in the **Time** box under **Periodic Report**.
16. To attach instantaneous values to **Periodic Report**, select the **Instantaneous Data** check box.
17. Click the **Apply** button. The setting changes take effect.

Time Synchronization Client Settings

Enter these settings to automatically synchronize the time.

1. From the top screen, click **Communication Setting** > **SNTP Client Setting**.

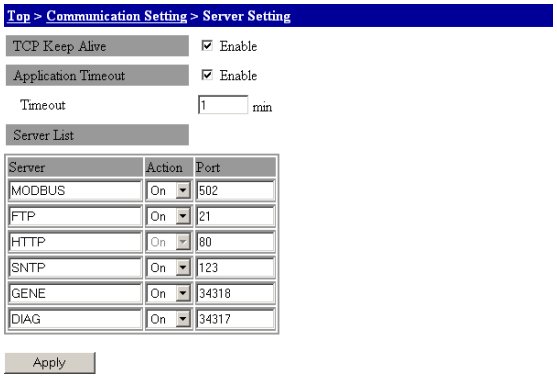


2. Select the **SNTP Client Function** check box to enable the function.
3. Enter the name of the NTP/SNTP server in the **Server** box under **SNTP Server**.
4. Enter the NTP/SNTP server port number in the **Port** box.
5. Enter a reference time to be queried **Ref.Time** box under **Query Action**. Next, select a query time interval in the **Interval** list.
6. Click the **Apply** button. The setting changes take effect.

Server Settings

These settings enable the various server functions.

1. From the top screen, click **Communication Setting** > **Server Setting**.



Keep Alive Function

2. Select the **TCP Keep Alive** check box to to enable the keepalive function.

▶ For a description of the keepalive function, see “Communication” in section 5.2.

Communication Timeout Function

2. Select the **Application Timeout** check box to enable the application timeout function when connecting to the MW100-specific communication (GENE) server.
3. Enter the timeout value for the connection to the GENE server in the **Timeout** box.

Server List Settings

4. To use a server, turn it **On** in the **Action** box of the corresponding server name. The HTTP server is always turned On.
5. Enter the port number used by the server in the **Port** box. Normally, you can use the default setting.

▶ For a description of each server, see “Communication” in section 5.2.

6. Click the **Apply** button. The setting changes take effect.

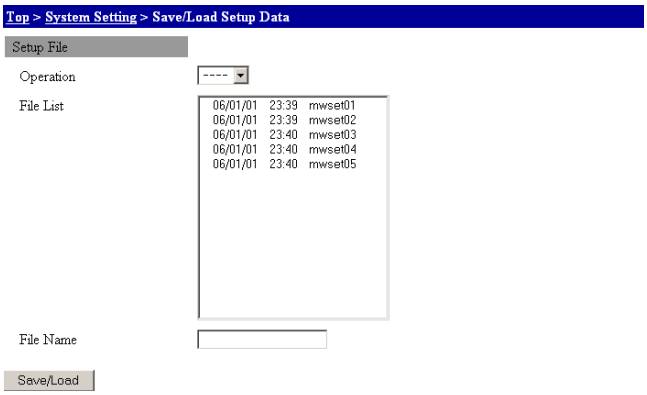
3.15 Saving and Loading Setup Data

You can save and load MW100 main unit settings. The setup file is stored in the CONFIG folder of the CF card.

▶ For the settings that are saved and loaded, see “Saving Data to the CF Card” in section 1.3.

Saving and Loading Setup Data

From the top screen, click **System Setting** > **Save/Load Setup Data**.



Saving Settings

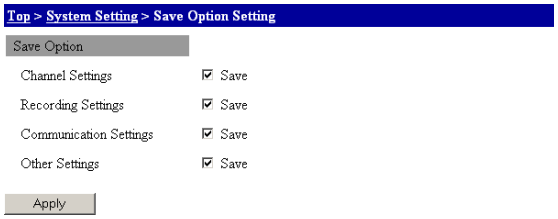
1. Select Save in the **Operation** list.
2. Enter a file name in the **File Name** box, then click the **Save/Load** button.The extension cannot be input (it is fixed at PNL). If you enter an existing file name, the existing file is overwritten.

Loading Settings

1. Select Load in the **Operation** list.
2. Enter a file name in the **File** box, then click the **Save/Load** button.

Setup Data Save Conditions

1. From the top screen, click **System Setting** > **Save Option Setting**.



2. Select the settings you wish to save by selecting the **Channel Settings**, **Recording Settings**, **Communication Settings**, and **Other Settings** check boxes.
3. Click the **Apply** button. The setting changes take effect.

3.16 Measured Data Monitor Display/Settings

You can monitor-display data measured on the MW100.
The available screen formats are Single Screen, Dual Screen, and Data View.
Single Screen and Dual Screen: You can select trend display, numerical display, meter display, bar graph display, or overview display.
Data View: You can select alarm summary, manual sample, or report display.

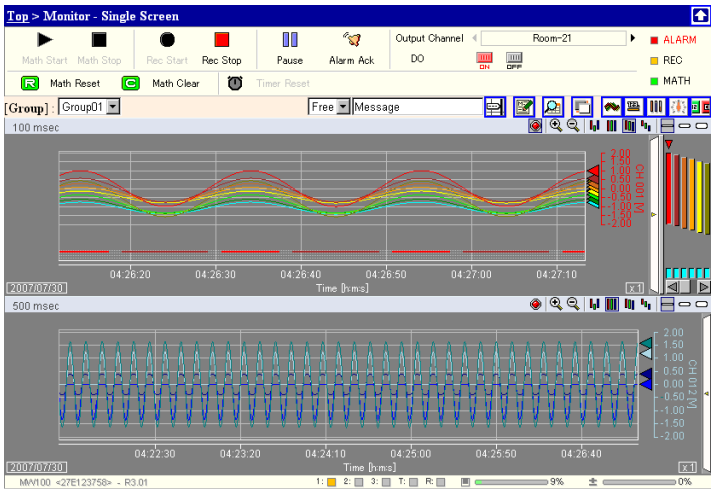
Meas. Mode

Monitor-Display of Measured Data

The measured data is displayed in single screen or dual screen. The next the display is shown, the display is shown in the previous condition (you must enable the browser cookies).

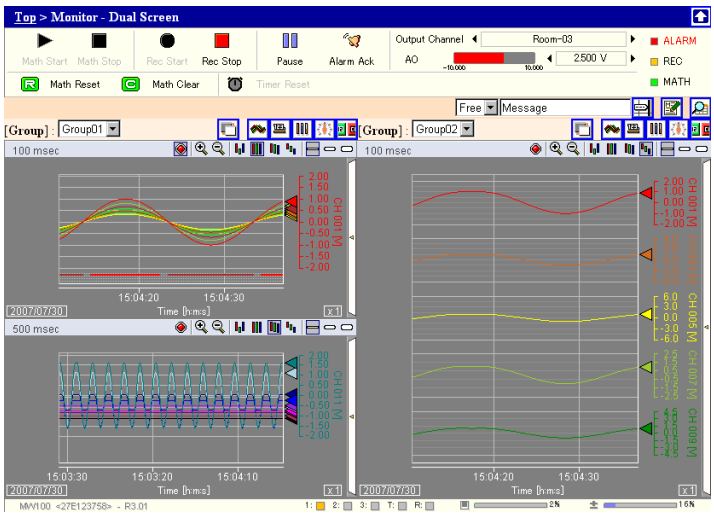
Single Screen

Use this when the monitor contains a single screen. You can display one group.
From the top screen, click **Single Screen**.



Dual Screen

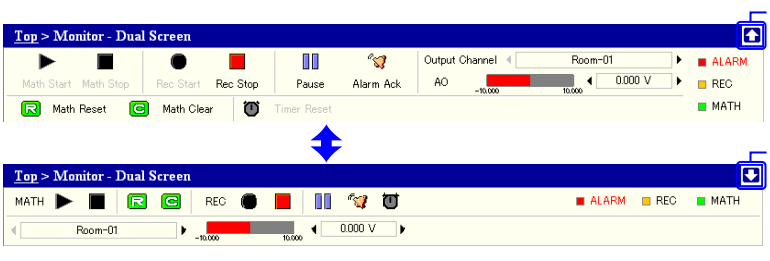
Use this when the monitor contains two screens. You can display two groups.
From the top screen, click **Dual Screen**.



Explanation of Display Items

This is an explanation of the icons and measured data display items used in the monitor screen.

Switching the Operation Icons



Switch to small operation icons
You can switch from large to small operation icons

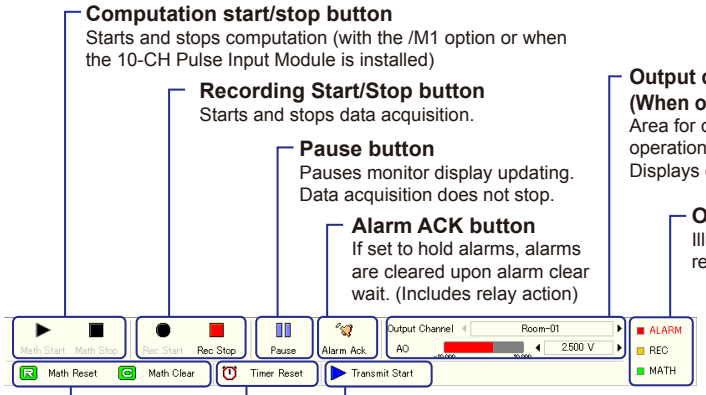
Switch to large operation icons
You can switch from small to large operation icons

Record Start/Stop, Computation Start/Stop

Used to start and stop data acquisition.

The icons of all functions are shown in the figure for the sake of explanation, but normally buttons are dimmed when disabled.

- **Operation Icons**



Computation start/stop button
Starts and stops computation (with the /M1 option or when the 10-CH Pulse Input Module is installed)

Recording Start/Stop button
Starts and stops data acquisition.

Pause button
Pauses monitor display updating. Data acquisition does not stop.

Alarm ACK button
If set to hold alarms, alarms are cleared upon alarm clear wait. (Includes relay action)

Output channel operation icons (When output modules installed)
Area for displaying manual DO and operation icons for arbitrary output. Displays one channel's worth.

Operational status
Illuminates during alarms, recording, and computation.

Timer reset button
Resets the timer.

Computation reset/clear button
Resets/clears computation.
(with the /M1 option or when the 10-CH Pulse Input Module is installed)

Transmission output start/stop button (When output modules installed)
Collectively starts or stops output on output channels set for transmission output. If both ON and OFF are mixed in the transmission output control settings, the transmission output stop display is invoked.

- **Output Channel Operation Icons**

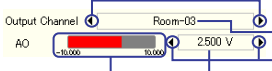
Manual DO channel:

Channel number switching
Click to switch the channel number

Channel number/tag name display

Relay ON/OFF button
Click to turn relays ON and OFF

Arbitrary output channel:



Channel number switching
Click to switch the channel number

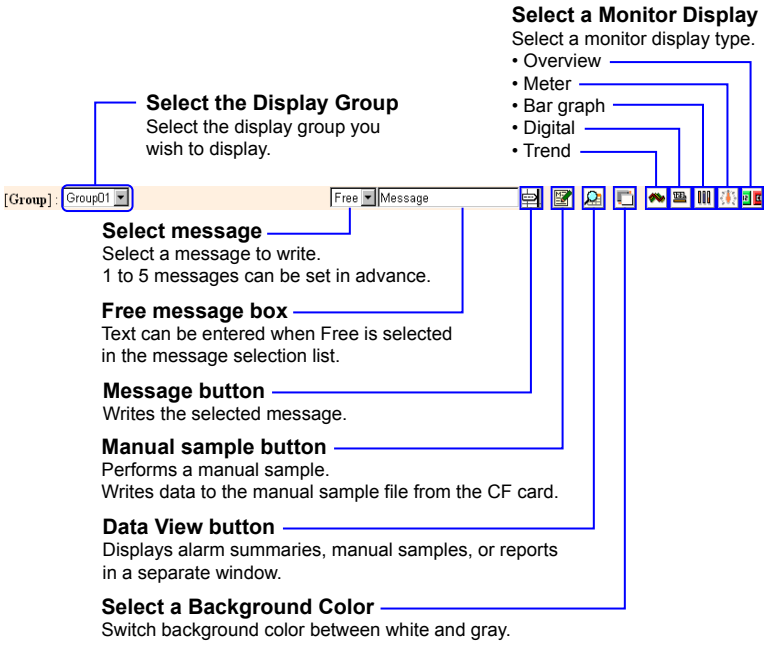
Channel number/tag name display

Changes outputvalue
Click to change the output value.

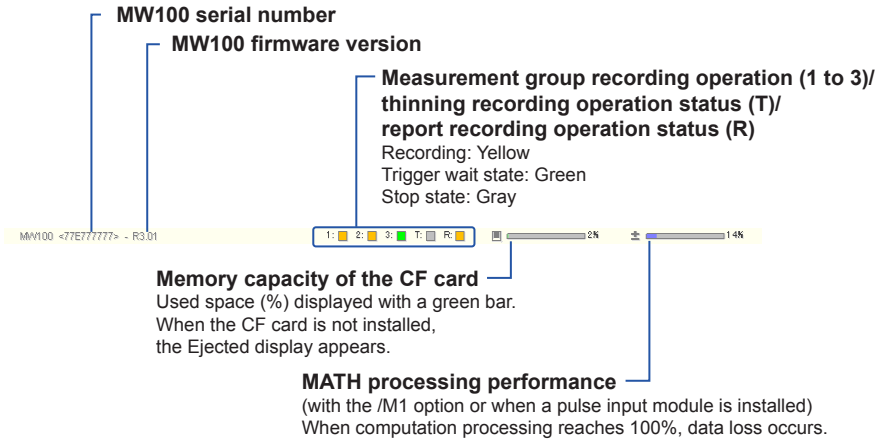
Output value display
Analog output: V or mA display
PWM Output: % display

Output value display bar
Displays output values in a bar graph. Also, you can click to change the output values.

Monitor Display Switching and Group Selection

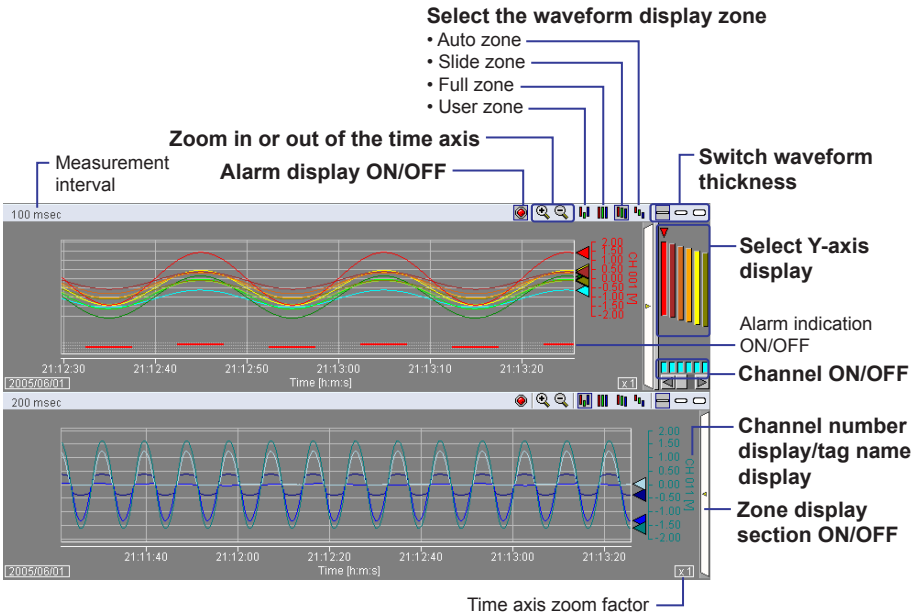


Contents of the Status Bar



Monitor Display Screen

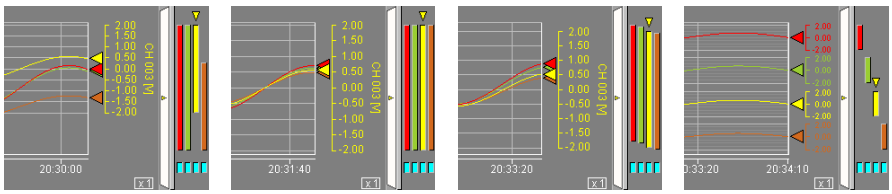
- **Trend Display**



Selecting the Display Zone of Waveforms

- User Zone
  Displays each waveform at the position of the Zone specified in the Display Scale. The Y-axis displays active channels.
- Full Zone
  Each waveform is displayed in the full zone of the waveform display area. The Y-axis displays active channels.
- Slide Zone
  Each waveform is displayed slightly staggered across the waveform display area. The Y-axis displays active channels.
- Auto Zone
  The waveform display area is divided up according to the number of displayed waveforms.

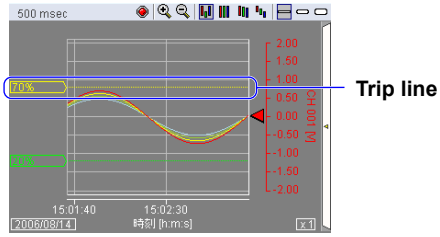
• User zone • Full zone • Slide zone • Auto zone



Trip line

You can display a trip line in the Trend display.

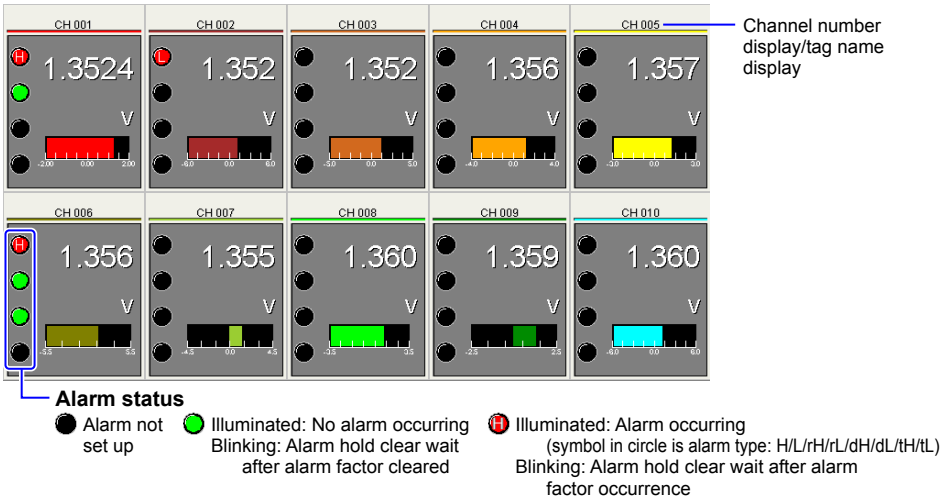
▶ For the procedure to set the trip line, see “Trip Line Setting” in “Display Settings” in this section.



- **Digital Display**

  Displays measured data as numerical values. When alarms are set, the alarm status is displayed to the left of the numerical value. You can set the graph display reference position to Normal or Center for the bar graph section.

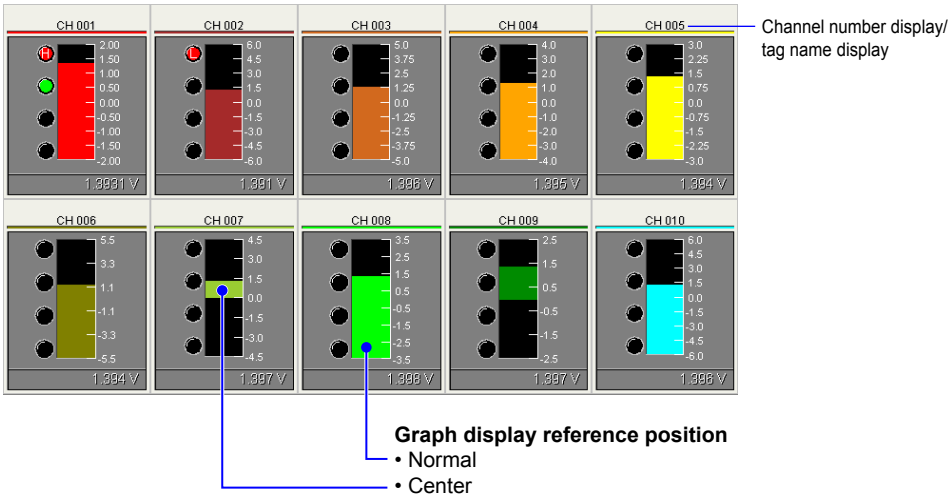
  ▶ For a description of the graph display reference position, see “Bar Graph Display” in “Monitor Display Screen” in this section.



- **Bar Graph**

  Displays measured values in a bar graph. When alarms are set, the alarm status is displayed to the left of the bar graph. For information on alarm statuses, see Digital Display in this section. You can set the graph display reference position to Normal or Center for the bar graph section.

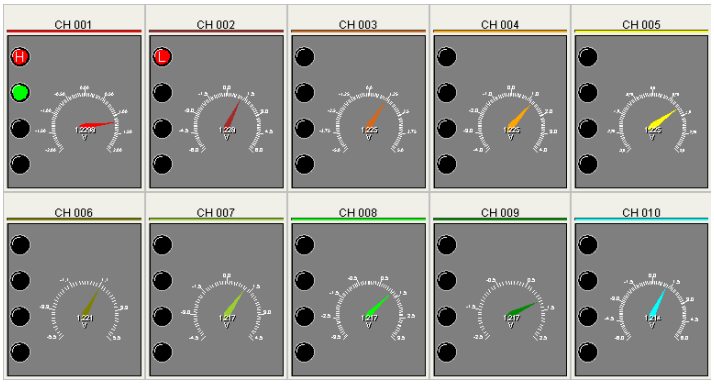
  ▶ For a description of the alarm status, see “Digital Display” in “Monitor Display Screen” in this section.



- **Meters**

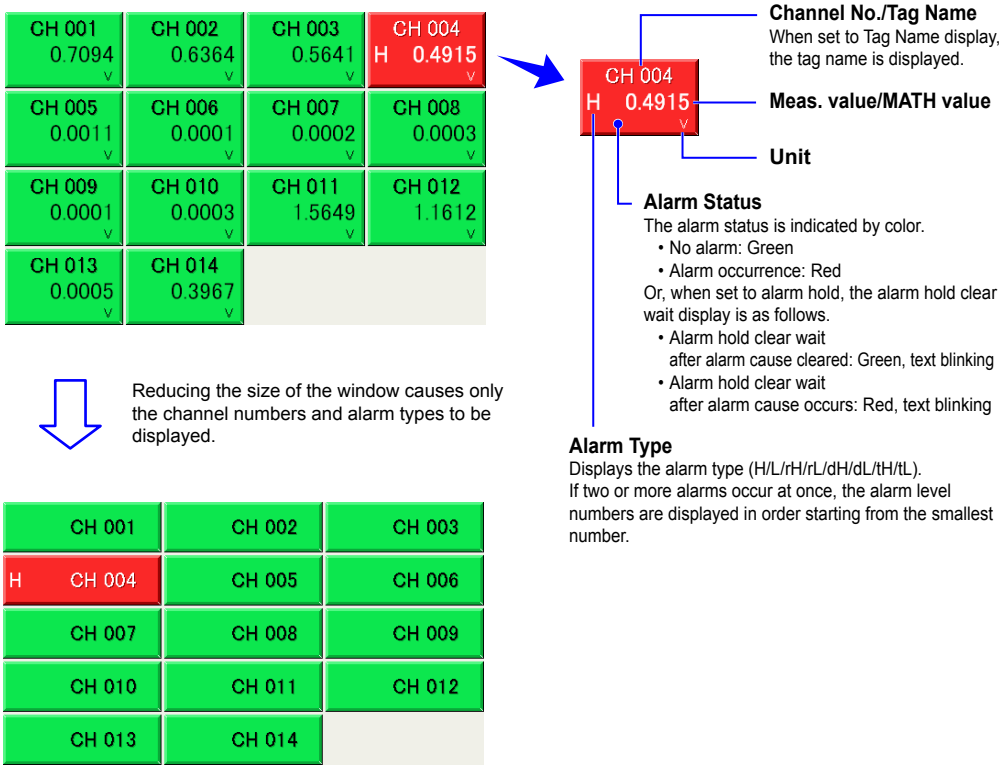
  Displays measured values in a meter. When alarms are set, the alarm status is displayed to the left of the meter. For information on alarm statuses, see Digital Display in this section.

  ▶ For a description of the alarm status, see “Digital Display” in “Monitor Display Screen” in this section.



- **Overview Display**

  Displays alarms and measured values using digital values in the Monitor display. Channels set to Skip are not displayed.

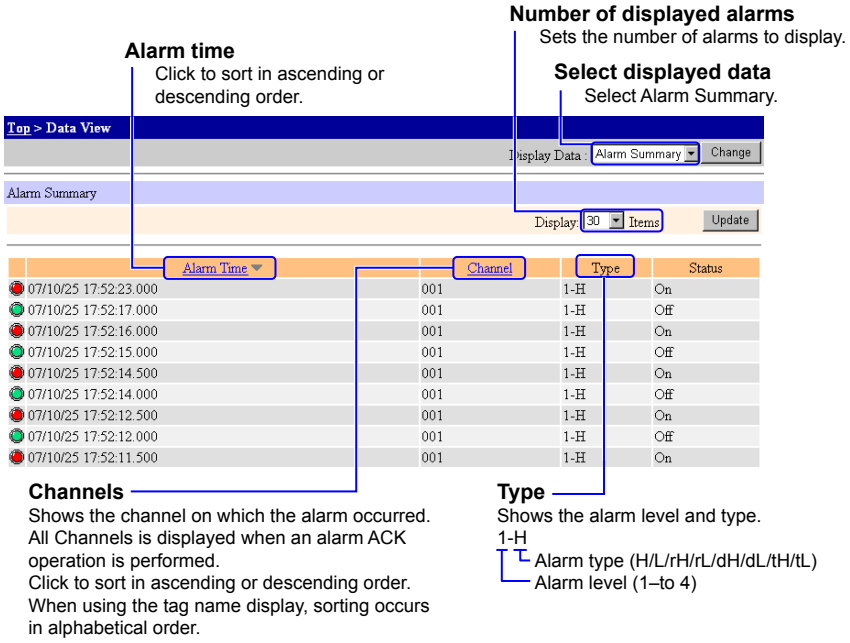


Data View

From the **Display Data** list, select Alarm Summary, Manual Sample, Report - Digital, or Report - Graph and click the **Change** button.

- **Alarm Summary**

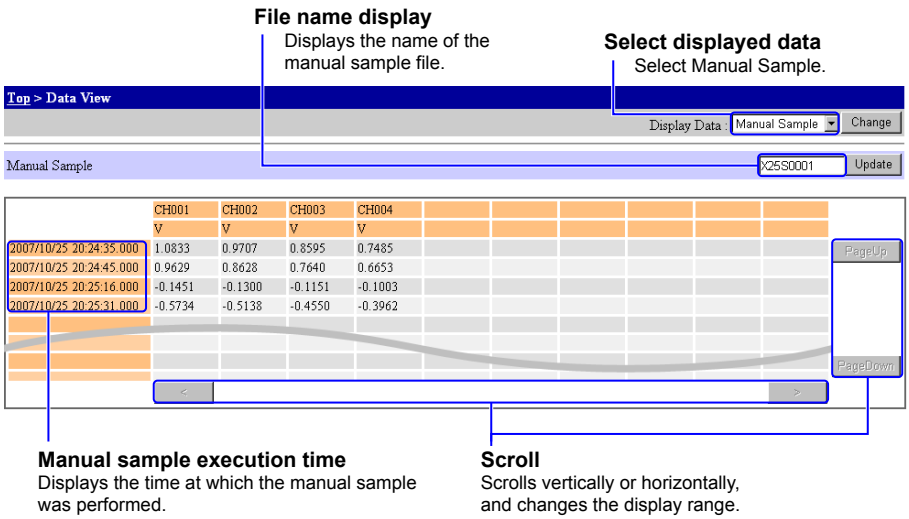
  Select a number of events from 30, 60, 100, 150. Also, the screen automatically updates once per minute. You can also click the **Update** button to refresh the screen manually.



- **Manual Sample**

  Displays manual sample file data saved on the CF card. Click the **Update** button to update* the data. Displays the latest manual sample file.

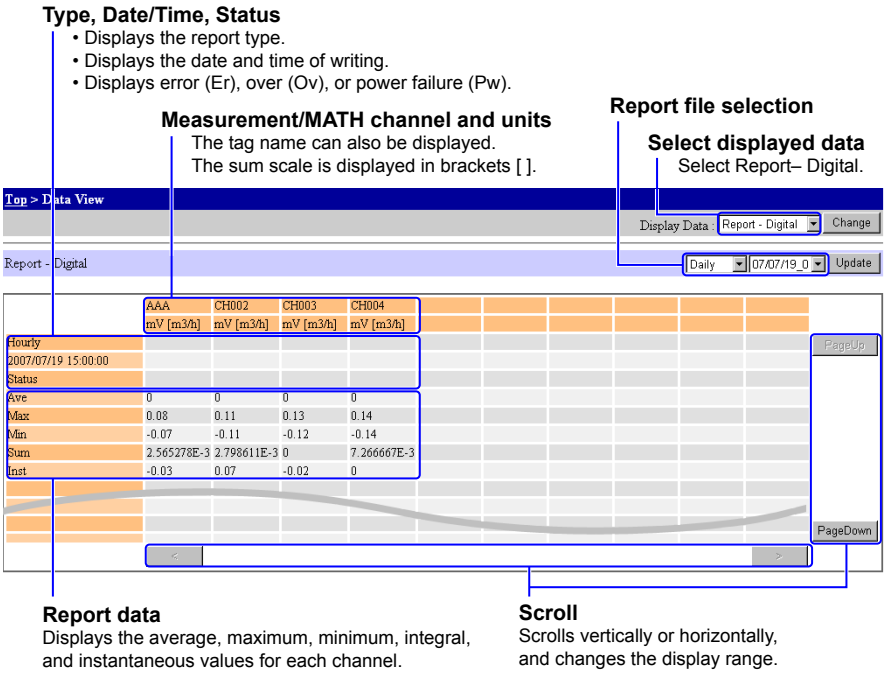
  * If you click the Update button while writing of data to a file is in progress, the data might not be displayed. After writing of the data, click the Update button again.



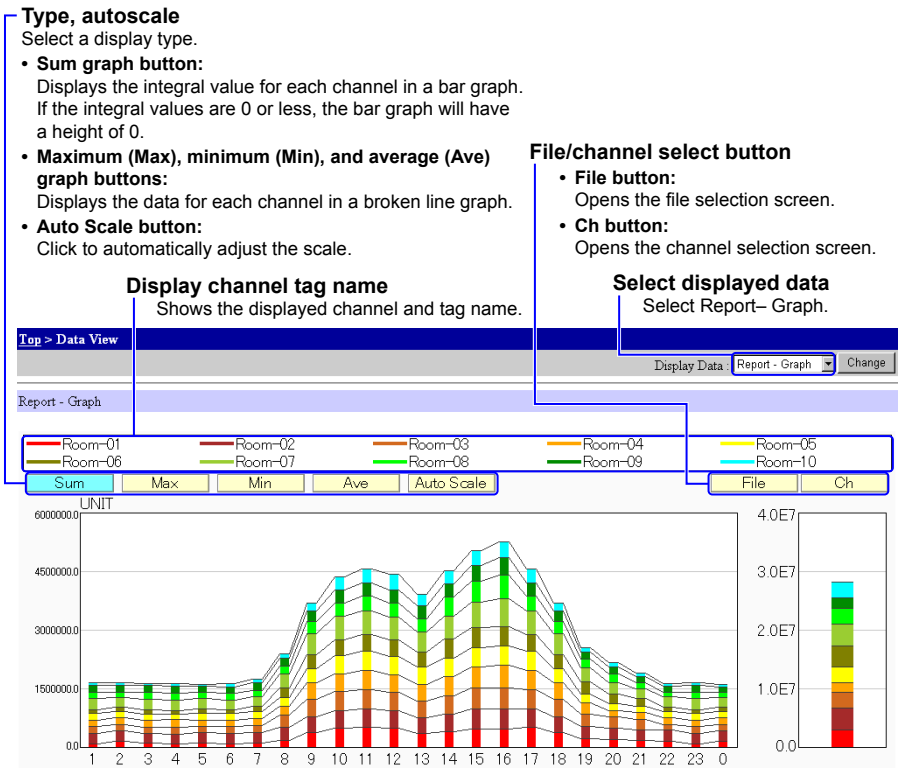
- **Report - Digital**

  Select a report file to display of Daily, Weekly, or Monthly and a date from the report file selection list then click the **Update** button.

  In the example below, the hourly report from 16:00 to 17:00 in the daily report file is displayed.



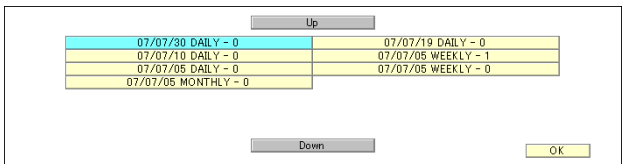
- **Report - Graph**



File selection screen

Selects the report file to be displayed in the graph.

Click the **OK** button to return to the Report - Graph screen.

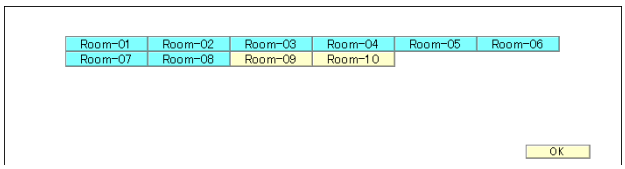


Channel selection screen

Selects the channels and tag names displayed in the graph.

Up to 10 channels can be selected.

Click the **OK** button to return to the Report - Graph screen.



Setting Mode

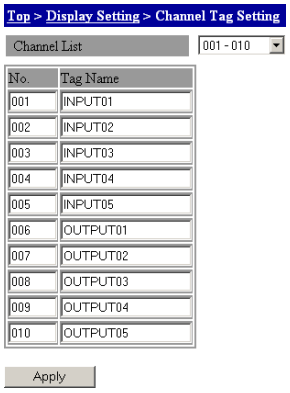
Display Settings

Tag Settings

Enter Tag names to assign to measurement and MATH channels. If the tag name display is enabled, the tag names specified here are displayed.

▶ For the procedure to switch to the tag name display, see “Other Settings” in this section.

1. From the top screen, click **Display Setting** > **Channel Tag Setting**.



2. Select the tag number group you wish to set from the **Channel List** list.
3. Enter a tag name in the **Tag** box of each tag number.
   You can use 15 alphanumeric characters. If you do not enter the tag names, the channel numbers are displayed even if the tag name display is enabled.
4. Click the **Apply** button. The setting changes take effect.

Message Settings

You can specify a message to be written along with data saving during recording.

1. From the top screen, click **Display Setting** > **Message Setting**.

2. Enter the message in the **Message** box in the Message List. You can use fifteen alphanumeric characters.
3. Click the **Apply** button. The setting changes take effect.

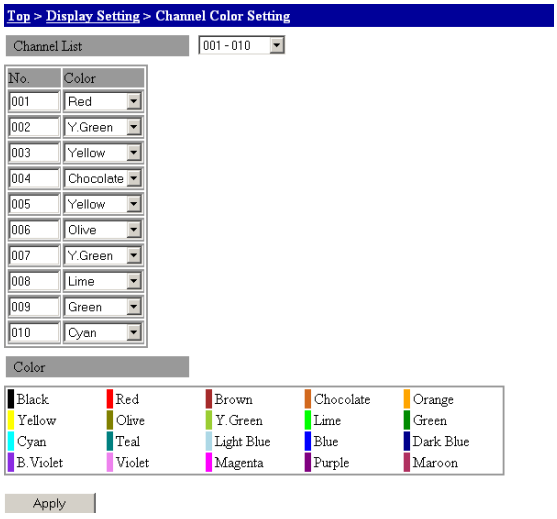
Note

Enter the free message in the free message box in the monitor screen.

For information on free messages, see “Explanation of Display Items” in this section.

Setting Display Colors

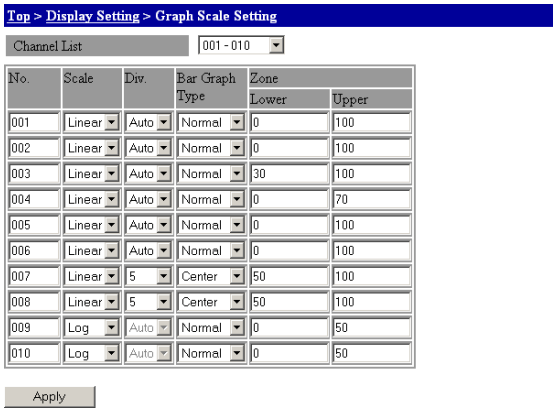
1. From the top screen, click **Display Setting** > **Channel Color Setting**.



2. Select the channel group you wish to set from the **Channel List** list.
3. Select the color you wish to assign in the **Color** list of each channel. Color samples are shown towards the bottom of the screen.
4. Click the **Apply** button. The setting changes take effect.

Graph Scale Settings

1. From the top screen, click **Display Setting** > **Graph Scale Setting**.

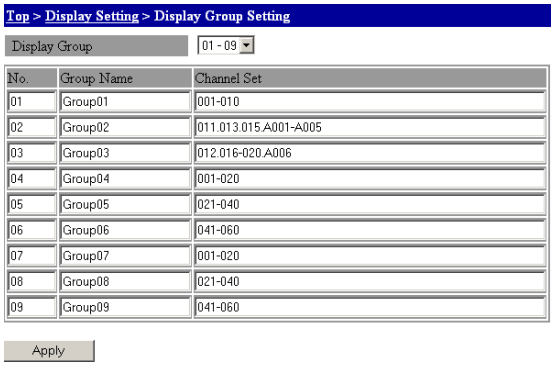


2. Select the channel group you wish to set from the **Channel List** list.
3. Select Linear or Log in the **Scale** list.
4. Select the number of divisions in the **Div** list. It can only be selected when set to Linear display. If you select Auto, the number of divisions is determined automatically from the scale or span of the specified channel.
5. Select a display position of Normal or Center in the **Bar Graph Type** list. The digital or bar graph display is updated accordingly.
6. Specify a percentage from the top or bottom in the **Zone** boxes. Enter a Lower value of 0 to 95 (%), and an upper value from 5 to 100 (%).
7. Click the **Apply** button. The setting changes take effect.

Display Groups Settings

You can display the measured data for each specified group in the Monitor display.

1. From the top screen, click **Display Setting** > **Display Group Setting**.

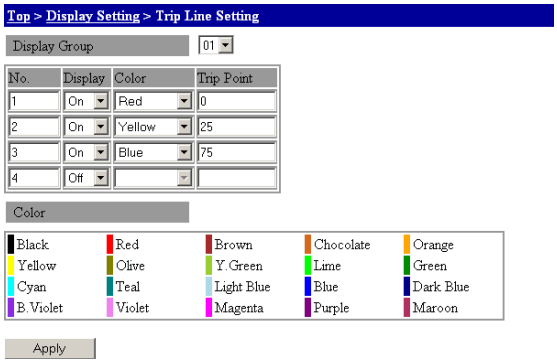


2. Select the group you wish to set from the **Display Group** list.
3. Enter the group name in the **Group Name** box (using up to 15 characters).
4. Enter the channel numbers you wish to assign to the group in the **Channel Set** box. Specify channel numbers by delimiting them with dots as in 001.003.005, or specify a range as in 004-008. Up to 20 channels (using up to 100 characters) can be specified. If more than 20 channels is specified, the first 20 channels are displayed.
5. Click the **Apply** button. The setting changes take effect.

Trip Line Setting

You can display a trip line in the Trend display.

1. From the top screen, click **Display Setting** > **Trip Line Setting**.



2. Select the group number you wish to set from the **Display Group** list.
3. Turn **On** the line you wish to display in the **Display** list.
4. Select the color you wish to display in the **Color** list. Color samples are shown toward the bottom of the screen.
5. Specify a percentage for the position of the trip line in the **Trip Point** box. 100% is the scale maximum in the trend display, and 0% is the minimum.
6. Click the **Apply** button. The setting changes take effect.

Other Settings (Selecting Channel Number Display or Tag Name Display)

1. From the top screen, click **Display Setting** > **Other Settings**.

2. Select whether to display channel numbers or tag names in the **Channel No./Tag Display** list.
3. Click the **Apply** button. The setting changes take effect.

Setting Mode

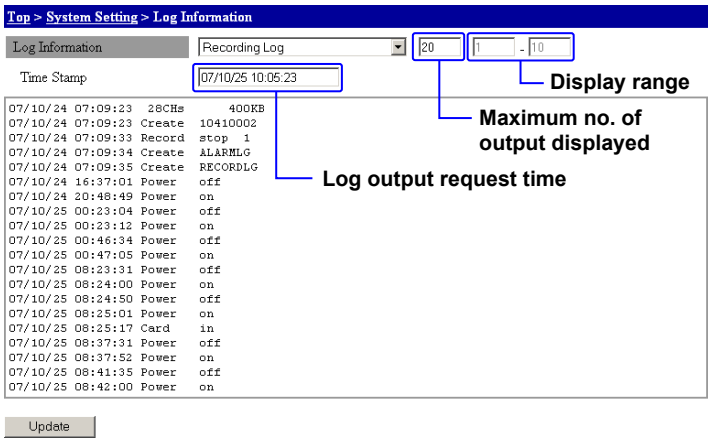
Meas. Mode

Log Information

You can display information from the recording log, alarm summaries, and other sources. For information about display contents, see the MW100 Communication Command manual (IM MW100-17E).

Log Information

1. From the top screen, click **System Setting** > **Log Information**.



2. Select the type of log you wish to display in the **Log Information** list.
3. Enter the number of logs to display or the display range in the box to the right of the list. The box that you enter varies depending on the type of log you wish to display.
4. Click the **Update** button. The updated time is displayed in the display box aligned with the **Log Information** list, and the updated time current log information is displayed in the log display area.

4.1 Error Display on the 7-Segment LED and Corrective Actions

The main module has a two-digit 7-segment LED. The 7-segment LED displays the system status. This section describes the displays on the 7-segment LED when errors occur on the system and their corrective actions. For information about normal displays other than for errors, see section 1.3, “Functions of the Main Module.”

If servicing is necessary, or if the instrument is not operating correctly after performing the corrective actions below, contact your nearest YOKOGAWA dealer.

Errors upon Startup

The left and right digits of the 7-segment LED display “b” and an error code, respectively. The LED illuminates.

Display	Probable Cause	Corrective Action	Ref. section
b* (where * is any character other than F).	The dip switch settings are not correct.	Turn OFF the power, remove the CF card, turn ON all dip switches, and power up again. If the situation does not change servicing is required.	1.3
bF	The dip switch settings are not correct.	Powering up in setup reset mode. Turn OFF the power, turn ON all dip switches, and power up again. Since all settings such as the IP address are initialized, reconfiguration is necessary.	1.3

System Errors

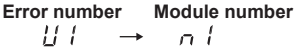
The left and right digits of the 7-segment LED display “F” and an error code, respectively. The LED illuminates.

Display	Possible Problem	Corrective Action	Ref. section
F0	System ROM error.	Servicing required.	-
F1	SRAM error	Servicing required.	-
F2	EEPROM error	Servicing required.	-
F3	Error in the internal battery of the main module.	Servicing required. However, this error is also displayed immediately after the battery is replaced. If this happens, power-cycle the MW100.	-
F4	Ethernet controller error	Servicing required.	-
F6	Web file load error	Servicing required.	-
FF	Error in writing unit information	Servicing required.	-

Module Errors

The left and right digits of the 7-segment LED display are U and an error code, respectively. The LED illuminates.

In the case of module errors, the error number and the corresponding module number are displayed alternately as shown in the figure below.



Display	Possible Problem	Corrective Action	Ref. section
U0	Range information error.	Servicing required.	-
U1	Calibration value error.	Check the module’s installation status, then recalibrate the module. If the error occurs even after recalibrating, servicing is required.	-
U2	Calibration reference voltage value is not correct. (during calibration)	Check whether the correct calibration reference voltage is being applied or whether the channel to which the voltage is applied is correct.	-
U3	Error in writing the calibration value.	Servicing required.	-
U4	The installed module cannot be used.	Replace the module with one that can be used.	-

Communication Errors

The left and right digits of the 7-segment LED display “C” and an error code, respectively. The LED blinks.

Display	Possible Problem	Corrective Action	Ref. section
C0	DHCP address acquisition error	Check network connections. Use a Fixed IP address Check with your network administrator whether your environment supports acquisition of addresses by DHCP.	2.6, 3.2 *
C1	DNS name error	Check network connections. Check with your network manager to determine whether your environment supports host name registration.	2.6 *

* See the MW100 Viewer Software User’s Manual (IM MW180-01E).

Settings Errors

The code is divided into two parts which are displayed alternately on the 7-segment LED; in the first part, the letter E appears in the left digit with the hundreds digit of the error code to the right, and the second part consists of the last two digits of the error code.

Display	Possible Problem	Corrective Action
E001	Invalid function parameter.	Enter the correct parameter.
E002	Value exceeds the setting range.	Set a value within the allowable range.
E003	Incorrect real number format.	Use the correct real number format.
E004	Real number value exceeds the setting range.	Set a real number within the allowable range.
E005	Incorrect character string.	Set an allowable character string.
E006	Character string too long.	Set a character string within the allowable length.
E007	Incorrect display color format.	Specify a display color using the correct format.
E008	Incorrect date format.	Enter the date using the correct format.
E009	Data value exceeds the setting range.	Set a date within the allowable range.
E010	Incorrect time format.	Enter the time using the correct format.
E011	Time value exceeds the setting range.	Set a time within the allowable range.
E012	Incorrect time zone format.	Specify a time zone using the correct format.
E013	Time zone value exceeds the setting range.	Set a time zone within the allowable range.
E014	Incorrect IP address format.	Enter an IP address using the correct format.
E020	Invalid channel number.	Enter the correct channel number.
E021	Invalid sequence of first and last channel.	Set a value for the last channel that is greater or equal to than the first channel.
E022	Invalid alarm number.	Enter the correct alarm number.
E023	Invalid relay number.	Enter a correct relay number.
E024	Invalid sequence of first and last relay.	Set a value for the last relay that is greater or equal to than the first relay.
E025	Invalid MATH group number.	Enter a correct MATH group number.
E026	Invalid box number.	Enter the correct box number.
E027	Invalid timer number.	Enter the correct timer number.
E028	Invalid match time number.	Enter the correct match time number.
E029	Invalid measurement group number.	Enter a correct measurement group number.
E030	Invalid module number.	Enter a correct module number.
E031	Invalid start and end time of DST.	Enter a correct start and end time.
E032	Invalid display group number.	Enter a correct display group number.
E033	Invalid tripline number.	Enter a correct tripline number.
E034	Invalid message number.	Enter a correct message number.
E035	Invalid user number.	Enter a correct user number.
E036	Invalid server type.	Enter a correct destination type.
E037	Invalid e-mail contents.	Enter a correct send destination.
E038	Invalid server number.	Enter a correct server number.
E039	Invalid command number.	Enter a correct command number.

Display	Possible Problem	Corrective Action
E040	Invalid client type.	Enter a correct client type.
E041	Invalid server type.	Enter a correct server type.
E050	Invalid input type.	Enter an input type that can be selected for the module specified by the channel number.
E051	Module of an invalid input type found in the range of specified channels.	Enter an input type that can be selected for all modules specified by the channel range.
E052	Invalid measuring range.	Enter a measurement range that can be selected for the module specified by the channel number.
E053	Module of an invalid measuring range found in the range of specified channels.	Enter a measurement range that can be selected for all modules specified by the channel range.
E054	Upper and lower limits of span cannot be equal.	Set a different value for the upper and lower limits of span.
E055	Upper and lower limits of scale cannot be equal.	Set a different value for the upper and lower limits of scale.
E056	Invalid reference channel number.	Set channels other than the input module's own channel.
E060	Cannot set an alarm for a skipped channel.	Set a type for the channel number setting other than SKIP.
E061	Cannot set an alarm for a channel on which MATH function is turned OFF.	Set the ON/OFF setting for expressions on the channel number to ON.
E062	Invalid alarm type.	Enter an allowed alarm type.
E063	Invalid alarm relay number.	Set a relay number for alarm output relays.
E065	Cannot set hysteresis for a channel on which alarm are turned OFF.	Set the channel number alarm type to something other than OFF.
E070	Nonexistent channel specified in MATH expression.	Check whether a channel number outside of the allowable range was specified in the expression.
E071	Nonexistent constant specified in MATH expression.	Check whether a MATH constant outside of the allowable range was specified in the expression.
E072	Invalid syntax found in MATH expression.	Check whether the syntax of the expression is correct.
E073	Too many operators for MATH expression.	Reduce the number of operators.
E074	Invalid order of operators.	Check whether the relationship between the operators used in the expression satisfies proper syntax.
E075	Upper and lower limits of MATH span cannot be equal.	Set a different value for the upper and lower limits of the MATH span.
E080	Incorrect MATH group format.	Check whether the MATH group format is correct.
E081	Incorrect channels for MATH group.	Check whether there are any channels outside the allowable range specified in the MATH group.
E082	Too many channels for MATH group.	Reduce the number of channels specified in the MATH group.
E090	Incorrect break point format.	Use the correct break point format.
E091	Time value of break point exceeds the setting range.	Set a time within the allowable range.
E092	Output value of break point exceeds the setting range.	Set an output value within the allowable range.
E093	No break point found.	Set one or more break points.
E094	Invalid time value of first break point.	Set the time of break point 1 to zero.
E095	Invalid time sequence found in break points.	Set the times of break points in ascending order.
E100	Invalid output type.	Enter an output type that can be selected for the module specified by the channel number.
E101	Module of an invalid output type found in the range of specified channels.	Enter an output type that can be selected for all modules specified by the channel range.
E102	Invalid output range.	Enter an output range that can be selected for the module specified by the channel number.
E103	Module of an invalid output range found in the range of specified channels.	Enter an output range that can be selected for all modules specified by the channel range.
E104	Upper and lower limits of output span cannot be equal.	Set a different value for the upper and lower limits of output span.
E105	Invalid transmission reference channel.	Set the input module or MATH channel number.
E110	Invalid channel number for contact input event.	Enter the channel number for DI input.
E111	Invalid channel number for alarm event.	Set an input module or MATH channel number.

4.1 Error Display on the 7-Segment LED and Corrective Actions

Display	Possible Problem	Corrective Action
E112	Invalid relay number for relay event.	Set the channel number for the DO module.
E113	Invalid action type.	Enter a correct action type.
E114	Invalid combination of edge and level detection actions.	Set the edge and level detection types to something different.
E115	Invalid combination of level detection actions.	Set events of different types to different actions in level detection.
E116	Invalid flag number.	Enter a correct flag number.
E120	Invalid measurement group number.	Set the measurement interval so that meas. gr 1 ≤ meas. gr 2 ≤ meas. gr 3. The maximum allowable ch for 10 ms measurement is 10, and for 50 ms, 30.
E121	Invalid measurement group number for MATH interval.	Set MATH interval to a measurement group of 100 ms or longer.
E130	Size of data file for measurement group 1 exceeds the upper limit.	Set the number of saved channels, recording interval, and recording data length so that the data file of measurement group 1 does not exceed 10 MB.
E131	Size of data file for measurement group 2 exceeds the upper limit.	Set the number of saved channels, recording interval, and recording data length so that the data file of measurement group 2 does not exceed 10 MB.
E132	Size of data file for measurement group 3 exceeds the upper limit.	Set the number of saved channels, recording interval, and recording data length so that the data file of measurement group 3 does not exceed 10 MB.
E133	Size of MATH data file exceeds the upper limit.	Set the number of saved channels, recording interval, and recording data length so that the MATH data file does not exceed 10 MB.
E134	Size of thinned data file exceeds the upper limit.	Set the number of saved channels, recording interval, and recording data length so that the thinned data file does not exceed 10 MB.
E135	Cannot set smaller value for thinning recording interval than measuring or MATH interval.	Set a value for the thinning recording interval higher than the measurement and MATH interval.
E136	Invalid combination of thinning recording, measuring and MATH interval.	Set a value for the thinning recording interval that is a common multiple of the measurement and MATH intervals.
E137	Combination of thinning recording interval and thinning recording data length incorrect.	Set the thinning recording data length to an integer multiple of the thinning recording interval.
E138	Cannot set recording operation for measurement group with no measuring interval.	Set the measurement interval of the measurement group number to something other than OFF.
E139	Invalid recording interval.	Set a recording interval which can be set to the measurement interval of the measurement group.
E140	Upper and lower limits of the display zone cannot be equal.	Set the upper and lower limits of display zone to a different value.
E141	Cannot set smaller value than lower limit of display zone for upper limit.	Set a larger value for the upper limit than that of the lower limit.
E142	Width of display zone must be 5% of that of the entire display or more.	Set the upper and lower limits so that the difference between them is 5% or more.
E145	Incorrect display group format.	Enter a display group of the correct format.
E150	IP address must belong to class A, B, or C.	Set an IP address belonging to class A, B, or C.
E151	Net or host part of IP address is all 0's or 1's.	Set a valid combination of IP address and subnet mask.
E152	Invalid subnet mask.	Enter a setting according to your network.
E153	Invalid gateway address.	Make sure that the network part of the IP address and default gateway match.
E160	Incorrect alarm e-mail channel format.	Specify a channel using the correct format.
E165	Invalid channel number for Modbus command.	Enter a correct channel.
E166	Invalid combination of start and end channel for Modbus command.	Set the first and last channel to the same type.
E167	Invalid sequence of start and end channel for Modbus command.	Set the last channel equal or greater than the first channel.
E168	Too many channels for command number.	Set a valid number of channels for the data type.
E170	Invalid channel number for report.	Set the channel included on the input module.

Execution Errors

The code is divided into two parts which are displayed alternately on the 7-segment LED; in the first part, the letter E appears in the left digit with the hundreds digit of the error code to the right, and the second part consists of the last two digits of the error code.

Display	Possible Problem	Corrective Action
E201	Cannot execute due to different operation mode.	Confirm the operation mode.
E202	Cannot execute when in setting mode.	Change the mode before execution.
E203	Cannot execute when in measurement mode.	Change the mode before execution.
E204	Cannot change or execute during memory sampling.	Stop the save operation before executing.
E205	Cannot execute during MATH operation.	Stop the MATH operation before executing.
E206	Cannot change or execute during MATH operation.	Stop the MATH operation before executing.
E207	Cannot change or execute while saving/loading settings.	Execute after the settings are saved or loaded.
E209	Cannot execute while memory sample is stopped.	Change the mode before execution.
E211	No relays for communication input found.	Check installation of relays and the relay output types.
E212	Initial balance failed.	Check the settings and wiring.
E213	No channels for initial balance found.	Check the target channels.
E214	No channels for transmission output found.	Specify channels for transmission output.
E215	No channels for arbitrary output found.	Specify channels for arbitrary output.
E221	No measurement channels found.	Check the measurement module, measurement group number, measurement interval, and other settings.
E222	Invalid measurement interval.	Set the measurement interval so that: Meas. gr 1 ≤ meas. gr 2 ≤ meas. gr 3
E223	Too many measurement channels.	The number of measurable channels during 10 ms measurement is 10, and for 50 ms measurement, 30.
E224	No MATH channels found.	Check the MATH channel settings.
E225	Invalid MATH interval.	Set the MATH interval to measurement groups of 100 ms or more. When measuring with measurement modules, set the measurement group numbers on which to perform measurement.
E226	Cannot start/stop MATH operation.	Cannot execute because MATH start is set for the level detection action.
E227	Cannot start/stop recording.	Cannot execute because recording start is set for the level detection action.

Execution Errors

The code is divided into two parts which are displayed alternately on the 7-segment LED; in the first part, the letter E appears in the left digit with the hundreds digit of the error code to the right, and the second part consists of the last two digits of the error code.

Display	Possible Problem	Corrective Action
E301	CF card error detected.	Do not eject or otherwise disturb the card while being accessed.
E302	No enough free space on CF card.	Delete unneeded files to free up space. Replace the CF card.
E303	CF card is write-protected.	Check write permissions.
E311	CF card not inserted.	Insert the CF card correctly.
E312	CF card format damaged.	Check the CF card. Please format the CF card.
E313	CF card damaged or not formatted.	The file may be damaged. Format or replace the CF card.
E314	File is write-protected.	Check write permissions.
E315	No such file or directory.	Check the files and folders.*
E316	Number of files exceeds the upper limit.	Delete unneeded files to reduce the number of files.
E317	Invalid file or directory name.	Check the files and folders.*
E318	Unknown file type.	Check the files.
E319	Same name of file or directory already exists.	Check the files and folders.*
E320	Invalid file or directory operation.	Check the files and folders.*
E321	File is in use.	Wait until access is finished.
E331	Setting file not found.	Check the name of the setting file.
E332	Setting file is broken.	Could not load setting file because it is corrupted.
E341	FIFO buffer overflow.	You must reduce the time required to store files. Delete unneeded files to free up space.
E342	Data to be saved to file not found.	Check the settings.
E343	Power failed while opening file.	Files may have been damaged. Take appropriate action for power failure.
E344	Some or all data prior to power outage could not be recovered.	Do not change the CF card during a power failure.
E345	Could not restart recording after recovery from power outage.	Perform the record start operation.
E346	Recording could not be started due to power outage.	Perform the re-recording start operation. Take appropriate action for power failure.

* May occur in the MW100 internal processing (during an abnormality)

Communication Command Errors

The code is divided into two parts which are displayed alternately on the 7-segment LED; in the first part, the letter E appears in the left digit with the hundreds digit of the error code to the right, and the second part consists of the last two digits of the error code.

Display	Possible Problem	Corrective Action
E401	Command string too long.	Keep the command within 2047 Bytes from first character to terminator.
E402	Too many commands enumerated.	Set the number of enumerated commands within 99.
E403	Invalid type of commands enumerated.	Send the commands without enumerating them.
E404	Invalid command.	Confirm the command name.
E405	Not allowed to execute this command.	Login at a level that allows execution of this command.
E406	Cannot execute due to different operation mode.	Switch to a mode that allows execution of this command.
E407	Invalid number of parameters.	Check the number of parameters.
E408	Parameter string too long.	Keep the length of individual parameters within 512 Bytes.
E411	Daylight saving time function not available.	Not available with the current model.
E412	Temperature unit selection not available.	Not available with the current model.
E413	MATH option not available.	Not available with the current model.
E414	Serial communication interface option not available.	Not available with the current model.
E415	Report option not available.	Not available with the current model.

Communication Errors

The code is divided into two parts which are displayed alternately on the 7-segment LED; in the first part, the letter E appears in the left digit with the hundreds digit of the error code to the right, and the second part consists of the last two digits of the error code.

Display	Possible Problem	Corrective Action
E501	Login first.	First, finish logging in.
E502	Login failed, try again.	Enter the correct user name and password.
E503	Connection count exceeded the upper limit.	Close unneeded connections and reconnect.
E504	Connection has been lost.	Try to make a new connection.
E505	Connection has time out.	Try to make a new connection.
E520	FTP function not available.	Enable the function.
E521	FTP control connection failed.	Check the FTP server address and the main unit address setting. Also check the Ethernet cable cannection.
E530	SMTP function not available.	Enable the function.
E531	SMTP connection failed.	Check the SMTP server address and the main unit address setting. Also check the Ethernet cable cannection.
E532	POP3 connection failed.	Check the POP3 server address and the main unit address setting. Also check the Ethernet cable cannection.
E550	SNTP function not available.	Enable the function.
E551	SNTP command/response failed.	Check the SNTP server address and the main unit address setting. Also check the Ethernet cable cannection.

System Errors

The code is divided into two parts which are displayed alternately on the 7-segment LED; in the first part, the letter E appears in the left digit with the hundreds digit of the error code to the right, and the second part consists of the last two digits of the error code.

Display	Possible Problem	Corrective Action
E999	System error.	Servicing required.

4.2 Error Display in the Monitor Screen and Corrective Actions

Error Message	Corrective Action
Could not connect to the instrument. Check cables and other connections.	Check Ethernet cable connections and the IP addresses of devices.
Communication error occurred. Check cables and other connections.	Check Ethernet cable connections and the IP addresses of devices.
The actually installed modules differ from the modules recognized by the system.	Reconstruct the module configuration.
The size of the data files exceeds the allowable upper limit.	Set the number of save channels, recording interval, and recording data length so that the data files of measurement groups 1, 2, and 3, and the computed and thinned data files are all within 10 MB.
Value smaller than measuring interval or MATH interval cannot be set for the thinning recording interval.	Set a value higher than the measurement and MATH interval.
Combination of thinning recording interval, measurement interval, MATH interval incorrect.	Set the thinning recording interval so that it is a common multiple of the measurement and MATH intervals.
The recording data length cannot be set equal to or less than the recording interval.	Set a recording data length larger than the recording interval.
Insufficient space on the CF card.	Delete unneeded files on the CF card to free up some space. Replace the CF card.
The CF card is not inserted.	Insert the CF card.
The CF card is damaged or not formatted.	Reinsert the CF card or format it.
No data found in file.	Check the recording settings.
Remove MATH start/stop action from the Event/Action settings.	Remove MATH start/stop action from the Event/Action settings.
Remove recording start/stop action from the Event/Action settings.	Remove recording start/stop action from the Event/Action settings.

4.3 Troubleshooting

If servicing is necessary, or if the instrument is not operating correctly after performing the corrective actions below, contact your nearest YOKOGAWA dealer.

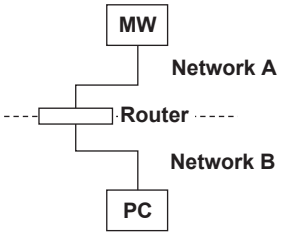
The 7-segment LED does not illuminate.

Possible Problem	Corrective Action	Ref. section
The power switch is not ON.	Turn ON the power switch.	2.5
The supply voltage is too low.	Check whether the voltage is within the supply voltage rating range.	2.5
The fuse is blown.	Servicing required.	-
The power supply is broken.	Servicing required.	-

The 7-segment LED blinks repeatedly.

Possible Problem	Corrective Action	Ref. section
The power supply is shorted inside the input/output module.	Remove the input/output module one by one and determine thebroken module (servicing required).	2.3
The power supply is shorted inside the main module.	Replace the main module. (Servicing required.)	2.3

The MW100 cannot be detected from the PC or cannot be detected with the Search button.

Possible Problem	Corrective Action	Ref. section
The LINK LED does not turn ON. The cable is broken.	Replace the Ethernet cable.	1.3
The LINK LED does not turn ON. There is a problem with the hub.	Check the hub's power supply. If it still does not work, replace the hub and check the hub's operation.	1.3
The LINK LED does not turn ON. There is a problem with the PC.	Check whether the PC can connect to the network. Replace the PC's NIC.	1.3
The ACT LED does not turn ON. There is a problem in the connection between the hub and the MW100.	Check the hub's power supply. If it still does not work, Replace the hub and check the hub's operation.	1.3
The ACT LED does not turn ON. There is a problem with the PC.	Check whether the PC can connect to the network. Replace the PC's NIC.	1.3
There is a problem in the network configuration. The settings are not correct.	Check that the IP address, subnet mask, and default gateway settings on the MW100 are correct.	*
There is a problem in the network configuration. The setting changes have not taken effect.	Turn OFF the power to the PC and the MW100, and carry out reconnection.	*
The PC and the MW100 are not in the same segment.	Connect the PC and the MW100 in the same network segment. When connected as shown in the following figure, the Search button cannot be used to detect the MW100, but you can make the connection by manually specifying the IP address of the MW100.  	*
	When using Windows XP or Windows Vista, check the firewall function.	*

* See the MW100 Viewer Software User's Manual.

4.3 Troubleshooting

The MW100 can be detected using the Search button, but browser connection fails.

Possible Problem	Corrective Action	Ref. section
The IP address is set to the default value. The default value cannot be used to make the connection.	Enter the correct IP address.	*
There is a problem in the network configuration.	Check that the IP address, subnet mask, and default gateway settings on the MW100 are correct.	*

* See the MW100 Viewer Software User's Manual.

MW100 Calibration Software not connected.

Possible Problem	Corrective Action	Ref. section
Attempting to make multiple connections. Another software program is already connected.	Exit all other software programs.	4.3,*

* See the MW100 Viewer Software User's Manual.

The connected input/output module is not detected.

Possible Problem	Corrective Action	Ref. section
Module connection or module startup error. Attached the module while the power was ON.	Turn OFF the power. Detach the input/output module once and attach it again.	2.5
Carried out an incorrect calibration.	Recalibrate.	4.3,*

* See the MW100 Viewer Software User's Manual.

The measured value is not correct

Possible Problem	Corrective Action	Ref. section
The input wiring is not correct.	Check the input wiring.	2.4
The measured value is at +Over or –Over. The measurement range setting and input range do not match.	Change to an appropriate setting.	3.5
The temperature error is large or is unstable. The TC type setting and the type actually connected are different.	Change to the correct setting.	3.5
The temperature error is large or is unstable. The RJC setting is not correct.	Change to the correct setting.	3.5
The temperature error is large or is unstable. The wind is hitting the terminals.	Block the wind from hitting the terminals.	-
The temperature error is large or is unstable. The ambient temperature change is drastic.	Suppress changes in the ambient temperature such as by inserting it into a box.	-
The temperature error is large or is unstable. There is an error in the wiring resistance (in the case of a 3-wire RTD).	Match the thickness and length of the three measurement cables.	2.4
The measurement error is large or is unstable. Noise effects.	Take measures against noise.	2.9
The measurement error is large or is unstable. Effects from the signal source resistance.	Reduce the signal source resistance such as by inserting a converter.	-
The temperature error is large or is unstable. Effects from parallel connections.	Stop parallel connections. Do not use the burnout setting.	-
Measured value from strain gauge type sensor not correct.	When using a sensor without a remote sensing wire, use the DV450-001 (conversion cable).	-
On the strain module (-B12, -B35), the gauge method and dip switch settings are not correct.	Enter the correct settings.	2.4
On the strain module (-B12, -B35), the gauge resistance and internal bridge resistance values are different	Use a module that supports the resistance value of the strain gauge (120 Ω, -B12; for 350 Ω, -B35).	2.4
On the strain module, scaling corresponding to the gauge method is not set (for 2 gauge and 4 gauge methods, the amount of strain is doubled or quadrupled.)	Displayed with 1 gauge method conversion. Set scaling appropriately depending on the gauge method.	1.8
On the strain module (-NDI), a strain gauge type sensor without a remote sensing wire is being used.	When using a sensor without a remote sensing wire, use the DV450-001 (conversion cable).	2.4

Alarms are not output.

Possible Problem	Corrective Action	Ref. section
There is a problem in the alarm setting.	Both the alarm and output relay must be set appropriately. Make the alarm and output relay settings appropriate.	3.7, 3.8

The CF card is not detected.

Possible Problem	Corrective Action	Ref. section
There is a problem with the CF card.	Replace the CF card. Eject and format the CF card, then insert it again.	2.10

4.4 Calibration

To maintain measuring accuracy, we recommend calibration once per year. Calibration of the instrument requires a calibration instrument of the necessary accuracy and resolution. Please consult with the dealer from whom you purchased the instrument.

Range Calibration for DC Voltage, RTD, Resistance, Strain, and Analog Output

Required Instruments

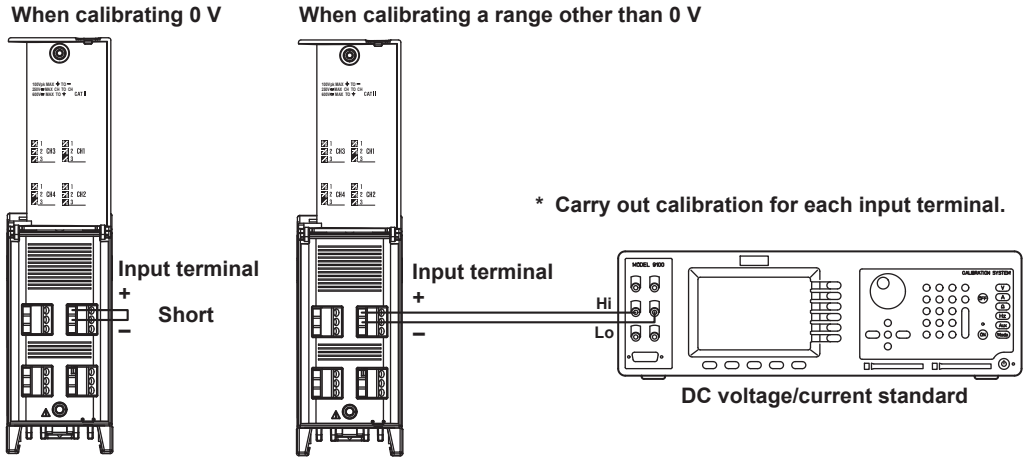
- DC Voltage/Current Standard
  Must meet the following specifications (M/9100 by FLUKE or equivalent)
  Output range: 20 mV to 100 V
  Output accuracy of output range: ±(0.01%+1 µV) or less
- Resistance standard
  Must meet the following specifications (ADR3204 by Alpha Electronics or equivalent)
  Resistance setting range (resolution): 0.2 to 1999 Ω (0.001 Ω), 0.2 to 19999 Ω (0.01 Ω)
  Resistance accuracy of the resistance setting range: ± (0.01% of rdg + 2 mΩ) or less
- Bridge head (Yokogawa Electric model 701955 and 701956)
- Digital multimeter
  Must meet the following specifications (7562 by Yokogawa or equivalent)
  Accuracy: ±0.01% or less

Calibration Procedure

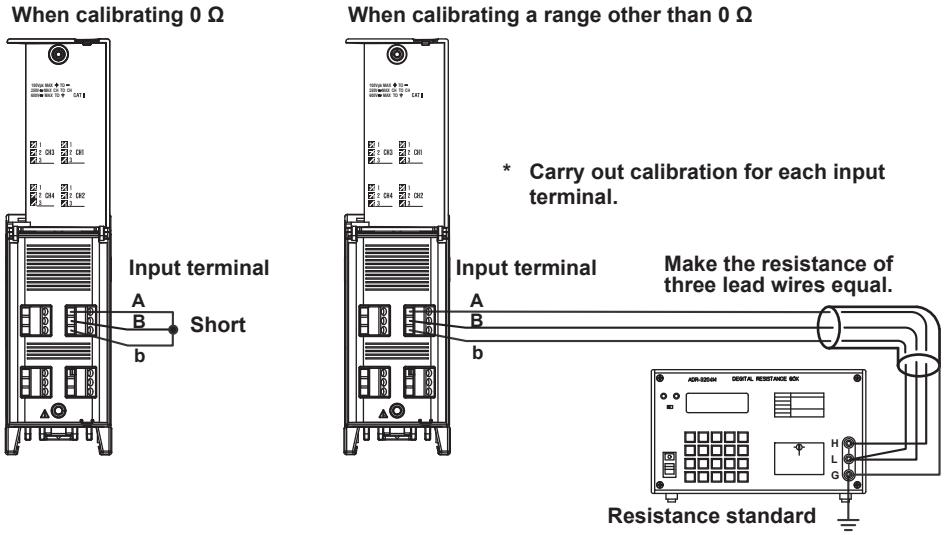
1. Wire the standard and instrument to be calibrated as shown in the figure below.
2. Turn ON the power while holding down user function key 1 on the MW100. The unit enters Calibration mode.
3. Allow a sufficient warm-up time for the MW100 Data Acquisition Unit (thirty minutes or more).
4. Confirm that the ambient temperature and humidity meet the standard operating conditions.
5. After setting up communications between the PC and the MW100, start the MW100 Calibration software and perform calibration.
   For instructions on the MW100 calibration software, see the MW100 Viewer Software User's Manual (IM MW180-01E).
6. To exit Calibration mode, turn the power OFF.

Wiring Diagram

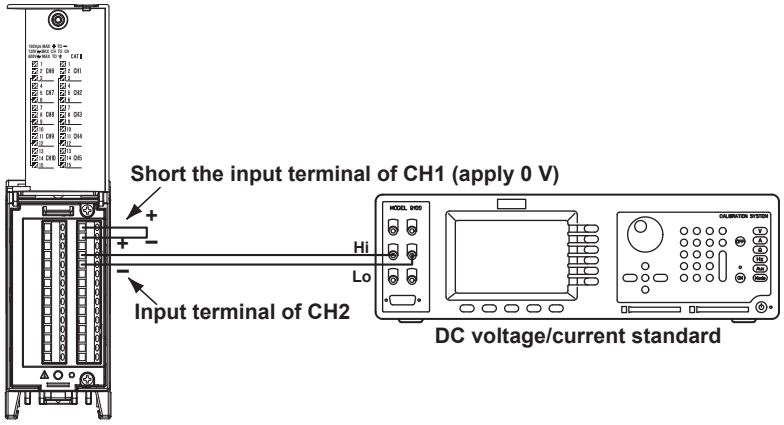
- When calibrating the DC voltage range of the 4-CH, High-Speed Universal Input module



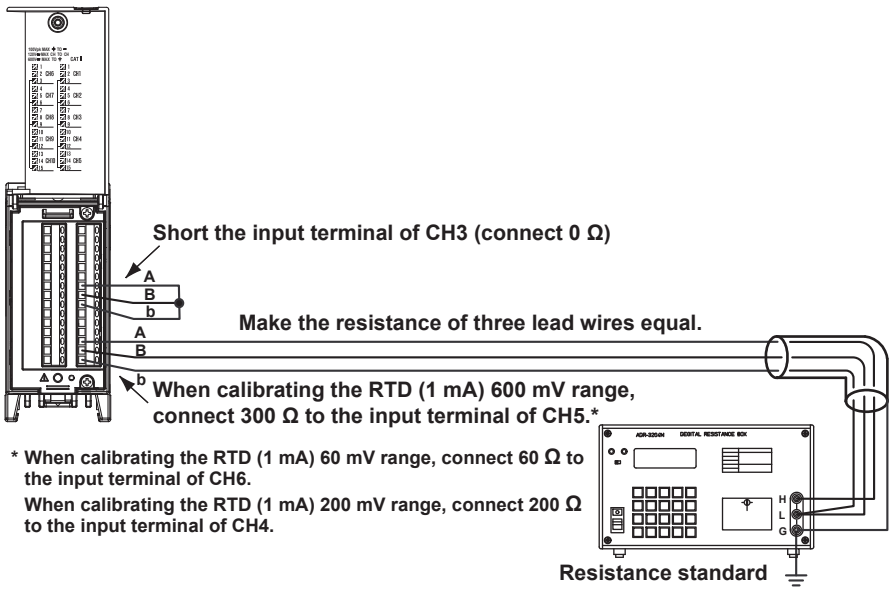
- When calibrating the RTD range of the 4-CH, High-Speed Universal Input module



- When calibrating the DC voltage range of the 10-CH, Medium-Speed Universal Input module

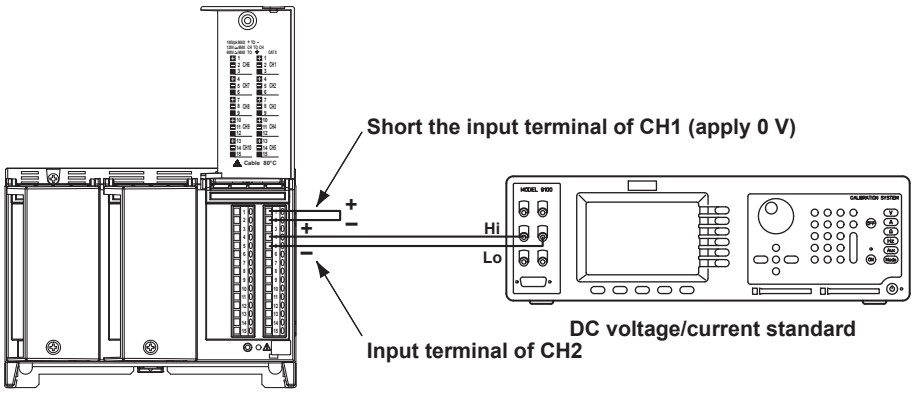


- When calibrating the RTD range of the 10-CH, Medium-Speed Universal Input module

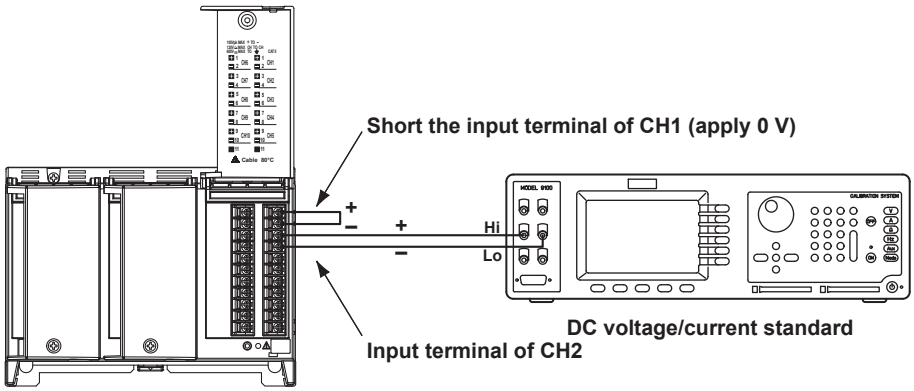


- When calibrating the DC voltage range of the 30-CH, Medium-Speed DCV/TC/DI Input module

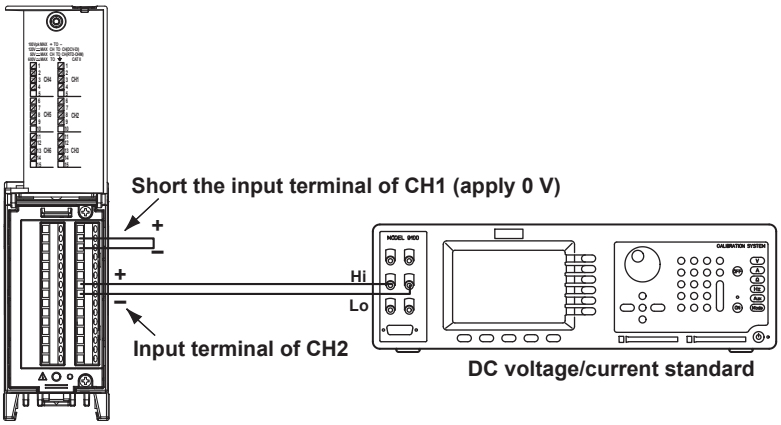
MX110-VTD-L30



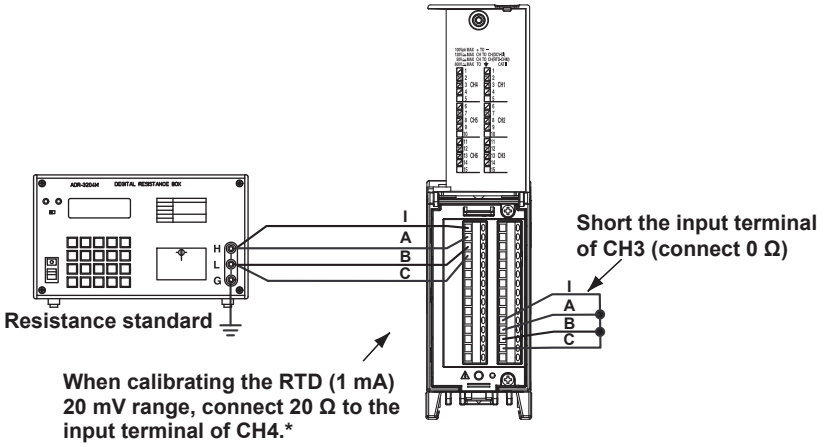
MX110-VTD-L30/H3



- When calibrating the DC voltage range of the 6-CH, Medium-Speed Four-Wire RTD Input module



- When calibrating the RTD or resistance range of the 6-CH, Medium-Speed Four-Wire RTD Resistance Input module



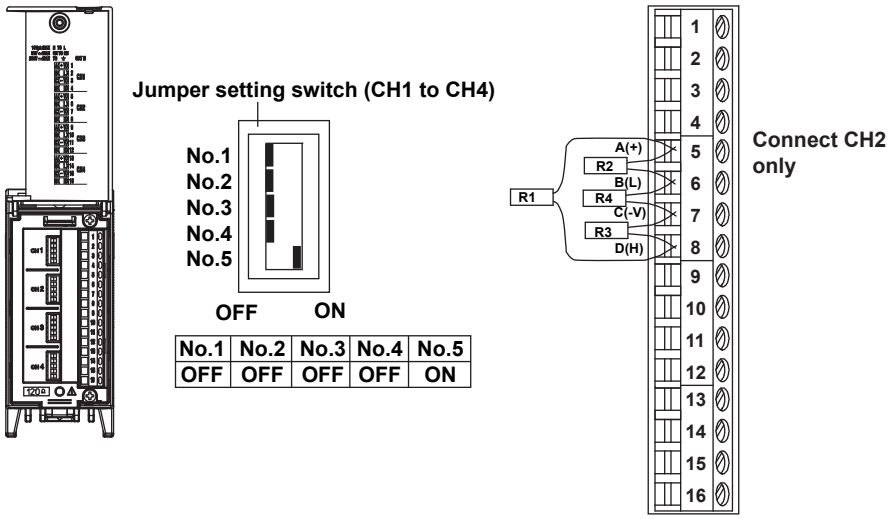
*** When calibrating the RTD (1 mA) 60 mV range, connect 60 Ω to the input terminal of CH5.**
When calibrating the RTD (1 mA) 200 mV range, connect 200 Ω to the input terminal of CH6.
When calibrating the RTD (1 mA) 600 mV range, connect 300 Ω to the input terminal of CH4.
When calibrating the RTD (0.25 mA) 600 mV range, connect 2400 Ω to the input terminal of CH5.
When calibrating the RTD (0.25 mA) 1 V range, connect 3000 Ω to the input terminal of CH6.

- When calibrating the range of the 4-CH, Medium-Speed Strain Module (-B12, -B35, and -NDI)
  The clamp terminals (-B12, -B35) and NDIS terminal (-NDI) are connected using the 4-gauge method (see below or next page). Use a resistance of 120 Ω for resistors R1 through R3, and connect a resistance to R4 equivalent to the Zero or Full value.
  To correctly calibrate the range, do so in the order Zero, then Full.

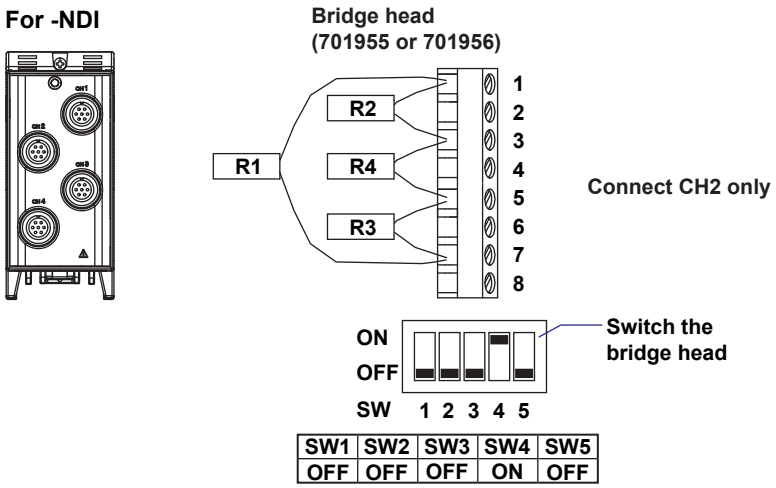
Calibration range	ZERO Resistors R4	FULL Resistor R4	Resistance value accuracy
ZERO	120.000 Ω	120.000 Ω	±0.005%, ±0.3 ppm/°C
2000 μSTR	120.000 Ω	117.154 Ω	±0.005%, ±0.3 ppm/°C
20000 μSTR	120.000 Ω	113.010 Ω	±0.005%, ±0.3 ppm/°C
200000 μSTR	120.000 Ω	80.000 Ω	±0.005%, ±0.3 ppm/°C

* The Full calibration value of the 2000 μStrain range is equivalent to 12000 μStrain
The Full calibration value of the 20000 μStrain range is equivalent to 30000 μStrain
The Full calibration value of the 200000 μStrain range is equivalent to 200000 μStrain

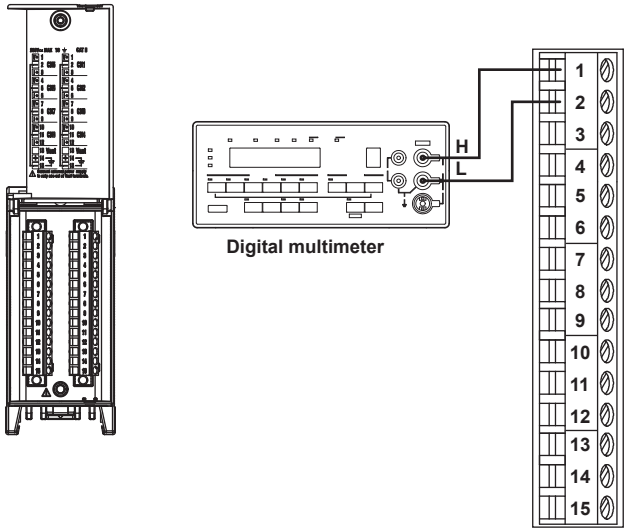
For -B12, -B35



No.1	No.2	No.3	No.4	No.5
OFF	OFF	OFF	OFF	ON



- When calibrating the output range of the 8-CH, Medium-Speed Analog Output module
  All eight channels are calibrated at Zero (0 V) and Full (10 V).



Calibration of Temperature Measurements using Thermocouples

Required Instruments

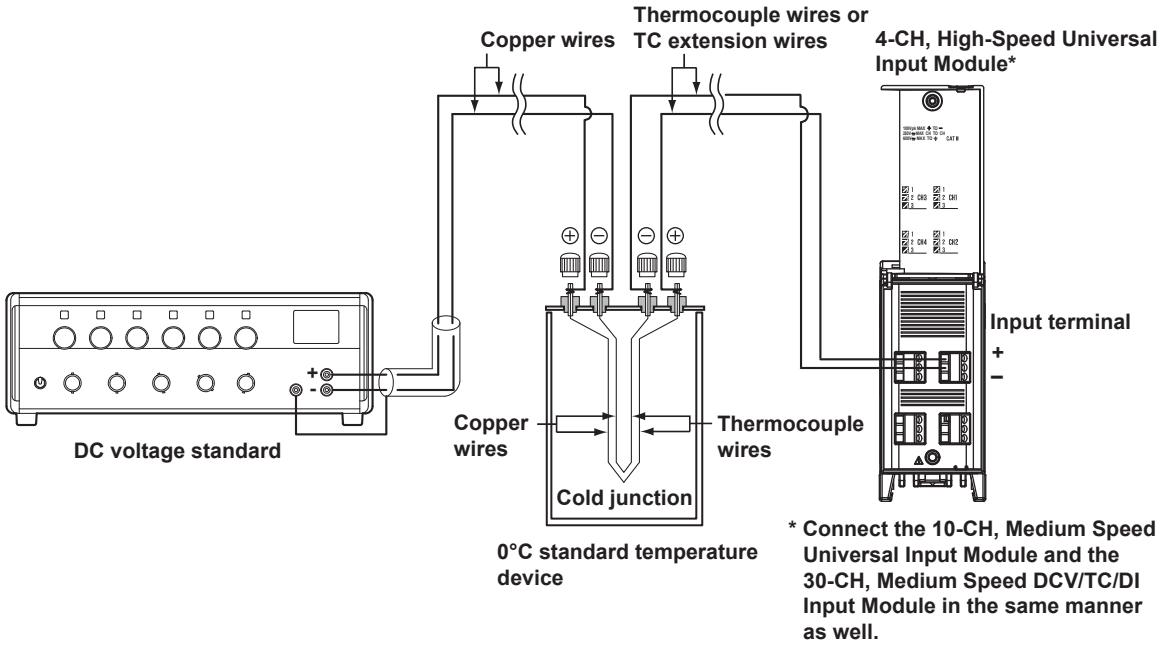
- DC Voltage/Current Standard
  Must meet the following specifications (5520A by FLUKE or equivalent):
  Output accuracy: ±(0.005%+1 μV) or less
- 0 °C reference temperature device
  Must meet the following specifications (ZC-114/ZA-10 by Coper Electronics or equivalent)
  Standard temperature stability accuracy: ±0.05°C or less

Reference Junction Compensation of Thermocouple Input

Normally, the input terminal of the input module is nearly at room temperature, therefore the actual thermocouple output differs from the value in the table for the thermoelectromotive force with the 0°C standard. Modules able to measure temperature with thermocouples can be compensated by measuring the temperature of the input terminal and adding the corresponding thermoelectromotive force to the actual thermocouple output. Therefore with the measurement terminal shorted (equivalent to an edge detection of 0°C), the measured value indicates the temperature of the input terminal.

When calibrating modules capable of temperature measurements using thermocouples, it is necessary to apply input from a DC standard voltage current generator with this compensation voltage subtracted (the electromotive force of the 0°C standard that is equivalent to the temperature of the input terminal). As in the figure, when performing reference junction compensation at 0°C using a 0°C standard temperature device, you can perform the calibration by inputting the 0°C standard electromotive force from DC standard voltage/current generator.

Wiring Diagram



Note

- Calibration of temperature measurements of the MW100 Data Acquisition Unit using thermocouples differs from calibration of DC voltage and RTD ranges in that the input cannot be adjusted. If the temperature measurement calibration using thermocouples does not meet the accuracy specifications, check thoroughly for input error and other problems, then contact your Yokogawa dealer or representative.
- If errors exist in the thermocouple wires and TC extension wires, correct calibration is not possible. Be sure to use a calibrated thermocouple.

4.5 Parts and Maintenance

This instrument does not have parts that need periodic replacement.
However the main module (model: MW100) has wearable parts listed below. Also, the aluminum electrolytic capacitors below are included with each input/output module.
There is no replacement service for the parts listed.
If you are to use the MW100 for an extended time, repair or replace the main module according to the service life of the parts and taking into consideration the actual usage conditions.

Part Name	Lifespan	Remarks
Lithium battery	Approx. 10 years	When used under standard operating conditions. One battery is used.
Aluminum electrolytic capacitor	Approx. 10 years	When used under standard operating conditions.

The main module and PWM output module have fuses. These fuses cannot be replaced by the user. If the fuse blows, contact your nearest YOKOGAWA dealer for repairs.

Installed Module	Rating
Main module AC power supply	Maximum rated voltage: 250 V; maximum rated current: 3.15 A Type: Timelag (T)
Main module DC power supply	Maximum rated voltage: 250 V; maximum rated current: 6.3 A Type: Timelag (T)
PWM module	Maximum rated voltage: 250 V; maximum rated current: 3.15 A Type: Timelag (T)

4.6 System Initialization

Perform this procedure to initialize the settings on the MW100. The following types of initialization are available.

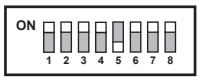
Initialization Type

Type	Level	Items Initialized
Initialization using dip switches	----	All settings
Initialization using communication commands	All	Setting other than configurated module information
	All except Comm.	Settings excluding the following items (IP address, host name, subnet mask, default gateway, DHCP parameters, DNS parameters, communication timeout parameters, login parameters, baud rate, parity bit, stop bit, data length, handshaking, and module recognition information)

Initialization Procedure

Using Dip Switches

1. Turn OFF the power to the MW100.
2. Check that the switch 5 of dip switch 1 on the main module is OFF.



3. Turn OFF the power to the MW100.
   After the 7-segment LED indicates the power ON self check, bF is displayed.
4. Check the status of step 3, then turn the power OFF.
5. Turn switch 5 of dip switch 1 ON.

Initialization using communication commands

Using a Browser

For information about initialization using communication command, see the MW100 Communication Command manual (IM MW100-17E).

1. From the top screen, click **System Settings** > **Module Information** under the **Top** item.
2. Select the initialization level from the **Initialization Level** box under System information.
3. Click the **Initialize** button. Initialization is performed.

▶ For a description of the operation screen for initialization, see section 3.3, “System Settings.”

4.7 Updating the System

You can upgrade the MW100 main unit firmware to the latest version. When you upgrade the version, you can use the upgraded firmware on the MW100.
Note that to add new functions by upgrading the style, you need to purchase the style upgrade kit.

CAUTION

- If you update the firmware, all settings such as the IP address and range settings are reset to factory default values. Saving the current settings to the CF card before updating the firmware makes it easy to reconfigure the MW100 after updating the firmware.
- The IP address, subnet mask, default gateway, host name, domain name, date, and time are not saved to the setup file. Take a note of the IP address, subnet mask, default gateway, host name, and domain name.
- Be sure to update both the firmware and Web software. Otherwise, the operation may become unstable.
- Depending on the firmware style (release number), it may also be necessary to upgrade the MW100 Viewer software. For details, visit our Website or contact your nearest Yokogawa dealer.

Update Preparation

Checking the Current Version

Check the current version of the MW100.

▶ For the procedure to check the version, see “Viewing and Initializing the System Information” in section 3.3.

Firmware and Web Software Preparation

1. A file for upgrading the version can be downloaded from our Web site.
   You must complete user registration at the URL given in the MW100 Data Acquisition Unit Operation Guide (IM MW100-02E) before downloading the version upgrade file.
2. Double-click the EXE file that you downloaded to decompress the file.
3. Save the two extracted files to the root directory on the CF card.
   The version upgrade files for style 3 are mw103m.lzh and web3_en.tar.
   Confirm that no other files having the same extension are saved on the CF card.

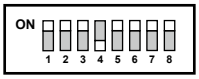
Updating Operation

Check that the MW100 is in Setting Mode before starting the operation.

▶ For a description of Setting Mode, see “Status Information and Processing” in section 3.3.

Updating the Firmware

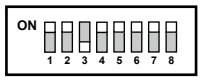
1. Turn OFF the MW100.
2. Insert the CF card containing the firmware in the MW100 CF card slot.
3. Turn OFF switch 4 of the MW100 dip switch 1.



4. Turn ON the MW100. The MW100 starts loading the firmware.
   If the 7-segment LED displays “90,” the loading operation is complete. If the LED does not display “90,” redo the procedure from “Firmware and Web Software Preparation.”
5. Turn OFF the MW100.
6. Turn ON switch 4 of the MW100 dip switch 1.
   To proceed with the updating of the Web software, skip step 7, and carry out the procedure from step 2 in “Updating the Web Software.”
7. Turn ON the MW100. The firmware is updated.

Updating the Web Software

1. Turn OFF the MW100.
2. Insert the CF card containing the Web software in the MW100 CF card slot.
3. Turn OFF switch 3 of the MW100 dip switch 1.



4. Turn ON the MW100. The MW100 starts loading the Web software.
   If the 7-segment LED displays “bc,” the loading operation is complete. If the LED does not display “bc,” redo the procedure from “Firmware and Web Software Preparation.”
5. Turn OFF the MW100.
6. Turn ON switch 3 of the MW100 dip switch 1.
7. Turn ON the MW100. The Web software is updated.

Update Confirmation

The MW100 settings are initialized after the update operation. If the latest firmware and Web software versions are displayed after specifying the network settings, the update operation is complete.

- For the procedure to check the version, see “Viewing and Initializing the System Information” in section 3.3.

Restoring the Settings

To restore the settings before the update operation, set the network, set the date/time, reconstruct the system, and load the setup file.

- For a description of the network settings, see section 3.2, “Communication Settings.”
- For a description of the date/time settings, see “Setting the Date and Time” in section 3.3.
- For a description of the system reconstruction, see “System Reconstruction” in section 3.3.
- For a description of the loading of the setup file, see “Saving and Loading Setup Data” in section 3.15.

Deleting Temporary Internet Files

When you update the MW100, the time information is initialized. In rare cases, the Setting or Monitor display of the browser may not display correctly. If this happens, delete the temporary internet files (cache) of the browser.

If Java Runtime by Sun Microsystems Is Used

When you update the MW100, the Setting or Monitor display of the browser will not display correctly. If you are using Java Runtime, clear the cache.

5.1 Common Specifications

Normal Operating Conditions

Rated power supply voltage:	AC power supply (with or without AC adapter): 100 to 240 VAC DC power supply: 12 to 28 VDC
Supply voltage range used:	AC power supply (with or without AC adapter): 100 to 250 VAC DC power supply: 10 to 32 VDC
Power supply frequency:	50 Hz ±2%, 60 Hz ±2%
Power consumption:	AC power, or DC power with AC adapter: Approx. 70 VA max. DC power supply: Approx. 35 VA max. * When any six I/O modules are installed
Vibration:	10 to 60 Hz 0.2m/s^2 or less
Shock:	Not allowed
Magnetic field:	400 A/m or less (50/60 Hz)
Position:	Position horizontally with feet down
Structure:	Not explosion-proof
Usage location:	Indoors
Operating altitude:	2,000 m or less
Overvoltage category:	II (per IEC61010-1 CSA22.2 No. 61010-1)
Measurement category:	II (per IEC61010-1 CSA22.2 No. 61010-1)
Pollution degree:	2 (per IEC61010-1 CSA22.2 No. 61010-1)

Transport and Storage Conditions

Environmental conditions during transport and storage:

Ambient storage temperature :	–25 to 70°C
Ambient storage humidity:	5% to 95% RH (no condensation)
Vibration:	10 to 60 Hz 4.9m/s^2 or less
Shock:	392 m/s^2 or less (packaged condition)

Mechanical Specifications (Excluding AC Adapter)

External dimensions:	Approx. 455 × 131 × 159 mm (when six slots are attached)
Weight:	Approx. 4.3 kg (maximum total weight)
Installation method:	Desktop or floor, panel mount, or attached to a DIN rail
Material:	Steel plate, aluminum die-cast, molded plastic resin

Standards Compliance

CSA:	CSA22.2 No 61010-1, overvoltage category II, measurement category II, pollution degree 2
UL:	Conforms to UL61010B-1 (CSA NRTL/C)
CE:	EMC directive; EN61326 Class A EN61000-3-2 EN61000-3-3 Low voltage directive; EN61010-1; overvoltage category II, measurement category II, pollution degree 2
C-Tick:	Conforms with AS/NZS CISPR11 Class A Group1
Overvoltage category II:	An index for defining transient overvoltages (includes the rated impulse withstand voltage, and applies to electrical equipment supplied with power from fixed installations such as a distribution board).
Pollution degree 2:	The degree of adherence by a solid, liquid, or vapor that reduces the withstand voltage or surface resistance factor (applies only to normal indoor atmospheres (with non-conductive pollution).
Measurement category II:	For measurements performed on circuits directly connected to the electrical distribution system such as provided by a wall outlet.

5.2 Main Module Specifications

Measurement

Style number: S3

Measurement range and accuracy:
See the measurement range and accuracy given in the specifications of each input module.

Maximum number of inputs:
60 inputs (however, only up to six modules can be controlled)

Measurement interval: Select from 10, 50, 100, 200, 500 ms, 1, 2, 5, 10, 20, 30, or 60 s.
Up to three intervals defined for the input modules can be set (multi-interval)
Also, the following limitations apply to the measurement interval and number of measurement channels.

Measurement Interval	Number of measurable channels
10 ms	10
10 ms and 50 ms mixed.	10
50 ms	30

Synchronization between modules:
Synchronized within the same sampling interval (in the same unit)

Synchronization between channels:
On the 4-CH, High-Speed Universal Input Module, the 10-CH, Pulse Input Module, and the 10-CH, High-Speed Digital Input Module: synchronized between channels.
On the 10-CH, Medium-Speed Universal Input Module, 30-CH, Medium Speed DCV/TC/DI Input Module, Six-Channel Medium-Speed Four-Wire RTD Resistance Input Module, and 4-CH, Medium-Speed Strain Input Module: not synchronized between channels due to the scanner type.

Filter function: First-Order Lag Filter
Applicable measurement types: For each channel of DC voltage, thermocouple, RTD, strain, pulse, and resistance you can select a time constant (time until 63.2% of the output value is reached) corresponding to the sampling interval indicated in the table below.
Time constant = measurement interval × N (where N = 5, 10, 20, 25, 40, 50, or 100)

Measurement Interval (s)	Selectable Time Constants (s)						
	N=5	N=10	N=20	N=25	N=40	N=50	N=100
0.01	0.05	0.1	0.2	0.25	0.4	0.5	1
0.05	0.25	0.5	1	1.25	2	2.5	5
0.1	0.5	1	2	2.5	4	5	10
0.2	1	2	4	5	8	10	20
0.5	2.5	5	10	12.5	20	25	50
1	5	10	20	25	40	50	100
2	10	20	40	50	80	100	200
5	25	50	100	125	200	250	500
10	50	100	200	250	400	500	1000
20	100	200	400	500	800	1000	2000
30	150	300	600	750	1200	1500	3000
60	300	600	1200	1500	2400	3000	6000

Measurement groups: Measurement channels can be divided into up to 3 groups by module. The measurement interval must be the same for all channels in the group.
Note that the equivalent of three modules worth of measurement group settings are entered for the 30-CH Medium Speed DCV/TC/DI Input Module. You cannot assign to different measurement groups or change the measurement interval. You must assign all three slots to the same measurement group.

MATH

Differential computation between channels:
Differential computation between arbitrary channels (DCV, TC, RTD, DI, strain, resistance, pulse)

Linear scaling: Scalable ranges: DCV, TC, RTD, DI, strain, resistance, pulse
Scaling range: –30000 to 30000
Scaling display range: –32000 to 32000
Decimal point position: Arbitrary
Units: Can be arbitrarily set using up to six characters

Linear scaling accuracy:
Linear scaling accuracy (digits)
= Measurement accuracy (digits) × expansion rate + 2 digits (rounded up to the decimal place)
Note that the expansion rate = scaling span (digits) / measurement span (digits)
(Ex.) Measuring range: 6 VDC (integral time of 16.67 ms or more)
Measurement span: 1.000 to 5.000 V,
Scaling span: For a setting of 0.000 to 2.000
The measuring accuracy for 5.000 V input is as follows according to the expression above.
± {(0.05% × 5.000 V + 2 digits) × (2000 / 4000) + 2 digits}
= ± {(0.0025 V + 2 digits) × 0.5 + 2 digits}
= ± 4.25
≈ 5 digits (rounded up to the decimal place)
Thus the measuring accuracy when scaling = ± 5 digits

MATH Function Specifications (/M1 Option)

The following MATH functions can be added with options.

Number of MATH channels: 60 (can also be used for communication input)
Number of channels for communication input: 240

Computation start/stop: Execution of computation starts and stops according to user commands (Start/Stop key, Event/Action function, or communication commands).
Note that computed data includes the data when computation started and stopped.

MATH interval: Specify one from among the measurement group numbers, and perform computation. However, measurement intervals of 10 ms or 50 ms cannot be specified.

Computation reset/clear: You can reset or clear the computed data via the Event/Action function, communication commands, or requests from operations in the monitor screen.

Group reset: Only the MATH channels set by group, up to seven groups, are reset by the Event/Action function. Can be executed using the Event/Action function.

Calculations: Basic math (+, –, ×, ÷, exponentiation)
Relational operators (>, ≥, =, ≤, <, ≠)
Logical operators (AND, OR, XOR, NOT)
Arithmetic operators (SQR, ABS, LOG, EXP)
TLOG computations (max, min, max-min, average, integration, pulse integration)
CLOG computations (max, min, max-min, average)
Conditional expressions ([EXPR1?EXPR2:EXPR3])

Order of precedence in expressions:
The order of precedence of operators is given below.

Type	Operator
(High order of precedence)	
Arithmetic, TLOG, and CLOG functions	ABS(), SQR(), LOG(), EXP(), TLOG.MAX(), TLOG.MIN(), TLOG.P-P(), TLOG.SUM(), TLOG.AVE(), TLOG.PSUM(), CLOG.MAX(), CLOG.MIN(), CLOG.P-P(), CLOG.AVE()
Conditional operation	[expression 1?expression 2:expression 3]
Power	**
Logical negation	NOT
Multiplication and division	*, /
Addition and subtraction	+, –
Relational computation	.GT., .LT., .GE., .LE.
Equal and not equal	.EQ., .NE.
Logical product	AND
Logical sum and exclusive logical sum	OR, XOR
(Low order of precedence)	

Calculation order: Performs calculation in ascending order by channel number.

Characters used in expressions:
Up to 120 per channel
For communication input channels only, a maximum of 8 characters can be used per channel. Four arithmetic operations and calculation constants can be written in addition to the communication input channel number.

Number of stacks: 35 or fewer per expression

Conditional expression: Other expressions can be nested in conditional expressions.
Conditional expressions can be nested together.
Operators cannot be used to combine conditional expressions.

MATH span: When displaying waveforms on the Web, set the upper and lower limit values.
The setting range is –9,999,999 to 99,999,999.

Decimal place setting: 0 to 4

Computation range: A given result during computation must be within ± 1.7 × 10^{308}.

Math output value: Data output by the computation (for binary output)

Data Type	Description
–9,999,999 to 99,999,999	Normal output range
2,147,450,879 (7FFF7FFFh)	Plus over
–2,147,385,343 (80018001h)	Minus over
–2,147,319,806 (80028002h)	Skip

* If the computation fails, the previous value is output.

MATH constants: 60
Precision: Mantissa, 5 digits; exponent, 2 digits
Range: –9.9999E+29 to –1.0000E-30,0,1.0000E-30 to 9.9999E+29

Reference channel: Measurement channel
MATH channels*
Communication input channels
Flag input channels
MATH constant
Program channels
* If an expression refers to its own channel or a channel of a larger number than its own channel, the data from the previous MATH interval is used.

Communication input channels: 300
Numerical values in expressions can be substituted using communication input.
Precision: Mantissa, 5 digits; exponent, 2 digits
Range: –9.9999E+29 to –1.0000E-30,0,1.0000E-30 to 9.9999E+29

Flag input channels: 60
Flag value can be substituted in computational expressions.
Range: 0, 1
Varies according to the operation of the Event/Action function.

Program channels: 3
Broken line data can be input into expressions.
You can set time since the start point (set in units of seconds) and the output values during that time using up to 32 points. Straight lines link those specified points, and values corresponding to the elapsed times are output.
No. of set points: 32
Elapsed time from start point: 0 to 86400 sec.
Start point time: Fixed at 0
Limitation on specification of elapsed time: Only 1 output value per specified time allowed
Output values: –30000 to 30000

Rolling average: Sampling interval:
1 to 6/10/12/15/20/30 s, 1 to 6/10/12/15/ 20/30 min, and 1 hour
Set the sampling interval to an integer multiple of the MATH interval. If it is not, the sampling interval is increased to an integer multiple of the MATH interval. If the sampling interval is shorter than the MATH interval, the sampling interval is set to the MATH interval.
Number of samples: 1 to 1500
When the number of samples is not reached:
Calculates the average using the available data.
When upper/lower limit is exceeded:
If the MATH data exceeds the upper or lower limit, the data is clipped at the upper or lower limit, and the rolling average is computed. The upper and lower limits are ±100000000. The decimal place is the same as that of the MATH span.
Resetting the rolling average:
The rolling average is reset when you execute the following operations. Clear the computed value, reset the computed value, reset the computed value of the MATH group, change the MATH channel, or change the channel setting of the rolling average.
Processing when dropouts occur in the computed data:
If a dropout occurs in the computed data while sampling, the rolling average is calculated using the next computed data.

MATH alarm function: Four levels per channel
Type: Upper limit, lower limit, delay high limit, and delay low limit.
No hysteresis function available.

Loss of computed data:
In the monitor screen, when the MATH performance meter exceeds 100%, some computations at each MATH interval cannot be completed, and loss of computed data occurs. When this happens, the previous computed value is held. If computation loss occurs frequently, lengthen the MATH interval to reduce the load. To stop computation promptly, press the Stop key on the main module.

When the volume of computations is high:
Display updating on the monitor screen, response to computation stop operations, and other behavior may be slow. To stop computation promptly, press the Stop key on the main module.

Operation after power failure:
If a power failure occurs during a computation, the value computed just before the power failure is recalled after recovery, and computation starts using that value.

Type	Value after power failure recovery
MATH channel data	Holds previous value
Communication input channel data	Holds previous value
Flag input channel data	Holds previous value
Program channel data	Holds elapsed time and previous value

RJC

With temperature measurement using thermocouples, the input terminal section is nearly at room temperature, therefore the actual thermocouple output differs from the value in the table for the thermoelectromotive force with the 0°C standard. Modules able to measure temperature with thermocouples can be compensated by measuring the temperature of the terminal and adding the corresponding thermoelectromotive force to the actual thermocouple output. For the compensation accuracy, see specifications of individual modules.

Internal RJC: Uses the reference junction compensation function of a module capable of measuring temperature with thermocouples.

External RJC: Uses an external reference junction compensation function. Set the RJC voltage to be added to the input.
Junction compensation setting range: –20000 to 20000 (μV)

Remote RJC: See “Remote RJC” in this section.

Remote RJC (RRJC)

When the item to be measured is located at a great distance, you can setup relay terminals near the item, measure between the relay terminal and the input terminal of the input module (reference channel) using thermocouples, and use the resultant value as the reference junction compensation of the temperature measurement. However, the same thermocouple type is used for reference channels and measured channels.

Alarms

Alarm types: Upper limit, lower limit, differential upper limit, differential lower limit, high limit on rate of change, low limit on rate of change, delay high limit, delay low limit

Number of settings: Four levels per channel
ON/OFF can be set for each channel and level

Alarm setting range: DC voltage, TC, RTD, DI, strain, pulse, resistance, linear scaling, differential between channels, remote RJC

Hysteresis: Alarm OFF value arbitrarily set

Number of alarm outputs:
10 to 60 outputs (10 points per DO module)

Output mode: Energize/De-energize, AND/OR, Hold/Non-hold

Alarm ACK: If set to hold using the alarm status or relay output Hold/Non-hold, the hold status is cleared.

Alarm output update interval:
100 ms (not synchronized with the measurement interval)

Delay alarm: Delay time:
1 to 3600 s, common setting for delay high and low limits.
Set the delay time to an integer multiple of the measurement or MATH interval. If it is not, the delay time is increased to an integer multiple of the measurement or MATH interval. If the delay time is shorter than the measurement or MATH interval, the delay time is set to the measurement or MATH interval.
Operation at power failure:
After the power supply recovers, the alarm detection behavior is reset, and new alarm detection is started.
Math start action:
The alarm detection behavior on the MATH channel is reset, and new alarm detection is started.

Reflash alarm: If multiple alarms are assigned to an output relay and the second alarm occurs while the first relay is activated, the relay is deactivated once and activated again.

Report Function Specifications (/M3 Option)

Report operations: Starts/stops creation of report data at the same time that measurement starts/stops. If recording is in progress at the report creation time, report data is saved to the CF card.
Report creation can be turned ON/OFF

Report types: Hourly, daily, weekly, or monthly

Report data channels: 60 max
Measurement and MATH channels can be selected. If a target channel is set to SKIP or OFF, report data is not created.

Report data types: Reports can be created using all maximum, minimum, average, integral, and instantaneous values from the specified channels.

Report data acquisition interval:
100 ms (shortest)

Report data values: Numerical range: –9999999 to 99999999 (excluding the decimal place)
Decimal place: Same as decimal place of the reference channel
Integratable range: 0.0001 to 1.000000E+16

Processing of special data:

You can select how to handle abnormal values maximum, minimum, integral, and average values.

You can select how to handle overflows for integral and average values.

* For details, see “Processing Reports with Abnormal Input Values or Overflow Values” in section 1.16.

Report file creation date/time:

You can set the date, day, or time of creation. The specified date/time will be the date/time at which report files are divided. The creation date/time for each report file is shown in the table.

Report File	Creation Date	Creation Day	Creation Time*3	Description
Daily file	– *1	– *1	0 to 23	Saves 1 day’s worth of hourly and daily reports.
Weekly file	– *1	Sun to Sat	0 to 23	Saves 1 week’s worth of daily and weekly reports.
Monthly file	1 to 28*2	– *1	0 to 23	Saves 1 month’s worth of daily and monthly reports.

*1 “–” indicates that the item is invalid.

*2 The creation date cannot be set to 29, 30, or 31.

*3 The creation time for weekly and monthly reports is the same as the creation time for the daily reports.

E-mail transmission: When an hourly, daily, weekly, or monthly report is created, creates a report and sends by e-mail.

You can set whether or not to send the e-mail

An e-mail can be sent when a report file is completed

FTP transfer (FTP client):

Files can be transferred using the FTP client function when report files are completed

Recorder Structure

Measured data, computed data, thinned data, manual sample data, report data, setting values, recording logs, and alarm summaries can be saved to the CF card.

Folder Structure

Folders for each file type are created on the CF card, and files are saved in them.

Folder types:

- Folder for storing data folders
- Data folder
- Folder for storing manual sample files
- Folder for storing report files
- Folder for storing settings files

Folder for storing data folders: DATA

Stores data folders.

Folder for storing manual sample files: MANUAL

Folder and file names cannot be specified

Folder for storing report files: REPORT

Folder and file names cannot be specified

Folder for storing settings files: CONFIG

Folder names cannot be specified

Data folder: Depends on the data folder name setting
If the data folder creation method is Auto, the folder number management file MWFOLDER.INF is created in the DATA folder. The file contains the latest folder numbers (nnnn), and should not be deleted. When a DATA folder is deleted, a new folder is created starting with 0000.
Folder for storing measured data, computed data, thinned data, recording logs, and alarm summary files.

Data folder names: Names are created with one of four methods: Auto (automatic), Partial (partially specified), Free (arbitrary string), or Date (date/time).

Auto: DATA + nnnn
DATA is fixed
nnnn is automatically generated from 0000 to 9999

Partial: Any 4 alphanumeric characters + nnnn, where nnnn = 0000 to 9999
You can specify a start number. The number is automatically incremented.
If 1 to 3 characters are used, all spaces are filled in to the left. If 5 characters or more are specified, they are not reflected in the folder name.
If the folder name already exists, the existing folder is used.

Free: Any 8 alphanumeric characters
If the folder name already exists, the existing folder is used.

Date: Date/time + n, where n = 0 to 9, A to Z
The date/time portion is in the format mddhhmm
The date/time is the local time when the folder is created.

m:	month	1 to 9, X (October), Y (November), Z (December)
dd:	day	1 to 31
hh:	hour	00 to 23
mm:	minute	00 to 59

Capacity of the CF card

Capacity needed for storage:

The recording starts only if sufficient free space for saving the data is available on the CF card. The required free space is a total of the following sizes.

- Space for storing the measured, computed, and thinned data.
  One file size for Single and FullStop
  Twice the one file size for Rotate
- Capacity of recording logs, alarm summaries, manual sample files, reports, and other files
  Approximately 5 MB

Recording of Measured/Computed Values

Measured and computed data can be saved by measurement group to the CF card.

Supported external media:

CF card Type I × 1 slot (Type I can be used)
Max. card size: 2 GB
Supported file systems: FAT12 and FAT16

Record start/stop: Starts and stops recording to CF card per the START and STOP keys, Event/Action function, communication commands, or monitor screen operation.

Recording action: Separate files created for each measurement group, and measured and computed data are recorded on the CF card.
For each measurement group, you can select whether or not to perform the save operation.

Recording stop action: Single, Full Stop, Rotate

- Single: Creates a single file of a specified size on the CF card and stops the recording.
- Fullstop: Creates files of a specified size until the CF card is full and stops the recording.
- Rotate: Creates files of a specified size until the CF card is full and continues the recording by deleting the oldest file in the folder.

The recording stop action can be specified for each interval group.
If free space cannot be secured or when securing of free space takes extended time, an error is indicated on the 7-segment LED. For details, see chapter 4.1, “Media Related Errors.”

Trigger (recording start action):

OFF, Direct, and Trigger

- Direct: Starts recording when recording start is executed.
- Trigger: Enters the trigger wait mode when recording start is executed. Recording starts when an event occurs.

The recording start action can be specified for each interval group.

Pretrigger function: The pretrigger when the recording start action is set to Trigger can be set for each interval group from 0 to 100% in 10% intervals.

Pretrigger length: When there are fewer than ten data, the pretrigger length is rounded up.
When there are ten or more data, the pretrigger length is rounded down.

Ex.) Recording interval 600 second, data length 1 hour, pritrigger 30 %
Number of data in a file: 1 hour / 600 s = 6
Pritrigger length = 6 × 30 / 100 = 1.8 about 2 files
Posttriger length = 6 - 2 = 4

Recording channels: You can select to record or not record for each channel. However, the number of recording channels is limited as follows:

No. of recording channels per unit of time:

1500 ch/s (when not using the report or manual sample function)
1200 ch/s (when using the report or manual sample function)

Ex.) Measurement group 1 Recording interval 10 ms, 10 ch
Measurement group 2 Recording interval 100 ms, 50 ch
(1 s / 0.01 s) × 10 ch + (1 s / 0.1 s) × 50 ch = 1500 ch/s.

Recording interval: Set the recording interval for each measurement group as a multiple of the measurement interval.
For a measurement interval of 50 ms, 500 ms, or 5 s, set a multiple of 1, 2, 4, or 10.
For other measurement intervals, set a multiple of 1, 2, 5, or 10.
Otherwise, set a multiple of 1, 2, 5, or 10.

File name: Automatically generated using the date and serial number
mddinnnn.MXD
- m: Month file created (local time), 1 to 9, X (October), Y (November), Z (December)
- dd: Date when file created (local time), 1 to 31
- i: Files for measurement groups 1 to 3 are 1 to 3
  Computed data files are M
  Thinned data files are T
- nnnn: Serial number (0000 to 9999)
- MXD: File extension (uppercase)

Data length: Measurement groups for which TRIGGER was selected can be set individually.
For the measurement groups on which Direct mode was selected, all groups have the same length.

Trigger Type	Selectable data length	Target
Direct	30 min.	All groups
	1, 2, 3, 4, 6, 8, or 12 hours	
	1, 2, 3, 5, 7, 10, 14, or 31 days	
Trigger	10, 20, or 30 min.	Individual groups
	1, 2, 3, 4, 6, 8, or 12 hours	
	1, 2, 3, 5, 7, or 10 days	

File size: Within approximately 10 Mbyte per file

File size calculation: File size (bytes) = header size[*1] + data size[*2]

*1 Header size (bytes) = Fixed length of 1448 + no. of recording channels × 232

*2 Measurement data size (bytes) = no. of recording measurement channels × 4 × no. of samples
Math data size (bytes) = no. of recording math channels × 6 × no. of samples
No. of samples = Data length (s)/recording interval (s)

Ex.) Recording interval: 100 ms; no. of measurement channels, 24; data length, 10 min.:
Header size = 1448 (bytes) + 24 × 232 (bytes) = 7016 (bytes)
Data size = 24 × 4 (bytes) × (600 (s)/0.1 (s)) = 576,000 (bytes)
File size = 7016 + 576000 = 583016 (byte)
≈ 569 (KB)

Guideline of the sample time for the different CF card sizes (when one type of recording interval is used):

Number of Saved CHs	Recording Interval	Capacity of the CF card		
		128 MB	512MB	1 GB
10 CHs	10 ms	8.8 hours	35.3 hours	2.8 days
	100 ms	3.7 days	14.8 days	28.9 days
	500 ms	18.5 days	74 days	144 days
	1 s	37 days	148 days	289 days
	2 s	74 days	296 days	578 days
24 CHs	100 ms	36.8 hours	6.1 days	12.0 days
	500 ms	7.7 days	30 days	60 days
	1 s	15.3 days	61 days	119 days
	2 s	30 days	122 days	239 days
60 CHs	100 ms	14.8 hours	2.4 days	4.8 days
	500 ms	3.0 days	12.3 days	24.1 days
	1 s	6.1 days	24.6 days	48 days
	2 s	12.3 days	49 days	96 days
	5 s	31 days	123 days	241 days

File division: You can use the Event/Action function, status screen operations, or communication commands to divide files at an arbitrary timing. Valid when the recording start action is Direct and recording stop action is Fullstop or Rotate.

File message: The maximum number of characters that can be specified is 120. The file message can be viewed when the file information is displayed on the MW100 Viewer Software.

Write message: During execution of the recording action, a message that corresponds to the recorded data can be included in the file.
No. of characters in message: Up to 15
Messages: 6 (messages 1 to 5, and Free)
No. of write operations: Up to 30 per file

Operation upon failure recovery:
If a power failure occurs during recording, the data up to the failure is restored upon recovery from the failure. The data after recovery is recorded continuously to newly created files.

Operation when synchronizing time:
If time synchronization to SNTP is carried out during recording, the time is saved to the recording log file.

Thinning Recording Function

Apart from the measured and computed data file, a set of thinned data from the measured and computed values are saved to CF card.

Record start/stop: Executed simultaneously with the start/stop of the recording of measured and computed values. No trigger functions are available. User can select Thinning record or Do not record

Recording stop action: Select a record stop action of Single, Full stop, or Rotate.
See recording stop action in “Recording of Measured/Computed Values”

Thinning time: Data saving is set for 1 per thinning time.
Set a thinning time of: 4, 5, 10, 20, or 30 sec; 1, 2, 3, 4, 5, 10, 20, or 30 min.; or 1 hour. However, the thinning time cannot be set shorter than the measurement interval.

Recording channels: Can be specified for each channel (settings for recording of measured and computed values is set separately)

File name: Generated automatically in sequence using the date and serial number (cannot be specified by the user).
See the file names in “Recording Measured/Computed Values."

Data length: Select 30 minutes, or 1, 2, 3, 4, 6, 8, or 12 hours, or 1, 2, 3, 5, 7, 10, 14, or 31 days. However, it cannot be set so that the file size could exceed 10 Mbyte. Also, the data length cannot be set shorter than the thinning time.

File size: Within approximately 10 Mbyte per file

File size calculation: Same as that for the computed data files.

File division: You can use the Event/Action function, status screen operations, or communication commands to divide files at an arbitrary timing. Valid when the recording stop action is Fullstop or Rotate.

File message: The maximum number of characters that can be specified is 120. The file message can be viewed when the file information is displayed on the MW100 Viewer Software.

Writing message: During execution of the recording action, a message that corresponds to the recorded data can be included in the file. Six messages of up to 15 characters each are available for including in a single file, up to 30 messages per file.

Operation upon failure recovery:

If a power failure occurs during recording, the data up to the failure is restored after appended during recovery from the failure. The data after recovery is recorded continuously to newly created files.

Manual Sample Recording Function

Manual sample operation:

- When Manual Sample is executed using an Event/Action, communication command, or status screen operation, the latest measured or computed values are saved to the CF card. If a manual sample operation is executed while writing to a manual sample file is in progress, the operation is ignored. Also, the manual sample file is divided when Manual Divide is executed.
- After manual sample data is recorded in backup memory (SRAM), it is saved to the manual sample file. If the CF card runs out of free space, data is recorded in the SRAM until space becomes available on the card, at which point it is saved to the file. The number of times samples can be saved to SRAM = 2048 ÷ (no. of channels + 3). If that number of times is exceeded, samples are overwritten (and deleted).
- The free space required on the CF card to save the manual sample file = total file size of measured/computed/thinned files (times 2 when Rotate is set) + 512 KB.
- When the recording action is Rotate and old files are deleted to create new files, (when there is no free space on the CF card), the manual sample file cannot be saved.

Special data values: When measured or computed data is special data, the manual sample data is as shown below in the table.

Measured/ Computed Data	Manual Sample Data	Notes
+OVER	Measured data: 99999	Decimal place depends on the setting
	Computed data: 99999999	
–OVER	Measured data: –99999	
	Computed data: –9999999	
INVALID, ILLEGAL	Blank	Measured values only

Number of samples: 100 samples/file

Sample channels: Can be specified for each channel

Data format: Tab delimited text

File name: Automatically generated using the date and serial number (the date is the file create date)

mddSnnnn.DAM

m: Month file created (local time), 1 to 9, X (October), Y (November), Z (December)

dd: Date when file created (local time), 01 to 31

S: Fixed character

nnnn: Serial number (0000 to 9999)

DAM: Manual sample file extension (uppercase)

Maximum file size: Approximately 360 KB/file (max)

Report Recording Function (/M3 Option)

Record start/stop operation: Executed simultaneously upon recording start/stop of measured and computed values. No trigger function available.

Report data: Creates daily, weekly, and monthly data. The creation time for daily, weekly, and monthly reports is the same as the daily report file creation time.

Report recording channels:
Can be specified for each channel (up to 60 channels).

Data format: Tab delimited text

File name: Automatically generated using the date and serial number (the date is the file create date)
jyymmddn.DAR
- j: D (daily), W (weekly), M (monthly)
- yy: Year when file created (local time), last 2 digits of Western calendar
- mm: Month when file created (local time), 01 to 12
- dd: Date when file created (local time), 01 to 31
- n: Serial number (0 to 9, A to Z)
- DAR: Report file extension (uppercase)

Maximum file size: Approximately 135 KB/file (max)

Saving Settings

Saves settings to CF card.

Saving/loading: Set by user function key on the main unit, browser, or by communication command. From the user function key, only the SETTING.PNL file can be saved and loaded.

Settings that can be saved:
All settings are saved

Saved items:
- Channel: Input range, output range, expression, calculation constant, MATH group, alarm, delay alarm, rolling average, filter and TC, strain input, relay, program channels, measurement operation, computation operation, output operation, and tag settings.
- Recording: Recording channel, recording operation, thinning recording operation, save option, file message, and data save folder settings
- Communication: User, serial communication, IP address*, server, Modbus client 1 to 3, Modbus master 1 and 2, DNS client, FTP client, mail client 1 to 3, and time synchronization client settings.
  * The DNS and IP address information can be saved, but the information is not loaded.
- Others: Event action, timer, match time, report, other (system), Daylight Savings Time, color, graph scale, trip line, message, display group, and other (display) settings.

File creation location: CONFIG folder on the CF card

Created file name: From the user function keys, SETTING.PNL.
An arbitrary file name can be set with the PNL extension from communication commands or the browser. The maximum number of characters for the file name is 8 excluding the extension.

Internal Backup Memory

Function overview: Using the main unit's internal backup memory (SRAM) even upon a power failure, data before the failure is saved to CF card without loss.

Backup memory capacity: For measured and computed data 1.25 Mbyte
For thinned data 256 Kbyte
For manual sample data 8 Kbyte
For report data 48 Kbyte

Display

Status LED Illuminated: Indicates measuring, recording, alarm occurrence, computing, and receiving data by serial communications
Blinking: Processing recording stop, processing MATH stop

Two-digit 7-segment LED:
MW100 Data Acquisition Unit status display
Unit number, error occurrence time, power ON self-check in progress, key lock ON, processing.

Ethernet port LED: Ethernet communication status (LINK, ACT)

Communication

Ethernet Port

Interface: Ethernet 10BASE-T/100BASE-TX
The data rate can be fixed to 10 Mbps half duplex by turning switch 6 of dip switch 1 OFF.

Connector type: RJ-45

Main protocols: FTP, SMTP, SNTP, DHCP, DNS, HTTP, Modbus/TCP, and MW100 dedicated protocol.

Communication services: Send/receive measured and computed values, send/receive setting values, maintenance/diagnostic services, and others.

Login function: Use when accessing a setting/measurement server, maintenance/diagnostic server, FTP server, or HTTP server. Up to 10 can be registered.

List of services: The port number of each server is the default number.

Server Type	Application	Port Number	Number of Simultaneous Connections
Modbus server	For the Modbus protocol	502	4
FTP server	File transfer service	21	4
HTTP server	Web service	80	Infinity
SNTP server	Adjust the time	123	Infinity
GENE server	For MW100-specific communication commands	34318	4
DIAG server	For MW100 maintenance	34317	1

Keep alive function: If no response is made to periodically sent test packets on the TCP level, the connection is forcibly closed.
The connection is checked every 30 s. If there is no response, the connection is checked four times at 5-s intervals. If no response is received, the connection is disconnected.

Timeout function: Connection to server from which no communication is made over a specified period is forcibly dropped.

Server Type	Timeout Value
Modbus server	30 s
FTP server	10 minutes
HTTP server	2 minutes
GENE server*	1 to 120 minutes. Set in unit of 1 minute.
DIAG server	10 minutes

* You can select whether to use the timeout function for the GENE server.

DHCP function: The IP address is automatically obtained from the DHCP server

SNTP function: Client function:

Acquires time information from the apecified SNTP server when the power is turned on, upon start of measurement, when the SNTP client is turned ON, at a user-specified time, and at a specified time interval.

When time information is acquired upon startup, measurement start, and when the SNTP client is turned ON, the time is not applied if the difference between the time of the MW100 and the server is 1 hour or more. When the time is acquired at specified time intervals, the MW100 time is corrected by 1 second at 10 second intervals. This is effective when the shortest measurement interval within a unit is two seconds or more. However, if the time between the server and MW100 is different by 10 minutes or more, the time is not applied.

Server function:

Provides time information to the MW100 connected to the network.

E-Mail function: Sends e-mail according to timing of: alarm activation/release, specified time intervals, file creation time, time at which free memory space drops below specified amount, time power turned ON, when specified errors occur, when reports are created, and other events.

Recipients: Two mail recipient locations can be set

Number of characters: Multiple addresses using up to 150 characters

FTP function: Client function:

Measured data, computed data, thinned data, manual sample data, report data files, recording logs, and alarm summaries that are saved to CF card can be sent.

Recipient:	Primary and secondary
Number of characters:	Up to 64 characters
Transmission time:	When the file is created
Transmission time shift:	You can delay the transmission timing by a specified time.

- Specified as 0 to 120 minutes, in 1-minute increments
- The duration of the transmission time shift cannot be set shorter than the recording data length. The maximum number of files on which the transmission time shift function can be used simultaneously is 24.

The files are sent to the primary recipient first, and if transmission fails, they are sent to the secondary recipient. If transmission to the secondary recipient also fails, the file is held in memory (up to 24 files that failed to be sent are held) and transmission is retried after the next file is created or when the power is turned on (assuming there are files in the CF card). File retransmission is cancelled if the FTP client function is turned OFF.

Server function:

Transfer or delete files according to commands from a PC.

HTTP function: Enables entry of settings on the MW100, starting and stopping of measurement, computation, and recording, and real time monitoring of measured and computed values using a Web browser, as well as acquisition of CF card files using WebDAV.

RS-232 Interface (/C2 Option)

Connection method: Point-to-point
Communications: Full-duplex
Synchronization: Start-stop synchronization
Baud rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 bits
Start bit: 1 bit, fixed
Data length: Select either 7 or 8 bits
Parity: Select even, odd, or none.
Stop bit: Select either 1 or 2 bits
Hardware handshaking: RS-CS can be used
Software handshaking: X-ON, X-OFF can be used
Receive buffer length: 2047Byte
Protocol: Dedicated protocol and Modbus/RTU
Communication services: Send/receive setting values, send/receive measured and computed values.

RS-422A/485 Interface (/C3 Option)

Connection method: Multi-drop: 4-wire 1: 32, 2-wire 1: 31
Communications: Half-duplex
Synchronization: Start-stop synchronization
Baud rate: Select 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 bps
Start bit: 1 bit, fixed
Data length: Select either 7 or 8 bits
Parity: Select even, odd, or none.
Stop bit: Select either 1 or 2 bits
Receive buffer length: 2047Byte
Protocol: Dedicated protocol and Modbus/RTU
Communication services: Send/receive setting values, send/receive measured and computed values.

Communication Input Function

All settings on the main unit other than dip switch operation can be performed with communication commands. For information about communication commands, see the MW100 Communication Command manual (IM MW100-17E).

Communication Output Function

The following information about the main unit can be output using communication commands. For information about communication commands, see the MW100 Communication Command manual (IM MW100-17E).

Item	Description
Measured value	Outputs most recent measured value
Computed value	Outputs most recent computed value
Output value	Outputs most recent output value
Units, decimal place	Outputs the units and decimal place for measured and computed values
Measured and computed value FIFO data	Outputs the measured and computed values from the FIFO buffer
Thinned values FIFO data	Outputs the thinned values from the FIFO buffer
Alarm summary	Outputs the alarm summary
Message summary	Outputs the message summary
Recording log	Outputs the recording log
Computation status	Outputs the MATH status
Recording status	Outputs the recording status
Operation log	Outputs the key operation log
Communication log	Outputs the communication log
FTP log	Outputs the FTP operation log
SMTP client log	Outputs the mail transmission log
DHCP log	Outputs the DHCP log
HTTP log	Outputs the HTTP log
Modbus client log	Outputs the Modbus client log
Modbus client command	Outputs the Modbus client status
Modbus client connection status	Outputs the Modbus client connection status
Modbus master log	Outputs the Modbus master log
Modbus master command	Outputs the Modbus client status
Modbus master connection status	Outputs the Modbus master connection status
Status	Status byte information
User information	User settings
Relay information	Relay action information
System information	Outputs the module recognition status
Analog output information	Outputs the analog output value information
Initial balancing information	Outputs initial balance information for the strain input module

Communication Test

This function checks whether the FTP and mail transmission settings are entered correctly.

Notation	Description
FTP1	Transfers a test file to recipient 1.
FTP2	Transfers a test file to recipient 2.
SMTP1	Transfers a test mail to recipient 1.
SMTP2	Transfers a test mail to recipient 2.

Modbus Protocol Specifications

Common to Modbus Master Function and Modbus Slave Function

Communication possible in RTU mode of the Modbus protocol

Communication media: RS-232, RS-422A/485

Control method: No flow control (None only)

Baud rate: Select 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 bps

Start bit: 1 bit, fixed

Data length: 8 bit, fixed

Parity: Select Odd, Even, or None

Stop bit: Select either 1 or 2 bits

Transmission mode: RTU (remote terminal unit) mode only

Slave address: 1 to 247 (slave address only)

Modbus Master Function (/M1 option)

Communication interval: The interval for reading and writing data to and from other instruments is selected from the following.
100, 200, 250, 500 ms, or 1, 2, 5, 10, 20, 30, 40, 50, 60, 90, 120 s
Depending on the performance of the main unit, if data reading and writing is not possible at the set communication interval, data loss results. If this occurs, the previous value is held for the communication input channel data. In this case, you must lengthen the communication interval, or reduce the load on the main unit.

Timeout time: From the following, select a timeout time for no response from the specified slave after sending commands from the main unit.
100, 200, 250, 500 ms, or 1 s

Number of retries: The number of transmissions attempted if no response to commands from the main unit are received from the slaves.
Select from the following: OFF, 1, 2, 3, 4, or 5

Communication recovery time: You can select from the following the send interval for the command sent after the point at which there is no response from the slaves after sending commands the specified number of retry times.
1 to 120 s

Wait between commands: Select a time to wait between receiving of the response to a command until the next command is sent.
Off, 0, 10, 20, 50, 100 ms

Supported functions: The functions that the MW100 supports are as follows.

Function Code	Function	Operation
3	Read hold registers (4XXXX, 4XXXXX)	MW100 loads data from the hold registers of another instrument to its communication input channel data.
4	Read input registers (3XXXX, 3XXXXX)	MW100 writes data from the input register of another instrument to its communication input channel data.
6	Simple write to hold registers (4XXXX, 4XXXXX)	MW100 writes to the hold register of another instrument.
16	Write to hold registers (4XXXX,4XXXXX)	MW100 writes to the hold register of another instrument

Command settings: Up to 100 commands can be set.

Command items:

Loading channels:	C001 toC300
Writing channels:	001 to 060, A001 to A300, C001 to C300
Address:	1 to 247
Input registers:	30001 to 39999, 300001 to 365535
Hold registers:	40001 to 49999, 400001 to 465535

Type:

Type	Description
Int 16	Signed 16-bit integer
Uint 16	Unsigned 16-bit integer
Int 32 - Big	Signed 32-bit integer (from upper to lower.)
Int 32 - Little	Signed 32-bit integer (from lower to upper.)
Uint 32 - Big	Unsigned 32-bit integer (from upper to lower.)
Uint 32 - Little	Unsigned 32-bit integer (from lower to upper)
Float - Big	32-bit floating decimal (from upper to lower.)
Float - Little	32-bit floating decimal (from lower to upper)

If the type is Int 16 or Uint 16, the maximum number of channels that can be specified for read/write channels is 127. For other types, the maximum is 63.

Modbus Slave Function

Supported function: The functions that the MW100 supports are as follows.

Function Code	Function	Operation
3	Read hold registers (4XXXX)	MW100 read communication input data 16 written by function code 6 or 16
4	Read Input registers (3XXXX)	MW100 reads the main instrument's measured, computed, and time data.
6	Simple write to hold registers (4XXXX)	MW100 writes to the main instrumentls communication input data.
8	Loop back test	MW100 performs the loop back test on the main instrument. Main instrument only support message return (diagnostic code (0x00).
16	Write to hold registers (4XXXX)	MW100 writes to the main instrument's communication input data.

Register Assign (Modbus Server Functions and Sharing)

Input Registers	Data	Data Type
30001	Lower byte of measured data of measurement channel 001	Int 32
30002	Upper byte of measured data of measurement channel 001	
|	|	
30119	Lower byte of measured data from measurement channel 060	
30120	Upper byte of measured data from measurement channel 060	
• No decimal place information.		
31001	Lower byte of measured data from measurement channel 001	Float
31002	Upper byte of measured data from measurement channel 001	
|	|	
31119	Lower byte of measured data from measurement channel 060	
31120	Upper byte of measured data from measurement channel 060	
• Includes decimal place information.		
32001	Alarm status of measured data of measurement channel 001	Bit string
|	|	
32060	Alarm status of measured data of measurement channel 060	

• Register structure and alarm status values

Alarm	2	1	4	3
	4 bits	4 bits	4 bits	4 bits

0: No alarms
1: Upper limit alarm occurs
2: Lower limit alarm occurs
3: Differential upper limit alarm occurs
4: Differential lower limit alarm occurs
5: Rate of change upper limit alarm occurs
6: Rate of change lower limit alarm occurs
7: Delay high limit alarm occurs
8: Delay low limit alarm occurs

Input Registers	Data	Data Type
33001	Lower byte of computed data of computation channel A001	Int 32
33002	Upper byte of computed data of computation channel A001	
|	|	
33599	Lower byte of computed data of computation channel A300	
33600	Upper byte of computed data of computation channel A300	
	• No decimal place information.	
34001	Lower byte of computed data of computation channel A001	Float
34002	Upper byte of computed data of computation channel A001	
|	|	
34599	Lower byte of computed data of computation channel A300	
34600	Upper byte of computed data of computation channel A300	
	• Includes decimal place information.	
35001	Alarm status of computed data of computation channel A001	Bit string
|	|	
35300	Alarm status of computed data of computation channel A300	
	• Register structure and alarm status value: Same as alarm status of measured data.	
39001	Year	Int 16
39002	Month	
39003	Day	
39004	Hours	
39005	Minute	
39006	Second	
39007	Milliseconds	
39008	DST(0, 1)	

Hold Registers	Data	Data Type
40001	Lower byte of communication input channel C001	Float
40002	Upper byte of communication input channel C001	
|	|	
40599	Lower byte of communication input channel C300	
40600	Upper byte of communication input channel C300	

Modbus error response: The main unit returns the following error codes to the master instrument.

Code	Function	Operation
1	Function code invalid	Requested non-supported function
2	Invalid register number	Attempted to read/write registers for which no corresponding channels could be found.
3	Invalid number of registers	The specified number of registers was zero.
7	Could not be executed	Attempted to read MATH registers from an instrument without the MATH function option.

However, there is no response in the following cases.
- CRC Error
- Errors other than in above table.

Modbus Client Function (/M1 option)

Communication possible with Modbus/TCP protocol

Communication media: Ethernet 10BASE-T/100BASE-TX

Communication interval: You can select the following:
100, 200, 250, or 500 ms, or 1, 2, 5, or 10 s
Depending on the performance of the main unit, data reading and writing may not be able to be performed at the set communication interval resulting in data loss. If this occurs, the communication input channel holds the previous value. In this case, you must lengthen the communication interval, or reduce the load on the main unit.

Connection wait time: The connection can be dropped if there is no response from the server after sending commands.
You can select the connection wait time from the following.
Forever (do not drop connection), 0 to 10 s

Communication recovery wait: The time after which commands are sent following disconnection after the connection wait time. Selected from the following: Soon (communication interval), 1-60 s

Connection destination (server): Up to 10 can be set.

Supported function: Same as Modbus master function

Command settings: Up to 100 commands can be set.

Command items: Loading channels: C001 to C300
Writing channels: 001 to 060, A001 to A300, C001 to C300
Server (specified by registered number): 1 to 10
Input registers: Same as Modbus master function
Hold registers: Same as Modbus master function
Type: Same as Modbus master function
If the type is Int 16 or Uint 16, the maximum number of channels that can be specified for read/write channels is 127. For other types, the maximum is 63.

Modbus Server Function

Communication possible with Modbus/TCP protocol

Communication media: Ethernet 10BASE-T/100BASE-TX

Port: 502/tcp

Maximum no. of simultaneous connections: 4

Receive timeout: Drops communication connection if packets not received for 30 s (fixed) or more

Supported function: Same as Modbus slave function. However, there is no function code 8 (loopback test).

Register assignments: Same as Modbus slave function

Modbus error response: Same as Modbus slave function

Event Action

By linking the Event function and Action function, you can control the operations of the main unit.

Number of settings: 30

Event function: Digital input information, alarm occurrence, relay action, internal timer time up, match time, user function key, and recording start. A relay action caused by the reflash alarm also operates as an event.

Action function: Recording start/stop, activate trigger, computation start/stop/reset/clear/group reset, reset timer, alarm ACK, flag input, write message, divide file (measurement/computation/thinning daia file, read/write settings, perform manual sample, divide manual sample file
Read/write setting value file can be performed with user function key.

Event detection: Edge: Execute an operation once according to changes in events
Level: Continue operation as long as the condition continues.
MATH operation start, recording operation start, flag input enabled
The same start function cannot be set to edge start or multiple settings simultaneously. When setting the start operation to time up on the timer, match time, or user function key, then computation start/stop, recording start/stop, and flag input 0/1 repeat alternately.

Execution sequence: Execute from Event/Action setting number 1.
The action that is performed is of the last event that is executed.

Timer and Match Time

Internal Timer

No. of timers: 6

Types of timers: Two; Relative timer and Absolute timer

Relative time timer: Repeats time up every specified time interval.
Time interval can be set in 1-minute intervals.
Setting range is 00 days 00 hours 01 min. to 31 days 23 hours 59 minutes. If the setting of the relative timer is changed or in the event of a power failure, the timer is reset to 0 and starts again. If the clock is changed, the timer time is not adjusted.

Absolute time timer: Using the specified reference time as a standard, repeats the time up every specified time interval.
Reference time set in one-minute intervals in the range of 00 hours 00 min. to 23 hours 59 minutes.
Time intervals: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 min, 1, 2, 3, 4, 6, 8, 12, 24 h. When the power fails or the clock is changed and the timeup time is exceeded, the time up is not acknowledged.

Match Time

No. of match times: 3

Match time function: Time up occurs: every month on the specified day, every week on the specified time; or every day at the specified time.
The setting is set in 1-minute intervals. When the power fails or the clock is changed and the timeup time is exceeded, the time up is not acknowledged.

User Interface

Number of keys: 4: Start key (START) and Stop key (STOP),
User function key 1 (USER1),
User function key 2 (USER2),

Key action:
- START: Measurement, computation, and recording start
- STOP: Measurement, computation, and recording stop, and saving of data acquisition logs and alarm summaries
- USER1: Write setting values file (default)
- USER2: Load setting file (default)

User function keys: Keys can be assigned arbitrarily by the user with the Event/Action function.

Key lock function: All keys can be enabled or disabled at once.

Dip switch 1: Operation upon power ON determined by dip switch settings.
All switches ON: Normal operation
Switch 5 (only) OFF: All settings initialized
Switch 6 (only) OFF: Fixed to 10-Mbps half-duplex Ethernet communication
Switch 8 (only) OFF: Fixed IP address (192.168.0.10)
Switch 4 (only) OFF: Load the firmware
Switch 3 (only) OFF: Load the Web software

Other Functions

Time

Time function: Time settings consist of date, time, and time zone.
Backup function included.
Year designation: Last two digits of Western calendar
80 to 99 (1980-1999), 00 to 35(2000-2035)

Internal time accuracy: ±100ppm

Daylight saving time: The time on the internal clock is updated on the specified month, week, weekday, and time.
- Summer: On the month, week, weekday, and hour set as Summer time, the time on the internal clock is moved one hour ahead.
- Winter: On the month, week, weekday, and hour set as Winter time, the time on the internal clock is moved one hour behind.

Unlike the internal clock, which is changed on the main unit, the dates of the measured and computed values are not adjusted.

Tag Strings

During recording: Tags can be stored for measured and computed values that are recorded and saved.

During displaying: You can select whether to display tags or channel numbers on all channels.

Tag string settings: Can be set channel by channel.

No. of characters: Up to 15

Log Information

- Recording logs
  When recording is stopped, data acquisition logs saved on the main unit are all saved to the CF card.
  Maximum no. of saved logs:
  1021 (if this number exceeded, old files are overwritten by new ones)
  File name: RECORDLG.TXT
  Save location: During recording, in the DATAnnnn folder on the CF card
  When recording stopped, on the root folder of the CF card
- Alarm summaries
  When recording is stopped, alarm summaries saved on the main unit are all saved to the CF card.
  Maximum no. of saved summaries:
  256 (if this number exceeded, old files are overwritten by new ones)
  File name: ALARMLG.TXT
  Save location: During recording, in the DATAnnnn folder on the CF card
- Communication related log information can be saved in the main unit.
  Communication log, FTP client operation log, e-mail operation log, DHCP operation log. Information logs can be referenced via output from communication commands and on the browser, and when the power is cut, they are initialized and not backed up.
  Maximum no. saved: Shown in the table below. If the number is exceeded, old logs are overwritten

Item	Maximum no. saved
Operation log	256
Error log	50
Message summary	50
Communication log	200
FTP client log	50
SNTP client log	50
SNTP client log	50
DHCP client log	50
FTP server log	50
HTTP server log	50
Modbus master log	50
Modbus client log	50
Modbus slave log	50
Modbus server log	50
Computation status	1
Recording status	1

Maximum no. displayed

Item	Maximum no. displayed
Modbus client connection command	100
Modbus client connection status	10
Modbus master command	100
Modbus master connection status	247
Strain initial balance result	60

Initializing Settings

Two types of settings initialization are available.

Initialization of all settings:

Initializes all setting values and measured values on the main unit. You can perform initialization through communication commands, from the browser, or by resetting the dip switch positions and turning ON the unit. However, when initialized using communication commands or the browser, module recognition information is not initialized.

Initialization of all settings excluding communication parameters:

All settings and measured values except for communication parameters and module recognition information are initialized. Communication commands are executed from the browser.

Initialization of the CF Card

Formats the CF card.

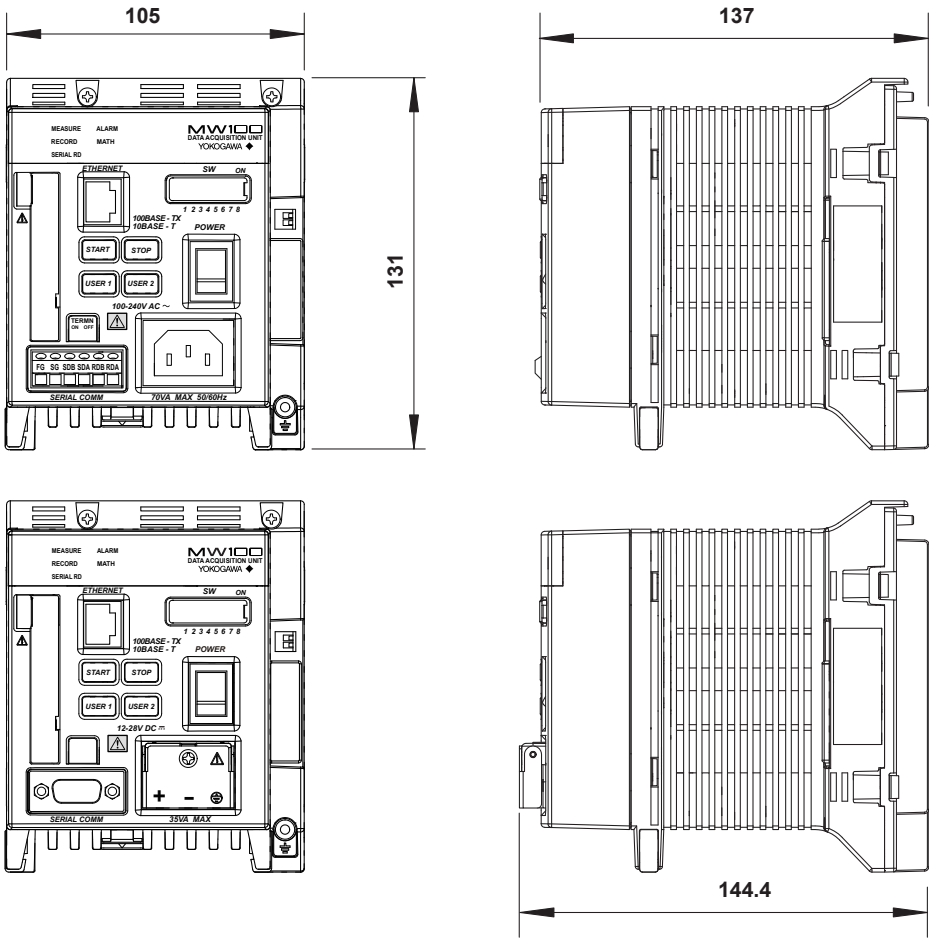
Format type:	Supports FAT12/FAT16, logical format only
CF card size:	2 GB maximum
File name format:	8.3 format

General Specifications

Operating temperature:	–20 to 60°C
Operating humidity:	20 to 80% RH for –20 to 40°C 10 to 50% RH for 40 to 50°C 5 to 30% RH for 50 to 60°C
Power consumption:	Approx. 8 W
Insulation resistance:	Between power supply terminal and earth terminal: 20 MΩ or more (500 VDC)
Withstand Voltage	AC power Between AC power supply terminal and earth terminal: 1500 VAC (50/60 Hz) for one minute DC power Between DC power supply terminal and earth terminal: 1000 VAC (50/60 Hz) for one minute
External dimensions:	Approx. 105 (W) × 131 (H) × 137 (D) mm
Weight:	Approx. 1 kg.

External Dimensions

Units: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

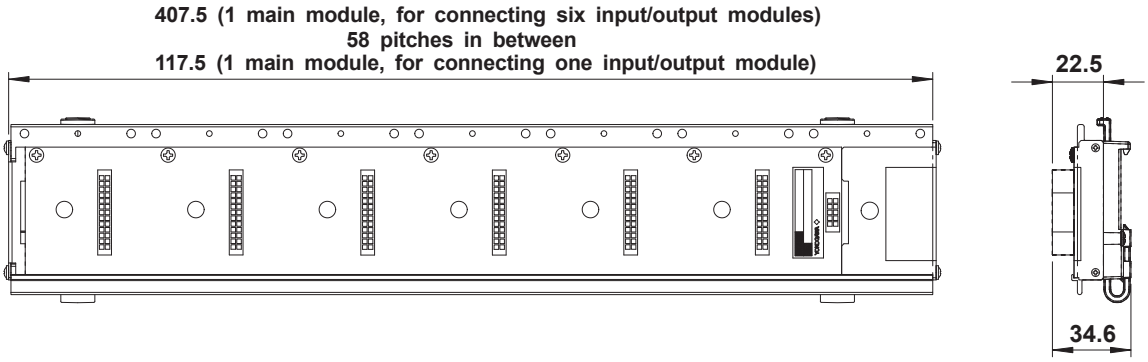
5.3 Base Plate Specifications

Number of main modules that can be attached:
1 (always attached)
Number of input/output modules that can be attached:
1 to 6* (specified by the suffix code)
* One 30-CH Medium Speed DCV/TC/DI Input Module uses three modules worth.
External dimensions: Approx. 118 to 408 (W) × 75 (H) × 35 (D) mm
Weight: Approx. 0.37 kg (1 main module, for connecting six input/output modules)

External Dimensions

Units: mm

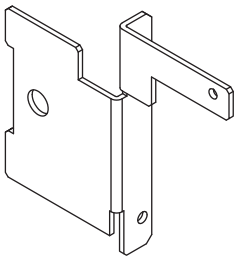
MX150-1, -2, -3, -4, -5, -6



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

Attaching the MW100 Main Module

The accessory bracket must be attached in order to attach the MW100 main module to the base plate. For information about attaching the bracket, see the Installation and Connection Guide (IM MW100-72E).



5.4 4-CH, High-Speed Universal Input Module Specifications

Style number: S1
Type of measurement: DC voltage, thermocouple, 3-wire RTD, DI (contact, LEVEL)
Number of inputs: 4
Input method: Floating unbalanced input, insulation between channels
A/D resolution: 16 bits (±20000/±6000/0 to 60000)
Measurement range and accuracy:
The accuracy applies to standard operating conditions: Ambient temp: 23 ±2°C, ambient humidity: 55 ±10% RH, supply voltage: 90 to 250 VAC, power frequency: 50/60 Hz ±1%, warm-up time: at least 30 minutes, without adverse conditions such as vibrations.

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 1.67 ms	Highest Resolution (1 Digit)
DC voltage	20 mV	–20.000 to 20.000 mV	±(0.05% of rdg + 5 digits)	±(0.1% of rdg + 25digits)	1 µV
	60 mV	–60.00 to 60.00 mV	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10digits)	10 µV
	200 mV	–200.00 to 200.00 mV	±(0.05% of rdg + 2 digits)		10 µV
	2 V	–2.0000 to 2.0000 V	±(0.05% of rdg + 5 digits)		100 µV
	6 V	–6.000 to 6.000 V	±(0.05% of rdg + 2 digits)		1 mV
	20 V	–20.000 to 20.000 V	±(0.05% of rdg + 2 digits)		1 mV
	100 V	–100.00 to 100.00 V	±(0.05% of rdg + 2 digits)		10 mV
	60 mV (high res.)	0.000 to 60.000 mV	±(0.05% of rdg + 20 digits)	±(0.1% of rdg + 100 digits)	1 µV
	1 V	–1.0000 to 1.0000 V	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10 digits)	100 µV
	6 V (high res.)	0.0000 to 6.0000 V	±(0.05% of rdg + 20 digits)	±(0.1% of rdg + 100 digits)	100 µV
Thermocouple (excludes RJC accuracy, when burnout is OFF)	R*1	0.0 to 1760.0°C	±(0.05% of rdg + 1°C) Except 0 to 100°C: 3.7°C, 100 to 300°C: 1.5°C for R and S; 400 to 600°C: 2°C, less than 400°C: not guaranteed for B	±(0.1% of rdg + 4°C) Except 0 to 100°C: 10°C, 100 to 300°C: 5°C for R and S; 400 to 600°C: 7°C, less than 400°C: not guaranteed for B	0.1°C
	S*1				
	B*1	0.0 to 1820.0°C			
	K*1	–200.0 to 1370.0°C	±(0.05% of rdg + 0.7°C) Except –200°C to –100°C: ±(0.05% of rdg + 1°C)	±(0.1% of rdg + 3.5°C) Except –200°C to –100°C: ±(0.1% of rdg + 6°C)	
	E*1	–200.0 to 800.0°C	±(0.05% of rdg + 0.5°C) Except –200°C to –100°C: ±(0.05% of rdg + 0.7°C) for J and L	±(0.1% of rdg + 2.5°C) Except –200°C to –100°C: ±(0.1% of rdg + 5°C) for J and L	
	J*1	–200.0 to 1100.0°C			
	T*1	–200.0 to 400.0°C			
	L*2	–200.0 to 900.0°C			
	U	–200.0 to 400.0°C			
	N*3	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 3.5°C)	
	W*4	0.0 to 2315.0°C	±(0.05% of rdg + 1°C)	±(0.1% of rdg + 7°C)	
	KPvsAu7Fe	0.0 to 300.0K	±(0.05% of rdg + 0.7K)	±(0.1% of rdg + 3.5K)	0.1K
	PR40-20	0.0 to 1900.0°C	±(0.05% of rdg + 2.5°C) Except 300 to 700°C: 6°C, less than 300°C: not guaranteed	±(0.1% of rdg + 12°C) Except 300 to 700°C: 25°C, less than 300°C: not guaranteed	0.1°C
	NiNiMo	0.0 to 1310.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 2.7°C)	
	WRe3-25	0.0 to 2400.0°C	±(0.05% of rdg + 2°C) Except 0 to 200°C: 2.5°C, more than 2000°C: ±(0.05% of rdg + 4°C)	±(0.1% of rdg + 7°C) Except 0 to 200°C: 12°C, more than 2000°C: ±(0.1% of rdg + 11°C)	
	W/WRe26	0.0 to 2400.0°C	±(0.05% of rdg + 2°C) Except 100 to 300°C: 4°C, less than 100°C: not guaranteed	±(0.1% of rdg + 8.5°C) Except 100 to 300°C: 12°C, less than 100°C: not guaranteed	
	N (AWG14)	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 3.5°C)	
	XK GOST	–200.0 to 600.0°C	±(0.05% of rdg + 0.5°C) Except –200 to 0°C: ±(0.2% of rdg + 0.7°C)	±(0.1% of rdg + 2.5°C) Except –200 to 0°C: ±(1% of rdg + 2.5°C)	

*1 R, S, B, K, E, J, T: ANSI, IEC 584, DIN IEC 584, JIS C 1602-1981
*2 L: Fe-CuNi, DIN43710/U: Cu-CuNi, DIN 43710
*3 N: Nicrosil-Nisil, IEC 584, DIN IEC 584
*4 W: W-5% Re/W-26%Re (Hoskins Mfg Co)

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 1.67 ms	Highest Resolution (1 digit)
RTD (Measurement current: 1 mA)	Pt100*1	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	JPt100*1	–200.0 to 550.0°C			
	Pt100 (high res.)	–140.00 to 150.00°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.01°C
	JPt100 (high res.)	–140.00 to 150.00°C			
	Ni100 SAMA*2	–200.0 to 250.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Ni100 DIN*2	–60.0 to 180.0°C			
	Ni120*3	–70.0 to 200.0°C			
	Pt100 (high noise resistance)	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 2.5°C)	0.1°C
	JPt100 (high noise resistance)	–200.0 to 550.0°C			
	Pt100 GOST	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	±(0.05% of rdg + 0.3°C)	0.1°C
RTD (Measurement current: 2 mA)	Pt100*1	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	JPt100*1	–200.0 to 550.0°C			
	Pt100 (high res.)	–140.00 to 150.00°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.01°C
	JPt100 (high res.)	–140.00 to 150.00°C			
	Pt50*1	–200.0 to 550.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu10 GE*4	–200.0 to 300.0°C	±(0.1% of rdg + 0.7°C)	±(0.2% of rdg + 2.5°C)	
	Cu10 L&N*4	–200.0 to 300.0°C			
	Cu10 WEED*4	–200.0 to 300.0°C			
	Cu10 BAILEY*4	–200.0 to 300.0°C			
	J263B	0.0 to 300.0K	±(0.05% of rdg + 0.3K)	±(0.1% of rdg + 1.5K)	0.1K
	Cu10 at 20°C alpha=0.00392	–200.0 to 300.0°C	±(0.1% of rdg + 0.7°C)	±(0.2% of rdg + 2.5°C)	0.1°C
	Cu10 at 20°C alpha=0.00393	–200.0 to 300.0°C			
	Cu25 at 0°C alpha=0.00425	–200.0 to 300.0°C	±(0.1% of rdg + 0.5°C)	±(0.2% of rdg + 2°C)	0.1°C
	Cu53 at 0°C alpha=0.00426035	–50.0 to 150.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu100 at 0°C alpha=0.00425	–50.0 to 150.0°C			
	Pt25(JPt100/4)	–200.0 to 550.0°C	±(0.1% of rdg + 0.5°C)	±(0.2% of rdg + 2°C)	0.1°C
	Cu10 GE (high resolution)	–200.0 to 300.0°C	±(0.1% of rdg + 0.7°C)	±(0.2% of rdg + 2.5°C)	0.1°C
	Cu10 L&N (high resolution)	–200.0 to 300.0°C			
	Cu10 WEED (high resolution)	–200.0 to 300.0°C			
	Cu10 BAILEY (high resolution)	–200.0 to 300.0°C			
	Pt100 (high noise resistance)	–200.0 to 250.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	JPt100 (high noise resistance)	–200.0 to 250.0°C			
	Cu100 GOST	–200.0 to 200.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu50 GOST	–200.0 to 200.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu10 GOST	–200.0 to 200.0°C	±(0.1% of rdg + 0.7°C)	±(0.2% of rdg + 0.5°C)	0.1°C
DI	Level	Vth = 2.4 V	Threshold level accuracy: ±0.1 V		
	Contact input		ON for 100 Ω or less, OFF for 10 kΩ or more*5		

*1 Pt50: JIS C 1604-1981, JIS C 1606-1986/Pt100: JIS C 1604-1997, JIS C 1606-1989, IEC 751, DIN IEC 751/
JPt100: JIS C 1604-1989, JIS C 1606-1989
*2 SAMA/DIN
*3 McGRAW EDISON COMPANY
*4 Guaranteed accuracy range Cu10 GE: –84.4 to 170.0°C/Cu10 L&N: –75.0 to 150.0°C/Cu10 WEED: –20.0 to 250.0°C/
Cu10 BAILEY: –20.0 to 250.0°C
*5 Measured using a measurement current of approximately 10μA at 200 mV range. Threshold level is approximately 0.1 V.

Measurement interval, integration time, and filter:

Measurement Interval	Integration Time	Filter	Rejected Noise and Notes
10 ms	1.67 ms*1	Rectangular	600 Hz and its integer multiples
50 ms	16.67 ms		60 Hz and its integer multiples
	20 ms		50 Hz and its integer multiples
	Auto*2		Automatically detects the power supply frequency and set 16.67 or 20 ms
100 ms	36.67 ms	Trapezoidal	50 Hz or 60 Hz and their integer multiples
200 ms			
500 ms	100 ms	Rectangular	10 Hz and its integer multiples
1 s	200 ms	Cos	Fc = 5-Hz low-pass filter
2, 5,10, 20, 30, 60 s			

*1 When the measurement interval is 10 ms, measured values may fluctuate since power supply frequency noise is not rejected. In such cases, set the measurement interval to 50 ms or more.
*2 For DC power, set to 20 ms.

Reference junction compensation:

Switch external/internal by channel, includes remote RJC function

Reference junction compensation accuracy:
When measuring temperature greater than or equal to 0°C and when the temperature of the input terminal is balanced
Type R, S, W: ±1°C
Type K, J, E, T, N, L, U, XK GOST: ±0.5°C
Type N(AWG14), PLATINEL, NiNiMo, WRe3-25, W/WRe26: ±1°C
Note: The internal reference junction compensation is fixed to 0°C for type B and PR40-20

Maximum input voltage: DC voltage at 1-V range or less, TC, RTC, and DI (contact): ±10 VDC (continuous)
Other measurement ranges: ±120 VDC (continuous)

Normal mode voltage: DC voltage, TC, DI (LEVEL): 1.2 times the range rating or less (50/60 Hz, peak value including the signal component)
RTD 100 Ω: 50 mVpeak
RTD 10 Ω, 25 Ω, 50 Ω: 10 mVpeak

Normal mode rejection ratio: For integration time of 16.67 ms or more: 40 dB or more (50/60 Hz ± 0.1%)
For integration time of 1.67 ms: 50/60 Hz is not rejected
The RTD and resistance ranges indicates the voltage conversion value when current flows.

Common-mode voltage: 600 VACrms (50/60 Hz), reinforced (double) insulation

Common mode rejection ratio (50/60 Hz ±0.1%, 500 Ω unbalanced between minus measurement terminal and ground)
The RTD and resistance ranges indicates the voltage conversion value when current flows.
When the integration time is 16.67 ms or more: 120 dB or more
When the integration time is 1.67 ms or more: 80 dB or more

Common-mode voltage between channels:
250 VACrms (50/60 Hz), reinforced (double) insulation

Noise rejection: Rejection by the integrating A/D converter and the use of low pass filters

Input resistance: For DC voltage 1 V range or less and thermocouple range: 10 MΩ or less
For DC voltage 2 V range or higher: Approx. 1 MΩ
While measurement stopped: Approx. 1 MΩ

Insulation resistance: Between input terminal and earth terminal: 20 MΩ or more (500 VDC)

Input bias current: 10 nA or less (except for burnout setting)

Withstand voltage: 2300 VAC (50/60 Hz) for one minute between input terminals
3700 VAC (50/60 Hz) for one minute between the input terminal and earth terminal

Input signal source resistance: DC voltage, thermocouple: 2 kΩ or less
RTD 50 Ω, 100 Ω types: 10 Ω per line or less
RTD10 Ω, 25 Ω types: 1 Ω per line or less

Thermocouple burnout: Superposed electric current system, detection within the thermocouple range (detection ON/OFF possible)
Up/Down setting is possible, current approximately 100 nA
2 kΩ or less normal, 10 MΩ or more disconnected
Effect on measurement accuracy: ±15 μV or less (not including effect of signal source resistance)

Parallel capacity during RTD: 0.01 μF or less

Power consumption: Approx. 3 W

External dimensions: Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)

Weight: Approx. 0.5 kg.

Terminal type: Clamp, detachable per channel

Applicable wire size: 0.2 to 2.5 mm^2 (AWG24 to 12)

Effects of Operating Conditions

The specifications below apply when the integration time is 16.67 ms or more.

Warm-up time: At least 30 minutes after power-up

Effects of ambient temperature:

The effect received by changes in 10°C increments of the ambient temperature is
±(0.05% of rdg. + 0.05% of range) or less
However, for Cu10 Ω: ±(0.2% of range + 1 digit)

Effects of power fluctuation:

Meets the accuracy specifications for AC power supply in the range 90 to 132 V and 180 to 250 V

Effects of magnetic field: The fluctuation in external magnetic fields for AC (50/60 Hz) 400 A/m is
±(0.1% of rdg. + 10 digits) or less

Effects from the signal source resistance:

Effect from fluctuation in DC voltage and thermocouple signal source resistance of 1 kΩ

DC voltage: 1 V range or less ±10 μV or less
2 V range or higher ±0.15% of rdg. or less

Thermocouple: ±10 μV or less
However, when burnout is set, ±150 μV or less

RTD: Fluctuation per 10 Ω change per line (3 lines all same resistance) for 100 Ω types: ±0.1°C or less; other than 100 Ω types: ±1.0°C or less; fluctuation resulting from difference in resistance between lead wires of 40 mΩ (max. difference among three wires): approximately 0.1°C (for Pt100)

Effect of position: Horizontal with the feet at the bottom is the rule.

Effects of vibration: The fluctuation that results by applying a sinusoidal vibration along all three axes at a frequency between 10 to 60 Hz and an acceleration of 0.2 m/s^2 is ±(0.1% of rdg. + 1 digit) or less

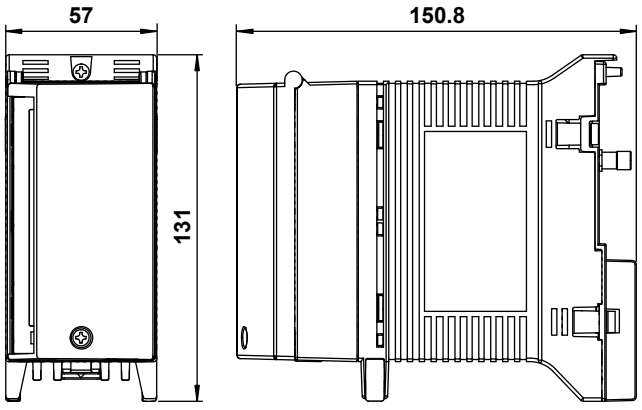
General Specifications

Operating temperature range: –20 to 60°C

Operating humidity range: 20 to 80% RH for –20 to 40°C
10 to 50% RH for 40 to 50°C
5 to 30% RH for 50 to 60°C

External Dimensions

Units: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

5.5 10-CH, Medium-Speed Universal Input Module Specifications

Style number: S1
Type of measurement: DC voltage, thermocouple, 3-wire RTD, DI (contact, LEVEL)
Number of inputs: 10
Input method: Floating unbalanced input, insulation between channels (b terminal common for RTD)
A/D resolution: 16 bits (±20000/±6000/0 to 60000)
Measurement range and accuracy:
The accuracy applies to standard operating conditions: Ambient temp: 23 ±2°C, ambient humidity: 55 ±10% RH, supply voltage: 90 to 250 VAC, power frequency: 50/60 Hz ±1%, warm-up time: at least 30 minutes, without adverse conditions such as vibrations.

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 16.67 ms	Highest Resolution (1 digit)
DC voltage	20 mV	–20.000 to 20.000 mV	±(0.05% of rdg + 5 digits)	±(0.1% of rdg + 25digits)	1 µV
	60 mV	–60.00 to 60.00 mV	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10digits)	10 µV
	200 mV	–200.00 to 200.00 mV	±(0.05% of rdg + 2 digits)		10 µV
	2 V	–2.0000 to 2.0000 V	±(0.05% of rdg + 5 digits)		100 µV
	6 V	–6.000 to 6.000 V	±(0.05% of rdg + 2 digits)		1 mV
	20 V	–20.000 to 20.000 V	±(0.05% of rdg + 2 digits)		1 mV
	100 V	–100.00 to 100.00 V	±(0.05% of rdg + 2 digits)		10 mV
	60 mV (high res.)	0.000 to 60.000 mV	±(0.05% of rdg + 20 digits)	±(0.1% of rdg + 100 digits)	1 µV
	1 V	–1.0000 to 1.0000 V	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10 digits)	100 µV
	6 V (high res.)	0.0000 to 6.0000 V	±(0.05% of rdg + 20 digits)	±(0.1% of rdg + 100 digits)	100 µV
Thermocouple (excludes RJC accuracy)	R*1	0.0 to 1760.0°C	±(0.05% of rdg + 1°C) Except 0 to 100°C: 3.7°C, 100 to 300°C: 1.5°C for R and S; 400 to 600°C: 2°C, less than 400°C: not guaranteed for B	±(0.1% of rdg + 4°C) Except 0 to 100°C: 10°C, 100 to 300°C: 5°C for R and S; 400 to 600°C: 7°C, less than 400°C: not guaranteed for B	0.1°C
	S*1				
	B*1	0.0 to 1820.0°C			
	K*1	–200.0 to 1370.0°C	±(0.05% of rdg + 0.7°C) Except –200°C to –100°C: ±(0.05% of rdg + 1°C)	±(0.1% of rdg + 3.5°C) Except –200°C to –100°C: ±(0.1% of rdg + 6°C)	
	E*1	–200.0 to 800.0°C	±(0.05% of rdg + 0.5°C) Except –200°C to –100°C: ±(0.05% of rdg + 0.7°C) for J and L	±(0.1% of rdg + 2.5°C) Except –200°C to –100°C: ±(0.1% of rdg + 5°C) for J and L	
	J*1	–200.0 to 1100.0°C			
	T*1	–200.0 to 400.0°C			
	L*2	–200.0 to 900.0°C			
	U	–200.0 to 400.0°C			
	N*3	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 3.5°C)	
	W*4	0.0 to 2315.0°C	±(0.05% of rdg + 1°C)	±(0.1% of rdg + 7°C)	
	KPvsAu7Fe	0.0 to 300.0K	±(0.05% of rdg + 0.7K)	±(0.1% of rdg + 3.5K)	0.1K
	PR40-20	0.0 to 1900.0°C	±(0.05% of rdg + 2.5°C) Except 300 to 700°C: 6°C, less than 300°C: not guaranteed	±(0.1% of rdg + 12°C) Except 300 to 700°C: 25°C, less than 300°C: not guaranteed	0.1°C
	NiNiMo	0.0 to1310.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 2.7°C)	
	WRe3-25	0.0 to 2400.0°C	±(0.05% of rdg + 2°C) Except 0 to 200°C: 2.5°C, more than 2000°C: ±(0.05% of rdg + 4°C)	±(0.1% of rdg + 7°C) Except 0 to 200°C: 12°C, more than 2000°C: ±(0.1% of rdg + 11°C)	
	W/WRe26	0.0 to 2400.0°C	±(0.05% of rdg + 2°C) Except 100 to 300°C: 4°C, less than 100°C: not guaranteed	±(0.1% of rdg + 8.5°C) Except 100 to 300°C: 12°C, less than 100°C: not guaranteed	
	N (AWG14)	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 3.5°C)	
	XK GOST	–200.0 to 600.0°C	±(0.05% of rdg + 0.5°C) Except –200 to 0°C: ±(0.2% of rdg + 0.7°C)	±(0.1% of rdg + 2.5°C) Except –200 to 0°C: ±(1% of rdg + 2.5°C)	

*1 R, S, B, K, E, J, T: ANSI, IEC 584, DIN IEC 584, JIS C 1602-1995
*2 L: Fe-CuNi, DIN43710/U: Cu-CuNi, DIN 43710
*3 N: Nicrosil-Nisil, IEC 584, DIN IEC 584
*4 W: W-5% Re/W-26%Re (Hoskins Mfg Co)

5.5 10-CH, Medium-Speed Universal Input Module Specifications

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 1.67 ms	Highest Resolution (1 digit)
RTD (Measurement current: 1 mA)	Pt100*1	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	JPt100*1	–200.0 to 550.0°C			
	Pt100 (high res.)	–140.00 to 150.00°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.01°C
	JPt100 (high res.)	–140.00 to 150.00°C			
	Ni100 SAMA*2	–200.0 to 250.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Ni100 DIN*2	–60.0 to 180.0°C			
	Ni120*3	–70.0 to 200.0°C			
	Pt50	–200.0 to 550.0°C			
	Cu10 GE*4	–200.0 to 300.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	0.1°C
	Cu10 L&N*4	–200.0 to 300.0°C			
	Cu10 WEED*4	–200.0 to 300.0°C			
	Cu10 BAILEY*4	–200.0 to 300.0°C			
	J263B	0.0 to 300.0K	±(0.05% of rdg + 0.3K)	±(0.1% of rdg + 1.5K)	0.1K
	Cu10 at 20°C alpha=0.00392	–200.0 to 300.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	0.1°C
	Cu10 at 20°C alpha=0.00393	–200.0 to 300.0°C			
	Cu25 at 0°C alpha=0.00425	–200.0 to 300.0°C	±(0.1% of rdg + 0.5°C)	±(0.2% of rdg + 2°C)	0.1°C
	Cu53 at 0°C alpha=0.00426035	–50.0 to 150.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu100 at 0°C alpha=0.00425	–50.0 to 150.0°C			
	Pt25(JPt100/4)	–200.0 to 550.0°C	±(0.1% of rdg + 0.5°C)	±(0.2% of rdg + 2°C)	0.1°C
	Cu10 GE (high resolution)	–200.0 to 300.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	0.1°C
	Cu10 L&N (high resolution)	–200.0 to 300.0°C			
	Cu10 WEED (high resolution)	–200.0 to 300.0°C			
	Cu10 BAILEY (high resolution)	–200.0 to 300.0°C			
	PT100GOST	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu100GOST	–200.0 to 200.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu50GOST	–200.0 to 200.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu10GOST	–200.0 to 200.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	0.1°C
DI	Level	Vth = 2.4 V	Threshold level accuracy: ±0.1 V		
	Contact input		ON for 100 Ω or less, OFF for 10 kΩ or more*5		

*1 Pt50: JIS C 1604-1981, JIS C 1606-1986/Pt100: JIS C 1604-1997, JIS C 1606-1989, IEC 751, DIN IEC 751/
JPt100: JIS C 1604-1989, JIS C 1606-1989
*2 SAMA/DIN
*3 McGRAW EDISON COMPANY
*4 Guaranteed accuracy range Cu10 GE: –84.4 to 170.0°C/Cu10 L&N: –75.0 to 150.0°C/Cu10 WEED: –20.0 to 250.0°C/
Cu10 BAILEY: –20.0 to 250.0°C
*5 Measured using a measurement current of approximately 10 μA at 200 mV range. Threshold level is approximately 0.1 V.

Measurement interval, integration time, and filter:

Measurement Interval	Integration Time	Burnout Detection Cycle	Filter	Rejected Noise and Notes
100 ms	1.67 ms	1 s*1	Rectangular	600 Hz and its integer multiples*2
200 ms		Measurement interval		
500 ms	16.67 ms			60 Hz and its integer multiples
	20 ms			50 Hz and its integer multiples
	Auto*3			Automatically detects the power supply frequency andset 16.67 or 20 ms
1 s	36.67 ms		Trapezoidal	50 Hz or 60 Hz and their integer multiples
2 s	100 ms*4		Rectangular	10 Hz and its integer multiples
5 s	200 ms*5		Cos	Fc = 5-Hz low-pass filter
10, 20, 30, 60 s	200 ms			

*1 When the measurement interval is 100 ms, burnout is detected in one channel per measurement interval. Therefore, if measurement is started in a burnout condition or after a burnout occurs, burnout cannot be detected for up to 10 measurements (approximately 1 second).
*2 Because the power supply frequency noise is not rejected, measured values may fluctuate particularly for temperature measurements using thermocouples. If this happens, make the measurement interval longer, or use the 4-CH High-Speed Universal Input Module.
*3 For DC power, set to 20 ms.
*4 When synchronizing time by SNTP, the integral time is set to 36.67 ms. Also in this case, noise of 50 Hz, 60 Hz, and their integer multiples is rejected.
*5 When synchronizing time by SNTP, the integral time is set to 100 ms. Also in this case, noise of 10 Hz and its integer multiples is rejected.

Reference junction compensation:

Switch external/internal by channel, includes remote RJC function

Reference junction compensation accuracy:
When measuring temperature greater than or equal to 0°C and when the temperature of the input terminal is balanced
Type R, S, W: ±1°C
Type K, J, E, T, N, L, U, XK GOST: ±0.5°C
Type N (AWG14), PLATINEL, NiNiMo, WRe3-25, W/WRe26: ±1°C
Note: Type B and PR40-20 internal RJC is fixed at 0°C

Maximum input voltage: DC voltage at 1-V range or less, TC, RTC, and DI (contact): ±10 VDC (continuous)
Other measurement ranges: ±120 VDC (continuous)

Normal-mode voltage: DC voltage, TC, DI (LEVEL): 1.2 times the range rating or less (50/60 Hz, peak value including the signal component)
RTD 100 Ω: 50 mVpeak
RTD 10 Ω, 25 Ω, 50 Ω: 10 mVpeak

Normal-mode rejection ratio:
For integration time of 16.67 ms or more: 40 dB or more (50/60 Hz ± 0.1%)
For integration time of 1.67 ms: 50/60 Hz is not rejected.
The RTD and resistance ranges indicate the voltage conversion value when current flows.

Common-mode voltage:600 VACrms (50/60 Hz), reinforced (double) insulation

Common mode rejection ratio (50/60 Hz ±0.1%, 500 Ω unbalanced between minus measurement terminal and ground)
The RTD and resistance ranges indicate the voltage conversion value when current flows.
When the integration time is 16.67 ms or more: 120 dB or more
When the integration time is 1.67 ms: 80 dB or more

Common-mode voltage between channels: 120 VACrms (50/60 Hz)

Noise rejection: Rejection by the integrating A/D converter and the use of low pass filters

Input resistance: For DC voltage 1 V range or less and thermocouple range: 10 MΩ or less
For DC voltage 2 V range or higher: Approx. 1 MΩ

Insulation resistance: Between input and ground: 20 MΩ or more (500 VDC)

Input bias current: 10 nA or less (except for burnout setting)

Withstand Voltage: 1000 VAC (50/60 Hz) for one minute between input terminals
3700 VAC (50/60 Hz) for one minute between the input terminal and earth terminal

Input signal source resistance:
DC voltage, thermocouple: 2 kΩ or less
RTD 50 Ω, 100 Ω types: 10 Ω per line or less
RTD 10 Ω, 25 Ω types: 1 Ω per line or less

Thermocouple burnout: Detection at a specified detection interval per measurement interval and detection within the thermocouple range (detection ON/OFF possible)
Up/Down setting is possible
2 kΩ or less normal, 200 kΩ or more disconnected
(shunt capacitance: 0.01 μF or less), detection current approx. 10 μA, detection time approx. 2 ms

Parallel capacity during RTD: 0.01 μF or less

Power consumption: Approx. 1.2 W

External dimensions: Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)

Weight: Approx. 0.5 kg.

Terminal type: Clamp, terminal board is detachable

Applicable wire size: 0.14 to 1.5 mm^2 (AWG26 to 16)

Effects of Operating Conditions

The specifications below apply when the integration time is 16.67 ms or more.

Warm-up time: At least 30 minutes after power-up

Effects of ambient temperature:

The effect received by changes in 10°C increments of the ambient temperature is
±(0.05% of rdg. + 0.05% of range) or less
However, for Cu10 Ω: ±(0.2% of range + 1 digit)

Effects of power fluctuation:

Meets the accuracy specifications for AC power supply in the range 90 to 132 V and 180 to 250 V

Effects of magnetic field: The fluctuation in external magnetic fields for AC (50/60 Hz) 400 A/m is ±(0.1% of rdg. + 10 digits) or less

Effects from the signal source resistance:

Effect from fluctuation in DC voltage and thermocouple signal source resistance of 1 kΩ

DC voltage:	1 V range or less	±10 μV or less
	2 V range or higher	±0.15% of rdg. or less
Thermocouple:	±10 μV or less	
RTD:	Fluctuation per 10 Ω change per line (3 lines all same resistance) for 100 Ω types: ±0.1°C or less; other than 100 Ω types: ±1.0°C or less; fluctuation resulting from difference in resistance between lead wires of 40 mΩ (max. difference among three wires): approximately 0.1°C (for Pt100)	

Effect of position: Horizontal with the feet at the bottom is the rule.

Effects of vibration: The fluctuation that results by applying a sinusoidal vibration along all three axes at a frequency between 10 to 60 Hz and an acceleration of 0.2 m/s^2 is ±(0.1% of rdg. + 1 digit) or less

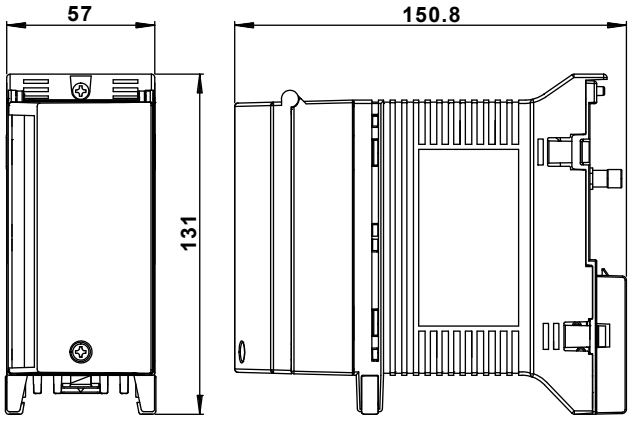
General Specifications

Operating temperature range: –20 to 60°C

Operating humidity range: 20 to 80% RH for –20 to 40°C
10 to 50% RH for 40 to 50°C
5 to 30% RH for 50 to 60°C

External Dimensions

Units: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

5.6 30-CH, Medium-Speed DCV/TC/DI Input Module Specifications

Style number: S3
Type of measurement: DC voltage, thermocouple, DI (contact, LEVEL)
Number of inputs: 30
Module width: 3 modules wide
Input method: Floating unbalanced input, insulation between channels
A/D resolution: 16 bits (±20000/±6000/0 to 60000)
Measurement range and accuracy:

The accuracy applies to standard operating conditions: Ambient temp: 23 ±2°C, ambient humidity: 55 ±10% RH, supply voltage: 90 to 250 VAC, power frequency: 50/60 Hz ±1%, warmup time: at least 30 minutes, without adverse conditions such as vibrations.

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 16.67 ms	Highest Resolution (1 digit)
DC voltage	20 mV	–20.000 to 20.000 mV	±(0.05% of rdg + 5 digits)	±(0.1% of rdg + 25digits)	1 µV
	60 mV	–60.00 to 60.00 mV	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10digits)	10 µV
	200 mV	–200.00 to 200.00 mV	±(0.05% of rdg + 2 digits)		10 µV
	2 V	–2.0000 to 2.0000 V	±(0.05% of rdg + 5 digits)		100 µV
	6 V	–6.000 to 6.000 V	±(0.05% of rdg + 2 digits)		1 mV
	20 V	–20.000 to 20.000 V	±(0.05% of rdg + 2 digits)		1 mV
	100 V	–100.00 to 100.00 V	±(0.05% of rdg + 2 digits)		10 mV
	60 mV (high res.)	0.000 to 60.000 mV	±(0.05% of rdg + 20 digits)	±(0.1% of rdg + 100 digits)	1 µV
	1 V	–1.0000 to 1.0000 V	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10 digits)	100 µV
	6 V (high res.)	0.0000 to 6.0000 V	±(0.05% of rdg + 20 digits)	±(0.1% of rdg + 100 digits)	100 µV
Thermocouple (excludes RJC accuracy)	R*1	0.0 to 1760.0°C	±(0.05% of rdg + 1°C) Except 0 to 100°C: 3.7°C, 100 to 300°C: 1.5°C for R and S; 400 to 600°C: 2°C, less than 400°C: not guaranteed for B	±(0.1% of rdg + 4°C) Except 0 to 100°C: 10°C, 100 to 300°C: 5°C for R and S; 400 to 600°C: 7°C, less than 400°C: not guaranteed for B	0.1°C
	S*1				
	B*1	0.0 to 1820.0°C			
	K*1	–200.0 to 1370.0°C	±(0.05% of rdg + 0.7°C) Except –200°C to –100°C: ±(0.05% of rdg + 1°C)	±(0.1% of rdg + 3.5°C) Except –200°C to –100°C: ±(0.1% of rdg + 6°C)	
	E*1	–200.0 to 800.0°C	±(0.05% of rdg + 0.5°C) Except –200°C to –100°C: ±(0.05% of rdg + 0.7°C) for J and L	±(0.1% of rdg + 2.5°C) Except –200°C to –100°C: ±(0.1% of rdg + 5°C) for J and L	
	J*1	–200.0 to 1100.0°C			
	T*1	–200.0 to 400.0°C			
	L*2	–200.0 to 900.0°C			
	U	–200.0 to 400.0°C			
	N*3	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 3.5°C)	
	W*4	0.0 to 2315.0°C	±(0.05% of rdg + 1°C)	±(0.1% of rdg + 7°C)	
	KPvsAu7Fe	0.0 to 300.0K	±(0.05% of rdg + 0.7K)	±(0.1% of rdg + 3.5K)	0.1K
	PR40-20	0.0 to 1900.0°C	±(0.05% of rdg + 2.5°C) Except 300 to 700°C: 6°C, less than 300°C: not guaranteed	±(0.1% of rdg + 12°C) Except 300 to 700°C: 25°C, less than 300°C: not guaranteed	0.1°C
	NiNiMo	0.0 to1310.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 2.7°C)	
	WRe3-25	0.0 to 2400.0°C	±(0.05% of rdg + 2°C) Except 0 to 200°C: 2.5°C, more than 2000°C: ±(0.05% of rdg + 4°C)	±(0.1% of rdg + 7°C) Except 0 to 200°C: 12°C, more than 2000°C: ±(0.1% of rdg + 11°C)	
	W/WRe26	0.0 to 2400.0°C	±(0.05% of rdg + 2°C) Except 100 to 300°C: 4°C, less than 100°C: not guaranteed	±(0.1% of rdg + 8.5°C) Except 100 to 300°C: 12°C, less than 100°C: not guaranteed	
	N (AWG14)	0.0 to 1300.0°C	±(0.05% of rdg + 0.7°C)	±(0.1% of rdg + 3.5°C)	
	XK GOST	–200.0 to 600.0°C	±(0.05% of rdg + 0.5°C) Except –200 to 0°C: ±(0.2% of rdg + 0.7°C)	±(0.1% of rdg + 2.5°C) Except –200 to 0°C: ±(1% of rdg + 2.5°C)	
DI	Level		Threshold level accuracy: ±0.1 V		
	Contact input		ON for 100 Ω or less, OFF for 10 kΩ or more*5		

*1 R, S, B, K, E, J, T: ANSI, IEC 584, DIN IEC 584, JIS C 1602-1995
*2 L: Fe-CuNi, DIN43710/U: Cu-CuNi, DIN 43710
*3 N: Nicrosil-Nisil, IEC 584, DIN IEC 584
*4 W: W-5% Re/W-26%Re (Hoskins Mfg Co)
*5 Measured using a measurement current of approximately 10 µA at 200 mV range. Threshold level is approximately 0.1 V.

Measurement Interval, Integration Time, and Filter:

Measurement Interval	Integration Time	Burnout Detection Cycle	Filter	Rejected Noise and Notes
500 ms	1.67 ms	Measurement interval	Rectangular	600 Hz and its integer multiples*1
1 s	16.67 ms			60 Hz and its integer multiples
	20 ms			50 Hz and its integer multiples
	Auto*2			Automatically detects the power supply frequency andset 16.67 or 20 ms
2 s	36.67 ms*3		Trapezoidal	50 Hz or 60 Hz and their integer multiples
5 s	100 ms*4		Rectangular	10 Hz and its integer multiples
10, 20, 30, 60 s	100 ms			

*1 Because the power supply frequency noise is not rejected, the measured vales may fluctuate especially with temperature measurement using thermocouples. In such cases, increase the measurement interval, or use the 4-CH High-Speed Universal Input Module or the 10-CH, Medium Speed Universal Input Module.
*2 For DC power, set to 20 ms.
*3 When synchronizing time by SNTP, the integral time is the same as when the measurement interval is 1 s.
*4 When synchronizing time by SNTP, the integral time is set to 36.67 ms. Also in this case, noise of 50 Hz, 60 Hz, and their integer multiples is rejected.

Reference junction compensation:
Switch external/internal by channel, includes remote RJC function

Reference junction compensation accuracy:
When measuring temperature greater than or equal to 0 °C and when the temperature of the input terminal is balanced
Type R, S, W: ±1°C
Type K, J, E, T, N, L, U, XK GOST: ±0.5°C
Type N (AWG14), PLATINEL, NiNiMo, WRe3-25, W/WRe26: ±1°C
Note: Type B and PR40-20 internal RJC is fixed at 0°C

Maximum input voltage: DC voltage at 1-V range or less, TC, and DI (contact): ±10 VDC (continuous)
Other measurement ranges: ±120 VDC (continuous)

Normal-mode voltage: DC voltage, TC, DI (LEVEL): 1.2 times the range rating or less (50/60 Hz, peak value including the signal component)

Normal-mode rejection ratio:
For integration time of 16.67 ms or more: 40 dB or more (50/60 Hz ± 0.1%)
For integration time of 1.67 ms: 50/60 Hz is not rejected.

Common-mode voltage: 600 VACrms (50/60 Hz), reinforced (double) insulation

Common mode rejection ratio:
When the integration time is 16.67 ms or more: 120 dB or more
When the integration time is 1.67 ms: 80 dB or more
(50/60 Hz ±0.1%, 500 Ω unbalanced between minus measurement terminal and ground)

Common-mode voltage between channels: 120 VACrms (50/60 Hz)

Noise rejection: Rejection by the integrating A/D converter and the use of low pass filters

Input resistance: For DC voltage 1 V range or less and thermocouple range: 10 MΩ or less
For DC voltage 2 V range or higher: Approx. 1 MΩ

Insulation resistance: Between input and ground: 20 MΩ or more (500 VDC)

Input bias current: 10 nA or less (except for burnout setting)

Withstand Voltage: 1000 VAC (50/60 Hz) for one minute between input terminals
3700 VAC (50/60 Hz) for one minute between the input terminal and earth terminal

Input signal source resistance:
DC voltage, thermocouple: 2 kΩ or less

Thermocouple burnout: Detection at a specifi ed detection interval per measurement interval and detection within the thermocouple range (detection ON/OFF possible)

Up/Down setting is possible
2 kΩ or less normal, 200 kΩ or more disconnected
(shunt capacitance: 0.01 µF or less), detection current approx. 10 µA, detection time approx. 1.6 ms

Power consumption: Approx. 1.2 W
External dimensions: Approx. 174 (W) × 131 (H) × 150 (D) mm (including the terminal cover)
Weight: Approx. 0.8 kg.
Terminal type: Clamp, or M3 screw terminal (if /H3 option is added)
Applicable wire size: 0.14 to 1.5 mm^2 (AWG26 to 16) (for clamp terminals)

Effects of Operating Conditions

The specifications below apply when the integral time is 16.67 ms or more.

Warm-up time: 30 minutes after power -up.

Effects of ambient temperature:
The effect received by changes of 10°C increments of the ambient temperature is
±(0.05% of rdg. + 0.05% of range) or less

Effects of power fluctuation:
Meets the accuracy specifications for AC power supply in the range 90 to 132 V and 180 to 250 V.

Effect of magnetic field: The fluctuation in external magnetic fields for AC (50/60 Hz) 400 A/m is ±(0.1% of rdg. + 10 digits) or less

Effects from the signal source resistance:
Effect from fluctuation in DC voltage and thermocouple signal source resistance of 1 kΩ

DC voltage:	1 V range or lower	±10 µV or less
	2 V range or higher	±0.15% of rdg. or less
Thermocouple:	±10 µV or less	

Effect of position: Horizontal with the feet at the bottom is the rule.

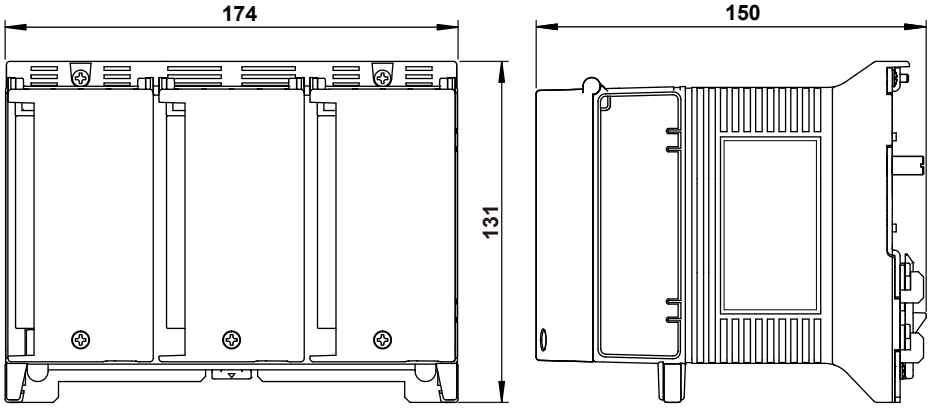
Effects of vibration: The fluctuation that results by applying a sinusoidal vibration along all three axes at a frequency between 10 to 60 Hz and an acceleration of 0.2 m/s^2 is ±(0.1% of rdg. + 1 digit) or less.

General Specifications

Operating temperature range: –20 to 60°C
Operating humidity range: 20 to 80% RH for –20 to 40°C
10 to 50% RH for 40 to 50°C
5 to 30% RH for 50 to 60°C

External Dimensions

Units: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

5.7 6-CH, Medium-Speed Four-Wire RTD Resistance Input Module Specifications

Style number: S2
Type of measurement: DC voltage, 4-wire RTD, 4-wire resistance, DI (contact, LEVEL)
Number of inputs: 6
Input method: Floating unbalanced input, insulation between channels
A/D resolution: 16 bits (±20000/±6000/0 to 60000)
Measurement range and accuracy:
The accuracy applies to standard operating conditions: Ambient temp: 23 ±2°C, ambient humidity: 55 ±10% RH, supply voltage: 90 to 250 VAC, power frequency: 50/60 Hz ±1%, warm-up time: at least 30 minutes, without adverse conditions such as vibrations.

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 1.67 ms	Highest Resolution (1 digit)
DC voltage	20 mV	–20.000 to 20.000 mV	±(0.05% of rdg + 5 digits)	±(0.1% of rdg + 25 digits)	1 µV
	60 mV	–60.00 to 60.00 mV	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10 digits)	10 µV
	200 mV	–200.00 to 200.00 mV	±(0.05% of rdg + 2 digits)		10 µV
	2 V	–2.0000 to 2.0000 V	±(0.05% of rdg + 5 digits)		100 µV
	6 V	–6.000 to 6.000 V	±(0.05% of rdg + 2 digits)		1 mV
	20 V	–20.000 to 20.000 V	±(0.05% of rdg + 2 digits)		1 mV
	100 V	–100.00 to 100.00 V	±(0.05% of rdg + 2 digits)		10 mV
	60 mV (high res.)	0.000 to 60.000 mV	±(0.05% of rdg + 20 digits)	±(0.1% of rdg + 100 digits)	1 µV
	1 V	–1.0000 to 1.0000 V	±(0.05% of rdg + 2 digits)	±(0.1% of rdg + 10 digits)	100 µV
	6 V (high res.)	0.0000 to 6.0000 V	±(0.05% of rdg + 20 digits)	±(0.1% of rdg + 100 digits)	100 µV
RTD*5 (Measurement current: 1 mA)	Pt100*1	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	JPt100*1	–200.0 to 550.0°C			
	Pt100 (high res.)	–140.00 to 150.00°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.01°C
	JPt100 (high res.)	–140.00 to 150.00°C			
	Ni100 SAMA*2	–200.0 to 250.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Ni100 DIN*2	–60.0 to 180.0°C			
	Ni120*3	–70.0 to 200.0°C			
	Pt50	–200.0 to 550.0°C			
	Cu10 GE*4	–200.0 to 300.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	0.1°C
	Cu10 L&N*4	–200.0 to 300.0°C			
	Cu10 WEED*4	–200.0 to 300.0°C			
	Cu10 BAILEY*4	–200.0 to 300.0°C			
	J263B	0.0 to 300.0K	±(0.05% of rdg + 0.3K)	±(0.1% of rdg + 1.5K)	0.1K
	Cu10 at 20°C alpha=0.00392	–200.0 to 300.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	0.1°C
	Cu10 at 20°C alpha=0.00393	–200.0 to 300.0°C			
	Cu25 at 0°C alpha=0.00425	–200.0 to 300.0°C	±(0.1% of rdg + 0.5°C)	±(0.2% of rdg + 2°C)	0.1°C
	Cu53 at 0°C alpha=0.00426035	–50.0 to 150.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu100 at 0°C alpha=0.00425	–50.0 to 150.0°C			
	Pt25(JPt100/4)	–200.0 to 550.0°C	±(0.1% of rdg + 0.5°C)	±(0.2% of rdg + 2°C)	0.1°C
	Cu10 GE (high resolution)	–200.0 to 300.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	0.1°C
	Cu10 L&N (high resolution)	–200.0 to 300.0°C			
	Cu10 WEED (high resolution)	–200.0 to 300.0°C			
	Cu10 BAILEY (high resolution)	–200.0 to 300.0°C			
	Pt100 GOST	–200.0 to 600.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu100 GOST	–200.0 to 200.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu50 GOST	–200.0 to 200.0°C	±(0.05% of rdg + 0.3°C)	±(0.1% of rdg + 1.5°C)	0.1°C
	Cu10 GOST	–200.0 to 200.0°C	±(0.1% of rdg + 2°C)	±(0.2% of rdg + 5°C)	0.1°C

*1 Pt50: JIS C 1604-1981, JIS C 1606-1986/Pt100: JIS C 1604-1997, JIS C 1606-1989, IEC 751, DIN IEC 751/
JPt100: JIS C 1604-1989, JIS C 1606-1989
*2 SAMA/DIN
*3 McGRAW EDISON COMPANY
*4 Guaranteed accuracy range Cu10 GE: –84.4 to 170.0°C/Cu10 L&N: –75.0 to 150.0°C/Cu10 WEED: –20.0 to 250.0°C/
Cu10 BAILEY: –20.0 to 250.0°C
*5. 4-wire RTD, 4-wire resistance

Input	Measurement Range Type	Rated Measurement Range	Measurement Accuracy Integration Time: 16.67 ms or More	Measurement Accuracy Integration Time: 1.67 ms	Highest Resolution (1 Digit)
RTD*3 (Measurement current: 0.25 mA)	Pt500*2	–200.0 to 600.0°C	±(0.05% of rdg + 3digits)	±(0.1% of rdg + 1.5digits)	0.1°C
	Pt1000*2	–200.0 to 600.0°C			
Resistance	20 Ω (Measurement current 1 mA)	0.000 to 20.00 Ω	±(0.05% of rdg + 7digits)	±(0.1% of rdg + 25digits)	0.001 Ω
	200 Ω (Measurement current 1 mA)	0.00 to 200.00 Ω	±(0.05% of rdg + 3digits)	±(0.1% of rdg + 15digits)	0.01 Ω
	2 kΩ (Measurement current 0.25 mA)	0.0 to 2000.0 Ω	±(0.05% of rdg + 3digits)	±(0.1% of rdg + 10digits)	0.1 Ω
DI	Level	Vth = 2.4 V	Threshold level accuracy: ±0.1 V		
	Contact input		ON for 100 Ω or less, OFF for 10 kΩ or more*1		

*1 Measured using a measurement current of approximately 10 μA at 200 mV range. Threshold level is approximately 0.1 V.
*2 The Pt500 resistance table is Pt100 × 5, and the resistance table for Pt1000 is Pt100 × 10
*3 4-wire RTD, 4-wire resistance.

Measurement interval, integration time, and filter:

Measurement Interval	Integration Time	Filter	Rejected Noise and Notes
100 ms	1.67 ms	Rectangular	600 Hz and its integer multiples*1
200 ms			
500 ms	16.67 ms		60 Hz and its integer multiples
	20 ms		50 Hz and its integer multiples
	Auto*2		Automatically detects the power supply frequency and set 16.67 or 20 ms
1 s	36.67 ms	Trapezoidal	50 Hz, 60 Hz and their integer multiples
2 s	100 ms*3	Rectangular	10 Hz and its integer multiples
5 s	200 ms*4	Cos	Fc = 5-Hz low-pass filter
10, 20, 30, 60 s	200 ms		

*1 When the measurement interval is 100 ms or 200 ms, measured values may fluctuate (especially for temperature, 20 Ω, and other measurements) since power supply frequency noise is not rejected. In such cases, set the measurement interval to 500 ms or more.
*2 For DC power, set to 20 ms.
*3 When synchronizing time by SNTP, the integral time is set to 36.67 ms. Also in this case, noise of 50 Hz, 60 Hz, and their integer multiples is rejected.
*4 When synchronizing time by SNTP, the integral time is set to 100 ms. Also in this case, noise of 10 Hz and its integer multiples is rejected.

Maximum input voltage:

DC voltage at 1-V range or less, RTD, resistance, and DI (contact): ±10 VDC (continuous)
Other measurement ranges: ±120 VDC (continuous)

Normal-mode voltage:

DC voltage, DI (LEVEL): 1.2 times the range rating or less (50/60 Hz, peak value including the signal component)
Resistance 2 kΩ, RTD 100 Ω, 500 Ω: 1000 Ω types: 50 mVpeak
Resistance 200 Ω, RTD 10 Ω, 25 Ω: 50 Ω types: 10 mVpeak
Resistance 20 Ω: 4 mVpeak

Normal-mode rejection ratio:

For integration time of 16.67 ms or more: 40 dB or more (50/60 Hz ±0.1%)
For integration time of 1.67 ms: 50/60 Hz is not rejected

Common-mode voltage: 600 VACrms (50/60 Hz), reinforced (double) insulation

Common mode rejection ratio (50/60 Hz ±0.1%, 500 Ω unbalanced between minus measurement terminal and ground. The RTD and resistance ranges indicate the voltage conversion value when current flows)
When the integration time is 16.67 ms or more: 120 dB or more
When the integration time is 1.67 ms: 80 dB or more

Common-mode voltage between channels:

DC voltage, DI: 120 VACrms (50/60 Hz)
RTD, resistance: 50 VACrms (50/60 Hz)

Noise rejection: Rejection by the integrating A/D converter and the use of low pass filters
Input resistance: For DC voltage 1 V range or less: 10 MΩ or less
For DC voltage 2 V range or higher: Approx. 1 MΩ
Insulation resistance: Between input terminal and earth terminal: 20 MΩ or more (500 VDC)
Input bias current: 10 nA or less
Withstand voltage: 1000 VACrms (50/60 Hz) for one minute between input terminals (DC voltage and DI)
620 VACrms (50/60 Hz) for one minute between input terminals (RTD and resistance)
3700 VACrms (50/60 Hz) for one minute between the input terminal and earth terminal
Input signal source resistance:
DC voltage: 2 kΩ or less
Resistance and RTD ranges: 10 Ω or less per line (same for all ranges)
Shunt capacity: 0.01 µF or less (when using RTD and resistance ranges)
Power consumption: Approx. 1.2 W
External dimensions: Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)
Weight: Approx. 0.5 kg.
Terminal type: Clamp, terminal board is detachable
Applicable wire size: 0.14 to 1.5 mm^2 (AWG26 to 16)

Effects of Operating Conditions

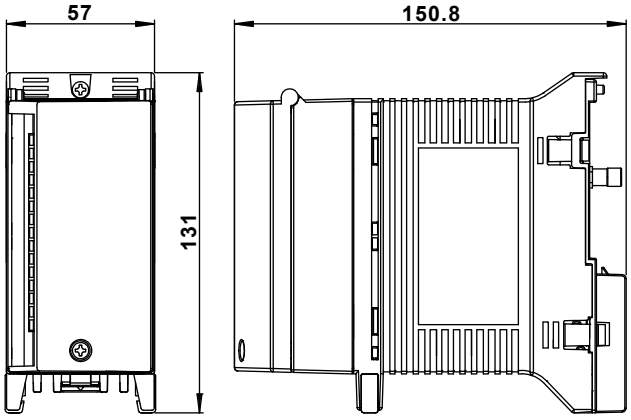
The specifications below apply when the integration time is 16.67 ms or more.
Warm-up time: At least 30 minutes after power-up
Effects of ambient temperature:
The effect received by changes in 10 degree increments of the ambient temperature is ±(0.05% of rdg. + 0.05% of range) or less. However, for Cu10 Ω: ±(0.2% of range + 1 digit)
Effects of power fluctuation:
Meets the accuracy specifications for AC power supply in the range 90 to 132 V and 180 to 250 V
Effects of magnetic field: The fluctuation in external magnetic fields for AC (50/60 Hz) 400 A/m is ±(0.1% of rdg. + 10 digits) or less
Effects from the signal source resistance: Effect from fluctuation in DC voltage signal source resistance of 1 kΩ
1 V range or less ±10 µV or less
2 V range or higher ±0.15% of rdg. or less
RTD: Fluctuation from 10 Ω change per line
1000 Ω, 100 Ω types: ± 0.1°C or less
Other than 1000 Ω, 100 Ω types: ± 1.0°C or less
Resistance: Fluctuation from 10 Ω change per line: ±1 digit or less
Effect of position: Horizontal with the feet at the bottom is the rule.
Effects of vibration: The fluctuation that results by applying a sinusoidal vibration along all three axes at a frequency between 10 to 60 Hz and an acceleration of 0.2 m/s^2 is ±(0.1% of rdg. + 1 digit) or less

General Specifications

Operating temperature range: –20 to 60°C
Operating humidity range: 20 to 80% RH for –20 to 40°C
10 to 50% RH for 40 to 50°C
5 to 30% RH for 50 to 60°C

External Dimensions

Units: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

5.8 4-CH, Medium-Speed Strain Input Module Specifications

Style number: S2

Number of inputs: 4

Input type: Strain gauge or strain gauge type sensors (static strain)

Input method: Floating balanced input isolated between channels (NDIS is non-isolated)

Measurement range and accuracy:

The accuracy applies to standard operating conditions: Ambient temp: 23±2°C, ambient humidity: 55±10% RH, supply voltage: 90 to 250 VAC, power frequency: 50/60 Hz ± 1%, warm-up time: at least 30 minutes, without adverse conditions such as vibrations.

One-Gauge Method Conversion

Input	Measurement Range Type	Rated Measurement Range	Integration time: 16.67 ms or more		Integration time: 1.67 ms or more	
			Measurement Accuracy	Resolution	Measurement Accuracy	Resolution
Strain	2000 µStrain	±2000.0 µStrain	±0.5% of range	0.1 µStrain	2% of range	1 µStrain*1
	20000 µStrain	±20000 µStrain	±0.3% of range	1 µStrain	1% of range	2 µStrain*2
	200000 µStrain	±200000 µStrain	±0.3% of range	10 µStrain	1% of range	10 µStrain

*1 Display resolution is 0.1 µStrain
*2 Display resolution is 1 µStrain

AD resolution: Equivalent to ± 20000 FS display
However, excludes 1.67 ms integration time

AD integration time:

Measurement Interval	Integration Time	Filter	Rejected Noise and Notes
100 ms	1.67 ms	Rectangular	600 Hz and its integer multiples*1
200 ms	16.67 ms		60 Hz and its integer multiples
	20 ms		50 Hz and its integer multiples
	Auto*2		Automatically detects the power supply frequency and set 16.67 or 20 ms
500 ms	36.67 ms	Trapezoidal	50 Hz, 60 Hz and their integer multiples
1 s	100 ms	Rectangular	10 Hz and its integer multiples
2 s	200 ms*3	Cos	Fc = 5-Hz low-pass filter
5, 10, 20, 30, 60 s	200 ms		

*1 When the measurement interval is 100 ms, measured values may fluctuate since power supply frequency noise is not rejected. In such cases, set the measurement interval to 200 ms or more.
*2 For DC power, set to 20 ms.
*3 When synchronizing time by SNTP, the integral time is set to 100 ms. Also in this case, noise of 10 Hz and its integer multiples is rejected.

Gauge connection method:

1-gauge (2 or 3 wire systems), opposing 2 gauge, adjacent 2- or 4-gauge

With clamp terminals, set on a channel basis with switches

Applicable gauge resistance: 100 to 1000 Ω

120 Ω for -B12; 350 Ω, built-in resistance for -B35

Bridge voltage: Fixed at 2 VDC. Accuracy ±5% compensated with internal Cal

Applicable gauge factor:

Fixed at 2.0. Gauge factor can be compensated with the scaling function

Balance adjustment: Automatic, digital calculation methods

Balance adjustment range:

±10000 µstrain (1 gauge method conversion)

Balance adjustment accuracy:

The measurement accuracy or less

Resistance accuracy for bridge:

±0.01% ±5ppm/°C

Input resistance: 1 MΩ or more.

Allowable wiring resistance:
100 Ω or less
Effect of wiring resistance:
NDIS 50 ppm of rdg. / Ω (when using remote sensing wire)
Does not compensate for clamp wiring resistance. Depends on the gauge resistance.
Allowable input voltage:
±10 VDC (between H-L) continuous
Allowable common-mode voltage: Channel-to-channel: 30 VACrms
Between input and ground: 250 VACrms (-B12, -B35), 30 VACrms (-NDI)
However, NDIS connector shell is connected to earth potential.
Common mode rejection ratio*:
When the integration time is 16.67 ms or more: 120 dB or more.
When the integration time is 1.67 ms: 80 dB or more
(voltage conversion value at 50/60 Hz ±0.1%, bridge voltage of 2 V)
Normal mode rejection ratio:
For integral time of 16.67 ms or more: 40 dB or more (50/60 Hz ± 0.1%)
For integral time of 1.67: 50/60 Hz is not rejected.
(voltage conversion value given a bridge voltage of 2 V)
Insulation resistance*: Between input and earth 20 MΩ or more (500 VDC)
Withstand voltage*: Between input and earth 2300 VAC for one minute
Channel-to-channel: 30 VACrms or less
Power consumption: Approx. 3 W (one module)
Weight: Approx. 0.5kg.
External dimensions: Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)
Terminal type: -B12, -B35: Clamp, terminal board is detachable
-NDI: NDIS, detachable by channel
Applicable wire size: 0.14 to 1.5 mm^2 (AWG26 to 16) (excluding -NDI)

* Does not apply to the NDIS terminal.

Effects of Operating Conditions

The specifications below apply when the integration time is 16.67 ms or more.
Warm-up time: At least 30 minutes after power-up
Effects of ambient temperature:
The effect received by changes in 10°C increments of the ambient temperature is
±(0.1% of range) or less
Effects of power fluctuation:
Meets the accuracy specifications for AC power supply in the range 90 to 132 V and 180 to 250 V
Effects of magnetic field:
The fluctuation in external magnetic fields for AC (50/60 Hz) 400 A/m is ±2% of range or less
Effect of position: Horizontal with the feet at the bottom is the rule.

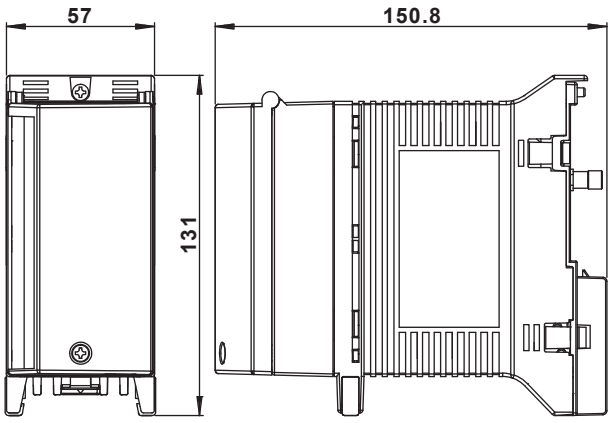
General Specifications

Operating temperature range:	–20 to 60°C
Operating humidity range:	20 to 80% RH for –20 to 40 °C
	10 to 50% RH for 40 to 50 °C
	5 to 30% RH for 50 to 60 °C

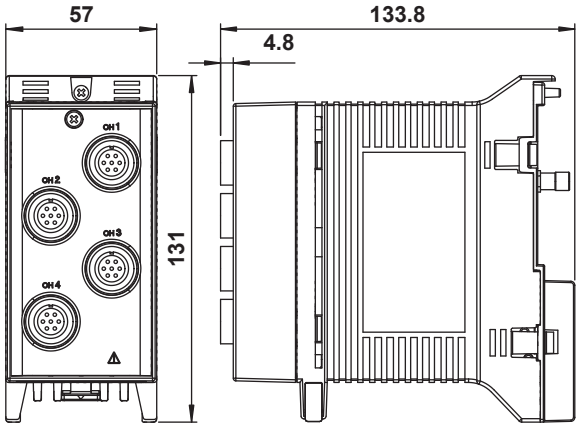
External Dimensions

Units: mm

-B12, -B35



-NDI



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

5.9 10-CH, Pulse Input Module Specifications

Style number: S3
Number of Inputs: 10
Input type: Pull up internally at approx. 5 V/approx. 5 kΩ, non-isolated between channels
Measurement interval: Select 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, or 60 s.
Input types: Contact (non-voltage contact, open collector), LEVEL (5-V logic)
Rated measuring range:
0 to 30000
However when using the SNTP time synchronization function, the measurement interval becomes that when the next time synchronization is executed, and the rated measuring range at that time must not be exceeded.

Set Measurement Interval	Measurement Interval When Time Synch. Executed
2 s	1 s to 3 s
5 s	4 s to 6 s
10 s	9 s to 11 s
20 s	18 s to 22 s
30 s	27 s to 33 s
60 s	54 s to 66 s

Measurement accuracy:
Count ± 1 pulse (note that time axis accuracy (time accuracy) is not included).
For integration computation, the following accuracies are added.
Computation start: + no. of integrations in the MATH interval
Computation stop: + no. of integrations in the MATH interval
Resolution: 1
Filter: First-order lag filter (digital filter):
Measurement interval of 5 s or less: The wider of the ON/OFF width of the interval of approximately 75–90% of the measurement interval.
Measurement interval of 5 s or more: The wider of the ON/OFF width of approximately 4.5 seconds.
Chattering filter (analog filter)
Turn on to remove chattering (of up to 5 ms)
Can be turned ON/OFF on individual channels.
Measurement mode RATE (count instantaneous mode):
Outputs the input number of pulses at the specified interval.
Input range: 10000 count/s or less
(plus over if the count within the measurement range exceeds 31500)
Minimum input pulse width: 40 µs
Input threshold level: Contact (non-voltage contact or open collector):
Counts when changing from contact open (100 kΩ or more) to contact close (100 Ω or less)
LEVEL (5 V logic):
Counts when changing from 1 V or less to 3 V or more.
Hysteresis width: Approximately 0.1 V

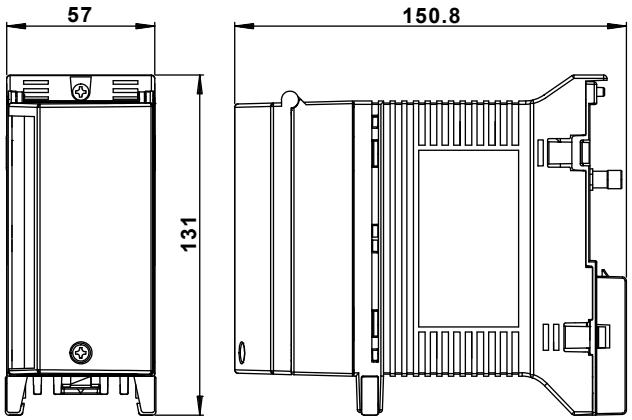
Contact/transistor rating:
Contact with a rating of 15 VDC or more, and 30 mA or more
Transistor with a rating of Vce > 15, and Ic > 30 mA
Maximum input voltage: ± 10 V
Insulating resistance: Input terminals to ground: 20 MΩ or more (500 VDC)
Withstand voltage: Input terminal to ground: 2300 VAC (50/60 Hz), for one minute
Maximum common mode voltage:
250 VACrms (50/60 Hz)
Terminal type: Clamp
Power consumption: Approx. 1.5 W
Applicable wire size: 0.14 to 1.5 mm^2 (AWG26 to 16)
External dimensions: Approx. 57 (W) × 131 (H) × 151 (D) mm (including terminal cover)
Weight: Approx. 0.5 kg.

General Specifications

Operating temperature range: –20 to 60°C
Operating humidity range: 20 to 80% RH for –20 to 40°C
10 to 50% RH for 40 to 50°C
5 to 30% RH for 50 to 60°C

External Dimensions

Units: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

5.10 10-CH, High-Speed Digital Input Module Specifications

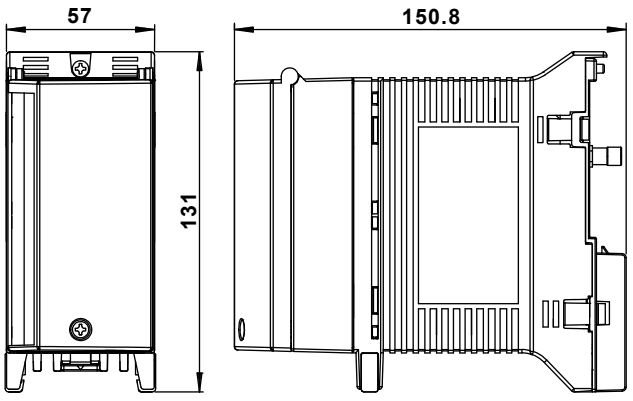
Style number:	S1(-D05), S2(-D24)
Input type:	-D05: Contact (non-voltage contact, open collector) and LEVEL (5-V logic) -D24: LEVEL (24-V logic)
Number of inputs:	10
Input format:	-D05: Pull up at approx. 5 V/approx. 5 kΩ, non-isolated between channels -D24: No isolation between channels
Measurement interval:	Select 10 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, or 60 s
Filter	Measurement interval of 5 s or less: Use the wider of the ON/OFF width of the detection period (approximately 75% to 90% of the measurement interval) Measurement interval of 5 s or more: Use the wider of the ON/OFF width of approximately 4.5 s
Minimum detection pulse width:	Twice the sampling interval or more
Input threshold level:	-D05: Contact (non-voltage contact, open collector): 100 Ω or less, ON, 100 kΩ or more, OFF LEVEL (5-V logic): OFF at 1 V or less and ON at 3 V or more -D24: LEVEL (24-V logic): OFF at 6 V or less and ON at 16 V or greater
Hysteresis width:	-D05: Approx. 0.1 V -D24: Approx. 1.5 V
Contact transistor rating:	15 VDC or greater and 30 mA or greater Transistor with a rating of Vce > 15 VDC and Ic > 30 mA
Maximum input voltage:	-D05: ±10 V -D24: ±50 V
Insulation resistance:	Between input terminals and ground: 20 MΩ or more (500 VDC)
Withstand voltage:	2300 VAC (50/60 Hz) for one minute between input and earth
Maximum common mode voltage:	250 VACrms (50/60 Hz)
Terminal type:	Clamp
Power consumption:	Approx. 1.5 W
Applicable wire size:	0.14 to 1.5 mm^2 (AWG26 to 16)
External dimensions:	Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)
Weight:	Approx. 0.5 kg.

General Specifications

Operating temperature range:	–20 to 60°C
Operating humidity range:	20 to 80% RH for –20 to 40°C 10 to 50% RH for 40 to 50°C 5 to 30% RH for 50 to 60°C

External Dimensions

Units: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

5.11 8-CH, Medium-Speed Analog Output Module Specifications

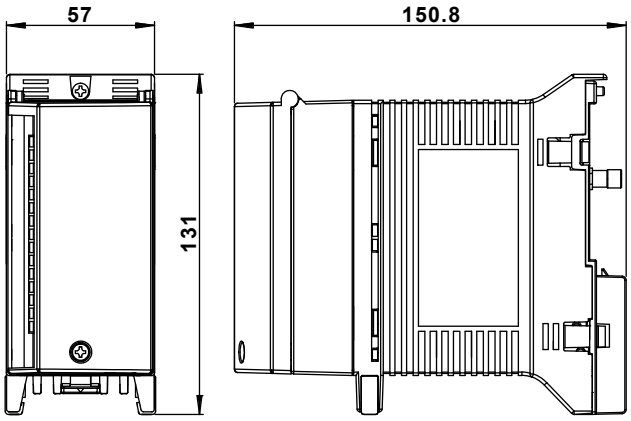
Style number: S2
Number of outputs: 8
Update interval: 100 ms minimum (not synchronized to the measurement interval)
Output types: DC voltage, DC current (external 24-V power supply required when using current output)
Rated output range: Voltage: –10 to 10 V
Current: 0 to 20 mA sourcing (for 1 to 5 V output, 4 to 20 mA is output)
Maximum allowable output range:
Voltage: –11 to 11 V Current: 0 to 22 mA
Load impedance: Voltage: 5 kΩ or more Current: 600 Ω or less.
Accuracy: ±0.2% of F.S. at the rated output range or less (F.S. = 10 V or 20 mA). However, for current output, accuracy is met at 1 mA or more.
The accuracy applies to standard operating conditions:
Ambient temp: 23 ±2°C, ambient humidity: 55 ±10% RH, supply voltage: 90 to 250 VAC, power frequency: 50/60 Hz ±1%, warm-up time: at least 30 minutes, without adverse conditions such as vibrations.
Output resolution: 12 bits of F.S. or more
Resolution –10.000 V to 10.000 V (1 mV resolution)
0.000 mA to 20.000 mA (1µA resolution)
Effects of ambient temperature:
±(50 ppm of Setting + 50 ppm of F.S.) per degree 1°C or less (F.S. = 10 V or 20 mA)
External power supply: 24 V ±10% (required when using current output)
Connect a device with capacity of 250 mA or more.
Insulation resistance: Between output terminals and earth terminal: 20 MΩ or more (500 VDC)
Across output terminals: non-isolated (- terminal common potential)
Withstand voltage: 2300 VAC (50/60 Hz) for one minute between the output terminal and earth.
Across output terminals: non-isolated (-terminal common potential).
Power consumption: Approx. 2.5 W (not including power consumption of external power supply).
Terminal type: Clamp, attached and removed in units of 4 channels
Applicable wire size: 0.08 to 2.5 mm^2 (AWG28 to 12)
External dimensions: Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)
Weight: Approx. 0.5 kg.

General Specifications

Operating temperature range: –20 to 50°C
Operating humidity range: 20 to 80% RH for –20 to 40°C
10 to 50% RH for 40 to 50°C

External Dimensions

Units: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

Output Span Setting

Limit value of V mode and mA mode

Modes	Output lower limit*1	Setting span lower limit	Setting span upper limit	Output upper limit*2
V mode	–11[V]	–10[V]	+10[V]	+11[V]
mA mode	0[mA]	0[mA]	20[mA]	22[mA]

*1 –OVER, preset value
*2 + OVER, preset value

Handling Abnormal Data

Abnormal Data Types	Output value
Data upon startup	Preset value or previously held value can be selected
Data upon error occurrence	Preset value or previously held value can be selected
+OVER	5% of output Full Span
–OVER	–5% of output Full Span

±OVER conditions

- When the input channel is ±OVER in the case of transmission output
- When outside the range of voltage –11 V to +11 V, or current 0 mA to 22 mA (accuracy assured at 1 mA or more)

5.12 8-CH, Medium-Speed PWM Output Module Specifications

Style number: S2
Number of outputs: 8
Update interval: 100 ms minimum (not synchronized to the measurement interval)
Output interval: 1 ms to 300 s (can be set channel by channel)
However,
1 ms interval setting range: 1 ms to 30.000 s (can be set in units of 1 ms)
10 ms interval setting range: 10 ms to 300.00 s (can be set in units of 10 ms)
Output types: Pulse width:
Update timing: After receiving change command, duty is changed from falling of the next interval
Pulse interval accuracy: ±100ppm of Setting
External power supply: 4 to 28 V
Insulation resistance: Between output terminals and earth terminal: 20 MΩ or more (500 VDC)
Across output terminals: non-isolated
Withstand voltage: 2300 VAC (50/60 Hz) for one minute between the output terminal and earth
Across output terminals: non-isolated
Duty resolution: 1 ms interval setting range: 12000
10 ms interval setting range: 60000
Set at 0 to 100.000% (0.001% resolution)
Duty accuracy (at a load resistance 100 Ω or less):
For 1 ms interval setting range, ±0.017% or ±2 μs whichever is longer
For 10 ms interval setting range, ±0.0035% or ±2 μs whichever is longer
When the load resistance is greater than 100 Ω, the output duty can shift.
Output format: External power supply sourcing
ON resistance: 2 Ω or less, when output current is 200 mA or more.
Output capacity: 1 A/ch max, however, 4 A or less total for all modules[*1, *2]

*1 A 1A current limit circuit is built in to the output circuit. Once the current limit circuit is ON, the circuit continues to operate unless the external power supply is turned OFF (maintains the output OFF status)
After turning OFF external power supplies, check the load, then start up the external power supply again.

*2 This module has a built-in fuse. The built-in fuse protects against fires or abnormal emissions of heat due to load short-circuiting or other abnormalities.

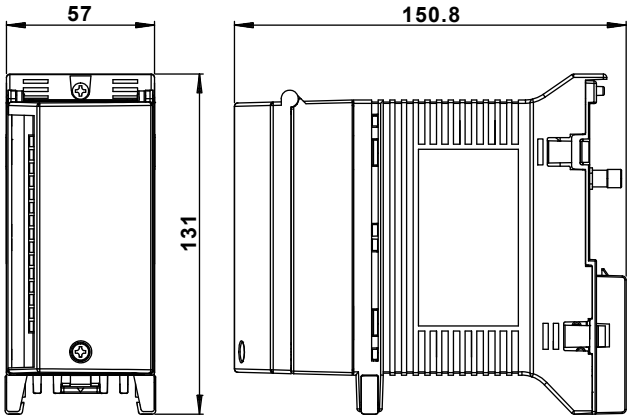
Power consumption: Approx. 2.5 W (not including power consumption of external power supply)
Terminal type: Clamp, attached and removed in units of 4 channels
Applicable wire size: 0.08 to 2.5 mm^2 (AWG28 to 12)
External dimensions: Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)
Weight: Approx. 0.5 kg.

General Specifications

Operating temperature range: –20 to 50°C
Operating humidity range: 20 to 80% RH for –20 to 40 °C
10 to 50% RH for 40 to 50°C

External Dimensions

Units: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

Handling Abnormal Data

Abnormal Data Types	Output value
Data upon startup	Preset value or previously held value can be selected
Data upon error occurrence	Preset value or previously held value can be selected
+OVER	Duty: +5% of the output Full Span
–OVER	Duty: –5% of the output Full Span

±OVER conditions

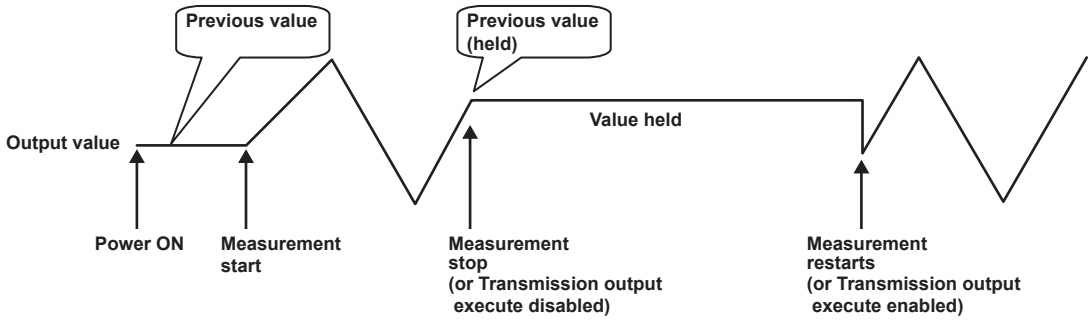
- When duty exceeds 0.000 to 100.000%
- When the input channel is ±OVER in the case of transmission output

5.13 Operations Common to the 8-CH Medium-Speed Analog Output Module and the 8-CH Medium Speed PWM Output Module

Settings Related Specifications (by Module)

Setting channel (Module)	Setting Contents			Settings	Remarks
Output Channel (AO, PWM)	Span Setting range	AO(V)	–10.000 to 10.000V	—	The output range for arbitrary output is within the range on the left
		AO(mA)	0.000 to -20.000 mA		
		PWM	0.000 to 100.000%		
	Preset value Setting range	AO(V)	–11.000 to 11.000V	—	—
		AO(mA)	0.000 to 22.000 mA		
		PWM	0.000 to 100.000%		
	Setting span (minimum and maximum) specified in reverse			Yes	—
	Setting span (minimum, maximum) same value specification			No	—

Overview of Output Operation When Setting Holding of Previous Value of Transmission Output



5.14 10-CH, Medium-Speed Digital Output Module Specifications

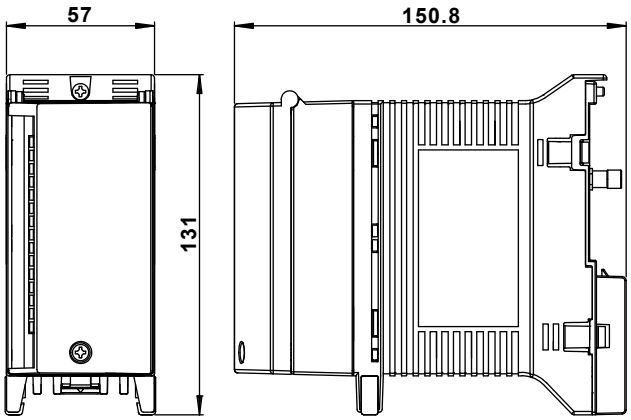
Style number:	S1
Number of outputs:	10
Contact mode:	A contact (SPST)
Update interval:	100 ms minimum (not synchronized to the measurement interval)
Contact capacity:	250 VDC/0.1 A, 250 VAC/2 A, or 30 VDC/2 A (resistance load)
Contact life*:	100,000 times at rated load (typical) 20,000,000 times at no load (typical) * The contact life varies depending on the load conditions and the environment in which it is used.
Insulation resistance:	Between output terminals and earth terminal: 20 MΩ or more (500 VDC) Between output terminals: 20 MΩ or more (500 VDC)
Withstand voltage:	2300 VAC (50/60 Hz) for one minute between the output terminal and earth 2300 VAC (50/60 Hz) for one minute between output terminals
Maximum common-mode voltage:	250 VACrms (50/60 Hz)
Power consumption:	Approx. 2 W (when all relays are turned ON)
Terminal type:	Clamp, attached and removed in units of 5 channels
Applicable wire size:	0.08 to 2.5 mm^2 (AWG28 to 12)
External dimensions:	Approx. 57 (W) × 131 (H) × 151 (D) mm (including the terminal cover)
Weight:	Approx. 0.5 kg.

General Specifications

Operating temperature range:	–20 to 50°C
Operating humidity range:	20 to 80% RH for –20 to 40°C 10 to 50% RH for 40 to 50°C

External Dimensions

Units: mm



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

Appendix 1 Supported Characters

When entering characters on the MW100 from a browser, the following characters can be used. There are limits to which characters can be used depending on the type of entry item. For information on the characters can that can be used in communication commands, see the MW100 Communication Command manual (IM MW100-17E).

Lower 4 bits \ Upper 4 bits	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P		p								
1			!	1	A	Q	a	q								
2				2	B	R	b	r								
3			#	3	C	S	c	s								
4				4	D	T	d	t								
5			%	5	E	U	e	u								
6			&	6	F	V	f	v								
7				7	G	W	g	w								
8			(	8	H	X	h	x								
9			)	9	I	Y	i	y								
A			*		J	Z	j	z								
B			+		K	[	k	{								
C				<	L		l	|							
D			-	=	M	]	m	}								
E			.	>	N	^	n	~								
F			/		O	_	o									

User Specified Strings

Alphanumeric English characters can be entered.

Passwords

Alphanumeric English characters can be entered. However, the following characters may not be used.

Space (blank) and asterisk (*)

Host Name, Domain Name, and Server Name

Alphanumeric English characters and hyphens (-), periods (.), and underscores (_) can be used.

File Name

Alphanumeric English characters and “#”, “%”, “(”, “)”, “-”, “@”, and “_” can be used. However, the following character combinations may not be used.

AUX, CON, PRN, NUL, COM1 to COM9, and LPT1 to LPT9

Appendix 2 Setting Data Communication That Uses Modbus Protocol

This section descries the procedure for data transmission and reception based on a configuration in which two MW100s are connected for Modbus communications (Modbus/TCP) over an Ethernet. Note that the MATH function (/M1 option) is required to use the Modbus client function.

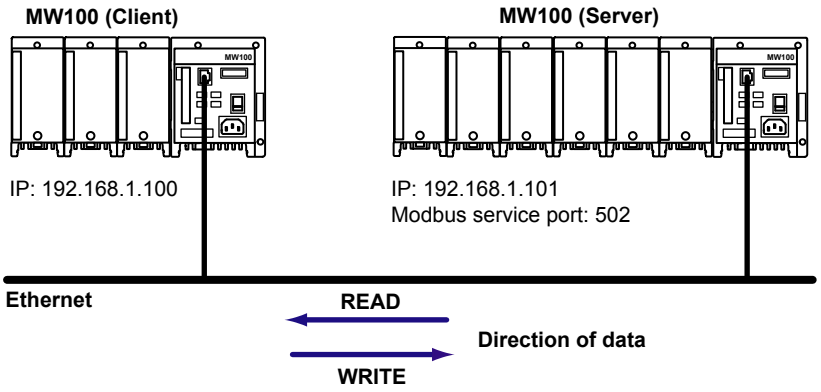
Setup Procedure

The following shows the procedures for entering settings, from connecting to the Ethernet to applying the data acquired via Modbus communications. For detailed instructions and specifications on each function, see the MW100 Data Acquisition Unit user's manual.

	Connect to Ethernet	Connect the MW100s to the Ethernet. ▶ See section 2.6
	Enter Ethernet settings	Enter Ethernet Communication Settings ▶ See section 3.2 ▶ See IM MW100-76E for how to check the connection.
Server Settings	**Enter Server Settings**	Enter Server Settings ▶ See "Server Settings" in section 3.14.
Client Settings	**Enter Client Settings, 1**	Enable the client function. ▶ See section 3.2, "Modbus Client Settings, 1."
	Enter Client Settings, 2	Enter the destination server. ▶ See section 3.2, "Modbus Client Settings, 2."
	Enter Client Settings, 3	Enter register settings. ▶ See section 3.2, "Modbus Client Settings, 3." ▶ See section 5.2 for details on registers.
	Enter MATH channel settings	Apply data acquired via Modbus communications. ▶ See section 3.6 for the settings. ▶ See section 1.15 regarding communication input channels.

Example System

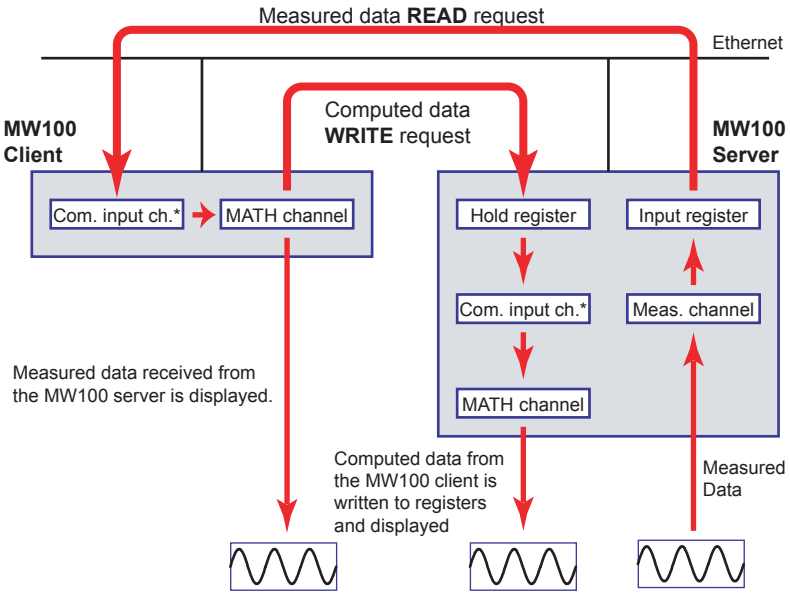
In this example, the system comprises one client MW100 and one server MW100 connected via Ethernet.



The MW100 set up as the client in the above system diagram is referred to as the MW100 client. Likewise, the MW100 set up as the server is referred to as the MW100 server.

Setup Example

Data is sent and received between the MW100 client and MW100 server. The MW100 client loads and displays measured data from measurement channels 001 to 004 of the MW100 server, and also writes that data to the MW100 server. The following is an example in which the data written to the MW100 server is displayed.



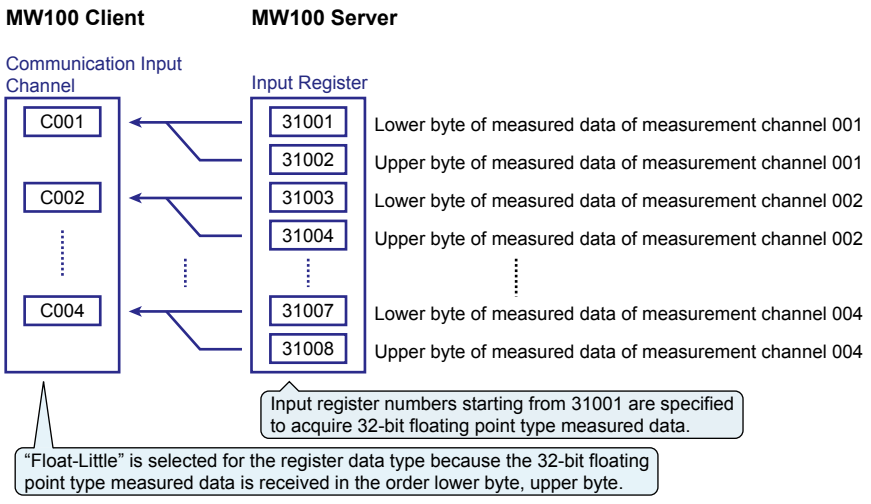
* Com. input ch. : Communication input channel

Data in the Example

The data that is sent and received in this setting example is as follows.

1. Measured data from measurement channels 001 to 004 of the MW100 server are written to communication input channels C001 to C004 of the MW100 client as 32-bit floating point (float) type data.

   For READ (client loads data from server)

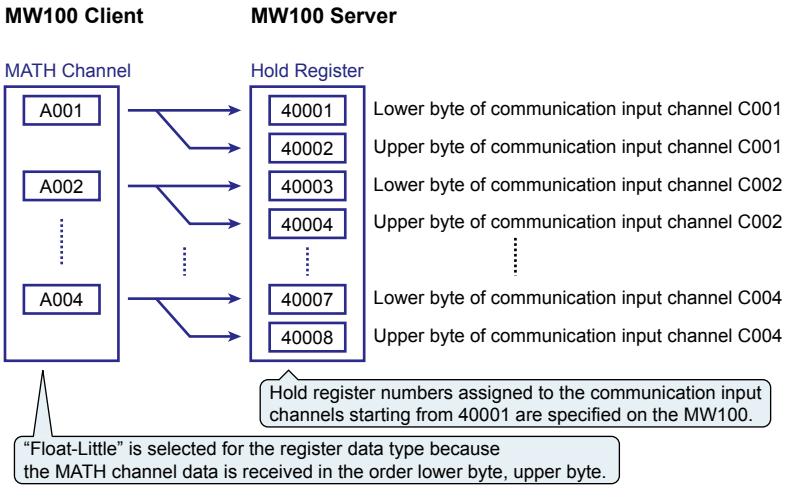


App

Appendix

2. Computed data from MATH channels A001 to A004 of the MW100 client are written to communication input channels C001 to C004 of the MW100 server.

For WRITE (client writes data to the server)

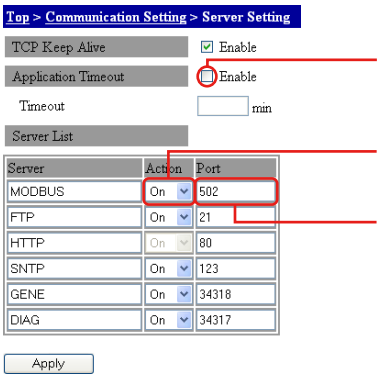


Client/Server Settings for READ

Server-Side Settings

Server Settings

Set the MW100 server as the server device.



Application timeout setting
When set to Modbus server, the timeout value is fixed to 30 s regardless of whether the check box is selected.

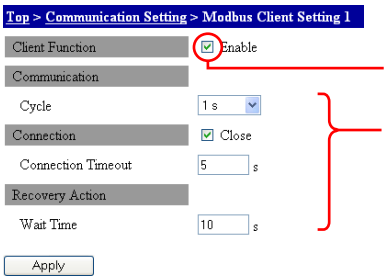
Turn on Action on the server
Turn the MODBUS server action "ON."

Enter the server port number
Enter the server port number. Use the default value unless otherwise necessary. In the example, the default value is "502."

Client-Side Settings

Client Setteing 1

Set the MW100 client as the client device.



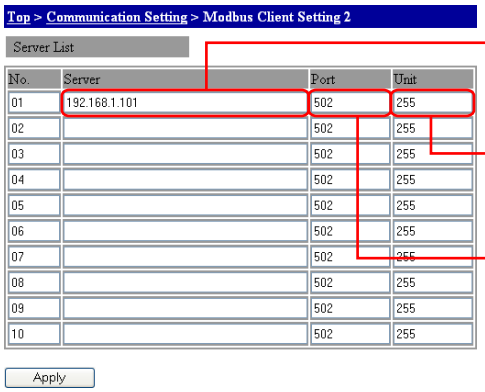
Select
The setting is applied on the client device.

Set according to network environment

- **Cycle:**
  Select a cycle appropriate for the unit's performance.
- **Connection:**
  Disconnect when no response is received from the server.
- **Connection Timeout:**
  Enter the time to wait before disconnecting.
- **Wait Time:**
  Enter the time to wait between disconnection and sending of commands.

Client Setting 2

Enter settings for the destination server.



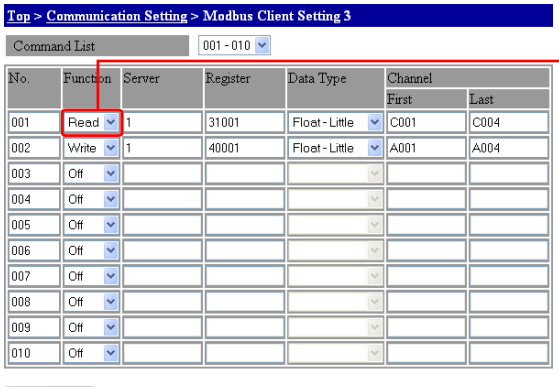
Enter the IP address of the server
Enter the IP address or host name of the destination server. In the example, an IP address of "192.168.1.101" is entered.

Enter the server unit number
Only Modbus/TCP connections are used in the example, therefore the default unit number of "255" is used.

Enter the server port number
Enter the port number of the destination server. In the example, "502" is entered.

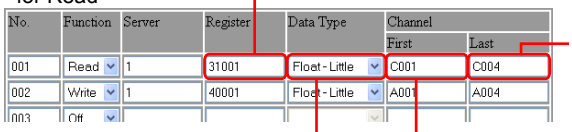
Client Setting 3

Enter settings for registers to be used for receiving data. For data types, see "Register Data Types."



Select the register function (read or write)
If the client will be reading from the server, select "Read."

• for Read



Enter the number of the destination server
Enter the number set in Client Setting 2. In the example, "1" is entered.

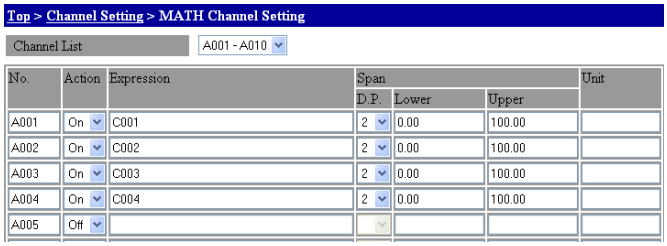
Enter the communication input channels on which to read by the client
In the example, the client will read on communication input channels "C001" to "C004."

Select the data type for the registers on the destination server that will be read.
In the example, "Float-Little" is entered indicating that the register data type is 32-bit floating point and the order is lower byte, upper byte.

Enter the number of the first input register on the destination server that will be read.
In the example, "31001" is entered since the measured data read out from measurement channels 001 to 004 is of the 32-bit floating point type.

MATH Channel Settings

In order to display data loaded to the communication input channels from the MW100 server, enter the communication input channel numbers in the MATH channel expression entry area.



Client/Server Settings for WRITE

Server-Side Settings

Server Settings

Set the MW100 server as the server device. These are the same as the server-side settings for READ.

MATH Channel Settings

In order to display data written to the hold registers from the MW100 client, enter the communication input channel numbers in the MATH channel expression entry area. These are the same as the MATH channel settings for READ.

Client-Side Settings

Client Setting 1

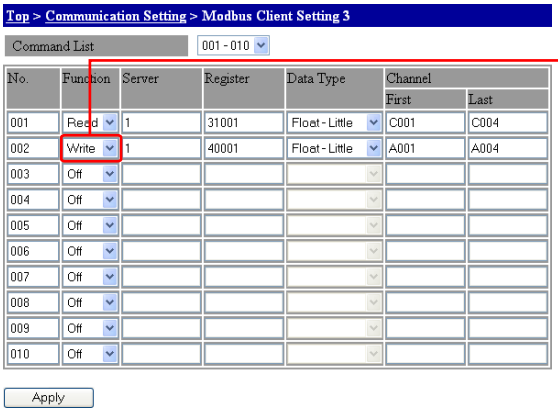
Set the MW100 client as the client device. These are the same as the client-side settings for READ.

Client Setting 2

Enter settings for the destination server. These are the same as the client-side settings for READ.

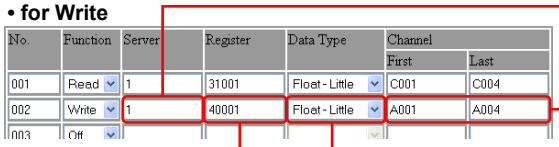
Client Setting 3

Enter settings for registers to be used for sending data.



Select the register function (read or write)
If the client will be writing to the server, select Write.

• for Write



Enter the number of the destination server
Enter the number set in Client Setting 2. In the example, "1" is entered.

Enter the channels on the client that will be written to the destination server
In the example, "A001" to "A004" is entered since computed data from MATH channels 001 to 004 are written.

Select the data type for the hold registers of the destination server.
In the example, "Float-Little" is entered indicating that the register data type is 32-bit floating point.

Enter the number of the first hold register that is written to on the destination server.
In the example, "40001" is entered since the client will write to communication input channels C001 to C004 on the server.

Starting Communication

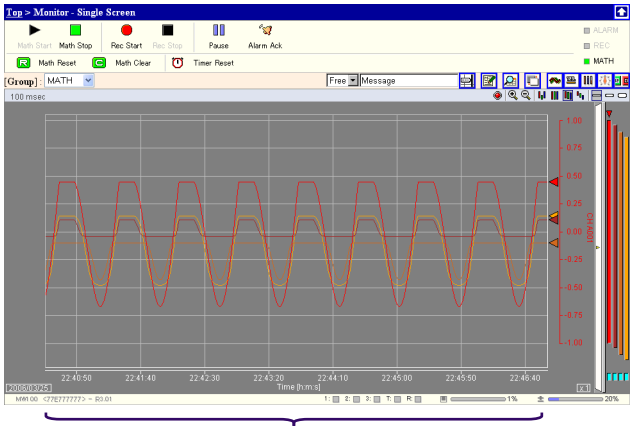
Starting Measurement and Computation

MATH channels must be displayed to show transmitted data. After starting measurement, start computation.

Displaying Data

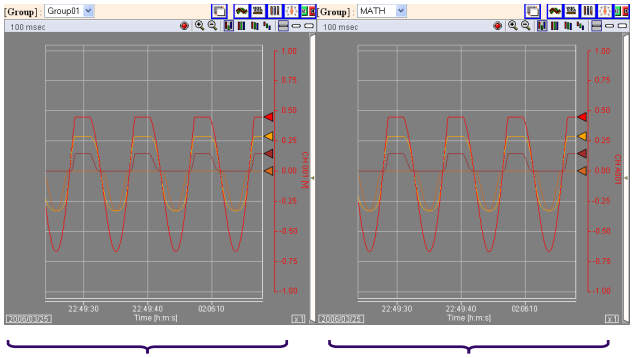
When data is sent/received via Modbus communication, the following waveform is displayed on the monitor screen of a Web browser.

- **Displaying MW100 Client Data (Trend)**



Computed data (data received via Modbus communications)

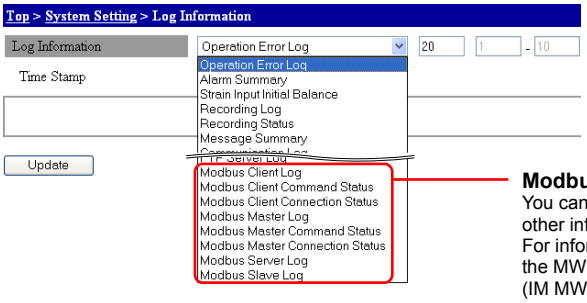
- **Displaying MW100 Server Data (Trend)**



Measured data **Computed data (data received via Modbus communications)**

Checking the Communication Status

You can view log information to check the status of Modbus communications.



Modbus communication log information
You can check the status of communication and other information by selecting items here.
For information about displayed contents, see the MW100 Communication Command Manual (IM MW100-17E).

Register Data Types

The figure below describes specification of data types for registers used during Modbus communications. Registers are fixed to 16-bits in length. Data longer than 16 bits are stored using multiple registers. In this case, the data sequence (Endian) must be specified. The MW100 can process 32-bit data. Specify “Little” to store data from the least significant byte, and “Big” to store data from the most significant byte.

Register	Assignment		Data Type	Data Type Specification
30001	Signed integer	(16bit)	Int16	----- Int16
30001	Unsigned integer	(16bit)	UInt16	----- UInt16
30001 30002	Signed integer	(Lower 16bit) (Upper 16bit)	Int32	----- Int32 - Little
30001 30002	Signed integer	(Upper 16bit) (Lower 16bit)	Int32	----- Int32 - Big
30001 30002	Unsigned integer	(Lower 16bit) (Upper 16bit)	UInt32	----- UInt32 - Little
30001 30002	Unsigned integer	(Upper 16bit) (Lower 16bit)	UInt32	----- UInt32 - Big
31001 31002	Floating point real number	(Lower 16bit) (Upper 16bit)	Float	----- Float - Little
31001 31002	Floating point real number	(Upper 16bit) (Lower 16bit)	Float	----- Float - Big

* MW100 data are all Little Endian, and assigned to Modbus registers. When loading MW100 data, specify “Little.”

For the available MW100 register numbers, Modbus protocol specifications, and other information, see "Modbus Protocol Specifications" in section 5.2 of the MW100 User’s Manual (IM MW100-01E).

Appendix 3 Using the Event Action

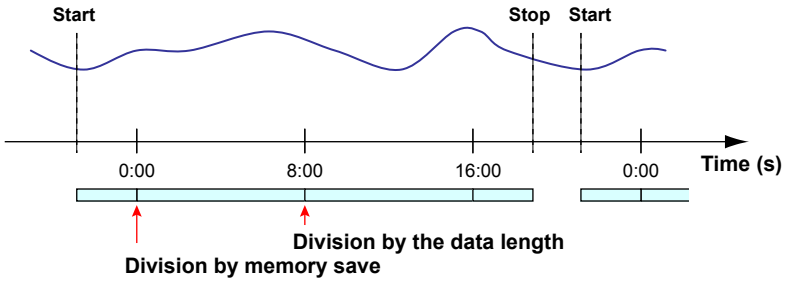
This section introduces an example in which the event action function is used to save the data.

- Saving data on the hour
- Acquiring periodic data (periodic report)
- Diving the data on each event

Saving Data on the Hour

Data is saved on the hour by setting the event to Timer and action to Memory Save. In this example, data is saved at hour 0 using Memory Save.

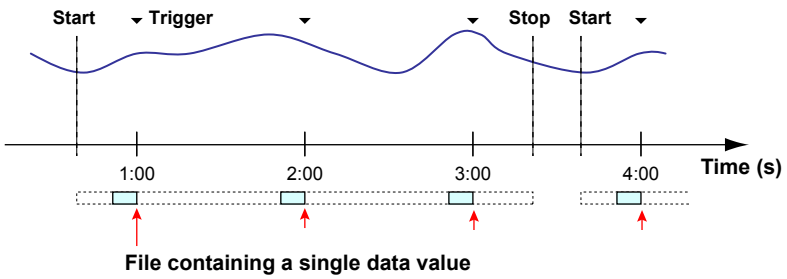
- Setting the event action
  Event: Timer, action: Memory Save, event detection: Edge
- Setting the Recording
  Recording start action: Direct, recording stop action: Fullstop or Rotate,
  data length: 8 h
- Setting the timer
  Timer type: Absolute, Reference time: 0:00, 8 h interval



Acquiring Periodic Data

Create a file containing a single data value by setting the event to Timer and action to Trigger. This is used to record data periodically (period reporting).

- Setting the event action
  Event: Timer, action: Trigger, event detection: Edge
- Setting the Recording
  Recording start action: Trigger (pretrigger 100%), measurement interval: 1 min, recording interval: 10x
  Recording stop action: Fullstop or Rotate, data length: 10 min
- Setting the timer
  Timer type: Absolute, Reference time: 0:00, 1 h interval

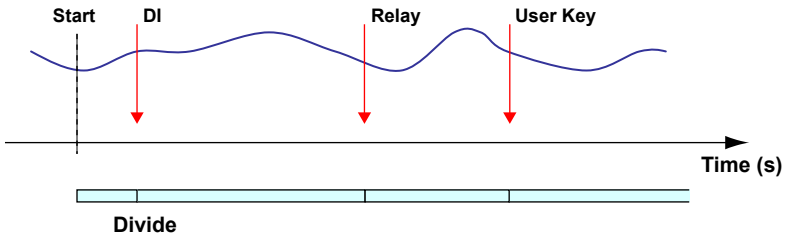


In the recording interval setting above, one data value is recorded every 10 minutes. To record the data to the file on the hour, start the recording at 0:00, 0:10, 0:20 and so on (at any of the 10 minute intervals). If you start the recording at 0:03, the data is recorded at 0:53, 1:53, 2:53, and so on.

Diving the Data on Each Event

Data is divided by setting the input/output event and the action to Memory Save.

- Setting the event action
  Event: DI, Alarm, Relay, UserKey, etc. Action: Memory Save
  Event detection: Edge
- Setting the Recording
  Recording start action: Direct, recording stop action: Fullstop or Rotate, data length: arbitrary (long time)



Appendix 4 E-Mail Format

In the explanations that follow, *CRLF* means “carriage return/line feed.”
A user-defined character string can be attached to the subject of each mail.

Alarm Notification E-mail Format

- **Subject**

  `Subject: [Alarm Summary]`

- **Syntax**

```
CRLF
Alarm_SummaryCRLF
DATE_yy/mo/ddCRLF
TIME_hh:mi:ssCRLF
CRLF
<Alarm Summary>CRLF
cc____lq_aaaCRLF
.........................
mmmm_lq_aaaCRLF
.........................
CRLF
<CH_Data>CRLF
ccc*ddddddd_[uuuuuu]CRLF
.........................
mmmm*eeeeeeeee_[uuuuuu]CRLF
.........................
CRLF
ENDCRLF
CRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mi	Minute (00 to 59)
ss	Seconds (00 to 59)
*	Tab
ccc	Measurement ch no. (001 to 060, SKIP channels not output)
mmmm	MATH ch no. (A001 to A300, OFF channels not output)
l	Alarm level (1 to 4)
q	Alarm type (H, L, h, l, R, r, T, t) H (upper limit alarm), L (lower limit alarm), h (differential upper limit alarm), l (differential lower limit alarm), R (high limit on rate of change alarm), r (low limit on rate of change alarm), T (delay high limit alarm), t (delay low limit alarm)
aaa	Alarm status (off, on)
ddddddd	Measured data (measurement channel, includes decimal point and minus sign, all space filled in to the left when 6 characters or fewer)
eeeeeeeee	Computed data (MATH channel, includes decimal point and minus sign, all space filled in to the left when 8 characters or fewer)

uuuuuu	Unit information (output using 6 chars., left justified) mV____: mV V_____: V ^C____: °C XXXXXX: (user specified char. string)
_	Blank

Note

If measured / computed data results in an error (+Over, –Over, Invalid, or Illegal), the errors are sent without the values.

Report Notification E-mail Format (/M3 option)

- **Subject**

  Subject: [Report_Data]

- **Syntax**

```
CRLF
Report_DataCRLF
<Time>CRLF
DATE_yy/mo/ddCRLF
TIME_hh:mi:ssCRLF
CRLF
<ttttttt_Report_Data>CRLF
Start_Time:*ssssssssssssssssCRLF
Time:*iiiiiiiiiiiiiiiiCRLF
CRLF
Ch*Max*Min*Ave*Sum*InstCRLF
ccc*rrrrrrrrr* rrrrrrrrr * rrrrrrrrr * eeeeeeeeeeee *
  rrrrrrrrr * [uuuuuu(bbbbbb)]*kkkkkkCRLF
••••••••••••••
mmmm* rrrrrrrrr * rrrrrrrrr * rrrrrrrrr * eeeeeeeeeeee *
  rrrrrrrrr * [uuuuuu(bbbbbb)]*kkkkkkCRLF
••••••••••••••
CRLF
EndCRLF
CRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mi	Minute (00 to 59)
ss	Seconds (00 to 59)
ttttttt	Report type information (Hourly, Daily, Weekly, Monthly)
*	Tab
ssssssssssssssss	Report start date/time (yy/mo/dd_hh: mi: ss)
Iiiiiiiiiiiiiiii	Report stop date/time (yy/mo/dd_hh: mi: ss)
kkkkkk	Report status (error (Er), over (Ov), or power failure (Pw)) (omitted if none)
ccc	Measurement channel numbers
mmmm	Computation channel numbers

rrrrrrrrr	Report data (excluding integral value, sends in the order maximum/minimum/average/instantaneous value, includes decimal point and minus sign, all space filled in to the left when 8 characters or fewer)
eeeeeeeeeeeee	Integral data (includes exponent display (e.g.: -4.000000E+19), decimal point, minus sign, and E, all space filled in to the left when 12 characters or fewer)
uuuuuu	Unit information (output using 6 chars., left justified) mV____: mV V_____: V ^C____: °C xxxxxx: (user specified char. string)
bbbbbb	Sum scale information (omitted when none)
_	Blank

File Creation Notification E-mail Format

- **Subject**

  Subject: [File End]

- **Syntax**

  CRLF
  File_End*CRLF*
  <Time>*CRLF*
  DATE_yy/mo/dd*CRLF*
  TIME_hh:mi:ss*CRLF*
  CRLF
  <File_Name>*CRLF*
  fl/fn*CRLF*
  CRLF
  END*CRLF*
  CRLF

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mi	Minute (00 to 59)
ss	Seconds (00 to 59)
fl	Folder name
fn	File name
_	Blank

Media Remaining Space Notification E-mail Format

- **Subject**

  Subject: [Media Remain]

- **Syntax**

  CRLF
  Media_Remain*CRLF*
  <Time>*CRLF*
  DATE_yy/mo/dd*CRLF*
  TIME_hh:mi:ss*CRLF*
  CRLF
  <Media_Info>
  aaaaaaa_K_byte_total*CRLF*
  bbbbbbb_K_byte_free*CRLF*
  CRLF
  END*CRLF*
  CRLF

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mi	Minute (00 to 59)
ss	Seconds (00 to 59)
aaaaaaa	Media capacity [KB] (0000000 to 9999999)
bbbbbbb	Media total capacity [KB] (0000000 to 9999999)
_	Blank

Power ON Notification E-mail Format

- **Subject**

  Subject: [Power Failure]

- **Syntax**

  CRLF
  Power_Failure*CRLF*
  <Power_Off>*CRLF*
  DATE_yy/mo/dd*CRLF*
  TIME_hh:mi:ss*CRLF*
  CRLF
  <Power_On>*CRLF*
  DATE_yy/mo/dd*CRLF*
  TIME_hh:mi:ss*CRLF*
  CRLF
  END*CRLF*
  CRLF

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mi	Minute (00 to 59)
ss	Seconds (00 to 59)
_	Blank

System Error Notification E-mail Format

- **Subject**

  Subject: [ERROR]

- **Syntax**

  CRLF
  ERROR*CRLF*
  <Time>*CRLF*
  DATE_yy/mo/dd*CRLF*
  TIME_hh:mi:ss*CRLF*
  CRLF
  <ERROR_Message>*CRLF*
  nnn_mmmmmmmm*CRLF*
  CRLF
  END*CRLF*
  CRLF

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mi	Minute (00 to 59)
ss	Seconds (00 to 59)
nnn	Error number
mm‥mm	Error message
_	Blank

Periodic Report Notification E-mail Format

- **Subject**

  Subject: [Periodic Data]

- **Syntax**

  CRLF
  Periodic_Data*CRLF*
  <Time>*CRLF*
  DATE_yy/mo/dd*CRLF*
  TIME_hh:mi:ss*CRLF*
  CRLF
  <CH_Data>*CRLF*
  ccc*dddddddd_[uuuuuu]*CRLF*
  .....
  mmmm*eeeeeeeee_[uuuuuu]*CRLF*
  .....
  CRLF
  END*CRLF*
  CRLF

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mi	Minute (00 to 59)
ss	Seconds (00 to 59)
*	Tab
ccc	Measurement ch no. (001 to 060, SKIP channels not output)

mmmm	Computation channel no. (A001 to A300, OFF channels not output)
f	Minus sign (omitted if +)
ddddddd	Measured data (measurement channel, includes decimal point and minus sign, all space filled in to the left when 6 characters or fewer)
eeeeeeeee	Computed data (MATH channel, includes decimal point and minus sign, all space filled in to the left when 8 characters or fewer)
uuuuuu	Unit information (output using 6 chars., left justified)
	mV____: mV
	V_____: V
	^C____: °C
	xxxxxx: (user specified char. string)
–	Blank

Note

If measured / computed data results in an error (+Over, –Over, Invalid, or Illegal), the errors are sent without the values.

Test E-mail Format

- **Subject**

  Subject: [Test]

- **Syntax**

  CRLF
  Test*CRLF*
  <Time>*CRLF*
  DATE_yy/mo/dd*CRLF*
  TIME_hh:mi:ss*CRLF*
  CRLF
  END*CRLF*
  CRLF

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mi	Minute (00 to 59)
ss	Seconds (00 to 59)
_	Blank

Appendix 5 Retrieving Files Using WebDAV

The MW100 communication service contains the WebDAV function. This function is used to operate the files on the CF card that is attached to the MW100 or retrieve the files. This section explains the method using a browser. Internet Explorer is used for the browser.
Another method is to use **Create a new connection** from **My Network Places**.

File Operation

You can perform file operations such as move and copy in the same manner as normal files.

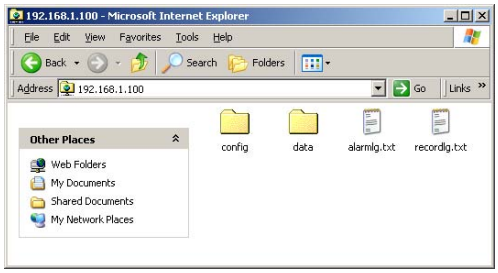
Connection Using a Browser

Connect the MW100 to the PC and configure the network.

For Windows 2000 and Windows XP

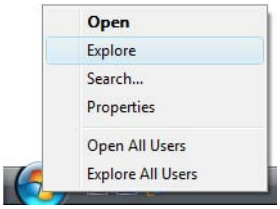
1. Start the browser.
2. On the **File** menu, choose **Open**.
3. In the **Open** dialog box, type the IP address or host name.
   Example) When the IP address of the MW100 is 192.168.1.100
   If the OS is Windows XP: http://192.168.1.100/?
   If the OS is not Windows XP: http://192.168.1.100/

4. Select the **Open as Web Folder** check box.
5. Click **OK**. The folder opens.

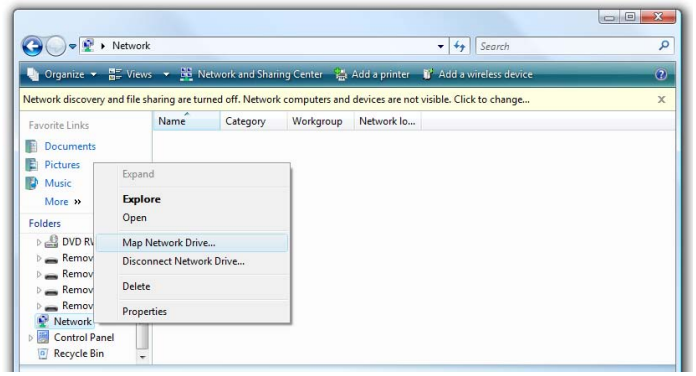


For Windows Vista

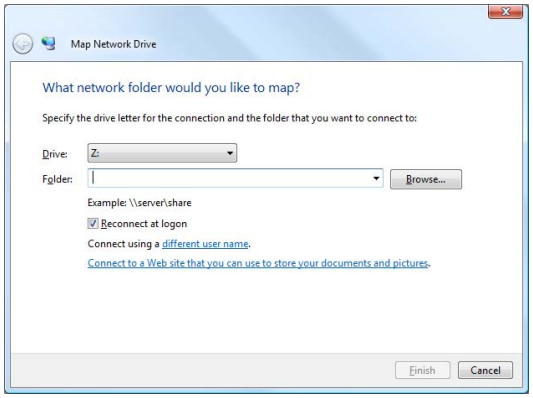
1. To use the WebDAV function, you must apply the patch provided by Microsoft. Download the file from their Web site and apply (install) the patch.
   There is a link to the Microsoft Web site on the Yokogawa MW100 Web site.
2. Right click the Start menu and select Explorer.
   The Windows Explorer opens.



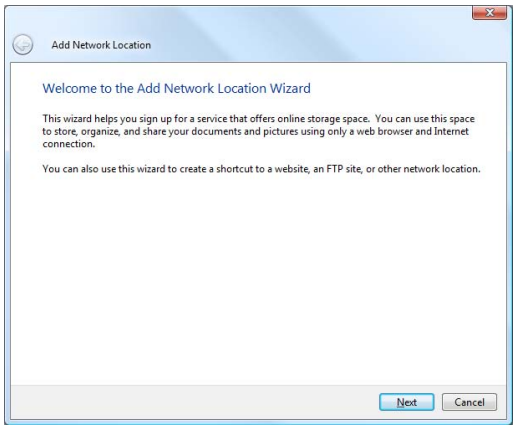
3. In the Explorer, right-click Computer and select Map Network Drive...
   The Map Network Drive window is displayed.



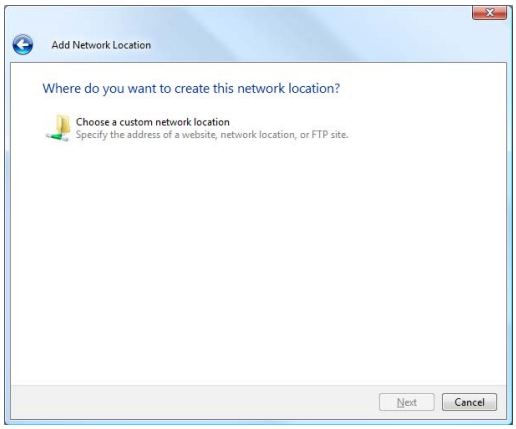
4. Click, “Connect to a Web site that you can use to store your documents and pictures.”
   The Add Network Location window appears.



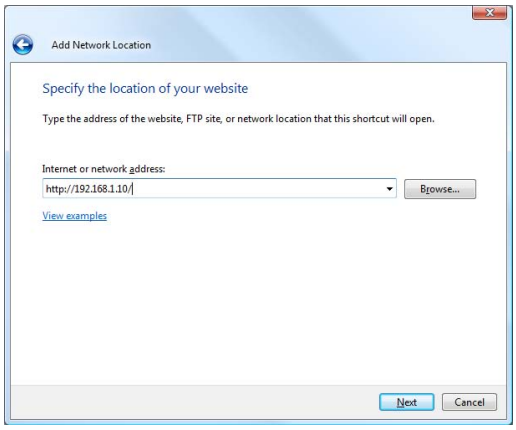
5. Click the Next button.
   The Connect to the Internet and Add Network Location windows appear.



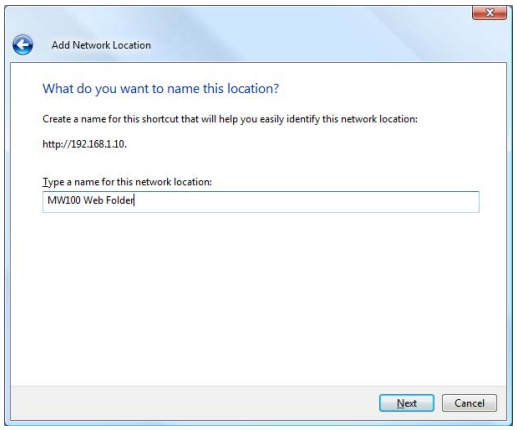
6. Click the Cancel button in the Connect to the Internet window to close it.
7. Select the Add Network Location window. Click Select Choose a custom network location, then click the Next button.



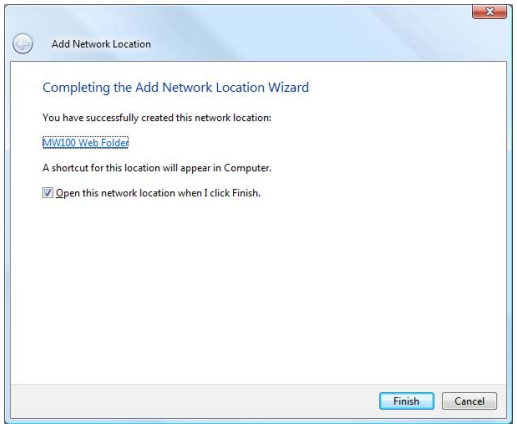
8. Enter the IP address of the MW100 in the Internet or network address box, then click the Next button.
   If the MW100's IP address is 192.168.1.10, enter http://192.168.1.10/.



9. Enter the WebDAV name in the “Type a name for this network location” box, then click the Next button.
Use an easy-to-identify name.

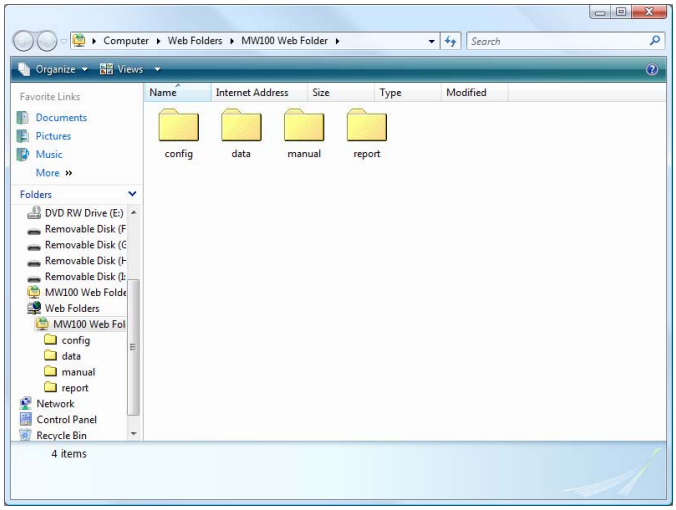


10. Click the Finish button.



Settings complete.

If you open the Explorer and select a Web folder, the folder opens.



Appendix 6 Network Terminology

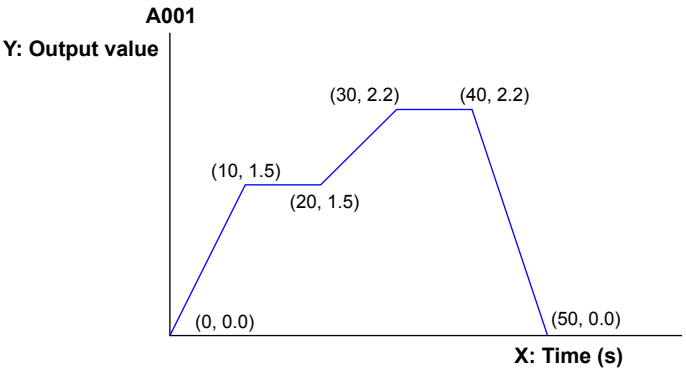
Network Terminology

Term	Description
IP address	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.
Subnet mask	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.
Default gateway	A representative router or computer that is used when accessing a computer outside its own network. If the IP address of the access destination does not specify a specific gateway, data is sent to the host designated as the default gateway.
DNS	Abbreviation 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.
DHCP	Abbreviation for Dynamic Host Configuration Protocol. A protocol that automatically assigns required information such as an IP address to the computer that is temporarily connecting to the Internet. The DHCP server provides the information to the computer (client) that access the server. If the client finishes the communication, the server withdraws the address and assigns it to another computer.
HTTP	Abbreviation for HyperText Transfer Protocol. A protocol used to exchange data between the Web server and the client (Web browser, etc.). HTML documents and image, sound, video files that are linked to the document can be exchanged including the expression information.
SNTP	Abbreviation 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 constructs 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 the application of the client querying the time to the server.
SMTP	Abbreviation for Simple Mail Transfer Protocol. A protocol used to transmit e-mail on the Internet. It is used to exchange mail between servers and used by the client to send mail to the server.
FTP	Abbreviation for File Transfer Protocol. A protocol used to transfer files over the TCP/IP network such as the Internet.
POP3	Abbreviation for Post Office Protocol version 3 A protocol used to receive mail from a server storing e-mail on the intranet or Internet. POP3 is currently the most popular protocol.
POP before SMTP	One of the user authentication methods used when sending e-mail. Access to the SMTP server is granted by accessing the specific POP3 server first before sending the e-mail.
PASV mode	Passive (PASV) 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 PASV mode is necessary.
WebDAV	Abbreviation for Distributed Authoring and Versioning protocol for the WWW. Specifications that expands HTTP used to transfer files on the WWW so that the files and folders on the Web server can be managed from the client (Web browser). It allows (1) the document created on the client to be transmitted to the server for disclosure, (2) the list of folders and files on the server to be retrieved, and (3) the files and folders to be copied, moved, and deleted.

Appendix 7 Using the Broken Line Data of Decimal Values

Because the output value of a program channel is an integer, an expression is used to output decimal values.

- **Setting Example**
  A001=P01/K01
  Here, MATH channel is A001, program channel is P01, and calculation constant is K01.



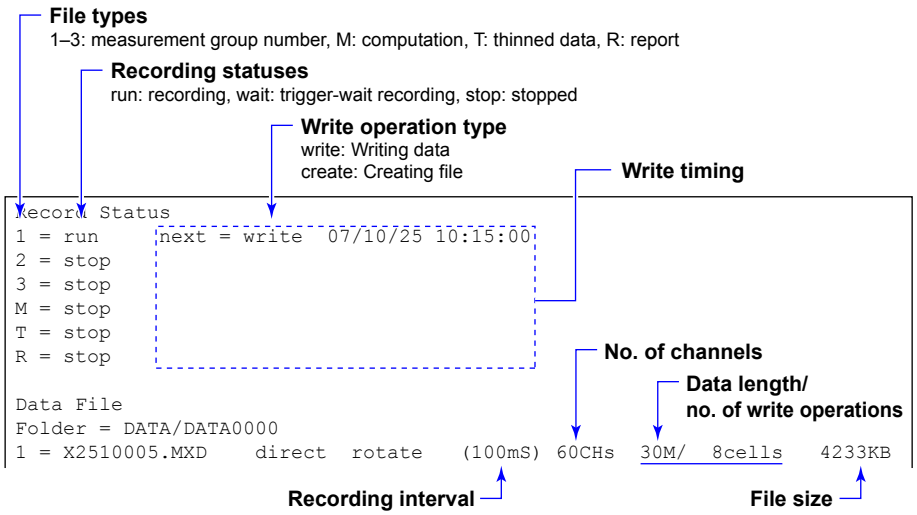
- **Entry Example**
  Set the calcuation constant as K01=10.
  The broken line data P01 is as follows:
  (0.0), (10.15), (20.15), (30.22), (40.22), (50.0), (-1.0)

Appendix 8 Saving Data to the CF Card

Write Timing

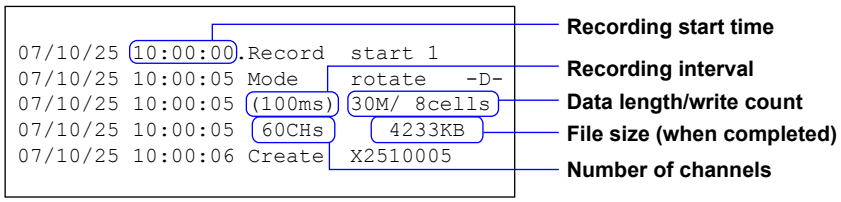
Write Timing

You can check the time when data is written to the CF card using the recording status in the log information.



Write interval

When data is saved to the CF card, the data is written several times in sections. The writing interval can be read from the recording status of the log information or the recording log.

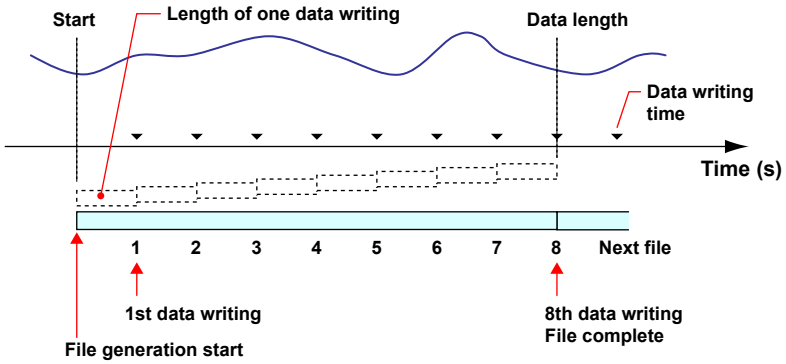


In this recording log example, a file of 30-minute data length (30M) is written 8 times (8 cells) to the CF card.

30 minutes/8 times = 3 minutes 45 seconds

The time when data is written to the CF card is every 3 minutes and 45 seconds from the recording start time at 10:00.

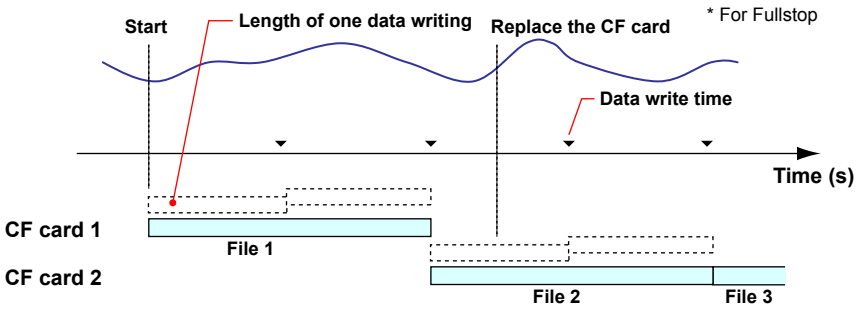
The data save operations is as follows:



Replacing the CF Card While Recording

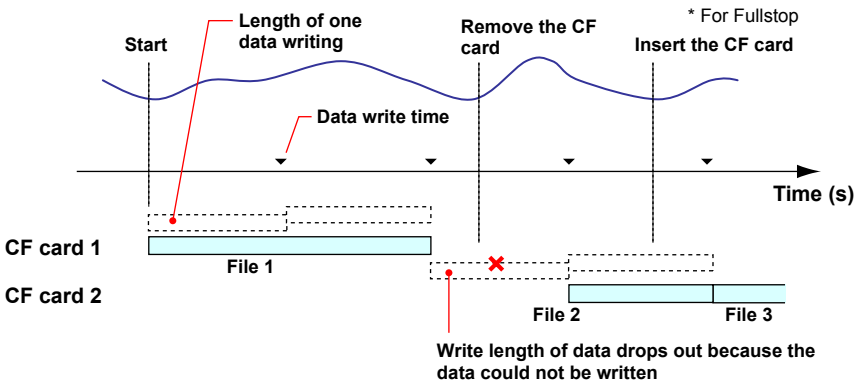
You can replace the CF card while recording is in progress. Replace the CF card while the access indication to the CF card is not showing. An access forewarning is indicated before the CF card is accessed.

The data save operation when the card is replaced between data write intervals is as follows:



If the data write interval arrives while the CF card is being replaced (CF card removed from the MW100), the write length of data drops out.

The data save operation if the data write interval arrives while the CF card is being replaced is as follows:



You can join files divided by replacing the CF card on the MW100 Viewer. The files that can be joined are those when the recording start operation is direct, and when the recording start operation is trigger and the action becomes true (post trigger). If a portion is lacking, the remaining portion can still be joined. For details, see the MW100 Viewer Software User's Manual (IM MW180-01E).

Write Count

When data is saved to the CF card, the data is written several times in sections.
The write count can be calculated in advance.

Equation

The relationship between the data length and write count is as follows:

Data length = write length × write count

Because the write length is designed not to exceed the storage time (one-half the time that can be stored in the internal memory), write length is less than the storage time. Here, the storage time is derived from the storage data size and recording interval as follows:

$$\text{Storage time} = \frac{\text{One-half the internal memory size}}{\text{Storage data size}} \times \text{recording interval}$$

The storage data size is given by

Storage data size = measured data + MATH data + thinned data
- Measured data: Time information 16 bytes + measured data 4 bytes × number of recorded measurement channels
- MATH data: Time 16 bytes + MATH data 6 bytes × number of recorded MATH channels
- Thinned data: Time 16 bytes + thinned data 6 bytes × number of thinning recording channels

Thus, the write count N is given by

$$\text{Write Count N} > \frac{\text{Data length [s]}}{\frac{\text{One-half the internal memory size [byte]}}{\text{Storage data size [byte]}} \times \text{recording interval [s]}}$$

However, the write count N is a number that divide the data length evenly.

Calculation of the Write Count

Given a recording interval of 100 ms, 60 measurement channels, and 30 minute data length, the write count is calculated as follows:

The storage data size is given by

Storage data size [byte] = 16 + 4 × 60 [ch] = 256

Because the write length is designed to be less than a half the internal memory size of 1.25 Mbyte (when not using multi interval), the write count N is given by

$$\text{Write Count N} > \frac{30 \text{ min} \times 60}{\frac{1.25 \text{ Mbyte} / 2}{256 \text{ bytes}} \times 100 \text{ ms}} = 7.03$$

In this example, data is written 8 times (30 minutes/8 = 3 minutes 45 seconds).

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