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**User's  
Manual**



**MW100  
Communication Command  
Manual**

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**vigilantplant®**

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## Foreword

Thank you for purchasing the MW100 Data Acquisition Unit. This user's manual describes MW100 communication commands and responses. To ensure correct use, please read this manual thoroughly before beginning operation. The six manuals below relating to the MW100 are provided in addition to this one. Read them along with this manual. Like this manual, the MW100 Data Acquisition Unit User's Manual, MW100 Data Acquisition Unit Operation Guide, and MW100 Viewer Software User's Manual are included on the MW100 Manual CD-ROM.

Manual Title	Manual No.	Description
MW100 Data Acquisition Unit User's Manual	IM MW100-01E	Explains the MW100 Data Acquisition Unit functions, installation and wiring procedures, precautions, and browser operations.
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 Connecting Ethernet and Checking the Connection	IM MW100-71E	Explains the procedure to check the Ethernet connection.
Precautions on the Use of the MX100/MW100	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.
MX100/MW100 Quick Start Package Checking the Contents of the Package	IM MX100-79E	Explains the contents of the quick start package (/SL1, /SL2, and /SL3 options).
Control of pollution caused by MX100/MW100 products	IM MX100-91C	Describes control of pollution caused by the product.
772075 AC Adapter	IM 772075-01E	Describes the specifications of the AC adapter (power supply suffix code "-2").
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 style number S3 of the MW100 Data Acquisition Unit.
- The contents of this manual are subject to change without prior notice as a result of improvements in the software's performance and functions. Display contents illustrated in this manual may differ slightly from what actually appears on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA representative, dealer, or sales office.
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## Revisions

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4th Edition March, 2012

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# How to Use This Manual

## Structure of the Manual

This user's manual contains the following chapters.

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<b>Chapter 1</b>	<b>Commands</b>
	Explains all available commands, one-by-one.
<b>Chapter 2</b>	<b>Responses</b>
	Describes the format of settings and measured or computed data output by this instrument.
<b>Appendix</b>	
	Provides serial interface specifications, a table of ASCII character codes, and other information.
<b>Index</b>	
	An alphabetical index of this manual.

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## Symbols Used in This Manual

### Unit

- k: Denotes 1000. Example: 5 kg, 100 kHz
- K: Denotes 1024. Example: 10 KB

### Safety Markings

The following safety 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.

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### **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.

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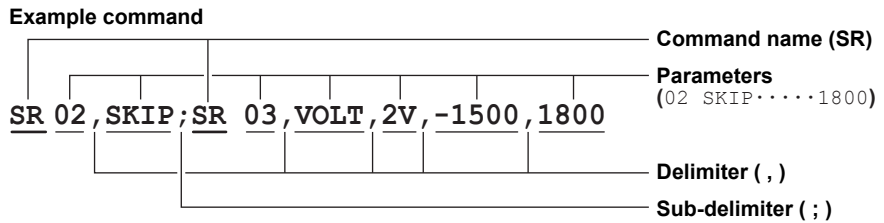
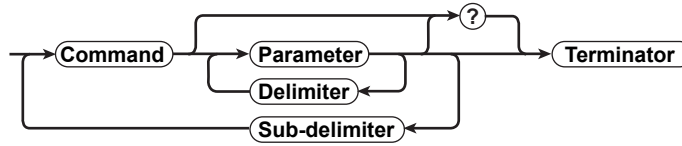
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# 1.1 Command Format

## Command Format

The format for MW100 commands is described below. ASCII character codes (see Appendix 5) are used.



### Command Name

Consists of two alphabetic characters.

### Parameters

- The arguments of the command.
- Set using alphanumeric characters.
- A delimiter (comma) is inserted between parameters.
- If the parameter is a numerical value, the valid setting range varies depending on the command.
- Spaces before, after, or inside of a parameter are ignored (except for parameters (units) set as user-specified strings which allow spaces).
- Parameters can be omitted unless a change from a current setting is required. However, the delimiter cannot be omitted.

Example SR01 , , 2V<terminator>

If multiple parameters are omitted, and delimiters are continuous until the terminator, those delimiters can be omitted.

Example SR01 , VOLT , , , <terminator> -> SR01 , VOLT<terminator>

- The maximum length for a single parameter is 512 bytes.

### Queries

- Question marks (?) are used for queries.
- You can place a query after a command or parameter to query the setting of that command. There are commands for which queries cannot be made. See section 1.4 to 1.8 for the queries for each command.

Ex. 1 SR[p1]? Execute SR? or SRp1?.

Ex. 2 SA[p1[p2]]? Execute SA?, SAp1?, or SAp1,p2?.

### Delimiters

- Commas ( , ) are used as delimiters.
- A delimiter is inserted between parameters.



## 1.1 Command Format

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### Sub-Delimiters

- Semicolons ( ; ) are used as sub-delimiters.
- You can enumerate up to 99 commands by connecting them one-by-one with the sub-delimiter. However, the following commands and queries cannot be enumerated. Use them solitarily.
  - Control commands
  - Output commands
  - Queries

### Terminator

You can use one of the following as the terminator.

- CR + LF (or 0x0d 0x0a in base 16 ASCII code. )
- LF (or 0x0a in base 16 ASCII code.)

### **Note**

- Commands must be kept within 2047 bytes from the first character to the terminator.
  - Except for user-specified strings, commands are not case-sensitive.
  - Even if a command enumerated with other commands experiences an error, the other commands are all executed.
- 

## Response

The instrument receives a single response (affirmative or negative) for every command delimited with a terminator.\* Please maintain a 1-to-1 command-response ratio on the controller side as well. If this command-response format is not upheld, correct operation cannot be guaranteed. For the format of responses, see section 2.1.

\* There are exceptions with RS-422A/485 specific commands (see section 2.1).

## 1.2 List of Commands

### Setting Commands (System Related)

Command Name	Functions	Operation Mode	Administrator	User	Page
SR	Input Range Settings	Setting	Yes	No	1-16
SF	Filter Settings	Setting	Yes	No	1-17
XB	Burnout Settings	Setting	Yes	No	1-17
XJ	Reference Junction Compensation Settings	Setting	Yes	No	1-17
PF	Pulse Input Module Chattering Filter Settings	Setting	Yes	No	1-17
SA	Alarm Settings	All modes	Yes	No	1-18
VA	Alarm Hysteresis Settings	All modes	Yes	No	1-18
XA	Settings Related to Alarm	Setting	Yes	No	1-18
BD	Delay Alarm Settings	Setting	Yes	No	1-19
XD	Relay Settings	Setting	Yes	No	1-19
SO	Expression Settings	Setting	Yes	No	1-19
SK	MATH Constant Settings	Setting	Yes	No	1-20
MG	MATH Group Settings	Setting	Yes	No	1-20
RO	Report Operation and Creation Time Settings	Setting	Yes	No	1-20
RM	Report Execution Channel Settings	Setting	Yes	No	1-20
VL	Broken-Line Input Channel Settings	Setting	Yes	No	1-21
AO	Output Range Settings	Setting	Yes	No	1-21
AP	Preset Operation Settings	Setting	Yes	No	1-22
SL	Event/Action Settings	Setting	Yes	No	1-22
SI	Timer Settings	Setting	Yes	No	1-24
SQ	Match Time Settings	Setting	Yes	No	1-24
XV	Measurement Interval Settings	Setting	Yes	No	1-25
XI	Measurement Groups and A/D Integration Time Settings	Setting	Yes	No	1-25
VM	MATH Interval Settings	Setting	Yes	No	1-25
XG	Settings of Operation upon MATH Error	Setting	Yes	No	1-25
MC	File Message Settings	Setting	Yes	No	1-26
MD	Data Save Folder Settings	Setting	Yes	No	1-26
MH	Recording Channel Settings	Setting	Yes	No	1-27
MW	Recording Operation Settings	Setting	Yes	No	1-27
ML	Recording Data Length Settings	Setting	Yes	No	1-28
MR	Recording Free Space Settings	Setting	Yes	No	1-28
MX	Thinning Recording Operation Settings	Setting	Yes	No	1-28
MU	Setting Save Operation Settings	Setting	Yes	No	1-28
XK	Key Lock Settings	All modes	Yes	No	1-28
XT	Temperature Unit Settings	Setting	Yes	No	1-29
SW	Daylight Saving Time Settings	Setting	Yes	No	1-29
SS	Daylight Saving Time Operation Settings	Setting	Yes	No	1-29
BA	Settings of Strain Input Initial Balancing	Setting	Yes	No	1-29
UN	Unit Number Settings	Setting	Yes	No	1-29
SV	Rolling Average Settings	Setting	Yes	No	1-29

Yes: Permitted to use command, No: Not permitted to use command

#### Note

- The instrument has two operation modes. If a command intended for use in one mode is executed while in a different mode, an error results. Switch to the proper mode before executing the command. Queries can be used regardless of the mode.
- Setting Mode**  
In this mode, measurement, computation, and recording is stopped, and settings can be changed.
- Measurement Mode**  
Computation and recording can be executed during measurement.
- The administrator and user distinction shows the user level specified on the instrument's communication login function. For details, see the *MW100 Data Acquisition Unit User's Manual* (IM MW100-01E).
- Queries can be executed by both administrator and users.

## 1.2 List of Commands

### Setting Commands (Display Related)

Command Name	Functions	Operation Mode	Administrator	User	Page
ST	Tag Settings	Setting	Yes	No	1-30
SZ	Zone Settings	Setting	Yes	No	1-30
SC	Display Color Settings	Setting	Yes	No	1-30
SB	Display Scale Settings	Setting	Yes	No	1-30
SX	Display Group Settings	Setting	Yes	No	1-31
TL	Trip Line Settings	Setting	Yes	No	1-31
XR	Channel and Tag Display Switching	Setting	Yes	No	1-31
SG	Message Settings	All modes*	Yes	No	1-31

\* Available for certain messages

Yes: Permitted to use command, No: Not permitted to use command

### Setting Commands (Communication Related)

Command Name	Functions	Operation Mode	Administrator	User	Page
UA	User Settings	Setting	Yes	No	1-32
YS	Serial Communication Settings	Setting	Yes	No	1-32
YA	IP Address Settings	Setting	Yes	No	1-32
YD	Host Name and Domain Name Settings	Setting	Yes	No	1-32
YN	DNS Client Settings	Setting	Yes	No	1-33
YH	DHCP Client Settings	Setting	Yes	No	1-33
YF	FTP Client Settings	Setting	Yes	No	1-33
YG	FTP Client Operation Settings	Setting	Yes	No	1-33
YM	Mail Client Settings	Setting	Yes	No	1-33
YV	Mail Sender and Recipient Settings	Setting	Yes	No	1-33
YU	Mail Contents Settings	Setting	Yes	No	1-34
YC	E-Mail Alarm Transmission Settings	Setting	Yes	No	1-34
YT	Time Synchronization Settings	Setting	Yes	No	1-34
WD	Modbus Client Operation Settings	Setting	Yes	No	1-35
WE	Modbus Client Connection Settings	Setting	Yes	No	1-35
WF	Modbus Client Command Settings	Setting	Yes	No	1-35
WA	Modbus Master Settings	Setting	Yes	No	1-36
WB	Modbus Master Command Settings	Setting	Yes	No	1-36
UL	Validation of Login Function	Setting	Yes	No	1-37
WC	Validation of Client Function	Setting	Yes	No	1-37
WS	Validation of Server Function	Setting	Yes	No	1-37
YQ	Communication Timeout Settings	Setting	Yes	No	1-37

Yes: Permitted to use command, No: Not permitted to use command

### Control Commands

Command Name	Functions	Operation Mode	Administrator	User	Page
DS	Operation Mode Switching	All modes	Yes	No	1-38
EX	Computation Start/Stop/Reset/Clear	Measurement	Yes	No	1-38
PS	Recording Start/Stop	Measurement	Yes	No	1-38
MV	Setting File Save/Write	Setting	Yes	No	1-38
MQ	Measured, Computed, and Thinned File Division	Measurement	Yes	No	1-38
MS	Message Writing	Measurement	Yes	No	1-38
MP	Execution of Manual Sample	Measurement	Yes	No	1-38
KI	Main Unit Key Operation	All modes	Yes	No	1-38
CE	Error Display Clear	All modes	Yes	No	1-39
AK	Alarm Acknowledgment	All modes	Yes	No	1-39
IR	Timer Reset	Measurement	Yes	No	1-39
CM	Communication Input Data Settings	All modes	Yes	No	1-39
VD	Relay ON/OFF	All modes	Yes	No	1-39

Yes: Permitted to use command, No: Not permitted to use command

**Control Commands (Cont.)**

Command Name	Functions	Operation Mode	Administrator	User	Page
SD	Date and Time Settings	Setting	Yes	No	1-39
RC	Initialization of Settings	Setting	Yes	No	1-40
RS	Reconfiguration	Setting	Yes	No	1-40
MF	Media Preparations	Setting	Yes	No	1-40
BL	Execution of Strain Input Initial Balancing	Setting	Yes	No	1-40
PV	Transmission Output Control	Measurement	Yes	No	1-40
SP	User Output Settings	Measurement	Yes	No	1-40
EC	Execution of Communication	Setting	Yes	No	1-40
TC	Communication Test	All mode	Yes	No	1-40
CC	Communication Open/Close	All mode	Yes	Yes	1-40
BO	Byte Output Order Settings	All mode	Yes	Yes	1-40
CS	Checksum Settings	All mode	Yes	Yes	1-41
GR	Resetting of the MATH Channels Specified by the MATH Group	Measurement	Yes	No	1-41

Yes: Permitted to use command, No: Not permitted to use command

**Output Commands**

Command Name	Functions	Operation Mode	Administrator	User	Page
FD	Output of Latest Measured/Computed Data	All mode	Yes	Yes	1-41
FO	Output of Latest Output Data	All mode	Yes	Yes	1-41
FE	Output of Decimal Place, Units, and Setting Data	All mode	Yes	Yes	1-41
FF	Output of Measured/Computed FIFO Data	All mode	Yes	Yes	1-42
FL	Output of Logs, Alarm Summaries, and Status	All mode	Yes	Yes	1-42
IS	Output of Status Information	All mode	Yes	Yes	1-43
VF	Output of Relay Status	All mode	Yes	Yes	1-43
CF	Output of System Recognition Status	All mode	Yes	Yes	1-43
ME	Output of Media Information	All mode	Yes	Yes	1-43

Yes: Permitted to use command, No: Not permitted to use command

**Output Commands (RS-422A/485 Specific Commands)**

Command Name	Functions	Operation Mode	Administrator	User	Page
Esc O	Instrument Open	All mode	Yes	Yes	2-4
Esc C	Instrument Close	All mode	Yes	Yes	2-4

Yes: Permitted to use command, No: Not permitted to use command

**List of Commands Valid When Option Functions Are Installed**

Option	Command Name
/C2 or /C3	YS
/M1	SO/SK/MG/VL/VM/XG/EX/WD/WE/WF/SV/GR
/C2 and /M1 or /C3 and /M1	WA/WB
/M3	RO/RM

## 1.3 Parameters

The numerical value and string parameters of commands have restrictions on format. The following describes commands whose parameters are restricted.

### Channel Numbers and Channel Ranges

Channel Type	Setting Range and Command Setting Parameters
Measurement channels	001-060
Output channels	001-060
Relay	001-060
Channels (type not specified)	001-060
MATH channels	A001-A300
MATH constants	K01-K60
Communication input channels	C001-C300
Flag input channels	F01-F60
Broken-line input channels	P01-P03

- In addition to individual channel numbers, you can specify channel ranges. Use a hyphen between the first and last channel in the range.
- Channel numbers outside of the range specified above are considered invalid and result in errors.
- For channels starting with numbers, if you omit the "0" on the front, the channel is still accepted as long as it lies within the range.
- For channels starting with characters, if you omit a "0" when it is the second or later character, the channel is still accepted as long as it lies within the range.  
Ex.: 1 is recognized as 001, and A1 is recognized as A001.
- If some channels that do not exist are specified in the channel numbers or range, the specification is considered invalid and an error results. An error also occurs when existing channels are specified but their corresponding modules are not installed. However, an error does not occur if all specified channels exist and at least one channel's corresponding module is installed (even if one or more channels' module is not installed).
- Multiple channel ranges cannot be specified at the same time.
- Depending on the installed modules, channels numbers and ranges in setting commands (display related), control commands, and output commands may not be recognized.

### Upper and Lower Limit of Span (Measurement Channels)

#### Decimal Point

The decimal place is determined for both input and output. The upper and lower limit values are set without a decimal point, but with the decimal place taken into account.

#### • DC Voltage

Input Type	String	Measuring Range		Setting Range for Lower/Upper Limit of Span	
			String		Difference Computation
Voltage	VOLT	20 mV	20mV	-20.000 to 20.000 mV	±20.000 mV
		60 mV	60mV	-60.00 to 60.00 mV	±60.00 mV
		200 mV	200mV	-200.00 to 200.00 mV	±200.00 mV
		2 V	2V	-2.0000 to 2.0000 V	±2.0000 V
		6 V	6V	-6.000 to 6.000 V	±6.000 V
		20 V	20V	-20.000 to 20.000 V	±20.000 V
		100 V	100V	-100.00 to 100.00 V	±100.00 V
		60 mV (high resolution)	60mVH	0.000 to 60.000 mV	0.000 to 60.000 mV
		1 V	1V	-1.0000 to 1.0000 V	±1.0000 V
		6 V (high resolution)	6VH	0.0000 to 6.0000 V	0.0000 to 6.0000 V

## • Contact

Input Type	Measuring Range		Setting Range for Lower/Upper		
	String	String	Limit of Span	Difference Computation	
Contact	DI	Level	LEVEL	0 or 1 (0 for less than 24 V, 1 for 24 V or more)	-1, 0, 1
		Contact	CONTACT	0 or 1 (0 for contact OFF, 1 for contact ON)	-1, 0, 1

## • Thermocouple

Input Type	Measuring Range		Setting Range for Lower/Upper		
	String	String	Limit of Span	Differential Computation	
Thermo-couple	TC	Type R	R	0.0 to 1760.0 °C	±1760.0 °C
		Type S	S	0.0 to 1760.0 °C	±1760.0 °C
		Type B	B	0.0 to 1820.0 °C	±1820.0 °C
		Type K	K	-200.0 to 1370.0 °C	±1570.0 °C
		Type E	E	-200.0 to 800.0 °C	±1100.0 °C
		Type J	J	-200.0 to 1100.0 °C	±1300.0 °C
		Type T	T	-200.0 to 400.0 °C	±600.0 °C
		Type N	N	0.0 to 1300.0 °C	±1300.0 °C
		Type W	W	0.0 to 2315.0 °C	±2315.0 °C
		Type L	L	-200.0 to 900.0 °C	±1100.0 °C
		Type U	U	-200.0 to 400.0 °C	±600.0 °C
		KPvsAu7Fe	KPvsAu7Fe	0.0 to 300.0 K	±300.0 K
		PLATINEL	PLATINEL	0.0 to 1400.0 °C	±1400.0 °C
		PR40-20	PR40-20	0.0 to 1900.0 °C	±1900.0 °C
		NiNiMo	NiNiMo	0.0 to 1310.0 °C	±1310.0 °C
		WRe3-25	WRe3-25	0.0 to 2400.0 °C	±2400.0 °C
		W/WRe26	WWRe26	0.0 to 2400.0 °C	±2400.0 °C
Type N (AWG14)	N14	0.0 to 1300.0 °C	±1300.0 °C		
Type XK GOST	XK	-200.0 to 600.0 °C	±800.0 °C		

## • RTD

Input Type	Measuring Range		Setting Range for Lower/Upper Limit		
	String	String	of Span	Differential Computation	
RTD	RTD	Pt100	[1] Pt100-1	-200.0 to 600.0 °C	±800.0 °C
			[2] Pt100-2	-200.0 to 250.0 °C	±450.0 °C
		JPt100	[1] JPt100-1	-200.0 to 550.0 °C	±750.0 °C
			[2] JPt100-2	-200.0 to 250.0 °C	±450.0 °C
		Pt100 (high [2] resolution)	[1] Pt100-1H	-140.00 to 150.00 °C	±290.00 °C
			Pt100-2H		
		JPt100 (high [2] resolution)	[1] JPt100-1H	-140.00 to 150.00 °C	±290.00 °C
			[2] JPt100-2H		
		Ni100 SAMA	Ni100SAMA	-200.0 to 250.0 °C	±450.0 °C
		Ni100 DIN	Ni100DIN	-60.0 to 180.0 °C	±240.0 °C
		Ni120	Ni120	-70.0 to 200.0 °C	±270.0 °C
		Pt50	Pt50	-200.0 to 550.0 °C	±750.0 °C
		Cu10 GE	Cu10GE	-200.0 to 300.0 °C	±500.0 °C
		Cu10 L&N	Cu10LN	-200.0 to 300.0 °C	±500.0 °C
		Cu10 WEED	Cu10WEED	-200.0 to 300.0 °C	±500.0 °C
		Cu10 BAILEY	Cu10BAILEY	-200.0 to 300.0 °C	±500.0 °C
		J263B	J263B	0.0 to 300.0 K	±300.0 K
Cu10 at 20°C a=0.00392	Cu10a392	-200.0 to 300.0 °C	±500.0 °C		
Cu10 at 20°C a=0.00393	Cu10a393	-200.0 to 300.0 °C	±500.0 °C		
Cu25 at 0°C a=0.00425	Cu25	-200.0 to 300.0 °C	±500.0 °C		

The number in brackets for the setting range is the RTD measurement current (mA). If no number is given, 1 mA, 2 mA, or both are supported.

### 1.3 Parameters

- RTD (cont.)

Input Type		Measuring Range		Setting Range for Lower/Upper Limit	
	String		String	of Span	Differential Computation
RTD	RTD	Cu53 at 0°C a=0.00426035	Cu53	-50.0 to 150.0 °C	±200.0°C
		Cu100 at 0°C a=0.00425	Cu100	-50.0 to 150.0 °C	±200.0°C
		Pt25	Pt25	-200.0 to 550.0 °C	±750.0°C
		Cu10 GE (high resolution)	Cu10GEH	-200.0 to 300.0 °C	±500.0°C
		Cu10 L&N (high resolution)	Cu10LNH	-200.0 to 300.0 °C	±500.0°C
		Cu10 WEED (high resolution)	Cu10WEEDH	-200.0 to 300.0 °C	±500.0°C
		Cu10 BAILEY (high resolution)	Cu10BAILEYH	-200.0 to 300.0 °C	±500.0°C
		Pt100 [1] (Anti noise) [2]	Pt100-1R	-200.0 to 600.0 °C	±800.0°C
			Pt100-2R	-200.0 to 250.0 °C	±450.0°C
		JPt100 [1] (Anti noise) [2]	JPt100-1R	-200.0 to 550.0 °C	±750.0°C
			JPt100-2R	-200.0 to 250.0 °C	±450.0°C
		Pt100 GOST	Pt100G	-200.0 to 600.0 °C	±800.0°C
		Cu100 GOST	Cu100G	-200.0 to 200.0 °C	±400.0°C
		Cu50 GOST	Cu50G	-200.0 to 200.0 °C	±400.0°C
		Cu10 GOST	Cu10G	-200.0 to 200.0 °C	±400.0°C
		Pt500	Pt500	-200.0 to 600.0 °C	±800.0°C
Pt1000	Pt1000	-200.0 to 600.0 °C	±800.0°C		

The number in brackets for the setting range is the RTD measurement current (mA). If no number is given, 1 mA, 2 mA, or both are supported.

- Resistance

Input Type		Measuring Range		Setting Range for Lower/Upper Limit	
	String		String	of Span	Differential Computation
Resis- tance	OHM	20 Ω	20ohm	0.000 to 20.000 Ω	±20.000 Ω
		200 Ω	200ohm	0.00 to 200.00 Ω	±200.00 Ω
		2 kΩ	2000ohm	0.0 to 2000.0 Ω	±2000.0 Ω

- Strain

Input Type		Measuring Range		Setting Range for Lower/Upper	
	String		String	Limit of Span	Differential Computation
Strain	STR	2000 μSTR	2000uSTR	-2000.0 to 2000.0 μSTR	±2000.0 μSTR
		20000 μSTR	20000uSTR	-20000 to 20000 μSTR	±20000 μSTR
		200000 μSTR	200000uSTR	-20000 to 20000 μSTR	±200000 μSTR

The 200000 μSTR measuring range is 20000 (minimum resolution of 10 μSTR) on the instrument's setting/output data.

- Pulse

Input Type		Measuring Range		Setting Range for Lower/Upper Limit	
	String		String	of Span	Differential Computation
Pulse	PULSE	LEVEL	LEVEL	0 to 30000	±30000
		CONTACT	CONTACT	0 to 30000	±30000

- Analog Output

Output Type		Output Range		Setting Range for Lower/Upper Limit	
	String		String	of Span	Available output range
Volt Current	AO	Volt output (V)	10V	-10.000 to 10.000 V	±11.000 V
		Current output (mA)	20mA	0.000 to 20.000 mA	0.000 to 22.000 mA

- **PWM Output**

Output Type	Output Range		Pulse Interval Range*	Span Setting Range
	String	String		
PMW	PMW	PMW output (1ms)	1mS	1 to 30000 ms
		PMW output (10ms)	10mS	10 to 300000 ms

\* Settings of 1 to 30000 ms (1 ms range) and 10 to 30000 ms (10 ms range) are allowed, but the setting command is specified as a multiple of the output range. Refer to the AO command in section 1.4.

**Note**

For information on the measurement accuracy at each measuring range, see the *MW100 Data Acquisition Unit User's Manual* (IM MW100-01E).

## Upper and Lower Limit of Span (MATH Channels)

Set the mantissa between –9999999 and 99999999. Set the decimal place in the range from 0 to 4.

## Upper and Lower Limit of Scaling

Set between –30000 and 30000. Set the decimal place in the range from 0 to 4.

## Alarm Types

The following shows alarm types that can be set by channel and input type.

Channel Type	Input Type	MATH Type	Alarm Type			
			Hi/Lo lim (H/L)	Diff. H/L lim (DH/DL)	RoC lim. on inc/dec (RH/RL)	Delay on inc/dec (TH/TL)
Meas channels	SKIP	-	No	No	No	No
	VOLT/TC/	OFF	Yes	No	Yes	Yes
	RTD/DI/OHM/	Scale	Yes	No	Yes	Yes
	STR/PULSE	Diff. comp	Yes	Yes	Yes	Yes
	RRJC	-	Yes	No	Yes	Yes
MATH channels	-	OFF	No	No	No	No
		ON	Yes	No	No	Yes

Yes: Can be set, No: Cannot be set

## Alarm Value Setting Range

The following shows the setting ranges for alarm values.

### Measurement Channels

Alarm Type	Computation Type	Alarm Value Setting Range
H/L	OFF/DELTA/RRJC	Normal mode span setting range
	SCALE	Scale Low to High limit (low limit < high limit) Scale High to Low limit (high limit < low limit)
DH/DL	DELTA	Difference mode span setting range
RH/RL	OFF/DELTA/RRJC	1 to width of normal mode span setting range
	SCALE	1 to width of scale upper/lower limit values
TH/TL	OFF/DELTA/RRJC	Normal mode span setting range
	SCALE	Scale Low to High limit (low limit < high limit) Scale High to Low limit (high limit < low limit)

### MATH Channels

Within the MATH channels span range (–9999999 to 99999999 (mantissa))

## Hysteresis Value Setting Range

The following shows the setting ranges for hysteresis values. The set hysteresis does not apply to the upper/lower limit on rate-of-change alarm.

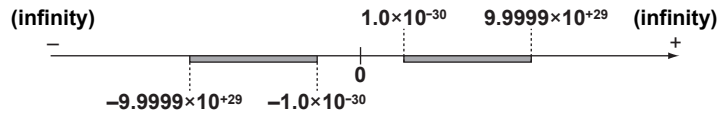
Alarm Type	Hysteresis Value Setting Range
H/DH/TH	0 to (alarm value – alarm value setting range lower limit)
L/DL/TL	0 to (alarm value setting range upper limit – alarm value)



### MATH Constants and Communication Input Values

The following shows the allowable setting range and notation methods for MATH constants and communication input values.

#### Setting Range for MATH Constants and Communication Input Values



Allowed Setting Range

- (1) Negative number ( $-9.9999 \times 10^{+29}$  to  $-1.0000 \times 10^{-30}$ )
- (2) Zero (0)
- (3) Positive number ( $1.0000 \times 10^{-30}$  to  $9.9999 \times 10^{+29}$ )

#### Notation for MATH Constants and Communication Input Values

Notation	Format	General Example
Real number notation	<Mantissa>	+0.12, -1.3, 2.456, 78
Exponential notation	<Mantissa>E<Exponent>	-1.23E-21
	<Mantissa>: =<symbol><numerical value> [.<numerical value>] <Mantissa>: =<symbol><numerical value> <numerical value>: =0 to 9 (1 or more) <symbol>: = "+", "-", or blank	

- The maximum number of digits for the mantissa is 5. Values having 6 or more digits are rounded to the 5th digit.
- If the symbol is blank, the next numerical value is treated as a positive number.

### Channel Structure

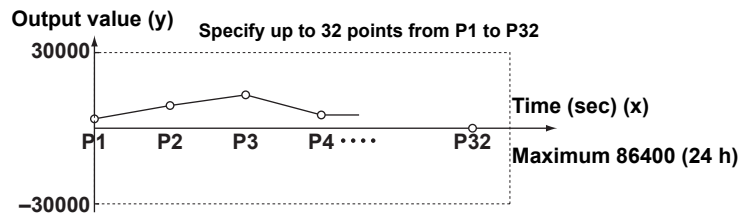
Individual measurement and MATH channels (001-060 or A001-300) can be separated by periods, or a consecutive range of channels can be specified using a hyphen.

Example To specify A001 and A003, A001.A003. To specify A001 through A003, A001-003. To specify A001 through A003 and A005, A001-A003.A005.

### Point Structure

This is the point structure of broken-line input channels. Each point represents a time of up to thirty-two points (x: integer between 0 and 86400) and an output value (y: integer between -30000 and 30000).

#### Point Structure of Broken-Line Input Channels.

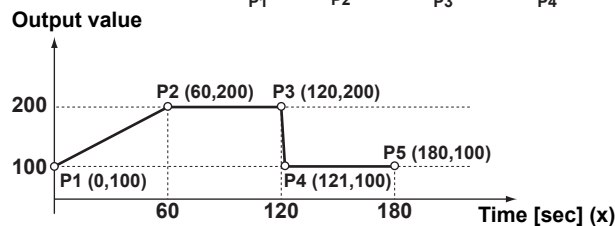


#### Example of Broken-Line Input Channel Setting

The points of the broken-line input channel consist of only those specified as parameters of the UL command. The last point must be set to a terminator of point (-1.0).

VL commands of three types can be selected: OFF, SINGLE, and REPEAT.

(Example) VLP01, SINGLE, (0.100), (60.200), (120.200), (121.100), (180.100), (-1.0)



## Action Types

The following shows the action types available for Event/Action settings (SL commands).

### Action Types

Action Types	Description
MEMORY_START	Starts recording
MEMORY_STOP	Stops recording
MEMORY_SAVE	Divides and Saves the measured/computed data file
MEMORY_SAVE_T	Divides and saves the thinned data file
MATH_START	Starts computation
MATH_STOP	Stops computation
MATH_CLEAR	Clears the computation
MATH_RESET	Resets computation
MATH_RST_GRP1	Resets computation on MATH group 1
MATH_RST_GRP2	Resets computation on MATH group 2
MATH_RST_GRP3	Resets computation on MATH group 3
MATH_RST_GRP4	Resets computation on MATH group 4
MATH_RST_GRP5	Resets computation on MATH group 5
MATH_RST_GRP6	Resets computation on MATH group 6
MATH_RST_GRP7	Resets computation on MATH group 7
TRIGGER1	Activates trigger 1
TRIGGER2	Activates trigger 2
TRIGGER3	Activates trigger 3
ALARM_ACK	Checks the alarm status
FLAG	Sets the flag to a value
TIMER1_RESET	Resets timer 1
TIMER2_RESET	Resets timer 2
TIMER3_RESET	Resets timer 3
TIMER4_RESET	Resets timer 4
TIMER5_RESET	Resets timer 5
TIMER6_RESET	Resets timer 6
MESSAGE0	Writes message 0 (Free message) in the data file being acquired
MESSAGE1	Writes message 1 in the data file being acquired
MESSAGE2	Writes message 2 in the data file being acquired
MESSAGE3	Writes message 3 in the data file being acquired
MESSAGE4	Writes message 4 in the data file being acquired
MESSAGE5	Writes message 5 in the data file being acquired
FILE_SAVE	Saves settings files
FILE_LOAD	Loads settings files
MANUAL_SAMPLE	Executes manual sample recording
MANUAL_DIVIDE	Divides manual sample files

- You cannot set same action type for EDGE and LEVEL.
  - \* The following action types are judged as being the same.
    - MEMORY\_START and MEMORY\_STOP
    - MATH\_START and MATH\_STOP
    - FLAG of the same flag number
- You cannot set same action type for multiple LEVELs.
  - \* The following action types are judged as being the same.
    - MEMORY\_START and MEMORY\_STOP
    - MATH\_START and MATH\_STOP
    - FLAG of the same flag number

The above setting errors occur when transitioning from Setting mode to Measurement mode.

Action Types That Can Be Set (When Event Detection Method Is EDGE)

Action Type	Event Type							
	DI	ALARM	MEMORY	ALARM_CH	RELAY	TIMER	MATH_TIME	USER_KEY
MEMORY_START	✓	✓		✓	✓	✓	✓	✓
MEMORY_STOP	✓	✓		✓	✓	✓	✓	✓
MEMORY_SAVE	✓	✓		✓	✓	✓	✓	✓
MEMORY_SAVE_T	✓	✓		✓	✓	✓	✓	✓
MATH_START	✓	✓	✓	✓	✓	✓	✓	✓
MATH_STOP	✓	✓	✓	✓	✓	✓	✓	✓
MATH_CLEAR	✓	✓	✓	✓	✓	✓	✓	✓
MATH_RESET	✓	✓	✓	✓	✓	✓	✓	✓
MATH_RST_GR1	✓	✓	✓	✓	✓	✓	✓	✓
MATH_RST_GR2	✓	✓	✓	✓	✓	✓	✓	✓
MATH_RST_GR3	✓	✓	✓	✓	✓	✓	✓	✓
MATH_RST_GR4	✓	✓	✓	✓	✓	✓	✓	✓
MATH_RST_GR5	✓	✓	✓	✓	✓	✓	✓	✓
MATH_RST_GR6	✓	✓	✓	✓	✓	✓	✓	✓
MATH_RST_GR7	✓	✓	✓	✓	✓	✓	✓	✓
TRIGGER1	✓	✓	✓	✓	✓	✓	✓	✓
TRIGGER2	✓	✓	✓	✓	✓	✓	✓	✓
TRIGGER3	✓	✓	✓	✓	✓	✓	✓	✓
ALARM_ACK	✓	✓	✓	✓	✓	✓	✓	✓
FLAG	✓	✓	✓	✓	✓	✓	✓	✓
TIMER1_RESET	✓	✓	✓	✓	✓	✓	✓	✓
TIMER2_RESET	✓	✓	✓	✓	✓	✓	✓	✓
TIMER3_RESET	✓	✓	✓	✓	✓	✓	✓	✓
TIMER4_RESET	✓	✓	✓	✓	✓	✓	✓	✓
TIMER5_RESET	✓	✓	✓	✓	✓	✓	✓	✓
TIMER6_RESET	✓	✓	✓	✓	✓	✓	✓	✓
MESSAGE0	✓	✓	✓	✓	✓	✓	✓	✓
MESSAGE1	✓	✓	✓	✓	✓	✓	✓	✓
MESSAGE2	✓	✓	✓	✓	✓	✓	✓	✓
MESSAGE3	✓	✓	✓	✓	✓	✓	✓	✓
MESSAGE4	✓	✓	✓	✓	✓	✓	✓	✓
MESSAGE5	✓	✓	✓	✓	✓	✓	✓	✓
FILE_SAVE								✓
FILE_LOAD								✓
MANUAL_SAMPLE	✓	✓		✓	✓	✓	✓	✓
MANUAL_DIVIDE	✓	✓		✓	✓	✓	✓	✓

✓: Can be set, Blank: Cannot be set

## Action Types That Can Be Set (When Event Detection Method Is LEVEL)

Action Type	Event Type							
	DI	ALARM	MEMORY	ALARM_CH	RELAY	TIMER	MATH_TIME	USER_KEY
MEMORY_START	✓	✓		✓	✓	✓	✓	✓
MEMORY_STOP								
MEMORY_SAVE								
MEMORY_SAVE_T								
MATH_START	✓	✓	✓	✓	✓	✓	✓	✓
MATH_STOP								
MATH_CLEAR								
MATH_RESET								
MATH_RST_GR1								
MATH_RST_GR2								
MATH_RST_GR3								
MATH_RST_GR4								
MATH_RST_GR5								
MATH_RST_GR6								
MATH_RST_GR7								
TRIGGER1								
TRIGGER2								
TRIGGER3								
ALARM_ACK								
FLAG	✓	✓	✓	✓	✓	✓	✓	✓
TIMER1_RESET								
TIMER2_RESET								
TIMER3_RESET								
TIMER4_RESET								
TIMER5_RESET								
TIMER6_RESET								
MESSAGE0								
MESSAGE1								
MESSAGE2								
MESSAGE3								
MESSAGE4								
MESSAGE5								
FILE_SAVE								
FILE_LOAD								
MANUAL_SAMPLE								
MANUAL_DIVIDE								

✓: Can be set, Blank: Cannot be set

## Byte Output Order

The following explains the output order for 2 bytes, 4 bytes, and 8 bytes when the byte output order is set to MSB (most significant byte) first or LSB (least significant byte) first.

**Example of storage of 2 bytes of data Data = 0x 01 23 (hexadecimal notation)**

	byte 0	byte 1
Byte array (stored with MSB)	0x 01	0x 23
Byte array (stored with LSB)	0x 23	0x 01

**Example of storage of 4 bytes of data Data = 0x 01 23 45 67 (hexadecimal notation)**

	byte 0	byte 1	byte 2	byte 3
Byte array (stored with MSB)	0x 01	0x 23	0x 45	0x 67
Byte array (stored with LSB)	0x 67	0x 45	0x 23	0x 01

**Example of storage of 8 bytes of data Data = 0x 01 23 45 67 89 ab cd ef (hexadecimal notation)**

	byte 0	byte 1	byte 2	byte 3	byte 4	byte 5	byte 6	byte 7
Byte array (stored with MSB)	0x 01	0x 23	0x 45	0x 67	0x 89	0x ab	0x cd	0x ef
Byte array (stored with LSB)	0x ef	0x cd	0x ab	0x 89	0x 67	0x 45	0x 23	0x 01

## Measurement Interval and MATH Interval

The following setting errors occur when transitioning from Setting mode to Measurement mode.

- Make sure measurement groups 1, 2, and 3 satisfy the following relationship. Measurement groups turned OFF are ignored.  
Meas. gr 1 ≤ meas gr 2 ≤ meas gr 3
- When using a 10 ms measurement interval, the maximum number of measurement channels is 10.
- When using a 50 ms measurement interval, the maximum number of measurement channels is 30.
- Set an interval of 100 ms or more for the measurement and MATH intervals of the modules with shortest measurement intervals of 100 ms.
- Set an interval of 500 ms or more for the measurement and MATH intervals of the modules with shortest measurement intervals of 500 ms.

The following setting error occurs when computation starts.

- Set a MATH interval is 100 ms or higher.

## User Specified Strings

Alphanumeric English characters and symbols can be entered (see appendix 5, “ASCII Character Codes.”

However, the following characters may not be used.

[ " ] (double-quote), [ ' ] (single quote), [ , ] (comma), [ : ] (colon), [ ; ] (semicolon), [ ? ] (question mark)

## Password String

Alphanumeric English characters and symbols can be entered (see appendix 5, “ASCII Character Codes.”

However, the following characters may not be used.

[ ] (space), [ " ] (double-quote), [ ' ] (single quote), [ \* ] (asterisk), [ , ] (comma), [ : ] (colon), [ ; ] (semicolon), [ ? ] (question mark)

## Host Name and Domain Name String

Alphanumeric English characters and hyphens [ - ], periods [ . ], and underscores [ \_ ] can be used.

## File Name and Folder Name String

Alphanumeric English characters and pound signs [ # ], percentage symbols [ % ], parentheses [ ( ) ], hyphens [ - ], at marks [ @ ], and underscores [ \_ ] can be used. However, the following character strings cannot be entered.

AUX, CON, PRN, NUL, COM1 to COM9, LPT1 to LPT9

## 1.4 Setting Commands (System Related)

### SR Input Range Settings

**Setting** When p2=SKIP  
 SRp1,p2<terminator>  
 When p2=RRJC  
 SRp1,p2,p3,p4,p5,p6<terminator>  
 When p2=VOLT, TC, RTD, DI, OHM, STR, or PULSE  
 When p6=OFF  
 SRp1,p2,p3,p4,p5,p6<terminator>  
 When p6=DELTA  
 SRp1,p2,p3,p4,p5,p6,p7<terminator>  
 When p6=SCALE  
 SRp1,p2,p3,p4,p5,p6,p7,p8,p9,p10  
 <terminator>

#### When Setting SKIP

**Setting** SRp1,p2<terminator>  
 p1 Channel range (001 to 060)  
 p2 Input type (SKIP)

**Query** SR[p1]?

**Example** Skip channel 1.  
 SR001,SKIP

**Explanation**

- Channels set to SKIP are not measured.
- Specify measurement channels for p1.

#### When Setting RRJC

**Setting** SRp1,p2,p3,p4,p5,p6<terminator>  
 p1 Channel range (001 to 060)  
 p2 Input type (RRJC)  
 RRJC Remote RJC  
 p3 Measuring range (specify thermocouple range)  
 p4 Lower limit of span  
 p5 Upper limit of span  
 p6 Reference channel number (001 to 060)

**Query** SR[p1]?

**Example** Set the measuring range on channel 2 to K, lower limit of span to 0.0°C, upper limit of span to 500.0°C, and set channel 1 (reference channel) as the remote RJC reference channel.  
 SR002,RRJC,K,0,5000,001

**Explanation**

- Set the p3, p4, and p5 setting parameters according to the table in section 1.3.
- The decimal place is fixed as shown in the table in section 1.3.
- Specify measurement channels on p1.

### When Setting Voltage, TC, RTD, Contact, Resistance, Strain Input, and Pulse

#### • With no MATH

**Setting** SRp1,p2,p3,p4,p5,p6<terminator>  
 p1 Channel range (001 to 060)  
 p2 Input type  
 VOLT DC voltage  
 TC Thermocouple  
 RTD Resistance temperature detector  
 DI Contact  
 OHM Resistance  
 STR Strain  
 PULSE Pulse  
 p3 Measuring range  
 p4 Lower limit of span  
 p5 Upper limit of span  
 p6 MATH type (OFF)

**Query** SR[p1]?

**Example** Set the input type for channels 1 to 4 to TC type R, the lower limit span to 0.0°C, and the upper limit of span to 1760.0°C.  
 SR001-004,TC,R,0,17600,OFF

**Explanation** Specify measurement channels for p1.

#### • When Setting Difference Computation between Channels

**Setting** SRp1,p2,p3,p4,p5,p6,p7<terminator>  
 p1 Channel range (001 to 060)  
 p2 Input type  
 VOLT DC voltage  
 TC Thermocouple  
 RTD Resistance temperature detector  
 DI Contact input  
 OHM Resistance input  
 STR Strain input  
 PULSE Pulse  
 p3 Measuring range  
 p4 Lower limit of span  
 p5 Upper limit of span  
 p6 MATH type (DELTA)  
 p7 Reference channel numbers (001 to 060)

**Query** SR[p1]?

**Example** Set the MATH type for channel 10 to difference computation between channels with channel 1 (the reference channel), set the input type to TC, measuring range to R, the lower limit span to 10.0°C, and the upper limit of span to 100.0°C.  
 SR010,TC,R,100,1000,DELTA,001

**Explanation** Specify measurement channels on p1.

**When Setting Scaling**

Setting SRp1,p2,p3,p4,p5,p6,p7,p8,p9,p10  
<terminator>

p1 Channel range (001 to 060)

p2 Input type

VOLT	DC voltage
TC	Thermocouple
RTD	Resistance temperature detector
DI	Contact input
OHM	Resistance input
STR	Strain input
PULSE	Pulse

p3 Measuring range

p4 Lower limit of span

p5 Upper limit of span

p6 MATH type (SCALE)

p7 Scaling lower limit (-30000 to 30000)

p8 Scaling upper limit (-30000 to 30000)

p9 Decimal place (0 to 4)

p10 Unit (max 6 characters)

Query SR[p1]?

Example Convert the DC voltage measured on channel 2 to DC current. Set the measuring range to 6V (high resolution), lower limit of span to 1 V, upper limit of span to 5 V, lower limit of scaling to 0.00A, and upper limit of scaling to 5.00A.

SR002,VOLT,6VH,10000,50000,SCALE,0,500,2,A

Explanation

- Set the p3, p4, and p5 setting parameters according to the table in section 1.3.
- Specify measurement channels on p1.
- For the characters that can be used for p10, see user specified characters in section 1.3.

**SF Filter Settings**

Setting SFp1,p2<terminator>

p1 Channel range (001 to 060)

p2 Filter coefficient (0, 5, 10, 20, 25, 40, 50, 100)

Query SF[p1]?

Example Set the filter coefficient for channel 2 to 5.

SF002,5

Explanation Specify measurement channels on p1. However, do not set this on the channels of the digital input module.

**XB Burnout Settings**

Setting XBp1,p2<terminator>

p1 Channel range (001 to 060)

p2 Burnout processing (OFF, UP, DOWN)

Query XB[p1]?

Example Set UP (+OVER) when burnout occurs on channel 1.

XB001,UP

Explanation Specify measurement channels that can accept TC input for p1.

**XJ Reference Junction Compensation Settings**

Setting

When p2=INT  
XJp1,p2<terminator>

When p2=EXT  
XJp1,p2,p3<terminator>

**For an Internal Compensation Circuit**

Setting XJp1,p2<terminator>

p1 Channel range (001 to 060)

p2 Reference junction compensation selection (INT)

Query XJ[p1]?

Example Set RJC on channel 1 to internal compensation circuit.

XJ001,INT

Explanation Specify measurement channels that can accept TC input for p1

**For External RJC**

Setting XJp1,p2,p3<terminator>

p1 Channel range (001 to 060)

p2 Reference junction compensation selection (EXT)

p3 External RJC value (-20000 to 20000)

Query XJ[p1]?

Example Set RJC on channel 2 to external RJC, and the compensation value to 0  $\mu$ V.

XJ002,EXT,0

Explanation

- Units of p3 are  $\mu$ V.
- Specify measurement channels that can accept TC input for p1.

**PF Pulse Input Module Chattering Filter Settings**

Setting PFp1,p2

p1 Channel range (001 to 060)

p2 Chattering filtering (OFF/ON)

Query PF[p1]?

Example Turn on the chattering filter on channel 23.

PF23,ON

Explanation For p1, specify channels included on the pulse input module.



## 1.4 Setting Commands (System Related)

### SA Alarm Settings

Setting When p3=OFF  
`SAp1,p2,p3<terminator>`  
 When p3 is not OFF  
`SAp1,p2,p3,p4,p5<terminator>`

#### When Alarms are OFF

Setting `SAp1,p2,p3<terminator>`  
 p1 Channel range (001 to 060 and A001 to A300)  
 p2 Alarm number (1 to 4)  
 p3 Alarm type (OFF)

Query `SA[p1[p2]]?`

Example Turn OFF alarm number 1 on channel 10.

`SA10,1,OFF`

Explanation

- If the /M1 MATH function option is not included, MATH channel settings cannot be performed (including queries).
- Specify measurement channels on 001 to 060 of p1.

#### With Alarms

Setting `SAp1,p2,p3,p4,p5<terminator>`  
 p1 Channel range (001 to 060 and A001 to A300)  
 p2 Alarm number (1 to 4)  
 p3 Alarm type  
     H Upper limit alarm  
     L Lower limit alarm  
     DH Differential upper limit alarm  
     DL Differential lower limit alarm  
     RH Upper limit on rate-of-change alarm  
     RL Lower limit on rate-of-change alarm  
     TH Delay upper limit alarm  
     TL Delay lower limit alarm  
 p4 Alarm value  
 p5 Relay number  
     OFF No relay setting  
     001 to 060 Relay number

Query `SA[p1[p2]]?`

Example Set alarm number 1 on channel 2 to upper limit alarm (alarm value 100.0), and set relay number 12 to operate upon alarm occurrence.

`SA002,1,H,1000,012`

Explanation

- If the /M1 MATH function option is not included, MATH channels (A001 to A300) cannot be set (including queries). However, if the pulse input module is installed, MATH channels (A001 to A060) can be set (including queries).
- Specify measurement channels on 001 to 060 of p1.
- When the input range setting (SR command) is SKIP, p3 cannot be set to anything other than OFF.

- In the following case, all alarm settings for the channel are OFF.
  - Changing the input type, measuring range, and MATH type
  - When scaling, changing the scaling values (including changing the decimal place).
  - Turning MATH channels ON/OFF and changing expressions.
- The p3 DH and DL setting are only valid when the MATH type is difference between channels.
- If p3 is set to RH or RL, set the interval time for high limit/low on rate of change using the XA command.
- If p3 is set to TH or TL, set the delay time using the BD command.
- See the table in section 1.3 for the alarm value setting range for p4.
- For information on how to add relay numbers, see the main manual.
- For MATH channels, the alarm types that can be set are H (upper limit alarm), TH (delay upper limit), TL (delay lower limit), and L (lower limit alarm) only.
- Set the output type for relays to alarm using the XD command, and set the relay numbers to p5.
- p3 and p5 cannot be changed while recording.

### VA Alarm Hysteresis Settings

Setting `VAp1,p2,p3<terminator>`  
 p1 Channel range (001 to 060)  
 p2 Alarm number (1 to 4)  
 p3 Hysteresis value

Query `VA[p1[p2]]?`

Example Set alarm number 1 on channel 2 to hysteresis value 100.

`VA002,1,100`

Explanation

- Specify measurement channels on 001 to 060 of p1.
- If the alarm type is high limit/low limit on rate-of-change alarm, the hysteresis setting is invalid.
- See section 1.3 for the setting ranges for hysteresis values.
- If the alarm setting is no alarms, this cannot be set.

### XA Settings Related to Alarm

Setting `XAp1,p2,p3<terminator>`  
 p1 Rate-of-change limit on increase interval (1 to 32)  
 p2 Rate-of-change limit on decrease interval (1 to 32)  
 p3 Alarm status hold (OFF/ON)

Query `XA?`

Example Set the rate-of-change limit on increase interval to 10 and the rate-of-change limit on decrease to 12. Hold the alarm status.

`XA10,12,ON`

Explanation Interval is set using the units of the measurement interval. The measurement interval is set using the XV command.

## 1.4 Setting Commands (System Related)

### BD Delay Alarm Settings

**Setting** BDp1,p2<terminator>  
p1 Channel number (001 to 060 or A001 to A300)  
p2 Alarm delay (1 to 3600 s)

**Query** BD[p1]?

**Example** Set the alarm delay of channel 1 to 20 s.  
BD001,20

**Explanation** Set the delay time to an integer multiple of the measurement or MATH interval.

### XD Relay Settings

**Setting** When p2=MEDIA, FAIL, or ERROR  
XDp1,p2<terminator>  
When p2=COM  
XDp1,p2,p3<terminator>  
When p2=ALARM, p4=ON, or p5=AND  
XDp1,p2,p3,p4,p5<terminator>  
When p2=ALARM, p4=OFF, or p5=OR  
XDp1,p2,p3,p4,p5,p6,p7,p8<terminator>

p1 Relay range (001 to 060)  
p2 Relay output type  
ALARM Alarm  
COM Communication input  
MEDIA Media free space  
FAIL FAIL output  
ERROR Error output

p3 Relay energized/de-energized  
ENERG Energize  
DE\_EN De-energize

p4 Relay status hold (OFF/ON)

p5 Relay operation conditions  
AND Operate when all specified alarms are on alarm status.  
OR Operate when at least one of the specified alarms is alarm status.

p6 Reflash function (OFF/ON)

p7 Preset value upon error (Firmware version R3.03 or later)  
OFF  
OPEN Opens (de-energizes) the output relay upon stop  
CLOSE Closes (energizes) the output relay upon stop

p8 Preset value upon stop (Firmware version R3.03 or later)  
OFF  
OPEN Opens (de-energizes) the output relay upon stop  
CLOSE Closes (energizes) the output relay upon stop

**Query** XD[p1]?

**Example** Set relay number 11 to energize, relay status hold to OFF, relay operation condition to OR, and reflash function to ON.  
XD11,ALARM,ENERG,OFF,OR,ON

**Explanation**

- Specify relay on p1.
- If the relay on p1 is set to the relay number of the SA command, if you change the output type the SA command's relay number turns OFF.
- The relay output type and affirmative/negative of the parameter settings are shown below.

Relay Output Type	Energize/De-energize	Hold/Non-Hold	AND/OR	Reflash Function
ALARM	Yes	Yes	Yes	Yes
COM	Yes	No (fixed to non-hold)	No (fixed to OR)	No (fixed to OFF)
MEDIA	No (fixed to energize)	No (fixed to non-hold)	No (fixed to OR)	No (fixed to OFF)
FAIL	No (fixed to de-energize)	No (fixed to non-hold)	No (fixed to OR)	No (fixed to OFF)
ERROR	No (fixed to energize)	No (fixed to non-hold)	No (fixed to OR)	No (fixed to OFF)

- The reflash alarm can only be used when the relay status is non-hold (OFF) and the relay operation condition is OR.
- The preset value (OPEN/CLOSE) is only valid when the DO type is alarm DO, and the condition is: "relay operation is non-hold" OR "reflash is OFF."
- When the preset value (OPEN/CLOSE) occurs, priority is given over the alarm relay output, and the preset output is carried out.

### SO Expression Settings

**Setting** When p2=OFF  
SOp1,p2<terminator>  
When p2=ON  
SO p1,p2,p3,p4,p5,p6,p7<terminator>

p1 MATH channel range (A001 to A300)  
p2 MATH ON/OFF  
p3 Expression (A001 to A060: max. 120 characters, A061 to A300: max. 10 characters\*)  
\* Or "8 characters" on models with firmware version R3.02 or earlier

p4 Lower limit of span (-9999999 to 9999999)  
p5 Upper limit of span (-9999999 to 9999999)  
p6 Span decimal place (0 to 4)  
p7 Units (max 6 characters)

**Query** SO[p1]?

**Example** Turn MATH on MATH channel number 31 ON, set the expression to the sum of channels 1 and 2, set lower limit of span to 1.0000, upper limit of span to 5.0000, and units to V.  
SOA031,ON,001+002,10000,50000,4,V

**Explanation**

- You can set this command on products with the /M1 MATH function option, or when the pulse input module is installed. The MATH channel range when the pulse input module is installed is (A001 to A060).
- For expressions, see the *MW100 Data Acquisition Unit User's Manual* (IM MW100-01E).

## 1.4 Setting Commands (System Related)

- Enter setting parameters for p4, p5 excluding the decimal place.
- If p1 is set to a MATH channel between A061 and A300, you can specify four arithmetic operations or MATH constants in p3 in addition to a communication input channel between C001 and C300.
- For the characters that can be used for p7, see user specified characters in section 1.3.

### SK MATH Constant Settings

- Setting** SKp1,p2<terminator>  
p1 Channel range (K01 to K60)  
p2 MATH constants
- Query** SK[p1]?
- Example** Set MATH constant K01 to 1.0000E-10.  
SKK01,1.0000E-10
- Explanation**
- You can set this command on products with the /M1 MATH function option.
  - See section 1.3 for the setting range for MATH constants.

### MG MATH Group Settings

- Setting** MGp1,p2<terminator>  
p1 MATH group number (1 to 7)  
p2 Channel structure (up to 36 characters)  
(A001 to A060)
- Query** MG[p1]?
- Example** Set MATH group number 1 to channels A001 to A003.  
MG1,A001-A003
- Explanation**
- You can set this command on products with the /M1 MATH function option, or when the pulse input module is installed.
  - See section 1.3 for the channel setting method. Note that the channels that can be input are A001 to A060.

### RO Report Operation and Creation Time Settings

- Setting** When p1=OFF  
ROp1<terminator>  
When p1=ON  
ROp1,p2,p3,p4,p5,p6,p7<terminator>  
p1 Report operation (OFF/ON)  
p2 Reset data when recording starts  
ON Reset  
OFF Do not reset  
p3 Time to create daily, weekly, and monthly reports  
hh Hour (00 to 23)  
p4 Day of week to create weekly report  
SUN Sunday  
MON Monday

- TUE Tuesday  
WED Wednesday  
THU Thursday  
FRI Friday  
SAT Saturday
- p5 Date to create monthly report  
dd Date (1 to 28)
- p6 Handling of abnormal input values for maximum, minimum, integral, or average values  
ERROR The report data is "Error"  
SKIP Ignore the abnormal input value and use the previous value
- p7 Handling of overflow values for integral/average values  
ERROR The report data is "Error"  
SKIP Ignore the overflow value and use the previous value  
LIMIT\*1 The overflow value is replaced with the upper or lower limit

\*1 The lower/upper limit value replaced differs depending on the channel's setting condition.

Measurement input channel	Measurement range upper and lower limit
Scaled measurement input channel	Upper and lower limit of scaling
MATH channel	Upper/lower limit of span

- Query** RO?
- Example** Set the following: Resetting upon recording start and report operation: ON; daily, weekly, and monthly reports: hour = 0 am; weekly reports: Monday; create monthly reports on the 1st; abnormal input value: ERROR; overflow values: ERROR.  
ROON,ON,00,MON,01,ERROR,ERROR
- Explanation**
- You can set this command on products with the /M3 report function option.
  - The hour on which daily, weekly, and monthly reports are created is the same for all.

### RM Report Execution Channel Settings

- Setting** When p2=OFF  
RMp1,p2<terminator>  
When p2=ON  
RMp1,p2,p3,p4,p5<terminator>  
p1 Box number (01 to 60)  
p2 Use/do not use box (OFF/ON)  
p3 Channel range (001 to 060 and A001 to A300)  
p4 Unit of time for integration  
OFF The integral value of the data from each measurement or MATH interval

## 1.4 Setting Commands (System Related)

	SEC	The integral value of data from each measurement or MATH interval ÷ computations per second
	MIN	The integral value of data from each measurement or MATH interval ÷ computations per minute
	HOURL	The integral value of data from each measurement or MATH interval ÷ computations per hour
	DAY	The integral value of data from each measurement or MATH interval ÷ computations per day
	p5	Displayed unit string for integration (max 6 characters)
Query	RM[p1]?	
Example	Turn ON box number 1, set the channel to 002, set the integration unit of time to hourly, and the unit string to kg/h.	
	RM01,ON,HOURL,kg/h	
Explanation		<ul style="list-style-type: none"> <li>You can set this command on products with the /M3 report function option.</li> <li>If the /M1 MATH function option is not included, MATH channels (A001 to A300) cannot be set (including queries). However, if the pulse input module is installed, MATH channels (A001 to A060) can be set (including queries).</li> <li>For the characters that can be used for p5, see "User Specified Strings" in section 1.3.</li> </ul>

### VL Broken-Line Input Channel Settings

Setting	When not using broken line VLp1,p2<terminator> When using broken line VLp1,p2,p3,p4,...p33,p34<terminator>
	p1 Sets broken-line input channels (P01 to P03)
	p2 Use/do not use broken line OFF Do not use SINGLE Execute 1 cycle REPEAT Execute repeatedly
	p3-p34 Point structure (point notation (xx.yy)) xx Break point time (0 to 86400 (sec.)) yy Break point output value (-30000 to 30000)
Query	VL[p1]?
Example	Set broken line input channel p1 to a point structure of 0:100, 60:200, 120:200, 180:100. VLP01,SINGLE,(0.100),(60.200),(120.200),(180.100),(-1.0)
Explanation	<ul style="list-style-type: none"> <li>You can set this command on products with the /M1 MATH function option.</li> <li>The p3 of break point time is fixed at 0 seconds.</li> </ul>

- Set the break point time in ascending order. You cannot set multiple output values to the same time.
- You must set the end of the point structure to (-1.0).
- When broken line usage is SINGLE or REPEAT, and there is not even 1 point set for the point structure, this cannot be set.

### AO Output Range Settings

Setting	When p2=SKIP AOp1,p2<terminator> When p2=AO When p3=COM AOp1,p2,p3,p4,p5,p6,p7<terminator> When p3=TRANS AOp1,p2,p3,p4,p5,p6,p7,p8<terminator> When p2=PWM When p3=COM AOp1,p2,p3,p4,p5,p6,p7,p8<terminator> When p3=TRANS AOp1,p2,p3,p4,p5,p6,p7,p8,p9<terminator>
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#### When Setting SKIP

Setting	AOp1,p2<terminator> p1 Channel range (001 to 060) p2 Output type (SKIP)
Query	AO[p1]?
Example	Skip channel 1. AO001,SKIP

Explanation Specify output channels on p1.

#### When Setting AO Channels

Setting	When using arbitrary output AOp1,p2,p3,p4,p5,p6.p7<terminator> When using transmission output AOp1,p2,p3,p4,p5,p6,p7,p8<terminator>
	p1 Channel range (001 to 060) p2 Output type (AO) p3 Output method TRANS Transmission output COM Arbitrary output
	p4 Output range 10V Voltage output 20mA Current output
	p5 Lower limit of span (specify using mV or µA) -10000 to 10000 (when p4 is 10 V) 0 to 20000 (when p4 is 20 µA)
	p6 Lower limit of span (specify using mV or µA) -10000 to 10000 (when p4 is 10 V) 0 to 20000 (when p4 is 20 mA)
	p7 Preset value (specify using mV or µA) -11000 to 11000 (for voltage output) 0 to 22000 (for current output)
	p8 Reference channel 001 to 060 or A001 to A300

## 1.4 Setting Commands (System Related)

Query	AO[p1]?
Example	Set transmission output on channel 11 to 4-20 mA relative to the measured values on channel 1. AO011,AO,TRANS,20mA,4000,20000,0,001
Explanation	<ul style="list-style-type: none"> <li>Specify output channels on p1.</li> <li>When entering the setting parameters of p5, p6, and p7, exclude the decimal point.</li> <li>If the /M1 MATH function option is not included, MATH channels (A001 to A300) cannot be set (including queries) on p8. However, if the pulse input module is installed, MATH channels (A001 to A060) can be set (including queries).</li> </ul>

### When Setting PWM Channels

Setting	When using arbitrary output AOp1,p2,p3,p4,p5,p6,p7,p8<terminator> When using transmission output AOp1,p2,p3,p4,p5,p6,p7,p8,p9<terminator>
p1	Channel range (001 to 060)
p2	Output type (PWM)
p3	Output method TRANS Transmission output COM arbitrary output
p4	Output range 1 mS 1 ms interval output 10 mS 10 ms interval output
p5	Lower limit of span (0.001% units, 0 to 100000)
p6	Upper limit of span (0.001% units, 0 to 100000)
p7	Pulse interval (specify as a multiple) 1 to 30000 (both p4:1mS and 10mS same range)
p8	Preset value (0.001% units, 0 to 100000)
p9	Reference channel 001 to 060 or A001 to A300

Query	AO[p1]?
Example	Set output on channel 12 to arbitrary output. AO012,PWM,COM,1mS,0,100000,10,100000
Explanation	<ul style="list-style-type: none"> <li>Specify output channels on p1.</li> <li>Channels set to SKIP are not output.</li> <li>If the /M1 MATH function option is not included, MATH channels (A001 to A300) cannot be set (including queries) on p9. However, if the pulse input module is installed, MATH channels (A001 to A060) can be set (including queries).</li> <li>When p4=10ms, p7=10, the pulse interval is 10 x 10 = 100 ms.</li> </ul>

## AP Preset Operation Settings

Setting	APp1,p2,p3,p4<terminator>
p1	Channel range (001 to 060)
p2	Operation upon startup LAST Hold previous value PRESET Output preset value
p3	Operation upon errors LAST Hold previous value PRESET Output preset value
p4	Operation upon measurement stop, computation stop, or transmission stop (Firmware version R3.03 or later) LAST Hold previous value PRESET Output preset value

Query	AP[p1]?
Example	Set the operation upon startup for channel 1 to PRESET, and operation upon errors to LAST. AP001,PRESET,LAST
Explanation	Specify output channels on p1.

## SL Event Action Settings

Setting	When p2=OFF SLp1,p2<terminator> When p2=DI SLp1,p2,p3,p4,p5,p6<terminator> When p2=ALARM SLp1,p2,p3,p4,p5<terminator> When p2=MEMORY SLp1,p2,p3,p4,p5<terminator> When p2=ALARM_CH SLp1,p2,p3,p4,p5,p6,p7<terminator> When p2=RELAY SLp1,p2,p3,p4,p5,p6<terminator> When p2=TIMER SLp1,p2,p3,p4,p5,p6<terminator> When p2=MATCH_TIME SLp1,p2,p3,p4,p5,p6<terminator> When p2=USER_KEY SLp1,p2,p3,p4,p5,p6<terminator>
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### When Action Does Not Occur

Setting	SLp1,p2<terminator> p1 Box number (01 to 30) p2 Event type (OFF)
Query	SL[p1]?
Example	Set box number 01 to no action. SL01,OFF

## 1.4 Setting Commands (System Related)

**When Action Occurs on Digital Input**

Setting SLp1,p2,p3,p4,p5,p6<terminator>

p1 Box number (01 to 30)  
 p2 Event type (DI)  
 p3 Channel numbers (001 to 060)  
 p4 Event detection method  
     EDGE      Edge start  
     LEVEL     Level start  
 p5 Action types  
 p6 Flag numbers (F01 to F60)

Query SL[p1]?

Example Set box number 02 to computation start action.

SL02,DI,001,EDGE,MATH\_START

Explanation

- The p6 setting is only valid when p5 is FLAG. For the action types, see section 1.3.
- Specify a measurement channel number for p3 that allows contact input.

**When Action Occurs on Alarm Output**

Setting SLp1,p2,p3,p4,p5<terminator>

p1 Box number (01 to 30)  
 p2 Event type (ALARM)  
 p3 Event detection method  
     EDGE      Edge start  
     LEVEL     Level start  
 p4 Action types  
 p5 Flag numbers (F01 to F60)

Query SL[p1]?

Example Set box number 3 to recording start action on alarm occurrence.

SL03,ALARM,LEVEL,MEMORY\_START

Explanation The p5 setting is only valid when p4 is FLAG. For the action types, see section 1.3.

**When Action Occurs on Recording Start**

Setting SLp1,p2,p3,p4,p5<terminator>

p1 Box number (01 to 30)  
 p2 Event type (MEMORY)  
 p3 Event detection method  
     EDGE      Edge start  
     LEVEL     Level start  
 p4 Action types  
 p5 Flag numbers (F01 to F60)

Query SL[p1]?

Example Set box number 4 to the alarm acknowledge action.

SL04,MEMORY,EDGE,ALARM\_ACK

Explanation The p5 setting is only valid when p4 is FLAG. For the action types, see section 1.3.

**When Action Occurs on Occurrence of Alarm on Certain Channel**

Setting SLp1,p2,p3,p4,p5,p6.p7<terminator>

p1 Box number (01 to 30)  
 p2 Event type (ALARM\_CH)  
 p3 Channel numbers (001 to 060 and A001 to A300)  
 p4 Alarm number (1 to 4)

p5 Event detection method

EDGE      Edge start

LEVEL     Level start

p6 Action types

p7 Flag numbers (F01 to F60)

Query SL[p1]?

Example Set box number 5 to recording start/stop action on occurrence of alarm on channel 1.

SL05,ALARM\_CH,001,1,LEVEL,MEMORY\_START

Explanation

- The p7 setting is only valid when p6 is FLAG. For the action types, see section 1.3.
- Specify measurement channels on 001 to 060 of p3.
- If the /M1 MATH function option is not included, MATH channels (A001 to A300) cannot be set (including queries). However, if the pulse input module is installed, MATH channels (A001 to A060) can be set (including queries).

**When Action Occurs on Relay Operation**

Setting SLp1,p2,p3,p4,p5,p6<terminator>

p1 Box number (01 to 30)  
 p2 Event type (RELAY)  
 p3 Relay numbers (001 to 060)  
 p4 Event detection method  
     EDGE      Edge start  
     LEVEL     Level start  
 p5 Action types  
 p6 Flag numbers (F01 to F60)

Query SL[p1]?

Example Set box number 5 to an action of activation of trigger 1 upon change in status of relay 1.

SL06,RELAY,001,EDGE,TRIGGER1

Explanation

- The p6 setting is only valid when p5 is FLAG. For the action types, see section 1.3.
- Specify relay number on p3.

**When Action Occurs on Timer**

Setting SLp1,p2,p3,p4,p5,p6<terminator>

p1 Box number (01 to 30)  
 p2 Event type (TIMER)  
 p3 Timer number (1 to 6)  
 p4 Event detection method  
     EDGE      Edge start  
     LEVEL     Level start

p5 Action types

p6 Flag numbers (F01 to F60)

Query SL[p1]?

Example Set box number 6 to an action in which computation starts every time specified for timer 1.

SL06,TIMER,1,EDGE,MATH\_START

Explanation The p6 setting is only valid when p5 is FLAG. For the action types, see section 1.3.

## 1.4 Setting Commands (System Related)

### When Action Occurs on Match Time

Setting SLp1,p2,p3,p4,p5,p6<terminator>

- p1 Box number (01 to 30)
- p2 Event type (MATCH\_TIME)
- p3 Match time number (1 to 3)
- p4 Event detection method
  - EDGE Edge start
  - LEVEL Level start
- p5 Action types
- p6 Flag numbers (F01 to F60)

Query SL[p1]?

Example Set box number 7 to an action in which recording starts at the time specified for match time 1.

SL07,MATCH\_TIME,1,EDGE,MEMORY\_START

Explanation The p6 setting is only valid when p5 is FLAG. For the action types, see section 1.3.

### When Action Occurs on USER Key

Setting SLp1,p2,p3,p4,p5,p6<terminator>

- p1 Box number (01 to 30)
- p2 Event type (USER\_KEY)
- p3 Key number (1, 2)
- p4 Event detection method
  - EDGE Edge start
  - LEVEL Level start
- p5 Action types
- p6 Flag numbers (F01 to F60)

Query SL[p1]?

Example Set box number 8 to an action in which the specified file is saved upon pressing of USER key 1.

SL08,USER\_KEY,1,EDGE,FILE\_SAVE

Explanation The p6 setting is only valid when p5 is FLAG. For the action types, see section 1.3.

## SI Timer Settings

Setting When p2=OFF

SIp1,p2<terminator>

When p2=RELATIVE

SIp1,p2,p3,p4<terminator>

When p2=ABSOLUTE

SIp1,p2,p3,p4<terminator>

### When Not Using the Timer

Setting SIp1,p2<terminator>

p1 Timer number (1 to 6)

p2 Timer type (OFF)

Query SI[p1]?

Example Set timer number 1 to OFF.

SI1,OFF

### When Using the Relative Timer

Setting SIp1,p2,p3,p4<terminator>

p1 Timer number (1 to 6)

p2 Timer type (RELATIVE)

p3 Time interval-days (0 to 31)

p4 Time interval-time (HH:MM)

HH hours (00 to 23)

MM Minute (00 to 59)

(However, when p3 is 0, 00:00 cannot be set.)

Query SI[p1]?

Example Set a relative time of 3 hours and 30 minutes on timer number 1.

SI1,RELATIVE,0,03:30

### When Using the Absolute Timer

Setting SIp1,p2,p3,p4<terminator>

p1 Timer number (1 to 6)

p2 Timer type (ABSOLUTE)

p3 Time interval

1M/2M/3M/4M/5M/6M/10M/12M/15M/20M/30M (minutes)

1H/2H/3H/4H/6H/8H/12H/24H (hours)

p4 Reference time (HH:MM)

HH hours (00 to 23)

MM Minute (00 to 59)

Query SI[p1]?

Example Set a time interval of 30 minutes and a reference time of 17 hours and 15 minutes on timer number 1.

SI1,ABSOLUTE,30M,17:15

## SQ Match Time Settings

Setting When p2=OFF

SQp1,p2<terminator>

When p2=MONTH

SQp1,p2,p3,p4<terminator>

When p2=WEEK

SQp1,p2,p3,p4<terminator>

When p2=DAY

SQp1,p2,p3<terminator>

### When Not Using the Match Time

Setting SQp1,p2<terminator>

p1 Match time number (1 to 3)

p2 Start type (OFF)

Query SQ[p1]?

Example Set match timer number 1 to OFF.

SQ1,OFF

### When Starting Match Time in Units of Months

Setting SQp1,p2,p3,p4<terminator>

p1 Match time number (1 to 3)

p2 Start type (MONTH)

p3 Start date/time-day (1 to 31)

p4 Start date/time-time (HH:MM)

HH hours (00 to 23)

MM Minute (00 to 59)

Query SQ[p1]?

Example Set match time number 1 to 1 day, 8 hours 30 minutes.

SQ1,MONTH,1,08:30



## 1.4 Setting Commands (System Related)

**When Starting Match Time in Units of Weeks**

Setting SQp1,p2,p3,p4<terminator>

p1 Match time number (1 to 3)

p2 Start type (WEEK)

p3 Start Date/time-day of week

SUN Sunday

MON Monday

TUE Tuesday

WED Wednesday

THU Thursday

FRI Friday

SAT Saturday

p4 Start date/time-time (HH:MM)

HH hours (00 to 23)

MM Minute (00 to 59)

Query SQ[p1]?

Example Set match time number 1 to Friday, 17 hours 30 minutes.

SQ1,WEEK,FRI,17:30

**When Starting Match Time in Units of One Day**

Setting SQp1,p2,p3<terminator>

p1 Match time number (1 to 3)

p2 Start type (DAY)

p3 Start date/time-time (HH:MM)

HH hours (00 to 23)

MM Minute (00 to 59)

Query SQ[p1]?

Example Set match time number 1 to 17 hours 30 minutes.

SQ1,DAY,17:30

**XV Measurement Interval Settings**

Setting XVp1,p2<terminator>

p1 Measurement group number (1 to 3)

p2 Measurement interval

OFF

10mS/50mS/100mS/200mS/500mS  
(milliseconds)

1S/2S/5S/10S/20S/30S/60S (seconds)

Query XV[p1]?

Example Set measurement group number 1 to a measurement interval of 1 second.

XV1,1S

**XI Measurement Groups and A/D Integration Time Settings**

Setting XIp1,p2,p3<terminator>

p1 Module number (0 to 5)

p2 Measurement group number (OFF, 1 to 3)

p3 A/D integration time

(AUTO, 50 Hz, 60 Hz)

Query XI[p1]?

Example Set module number 0 to measurement group 1 and A/D integration time to automatic detection.

XI0,1,AUTO

- Explanation
- If the module specified in p1 has a shortest measurement interval of 100 ms, you cannot set measurement group numbers having measurement intervals of 10 ms or 50 ms. Also, if the module has a shortest measurement interval of 500 ms, you cannot set measurement group numbers having measurement intervals of 10 ms, 50 ms, or 100 ms.
  - Measurement group numbers cannot be specified for output modules and unmounted modules.
  - For the 30-CH Medium Speed DCV/TC/DI Input Module, enter the same settings for the three measurement groups and A/D integral times.

**VM MATH Interval Settings**

Setting VMp1<terminator>

p1 Measurement group number

(OFF, 1 to 3)

Query VM?

Example Set MATH interval to measurement group number 1.

VM1

- Explanation
- You can set this command on products with the /M1 MATH function option, and when the pulse input module is installed.
  - Measurement group numbers of measurement interval 10 ms or 50 ms cannot be set.

**XG Settings of Operation upon MATH Error**

Setting XGp1,p2,p3,p4,p5,p6,p7<terminator>

p1 Operation upon Math Error

+OVER Set computed value to +Over

-OVER Set computed value to -Over

p2 Special MATH processing when the input value of the measurement input channel is in error in a computation other than TLOG and CLOG.

ERROR Sets the computed value to MATH error.

SKIP Continue the computation using the previous value for channels with an error in the input value.

p3 Special MATH processing when the input value of the measurement input channel is overflow in a computation other than TLOG and CLOG.

ERROR Compute using the overflow value

SKIP Continue the computation using the previous value for channels with an overflow value



## 1.4 Setting Commands (System Related)

LIMIT<sup>\*1</sup> Continue the computation by replacing the overflow value with upper or lower limit value

\*1 The upper or lower limit value that is replaced for the measurement input channel varies depending on the MATH type.

Measurement input channel	Upper/lower limit of the measuring range
Scaled measurement input channel	Upper/lower limit of scaling

p4 Sum scale of the TLOG.SUM computation

OFF Sum value of the data for each measurement interval

SEC Sum value of the data for each measurement interval/number of computations per second

MIN Sum value of the data for each measurement interval/number of computations per minute

HOUR Sum value of the data for each measurement interval/number of computations per hour

DAY Sum value of the data for each measurement interval/number of computations per day (Firmware version R3.03 or later)

p5 Special MATH processing when the input value of the measurement input channel is in error in a TLOG or CLOG computation<sup>\*2</sup>

ERROR Sets the computed value to MATH error.

SKIP Continue the computation using the previous value ignoring the input value in error

p6 Special MATH processing when the input value of the measurement input channel is overflow in a TLOG or CLOG computation<sup>\*2</sup>

ERROR Sets the computed value to MATH error.

SKIP Computed value is ignored and computation continues

LIMIT<sup>\*3</sup> Apply input to upper or lower limit value and continue computation

\*2 For details, see the *MW100 Data Acquisition Unit User's Manual* (IM MW100-01E).

\*3 The upper or lower limit value that is replaced for the reference channel varies depending on the MATH type.

Measurement input channel	Upper/lower limit of the measuring range
Scaled measurement input channel	Upper/lower limit of scaling
MATH channel	Upper/lower limit of span

p7 Overflow processing of TLOG.PSUM computation

OVER Stop the computation as overflow when 99999999 is exceeded

ROTATE Continue the computation by resetting the count to 0 when 99999999 is exceeded

Query XG?

Example Set operation upon MATH error to +OVER, operation upon abnormality in computation other than CLOG/TLOG to SKIP, overflow operation for other than CLOG/TLOG to SKIP, time scaling for TLOG.SUM computation to units of minutes, operation upon abnormal input from CLOG/TLOG computation to ERROR, operation upon CLOG/TLOG computation overflow to LIMIT, and operation upon TLOG.PSUM computation over to OVER.

XG+OVER, SKIP, SKIP, MIN, ERROR, LIMIT, OVER

Explanation You can set this command on products with the /M1 MATH function option, and when the pulse input module is installed.

## MC File Message Settings

Setting MCp1,p2<terminator>

p1 File message type

MESSAGE For recording

MESSAGE\_T For thinning recording

p2 Message string (up to 120 characters)

Query MC?

Explanation

- This command sets a common message to all files in the recording interval (between record start to record stop).
- There are two message types: recording and thinning recording. The recorded message is common to measurement groups 1 to 3 and MATH and does not depend on the record start timing.
- For the characters that can be used for the messages, see "User Specified Strings" in section 1.3.
- You cannot change the settings while recording.

## MD Data Save Folder Settings

Setting MDp1,p2,p3<terminator>

p1 Type

AUTO Auto generation

PARTIAL Partial setting

FREE Arbitrary string

DATE Date and time

p2 Folder name (1 to 8 characters)

p3 Start number (0 TO 9999)

Query MD?

## 1.4 Setting Commands (System Related)

**Example** Create the folder automatically.  
 MDAUTO  
 Set the folder name to XXX100.  
 MDPARTIAL,XXX,100  
 Set the folder name to ZZZZZZ.  
 MDFREE,ZZZZZZ  
 Set the folder name to the date/time when the recording is started.  
 MDDATE

**Explanation** • Folder type and format

Type	Naming convention	Format	Handling of duplicate folder names
AUTO	DATAAnnn	DATA: Fixed nnnn: Sequence number 0000 to 9999, automatic update	Available Sequence number updating
PARTIAL	xxxxnnnn	xxxx: Any 1 to 4 alphanumeric characters nnnn: Sequence number 0000 to 9999, automatic update	None
FREE	xxxxxxx	xxxxxxx: Any 1 to 8 alphanumeric characters	None
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: Sequence number (0 to 9, A to Z)	Available Sequence number updating

- The sequence number is managed by setting type. You can set the starting sequence number for the PARTIAL setting. You cannot set the starting sequence number of AUTO and DATE settings.
- The folder name cannot be blank (only spaces). Enter at least one character.
- If the number of characters of the folder name is 1 to 3 for the PARTIAL setting, the sequence number is moved forward immediately after the folder name. If the folder name is more than 4 characters, characters after the 4th character are ignored. If the folder name is set to DATA, consistency with the auto setting is not maintained.
- In the FREE setting, the data is saved to the same folder until the folder name is changed. The recording log and alarm summary files are overwritten when recorded to the same name. When the recording stop action is set to Rotate, previous old files are deleted.
- Commands can be sent or received with p2 and p3 attached regardless of the type (p1).
- For the character strings that can be used for the folder name, see "File and Folder Name Strings" in section 1.3.

### MH Recording Channel Settings

**Setting** MHp1,p2,p3,p4<terminator>  
 p1 Channel range (001 to 060 and A001 to A300)  
 p2 Recording OFF/ON  
 p3 Thinning recording OFF/ON  
 p4 Manual sample recording OFF/ON

**Query** MH[p1]?

**Example** Set recording on channel 1 OFF, thinning recording ON, and manual sample recording ON.  
 MH001,OFF,ON,ON

- Explanation**
- Specify measurement channels on 001 to 060 of p1.
  - If the /M1 MATH function option is not included, MATH channels (A001 to A300) cannot be set (including queries). However, if the pulse input module is installed, MATH channels (A001 to A060) can be set (including queries).

### MW Recording Operation Settings

**Setting** When p2=OFF  
 MWp1,p2<terminator>  
 When p2=ON and p3=DIRECT  
 MWp1,p2,p3,p4,p5<terminator>  
 When p2=ON and p3=TRIGGER  
 MWp1,p2,p3,p4,p5,p6,p7<terminator>  
 p1 Measurement group number (1 to 3)  
 p2 Recording OFF/ON  
 p3 Record start timing  
 DIRECT Record starts on record start  
 TRIGGER Record starts on trigger activation  
 p4 Recording stop action  
 SINGLE Recording stops after creating one file  
 FULLSTOP Recording stops when file is full  
 ROTATE Continue recording by deleting the old data  
 p5 Recording interval [measurement/times] (1, 2, 4, 5, 10)  
 p6 Recording data length  
 10M/20M/30M (units of minutes)  
 1H/2H/3H/4H/6H/8H/12H (units of hours)  
 1D/2D/3D/5D/7D/10D (units of days)  
 p7 Pretrigger length[%] (0/10/20/30/40/50/60/70/80/90/100)

**Query** MW[p1]?

**Example** Turn recording of measurement group 1 ON, set the record start timing to DIRECT, set the recording stop action to SINGLE, and set the recording interval to 2.  
 MW1,ON,DIRECT,SINGLE,2

## 1.4 Setting Commands (System Related)

- Explanation**
- Set p5 (recording interval) to an integer multiple of the measurement interval.
  - The recording interval can be set to 1, 2, 4, or 10 if the measurement interval is 50 mS, 500 mS, or 5 S.
  - The recording interval can be set to 1, 5, or 10 if the measurement interval is 200 mS.
  - The recording interval can be set to 1, 2, 5, or 10 for all other measurement intervals.

### ML Recording Data Length Settings

- Setting** MLp1<terminator>
- p1 Data length when the recording start timing is set to DIRECT under recording operation
- 30 M (units of minutes)
- 1H/2H/3H/4H/6H/8H/12H (units of hours)
- 1D/2D/3D/5D/7D/10D/14D/31D (units of days)
- Query** ML?
- Example** Set the recording start time data length to 1 hour.  
ML1H

### MR Recording Free Space Settings

- Setting** MRp1<terminator>
- p1 Recording time remaining on media set for small media free space
- 1H/2H/3H/4H/5H (units of hours)
- Query** MR?
- Example** Set media free space to 2 hours.  
MR2H

### MX Thinning Recording Operation Settings

- Setting** When p1=OFF  
MXp1<terminator>
- When p1 is not OFF  
MXp1,p2,p3<terminator>
- p1 Recording interval:
- OFF (do not record)
- 4S/5S/10S/20S/30S (units of seconds)
- 1M/2M/3M/4M/5M/10M/20M/30M (units of minutes)
- 1H (units of hours)
- p2 Recording stop action
- SINGLE Recording stops after creating one file
- FULLSTOP Recording stops when file is full
- ROTATE Continue recording by deleting the old data

- p3 Recording data length
- 30 M (units of minutes)
- 1H/2H/3H/4H/6H/8H/12H (units of hours)
- 1D/2D/3D/5D/7D/10D/14D/31D (units of days)

- Query** MX?
- Example** Set recording interval to 1H, recording operation to FULLSTOP, and recording data length to 2D.  
MX1H, FULLSTOP, 2D

- Explanation**
- p3 cannot be set to a time less than the p1 interval.
  - The relationship between the measurement and MATH intervals set on the input module and the allowed thinning recording interval setting is shown in the table below.

Thinning Recording Interval	Measurement Interval (Measurement Group/MATH Interval)						
	10ms, 50ms, 100ms 200ms, 500ms, 1s	2s	5s	10s	20s	30s	60s
4S	✓	✓					
5S	✓		✓				
10S	✓	✓	✓	✓			
20S	✓	✓	✓	✓	✓		
30S	✓	✓	✓	✓		✓	
1M	✓	✓	✓	✓	✓	✓	✓
2M	✓	✓	✓	✓	✓	✓	✓
3M	✓	✓	✓	✓	✓	✓	✓
4M	✓	✓	✓	✓	✓	✓	✓
5M	✓	✓	✓	✓	✓	✓	✓
10M	✓	✓	✓	✓	✓	✓	✓
20M	✓	✓	✓	✓	✓	✓	✓
30M	✓	✓	✓	✓	✓	✓	✓
1H	✓	✓	✓	✓	✓	✓	✓

✓: Can be set, Blank: Cannot be set

### MU Setting Save Operation Settings

- Setting** MUp1,p2,p3,p4<terminator>
- p1 Saving of channel related settings  
OFF/ON
- p2 Saving of recording related settings  
OFF/ON
- p3 Saving of communication related settings  
OFF/ON
- p4 Saving of other settings  
OFF/ON
- Query** MU?
- Example** Set so that all settings are saved.  
MHON, ON, ON, ON

### XK Key Lock Settings

- Setting** XKp1<terminator>
- p1 Key lock OFF/ON
- Query** XK?
- Example** Key lock settings.  
XKON
- Explanation** The setting is valid in Setting mode or Measurement mode.

## 1.4 Setting Commands (System Related)

**XT** Temperature Unit Settings

**Setting** XTp1<terminator>  
 p1 Units of temperature  
     DEG\_C    Temperature calculated in °C  
     DEG\_F    Temperature calculated in °F

**Query** XT?

**Example** Temperature units set in °F  
 XTDEG\_F

**Explanation** When the temperature units are changed, the settings of the SR, SF, XB, XJ, XD, AO, AP, and ST commands are initialized.

**SW** Daylight Saving Time Settings

**Setting** SWp1,p2,p3,p4,p5<terminator>  
 p1 Starts/stops date/time type  
     START    Start date/time  
     END      Exit date/time

p2 Date/time-month  
     JAN      January  
     FEB      February  
     MAR      March  
     APR      April  
     MAY      May  
     JUN      June  
     JUL      July  
     AUG      August  
     SEP      September  
     OCT      October  
     NOV      November  
     DEC      December

p3 Date/time-week  
     1st      First week  
     2nd      Second week  
     3rd      Third week  
     4th      Fourth week  
     LAST     Final week

p4 Date/time-day of week  
     SUN      Sunday  
     MON      Monday  
     TUE      Tuesday  
     WED      Wednesday  
     THU      Thursday  
     FRI      Friday  
     SAT      Saturday

p5 Date/time-hour (0 to 23)

**Query** SW[p1]?

**Example** Star Daylight Saving time on April, first week, Sunday, 2 hours.  
 SWSTART,APR,1st,SUN,2

**SS** Daylight Saving Time Operation Settings

**Setting** SSp1<terminator>  
 p1 Summer time operation valid/invalid  
     ON/OFF

**Query** SS?

**Example** Enables Daylight Saving time.  
 SSON

**BA** Settings of Strain Input Initial Balancing

**Setting** BAp1,p2<terminator>  
 p1 Channel range (001 to 060)  
 p2 Initial balancing valid/invalid (ON/OFF)

**Query** BA[p1]?

**Example** Enable strain input initial balance operation on channel 1.  
 BA001,ON

**Explanation** Specify measurement channels on p1.

**UN** Unit Number Settings

**Setting** UNp1<terminator>  
 p1 Unit number (00 to 89)

**Query** UN?

**Example** Set unit number to 5.  
 UN05

**SV** Rolling Average Settings

**Setting** When p2=OFF  
 SVp1,p2<terminator>  
 p1 MATH channel number (A001 to A060)  
 p2 Rolling average ON/OFF (OFF)

When p2=ON  
 SVp1,p2,p3,p4<terminator>  
 p1 MATH channel number (A001 to A060)  
 p2 Rolling average ON/OFF (ON)  
 p3 Sampling interval (1 to 6S, 10S, 12S, 15S, 20S, 30S, 1M to 6M, 10M, 12M, 15M, 20M, 30M, or 1H)  
     \_S: Interval setting in unit of seconds  
     \_M: Interval setting in unit of minutes  
     \_H: Interval setting in unit of hours  
 p4 Number of samples (1 to 1500)

**Query** SV[p1]?

**Example** Set the sampling interval to 1 minute and the number of samples to 360 on MATH channel A001.  
 SVA001,ON,1M,360

**Explanation**

- This command can be used on models with the /M1 math option.
- Set the sampling interval to an integer multiple of the MATH interval.

## 1.5 Setting Commands (Display Related)

### ST Tag Settings

**Setting** STp1,p2<terminator>  
 p1 Channel range (001 to 060 and A001 to A300)  
 p2 Tags (max 15 characters)

**Query** ST[p1]?

**Example** Set the tag of channel 2 to TAG2.  
 ST002,TAG2

**Explanation**

- For the characters that can be used for tags, see user specified characters in section 1.3.
- If the /M1 MATH function option is not included, MATH channels (A001 to A300) cannot be set (including queries). However, if the pulse input module is installed, MATH channels (A001 to A060) can be set (including queries).

### SZ Zone Settings

**Setting** SZp1,p2,p3<terminator>  
 p1 Channel range (001 to 060 and A001 to A300)  
 p2 Zone lower limit value (0 to 95) [%]  
 p3 Zone upper limit value (5 to 100) [%]

**Query** SZ[p1]?

**Example** Zone display channel 2 between 30 and 50%  
 SZ002,30,50

**Explanation**

- If the /M1 MATH function option is not included, MATH channels (A001 to A300) cannot be set (including queries). However, if the pulse input module is installed, MATH channels (A001 to A060) can be set (including queries).
- Set total display width of amplitude direction of waveform display area to 100%.
- A Zone width of less than 5% cannot be set.
- Set the upper and lower zone parameters so that the upper is greater than the lower.

### SC Display Color Settings

**Setting** SCp1,p2<terminator>  
 p1 Channel range (001 to 060 and A001 to A300)  
 p2 Display color (rrr.ggg.bbb)  
 rrr RGB R value (0 to 255)  
 ggg RGB G value (0 to 255)  
 bbb RGB B value (0 to 255)

**Query** SC[p1]?

**Example** Set display color of channel 2 to Yellow.  
 SC002,255.255.0

**Explanation** If the /M1 MATH function option is not included, MATH channels (A001 to A300) cannot be set (including queries). However, if the pulse input module is installed, MATH channels (A001 to A060) can be set (including queries).

### SB Display Scale Settings

**Setting** SBp1,p2,p3,p4<terminator>  
 p1 Channel range (001 to 060 and A001 to A300)  
 p2 Scale type  
 LINEAR Linear display  
 LOG Logarithmic display  
 p3 Number of scale divisions (1 to 12, AUTO)  
 p4 Bar graph display reference position (NORMAL, CENTER)

**Query** SB[p1]?

**Example** Set the display scale type on channel 2 to LINEAR, the number of scale divisions to 5, and the reference position of the bar graph display to NORMAL.  
 SB002,LINEAR,5,NORMAL

**Explanation**

- If the /M1 MATH function option is not included, MATH channels (A001 to A300) cannot be set (including queries). However, if the pulse input module is installed, MATH channels (A001 to A060) can be set (including queries).
- If AUTO is specified for p3, the number of divisions is automatically determined from the upper and lower limit (If scaling is turned ON in the range settings, it is determined from the upper and lower limit of scaling).
- If CENTER is set for p4, the center of the bar graph is drawn in the reference point.

**SX Display Group Settings**

Setting	SXp1,p2,p3<terminator> p1 Display group number (01 to 18) p2 Display group name (up to 16 characters) p3 Channel structure (up to 100 characters, up to 20 channels)
Query	SX[p1]?
Example	Channel 1 and channels 3 to 6 are given a group name of GROUP1 and set to group 1. SX1,GROUP1,001.003-006 Set the channel structure by delimiting individual channels with a period (.), and specifying ranges of channels with a hyphen (-).
Explanation	<ul style="list-style-type: none"> <li>For the characters that can be used for group names, see user specified characters in section 1.3.</li> <li>See section 1.3 for the channel structure.</li> </ul>

**TL Trip Line Settings**

Setting	When p3=OFF TLp1,p2,p3<terminator> When p3=ON TLp1,p2,p3,p4,p5<terminator> p1 Display group number (01 to 18) p2 Trip line number (1 to 4) p3 Trip line display ON/OFF p4 Display color (rrr.ggg.bbb) rrr RGB R value (0 to 255) ggg RGB G value (0 to 255) bbb RGB B value (0 to 255) p5 Display position (0 to 100) [%]
Query	TL[p1[,p2]]?
Example	Display trip line 1 in group one in red at 10% position. Set the top of the graph to 100% and the bottom to 0%. TL1,1,ON,255.0.0,10

**XR Channel and Tag Display Switching**

Setting	XRp1<terminator> p1 Display type CHANNEL Channel number display TAG Tag display
Query	XR?
Example	Set tag display. XR TAG

**SG Message Settings**

Setting	SGp1,p2<terminator> p1 Message number (0 to 5) p2 Message string (up to 15 characters)
Query	SG[p1]?
Example	Set the MESSAGE1 string to message number 1. SG1,MESSAGE1
Explanation	<ul style="list-style-type: none"> <li>For the characters that can be used for messages, see user specified characters in section 1.3.</li> <li>The message number 0 setting is valid in Setting mode and Measurement mode.</li> </ul>

## 1.6 Setting Commands (Communication Related)

### UA User Settings

**Setting** When p2=OFF  
 UA p1,p2<terminator>  
 When p2 is not OFF  
 UA p1,p2,p3,p4<terminator>  
 p1 User number (01 to 10)  
 p2 User level  
     OFF Do not use  
     ADMIN Administrator level  
     USER User level  
 p3 User name (up to 16 characters)  
 p4 Password (up to 8 characters)

**Query** UA[p1]?

**Example** Set User number 01 to an account with user name YOKOGAWA at the administrator level. Set the password to 1234.  
 UA01,ADMIN,YOKOGAWA,1234

**Explanation**

- For the characters that can be used for user names, see user specified characters in section 1.3.
- For the characters that can be used for passwords, see password strings in section 1.3.
- The password is output encrypted during a query.

### YS Serial Communication Settings

**Setting** When p1=NORMAL  
 YSp1,p2,p3,p4,p5,p6,p7<terminator>  
 When p1=MODBUS\_M or p1=MODBUS\_S  
 YSp1,p2,p3,p4,p5<terminator>

#### When Using as a General Purpose Communication Server

**Setting** YSp1,p2,p3,p4,p5,p6,p7<terminator>  
 p1 Function (NORMAL)  
 p2 Address (01 to 32)  
 p3 Baud rate [bps]  
     (1200/2400/4800/9600/19200/  
     38400/57600/115200)  
 p4 Parity  
     NONE No parity  
     EVEN Even  
     ODD Odd  
 p5 Stop bit [bit] (1, 2)  
 p6 Data length [bit] (7, 8)  
 p7 Handshaking  
     (OFF:OFF,XON:XON,XON:RS,CS:RS)

**Example** Set the address to 01, baud rate to 9600 bps, parity to even, stop bit to 1, data length to 8 bits, and handshaking to XON:RS.  
 YSNORMAL,01,9600,EVEN,8,1,XON:RS

#### When using as a Modbus master or Modbus slave

**Setting** YSp1,p2,p3,p4,p5<terminator>  
 p1 Function  
     MODBUS\_M Modbus master  
     MODBUS\_S Modbus slave  
 p2 Address (1 to 247)  
 p3 Baud rate [bps]  
     (1200/2400/4800/9600/19200/  
     38400/57600/115200)  
 p4 Parity  
     NONE No parity  
     EVEN Even  
     ODD Odd  
 p5 Stop bit [bit] (1, 2)

**Example** Set Address1 to the Modbus master, the baud rate to 9600 bps, parity to even, and stop bit to 1.

YSMODBUS\_M,1,9600,EVEN,1

**Explanation** MODBUS\_M of p1 can be set with the /M1 MATH function option.

### YA IP Address Settings

**Setting** YAp1,p2,p3<terminator>  
 p1 IP address  
     (0.0.0.0 to 255.255.255.255)  
 p2 Subnet Mask  
     (0.0.0.0 to 255.255.255.255)  
 p3 Default Gateway  
     (0.0.0.0 to 255.255.255.255)

**Query** YA?

**Example** Set the IP address to 192.168.111.24, the subnet mask to 255.255.255.0, and the default gateway to 0.0.0.0.  
 YA192.168.111.24,255.255.255.0,0.0.0.0

**Explanation** The settings updated with this command are enabled when the MW100's power is turned OFF, then turned back ON again.

### YD Host Name and Domain Name Settings

**Setting** YDp1,p2<terminator>  
 p1 Host name (up to 63 characters)  
 p2 Domain name (up to 63 characters)

**Query** YD?

**Example** Sets the host name "some\_host" and domain name "abc.com"  
 YDsome\_host,abc.com

**Explanation** For the characters that can be used for the host and domain names, see host and domain name strings in section 1.3.

## 1.6 Setting Commands (Communication Related)

**YN DNS Client Settings**

Setting	YNp1,p2,p3,p4<terminator>
	p1 DNS server primary (0.0.0.0 to 255.255.255.255)
	p2 DNS server secondary (0.0.0.0 to 255.255.255.255)
	p3 Domain suffix-primary (up to 63 characters)
	p4 Domain suffix-secondary (up to 63 characters)
Query	YN?
Example	Set the primary and secondary DNS server. YN192.168.0.1,192.168.0.2
Explanation	For the characters that can be used for domain suffixes, see host and domain name strings in section 1.3.

**YH DHCP Client Settings**

Setting	YHp1,p2<terminator>
	p1 Getting DNS information OFF/ON
	p2 Host name registration OFF/ON
Query	YH?
Example	Get DNS server information and turn ON host name registration. YHON,ON
Explanation	The settings updated with this command are enabled when the MW100's power is turned OFF, then turned back ON again.

**YF FTP Client Settings**

Setting	YFp1,p2,p3,p4,p5,p6,p7<terminator>
	p1 Connection type 1 Primary server 2 Secondary server
	p2 FTP server (up to 64 characters)
	p3 Port number (1 to 65535)
	p4 User name (up to 32 characters)
	p5 Password (up to 32 characters)
	p6 Directory (up to 32 characters)
	p7 Use passive mode (OFF/ON)
Query	YF[p1]?
Example	Transfer file to primary server. YF1,192.168.1.1,21,YOKOGAWA,1234,MW_DATA,OFF
Explanation	<ul style="list-style-type: none"> <li>For the characters that can be used for the FTP server, see host and domain name strings in section 1.3.</li> <li>For the characters that can be used for user names and directories, see user specified characters in section 1.3.</li> <li>For the characters that can be used for passwords, see password strings in section 1.3.</li> <li>The password is output encrypted during a query.</li> </ul>

**YG FTP Client Operation Settings**

Setting	YGp1<terminator>
	p1 Transfer time shift (0 to 120)[min]
Query	YG?
Example	Set to 3 minutes YG3

**YM Mail Client Settings**

Setting	When p5=OFF YMp1,p2,p3,p4,p5<terminator>
	When p5=POP3 or AUTH (Firmware version R3.02 or later) YMp1,p2,p3,p4,p5,p6,p7<terminator>
	p1 SMTP server name (up to 64 characters)
	p2 SMTP port number (1 to 65535)
	p3 POP3 server name (up to 64 characters)
	p4 POP3 port number (1-65535)
	p5 Use authorization (OFF/POP3/AUTH) OFF POP3 Use POP before SMTP AUTH Use SMTP Authentication
	p6 User name (up to 32 characters)
	p7 Password (up to 32 characters)
Query	YM?
Example	Enable POP3 before SMTP in the mail client settings. YMsmtplib_server.abc.com,25,pop3_server.abc.com,110,POP3,YOKOGAWA,1234
Explanation	<ul style="list-style-type: none"> <li>For the characters that can be used for the SMTP server and POP3 server, see host and domain name strings in section 1.3.</li> <li>For the characters that can be used for passwords, see password strings in section 1.3.</li> <li>The password is output encrypted during a query.</li> </ul>

**YV Mail Sender and Recipient Settings**

Setting	YVp1,p2,p3,p4<terminator>
	p1 Characters added to [Subject] (up to 32 characters)
	p2 Recipient address 1 (up to 150 characters)
	p3 Recipient address 2 (up to 150 characters)
	p4 Sender address (up to 64 characters)
Query	YV?
Example	Set a mail recipient 1 and 2, and the sender. YVALARM,kofu@abc.com,mitaka@abc.com,tokyo@abc.com
Explanation	For the characters that can be used for the subject, recipients, and sender, see user specified characters in section 1.3.



## 1.6 Setting Commands (Communication Related)

### YU Mail Contents Settings

**Setting** When p1=TIME  
YUp1,p2,p3,p4,p5<terminator>  
When p1=ALARM  
YUp1,p2,p3<terminator>  
When p1 is neither TIME, ALARM, nor REPORT  
YUp1,p2<terminator>

#### For other than report notification

**Setting** YUp1,p2,p3,p4,p5<terminator>  
p1 Send contents  
ALARM Alarm notification  
FILE File creation notification  
MEDIA Media free space notification  
POWER Startup notification  
SYSTEM Setting error notification  
TIME Periodic report  
p2 Recipient  
OFF Do not send  
1 Send to recipient address 1  
2 Send to recipient address 2  
1\_2 Send to recipient addresses 1 and 2  
p3 Add instantaneous value data ON/OFF  
p4 Send interval (1/2/3/4/6/8/12/24) [hours]  
p5 Reference time (HH:MM)  
HH hours (00 to 23)  
MM Minute (00 to 59)

**Query** YU?

**Example** Set mail to recipients 1 and 2 daily at 18:00 with an instantaneous value data attachment.  
YUTIME,1\_2,ON,24,18:00

#### For report notification

**Setting** YUp1,p2,p3,p4,p5,p6,p7,p8,p9,p10,p11<terminator>  
p1 Sent contents  
REPORT Notification of report results  
p2 Recipient  
OFF Do not send  
1 Send to recipient address 1  
2 Send to recipient address 2  
1\_2 Send to recipient addresses 1 and 2  
p3 Send when creating hourly report (OFF/ON)  
p4 Send when creating daily report (OFF/ON)  
p5 Send when creating weekly report (OFF/ON)  
p6 Send when creating monthly report (OFF/ON)

p7 Add maximum value data (OFF/ON)  
p8 Add minimum value data (OFF/ON)  
p9 Add average value data (OFF/ON)  
p10 Add integral value data (OFF/ON)  
p11 Add instantaneous value data (OFF/ON)

**Query** YU?

**Example** Add maximum and integral values when daily report is created and send to recipient 1  
YUREPORT,1,OFF,ON,OFF,OFF,ON,OFF,OFF,ON,OFF

**Explanation** You cannot enter REPORT settings on products without the /M3 report function option.

### YC E-Mail Alarm Transmission Settings

**Setting** YCp1<terminator>  
p1 Channel structure (up to 100 characters)

**Query** YC?

**Example** Set the channels for mail alarm transmission judgement to A001 to A005.  
YCA001-A005

**Explanation**

- See section 1.3 for the channel structure.
- You can specify measurement and MATH channels (only with the /M1 MATH function option and when the pulse input module is installed).

### YT Time Synchronization Settings

**Setting** YTp1,p2,p3,p4<terminator>  
p1 SNTP server name (up to 64 characters)  
p2 Port number (1 to 65535)  
p3 Reference time (HH:MM)  
HH hours (00 to 23)  
MM Minute (00 to 59)  
p4 Query interval (3H/12H/24H) [hours]

**Query** YT?

**Example** Set time synchronization for once daily at 5:00.  
YTsnntp\_server.abc.com,123,05:00,24H

<b>WD</b>	<b>Modbus Client Operation Settings</b>
Setting	WDp1,p2,p3<terminator> p1 Communication interval 100mS/200mS/250mS/500mS 1S/2S/5S/10S/20S/30S/40S/50S/60S/90s/ 120S p2 Communication recovery wait (0 to 60) [sec] p3 Connection wait (0 to 10, FOREVER) [sec]
Query	WD?
Example	Set communication interval to 10 sec., communication recovery wait to 1 sec., and connection hold to 0 sec. WD10S,1,0
Explanation	You can set this command on products with the /M1 MATH function option.

<b>WE</b>	<b>Modbus Client Connection Settings</b>
Setting	WEp1,p2,p3<terminator> p1 Server number (01 to 10) p2 Modbus server name (up to 64 characters) p3 Port number (1 to 65535)
Query	WE[p1]?
Example	Set server number 1, Modbus server name to Yokogawa, and port number to 502. WE1,Yokogawa,502
Explanation	<ul style="list-style-type: none"> <li>• You can set this command on products with the /M1 MATH function option.</li> <li>• For the characters that can be used for Modbus server names, see user specified characters in section 1.3.</li> <li>• Command to specify the unit number                Firmware version R3.03 or earlier: WE                Firmware version R3.04 or later: WF                See the note in the WF command description.</li> </ul>

<b>WF</b>	<b>Modbus Client Command Settings</b>
Setting	When p2=OFF WFp1,p2<terminator> When p2=ON WFp1,p2,p3,p4,p5,p6,p7,p8,p9<terminator> p1 Command number (001 to 100) p2 Command valid/invalid (ON/OFF) p3 Command types READ Load value from Modbus register of other instrument. WRITE Write value to Modbus register of other instrument p4 Server number (1 to 10) p5 Register address For p3=READ 00001 to 09999 (Firmware version R3.04 or later) 10001 to 19999 (Firmware version R3.04 or later) 100001 to 165535 (Firmware version R3.04 or later) 30001 to 39999 300001 to 365535 40001 to 49999 400001 to 465535 For p3=WRITE 00001 to 09999 (Firmware version R3.04 or later) 40001 to 49999 400001 to 465535 p6 Data Types BIT Bit Data (Firmware version R3.04 or later) INT16 Signed 16-bit integer UINT16 Unsigned 16-bit integer INT32_B Signed 32-bit integer (from upper to lower) INT32_L Signed 32-bit integer (from lower to upper) UINT32_B Unsigned 32-bit integer (from upper to lower.) UINT32_L Unsigned 32-bit integer (from lower to upper) FLOAT_B 32-bit floating decimal (from upper to lower) FLOAT_L 32-bit floating decimal (from lower to upper) p7 First channel (001 to 060, A001 to A300, C001 to C300) p8 Last channel (001 to 060, A001 to A300, C001 to C300) p9 Unit number (0 to 225) (Firmware version R3.04 or later)
Query	WF[p1]?

## 1.6 Setting Commands (Communication Related)

**Example** Set command number to 003, command to valid, command type to READ, server number to 1, register address to 30001, data type to INT16, first channel to C001, last channel to C005, and unit number to 1.  
WF003,ON,READ,1,30001,INT16,C001,C005,1

- Explanation**
- You can set this command on products with the /M1 MATH function option.
  - When p3 is READ, p7 and p8 can only be set to C001 to C003.
  - p7 and p8 can only be set to the same type of channel.
  - If the data type is INT16 or UNIT16, the maximum number of channels that can be set from first to last channel is 127. For other data types, the maximum is 63.
  - Command to specify the unit number  
Firmware version R3.03 or earlier: WE  
Firmware version R3.04 or later: WF  
See the note below.

### Note

The "Unit number" parameter of the WE command under the firmware version R3.03 has been changed to the WF command under firmware version R3.04. If settings files are loaded that are of older or newer version than the firmware version, any extra or missing parameters will be ignored or added when the settings are interpreted. For example, users not connected to Modbus Gateway (users using unit number 255) can obtain the same operational result even if they load settings files of older or newer versions. However, users connected to Modbus Gateway (users using unit numbers other than 255) will have to manually reenter the unit numbers after loading the settings file.

If an R3.04 or later settings file is loaded with firmware version R3.03 or earlier

Settings (Firmware version R3.04 or later)	Interpreted (Firmware version R3.03 or earlier)
WE01,modbus.server.com,502	WE01,modbus.server.com,502, <u>255</u> The underlined portion is added to the previous settings.
WF001,ON,READ,01,30001,INT16,C001,C001, <u>255</u>	WF001,ON,READ,01,30001,INT16,C001,C001 The underlined parameter is ignored.

If an R3.03 or earlier settings file is loaded with firmware version R3.04 or later

Settings (Firmware version R3.03 or earlier)	Interpreted (Firmware version R3.04 or later)
WE01,modbus.server.com,502, <u>255</u>	WE01,modbus.server.com,502 The underlined parameter is ignored.
WF001,ON,READ,01,30001,INT16,C001,C001	WF001,ON,READ,01,30001,INT16,C001,C001, <u>255</u> The underlined portion is added to the previous settings.

## WA

## Modbus Master Settings

**Setting** WAp1,p2,p3,p4,p5<terminator>

p1 Communication interval  
100mS/200mS/250mS/500mS  
1S/2S/5S/10S/20S/30S/40S/50S/60S/90S/120S

p2 Communication timeout  
100mS/200mS/250mS/500mS/1S

p3 Retry count (OFF/1 to 5)

p4 Communication recovery wait (0 to 120) [sec]

p5 Wait between commands (OFF/10 mS/20 mS/50 mS/100 mS)

**Query** WA?

**Example** Set the communication interval to 500 ms, the communication timeout to 250 ms, number of retries to 2, communication recovery wait to 30 seconds, and the gap between commands to 50 ms.  
WA500mS,250mS,2,30,50mS

**Explanation** You can set this command on products with the /M1 MATH function option.

## WB

## Modbus Master Command Settings

**Setting** When p2=OFF  
WBp1,p2<terminator>

When p2=ON  
WBp1,p2,p3,p4,p5,p6,p7,p8<terminator>

p1 Command number (001 to 100)

p2 Command valid/invalid (ON/OFF)

p3 Command types

READ Load value from Modbus register of other instrument.

WRITE Write value to Modbus register of other instrument

p4 Slave address (1 to 247)

p5 Register address

**For p3=READ**  
00001 to 09999 (Firmware version R3.04 or later)  
10001 to 19999 (Firmware version R3.04 or later)  
100001 to 165535 (Firmware version R3.04 or later)  
30001 to 39999  
300001 to 365535  
40001 to 49999  
400001 to 465535

**For p3=WRITE**  
00001 to 09999 (Firmware version R3.04 or later)  
40001 to 49999  
400001 to 465535

p6	Data Types
BIT	Bit Data (Firmware version R3.04 or later)
INT16	Signed 16-bit integer
UINT16	Unsigned 16-bit integer
INT32_B	Signed 32-bit integer (from upper to lower)
INT32_L	Signed 32-bit integer (from lower to upper)
UINT32_B	Unsigned 32-bit integer (from upper to lower. )
UINT32_L	Unsigned 32-bit integer (from lower to upper)
FLOAT_B	32-bit floating decimal (from upper to lower)
FLOAT_L	32-bit floating decimal (from lower to upper)
p7	First channel (001 to 060, A001 to A300, C001 to C300)
p8	Last channel (001 to 060, A001 to A300, C001 to C300)

Query WB[p1]?

Example Set command number to 003, command to valid, command type to READ, slave address to 1, register address to 30001, data type to INT16, first channel to C001, and last channel to C005.

WB003,ON,READ,1,30001,INT16,C001,C005

- Explanation
- You can set this command on products with the /M1 MATH function option.
  - When p3 is READ, p7 and p8 can only be set to C001 to C300.
  - p7 and p8 can only be set to the same type of channel.
  - If the data type is INT16 or UNIT16, the maximum number of channels that can be set from first to last channel is 127. For other data types, the maximum is 63.

### UL Validation of Login Function

Setting ULp1<terminator>

p1 Login function ON/OFF

Query UL[p1]?

Example Enables the login function.

ULON

### WC Validation of Client Function

Setting WCp1,p2<terminator>

p1	Client type
DHCP	DHCP client
FTP	FTP client
SMTP	SMTP client
SNTP	SNTP client
MODBUS_M	Modbus master
MODBUS_C	Modbus client
p2	Enable client function (ON/OFF)

Query WC[p1]?

Example Enable the FTP client.

WCFTP,ON

- Explanation
- The MODBUS\_C of p1 can only be set with the /M1 MATH function option.
  - The MODBUS\_M of p1 can be set with the serial interface option /C2 or /C3, or with the MATH function option /M1.

### WS Validation of Server Function

Setting WSp1,p2,p3<terminator>

p1	Server type
MODBUS	Modbus server
FTP	FTP server
HTTP	HTTP server
SNTP	SNTP server
GENE	MW100 dedicated protocol server
DIAG	Maintenance/diagnostics server

p2 Enable server function (ON/OFF)

p3 Port number (1 to 65535)

Query WS[p1]?

Example Enables FTP server on port number 21.

WSFTP,ON,21

### YQ Communication Timeout Settings

Setting YQp1,p2,p3<terminator>

p1	TCP keep alive (OFF/30 s)
p2	Timeout time (OFF, 1 to 120) [min]
p3	Modbus Delay Response (OFF, 10ms, 20ms, 50ms) (Firmware version R3.04 or later)
OFF	No delay
0mS, 20mS, 50mS:	Specify delay

Query YQ?

Example Set TCP keep alive to 30 seconds, communication timeout time to 3 minutes, and Modbus Delay Response to 10mS.

YQ30S,3,10mS

## 1.7 Control Commands

### DS Operation Mode Switching

Setting	DSpl<terminator> p1 Mode type 0 Measurement Mode 1 Setting Mode
Example	Sets the mode to Setting mode. DS1
Explanation	The operation mode cannot be changed during recording or computation operations.

### EX Computation Start/Stop/Reset/Clear

Setting	EXpl<terminator> p1 Operation 0 Computation start 1 Computation stop 2 Reset computation 3 Clear computation
Example	Starts computation. EX0
Explanation	<ul style="list-style-type: none"> <li>You can set this command on products with the /M1 MATH function option, or when the pulse input module is installed.</li> <li>Computation cannot be started or stopped during recording.</li> <li>You cannot start computation if MATH is not turned ON on at least one MATH channel using SO command.</li> <li>Computation cannot be started if the MATH interval is OFF, 10 ms, or 50 ms.</li> </ul>

### PS Recording Start/Stop

Setting	PSpl<terminator> p1 Recording start/stop 0 Start 1 Stop
Example	Starts recording. PS0
Explanation	<ul style="list-style-type: none"> <li>When recording is started, measured data is saved to the CF card.</li> <li>If the allowed size of a created measured value file, computed value file, or thinned value file is exceeded due to the combination of the recording channel, recording interval, and recording data length, recording will not be started.</li> <li>If the thinning recording interval is shorter than the measurement or MATH interval, recording will not start.</li> </ul>

### MV Setting File Save/Write

Setting	MVp1,p2<terminator> p1 Operation 0 Save settings file 1 Load settings file p2 File name (up to 8 characters)
Example	Loads settings file "SETFILE1." MV1,SETFILE1
Explanation	<ul style="list-style-type: none"> <li>Specify the file name without the extension.</li> <li>For the characters that can be used for file names, see "File Name and Folder Name String" in section 1.3.</li> </ul>

### MQ Measured, Computed, and Thinned File Division

Setting	MQp1<terminator> p1 Operation SAVE_M Execute division and saving of measurement / computation file SAVE_T Execute division and saving of thinned file
Example	Divides measurement files. MQSAVE_M
Explanation	After dividing a file, the next file division is enabled 10 minutes later.

### MS Message Writing

Setting	MSpl<terminator> p1 Message Number (0 to 5)
Example	Write message number 1. MS1

### MP Execution of Manual Sample

Setting	MPp1<terminator> p1 Operation SAMPLE Perform manual sample DIVIDE Divide manual sample file
Example	Perform a manual sample. MPSAMPLE
Explanation	A new manual sample cannot be performed while a manual sample file is being written (approximately 2 seconds).

### KI Main Unit Key Operation

Setting	KIpl<terminator> p1 Key type START1 START key START2 START key (equivalent to holding down for 2 sec) STOP1 STOP key
---------	--

	STOP2	STOP key (equivalent to holding down for 2 sec)
	USER1	USER1 key
	USER2	USER2 key
Example	Executes the START key. KISTART1	

## **CE** Error Display Clear

Setting	CEp1<terminator>
	p1 Clears the error display (0)
Example	Clears the error on the 7SEG display. CE0

## **AK** Alarm Acknowledgment

Setting	AKp1<terminator>
	p1 Check alarm status, and make notification (0) of output clear command for alarm relay output hold status
Example	Check alarm status, and make notification of output clear command for alarm relay output hold status. AK0

## **IR** Timer Reset

Setting	IRp1<terminator>
	p1 Number of timer
	0 Reset all timers
	1-6 Reset the specified timer
Example	Reset all timers. IR0

## **CM** Communication Input Data Settings

Setting	CMp1,p2<terminator>
	p1 Communication input channel range (C001 to C300)
	p2 Communication input value
	+INT (-∞)
	-INF (+∞)
	NAN (Not a Number)
	-9.9999E+29 to -1.0000E-30
	0
	1.0000E-30 to 9.9999E+29
Query	CM[p1]?
Example	Set a communication input value of 1.0000E-10 to communication input channel C001. CMC001,1.0000E-10
Explanation	See section 1.3 for the communication input value.

## **VD** Relay ON/OFF

Setting	VDp1,p2<terminator>
	p1 Relay range (001 to 060)
	p2 Relay status (OFF/ON)
Example	Turns the channel 1 relay ON. VD001,ON
Explanation	Valid only for the relay whose relay output type is set to manual DO (COM) with the XD command.

## **SD** Date and Time Settings

Setting	SDp1,p2,p3<terminator>
	p1 Date (YY/MM/DD)
	YY Year (80 to 99, 00 to 35)
	MM Month (01 to 12)
	DD Day (01 to 31)
	p2 Time (HH:MM:SS)
	HH hours (00 to 23)
	MM Minute (00 to 59)
	SS Seconds (00 to 59)
	p3 Timezone (SHH:MM)
	S Symbol (+/-)
	HH hours (00 to 23)
	MM Minute (00 to 59)

Query	SD?
Example	Sets the MW100's internal time to April 1, 2005, 13:00:00. The time zone is 9:00. SD05/04/01,13:00:00,+09:00

Explanation The positive time zone symbol can be omitted.

## **RC** Initialization of Settings

Setting	RCp1<terminator>
	p1 Initialization level
	0 Initialize all settings except the module recognition
	1 Initialize settings excluding the following items
	· IP address, host name, subnet mask, default gateway
	· Items relating to DHCP
	· Items relating to DNS
	· Items relating to communication timeout
	· Items relating to login function
	· Baud rate, parity bit, stop bit, data length, handshaking, and module recognition information

Example Initialize all settings.  
RC0

Explanation The communication settings are the parameters set using YS, YA, YD, YN, YH, UA, and YQ.

## 1.7 Control Commands/1.8 Output Commands

### **RS** Reconfiguration

Setting `RSpl<terminator>`  
`p1 System reconfiguration (0)`

Example Perform system reconfiguration (re-detect the modules).  
`RS0`

### **MF** Media Preparations

Setting `MFpl<terminator>`  
`p1 Media initialization (0)`

Example Initialize external media (CF card).  
`MF0`

### **BL** Execution of Strain Input Initial Balancing

Setting `BLpl<terminator>`  
`p1 Operation`  
`0 Reset initial balance value`  
`1 Execute initial balancing`

Example Executes initial balancing.  
`BL1`

Explanation Valid only for channels on strain input modules on which initial balancing is enabled (ON) with the BA command.

### **PV** Transmission Output Control

Setting `PVp1,p2<terminator>`  
`p1 Channel range (001 to 060)`  
`p2 Transmission output OFF/ON`  
`OFF No transmission output`  
`ON Perform transmission output`

Example Turn OFF transmission output on channels 1-8.  
`PV001-008,OFF`

Explanation Valid only for channels whose output method is set to transmission output (TRANS) with the AO command.

### **SP** User Output Settings

Setting `SPp1,p2<terminator>`  
`p1 Channel range (001 to 060)`  
`p2 User output value (within the output range's upper and lower limits of span)`

Example Sets the user output value on channel 1 to 3 V.  
`SP001,3000`

Explanation

- Set the output range using the AO command.
- Valid only for channels whose output method is set to arbitrary output (COM) with the AO command.
- Enter setting parameters for p2 excluding the decimal place.

### **EC** Execution of Communication

Setting `ECpl<terminator>`  
`p1 Operation`  
`0 Gets the time (queries the time on the SNTP server)`

Example Get the time.  
`EC0`

Explanation Valid if the SNTP client function is ON.

### **TC** Communication Test

Setting `TCpl<terminator>`  
`p1 Operation`  
`FTP_C FTP client test`  
`SMTP SMTP client test`  
`p2 Connection (1, 2)`

Example Execute the FTP client test.  
`TCFTP_C,1`

Explanation

- The FTP client test is valid if the FTP client function is ON.
- The SMTP client test is valid if the SMTP client function is ON.

### **CC** Communication Open/Close

Setting When p1=0  
`CCpl<terminator>`  
When p1=1  
`CCp1,p2,p3<terminator>`

#### When Closing the Connection

Setting `CCpl<terminator>`  
`p1 Closes the connection (0)`

Example Close the connection.  
`CC0`

#### When Opening the Connection

Setting `CCp1,p2,p3<terminator>`  
`p1 Opens the connection (1)`  
`p2 User name (up to 16 characters)`  
`p3 Password (max 8 characters)`

Example Try to open a connection using user name "ABC" and password "123456."  
`CC1,ABC,123456`

Explanation

- For the characters that can be used for user names, see user specified characters in section 1.3.
- For the characters that can be used for passwords, see password strings in section 1.3.

### **BO** Byte Output Order Settings

Setting `BOpl<terminator>`  
`p1 Byte output order`  
`0 Outputs in order from MSB (most significant byte)`  
`1 Outputs in order from LSB (least significant byte)`

Query `BO?`

Example Output from the top byte.  
`BO0`

Explanation This command operates per the byte order of the numerical data during BINARY output.

**CS**      **Checksum Settings**

Setting      CSp1<terminator>  
               p1   Checksum ON/OFF  
                   0    None (do not calculate sum)  
                   1    ON (calculate sum)

Query        CS?

Example     Turn checksum ON.

CS1

**GR**      **Resetting of the MATH Channels Specified by the MATH Group**

Setting      GRp1<terminator>  
               p1   MATH group number  
                   1 to 7   Reset the MATH channels of  
                               the specified MATH group

Example     Reset the MATH channels of MATH group 1.

GR1

- Explanation
- You can set this command on products with the /M1 MATH function option, or when the pulse input module is installed.
  - Resets the MATH channels assigned to a MATH group using the MG command.

**1.8**      **Output Commands****FD**      **Output of Latest Measured/Computed Data**

Setting      FDp1,p2,p3<terminator>  
               p1   Output data type  
                   0    Outputs the latest measured/  
                           computed data in ASCII  
                   1    Outputs the latest measured/  
                           computed data in BINARY  
               p2   First channel (001 to 060 and A001 to  
                   A300)  
               p3   Last channel (001 to 060 and A001 to  
                   A300)

Example     Output the most recent measured/computed data from  
 the instrument on channels 1 to 5 in ASCII format.

FD0,001,005

- Explanation
- The "latest measured/computed data," refers to the data most recently received into in the MW100's internal memory.
  - If the first channel is 001 and the last channel is A300, the data output is in the range 001 to 060 and A001 to A300.
  - Set a first and last channel so that the first is less than or equal to the last.

**FO**      **Output of Latest Output Data**

Setting      FOp1,p2,p3<terminator>  
               p1   Output data type  
                   0    Outputs the latest output  
                           channel data in ASCII  
                   1    Outputs the latest output  
                           channel data in BINARY  
               p2   First channel (001 to 060)  
               p3   Last channel (001 to 060)

Example     Output the most recent output data from the instrument  
 on channels 1 to 5 in ASCII format.

FO0,001,005

- Explanation
- Set a first and last channel so that the first is less than or equal to the last.

**FE**      **Output of Decimal Place, Units, and Setting Data**

Setting      FEp1,p2,p3<terminator>  
               p1   Output type  
                   0    Outputs the setting command  
                           query  
                   1    Outputs the decimal place and  
                           units  
               p2   First channel (001 to 060 and A001 to  
                   A300)  
               p3   Last channel (001 to 060 and A001 to  
                   A300)



## 1.8 Output Commands

**Example** Output the decimal place and units of the channels 1 to 5.  
 FE1,001,005

**Explanation** Set a first and last channel number so that the first is less than or equal to the last.

### **FF** Output of Measured/Computed FIFO Data

**Setting** When p1=0  
 FFp1,p2,p3,p4,p5,p6,p7<terminator>

When p1=1  
 FFp1,p2<terminator>

p1 Output type  
 0 Outputs the FIFO data  
 1 Outputs the FIFO read range

p2 Measurement groups  
 1 Data from measurement groups 1  
 2 Data from measurement groups 2  
 3 Data from measurement groups 3

p3 First channel (001 to 060 and A001 to A300)

p4 Last channel (001 to 060 and A001 to A300)

p5 Read out start position  
 (-1, 1 to 9999999999)  
 -1 Latest read position

p6 Read out end position  
 (-1, 1 to 9999999999)  
 -1 Latest read position

p7 Max. number of read blocks (1 to 9999)

**Example** Output the FIFO read range for measurement group 1.  
 FF1,1

- Explanation**
- The oldest FIFO buffer data is overwritten with the newest data in a cyclical manner.
  - The output value of p1=1 (output FIFO read range) is the allowable read range for p1=0 (FIFO data output).
  - Set a first and last channel number so that the first is less than or equal to the last.

### **FL** Output of Logs, Alarm Summaries, and Status

**Setting** When p1=0  
 FLp1,p2,p3<terminator>

When p1=1  
 FLp1,p2,p3,p4<terminator>

#### When Outputting Logs

**Setting** FLp1,p2,p3<terminator>

p1 Output type (0)  
 0 Log output

p2 Data type

ERROR	Operation error log
RECORD	Recording log
ALARM	Alarm summary
MESSAGE	Message summary
COM	General purpose communication log
FTP_C	FTP client log
SMTP	Mail client log
DHCP	DHCP client log
SNTP	Time synchronization client log
FTP_S	FTP server log
HTTP	HTTP server log
MODBUS_M	Modbus master log
MODBUS_C	Modbus client log
MODBUS_S	Modbus slave log
MODBUS_T	Modbus server log
CIP	CIP server log
PCCC	PCCC slave log*
MATH	Computation status*
CMD	Operation log
RECSTATUS	Recording status

\* Firmware version R3.02 or later

p3 Max. number of read blocks

ERROR	1 to 50
RECORD	1 to 250 (Or "1024" on models with firmware version R3.02 or earlier)
ALARM	1 to 256
MESSAGE	1 to 50
COM	1 to 200
FTP_C	1 to 50
SMTP	1 to 50
DHCP	1 to 50
SNTP	1 to 50
FTP_S	1 to 50
HTTP	1 to 50
MODBUS_M	1 to 50
MODBUS_C	1 to 50
MODBUS_S	1 to 50
MODBUS_T	1 to 50
CIP	1 to 50*
PCCC	1 to 50*
MATH	1
CMD	1 to 256
RECSTATUS	1

\* Firmware version R3.02 or later

**Example** Output 10 blocs of the operation error log.

FL0,ERROR,10

**Explanation** Outputs the log (records) saved to the instrument.

#### When Outputting Status

**Setting** FLp1,p2,p3,p4<terminator>

p1 Output type (1)  
 1 Outputs status

p2 Data type  
 MODBUS\_MC Modbus master command status  
 MODBUS\_MC Modbus master connection status  
 MODBUS\_CC Modbus client command status  
 MODBUS\_CS Modbus client connection status  
 BALANCE Strain input initial balance

p3 First data number  
 MODBUS\_MC 1 to 100  
 MODBUS\_MS 1 to 247  
 MODBUS\_CC 1 to 100  
 MODBUS\_CS 1 to 10  
 BALANCE 1 to 60

p4 Last data number  
 MODBUS\_MC 1 to 100  
 MODBUS\_MS 1 to 247  
 MODBUS\_CC 1 to 100  
 MODBUS\_CS 1 to 10  
 BALANCE 1 to 60

**Example** Output the Modbus master connection status of data number 1 to 10.

```
FL1,MODBUS_MS,1,10
```

## **IS** Output of Status Information

**Setting** ISp1<terminator>  
 p1 Outputs status information (0)

**Example** Output status information.  
 IS0

## **VF** Output of Relay Status

**Setting** VFp1<terminator>  
 p1 Outputs relay status (0)

**Example** Output relay status.  
 VF0

## **CF** Output of System Recognition Status

**Setting** CFp1<terminator>  
 p1 Outputs system recognition status (0)

**Example** Output the system recognition status  
 CF0

## **ME** Output of Media Information

**Setting** MEp1,p2<terminator>  
 p1 Output type  
 0 Outputs media free space  
 1 Outputs file information  
 p2 User name (up to 63 characters)  
 Enter using the full path.

**Example**

- Output file information.  
 ME0
- Output the information of MW100.txt in the DATA0 directory.  
 ME1,/DATA0/MW100.txt
- Output root directory information.  
 ME1,/

## 2.1 Response Format

For each of the commands in the previous chapter, there are the response types shown in the table below.

The instrument receives a single response (affirmative or negative) for every command delimited with a terminator.

Command Type	Description	Response Type	
		Affirmative Response	Negative Response
Setting commands	A command that sets the operation of the instrument, and whose setting is stored in the setting file	Affirmative Response	Single negative response or Multiple negative response
Control commands	A command that sets the operation of the instrument, but whose setting is not stored in the setting file		
Output commands	Command for outputting data measured and computed on the instrument	ASCII or binary output	
Queries	Command for outputting the current settings of the setting and control commands	ASCII output	
Commands common across instruments	Command for outputting in format determined for Yokogawa recorders	Responses common across instruments	

### Note

In this section, *CRLF* means "carriage return/line feed."

### Affirmative Responses

If a command is successfully executed, an affirmative response is returned. The response consists of E0, followed by CRLF, totalling 4 bytes.

#### Syntax

```
E0CRLF
```

#### Example

```
E0
```

### Single Negative Response

If a command was not successfully executed, a single negative response is returned. The response consists of E1 followed by an error number, an error message, and CRLF, on one line.

#### Syntax

```
E1_nnn_mmm...mCRLF
```

nnn Error number (001 to 999)

mmm...m Message (variable length, 1 line)

\_ Blank (space)

#### Example

```
E1 001 Fatal system error.
```

### Multiple Negative Response

If one of several commands delimited with a sub-delimiter results in an error, a multiple negative response is returned. The response consists of E2 followed by the error position, error number, and CRLF, on one line.

- It is only output for the portion of the command that was erroneous. If multiple commands resulted in errors, the responses are delimited with commas.
- The position of the error is indicated by a 1 for the first command, 2 for the second command, and so on.

**Syntax**

E2\_ee:nnnCRLF (if only one error occurred)

E2\_ee:nnn,ee:nnn,...,ee:nnnCRLF (if multiple errors occurred)

ee Error position (01 to 99)  
 nnn Error number (001 to 999)  
 \_ Blank

**Example**

E2 03:123,07:456

### ASCII Output

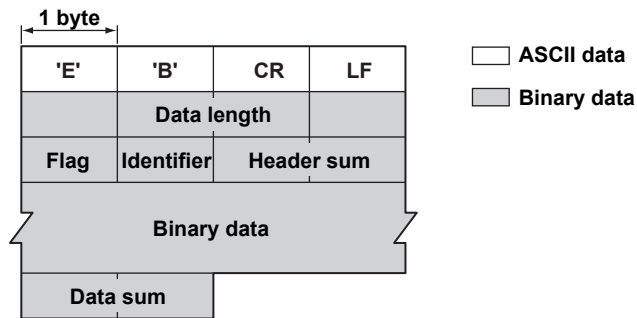
For the format of each, see section 2.2.

**Syntax**

EACRLF  
 .....CRLF  
 :  
 .....CRLF  
 .....CRLF  
 ENCRLF

### Binary Output

**Overview Diagram**



**EBCRLF**

Indicates that data is in binary.

**Data Length**

The number of bytes equalling flag + identifier + header sum + binary data + data sum.

**Header Sum**

Sum value of data length + flag + identifier.

**Binary Data**

For the output format of each data, see section 2.3.

**Data Sum**

Sum value of binary data.

- Sum value is calculated only when “calculate sum” is set in the CS command. The value “0” is stored in the sum value domain when “do not calculate sum” is set.

**Flag**

Bits	Notation	Flag value		Flag Meaning
		0	1	
7	BO	MSB	LSB	Byte order
6	CS	None	Y	Checksum
5		-	-	-
4		-	-	-
3		-	-	-
2		-	-	-
1		-	-	-
0		-	-	-

- The byte order is the data order of 2 or more bytes including the binary data portion. It indicates that data is stored in the MSB (top byte) first or LSB (bottom byte) first.
- Checksum indicates whether a sum value is in the header sum and data sum domains, and if the checksum value (CS) is 0, then 0 is stored in those domains.
- If a dash ( - ) is located in the notation or flag column, the bit is not used. The value is indefinite.

**Identifier**

Identifier	Binary Data Type	Format
0	Unspecified data	File
128	Unspecified data	Data
129	FIFO data	Data
130	The latest measured/computed data	Data
131	Latest output data	Data
132	FIFO read range	Data

### RS-422A/485 Specific Commands/Responses

Commands specific to the RS-422A/485 interface and their responses are shown in the table below.

Command Syntax	Command Meaning	Responses
<i>ESC Oxx CRLF</i>	Instrument open	<ul style="list-style-type: none"><li>• Response from instrument address specified by command: <i>ESC O xx CRLF</i></li><li>• No response when instrument address specified by command does not exist *</li></ul>
<i>ESC Cxx CRLF</i>	Instrument close	<ul style="list-style-type: none"><li>• Response from instrument address specified by command: <i>ESC C xx CRLF</i></li><li>• No response when instrument address specified by command does not exist *</li></ul>

\* The reasons that an instrument of the specified address might not exist include a command error, the specification does not match the address set on the instrument, the power to the instrument is not turned ON, or the instrument is not connected by serial interface.

- The xx in the table indicates the address of the instrument. An address from 01 to 32 can be set, in the range of addresses set on the target instrument.
- Only one instrument can be open at a time.
- If an instrument is opened using the ESC 0 command, commands and responses with that instrument are enabled.
- If one instrument is opened using the ESC 0 command, any other instrument that is already opened is automatically closed.
- Most commands can use CR+LF or LF as a terminator, but these commands can only use CF+LF.

**Note**

---

ESC is expressed as 0x1b in ASCII code. See appendix 5.

---

## 2.2 ASCII Output

ASCII data can be of the following types. The following explains the various formats.

- Response to query
- Output of the latest measured/computed data
- Output of the latest output data
- Output of setting data
- Output of the decimal place and units
- Output of logs and alarm summaries
- Output of status information
- Output of the relay status
- Output of the system recognition status
- Output of the media free space
- Output of file information
- Output of the strain input initial balance result

### **Note**

In this section, *CRLF* means "carriage return/line feed."

### Responses to Queries

Following the format, the current command settings stored in ASCII are output.

#### **Syntax**

```
EACRLF
ttsss...sCRLF
.....
ENCRLF
```

#### **Example 1: (SR?) parameter specified: No, relevant settings: Yes**

```
EA
SR001,VOLT,2V
SR001,VOLT,2V
.....
SR060,VOLT,2V
EN
```

#### **Example 2: (SR?) parameter specified: No, relevant settings: No**

```
EA
EN
```

#### **Example 3: (SR 001 ?) parameter specified: Yes**

```
EA
SR001,VOLT,2V
EN
```

## Output of the Latest Measured/Computed Data

- Output using the FD command.

### Syntax

```
EACRLF
DATE_YY/mo/ddCRLF
TIME_hh:mm:ssCRLF
s_ccccaaaauuuuufdddddEfppCRLF
.....
s_ccccaaaauuuuufeeeeeeeEfppCRLF
.....
ENCRLF
```

YY	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Seconds (00 to 59)
s	Data status (N, D, S, O, E) N: Normal, D: Differential input, S:Skip, O: Over, E: Error
_	Blank
cccc	Channel number (001 to 060 or A001 to A300)
aaaa	Alarm status (H, L, h, l, R, r, T, t, blank x 4 characters) H (upper limit alarm), L (lower limit alarm), h (differential upper limit alarm), l (differential lower limit alarm), R (upper limit on rate-of-change alarm), r (lower limit on rate-of-change alarm), T (delay upper limit alarm), t (delay lower limit alarm), blank character (no alarm)
uuuuuu	Unit information (output using 6 chars., left justified) mV____: mV V____: V ^C____: °C xxxxxx: (user specified char. string)
f	Data and exponent symbols (+, -)
dddd	Data mantissa (measurement channel, 00000 to 99999) -32767 to +65535: Normally allowed output range +99999: +over, error (measurement error occurs), or indefinite -99999: -OVER
eeeeeeee	Data mantissa (computation channel, 00000000 to 99999999) -99999999 to +99999999: Normally allowed output range +99999999: +OVER -99999999: -OVER
pp	Exponent (00 to 04)



**Example**

```
EA
DATE 05/04/01
TIME 19:56:32
N 001 hhllmV +12345E-01
N 002      mV -67890E-01
N 003      mV +12345E-02
N 004      mV +12345E-02
N 005      mV +12345E-02
N 006      mV +12345E-02
N 007      mV +12345E-02
N 008      mV +12345E-02
N 009      mV +12345E-02
S 010
EN
```

**Note**

- Data of nonexistent channels, including the channel number, are not output.
- In the case of SKIP channels, all values from alarm status to exponent become spaces.

**Output of the Latest Output Data**

- Output using the FO command.

**Syntax**

```
EACRLF
DATE_yy/mo/ddCRLF
TIME_hh:mm:ssCRLF
s_ccccuuuuufdddddEfpCRLF
.....
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Seconds (00 to 59)
s	Data status (N, S) N: Normal, S: Skip
cccc	Channel number (001 to 060)
uuuuuu	Unit information (output using 6 chars., left justified)
f	Data and exponent symbols (+, -)
dddddd	Data mantissa (output channel, 000000 to 999999)
pp	Exponent (00 to 04)
_	Blank

**Example**

```
EA
DATE 05/04/01
TIME 19:56:32
N 001 mA +123456E-01
N 002 mA +123456E-01
N 003 mA +123456E-01
N 004 mA +123456E-01
N 005 mA +123456E-01
N 006 mA +123456E-01
N 007 mA +123456E-01
N 008 mA +123456E-01
N 009 mA +123456E-01
N 010 mA +123456E-01
EN
```

**Output of Setting Data**

- Output using the FE0 command.

**Syntax**

```
EACRLF
ttsss...sCRLF
.....
ENCRLF
```

tt Command name (SR, SA..., XA, XI...)  
sss...s Setting data (variable length, 1 line)

**Example**

```
EA
SR001,VOLT,2V,-20000,20000
SR002,SKIP
SA001,1,OFF
SA001,2,OFF
.....
EN
```

## Output of Decimal Place and Units

- Output using the FE1 command.

### Syntax

EA*CRLF*

s\_ccccuuuuuu, fpp*CRLF*

.....

EN*CRLF*

s	Data status (N, D, S)
	N: Normal
	D: Differential input
	S: Skip
_	Blank
cccc	Channel numbers (001 to 060 or A001 to A300)
uuuuuu	Unit information (output using 6 chars., left justified)
f	Decimal place symbol (+/-)
pp	Decimal place (00 to 04)
	When f is (+)
	When 00, no decimal point is added (00000).
	When 01, the decimal point is added after the first digit (0000.0).
	When 02, the decimal point is added after the second digit (000.00).
	When 03, the decimal point is added after the third digit (00.000).
	When 04, the decimal point is added after the fourth digit (0.0000).
	When f is (-)
	When 01, the value is multiplied by 10.

### Example

EA

N 001 mV ,+03

N 002 mV ,+03

N 003 mV ,+03

N 004 mV ,+03

N 005 mV ,+03

N 006 mV ,+03

N 007 mV ,+03

N 008 mV ,+03

N 008 mV ,+03

N 010 mV ,+03

EN

### Output of Operation Error Logs (FL0, ERROR)

- Output using the FL command.
- The operation error log (records) is output. Up to 50 past operation error logs are retained. If that number is exceeded, old logs are overwritten with new ones.
- For information on the meanings of error codes, see the *MW100 Data Acquisition Unit User's Manual* (IM MW100-01E).

**Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_nnn_mmm...mCRLF
.....
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Seconds (00 to 59)
nnn	Error code (001 to 999)
mmm...m	Error message (up to 80 characters)
_	Blank

**Example**

```
EA
05/04/01 12:20:00 123 Range setting error.
05/04/01 12:30:00 456 Media access error.
EN
```

### Output of Recording Logs (FL0, RECORD)

- Output using the FL command.
- The data acquisition log is output. Up to 250\* past data acquisition logs are retained. If that number is exceeded, old logs are overwritten with new ones.
- 1 line, 40 characters (fixed length).
- For information on the meanings of error codes, see the *MW100 Data Acquisition Unit User's Manual* (IM MW100-01E).

\* Or "1021" on models with firmware version R3.02 or earlier.

**Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_ffffff_mmm...mCRLF
.....
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Seconds (00 to 59)
ffffff	Status ((Power, Card, Format, Record, Mode, Create, Trigger, Delete, Recover, Error, Code, Time, Save)
mmm...m	Message
_	Blank

**Data Acquisition Message Types**

Status	Message	Description
Power	on	Power ON
	off	Power OFF
Card	in	CF card inserted
	out	CF card ejected
	Code	CF card error detected
Format	Ok	CF card formatted successfully
	Code	CF card formatting concluded abnormally
Record	start <i>i</i>	Record start (i=1, 2, 3, M, T: file number)
	stop <i>i</i>	Record stop (i=1, 2, 3, M, T: file number)
	request	Record request accepted (recording conditions not valid)
Mode	rotate -#-	ROTATE recording operation (#=D, T: DIRECT, TRIGGER)
	fullstop -#-	FULLSTOP recording operation (#=D, T: DIRECT, TRIGGER)
	single -#-	SINGLE recording operation (#=D, T: DIRECT, TRIGGER)
(rec. interval)	Recording operation	Recording interval, recording operation, (recording data length/number of writing divisions)
Number of ch	File size	Recording channels, file size
Create	ALARMLG	Alarm log file creation
	RECORDLG	Recording log file creation
	Folder name	Create folder (folder name, /DATAxxxx)
	File name	Create measurement, computation, thinned file (file name: MDDIxxxx)
		Create manual sample file (file name: MDDSxxxx) Create report file (file name: DYYMMDDx (daily report), WYYMMDDx (weekly report), MYYMMDDx (monthly report))
Trigger	exec <i>i</i>	Record start through trigger output (i=1, 2, 3, M: file number)
Delete	(--)	File deletion (for ROTATE)
	File name	File deletion (file name, MDDIxxxx)
Recover	done <i>i</i>	Add remaining data (i=1, 2, 3, M, T: file number)
	none <i>i</i>	Do not add remaining data (i=1, 2, 3, M, T: file number)
	error <i>i</i>	Failed to add remaining data (i=1, 2, 3, M, T: file number)
Error	Error number	Error occurrence
Code	Code	File System Error Code
Time	collect	Time adjustment
Save	exec <i>i</i>	Recording division (i=1, 2, 3, M, or T: file number)

**File numbers**

1, 2, 3: Measurement groups 1 to 3  
M: Computation  
T: Thinning  
S: Manual sample  
R: Report (with the /M3 report function option)

**File size display**

Under 1 KB: \*\*\*\*bytes  
1 to 10 KB: \*.KB  
10 KB or more: \*\*\*\*\*KB

**Period after Time**

Period added: time of request, time request accepted  
No period: time of request, time operation completed

**Example**

```
EA
05/04/01 12:20:00 Power on
05/04/01 12:30:00 Card in
05/04/01 12:30:00.Record start 1
EN
```

## Output of Recording Status Logs (FL0, RECSTATUS)

- Output using the FL command.

### Syntax

```

EACRLF
Record StatusCRLF
n=_ssss_____next=_aaaaa_YY/MM/DD_hh:mm:ssCRLF
.....
CRLF
Data FileCRLF
Folder=_DATA/dddddddCRLF
n=_fffffff.MXD_ _ _ _ bbbbbbb_cccccccc_(iiii)_eeeCHs_LLL/
GGGcells_qqqquuuuuCRLF
.....
CRLF
Report FileCRLF
rrrrrrr=_REPORT/fffffff.DARCRLF
.....
CRLF
Manual Sample FileCRLF
MANUAL/fffffff.DAMCRLF
ENCRLF

```

] With the /M3 report function option

n	Measurement group number
1	Measurement group 1
2	Measurement group 2
3	Measurement group 3
M	MATH (with the /M1 MATH function option)
T	Thinning recording
R	Report (with the /M3 report function option)
ssss	Recording status
stop	No recording or stopped
run	Recording
wait	Recording (trigger wait state)
aaaaaa	Next recording operation (when recording status something other than stopped)
create	File creation
write	Data writing
YY	Year (00 to 99)
MM	Month (01 to 12)
DD	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
ddddddd	Folder name
fffffff	File name
bbbbbbb	Recording start operation
direct	direct
trigger	trigger

```

ccccccc Recording stop action
          single          single
          fullstop       full stop
          rotate         rotate

iiiiii  Recording interval (10 ms to 1 H)
eee      No. of recording channels (1 to 360)
LLL      Data length (10 M to 31 D)
GGG      No. of times to divide/write
qqqqq   Size of completed file
uuuuu   Units (bytes/KB)
rrrrrrr Report type identifier
          Daily          Daily
          Weekly         Weekly
          Monthly        Monthly
_        Blank

```

**Example**

EA

Record Status

```

1 = wait    next = write  07/04/19 19:58:00
2 = run     next = create 07/04/19 20:00:00
3 = stop
M = stop
T = stop
R = stop

```

Data File

Folder = DATA/DATA0000

```

1 = 41920005.MXD  trigger rotate (100mS) 30CHS 30M/ 5cells 2117KB
2 = 41930006.MXD  direct  rotate (200mS) 10CHS 30M/ 5cells 355KB

```

Report File

```

Daily    = REPORT/D0704180.DAR
Weekly   = REPORT/W0704150.DAR
Monthly  = REPORT/M0704010.DAR

```

Manual Sample File

MANUAL/419S0015.DAM

EN

## Output of Alarm Summaries (FL0, ALARM)

- Output using the FL command.
- Alarm summaries are output. Up to 256 past alarms are retained. If that number is exceeded, old alarms are overwritten with new ones.

### Syntax

EACRLF

yy/mo/dd\_hh:mm:ss.ttt\_cccc\_ls\_aaa..CRLF

.....

ENCRLF

YY	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Seconds (00 to 59)
ttt	Miliseconds (000 to 999)
cccc	Channel numbers (001 to 060 or A001 to A300)
l	Alarm level (1 to 4)
s	Alarm type (H, h, L, l, R, r, T, t)
	H: Upper limit alarm
	h: Differential upper limit alarm
	L: Lower limit alarm
	l: Differential lower limit alarm
	R: Upper limit on rate-of-change alarm
	r: Lower limit on rate-of-change alarm
	T: Delay upper limit alarm
	t: Delay lower limit alarm
aaa..	Alarm status (off,on)
	off: Alarm clear
	on: alarm occurs
_	Blank

(Note) When acknowledging alarm, AlarmAck is output in a position on and after the cccc channel number.

### Example

```
EA
05/04/01 12:20:00.000 001 1L on
05/04/01 12:20:00.000 A001 3t off
05/04/01 13:00:00.000 AlarmAck
EN
```



## Output of Message Summaries (FL0, MESSAGE)

- Output using the FL command.
- Message summaries are output. Up to 50 past messages are retained. If that number is exceeded, old messages are overwritten with new ones.

### Syntax

*EACRLF*

*yy/mo/dd\_hh:mm:ss\_n\_ffffff\_eee\_mmm...mCRLF*

.....

*ENCRLF*

<i>yy</i>	Year (00 to 99)
<i>mo</i>	Month (01 to 12)
<i>dd</i>	Day (01 to 31)
<i>hh</i>	Hour (00 to 23)
<i>mm</i>	Minute (00 to 59)
<i>ss</i>	Seconds (00 to 59)
<i>n</i>	Message number (0 to 5)
<i>ffffff</i>	File name
<i>eee</i>	Extension
<i>mmm...m</i>	Message strings (15 characters, blanks if fewer than that).
<i>_</i>	Blank

### Example

*EA*

05/04/01 12:20:00 1 60110001 MXD message1

05/04/01 12:20:00 2 60110001 MXD message2

*EN*

## Output of Communication Logs (FL0, COM)

- Output using the FL command.
- The communication information log is output. Up to 200 past logs are retained. If that number is exceeded, old logs are overwritten with new ones.

### Syntax

```
EACRLF
yy/mo/dd_hh:mm:ss_nn_uuu...u_d:_mmm...mCRLF
.....
ENCRLF
```

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	hour (00 to 23)
mm	Minute (00 to 59)
ss	Seconds (00 to 59)
nn	Connection type (s0, e0 to e3)
	s0: General purpose communications (serial)
	e0 to e3: General purpose communication (Ethernet)
uuu...u	User name (16 characters)
d:	Command/response (C/R)
	C: Command
	R: Response
mmm...m	Message (command/response)
_	Blank

### Example

```
EA
99/05/11 12:20:30 s0 admin          C: FF0,001,010
99/05/11 12:20:31 s0 admin          R: (Output)
99/05/11 12:31:10 s0 admin          C: SR001,VOLT
99/05/11 12:31:11 s0 admin          R: E1 123 System error
EN
```

## Output of FTP Client Logs (FL0, FTP\_C)

- Output using the FL command.
- FTP client logs are output. Up to 50 past file transfer logs are retained. If that number is exceeded, old logs are overwritten with new ones.

### Syntax

*EACRLF*

*yy/mo/dd\_hh:mm:ss\_k\_ffffffff\_eee\_mmm...mCRLF*

.....

*ENCRLF*

<i>yy</i>	Year (00 to 99)
<i>mo</i>	Month (01 to 12)
<i>dd</i>	Day (01 to 31)
<i>hh</i>	hour (00 to 23)
<i>mm</i>	Minute (00 to 59)
<i>ss</i>	Seconds (00 to 59)
<i>k</i>	Server type (P, S)
	P: Primary
	S: Secondary
<i>ffffffff</i>	File name (8 characters)
<i>eee</i>	Extension (3 characters)
<i>mmm...m</i>	Error message (only upon error occurrence)
<i>_</i>	Blank

### Example

EA

99/05/11 12:20:00 P 01010000 mxd

99/05/11 12:30:00 P 01010000 mxd

99/05/11 12:40:00 P 01010000 mxd EUNREACH

EN

### FTP Client Error Messages

Error Code	Description	Corrective Action
EHOSTADDR	IP address on the main unit not set.	Set the IP address on the MW100.
EDORMANT	Internal processing error	Servicing required.
ELINK	Ethernet not powered	Check cable connections and power of HUB
EMAIL	Internal processing error	Servicing required.
ESTATUS	Internal processing error	Servicing required.
ETIMEOUT	Internal processing error	Servicing required.
EPRIORITY	Internal processing error	Servicing required.
ENVRAM	Internal processing error	Servicing required.
EHOSTNAME	FTP server name not correct	Check whether destination server name is set correctly. Check the DNS server address setting.
ETCPIP	Internal processing error	Servicing required.
EUNREACH	FTP server not found	Check whether destination FTP server is running. Check the destination server address.
EOOBINLINE	Internal processing error	Servicing required.
ENAME	Internal processing error	Servicing required.
ECTRL	No response from FTP server	Check whether destination FTP server is functioning correctly.
EIAC	Command/response with FTP server failed	Check whether destination FTP server is functioning correctly
EEHC	Command/response with FTP server failed	Check whether destination FTP server is functioning correctly.
EREPLY	Command/response with FTP server failed	Check whether destination FTP server is functioning correctly.
EUSER	Failed to user name input	Check whether user name is allowed on FTP server.
EPASS	Failed to password input	Check whether user name and password are allowed on FTP server.
EACCT	Requested account input	Clear FTP server account function.
ETYPE	Failed to specify transfer mode	Check whether the FTP server supports BINARY transfer.
ECWD	Failed to specify directory	Check whether write permissions granted on the specified directory of the FTP server.
EPORT	Port command communication failed	Check whether a security function is working on the FTP server
EPASV	PASV command com. failed	Check whether the FTP server supports PASV.
ESCAN	PASV command com failed	Check whether PASV on FTP server is working correctly.
EMODE	Internal processing error	Servicing required.
ELOCAL	Internal processing error	Servicing required.

## Output of Mail Client Logs (FL0, SMTP)

- Output using the FL command.
- Mail client logs are output. Up to 50 past logs are retained. If that number is exceeded, old logs are overwritten with new ones.

### Syntax

EACRLF

yy/mo/dd\_hh:mm:ss\_ffffff\_n\_uuu...u\_mmm...mCRLF

.....

ENCRLF

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Seconds (00 to 59)
ffffff	Cause
	ALARM: Alarm mail
	TIME: Time mail
	POWER: Power failure recovery mail
	SYSTEM: Setting error mail
	FILE: File creation mail
	MEDIA: Media free space
	TEST: Test mail
	REPORT: Report mail
n	Recipient list
	1: Recipient 1 only
	2: Recipient 2 only
	+: Both recipients 1 and 2
uuu...u	Recipient mail address (delimited with blanks, 30 characters) (Domain name not output.)
mmm...m	Error message (only upon errors)
-	Blank

### Example

```
EA
01/05/11 12:20:30 ALARM 1 tom
01/05/11 12:20:31 TIME 2 joe ken          EHOSTNAME
EN
```

### Mail Client Error Messages

Error Code	Description	Corrective Action
EHOSTNAME	SMTP server name not correct	Check whether destination server name is set correctly.
ETIMEOUT	Communication with the SMTP power server timed out.	Check cable connections and of HUB.
ELINK	Ethernet not powered	Check cable connections and power of HUB.
EUNREACH	SMTP server not found	Check whether destination SMTP server address is set correctly. Check whether the server is running.

**Mail Client Error Messages (cont.)**

<b>Error Code</b>	<b>Description</b>	<b>Corrective Action</b>
EHELO	HELO command com failed	Check whether SMTP server is functioning correctly.
EMAILFROM	MAILFROM command com failed	Check whether SMTP server is correctly.
ERCPTTO	RCPTTO command com failed	Check whether SMTP server is functioning correctly.
EDATA	Data communication failed	Check whether SMTP server is functioning correctly.
ETCPIP	Internal processing error	Servicing required.
EINVAL	Internal processing error	Servicing required.
EPOP3HOSTNAME	SMTP server name not correct	Check whether destination server name is set correctly.
EPOP3UNREACH	POP3 server not found	Check whether destination POP3 server is running.
EPOP3TIMEOUT	Communication with the POP3 server timed out.	Check cable connections and power of HUB.
EPOP3AUTH	Authorization on POP3 server failed	Check whether user name and server name are allowed on server.
ESMTOAUTH	SMTP Authentication failed	Check whether user name and server name are allowed on server.
EANOTSUPPORT	Attempted to connect to a server requesting an encoding algorithm that is not supported by the MW100	Please change servers.

**Output of DHCP Client Logs (FL0, DHCP)**

- Output using the FL command.
- DHCP information logs are output. Up to 50 past logs are retained. If that number is exceeded, old logs are overwritten with new ones.

**Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_kkk...k_mmm...mCRLF
.....
ENCRLF
```

```
yy      Year (00 to 99)
mo      Month (01 to 12)
dd      Day (01 to 31)
hh      Hour (00 to 23)
mm      Minute (00 to 59)
ss      Seconds (00 to 59)
kkk...k Message type (15 characters)
mmm...m Message
_       Blank
```

**Example**

```
EA
99/05/11 12:20:30 link      on
99/05/11 12:20:31 apply    192.168.1.1
EN
```

**DHCP Client Message Type**

Message Type	Message	Description
link	off	Ethernet power supply blocked (disconnected)
	on	Ethernet power supply open (connected)
apply	Address	Ethernet I/F address setting
dhcp	off	Disable DHCP function
	on	Enable DHCP function
	renew	Renew lease address
	release	Release lease address
	reject	Reject lease address
dhcp event	RENEWED	Lease address renewal complete
	EXTENDED	Lease address extension request complete
	RELEASED	Lease address release complete
dhcp error	ESEND	DHCP message send failed
	ESERVER	Failed to find DHCP server
	ESERVFAIL	Response from DHCP server failed (communication timeout)
	ERENEWED	Lease address renewal failed
	EEXTENDED	Lease address extension request failed
	EEXPIRED	Lease address release failed
update	Host name	Registration of host name on DNS server (successful)
	Error Code	Registration of host name on DNS server (failed)
	(no host name)	MW100 main unit host name not set
	(no request)	MW100 main unit DNS Update function not enabled
remove	Host name	Deletion of host name registered on DNS server (successful)
	Error Code	Deletion of host name registered on DNS server (failed)
	(no linked)	Ethernet power supply not open(connected)

\* If the addresses leased from the DHCP server could not be received by the MW100 main unit, the addresses are rejected and the addresses are immediately returned to the DHCP server.

**Error Codes upon DNS Update/Remove Failure**

Location	Error Code	Description
MW100 Main unit	INTERNAL	Query failure (transmission error, receive timeout, other)
DNS Server	FORMERR	Query failure (DNS message format error)
	SERVFAIL	Query failure (DNS server processing error)
	NXDOMAIN	Query rejection (domain does not exist)
	REFUSED	Query rejection (process not allowed)
	YXDOMAIN	Query rejection (record exists)
	YXRRESET	Query rejection (record exists)
	NXRRESET	Query rejection (record does not exist)
	NOTAUTH	Query rejection (not authorized)
NOTZONE	Query rejection (mistaken query destination)	

### Output of Time Synchronization Logs (FL0, SNTP)

- Output using the FL command.
- SNTP client logs are output. Up to 50 past logs are retained. If that number is exceeded, old logs are overwritten with new ones.

#### Syntax

```
EACRLF
yy/mo/dd_hh:mm:ss_kkkkkkkkkk_mmm...mCRLF
.....
ENCRLF
```

YY	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Seconds (00 to 59)
kkk...k	Description
	error : Error
	report : Report of the execution results (no errors)
mmm...m	Error message (only upon error occurrence) or ADJUST (if no error)
-	Blank

#### Example

```
EA
99/05/11 12:20:30 error EBROKEN
99/05/11 12:30:00 report
EN
```

### Time Synchronization Client Error Messages

Error Code	Description	Corrective Action
EDORMANT	Internal processing error	Servicing required.
ENOTACTIVE	Internal processing error	Servicing required.
EACTIVE	Internal processing error	Servicing required.
ELINK	Ethernet not powered	Check cable connections and power of HUB
EHOSTNAME	SNTP server name not correct	Check whether destination server name is set correctly.
ETCPIP	Internal processing error	Servicing required.
EINVAL	Internal processing error	Servicing required.
ESEND	Queries the time on the server failed	Check the IP address of the MW100.
ETIMEOUT	Failed to receive response from server	Check whether destination SNTP server is running.
EBROKEN	Received time information corrupted	Check whether destination SNTP server is functioning correctly



## Output of FTP Server Logs (FL0, FTP\_S)

- Output using the FL command.
- FTP server logs are output. Up to 50 past logs are retained. If that number is exceeded, old logs are overwritten with new ones.

### Syntax

*EACRLF*

*yy/mo/dd\_hh:mm:ss\_d:\_mmm...mCRLF*

.....

*ENCRLF*

<i>yy</i>	Year (00 to 99)
<i>mo</i>	Month (01 to 12)
<i>dd</i>	Day (01 to 31)
<i>hh</i>	Hour (00 to 23)
<i>mm</i>	Minute (00 to 59)
<i>ss</i>	Seconds (00 to 59)
<i>d:</i>	Command/response (C/R)
	C: Command
	R: Response
<i>mmm...m</i>	Message (FTP command/response)
<i>_</i>	Blank

### Example

*EA*

*99/07/26 12:20:30 C: CWD/data*

*99/07/26 12:20:31 R: 200 Command successful*

*99/07/26 12:21:10 C: GET 00100011.MXD*

*99/07/26 12:21:11 R: 550 File is unavailable.*

*EN*

### Output of HTTP Server Logs (FL0, HTTP)

- Output using the FL command.
- HTTP server logs are output. Up to 50 past logs are retained. If that number is exceeded, old logs are overwritten with new ones.

#### Syntax

```
EACRLF
yy/mo/dd_hh:mm:ss_d:_mmm...mCRLF
.....
ENCRLF
```

YY	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Seconds (00 to 59)
d:	Command/response (C/R)
	C: Command
	R: Response
mmm...m	Message (command/response of HTTP)
_	Blank

#### Example

```
EA
99/07/26 12:20:30 C: GET/HTTP/1.1
99/07/26 12:20:31 R: HTTP/1.1 500 Bad Request.
99/07/26 12:31:10 C: GET/index.htm HTTP/1.1
99/07/26 12:31:11 R: HTTP/1.1 200 OK.
EN
```

## Output of Modbus Master Logs (FL0, MODBUS\_M)

- Output using the FL command.
- Modbus master information logs are output.

### Syntax

*EACRLF*

*yy/mo/dd\_hh:mm:ss\_xxx\_mmm...mCRLF*

.....

*ENCRLF*

<i>yy</i>	Year (00 to 99)
<i>mo</i>	Month (01 to 12)
<i>dd</i>	Day (01 to 31)
<i>hh</i>	Hour (00 to 23)
<i>mm</i>	Minute (00 to 59)
<i>ss</i>	Seconds (00 to 59)
<i>xxx</i>	Command number (001 to 100, ---)
<i>mmm...m</i>	Command status
<i>_</i>	Blank

### Example

EA

99/05/11 12:20:30 --- START

99/05/11 12:20:31 001 CONNECTING

99/05/11 12:20:32 001 VALID

EN

### List of Character Codes Showing Modbus Master Command Statuses

The table below also includes character codes that are only used by either the Modbus master or Modbus client.

Command Status	Meaning
SKIP	Command not set
INVALID	Cannot execute command
NO_DATA	Data could not yet be acquired
VALID	Data successfully acquired
STALE	Data became old (acquisition error)
WAITING	Server/slave communication recovery waiting
CLOSED	Connection with server/slave closed
RESOLVING	Establishing connection with server/slave (address being resolved)
CONNECTING	Establishing connection with server/slave (requesting connection)
UNREACH	Failed to connect to server/slave (not found)
TIMEDOUT	Failed to connect to server/slave (time out occurred)
BROKEN	Response message damaged (CRC error)
ERROR	Response message was an error message
BAD_SLAVE	Slave address of response message invalid (does not match command)
BAD_FC	Response message function code invalid (does not match command)
BAD_ADDR	Response message address invalid (does not match command)
BAD_NUM	Response message register invalid (does not match command)
BAD_CNT	Number of response message registers invalid (does not match command)
BAD_DATA	Conversion of response message data failed

### Output of Modbus Master Command Status (FL1, MODBUS\_MC)

- Output using the FL command.
- Modbus master information command status is output.

#### Syntax

EACRLF

SCAN = x, time = y msCRLF

xxx\_mmm...mCRLF

.....

ENCRLF

x            Number of successfully executed commands (0 to 100)

y            Time required to execute commands [ms] (0 to

xxx          Command number (001 to 100)

mmm...m     Command status

(See "List of Character Codes Showing Modbus Master Command Statuses" on  
page 2-25).

\_            Blank

#### Example

EA

scan = 100, time = 10 ms

001 NO\_DATA

002 VALID

003 SKIP

004 SKIP

005 SKIP

006 SKIP

007 SKIP

008 SKIP

009 SKIP

010 SKIP

EN

## Output of Modbus Master Connection Status (FL1, MODBUS\_MS)

- Output using the FL command.
- Modbus master connection status is output.

### Syntax

```
EACRLF
xxx_mmm...mCRLF
.....
ENCRLF
```

xxx            Modbus slave address (001 to 247)  
 mmm...m      Status of connection to Modbus slave  
 -             Blank

### Example

```
EA
001 OPENED
002 FAILED
003 CLOSED
004 CLOSED
005 CLOSED
006 CLOSED
007 CLOSED
008 CLOSED
009 CLOSED
010 CLOSED
EN
```

### List of Character Codes Showing Status of Connections with Modbus Server/Slave

The table below also includes character codes that are only used by either the Modbus master or Modbus slave.

Connection Status	Meaning
FAILED	Connection failed. Recovery wait status.
CLOSED	Connection closed (connection not needed)
OPENED	Connection opened (message could be transmitted)
RESOLVING	Resolving the address
CONNECTING	Requesting connection
CLOSING	Closing connection

## Output of Modbus Slave Log (FL0, MODBUS\_S)

- Output using the FL command.
- The Modbus slave information is output.

### Syntax

EACRLF

yy/mo/dd\_hh:mm:ss\_d:\_aaa\_FC\_nnn\_mmm...m

ENCRLF

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
d	Command/response (C/R)
aaa	Slave address (1 to 247)
nnn	Function code (1 to 127)
mmm...m	Message (see the output format of the command/response)
_	Blank

### Message Output Format (Command)

FC No.	Message Output
1	"(Read_Coil)_" + register number (absolute address) + "+_" + number of registers
2	"(Read_Input)_" + register number (absolute address) + "+_" + number of registers
3	"(Read_Register)_" + register number (absolute address) + "+_" + number of registers
4	"(Read_Register)_" + register number (absolute address) + "+_" + number of registers
5	"(Write_Coil)_" + register number (absolute address) + "+_" + number of registers
6	"(Write_Register)_" + register number (absolute address) + "+_" + number of registers
7	"(Read_Exception)"
8	"(Diagnostics)"
9	"(Program_484)"
10	"(Poll_484)"
11	"(Fetch_Event_Counter)"
12	"(Fetch_Event_Log)"
13	"(Program_584/984)"
14	"(Poll_584/984)"
15	"(Write_Coil)_" + register number (absolute address) + "+_" + number of registers
16	"(Write_Register)_" + register number (absolute address) + "+_" + number of registers
Others	"(???)"

**Message Output Format (Response)**

Response	Exception Code	Message Output
Normal response	None	""
Error response	1	"_ _ Illegal_function"
	2	"_ _ Illegal_data_address"
	3	"_ _ Illegal_data_value"
	4	"_ _ Illegal_response_length"
	5	"_ _ Acknowledge"
	6	"_ _ Slave_device_busy"
	7	"_ _ Negative_acknowledge"
	8	"_ _ Memory_parity_error"
	10	"_ _ Gateway_path_unavailable"
	11	"_ _ Gateway_device_failed_to_respond"
	Others	"_ _ ???"

**Example**

```
EA
06/01/23 16:59:17 C: 1 FC 16 (Write Register) 40011 + 2
06/01/23 16:59:17 R: 1 FC 16
06/01/23 16:59:17 C: 1 FC 3 (Read Register) 40011 + 2
06/01/23 16:59:17 R: 1 FC 3 - Illegal data value
EN
```

### Output of Modbus Client Logs (FL0, MODBUS\_C)

- Output using the FL command.
- Modbus client information logs are output.

#### Syntax

```
EACRLF
yy/mo/dd_hh:mm:ss_xxx_mmm...mCRLF
.....
ENCRLF
  YY      Year (00 to 99)
  mo      Month (01 to 12)
  dd      Day (01 to 31)
  hh      Hour (00 to 23)
  mm      Minute (00 to 59)
  ss      Seconds (00 to 59)
  xxx     Command number (001 to 100, ---)
  mmm...m Command status
          (See "List of Character Codes Showing Modbus Master Command Statuses" on
          page 2-25).
  _      Blank
```

#### Example

```
EA
99/05/11 12:20:30 --- START
99/05/11 12:20:31 001 CONNECTING
99/05/11 12:20:32 001 VALID
EN
```

### Output of Modbus Client Command Status (FL1, MODBUS\_CC)

- Output using the FL command.
- Modbus client command status is output.

#### Syntax

```
EACRLF
SCAN = x, time = y msCRLF
xxx_mmm...mCRLF
.....
ENCRLF
  x      Number of successfully executed commands (0 to 100)
  y      Time required to execute commands [ms] (0 to)
  xxx    Command number (001 to 100)
  mmm...m Command status
          (See "List of Character Codes Showing Modbus Master Command Statuses" on
          page 2-25).
  _      Blank
```



**Example**

```
EA
scan = 100, time = 10 ms
001 NO_DATA
002 VALID
003 SKIP
004 SKIP
005 SKIP
006 SKIP
007 SKIP
008 SKIP
009 SKIP
010 SKIP
EN
```

**Output of Modbus Client Connection Status (FL1, MODBUS\_CS)**

- Output using the FL command.
- Modbus master connection status is output.

**Syntax**

```
EACRLF
xxx_mmm...mCRLF
.....
ENCRLF
```

xxx	Modbus server number (001 to 247)
mmm...m	Status of connection to Modbus server (See page 2-27, "List of Character Codes Showing Status of Connections with Modbus Server/Slave.")
_	Blank

**Example**

```
EA
001 OPENED
002 CONNECTING
003 FAILED
004 CLOSED
005 CLOSED
006 CLOSED
007 CLOSED
008 CLOSED
009 CLOSED
010 CLOSED
EN
```

### Output of Modbus Server Log (FL0, MODBUS\_T)

- Output using the FL command.
- The Modbus server information is output.

#### Syntax

EACRLF

yy/mo/dd\_hh:mm:ss\_d:\_aaa\_FC\_nnn\_mmm...m

ENCRLF

yy	Year (00 to 99)
mo	Month (01 to 12)
dd	Day (01 to 31)
hh	Hour (00 to 23)
mm	Minute (00 to 59)
ss	Second (00 to 59)
d	Command/response (C/R)
aaa	Slave address (1 to 247)
nnn	Function code (1 to 127)
mmm...m	Message (see the output syntax of the command/response)
_	Blank

#### Message Output Format (Command)

FC No.	Message Output
1	"(Read_Coil)_" + register number (absolute address) + "+_" + number of registers
2	"(Read_Input)_" + register number (absolute address) + "+_" + number of registers
3	"(Read_Register)_" + register number (absolute address) + "+_" + number of registers
4	"(Read_Register)_" + register number (absolute address) + "+_" + number of registers
5	"(Write_Coil)_" + register number (absolute address) + "+_" + number of registers
6	"(Write_Register)_" + register number (absolute address) + "+_" + number of registers
7	"(Read_Exception)"
8	"(Diagnostics)"
9	"(Program_484)"
10	"(Poll_484)"
11	"(Fetch_Event_Counter)"
12	"(Fetch_Event_Log)"
13	"(Program_584/984)"
14	"(Poll_584/984)"
15	"(Write_Coil)_" + register number (absolute address) + "+_" + number of registers
16	"(Write_Register)_" + register number (absolute address) + "+_" + number of registers
Others	"(???)"

**Message Output Format (Response)**

Response	Exception Code	Message Output
Normal response	None	""
Error response	1	"_ _ _Illegal_function"
	2	"_ _ _Illegal_data_address"
	3	"_ _ _Illegal_data_value"
	4	"_ _ _Illegal_response_length"
	5	"_ _ _Acknowledge"
	6	"_ _ _Slave_device_busy"
	7	"_ _ _Negative_acknowledge"
	8	"_ _ _Memory_parity_error"
	10	"_ _ _Gateway_path_unavailable"
	11	"_ _ _Gateway_device_failed_to_respond"
	Others	"_ _ _???"

**Example**

```
EA
06/01/23 16:59:17 C: 1 FC 16 (Write Register) 40011 + 2
06/01/23 16:59:17 R: 1 FC 16
06/01/23 16:59:17 C: 1 FC 3 (Read Register) 40011 + 2
06/01/23 16:59:17 R: 1 FC 3 - Illegal data value
E
```

**Output of CIP Server Log (FL0, CIP)(Firmware version R3.02 or later)**

- Output using the FL command.
- The CIP server information is output.

**Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_d:_mmm...mCRLF
ENCRLF
```

```
yy Year (00 to 99)
mo Month (01 to 12)
dd Day (01 to 31)
hh Hour (00 to 23)
mm Minute (00 to 59)
ss Second (00 to 59)
d Command/response (C/R)
mmm...m Message (CIP command/response)
_ Blank
```

**Example**

```
EA
99/05/11 12:20:30 C: Register Session
99/05/11 12:20:31 R: Success
EN
```

**Output of PCCC Slave Log (FL0, PCCC)(Firmware version R3.02 or later)**

- Output using the FL command.
- The PCCC slave information is output.

**Syntax**

```
EACRLF
yy/mo/dd_hh:mm:ss_d:_mmm...mCRLF
ENCRLF

yy Year      (00 to 99)
mo Month    (01 to 12)
dd Day      (01 to 31)
hh Hour     (00 to 23)
mm Minute   (00 to 59)
ss Second   (00 to 59)
d           Command/response (C/R)
mmm...m    Message (PCCC command/response)
_          Blank
```

**Example**

```
EA
99/05/11 12:20:30 C: PLC-5 Typed Read, N10:0
99/05/11 12:20:31 R: Success
EN
```

**Output of MATH Status (FL0, MATH)**

- Output using the FL command.
- Computation information is output (specified MATH interval and actually required computation time).

**Syntax**

```
EACRLF
math_interval=_aaa.bbb_sCRLF
math_time_____=_aaa.bbb_sCRLF
.....
ENCRLF

math interval    Specified MATH interval
math time        Actually required computation time
aaa              Seconds (0 to 999)
bbb              Milliseconds (000 to 999)
_                Blank
```

**Example**

```
EA
math interval = 1.000 s
math time     = 0.800 s
EN
```

## Output of Operation Logs (FL0, CMD)

- Output using the FL command.
- Operation logs are output. Up to 50 past logs are retained. If that number is exceeded, old logs are overwritten with new ones.

### Syntax

*EACRLF*

*yy/mo/dd\_hh:mm:ss\_mmm...mCRLF*

.....

*ENCRLF*

<i>yy</i>	Year (00 to 99)
<i>mo</i>	Month (01 to 12)
<i>dd</i>	Day (01 to 31)
<i>hh</i>	Hour (00 to 23)
<i>mm</i>	Minute (00 to 59)
<i>ss</i>	Seconds (00 to 59)
<i>mmm...m</i>	Contents of operation (...)
	MeasStart            Measurement start
	MeasStop:           Measurement stop
	MemStart:            Recording start
	MemStop:             Recording stop
	MathStart:           Computation start
	MathStop:            Computation stop
	MathReset:          Reset MATH values
	MathClear:          Clear MATH values
	AlarmAck:            Check alarm status
	ManualSample:       Perform manual sampling
	ManualDivide:       Divide manual sample file
	Message0-5:          Write message 0 to 5
	MemorySave:         Divide measurement/computation file
	MemorySave_T:       Divide thinned file
	NewTime:             Time change
	Clear0:               Initialize measurement (RC 0)
	Clear1:               Initialize measurement (RC 1)
	Construct:           Reconfigures the system
	TimeReset1-6:       Reset timers 1-6
	BaranceReset:       Initialize balance value
	BaranceExec:        Execute initial balancing
	PowerOn:             Power ON
	PowerOff:            Power OFF
<i>_</i>	Blank

### Example

```
EA
99/05/11 12:20:30 PowerOn
99/05/11 12:20:31 PowerOff
EN
```

## Output of Strain Input Initial Balancing Result (FL1, BALANCE)

Output using the FL1 command.

### Syntax

```
EACRLF  
s_cccc_uuCRLF  
.....  
ENCRLF
```

s	Status (A, F, S)
	A: Executing initial balancing
	F: Exit initial balancing
	S: Skip
cccc	Channel number (001-060)
uu	Initial balancing result (OK, NG)
	OK: Reset or initial balance successful
	NG: Reset or initial balance failed
_	Blank

### Example

```
EA  
F 001 OK  
F 002 OK  
S 003  
EN
```

## Output of Status Information (IS)

- Output using the IS command.
- Outputs the operational status of the instrument.
- For details on the status information, see appendix 4, “Bit Structure of Status Information.”

### Syntax

```
EACRLF  
aaa.bbb.ccc.eee.fff.ggg.hhhCRLF  
ENCRLF
```

aaa	Status information (000 to 255)
bbb	Status information 1 (000 to 255)
ccc	Status information 3 (000 to 255)
ddd	Status information 4 (000 to 255)
eee	Status information 5 (000 to 255)
fff	Status information 6 (000 to 255)
ggg	Status information 7 (000 to 255)
hhh	Status information 8 (000 to 255)

### Example

```
EA  
000.000.002.000.000.000.000.000  
EN
```

## Output of Relay Status (VF)

- Output using the VF command.
- Regardless of the base unit type, 6 slots of module information is always output.

### Syntax

```
EACRLF
n_aaaaaaaaaCRLF
n_aaaaaaaaaCRLF
n_aaaaaaaaaCRLF
n_aaaaaaaaaCRLF
n_aaaaaaaaaCRLF
n_aaaaaaaaaCRLF
n_aaaaaaaaaCRLF
ENCRLF
```

n	Module number (0 to 5)
aaaaaaaaa	Relay status (from the left, corresponds to module relay numbers 01 to 10)
	1: Relay output ON
	0: Relay output OFF
-	Blank

### Example

```
EA
0 1111100000
1 1110000000
2 -----
3 -----
4 -----
5 -----
EN
```

## Output of System Recognition Status (CF)

- Output using the CF command.
- Regardless of the base unit type, 6 slots of module information is always output.

### Syntax

EACRLF

n\_S=aaa-bbb-ccc\_R=aaa-bbb-ccc\_mmm...mCRLF

n\_S=aaa-bbb-ccc\_R=aaa-bbb-ccc\_mmm...mCRLF

n\_S=aaa-bbb-ccc\_R=aaa-bbb-ccc\_mmm...mCRLF

n\_S=aaa-bbb-ccc\_R=aaa-bbb-ccc\_mmm...mCRLF

n\_S=aaa-bbb-ccc\_R=aaa-bbb-ccc\_mmm...mCRLF

n\_S=aaa-bbb-ccc\_R=aaa-bbb-ccc\_mmm...mCRLF

ENCRLF

n           Module number (0 to 5)  
 S=          Status of modules set on the system  
 R=          Status of modules actually installed  
           aaa:     Module model  
           bbb:     Module basic specifications code (input/output type)  
           ccc:     Module basic specifications code (measuring interval, no. of channels)  
 mmm...m    Module error status (10 characters)  
           RomError:   EEPROM damaged  
           CalError:   Calibration value damaged  
           SlotError:   30-CH Medium Speed DCV/TC/DI Input Module installed in  
                           invalid slot.  
 \_           Blank: Normalize without error

### Example

EA

0 S=MX110-UNV-H04 R=MX110-UNV-H04

1 S=MX110-UNV-M10 R=MX110-UNV-M10 CalError

2 S=MX110-UNV-M10 R=MX110-UNV-H04

3 S=MX115-D05-H10 R=MX115-D05-H10

4 S=MX125-MKC-M10 R=-----

5 S=----- R=-----

EN



## Output of Media Free Space (ME0)

- Output using the ME command.

### Syntax

```
EACRLF
aaaaaaa_/_bbbbbb_K byte freeCRLF
ENCRLF

          aaaaaa      Media free space [KB] (0 to 9999999)
          bbbbbbb     Media total capacity [KB] (0 to 9999999)
```

### Example

```
EA
      5000 /   16000 K byte free
EN
```

## Output of File Information (ME1)

- Output using the ME command.

### Syntax

```
EACRLF
fffffff_eee_sssssss_yy/mo/dd_hh:mm:ssCRLF
.....
aaaaaaa_/_bbbbbb_K byte freeCRLF
ENCRLF

          ffffffff     File or folder name (8 characters)
          eee          Extension (3 characters)
          sssssss     File data size (0 to 99999999) [byte(s)]
          yy          Year (00 to 99)
          mo          Month (01 to 12)
          dd          Day (01 to 31)
          hh          hour (00 to 23)
          mm          Minute (00 to 59)
          ss          Seconds (00 to 59)
          aaaaaa     Media free space [KB] (0 to 9999999)
          bbbbbbb     Media total capacity [KB] (0 to 9999999)
          _           Blank
```

### Example

```
EA
10000000 MXD      1204 05/02/24 20:07:12
10000001 MXD      1204 05/03/19 01:52:37
DATA      <DIR>    05/01/19 01:23:64
      7523 /   16000 K byte free
EN
```

# 2.3 Binary Output

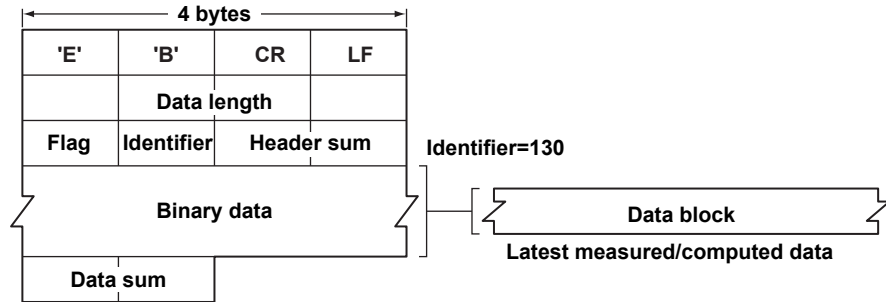
**Note**

In this section, *CRLF* means "carriage return/line feed."

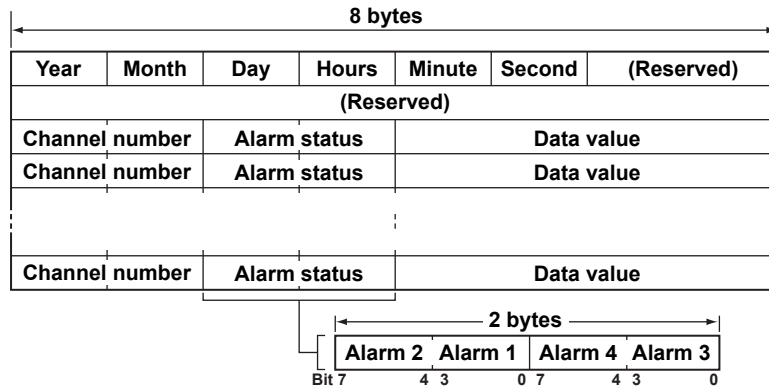
## Output of the Latest Measured/Computed Data

- Output using the FD1 command.

### Format of Response to FD1 Command



### Data Block Structure



### Data Block Member Values

Member Name	Value
Year	00 to 99 (70 to 99: 1970 to 1999, 00 to 69: 2000 to 2069)
Month	1 to 12
Day	1 to 31
Hour	0 to 23
Minute	0 to 59
Second	0 to 59
Channel number	1 to 60: Measurement Channel 101 to 400: MATH channels
Alarm value	0: Alarm OFF 1: Upper limit alarm occurs 2: Lower limit alarm occurs 3: Differential upper limit alarm occurs 4: Differential lower limit alarm occurs 5: Upper limit on rate-of-change alarm occurs 6: Lower limit on rate-of-change alarm occurs 7: Delay upper limit alarm occurs 8: Delay lower limit alarm occurs
Data values	-32767 to 65535 -9999999 to 99999999
Reserved	Undefined

### Special Data Values

During special statuses, measured and computed values are as shown in the table below.

Special Data Value Type	Value
+OVER	0x7fff 0x7fff
-OVER	0x8001 0x8001
Measurement SKIP/computation OFF	0x8002 0x8002
Error	0x8004 0x8004
Uncertain	0x8005 0x8005

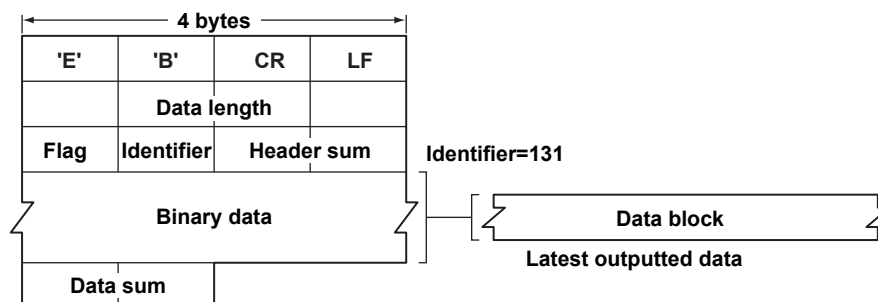
### Note

- With output of the latest measured or computed data (FD1), a time stamp is added not according to the time the data was created, but rather the time the command was issued.
- Measured/computed data values are stored as 32-bit integers.
- Alarm statuses are output without regard to the byte order specified in the BO command.

## Output of the Latest Output Data

- Output using the FO1 command.

### Format of Response to FO1 Command



### Data Block Structure

8 bytes						
Year	Month	Day	Hours	Minute	Second	(Reserved)
(Reserved)						
Channel number		(Reserved)	Data value			
Channel number		(Reserved)	Data value			
Channel number		(Reserved)	Data value			

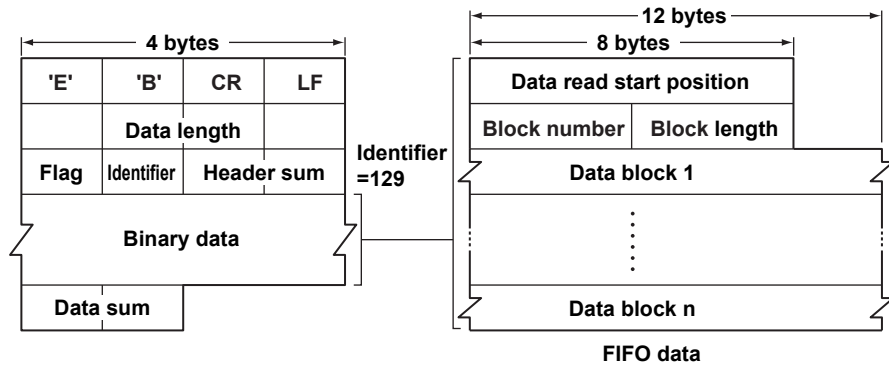
### Data Block Member Values

Member Name	Value
Year	00 to 99 (70 to 99: 1970 to 1999, 00 to 69: 2000 to 2069)
Month	1 to 12
Day	1 to 31
Hours	0 to 23
Minute	0 to 59
Second	0 to 59
Channel number	1 to 60: Output channel
Data value	-32767 to 100000
Unused	Undefined

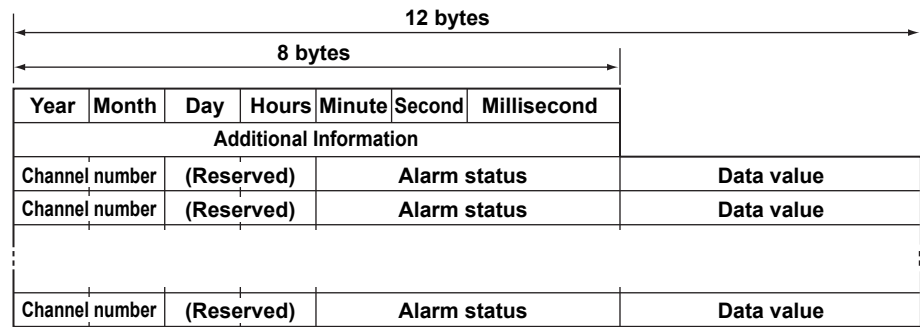
### Output of FIFO Data

- Output using the FF0 command.

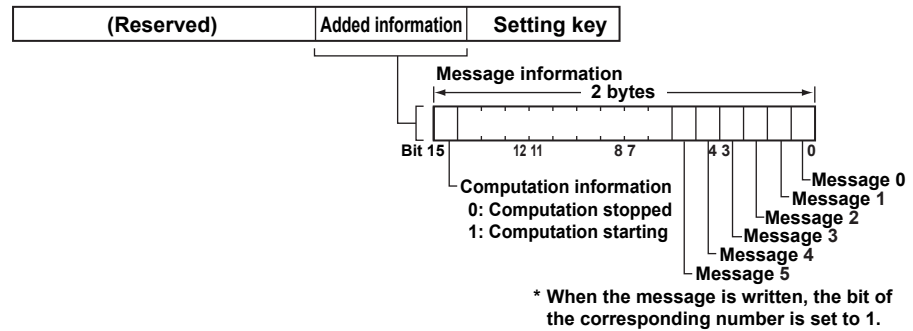
#### Format of Response to FF0 Command



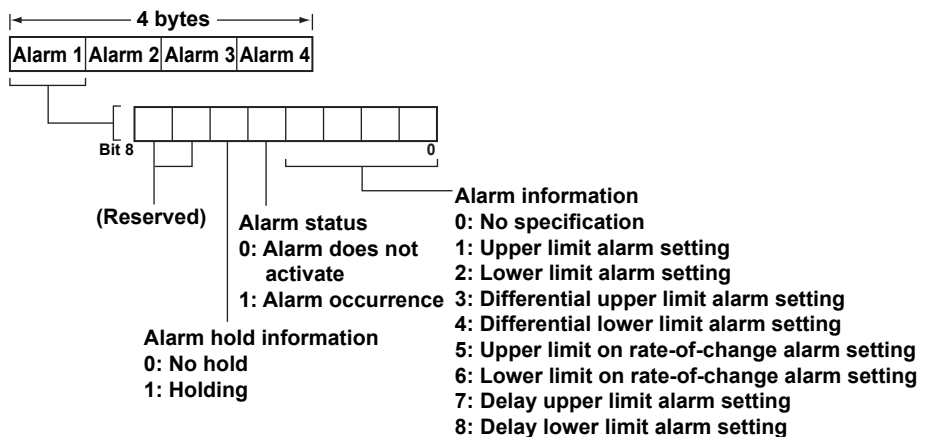
#### Data Block Structure



- Structure of Added Information



- Structure of Alarm Statuses



**Data Block Member Values**

Member Name	Value
Year	00 to 99 (70 to 99: 1970 to 1999, 00 to 69: 2000 to 2069)
Month	1 to 12
Day	1 to 31
Hours	0 to 23
Minute	0 to 59
Second	0 to 59
Milliseconds	0 to 990
Computation start	0, 1
Message information	Bits 0:0, 1 Bits 1:0, 1 • •
Setting key	0x0000 to 0xffff
Channel number	1 to 60: Measurement Channel 101 to 400: MATH channels
Alarm Status	0: No specification 1: Upper limit alarm setting 2: Lower limit alarm setting 3: Differential upper limit alarm setting 4: Differential lower limit alarm setting 5: Upper limit on rate-of-change alarm setting 6: Lower limit on rate-of-change alarm setting 7: Delay upper limit alarm setting 8: Delay lower limit alarm setting
Data value	-32767 to 65535 -9999999 to 99999999
Unused	Undefined

**Special Data Values**

During special statuses, measured and computed values are as shown in the table below.

Special Data Value Type	Value
+OVER	0x7fff 0x7fff
-OVER	0x8001 0x8001
Error	0x8004 0x8004

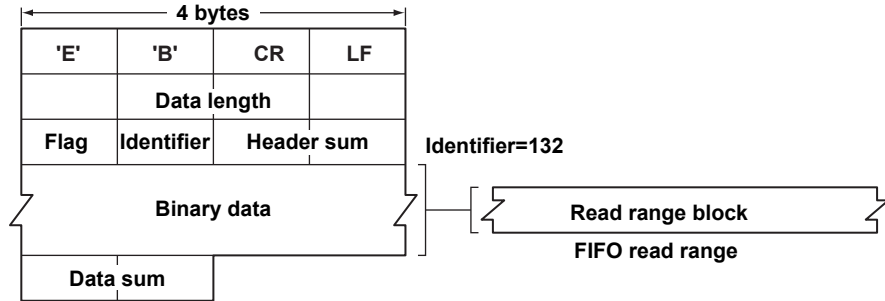
**Note**

- Added information and alarm statuses are output without regard to the byte order specified in the BO command.
- Messages inside added information is uncertain.

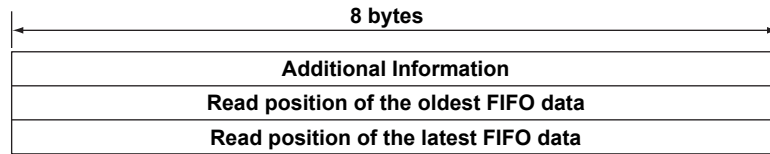
### FIFO Read Range

- Output using the FF1 command.

#### Format of Response to FF1 Command



#### Read Range Block Structure



#### Note

- Added information is output without regard to the byte order specified in the BO command.
  - Messages inside added information is uncertain.
-

## 3.1 Introduction

# ***EtherNet/IP™*** ***conformance tested***

There is a large installed base of industrial automation Programmable Logic Controllers (PLCs) and remote I/O that support EtherNet/IP (EIP) also known as Control and Information Protocol (CIP) over Ethernet. Most notable is the family of PLCs and I/O manufactured by Allen-Bradley (AB) consisting of such controllers: PLC 2, PLC 5, SLC 500, MicroLogix, CompactLogix, and ControlLogix. Yokogawa's MW100 DAQMASTER is a multi-protocol data acquisition, recording, and reporting device that supports communications to EIP devices. It is now possible for the MW100 to record data directly from EIP device inputs and registers over an Ethernet network. The MW100 may also act as remote I/O for EIP PLCs and Human Machine Interfaces (HMIs).

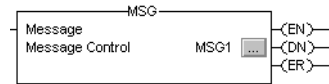
When using EIP, the MW100 is a passive device on the Ethernet network in that it does not initiate read or write requests. In most cases the MW100 will be working in conjunction with a PLC or controller. Read and write requests via EIP are initiated through program logic in controllers via Explicit Messaging and I/O Messaging (also known as Implicit Messaging). With the controller managing communications, it is possible to integrate messaging such that communications only occurs when dictated by the control logic. Management of communications by the controller allows the controller to decide when it is appropriate to write a value to the MW100 (e.g. when a computation is complete).

The MW100 also supports older controllers where EIP was not a standard option. For older controllers that support Programmable Controller Communication Commands (PCCC) also known as DF1 communications via serial ports, an inexpensive gateway can be used to convert communications to EIP. For controllers that support PCCC encapsulated via Ethernet, the MW100 supports EIP with embedded PCCC read and write requests. A step by step example of gateway configuration is detailed in appendix 9.

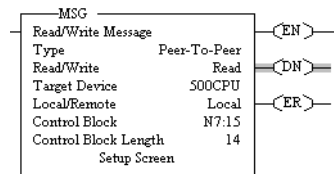
For example purposes RSLogix 5000, RSLogix 500, CompactLogix, and SLC 504 are used as examples of EIP configuration software and hardware – but any EIP software and hardware should work in a similar manner as long as they support Explicit and I/O (Implicit) messaging.

## 3.2 Explicit Messaging

Explicit Messaging is a point to point, request/response messaging protocol for unscheduled information transfer. In ladder logic programming explicit messaging is usually denoted by a messaging command that is all inclusive (what is going to be read or written and to what register in what device).



Example message command from RSLogix 5000 as used with CompactLogix PLC



Example message command from RSLogix 500 as used with SLC 500 PLC



## File Number / Tag Names for Explicit Messaging

The tables below detail the naming convention to use when creating explicit messages within RSLogix. In the left most column is the native MW100 register starting with I/O channels – 001 through 060, MATH channels A001 through A300 (also known as Math Channels), and finally Communication Channels C001 through C300. I/O Channels and MATH channels are considered read only while Communication Channels are read/write. To the right of the MW100 register are the naming conventions that are used within RSLogix messages. In an RSLogix 500 message, N10:0 would be used to retrieve an MW100's I/O Channel 001 as a 16-bit integer. In an RSLogix 5000 message, real[3299] would be used for read or write requests of an MW100's Communication Channel C300 as real. If a message was used to read MATH channel A060 as long integer from an MW100, RSLogix 5000 would use dint[2059] as the Source Element.

I/O Channel (001 to 060, max. 60-CH)

Ch.	PLC2	PLC5 / SLC	CIP int	CIP dint	CIP real
001	1000	N, L, F10:0	int [1000]	dint [1000]	real [1000]
:	:	:	:	:	:
060	1059	N, L, F10:59	int [1059]	dint [1059]	real [1059]

MATH channel (A001 to A300, max. 300-CH)

Ch.	PLC2	PLC5 / SLC	CIP int	CIP dint	CIP real
A001	2000	N, L, F20:0	int [2000]	dint [2000]	real [2000]
:	:	:	:	:	:
A300	2299	N, L, F22:99	int [2299]	dint [2299]	real [2299]

Communication Channel (C001 to C300, max. 300-CH)

Ch.	PLC2	PLC5 / SLC	CIP int	CIP dint	CIP real
C001	3000	N, L, F30:0	int [3000]	dint [3000]	real [3000]
:	:	:	:	:	:
C300	3299	N, L, F32:99	int [3299]	dint [3299]	real [3299]

With N file or CIP int tag, you can access to the data as short integer (word.)

With L file or CIP dint tag, you can access to the data as long integer (double word.)

With F file or CIP real tag, you can access to the data as real (float.)

## MSG Instructions That the MW100 Supports

When using RSLogix 5000 and RSLogix 500 there are different types of messages that correspond to the different type of PLCs. Everything from PLC 2 through an ControlLogix PLC can be communicated with using the MSG block. The following covers all the MSG instructions supported by the MW100 with EIP.

MW100 supports following MSG instructions.

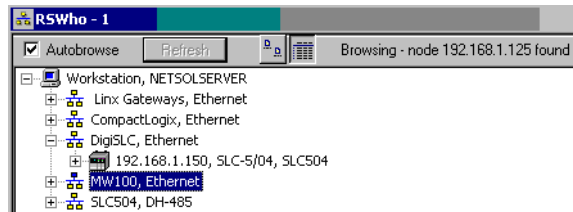
- PLC2 Unprotected Read/Write
- PLC5 Word Range Read/Write
- PLC5 Typed Read/Write
- SLC Typed Read/Write
- CIP Data Table Read/Write
- CIP Generic Read/Write

Step by step examples of explicit messaging within RSLogix 500 and RSLogix 5000 are detailed in appendix 8.

### 3.3 I/O Messaging (Implicit Messaging)

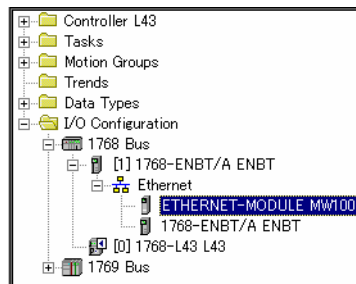
I/O Messaging also known as Implicit Messaging is used for point to point or multicast and are used to transmit application specific I/O data. Implicit messages are exchanged across I/O connections with a Connection Path (predefined path as first defined in RSLinx and then RSLogix). The Connection will define where the MW100 is located (IP Address), the Ethernet port on the PLC through which to communicate, as well as what points are considered inputs or outputs.

The following picture shows RSLinx setup to communicate to the Ethernet device MW100 (this connection points to an MW100 on the network).



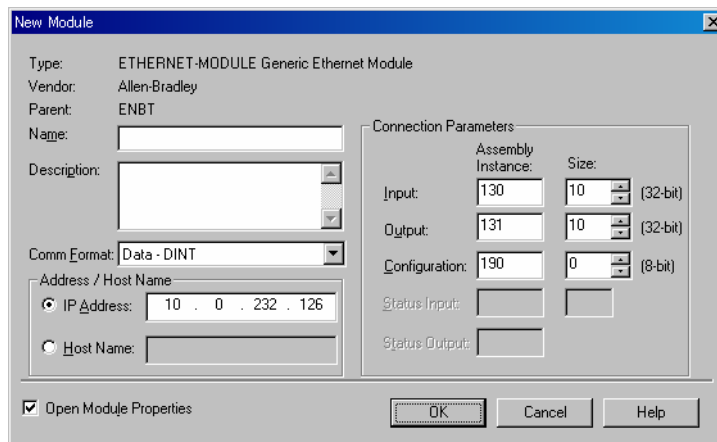
RSLinx Configured with path named MW100

Once a device is configured inside of RSLinx, it can be added to the RSLogix project. In the case below, ETHERNET-MODULE MW100 points to the networked MW100 configured as a Generic Ethernet Module.



Controller Organizer tree showing MW100 Path

By clicking on ETHERNET-MODULE MW100 within the Controller Organizer tree, the connection can be fully configured. Of note is the IP Address which should point to a MW100, Comm Format which defines what data types to use (MW100 supports only DINT type), and Connection Parameters which will layout the inputs and outputs of the MW100. In this case the connection is configured to communicate using double precision integers to an MW100 at IP address 10.0.232.126 with inputs at Assembly Instance 130 (corresponding to Communication Channel C001-C010; 10 Channels due to Size), and outputs at Assembly Instance 131 (corresponding to Communication Channel C101-C110; 10 Channels due to Size). The Size of the Input and Output Assembly Instance can range from 1 to 100 to encompass 100 Communication or MATH channels in a block and 60 for I/O Channels. When using I/O Messaging, there is a limit of 100 inputs and 100 outputs per MW100 (Explicit Messaging must be used to reach more MW100 channels). Note, a limit of 125 32-bit points per instance is the maximum data size that EIP allows for I/O Messaging.



Connection and Assembly Instance Configuration in RSLogix 5000

Assembly instances for I/O messaging (Channels in Assembly Object)

The following diagram depicts the available Instance IDs, Sizes, and Data Types that can be configured within a connection.

Table of MW100 channels with corresponding Instance ID

Ch.	Kind	Instance ID	Size	Type
001 - 060	Producer	110	4 x 60	dint
A001 - A100	Producer	120	4 x 100	dint
A101 - A200		121	4 x 100	
A201 - A300		122	4 x 100	
C001 - C100	Producer/	130	4 x 100	dint
C101 - C200	Consumer			
C201 - C300				
	Configuration	190	0	
	Consumer	191	0	

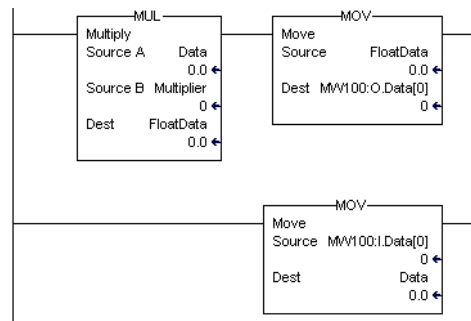
### 3.3 I/O Messaging (Implicit Messaging)

Once an instance has been properly configured, the MW100 inputs and outputs will show up in the Controller Tags window.



MW100 Channels within RSLogix 5000 Controller Tags Screen

These points can now be assigned as inputs and outputs as well as monitored (when online) within programs as shown in the example below. Note the tags can be used within any logic element (not just MSG blocks as with Explicit Messaging). In this case the logic is reading from the first input instance corresponding to Communication Channel C001 and writing to the output instance corresponding to Communication Channel C101.



Sample logic using I/O Messaging.

A step by step example of implicit messaging within RSLogix 5000 is detailed in appendix 8.

## 3.4 Specification

The following table describes how the MW100 conforms to the EIP specification. Note that when interfacing to the MW100 on an EIP network that no more than 10 connections can be active at any given time.

MW100 EtherNet/IP Model Specification

Spec.	Description
Implementation	Level 2 (Message Server + I/O Server)
Connection	Max. 20
Protocol	EIP/PCCC, EIP/native
Messaging	Explicit(UCMM, Class 3) + I/O(Class 1)
Object	Assembly, PCCC, Data Table
Data Exchange	Max. 300-CH(as integer or float data)
I/O	AI/AO, DI/DO(Max. 60-CH)
Sampling	100ms to 60s
Recording	Max. 360-CH(60 I/O + 300 Computation)

---

## 3.5 Summary

The MW100 with EIP support can easily communicate via Explicit or I/O messaging to a variety of PLCs. The MW100 requires that the PLC initiate all communications. Now that the MW100 can communicate with EIP based PLCs, the full capabilities of the DAQMASTER can easily be added to a controller network.

A PLC can use the MW100 as remote inputs and outputs within its control logic.

A PLC can write its inputs and register values into the MW100 Communication Channels (C001 through C300) so that the MW100 can record up to 300 PLC data points (Communication Channels must be placed into MATH channels; only MATH channels (A001 to A300) and I/O Channels (001 to 060) can be recorded on an MW100).

Full MW100 network service are available – including real-time web-pages for monitoring data values, FTP of data files, e-mail, as well as custom web-pages (layout the data with graphics and save on purchasing a standalone HMI).

# Appendix 1 Serial Interface (Optional) Specifications

The following are the specifications for both types of serial interface (optional) for the main unit, RS-232 and RS-422A/485.

## RS-232 Specifications

Connector Type	D-Sub, 9-pin, Plug
Electrical and mechanical spec.	Conforms with EIA-574 (EIA-232 (RS-232) standard for 9-pin)
Connection method	Point-to-point
Synchronization method	Start-stop (asynchronous) system
Baud rate	Select from 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
Start bit	1 bit, fixed
Data length (When outputting data in binary format, you must use 8 bits.)	Select either 7 or 8 bits
Parity	Select Odd, Even, or None
Stop bit	Select either 1 or 2 bits
Hardware handshaking	For RS and CS signals, select always TRUE, or to use as a control line.
Software handshaking	Select to control send using X-ON and X-OFF signals, or to use X-ON and X-OFF signals with send/receive signals. X-ON(ASCII 11H), X-OFF(ASCII 13H)
Receive buffer length	2047 bytes

## RS-422A/485 Specifications

Terminal Type	Six terminals; clamp, 0.14 to 1.5mm <sup>2</sup> (AWG26 to 16)
Electrical and mechanical spec.	Complies with EIA-422A (RS-422A) and EIA-485 (RS-485)
Connection method	Multidrop: 4-wire: 1:32 2-wire: 1:31
Communication mode	Half-duplex
Synchronization method	Start-stop (asynchronous) system
Baud rate	Select from 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
Start bit	1 bit, fixed
Data length	Select either 7 or 8 bits
Parity	Select Odd, Even, or None
Stop bit	Select either 1 or 2 bits
Receive buffer length	2047 bytes
Electrical characteristics	6 points: FG, SG, SDB, SDA, RDB, RDA SG, SDB, SDA, RDB, and RDA terminals are functionally isolated from the internal circuitry of the main unit. The FG terminal is frame ground.
Communication Distance	1.2 km maximum
Termination Resistance	Built-in (with switch) 120 Ω, 1/2 W

---

## Appendix 2 Modbus Protocol

### Modbus Protocol Specifications

The following are the Modbus specifications of the MW100.

<b>Specifications</b>	<b>Description</b>
Communication media	Ethernet, RS-232, or RS-422A/485
Control method	Ethernet RS-232: None only RS-422A/485: None only
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 Odd, Even, or None
Stop bit	Select either 1 or 2 bits
Data interval	24 bit time or less
Error detection	CRC-16
Transmission mode	RTU (remote terminal unit) mode only
Slave address	1~247



## Modbus Protocol Function Code

### Slave Function/Server Function

The slave function of the main unit does not support broadcasted commands.

Function Code	Function	Operation
1*	Read statuses of coils (0xxxx)	Reads statuses of a series of coils.
2*	Read statuses of input relays (1xxxx)	Reads statuses of a series of input relays.
3	Read values of hold registers (4xxxx)	Reads values of a series of hold registers.
4	Read values of Input registers (3xxxx)	Reads values of a series of input registers.
5*	Turn status of a single coil (0xxxx)	Turns status of a single coil.
6	Write a value to a single hold register (4xxxx)	Writes a value to a hold register.
8	Loop back test	Returns the same message as the command message.
15*	Turn statuses of coils (0xxxx)	Turns statuses of a series of coils.
16	Write values to hold registers (4xxxx)	Writes values to a series of hold registers.

\* Firmware version R3.03 or later

### Master Function/Client Function

Function Code	Function	Action
1*	Read statuses of coils (0xxxx)	Reads statuses of a series of coils.
2*	Read statuses of input relays (1xxxx)	Reads statuses of a series of input relays.
3	Read values of hold registers (4xxxx, 4xxxxx)	Reads values of a series of hold registers.
4	Read values of Input registers (3xxxx, 3xxxxx)	Reads values of a series of input registers.
5*	Turn status of a single coil (0xxxx)	Turns off/on a single coil.
6	Write a value to a single hold register (4xxxx, 4xxxxx)	Writes a value to a hold register.
15*	Turn statuses of coils (0xxxx)	Turns off/on a series of coils.
16	Write values to hold registers (4xxxx, 4xxxxx)	Writes values to a series of hold registers.

\* Firmware version R3.04 or later

Bit data values output by Modbus client/master when the command type is set to "Write" in the Modbus client/master settings, see the followings:

- Values per Modbus Registers (Measurement channel data and MATH channel data)(page App-7)
- Values per Modbus Registers (Communication input channel data)(page App-8)

## Register Assignments (Modbus Slave)

The supported Modbus register types differ depending on the MW100 firmware version.  
Measurement channel data, MATH channel data

Firmware version	Type			
	INT16	INT32	FLOAT	BIT
R3.04	Yes	Yes	Yes	Yes
R3.03	No	Yes	Yes	Yes
R3.02	No	Yes	Yes	No

Communication input channel data

Firmware version	Type			
	INT16	INT32	FLOAT	BIT
R3.04	Yes	Yes	Yes	Yes
R3.03	No	No	Yes	Yes
R3.02	No	No	Yes	No

The following are the Modbus slave register assignments.

### Coils

Firmware version R3.03 or later

Coil	Data	Data type
00001	Data on communication input channel C001	Bit
00002	Data on communication input channel C002	Bit
:	:	:
00300	Data on communication input channel C300	Bit

### Input Relays

Firmware version R3.03 or later

Input relay	Data	Data type
10001	Data on measurement channel 001	Bit
10002	Data on measurement channel 002	Bit
:	:	:
10060	Data on measurement channel 060	Bit
13001	Data on MATH channel A001	Bit
13002	Data on MATH channel A002	Bit
:	:	:
13300	Data on MATH channel A300	Bit
18001	Measuring	Bit
18002	Computing	Bit
18003	Recording	Bit
18004	Alarm occurring	Bit
18005	Waiting to confirm alarm status	Bit

### Input Registers

36001 to 36060, and 37001 to 37300 are for functions of firmware version R3.04 or later.

38001 to 38005 are for functions of firmware version R3.03 or later.

MATH channel registers can be used on products with the MATH function option.

Absolute Address	Relative Address	Allocation	Data Type
30001	0000	Lower byte of data from measurement channel 001	INT32
30002	0001	Upper byte of data from measurement channel 001	
⋮	⋮	⋮	⋮
30119	0118	Lower byte of data from measurement channel 060	INT32
30120	0119	Upper byte of data from measurement channel 060	
31001	1000	Lower byte of data from measurement channel 001	FLOAT
31002	1001	Upper byte of data from measurement channel 001	
⋮	⋮	⋮	⋮
31119	1118	Lower byte of data from measurement channel 060	FLOAT
31120	1119	Upper byte of data from measurement channel 060	
32001	2000	Alarm status of measurement channel 001	BIT16
⋮	⋮	⋮	⋮
32060	2059	Alarm status of measurement channel 060	BIT16
33001	3000	Lower byte of data from MATH channel A001	INT32
33002	3001	Upper byte of data from MATH channel A001	
⋮	⋮	⋮	⋮
33599	3598	Lower byte of data from MATH channel A300	INT32
33600	3599	Upper byte of data from MATH channel A300	
34001	4000	Lower byte of data from MATH channel A001	FLOAT
34002	4001	Upper byte of data from MATH channel A001	
⋮	⋮	⋮	⋮
34599	4598	Lower byte of data from MATH channel A300	FLOAT
34600	4599	Upper byte of data from MATH channel A300	
35001	5000	Alarm status of MATH channel A001	BIT16
⋮	⋮	⋮	⋮
35300	5290	Alarm status of MATH channel A300	BIT16
36001	6000	Data of measurement channel 001	INT16
⋮	⋮	⋮	⋮
36060	6059	Data of measurement channel 060	INT16
37001	7000	Data of MATH channel A001	INT16
⋮	⋮	⋮	⋮
37300	7299	Data of MATH channel A300	INT16
38001	8000	Measuring (0, 1)	INT16
38002	8001	Computing (0, 1)	INT16
38003	8002	Recording (0, 1)	INT16
38004	8003	Alarm occurring (0, 1)	INT16
38005	8004	Waiting to confirm alarm status (0, 1)	INT16
39001	9000	Year (4 digits) (1900 to )	INT16
39002	9001	Month (1 to 12)	
39003	9002	Day (1 to 31)	
39004	9003	Hours (0 to 23)	
39005	9004	Minute (0 to 59)	
39006	9005	Second (0 to 59)	
39007	9006	Milliseconds (0 to 999)	
39008	9007	DST(0,1)	

**Note**

- For INT32 or INT16, only the mantissa of the measured/computed data is acquired. The decimal place must be obtained separately.
- For FLOAT, the measured/computed data including the decimal place can be acquired.
- The FLOAT and INT32 data domains are set so that they can only be accessed (read/write) by the unit of two registers.
- Alarm statuses are output in the same format as those described in section 2.3, "Binary Output."

**Hold Registers**

41001 to 41600, and 42001 to 42300 are for functions of firmware version R3.04 or later.

Absolute Address	Relative Address	Allocation	Data Type
40001	0000	Lower byte of data from communication input channel C001	FLOAT
40002	0001	Upper byte of data from communication input channel C001	
⋮	⋮	⋮	⋮
40599	0598	Lower byte of data from communication input channel C300	FLOAT
40600	0599	Upper byte of data from communication input channel C300	
41001	1000	Lower byte of data from communication input channel C001	INT32
41002	1001	Upper byte of data from communication input channel C001	
⋮	⋮	⋮	⋮
41599	1598	Lower byte of data from communication input channel C300	INT32
41600	1599	Upper byte of data from communication input channel C300	
42001	2000	Data from communication input channel C001	INT16
⋮	⋮	⋮	⋮
42300	2299	Data from communication input channel C300	INT16

### Values per Modbus Registers (Measurement channel data and MATH channel data)

The main module handles data on measurement channels as type Int16, and data on MATH channels as type Int32. The Modbus register values of these data are shown in the table below.

Value type	Name/description of value	Value per Modbus register			
		Int 32	Int 16	Float	Bit <sup>*1</sup>
+Over	+Over	2,147,450,879	32,767	+Inf(0x7f80 0000)	0
	Data value greater than the upper limit	(0x7fff 7fff)	(0x7fff)		
-Over	-Over	-2,147,385,343	-32,767	-Inf(0xff80 0000)	0
	Data value smaller than the lower limit	(0x80001 8001)	(0x8001)		
Skip	Skip	-2,147,319,806	-32,766	-NaN(0xff80 0002)	0
	Channel disabled	(0x8002 8002)	(0x8002)		
No Channel	No channels	-2,147,254,269	-32,765	-NaN(0xff80 0003)	0
	No channels exist	(0x8003 8003)	(0x8003)		
Error	Error	-2,147,188,732	-32,764	-NaN(0xff80 0004)	0
	Error in computation of data value <sup>*2</sup>	(0x8004 8004)	(0x8004)		
Invalid	Undefined	-2,147,123,195	-32,763	-NaN(0xff80 0005)	0
	Data value is undefined <sup>*3</sup>	(0x8005 8005)	(0x8005)		
Lack	Computation omitted	-2,147,057,658	-32,762	-NaN(0xff80 0006)	0
	Computation not processed	(0x8006 8006)	(0x8006)		
Valid	Data is valid	Mantissa <sup>*4</sup>	Mantissa <sup>*4*5</sup>	Physical qty.	0, 1 <sup>*6</sup>

\*1 The value of the bit alone is insufficient to determine whether it is a special value. Mode (18000's, 38000's) and other information must also be used to determine whether it is a special value or other value.

\*2 If the data to be computed or the computed result is NaN, an error occurs. Furthermore, data resulting in an error is replaced with +Over or -Over according to the "Operation upon Computation Error" setting.

\*3 After turning the power to the MW100 ON, data values are undefined (Invalid) until initial measurement and computation are finished (until the first data of measurement and MATH channels is created).

\*4 Only the mantissa of values can be acquired from Int 32 format data of measurement and MATH channels. Decimal place information of some form must be acquired separately from the MW100 in order to convert to physical values.

\*5 When the expressible range in the Int 16 type is exceeded, the value takes on the upper or lower limit for the data range. Take care when you use Int 16 registers to handle MATH channel data. Let x and y denote the original data and the corresponding values per Modbus registers respectively,  
 $y = \min$  (when  $x < \min$ )  
 $y = x$  (when  $\min < x < \max$ )  
 $y = \max$  (when  $\max < x$ )  
 where  $\min = -32,768$  (0x8000),  $\max = 32767$  (0x7fff)

\*6 The value is 0 (Off) when the corresponding measurement channel data or MATH channel data is zero, and 1 (On) when data is not zero.

### Note

This is an example of acquiring decimal place information.

- For measurement channels
  - In the Web browser's Input Range Setting screen, check the values in the Decimal columns under Scale (when scaling is not used, the decimal place of the value in the Span column).
  - Acquire channel information using an SR command query of the MW100-specific communication service.
  - Output measurement channels using the FD command of the MW100-specific communication service, then check the "Exponent" value.
- For MATH channels
  - In the Web browser's "Expression Settings" screen, check the value in the Decimal column under Span.
  - Acquire channel information using an SO command query of the MW100-specific communication service.
  - Output MATH channels using the FD command of the MW100-specific communication service, then check the "Exponent" value.

**Values per Modbus Registers (Communication input channel data)**

The main module handles data from the communication input channels as type Float.  
 The Modbus register values of these data are shown in the table below.

Comm. Input Channel Data (Float)(x)	Value (y) per Modbus Register			
	Float	Int 32	Int 16	Bit <sup>*1</sup>
		min = -2,147,483,648 max = 2,147,483,647	min = -32,768 max = 32,767	
+Inf	+Inf	max	max	0
-Inf	-Inf	min	min	0
NaN	NaN	max	max	0
Valid	Data (physical qty.)	Data (integer) <sup>*2</sup> y = integral portion of x (min ≤ x ≤ max) y = min (x < min) y = max (x > max)	Data (integer) <sup>*2</sup> y = integral portion of x (min ≤ x ≤ max) y = min (x < min) y = max (x > max)	0, 1 <sup>*3</sup>

\*1 The value of the bit alone is insufficient to determine whether it is a special value. Mode (18000's, 38000's) and other information must also be used to determine whether it is a special value or other value.

\*2 The value is read in with the values after the decimal place removed. For example, if the value stored in a communication input channel is 56.78, the value read in under the Word type is 56. If the value stored in a communication input channel is -12.34, the value read in under the Word type is -12.

\*3 The value is 0 (Off) when the corresponding communication input data is zero, and 1 (On) when the data is not zero.

**Modbus Error Response (Modbus Slave)**

When using the Modbus slave function, the instrument returns the following error codes to the master device.

Code	Meaning	Cause
1	Function code invalid	Requested non-supported function
2	Invalid register number	Attempted to read/write registers with no corresponding channel.
3	Invalid number of registers	The specified number of registers was zero.
7	Could not be executed	Attempted to read MATH registers from MW100 without the MATH function option.

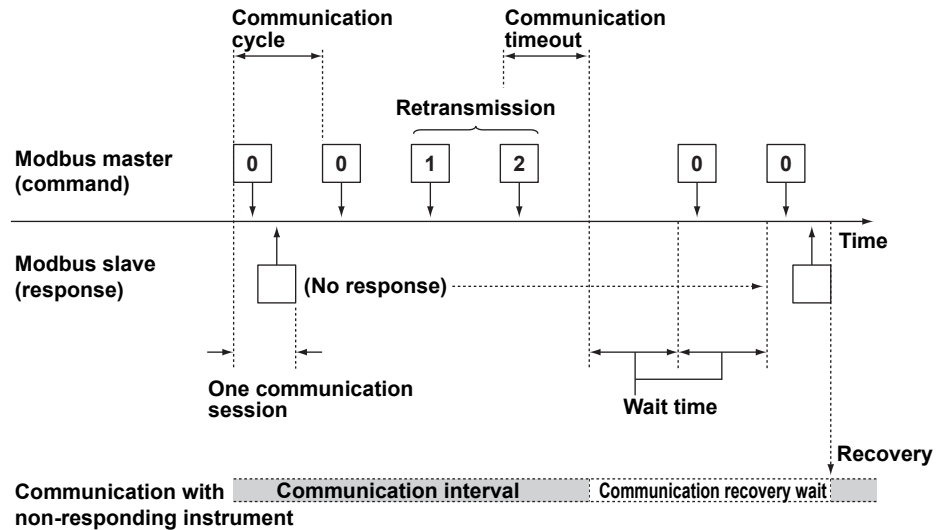
However, there is no response in the following cases.

- CRC Error
- Error other than in the table above

# Appendix 3 Modbus Communication Timeout

This MW100 has a function in which, communication with Modbus slave devices that could not receive a response after the number of retries or more is dropped every communication interval by access sequence. Communication with Modbus slave devices dropped in sequence is retried after the communication wait time has elapsed.

## Modbus Master Timer Function



## Timeout Types

Timeout	Description
Communication cycle	Modbus master command list (communication sequence) execution interval
Retransmission	When fails to receive response message, maximum number of retries until communication recovery wait status.
Wait time	Wait time until the next command message is sent to instruments that entered the communication recovery wait status.

## Appendix 4 Bit Structure of Status Information

The following status information is output upon request by the IS command.

### Status Information 1 (Task Complete 1)

Bit	Name	Description
0	A/D conversion cmplt'd 1	Set to 1 when A/D conversion on meas group 1 is completed.
1	A/D conversion cmplt'd 2	Set to 1 when A/D conversion on meas group 2 is completed.
2	A/D conversion cmplt'd 3	Set to 1 when A/D conversion on meas group 3 is completed.
3	Media access cmplt'd	Set to 1 when saving of recorded data to ext media is completed.
4	Report file creation cmplt'd	Set to 1 when saving of report data to ext media is completed.
5	Manual sample file creation cmplt'd	Set to 1 when saving of manual sample data to ext media is completed.
6	-	-
7	-	-

### Status Information 2 (Task Complete 2)

Bit	Name	Description
0	Computation reset	Set to 1 when the computation reset command (EX2) is received, or the MATH_RESET action of the Event/Action function occurs.
1	Reset MATH group 1	Set to 1 when the MATH_RST_GR1 action of the Event/Action function occurs.
2	Reset MATH group 2	Set to 1 when the MATH_RST_GR2 action of the Event/Action function occurs.
3	Reset MATH group 3	Set to 1 when the MATH_RST_GR3 action of the Event/Action function occurs.
4	Reset MATH group 4	Set to 1 when the MATH_RST_GR4 action of the Event/Action function occurs.
5	Reset MATH group 5	Set to 1 when the MATH_RST_GR5 action of the Event/Action function occurs.
6	Reset MATH group 6	Set to 1 when the MATH_RST_GR6 action of the Event/Action function occurs.
7	Reset MATH group 7	Set to 1 when the MATH_RST_GR7 action of the Event/Action function occurs.

### Status Information 3 (Abnormality)

Bit	Name	Description
1	Decimal place/units change	Set to 1 when the decimal place or units are changed.
2	Computation omitted	Set to 1 when timing of the MATH channel processing failed.
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-



**Status Information 4 (Event)**

Bit	Name	Description
0	-	-
1	-	-
2	Low free space on media	Set to 1 when there is only a small amount of remaining free space on the medium.
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-

**Status Information 5 (Mode)**

Bit	Name	Description
0	Setting	Set to 1 when transitioning to Setting mode.
1	Recording	Set to 1 when transitioning to Recording mode.
2	Computing	Set to 1 when computation starts.
3	Alarm occurrence	Set to 1 when alarm occurs.
4	Wait for alarm	Set to 1 when waiting for alarm acknowledgment (AK acknowledgment command).
5	Saving/loading settings	Set to 1 when saving or loading settings.
6	-	-
7	-	-

**Status Information 6 (Mode)**

Bit	Name	Description
0	Transmitting	Set to 1 during transmission output.
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
7	-	-

# Appendix 5 ASCII Character Codes

		Top 4 bits															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Bottom 4 bits	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	LF		*	:	J	Z	j	z								
	B		ESC	+	;	K	[	k	{								
	C			,	<	L		l									
	D	CR		-	=	M	]	m	}								
	E			.	>	N	^	n	~								
	F			/	?	O	_	o									

**Note**

- Delimiter (,), sub delimiter (;), query symbol (?), and terminator (CR, LF) cannot be used for parameters.

# Appendix 6 Maintenance/Diagnostic Server

The maintenance/diagnostic server function investigates the MW100 communication status. The MW100 main module is connected to a PC using an Ethernet cable, then using Telnet or some other terminal emulator, communication commands can be used from the PC to perform maintenance/diagnostics on the MW100. Commands are sent from the PC to the MW100, and the MW100 performs a command/response type communication with the PC. Only one PC can be connected to one MW100.

## Connection between the Main Module and PC

See the *MW100 Data Acquisition Unit User's Manual* (IM MW100-01E).

## Terminal Emulator Settings

Set up the terminal emulator as follows to perform MW100 maintenance/diagnostics using communication commands. The terminal emulator is set to connect using the MW100's IP address. The port number is 34317.

- Local echo: ON
- Line feed code of the transmit data: CR+LF

## List of Maintenance/Diagnostic Commands

Command Name	Functions
con	Output TCP connection information
eth	Output Ethernet information
help	Output command help
login	Login
logout	Log out
net	Output network information
uart	Outputs UART I/F information

## Main Specifications of the Maintenance/Diagnostic Server

Port number	34317/tcp
Transfer data	ASCII character string
Command	A string on a single line ending with the CR+LR terminator
Responses	Strings on multiple lines ending with the CR+LR terminator
Keep alive	Always enabled
Receive timeout	10 minutes
Maximum number of simultaneous connections	1

**con**

**Output Connection Information**

Function        Outputs a list of devices connected to the MW100.  
 Setting        **con**  
 Example        **con**  
                  EA  
                  Active Connections

```

                                ProtoLocal Address      Foreign Address State
TCP      10.0.233.126 : 3431710.0.232.194 : 1382 ESTABLISHED
TCP      0.0.0.0:34317  0.0.0.0:0          LISTEN
TCP      0.0.0.0:502    0.0.0.0:0          LISTEN
TCP      0.0.0.0:80      0.0.0.0:0          LISTEN
TCP      0.0.0.0:34318  0.0.0.0:0          LISTEN
TCP      0.0.0.0:34316  0.0.0.0:0          LISTEN
TCP      0.0.0.0:123    0.0.0.0:0          LISTEN
TCP      0.0.0.0:34323  0.0.0.0:0          LISTEN
EN
    
```

Explanation    Outputs a list of connections in a form enclosed by EA and EN.

```

Proto:          Protocol used
Local Address:  Address and port number of the MW100
Foreign Address: Address and port number on the PC
State:          Connection status
CLOSED         No connection
LISTEN         Waiting (SYN wait)
SYN_SENT       SYN sent (SYN+ACK wait)
SYN_RCVD       SYN received (wait for ACK to SYN)
ESTABLISHED    Connection established
CLOSE_WAIT     Close request (FIN wait)
FIN_WAIT_1     Close request wait-1 (FIN wait)
CLOSING        Closing (waiting ACK to FIN)
LAST_ACK       Remote close check waiting (ACK wait)
FIN_WAIT_2     Close request wait-2 (FIN wait)
TIME_WAIT      Time wait
    
```

**eth**

**Output of Ethernet Information**

Function        Outputs statistics on packets flowing on the MW100 Ethernet interface.  
                  Values output with this function are those that are accumulated starting  
                  when the MW100 power is turned ON.  
 Setting        **eth**  
 Example        **eth**  
                  EA  
                  Ethernet Statistics

```

Name  In Pkt   In Err   Out Pkt   Out Err   16 Coll
sn0   917      1        51        0         0
lo0   0        0        0         0         0
EN
    
```

**Explanation** Outputs statistical information of the packets that flowed through the interface in a form enclosed by EA and EN.

```
Name      : Interface name (sn: Ethernet, lo: loop back)
in Pkt   : Number of received packets
In Err   : Number of packets that generated receive errors
Out Pkt  : Number of sent packets
Out Err  : Number of packets that generated send errors
16 Coll  : Number of 16 collision occurrences
```

**help**

**Command Help Output**

**Function** Outputs a list of currently available maintenance/diagnostic commands.

**Setting** help

**Example** help

```
EA
Diagnostic command list

con      - echo active connections
eth      - echo ethernet statistics
help     - echo command list
login    - login or re-login
logout   - logout
net      - echo network statistics
uart     - echo UART statistics
EN
```

**Explanation** Outputs a list of currently available commands in a form enclosed by EA and EN.

**login**

**Login**

**Function** Authorizes users connected for maintenance/diagnostic services.

**Setting** login p1 p2  
(p1: user name, p2: password)

**Example** E1 501 Login first.  
login admin abc  
E0

**Explanation** Notifies success or failure of login using EO or E1.  
If the login function is not used, the password can be omitted.

**logout**

**Logout**

Function Closes the maintenance/diagnostic session and closes currently used TCP connections from the MW100 side.

Setting `logout`

Example `logout`

E0

Explanation After returning E0, the MW100 issues a close TCP/IP connection request (FIN).

**net**

**Output Network Information**

Function Outputs general network information related to the MW100 communication stack.

Setting `net`

Example `net`

EA

Network Statistics

TCP: connects = 1

TCP: closed = 0

TCP: timeoutdrop = 0

TCP: keepdrops = 0

TCP: sndtotal = 12

TCP: sndbyte = 25

TCP: sndrexitpack = 0

TCP: sndrexitbyte = 0

TCP: rcvtotal = 15

TCP: rcvbyte = 18

DLC: speed mode = 10 Mbps

DLC: duplex mode = half

DLC: link state = on

EN

Explanation Outputs general network information related to the MW100 communication stack in a form enclosed by EA and EN.

**uart****Outputs UART I/F Information**

Function Outputs statistics on the MW100 UART I/F (serial port).

Setting `uart`

Example `uart`

```
EA
UART Statistics

uart[]=
{
    break err      = 0
    parity err     = 0
    frame err      = 0
    under-run     = 0
    over-run       = 0
    RX bytes       = 0
    TX bytes       = 0
}
{
    break err      = 0
    parity err     = 0
    frame err      = 0
    under-run     = 0
    over-run       = 0
    RX bytes       = 0
    TX bytes       = 0
}
EN
```

Explanation Outputs statistics related to UART /IF in a form enclosed by EA and EN.

## Appendix 7 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.

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	Possible Problem	Corrective Action
b* (where * is any character other than F).	The dipswitch 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.
bF	The dipswitch settings are not correct.	Power up in setup reset mode. Turn OFF the power, turn ON all dipswitches, and power up again. Since all settings such as the IP address are initialized, reconfiguration is necessary.

### 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
F0	System ROM error.	Service required.
F1	SRAM error	Service required.
F2	EEPROM error	Service required.
F3	Error in the internal battery of the main module.	Service required. However, this error is also displayed immediately after the battery is replaced. If this happens, power-cycle the MW100.
F4	Ethernet controller error	Service required.
F6	Web file load error	Service required.
FF	Error in writing unit information.	Service 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.

Error number    Module number  


Display	Possible Problem	Corrective Action
U0	Range information error.	Service 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 is not correct. (during calibration)	Check whether the correct calibration reference voltage is or being applied or whether the channel to which the voltage is applied is correct.
U3	Error in writing the calibration value.	Service 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
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.
C1	DNS name error	Check network connections. Check with your network manager to determine whether your environment supports host name registration.

## Setting 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 correct parameters.
E002	Value exceeds the setting range.	Set a value within the allowable range.
E003	Incorrect real number format.	Enter 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	Date 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 valid a correct send destination.
E038	Invalid server number.	Enter a correct server number.
E039	Invalid command number.	Enter a correct command number.

## Appendix 7 Error Display on the 7-Segment LED and Corrective Actions

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 type 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 a channel number of the input module or a MATH channel number.
E110	Invalid channel number for contact input event.	Set the channel number for the universal input module or DI module.

## Appendix 7 Error Display on the 7-Segment LED and Corrective Actions

Display	Possible Problem	Corrective Action
E111	Invalid channel number for alarm event.	Set an input module or MATH channel number.
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	The combination of the thinning recording interval and the thinning recording data length is not correct.	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 allowed for 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 a first and last channel of 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 Error

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 save MATH operation before executing.
E206	Cannot change or execute during MATH operation.	Stop the save 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 $\leq$ meas. gr 2 $\leq$ 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 it is being accessed.
E302	No enough free space on CF card.	Delete unneeded files to free up some 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 reformat the CF card.
E313	CF card damaged or not formatted.	The file may be damaged. Format or replace the CF card.

## Appendix 7 Error Display on the 7-Segment LED and Corrective Actions

Display	Possible Problem	Corrective Action
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 failure.	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 Error

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 characters 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.	Check the daylight saving time settings.
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 Error

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 connection.
E530	SMTP function not available.	Enable the function.
E531	SMTP connection failed.	Check the SMTP server address and the main unit address settings. Also check the Ethernet cable connection.
E532	POP3 connection failed.	Check the POP3 server address and the main unit address settings. Also check the Ethernet cable connection.
E550	SNTP function not available.	Enable the function.
E551	SNTP command/response failed.	Check the SNTP server address and the main unit address settings. Also check the Ethernet cable connection.

## 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.

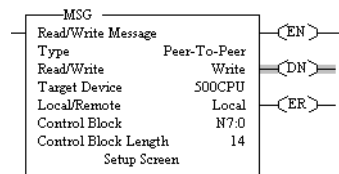
## Appendix 8 Detailed Explicit and I/O Messaging using RSLogix

The majority of devices that the MW100 will be connected to using EIP will be AB PLCs. RSLogix 500 or RSLogix 5000 are the programming packages used to configure and program everything from the legacy PLC 5 through the latest ControlLogix.

### Explicit Messaging with RSLogix 500

The following assumes basic familiarity with RSLogix 500 and RSLinx and that both are installed and that RSLogix 500 is able to communicate through RSLinx to the designated PLC.

Messages are designated as MSG under the Input/Output tab of the instruction bar and may be inserted as the output of a rung of ladder logic. The MSG command can be used for reads or writes (in this case the example below shows a write message). The target device should be set to 500CPU when talking to SLC 500s and PLC 5 when communicating to older PLC 5s. Control Block is used to set the location in memory for the MSG function to be stored and it should be different from the Data Table Address used on the Setup Screen (what data should be written to the MW100).



RSLogix 500 Write Message

## Appendix 8 Detailed Explicit and I/O Messaging using RSLogix

Once the Control Block is designated, the Setup Screen can be configured. The first item to fill in is the location of the data that is to be written from the PLC to the MW100, designated as the Data Table Address. In this case N7:49 is chosen with an element size of 1 (one byte of data - in order to read or write large amounts of data in a single message, increase the elements size to the appropriate value). Channel 0 designates what port to use on the PLC (in this case the serial port for DF1 communications – later routed via a DigiOne IAP (DF1 to EIP gateway)).

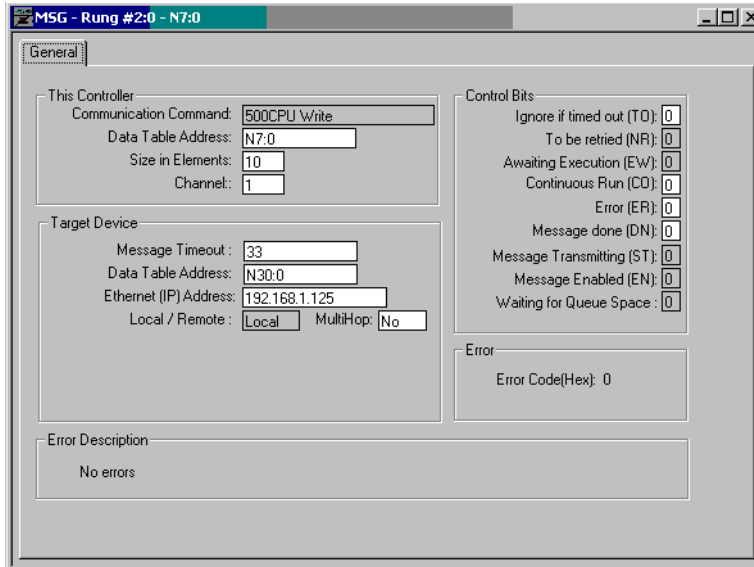
The next step is to configure where the message will be written. In this case a Message Timeout of 5 seconds is used and Communication Channel C001 is being written to as an integer using the syntax N30:0 for Data Table Address. In this case Local Node Addr is set to 1 so that the gateway device knows to route all commands issued to Node 1 to the IP address of a specific MW100. If multiple MW100s are on a network then using different Node Addresses within the message commands can be used in conjunction with a gateway to route messages to specific MW100s (e.g. Node 1 to MW100 A, Node 2 to MW100 B, etc...).

The screenshot shows the 'Write Message Setup Screen' for a PLC that supports DF1. The window title is 'MSG - N7:0 : (14 Elements)'. The 'General' tab is selected. The 'This Controller' section has the following settings: Communication Command: 500CPU Write, Data Table Address: N7:49, Size in Elements: 1, Channel: 0. The 'Target Device' section has the following settings: Message Timeout: 5, Data Table Address: N30:0, Local Node Addr (dec): 1, Local Node Addr (octal): 1, Local / Remote: Local. The 'Control Bits' section has the following settings: Ignore if timed out (TO): 0, To be retried (NR): 0, Awaiting Execution (EW): 0, Continuous Run (CO): 0, Error (ER): 0, Message done (DN): 1, Message Transmitting (ST): 0, Message Enabled (EN): 0, Waiting for Queue Space: 0. The 'Error' section has the following setting: Error Code(Hex): 0. The 'Error Description' section shows 'No errors'.

Write Message Setup Screen as configured for PLCs that support DF1.

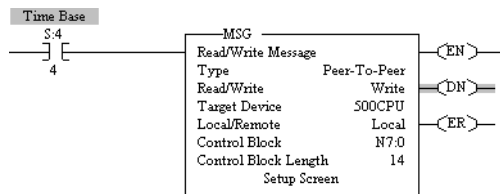


When using RSLogix 500 with controllers such as the MicroLogix series that have on board Ethernet support, the Setup Screen looks slightly different as instead of a Node Address, direct input of the MW100 IP address is allowed (no gateway or DF1 to EIP routing is required in this case).



Write Message as configured in a MicroLogix or SLC 505 with EIP support

An explicit message should be triggered on/off by some sort of logic; the following image represents using the seconds bit of the PLC's clock to activate the message.



Time Based Message Write

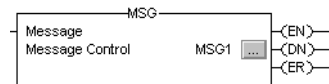
## Explicit Messaging with RSLogix 5000

Explicit Messaging within RSLogix 5000 is similar to messaging in RSLogix 500 but there are a few differences; the first is that everything is simplified if tags are predefined. From the Controller Organizer (tree on left) pick Controller Tags and create a tag of Data Type MESSAGE (in this example tag MSG1). Also create a tag that will hold the PLC data that will be written to the MW100 (in this example tag DATATransfer which is a block of 10 floating point numbers). A Boolean bit to activate the message was also created as the tag WriteMessageBit.

Name	Alias For	Base Tag	Data Type	Style
DATAtransfer			REAL[10]	Float
FloatData			REAL	Float
MSG1			MESSAGE	
Multiplier			DINT	Decimal
MW100:C			AB:ETHERNET_...	
MW100:I			AB:ETHERNET_...	
MW100:O			AB:ETHERNET_...	
WriteMessageBit			BOOL	Decimal

RSLogix 5000 Controller Tags Screen

The next step is to insert the message block from the Language Element Toolbar designated as MSG under the Input/Output tab. The MSG block can be inserted as the output of a rung. A controller tag of data type Message should be assigned to the MSG block, in this case tag MSG1.

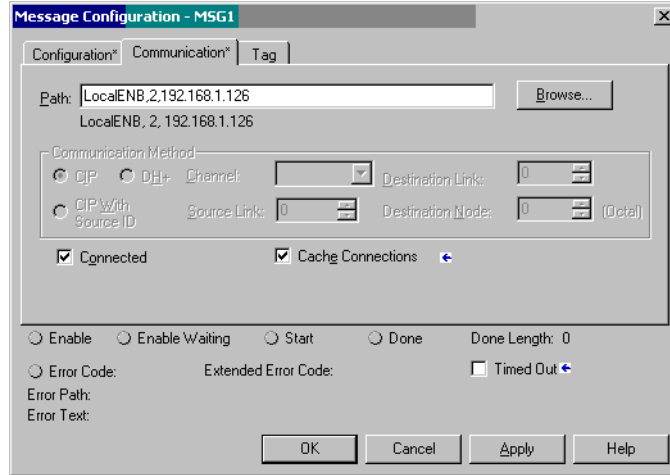


MSG block using tag MSG1

The next step is to configure the MSG block ([...] button). In this case the message block is configured to write data from the PLC to the MW100 and so Message Type is set to CIP Data Table Write. Source Element is set to DATATransfer (tag within PLC) and the Number of Elements is set to 10 (number of bytes of data - in order to read or write large amounts of data in a single message, increase the Number of Elements to the appropriate value). The Destination Element is set to real[3099] which corresponds to MW100 Communication Channel C100.

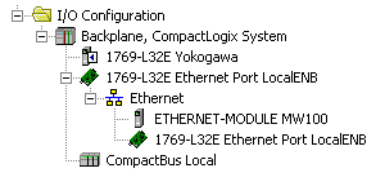
Message Configuration Tab

Next configure the Communication Tab by entering the Path to the MW100. The Path can be designated by the name of the Ethernet port on the PLC (in this case LocalENB – see I/O Configuration below) followed by a comma, with 2 (depth of communications) followed by a comma, and the IP address of the MW100 (e.g. 192.168.1.126). Check Connected and Cache Connections to speed up communications to the MW100.



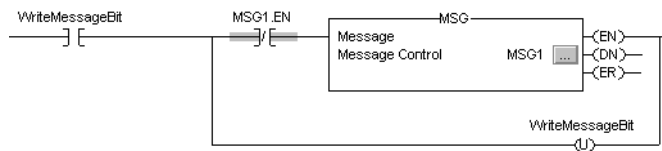
Message Configuration Communication Tab

If the path to the MW100 is already configured in RSLinx then RSLogix will automatically replace the explicit path (e.g. LocalENB,2,192.168.1.126) with named path (e.g. MW100 as seen below beside attached ETHERNET-MODULE). If the MW100 has not been configured within RSLinx then ETHERNET-MODULE MW100 would not be present in the tree below and the explicit path on the Communication Tab will not be resolved and replaced with MW100.



I/O Configuration within Controller Organizer tree

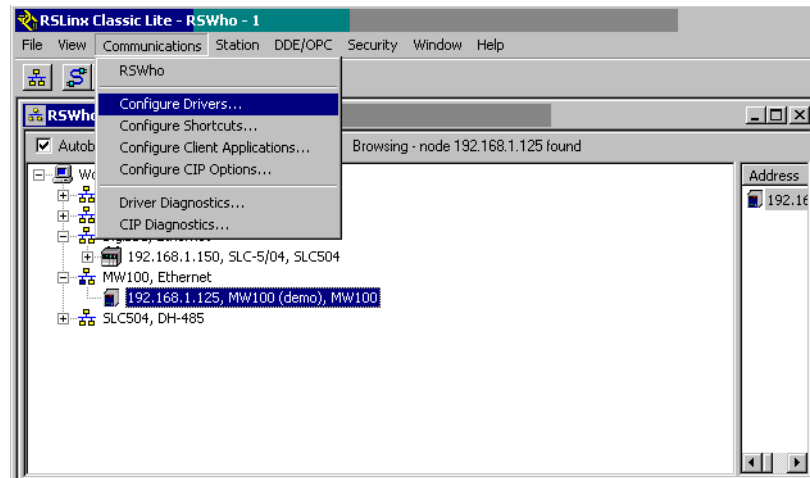
The last thing to do is to place some activation logic around the message to tell it when to write. In this case when the contact WriteMessageBit is toggled on the MSG block activates and writes to the MW100 and the WriteMessageBit is simultaneously toggled off with the output WriteMessageBit unlatch coil.



Contact Based MSG Logic in RSLogix 5000

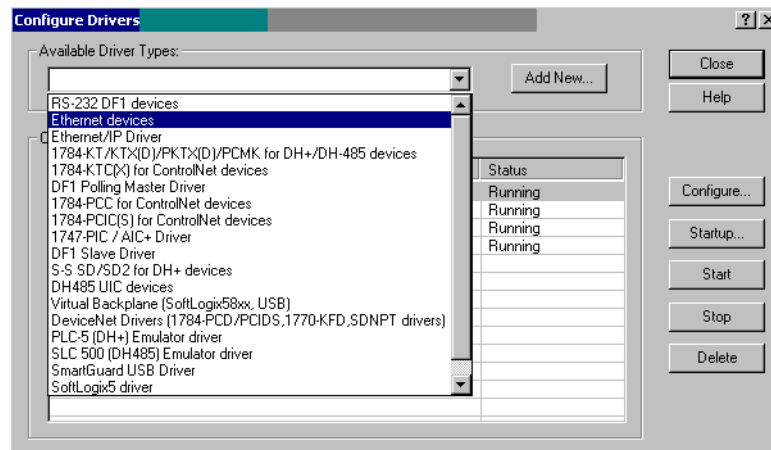
### I/O Messaging with RSLogix 5000

The first step in configuring an MW100 to communicate via I/O Messaging is to define a connection within RSLinx. From the top menu under Communications, pick Configure Drivers.



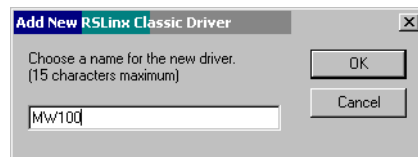
Configure Driver within RSLinx

The next step is to select Ethernet devices (not Ethernet/IP Driver) to support the MW100 and then pick Add New...



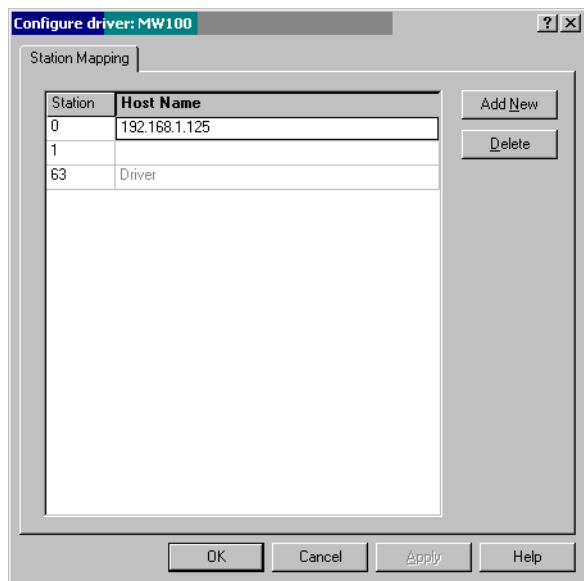
Ethernet devices driver for MW100

When prompted, name the driver – in this case MW100 was used but the name can be changed to suit different naming conventions.



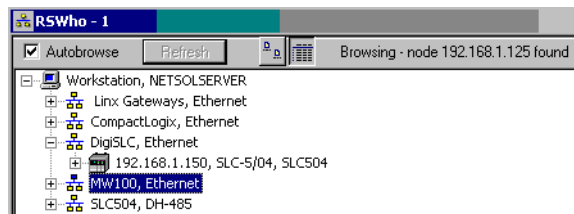
Path name for Ethernet Device

After the driver is named, enter the IP address of an MW100 and click OK to continue.



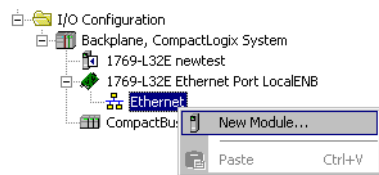
Configuring IP Address of MW100 within RSLinx

When properly configured there should be a new listing in RSLinx for MW100. Note that when browsing the connection, RSLinx indicates the node is found.



RSLinx with MW100 added

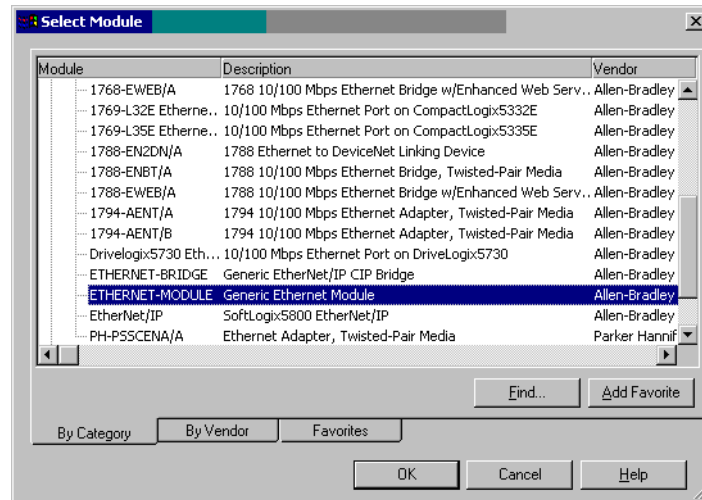
Open RSLogix 5000 and select the PLC that is going to communicate with the MW100. Right click on Ethernet and select New Module...



Adding a New Module to an RSLogix 5000 Project

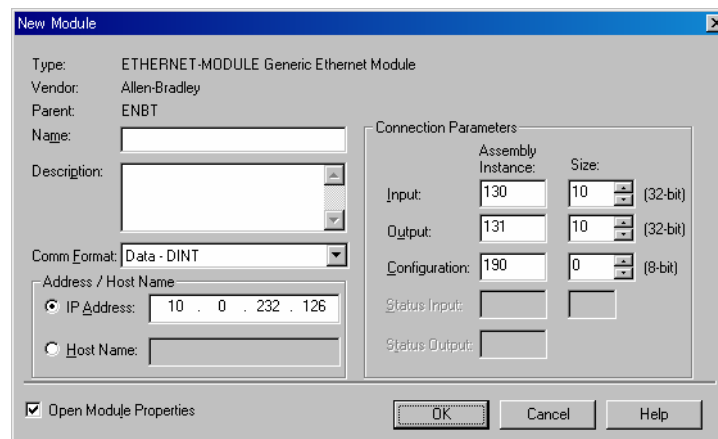
## Appendix 8 Detailed Explicit and I/O Messaging using RSLogix

Expand the Communications listing by clicking on the + sign and then scroll down and select ETHERNET-MODULE and click OK.



Selecting Generic Ethernet Module for MW100 Communications

A definition screen should now appear for the ETHERNET-MODULE. In the Name field – type MW100 (or whatever is desired for the connection name). Comm Format can be left at Data – DINT and IP Address should be set to the IP address of the MW100. Connection Parameters are where the inputs and outputs are defined. In the Assembly instances table below there are Instance IDs that correspond to channels in the MW100. All Instance IDs of Kind Producer can be assigned to Input (e.g. Instance ID 130 would point the Input at Communication Channel C001). All Instance IDs of Kind Consumer can be assigned to Output (e.g. Instance ID 131 would point the Output at Communication Channel C101). Size is how many channels are available per Instance ID. In the Assembly instances table, all Instance IDs can have Size 100 except for MW100 measurement channels 001-060 that have a maximum size of 60. A smaller size can be used if less channels are needed (e.g. below only 10 channels per Instance ID are configured). Configuration can be set to Instance 190 with Size 0. In the case that no Outputs are to be used, Output Instance can be set to 191, Size 0 for heartbeat purposes (allows MW100 to stop broadcasting for data if heartbeat goes away).

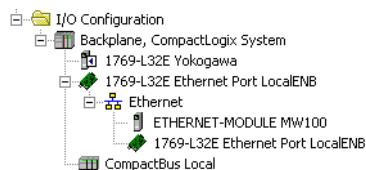


Configuring an MW100 as a Generic Ethernet Module

Assembly instances for I/O messaging (Channels in Assembly Object)

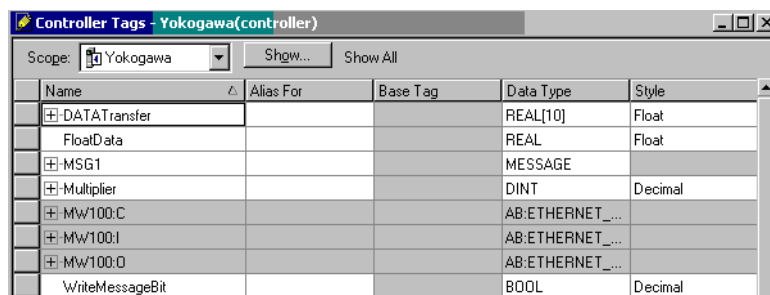
Ch.	Kind	Instance ID	Size	Type
001-060	Producer	110	4 x 60	dint
A001 - A100	Producer	120	4 x 100	dint
A101 - A200		121	4 x 100	
A201 - A300		122	4 x 100	
C001 - C100	Producer/Consumer	130	4 x 100	dint
C101 - C200		131	4 x 100	
C201 - C300		132	4 x 100	
	Configuration	190	0	
	Consumer	191	0	

Now that the MW100 is added, it should appear in RSLogix 5000 as a connection in the Controller Organizer.



I/O Configuration within Controller Organizer tree – ETHERNET-MODULE MW100

Browsing Controller Tags will now show MW100:I and MW100:O as tags that can be used within controller logic. Clicking on the + sign will expand the selection to show all the points up to the Size specified when defining the input and outputs on the module (e.g. Size 10 = 10 Channels/Tags).

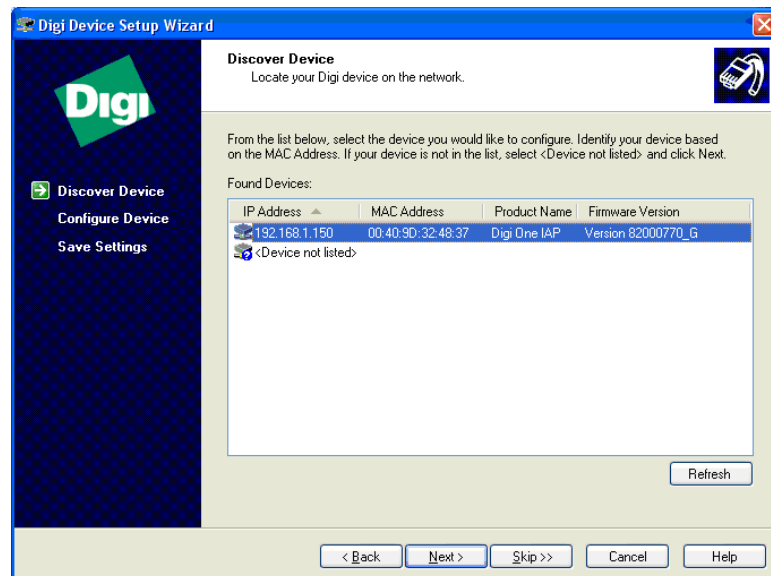


MW100 Channels now available as tags for controller logic

## Appendix 9 Detailed Configuration of DigiOne IAP Serial Gateway

For PLCs that support serial communications via DF1 protocol, there are various gateways that can be used to intercept serial communications and translate to EIP. One such device is the DigiOne IAP. The IAP has two serial ports and a single Ethernet port. Port 2 on the IAP is a 9 pin d-sub connector that can be connected to the 9 pin d-sub connector on PLC CPUs like the SLC 504 (and others). The IAP comes with a serial cable that easily connects the IAP to the SLC 504. A standard Ethernet patch cable can connect the IAP to an Ethernet network. This example will show how to configure an IAP bridge communications between RSLinx/RSLogix and an MW100 with a SLC 504.

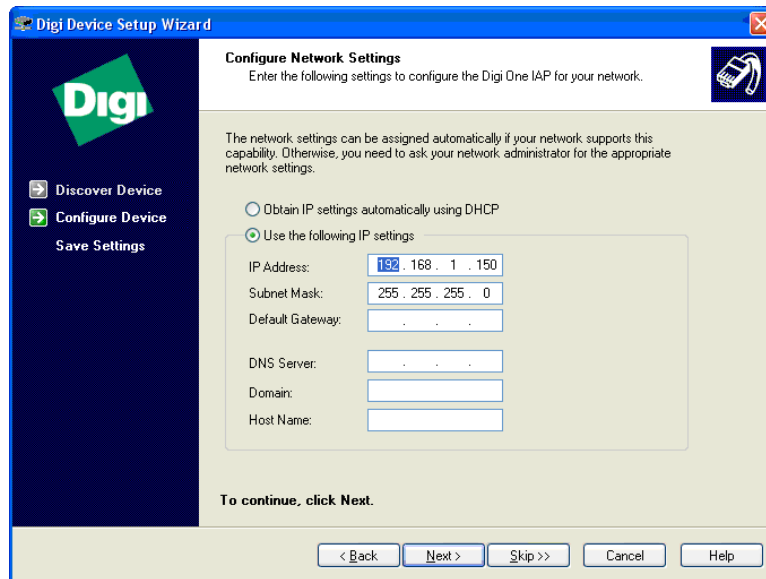
Connect the IAP to the serial port on the front of the SLC 504 via the included serial cable. Connect an appropriate DC power supply to the terminals of the IAP. Power the IAP up. Connect an Ethernet patch cable to the IAP and attach it to the network. The IAP comes with a CD that includes a setup utility. When the CD boots up (assuming auto-run is enabled), follow the instructions on the first page then click next and the setup utility will scan the network for IAPs. For a new IAP it will not have an IP address, but it should be easy to identify as the Product Name will show Digi One IAP. Select the IAP and click Next.



Auto discovery of IAP on network with Digi One Setup Utility

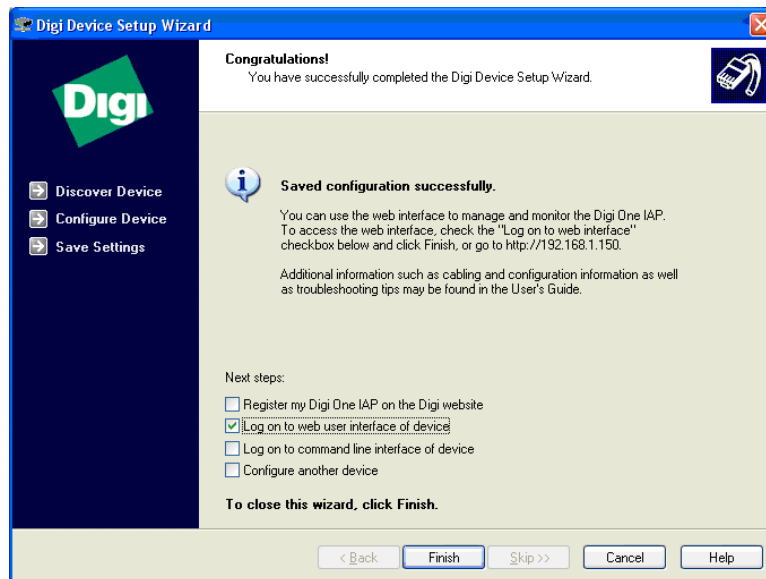


Enter the IP address and subnet mask that is desired.



Configuring IP Address of Digi One IAP

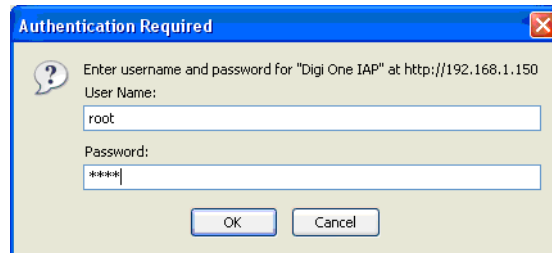
After configuring the network settings choose Skip and Next on the following two screens and the configuration should be saved to the IAP. The web interface has a wizard that can be used to configure the IAP for industrial networks. On the final screen of the setup utility select Log On to the web user interface of device and click Finish.



The final screen of the setup utility

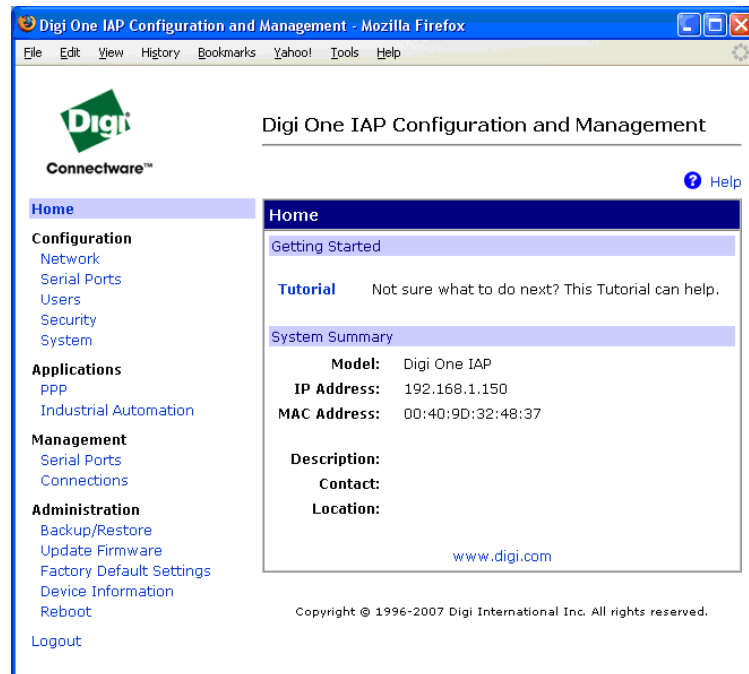
## Appendix 9 Detailed Configuration of DigiOne IAP Serial Gateway

The default web browser should pop up with a prompt for a user name and password (if it does not automatically launch the web browser, then open a web browser and browse the IP address of the IAP). The default User Name for the web interface is root and the default Password is dbps.



IAP Security Screen

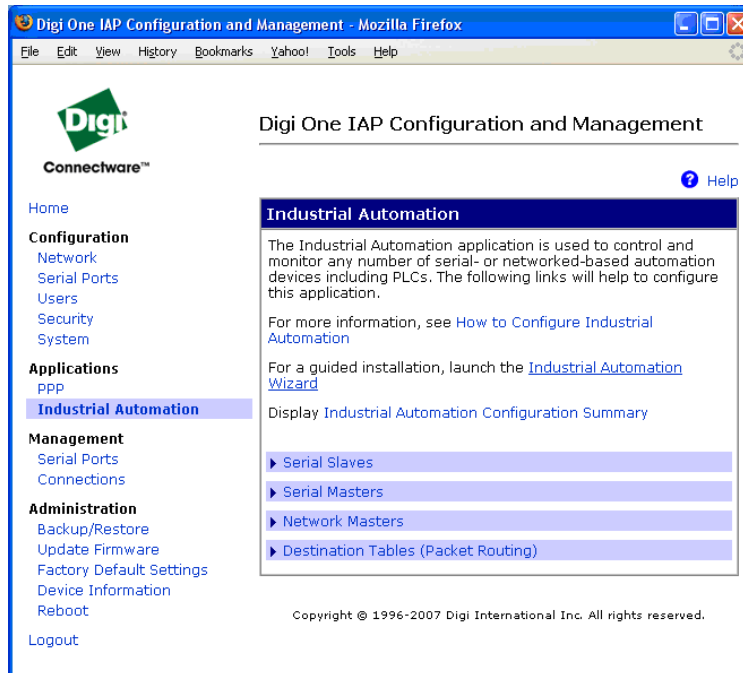
After logging, in the main page of the Digi One IAP web configuration should appear. Select Industrial Automation under Applications to continue.



Home page of IAP configuration

## Appendix 9 Detailed Configuration of DigiOne IAP Serial Gateway

Select Industrial Automation Wizard link in the center of the screen to configure the IAP for an industrial network.



Industrial Automation page

Enter a table name for this configuration and then click Next.

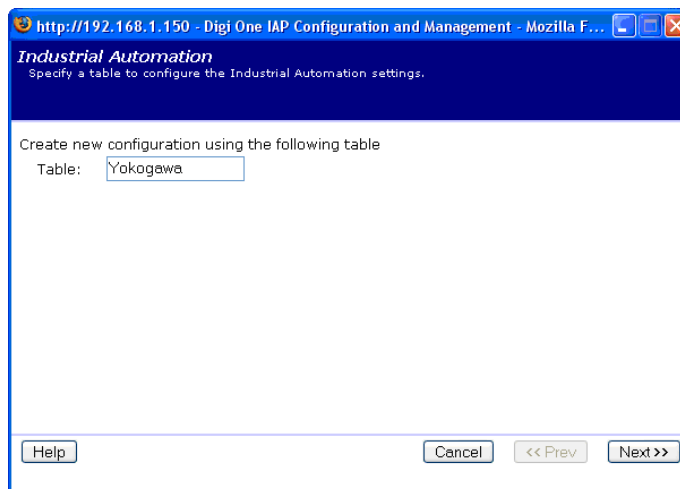
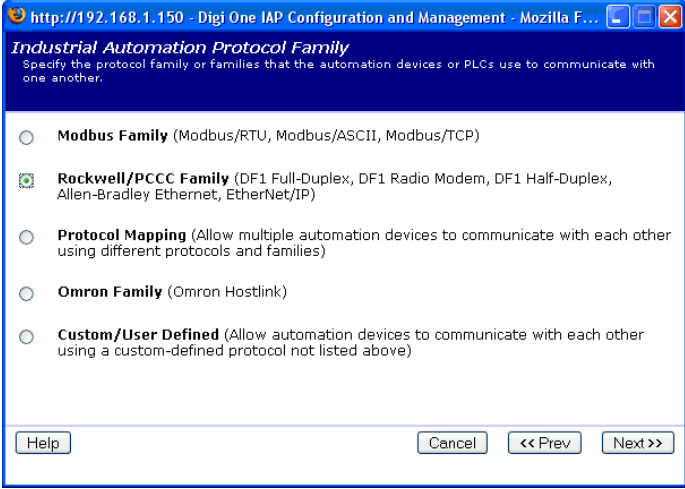


Table Name for Industrial Automation Setup

## Appendix 9 Detailed Configuration of DigiOne IAP Serial Gateway

Select Rockwell/PCCC family and then click Next twice.



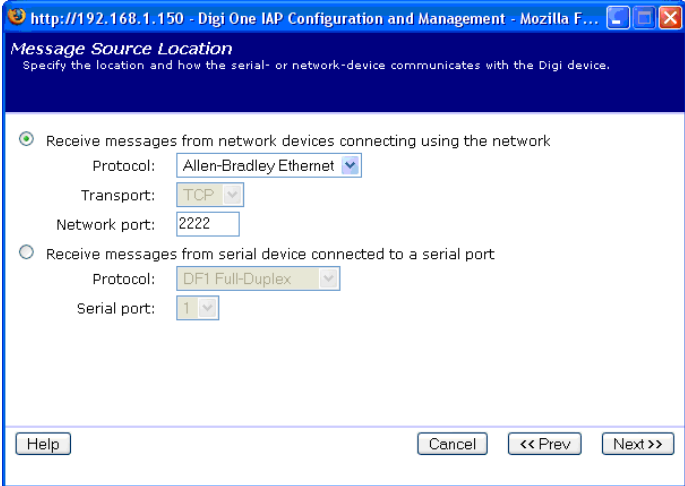
The screenshot shows a web browser window titled "http://192.168.1.150 - Digi One IAP Configuration and Management - Mozilla F...". The main content area is titled "Industrial Automation Protocol Family" and contains the instruction: "Specify the protocol family or families that the automation devices or PLCs use to communicate with one another." There are five radio button options:

- Modbus Family (Modbus/RTU, Modbus/ASCII, Modbus/TCP)
- Rockwell/PCCC Family (DF1 Full-Duplex, DF1 Radio Modem, DF1 Half-Duplex, Allen-Bradley Ethernet, EtherNet/IP)
- Protocol Mapping (Allow multiple automation devices to communicate with each other using different protocols and families)
- Omron Family (Omron Hostlink)
- Custom/User Defined (Allow automation devices to communicate with each other using a custom-defined protocol not listed above)

At the bottom of the window, there are four buttons: "Help", "Cancel", "<< Prev", and "Next >>".

Choosing Industrial Protocol

The first source that will be setup is the interface for RSLinx so choose Allen-Bradley Ethernet and click Next.



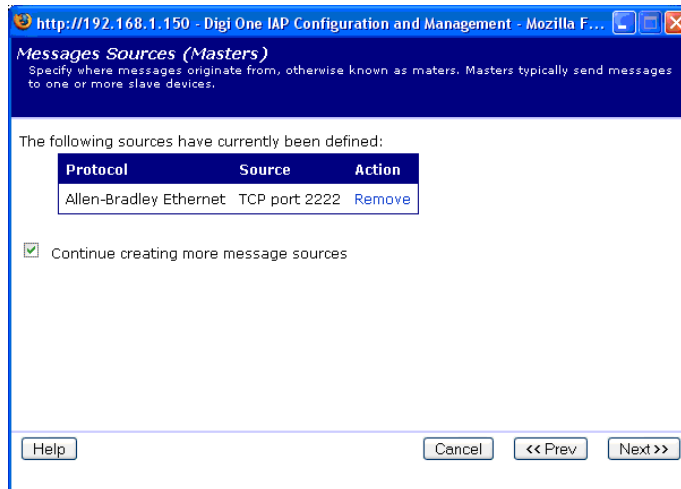
The screenshot shows a web browser window titled "http://192.168.1.150 - Digi One IAP Configuration and Management - Mozilla F...". The main content area is titled "Message Source Location" and contains the instruction: "Specify the location and how the serial- or network-device communicates with the Digi device." There are two radio button options:

- Receive messages from network devices connecting using the network
  - Protocol: Allen-Bradley Ethernet
  - Transport: TCP
  - Network port: 2222
- Receive messages from serial device connected to a serial port
  - Protocol: DF1 Full-Duplex
  - Serial port: 1

At the bottom of the window, there are four buttons: "Help", "Cancel", "<< Prev", and "Next >>".

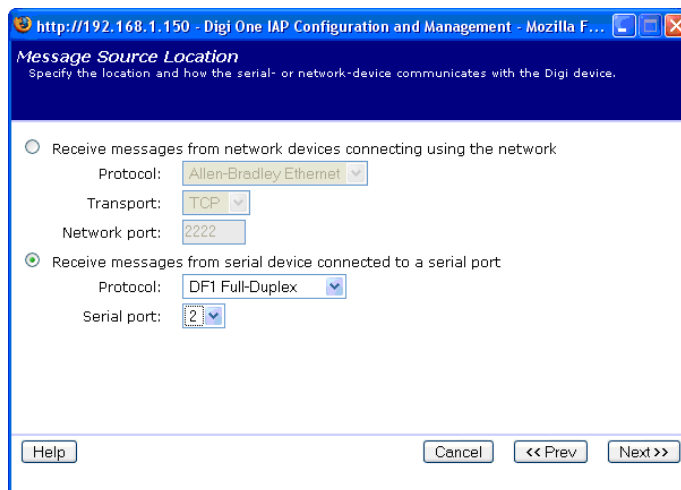
Choosing Message Source Location

Click Next until the following screen shows up and then check the Continue creating more message sources box and then click Next.



Message Source

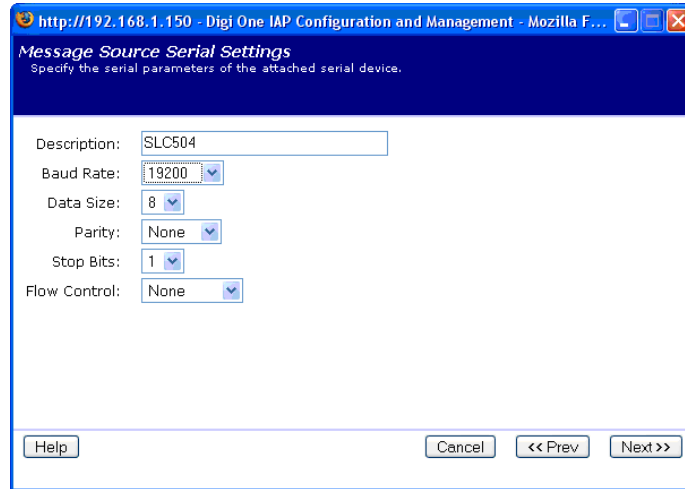
Select Receive messages from serial device connected to a serial port and choose DF1 Full-Duplex for the Protocol and 2 for the Serial port, click Next to continue.



Message Source Location

## Appendix 9 Detailed Configuration of DigiOne IAP Serial Gateway

Give the source a Description and configure the serial options to match the configuration of the PLC, then click Next.



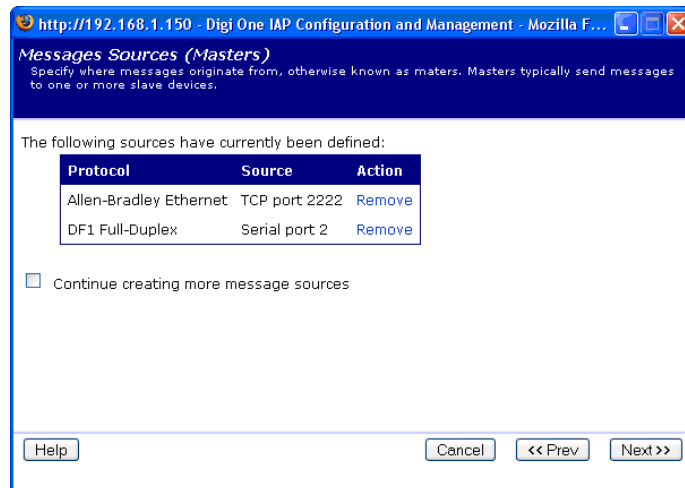
The screenshot shows a web browser window titled "http://192.168.1.150 - Digi One IAP Configuration and Management - Mozilla F...". The main content area is titled "Message Source Serial Settings" and contains the following fields:

- Description: SLC504
- Baud Rate: 19200
- Data Size: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None

At the bottom of the window are buttons for "Help", "Cancel", "<< Prev", and "Next >>".

Message Source Serial Settings

Click Next until the following screen shows up and then uncheck the Continue creating more message sources box and click Next.



The screenshot shows a web browser window titled "http://192.168.1.150 - Digi One IAP Configuration and Management - Mozilla F...". The main content area is titled "Messages Sources (Masters)" and contains the following information:

The following sources have currently been defined:

Protocol	Source	Action
Allen-Bradley Ethernet	TCP port 2222	<a href="#">Remove</a>
DF1 Full-Duplex	Serial port 2	<a href="#">Remove</a>

Continue creating more message sources

At the bottom of the window are buttons for "Help", "Cancel", "<< Prev", and "Next >>".

Message Sources

When the IAP receives communications it needs to know where to route the information. To send data to the SLC504 set protocol address to 0.

Message Destination Addresses

Address 0 communications need to be retransmitted over the serial port connected to the SLC. Set Protocol to DF1 Full-Duplex and Serial Port to 2.

Message Destination Location

## Appendix 9 Detailed Configuration of DigiOne IAP Serial Gateway

Click Next to accept defaults until returned to this screen and then check Continue creating more message destinations and Next.

Address	Protocol	Destination	Action
0	DF1 Full-Duplex	Serial port 2	Move Up Move Down Remove

Message Destinations (Slaves)

Now it is time to route communications to the MW100. In this case, all write and read commands issued from the SLC504 in this example are sent to Node 5 (it could be set to read or write to any other address). If the SLC is going to write to devices with different addresses, then confine the address to just the address of the specific MW100. In this example the IAP will route any message with an address of 5 to 255 to the MW100. Click Next to continue.

Send all messages to this destination

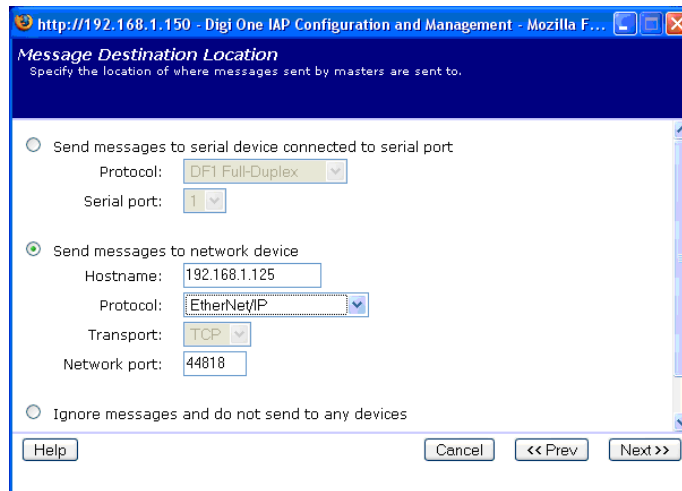
Send only messages matching specific protocol address  
Address: 0

Send only messages in a range of protocol addresses  
Addresses: 5 to 255

Message Destination Addresses

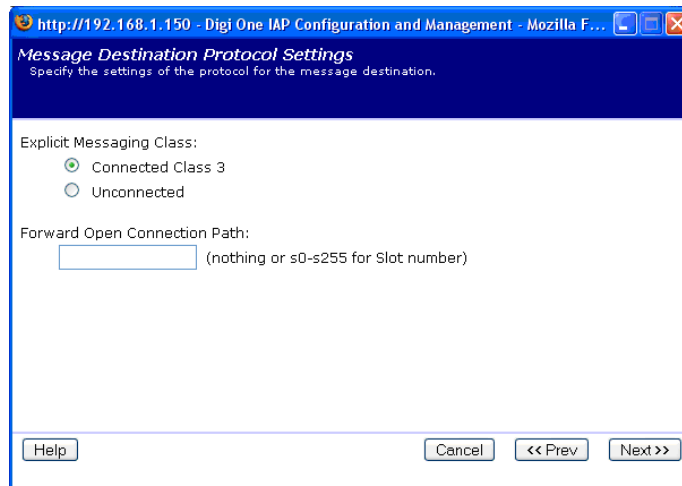


The next step is to tell the IAP where the MW100 is located and how to talk to it. Select Send messages to network device at Hostname – IP Address of MW100. Select EtherNet/IP for the Protocol and then Next.



Message Destination Location

When the Message Destination Protocol Settings screen shows up, ensure that Forward Open Connection Path: is left blank.



Message Destination Protocol Settings

## Appendix 9 Detailed Configuration of DigiOne IAP Serial Gateway

Click Next until the following screen shows up and then uncheck Continue creating more message destinations. Click Next to continue.

Address	Protocol	Destination	Action
0	DF1 Full-Duplex	Serial port 2	Move Up Move Down Remove
5 - 255	EtherNet/IP	192.168.1.125 on TCP port 44818	Move Up Move Down Remove

Continue creating more message destinations

Message Destinations (Slaves)

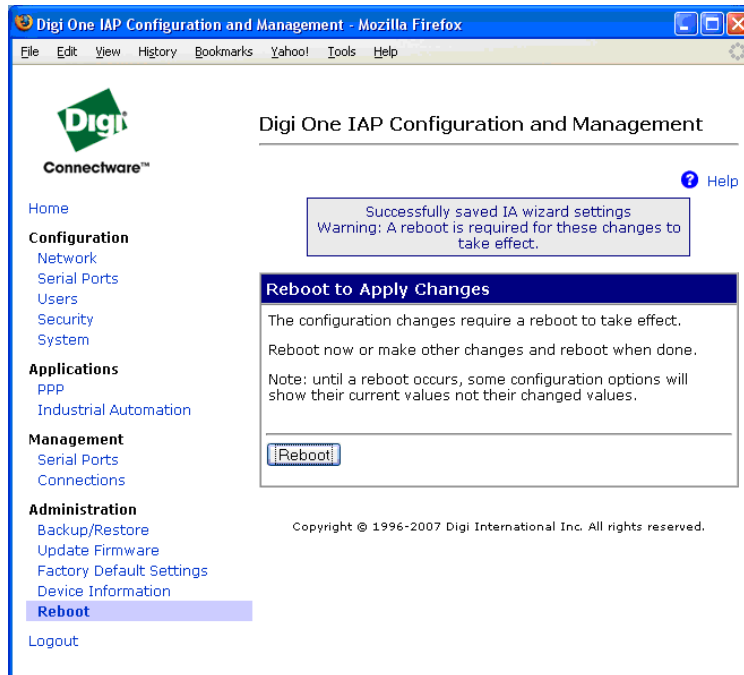
If all the settings match on the Summary page, click Finish to save the configuration in the IAP.

Protocol	Source	Settings
Allen-Bradley Ethernet	TCP port 2222	N/A
DF1 Full-Duplex	Serial port 2	19200 8N1 None

Address	Protocol	Destination	Settings
0	DF1 Full-Duplex	Serial port 2	19200 8N1 None
5 - 255	EtherNet/IP	192.168.1.125 on TCP port 44818	N/A

Summary

The IAP will then ask to be rebooted so that all the settings can take effect. Once the IAP is rebooted, the Digi One IAP and attached SLC 504 can now be added as an Ethernet Device (add driver) in RSLinx (use the IP address of the IAP as the IP address for the Ethernet Device).



Prompting rebooting

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