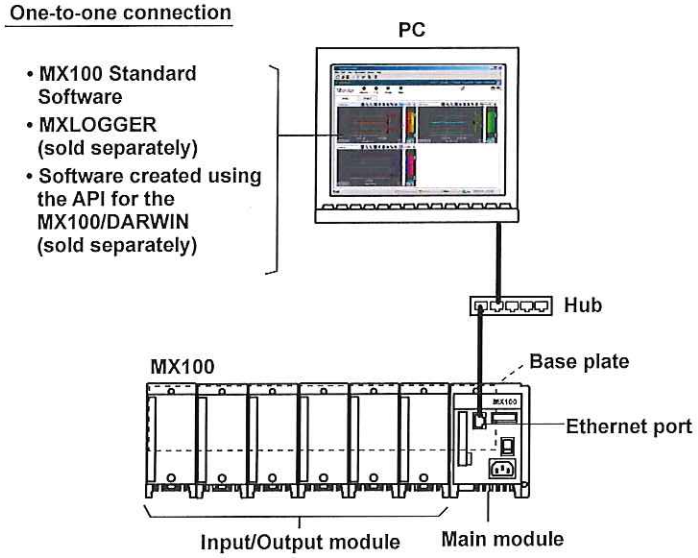
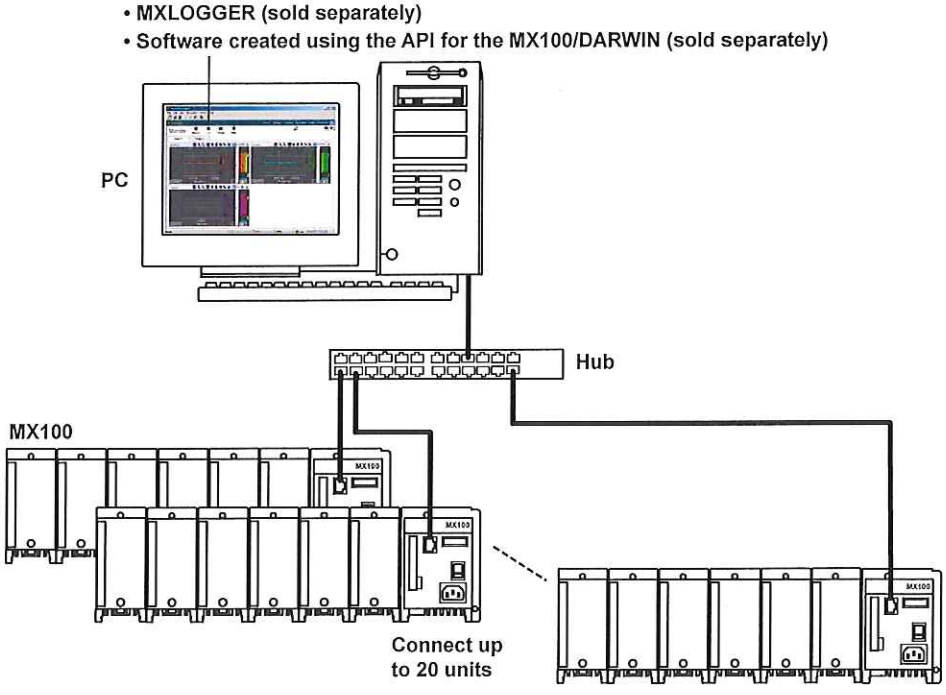
1.1 Overview of the MX100

The MX100 consists of the main module equipped with an Ethernet port, input/output modules that perform input or output of signals, and the base plate that attaches and connects all of these. By connecting the main module and a PC via the Ethernet interface and installing one of the dedicated software programs indicated below onto the PC, you can configure the acquisition conditions for the measured data from the PC as well as monitor and acquire the measured data on the PC. One to twenty MX100s can be connected to a single PC (one unit using the MX100 Standard Software, or one to twenty units (or up to 1200 input channels) using MXLOGGER).

One-to-one connection

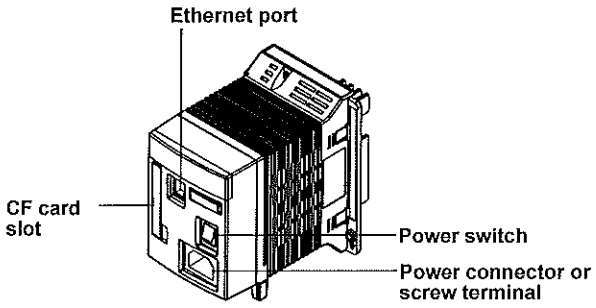


One-to-N connection



Main Module (MX100-E)

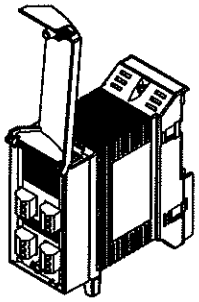
The main module is equipped with a power supply connector, a power switch, an Ethernet port, a CF card slot, and other parts. It controls the power supply to and the control of each input/output module, communications with a PC, data storage to the CF card when communication is disconnected, and other functions.



Input/Output Modules

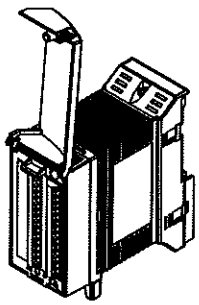
The following twelve types of modules are available. A plate with screw terminals and separately installed screw terminal block (both sold separately) are available as accessories for the 10-CH, Medium-Speed Universal Input Module and the 10-CH, High-Speed Digital Input Module.

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



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

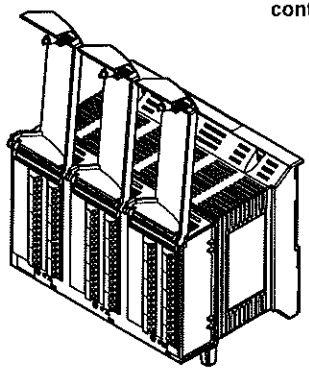
10-CH, Medium-Speed Universal Input Module (MX110-UNV-M10)



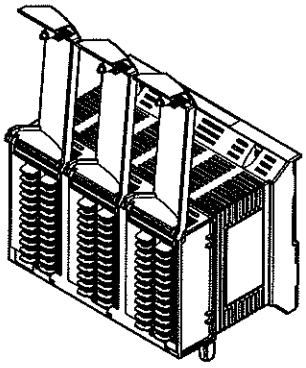
- **Minimum measurement interval: 100 ms**
- **Maximum number of inputs: 10 inputs**
- **Input types: DC voltage, TC, 3-wire RTD, and DI (LEVEL, non-voltage contact)**

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

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

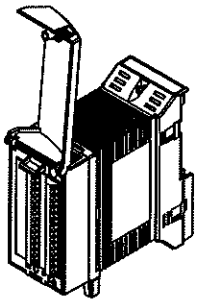


MX110-VTD-L30
(clamp terminal)



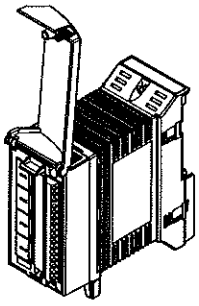
MX110-VTD-L30/H3
(M3 screw terminal)

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



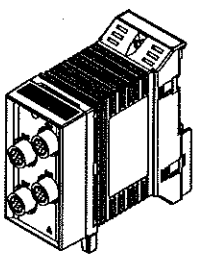
- Minimum measurement interval: 100 ms
- Maximum number of inputs: 6 inputs
- Input types: DC voltage, 4-wire RTD, 4-wire resistance, and DI (LEVEL, non-voltage contact)

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



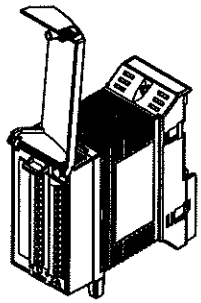
- Minimum measurement interval: 100 ms
- Maximum number of inputs: 4 inputs
- Input system: floating balanced input (isolation between channels)

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



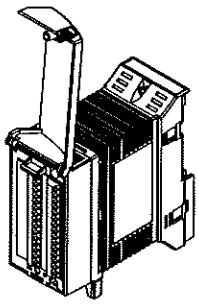
- Minimum measurement interval: 100 ms
- Maximum number of inputs: 4 inputs
- Input system: floating balanced input (non-isolation between channels)

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



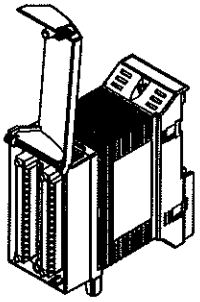
- Minimum measurement interval: 10 ms
- Maximum number of inputs: 10 inputs
- Input types: DI (non-voltage contact, open collector, and 5-V logic)

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



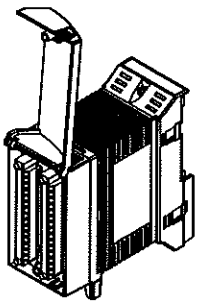
- Minimum measurement interval: 10 ms
- Maximum number of inputs: 10 inputs
- Input types: DI (24-V logic)

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



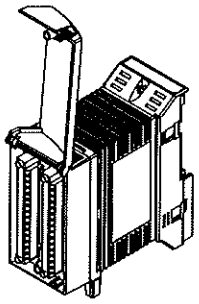
- Output update interval: 100 ms (shortest)
- Maximum number of inputs: 8 outputs
- Output type: DC voltage, DC current

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



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

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



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

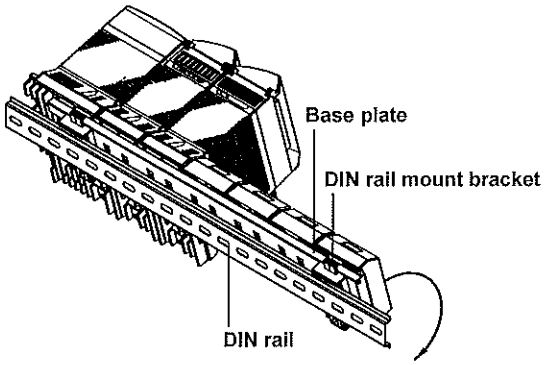
CAUTION

The 10-CH, Pulse Input Module (MX114-PLS-M10) cannot be used on the MX100 for the reasons below. Please use the 10-CH, Pulse Input Module with the MW100.

- Values measured on the MX100 are acquired by the MX100 Standard Software or MXLOGGER (sold separately).
  Pulse measurement values are transferred to the PC software every measurement interval per the MX100 clock. For pulse integral values, pulse measurement values sent from the MX100 per the PC clock are integrated on the PC.
  The error on the MX100 and PC clocks is different. Therefore discrepancies arise in the number of measurements and time, and the simultaneity of other measured values and pulse measured values is lost, along with the accuracy of pulse integral values.

Base Plate (MX150)

The base plate is equipped with connectors for connecting the main module and input/output modules.
Six different base plates are available to hold one to six input/output modules. You can rack-mount or panel-mount the MX100 by attaching a DIN rail mount bracket to this base plate.

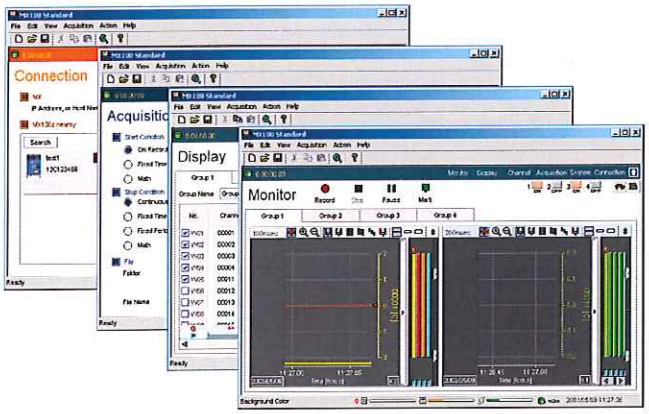


PC Software

One MX100 can be connected to a PC, and the MX100 Standard Software (that can acquire measured data) is included. The MX100 Standard Software consists of the three software programs below. For details about the software functions and operating procedures, see the *MX100 Standard Software User's Manual* (IM MX180-01E). When configuring a system using the MX100, the software release number and hardware style number matching conditions must be met (see "Notes" on page i).

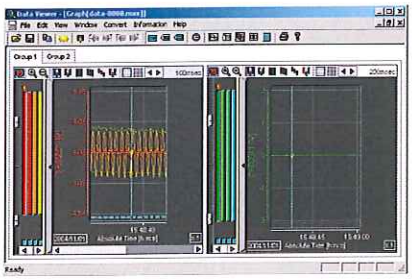
Integration Monitor

Enables you to connect or disconnect communications, configure acquisition conditions and display conditions of the measurement channels, set up computations channels, monitor measured and computed data, save measured and computed data, and carry out other operations.



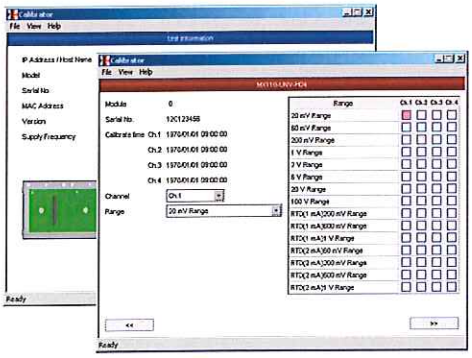
Viewer

Enables you to display measured and computed data that has been saved, read values and perform statistical computation over an area using cursors, and convert the measured and computed data into various file formats such as Excel.



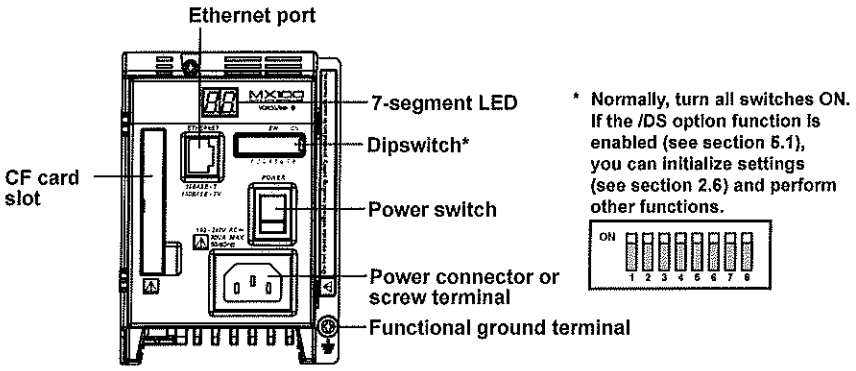
Calibrator

This program is used to calibrate the MX100 universal input modules, DCV/TC/DI input modules, 4-wire RTD resistance input module, strain input modules, and analog output module.



1.2 Main Module Functions

The main module is the heart of the MX100.

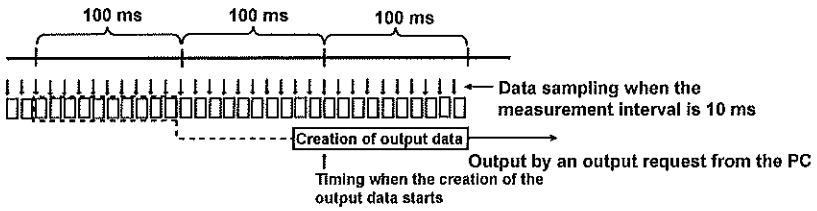


Communications

The main module is equipped with one auto-negotiating 10BASE-T/100BASE-TX Ethernet port. The LEDs at the upper-left and lower-left of the port indicate the communication status of the Ethernet interface.

Measurement

The main module acquires measured data sampled at specified intervals on each input module is acquired. Correcting computation, conversion to physical quantities, and other processes are performed on the acquired measured data, followed by transmission of measured data to a PC via the Ethernet interface at 100-ms intervals (shortest). Even if sampled at intervals less than 100 ms (10 ms or 50 ms), the data is transmitted collectively at 100-ms intervals. In addition, the main module receives output commands sent from the PC as necessary and generates signal output instructions to the output modules.



Synchronization of Measurements

- Synchronization between modules
  If set to the same measurement interval, measurements made by input modules in the same acquisition unit are synchronized.
- Synchronization between channels
  On the 4-CH, High-Speed Universal Input modules and 10-CH, high speed digital input modules (-D05 and -D24), measurements between channels are synchronized.
  On the 10-CH, Medium-Speed Universal Input modules, 30-CH, Medium-Speed DCV/TC/DI Input Modules, 6-CH Medium-Speed Four-Wire RTD Resistance Input modules, and 4-CH, Medium-Speed Strain Input modules (-B12, -B35, and -NDI), measurements are made sequentially one channel at a time. Therefore, measurements are not synchronized between channels (we can consider them synchronized within the measurement interval).

Measurement Time (When Using the MX100 Standard Software)

When a measurement start request or a measurement data output request is made by a PC to the main module, the PC's time information is transmitted to the main module. The main module generates measurement time using the internal clock based on the time when the measurement start request is received. When the measured data is sent to the PC, the PC's time information along with the measurement time information on the main module is returned to the PC. The time information used in the monitoring of the measured data on the PC is that of the main module. When measurement is made over an extended time, the time between the PC and main module may be misaligned (up to 60 seconds in one week excluding the accuracy of the PC clock). As a remedy to this problem, when the measured data is recorded (saved) on the PC, the PC's time information is stored along with the measurement time information on the main module. When the Viewer of the MX100 Standard Software is used to open the recorded measurement data, the "time synchronization" function can be used to correct the measurement time relative to the PC's time based on the PC's time information. For details on the time synchronization function, see the Technical Information, *MX100 Performance Specifications* (TI 04M08B01-00E). For information on obtaining a copy, contact your nearest YOKOGAWA dealer.

Range Over

When the MW100 detects a range over (see below) on a measurement or MATH channel, "+Over" or "-Over" is displayed.

- **Measurement channel range over**
  - During DC voltage input, strain input, and resistance (20 Ω, 200 Ω, etc.), a range over is detected if the value that is measured on a measurement channel is outside of the measurable range by more than ±5%. For example, when the measurement range is 2 V, the measurable range is -2.0000 to 2.0000 V. If the voltage exceeds 2.2000 V or goes below -2.2000 V, a range over is detected.
  - During high-resolution DC voltage input and pulse input, a value less than 0% of the measurable range is a negative range over, and a value greater than 105% of the measurable range is a positive range over.
  - If the input type is thermocouple or RTD, excluding the cases where the thermocouple or RTD has a special range, a range over is detected when the temperature goes more than approximately 10°C above or below the measurable range. For example, when the measurement range is set to R, the measurable range is 0.0 to 1760.0°C. If the temperature exceeds 1770.0°C, "+Over" will be displayed. If the temperature goes below -10.0°C, "-Over" will be displayed. The special ranges mentioned here are ranges such as KpvsAu7Fe or J263. If you are using a special range, "-Over" will be displayed if the temperature goes below approximately 0°C.
  - On channels that use linear scaling, the range-over values, after removing the decimal point, are above 32000 and below -32000. However, even if the measured value is within ±30000, if it is a range-over value according to the previous range, it will be handled as a range-over value.
  - When you are performing differential computation between channels (see "Computation" on next page), if the measured value is outside of the measurable range, a range over will be detected. When you are using a sensor such as a thermocouple, the measurable range when performing differential computation between channels may be larger than the measurable range when not performing differential computation between channels.

Filters

The main module is equipped with a first-order lag filter (see section 2.7, "Measures against Noise on the MX100". You can select a time constant (time until 63.2% of the output value is reached) corresponding to the measurement interval indicated in the equation below.

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

Computation

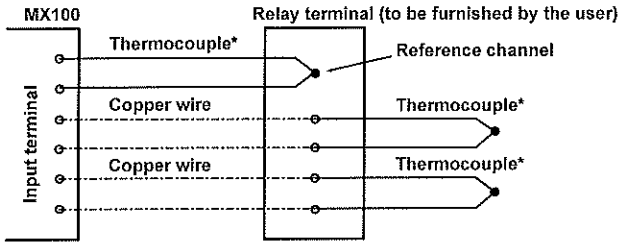
Difference computation between channels and linear scaling are possible. Linear scaling converts the measured values to values suitable for a particular purpose (scaled values) using the following equation.

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

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

Remote RJC (RRJC)

In measuring temperature with thermocouples within the same unit, when the item to be measured is located at a great distance, you can setup relay terminals near the item, measure the temperature of the relay terminal section using thermocouples (reference channel), and use the resultant value as the reference junction compensation value for the temperature measurement. By connecting a copper wire between the relay terminal and input terminal of the input module, and a thermocouple between the DUT and relay terminal, you can measure the temperature of the DUT without the need for a large amount of expensive thermocouples.



* Use the same type of thermocouples.

Alarms

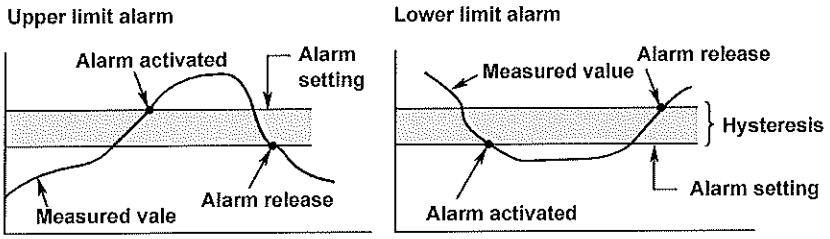
This function outputs alarms when measured or computed values* meet certain conditions. Select up to four alarms of the following six types on each channel.

- **Upper limit alarm**
  Generates an alarm when the measured or computed value* is greater than or equal to the alarm value.
- **Lower limit alarm**
  Generates an alarm when the measured or computed value* is less than or equal to the alarm value.
- **Differential upper limit alarm**
  Generates an alarm when differential input values (difference between the measured value of a channel and that of the reference channel) are greater than or equal to the alarm value.
- **Differential lower limit alarm**
  Generates an alarm when differential input values (difference between the measured value of a channel and that of the reference channel) are less than or equal to the alarm value.
- **Upper limit on rate-of-change alarm***
  Generates an alarm if the amount of change in the computed value in the rising direction exceeds the alarm value within the rate-of-change detection interval.
- **Lower limit on rate-of-change alarm***
  Generates an alarm if the amount of change in the computed value in the falling direction exceeds the alarm value within the rate-of-change detection interval.

* When using computed value alarms, do not disconnect the MX100 and the PC software. Alarms will not occur because the Computation function will not work on the MX100 by itself.

Alarm Value Hysteresis

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



Alarm Output Timing

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

Contents Displayed on the 7-Segment LED

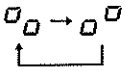
The two-digit 7-segment LED displays the unit number, operating status, operation complete, and operation error of the MX100.

Unit Number Display

When connecting to the MX100 Standard Software, the unit number is fixed to 00 and displayed as "00." When connecting to MXLOGGER (sold separately), the unit number is displayed as "00" to "19."

Display of the Self-Test Operation at Power On

When the power is turned ON the dip switch indicator lights (normally displays "00", or "0F" when the /DS option functions enabled), the operation ready indicator lights (the 88 display, and others), then the self-test is carried out. While the self-test is in progress, the following symbols are alternately displayed.



Operation Mode Hold Function Display (Only When the /DS Option Function is Installed)

Following the self-check, the /DS option function execution confirmation ("- -" is displayed.

Operation Mode Display

The MX100 has three operation modes: idle mode, measurement mode, and backup mode (measured data saved to a CF card due to the disconnection of communications). The modes are displayed as shown below. In the figure below, 00 indicates the unit number. If the unit number is not 00, the specified unit number is displayed.

- **Idle mode** — 00 — **Two zeroes**
- **Measurement mode** — 00. — **Two zeroes and a dot**
- **Backup mode** — 00.. — **Two zeroes and two dots**

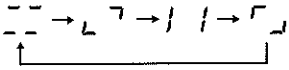
Display When Operation Is Complete

The figure below shows the display that appears when an operation such as IP address configuration and measurement condition change is completed. In the figure below, the unit number is "00." If the unit number is not 00, the specified unit number is displayed.

00 → **Turns off for 1 second** → 00

Display during Processing

The displays shown below repeats when the CF card is accessed, when the CF card is being formatted, or when calibration is taking place.



Unit Confirmation Display

The figure below shows the display that appears when you confirm the MX100 that is connected using the MX100 Standard Software or MXLOGGER (sold separately). The word –CALL– flows through the display from left to right.

- → - - → -C → CA → AL → LL → L - → - - → -

Operation Error Display

For details on the display and meaning of errors, see section 3.1, "Error Display on the 7-Segment LED and Corrective Actions."

Saving Data to the CF Card

Data Saving When Communication Is Disconnected and Dual Save Function

If communication is disconnected while the PC is recording (saving) measured data and a 60-s timeout* expires, the measured data is saved to the CF card at 60-s intervals. When the save operation is started, a file is created for each measurement interval (referred to as the *monitor interval* on the MX100 Standard Software). As the save operation progresses and the file for the shortest measurement interval reaches 5 MB, the file is closed. At the same time, files of other measurement intervals (files that have not reached 5 MB) are also closed. Then, a new file is created for each measurement interval setting once again, and the save operation continues. When the communication with the PC resumes and acquisition of measured data resumes, the save operation automatically stops.

If the /DS option function (see "Saving Data to the CF Card" in section 5.1) is enabled, saving of measured data to the CF card is linked to recording on the PC, even if communication is disconnected.

To manually stop the operation, press the access stop switch (see "Ejecting the CF Card" in section 2.8) located above the CF card slot on the main module.

The table below shows the interval (a guideline) over which data can be saved to the CF card when one type of measurement interval is used.

* The time from the point when the communication between the PC and MX100 is disconnected and acquisition of measured data is stopped to the point when data storage to the CF card starts.

Number of Saved CHs	Measurement Interval	Capacity of the CF card						
		32 MB (6 files)	64 MB (12 files)	128 MB (34 files)	256 MB (49 files)	512 MB (98 files)	1 GB (196 files)	2 GB (390 files)
10 CHs	10 ms	2.1 hours	4.2 hours	8.7 hours	17.5 hours	35.3 hours	2.9 days	5.9 days
	50 ms	10.9 hours	21.8 hours	1.8 days	3.6 days	7.3 days	14 days	29 days
	100 ms	21.8 hours	1.8 days	3.6 days	7.2 days	14 days	29 days	59 days
	200 ms	1.8 days	3.6 days	7.2 days	14 days	29 days	59 days	118 days
	500 ms	4.5 days	9 days	18 days	36 days	73 days	147 days	295 days
	1 s	9 days	18 days	36 days	72 days	147 days	295 days	591 days
	2 s	18 days	36 days	72 days	145 days	294 days	591 days	1182 days
24 CHs	10 ms	54 min.	1.8 hours	3.6 hours	7.3 hours	14.7 hours	29.5 hours	2.4 days
	50 ms	4.5 hours	9 hours	18 hours	1.5 days	3 days	6.1 days	12 days
	100 ms	9 hours	18 hours	1.5 days	3 days	6.1 days	12 days	24 days
	200 ms	18.1 hours	1.5 days	3 days	6.1 days	12 days	24 days	49 days
	500 ms	1.8 days	3.7 days	7.5 days	15 days	30 days	61 days	122 days
	1 s	3.7 days	7.5 days	15 days	30 days	61 days	123 days	246 days
	2 s	7.5 days	15 days	30 days	60 days	122 days	246 days	492 days
60 CHs	10 ms	21 min.	42 min.	1.4 hours	2.9 hours	5.8 hours	11.7 hours	23.4 hours
	50 ms	1.8 hours	3.6 hours	7.2 hours	14.7 hours	29.4 hours	2.4 days	4.9 days
	100 ms	3.6 hours	7.2 hours	14.4 hours	29.4 hours	2.4 days	4.9 days	9.8 days
	200 ms	7.2 hours	14.4 hours	28.8 hours	2.4 days	4.9 days	9.8 days	19 days
	500 ms	18.1 hours	1.5 days	3 days	6 days	12 days	24 days	49 days
	1 s	1.5 days	3 days	6 days	12 days	24 days	49 days	98 days
	2 s	3 days	6 days	12 days	24 days	49 days	98 days	196 days

File Structure and Saved Channels

A file is created on the CF card for every measurement interval. The measurement interval is the one specified as the monitor interval under Measurement Group in the Acquisition Conditions screen of the MX100 Standard Software (not the recording interval).

Measurement groups of the same monitoring interval are saved to the same file.

The channels saved to the file are those whose Monitor check boxes are selected in the Channel screen (not those whose Record check boxes are selected). For other specifications relating to saving of data, see "Data Storage" in section 4.2.

Precautions When Using the CF Card

On the MX100, measured data can only be saved to the CF card (backed up) when recording of measured data to the PC via communications is turned OFF (unless the /DS option function is active). In this case, saving of data to the CF card presumes that the following conditions are met.

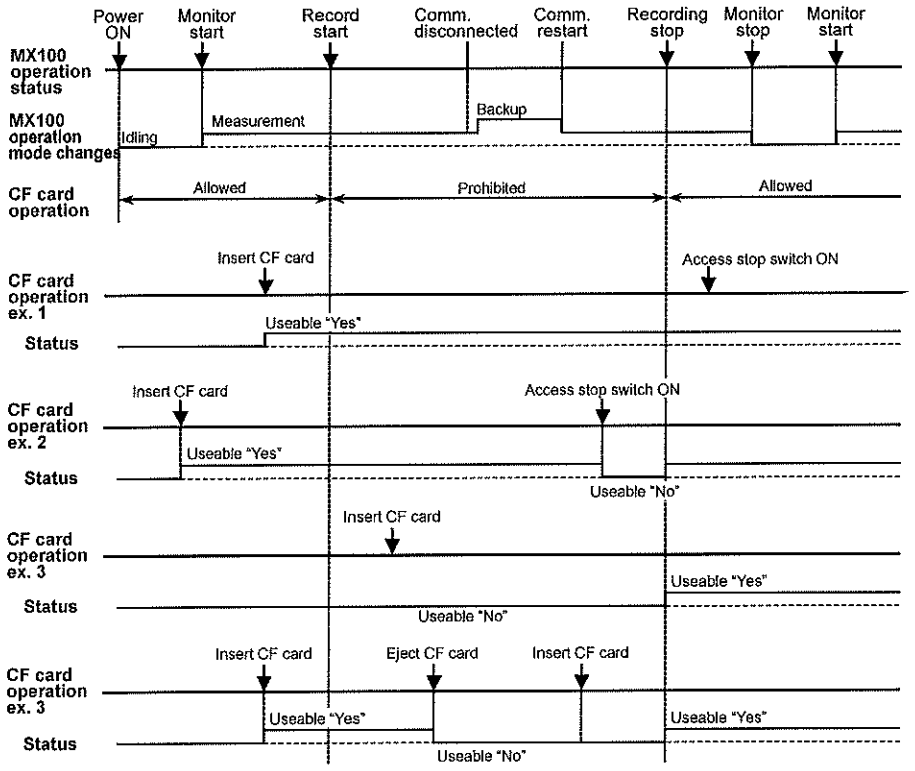
- **Checking the CF Card Status**
  Before starting recording, check that the CF card is inserted into the slot, the installation status is "Exists," and that "Usable" is "Yes."
  When using the MX100 Standard Software, check that the Status display under CF Card Information in the System screen is "Exists (Usable)." See "Explanation" in section 2.2 of the MX100 Standard Software User's Manual (IMMX180-01E).
  When using the API for MX100/DARWIN, check the installation status and usability by sending the status request command (getStatusDataMX).

Note

- If data saving has been restored after being disabled, due to a media-related error, check that the installation status is "Exists," and that Usable is "Yes."
- If the CF card is inserted during recording and the installation status is "Exists" but Usable is "No," data cannot be saved (example 3 in the CF card operation diagram below).

- **Operation of the CF Card**
  If you press the access stop switch (see "Ejecting the CF Card" in section 2.8) during recording, data is not saved to the CF card even if communication is disconnected.

MX100 Operation and Status Relative to CF Card Operation



Log File Storage

In addition to the measured data that is saved when the communication with the PC is disconnected, a log file of information related to the CF card operation and information of power ON/OFF is saved to the CF card in text format (MX100MLG.TXT). The maximum size of the log file is 40 KB. Up to 1021 events can be stored. When 1021 events are exceeded, the event is deleted in order from the oldest information. The log is written (overwritten to the same file name) to the CF card when you press the access stop switch (see "Ejecting the CF Card" in section 2.8).

Information Saved to the Log File

- Date/Time when the power is turn ON or OFF.
- Date/Time when the CF card is inserted or ejected.
- Save mode when data is saved (backup) and the start/stop log.
- The file creation and deletion log.
- Media-related errors.
- The CF card formatting log.

Log File Example

```
Yokogawa DAQMASTER MX100 <Media Info>
  Date      Time    Status  Message
70/01/01 00:00:00 Power   off
03/01/01 00:00:01 Power   on
03/03/25 10:12:13 Format  ok
03/03/25 11:14:12 Backup  start
03/03/25 11:14:12 Mode    rotary
03/03/25 11:14:13 Delete  (--)
03/03/25 11:14:21 Create  32500000
03/03/25 11:14:36 Code    12 MF
03/03/25 11:14:36 Error   P3
03/03/25 11:14:54 Backup  stop
03/03/25 11:15:18 Create  MX100MLG
03/03/25 11:15:22 Card    out
03/03/25 11:15:25 Card    in
>>
```

Time indicating that the settings have been initialized*

Time after resetting the internal clock*

Media error (records the error code)

Most-recent information

Termination mark

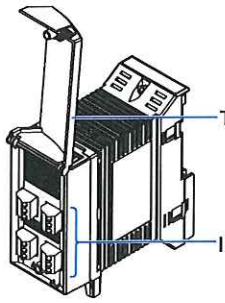
*** When the MX100 is initialized, the date/time on the MX100 is reset to 1970/01/01 00:00:00 once, then to the default value on the MX100 (2003/01/01 00:00:00). Then, when the PC software is started and connection to the MX100 is made, the current date/time on the PC is transmitted to the MX100. The MX100 is reset to the received date/time.**

CF Card Specifications

Item	Specification
Capacity	2 GB maximum
Type	Type I or Type II
Format	Supports quick (logical) format. 1 partition format (hard disk format) is possible only through a command from the PC when the MX operation mode is idle.
File system	FAT or FAT16

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

This module is equipped with four inputs and measures DC voltage, Thermocouple, three-wire RTD, and digital input (DI) at a minimum measurement interval of 10 ms.



Input Type and Measurement Range

The following measurements are possible.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	20 mV	–20.000 to 20.000 mV
	60 mV	–60.00 to 60.00 mV
	200 mV	–200.00 to 200.00 mV
	2 V	–2.0000 to 2.0000 V
	6 V	–6.000 to 6.000 V
	20 V	–20.000 to 20.000 V
	100 V	–100.00 to 100.00 V
Thermocouple	R	0.0 to 1760.0°C
	S	
	B	0.0 to 1820.0°C
	K	–200.0 to 1370.0°C
	E	–200.0 to 800.0°C
	J	–200.0 to 1100.0°C
	T	–200.0 to 400.0°C
	N	0.0 to 1300.0°C
	W	0.0 to 2315.0°C
	L	–200.0 to 900.0°C
	U	–200.0 to 400.0°C
	KPvsAu7Fe	0.0 to 300.0K
RTD (Measurement current: 1 mA)	Pt100	–200.0 to 600.0°C
	JPt100	–200.0 to 550.0°C
	Pt100 (high resolution)	–140.00 to 150.00°C
	JPt100 (high resolution)	–140.00 to 150.00°C
	Ni100 SAMA	–200.0 to 250.0°C
	Ni100 DIN	–60.0 to 180.0°C
	Ni120	–70.0 to 200.0°C
RTD (Measurement current: 2 mA)	Pt100	–200.0 to 250.0°C
	JPt100	–200.0 to 250.0°C
	Pt100 (high resolution)	–140.00 to 150.00°C
	JPt100 (high resolution)	–140.00 to 150.00°C
	Pt50	–200.0 to 550.0°C
	Cu10 GE	–200.0 to 300.0°C
	Cu10 L&N	–200.0 to 300.0°C
	Cu10 WEED	–200.0 to 300.0°C
	Cu10 BAILEY	–200.0 to 300.0°C
	J263B	0.0 to 300.0K
DI	Level	Vth = 2.4 V
	Contact input	ON: 100 Ω or less, OFF: 10 kΩ or more

The following inputs can be used on MXLOGGER or MX100/DARWIN API sold separately. These inputs cannot be used with the MX100 Standard Software.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	60 mV (high resolution)	0.000 to 60.000 mV
	1 V	–1.0000 to 1.0000 V
	6 V (high resolution)	0.0000 to 6.0000 V
Thermocouple	PLATINEL	0.0 to 1400.0°C
	PR40-20	0.0 to 1900.0°C
	NiNiMo	0.0 to 1310.0°C
	WRe3-25	0.0 to 2400.0°C
	W/WRe26	0.0 to 2400.0°C
	N (AWG14)	0.0 to 1300.0°C
	XK GOST	–200.0 to 600.0°C
RTD (Measurement current: 1 mA)	Pt100 (noise resistance)	–200.0 to 600.0°C
	JPt100 (noise resistance)	–200.0 to 550.0°C
	Pt100 GOST	–200.0 to 600.0°C
RTD (Measurement current: 2 mA)	Cu10 at 20°C alpha = 0.00392	–200.0 to 300.0°C
	Cu10 at 20°C alpha = 0.00393	–200.0 to 300.0°C
	Cu25 at 0°C alpha = 0.00425	–200.0 to 300.0°C
	Cu53 at 0°C alpha = 0.00426035	–50.0 to 150.0°C
	Cu100 at 0°C alpha = 0.00425	–50.0 to 150.0°C
	Pt25 (JPt100 × 1/4)	–200.0 to 550.0°C
	Cu10 GE (high resolution)	–200.0 to 300.0°C
	Cu10 L&N (high resolution)	–200.0 to 300.0°C
	Cu10 WEED (high resolution)	–200.0 to 300.0°C
	Cu10 BAILEY (high resolution)	–200.0 to 300.0°C
	Pt100 (noise resistance)	–200.0 to 250.0°C
	JPt100 (noise resistance)	–200.0 to 250.0°C
	Cu100 GOST	–200.0 to 200.0°C
	Cu50 GOST	–200.0 to 200.0°C
	Cu10 GOST	–200.0 to 200.0°C

Measurement Interval, Integration Time, and Filter

The table below shows the available measurement intervals. The module is equipped with an integrating A/D converter. The selectable integration time varies depending on the measurement interval as shown in the table below. For details about the relationship between noise and integration time, see section 2.7, "Measures against Noise on the MX100" In addition, the type of noise rejection filter switches as shown in the table below.

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

* Since the power supply frequency noise is not rejected, the measured vales may fluctuate especially with temperature measurement. In such cases, set the measurement interval to 50 ms or higher.

Measurement Synchronization

Each input channel has its own A/D converter. Therefore, measurements on each channel are synchronized.

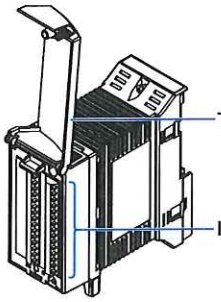
Common Mode Voltage

The common mode voltage between channels in a single module is 250 VACrms when the signal is applied continuously.

The common mode voltage between modules and between a module and earth is 600 VACrms when the signal is applied continuously.

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

This module is equipped with ten inputs and measures DC voltage, Thermocouple, three-wire RTD, and digital input (DI) at a minimum measurement interval of 100 ms.



Input Type and Measurement Range

The following measurements are possible.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	20 mV	–20.000 to 20.000 mV
	60 mV	–60.00 to 60.00 mV
	200 mV	–200.00 to 200.00 mV
	2 V	–2.0000 to 2.0000 V
	6 V	–6.000 to 6.000 V
	20 V	–20.000 to 20.000 V
	100 V	–100.00 to 100.00 V
Thermocouple	R	0.0 to 1760.0°C
	S	
	B	0.0 to 1820.0°C
	K	–200.0 to 1370.0°C
	E	–200.0 to 800.0°C
	J	–200.0 to 1100.0°C
	T	–200.0 to 400.0°C
	N	0.0 to 1300.0°C
	W	0.0 to 2315.0°C
	L	–200.0 to 900.0°C
	U	–200.0 to 400.0°C
	KPvsAu7Fe	0.0 to 300.0K
RTD (Measurement current: 1 mA)	Pt100	–200.0 to 600.0°C
	JPt100	–200.0 to 550.0°C
	Pt100 (high resolution)	–140.00 to 150.00°C
	JPt100 (high resolution)	–140.00 to 150.00°C
	Ni100 SAMA	–200.0 to 250.0°C
	Ni100 DIN	–60.0 to 180.0°C
	Ni120	–70.0 to 200.0°C
	Pt50	–200.0 to 550.0°C
	Cu10 GE	–200.0 to 300.0°C
	Cu10 L&N	–200.0 to 300.0°C
	Cu10 WEED	–200.0 to 300.0°C
	Cu10 BAILEY	–200.0 to 300.0°C
	J263B	0.0 to 300.0K
DI	Level	Vth = 2.4 V
	Contact input	ON: 1 kΩ or less, OFF: 100 kΩ or more (parallel capacitance: 0.01 µF or less)

The following inputs can be used on MXLOGGER or the MX100/DARWIN API (sold separately). These inputs cannot be used with the MX100 Standard Software.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	60 mV (high resolution)	0.000 to 60.000 mV
	1 V	–1.0000 to 1.0000 V
	6 V (high resolution)	0.0000 to 6.0000 V
Thermocouple	PLATINEL	0.0 to 1400.0°C
	PR40-20	0.0 to 1900.0°C
	NiNiMo	0.0 to 1310.0°C
	WRe3-25	0.0 to 2400.0°C
	W/WRe26	0.0 to 2400.0°C
	N (AWG14)	0.0 to 1300.0°C
	XK GOST	–200.0 to 600.0°C
RTD (Measurement current: 1 mA)	Cu10 at 20°C alpha = 0.00392	–200.0 to 300.0°C
	Cu10 at 20°C alpha = 0.00393	–200.0 to 300.0°C
	Cu25 at 0°C alpha = 0.00425	–200.0 to 300.0°C
	Cu53 at 0°C alpha = 0.00426035	–50.0 to 150.0°C
	Cu100 at 0°C alpha = 0.00425	–50.0 to 150.0°C
	Pt25 (JPt100 × 1/4)	–200.0 to 550.0°C
	Cu10 GE (high resolution)	–200.0 to 300.0°C
	Cu10 L&N (high resolution)	–200.0 to 300.0°C
	Cu10 WEED (high resolution)	–200.0 to 300.0°C
	Cu10 BAILEY (high resolution)	–200.0 to 300.0°C
	Pt100 GOST	–200.0 to 600.0°C
	Cu100 GOST	–200.0 to 200.0°C
	Cu50 GOST	–200.0 to 200.0°C
	Cu10 GOST	–200.0 to 200.0°C

Measurement Interval, Integration Time, and Filter

The table below shows the available measurement intervals. The module is equipped with an integrating A/D converter. The selectable integration time varies depending on the measurement interval as shown in the table below. For details about the relationship between noise and integration time, see section 2.7, "Measures against Noise on the MX100" In addition, the type of noise rejection filter switches as shown in the table below.

Measurement Interval	Integration Time	Burnout Detection Cycle	Filter	Rejected Noise and Notes
100 ms	1.67 ms	1 s*1	Rectangular	600 Hz and its integer multiples*2
200 ms		Measurement interval		
500 ms	16.67 ms			60 Hz and its integer multiples
	20 ms			50 Hz and its integer multiples
	Auto			Automatically detects the power supply frequency and set 16.67 or 20 ms
1 s	36.67 ms		Trapezoidal	50 Hz or 60 Hz and their integer multiples
2 s	100 ms		Rectangular	10 Hz and its integer multiples
5, 10, 20, 30, 60 s	200 ms		Cos	Fc = 5-Hz low-pass filter

*1 If the measurement interval is 100 ms, burnout detection is carried out on a single channel during one measurement interval. Therefore, when starting measurement during the burnout condition or thereafter, burnout can be detected for up to 10 measurements (approximately 1 second).

*2 Since the power supply frequency noise is not rejected, the measured vales may fluctuate especially with temperature measurement. In such cases, set the measurement interval to 500 ms or higher, or use the 4-CH, High-Speed Universal Input Module.

Measurement Synchronization

The module is equipped with a single A/D converter, and measurement is made sequentially. Therefore, measurements of each channel are not synchronized.

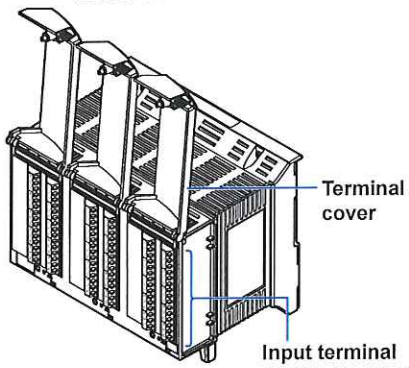
Common Mode Voltage

The common mode voltage between channels in a single module is 120 VACrms when the signal is applied continuously. The common mode voltage between modules and between a module and earth is 600 VACrms when the signal is applied continuously.

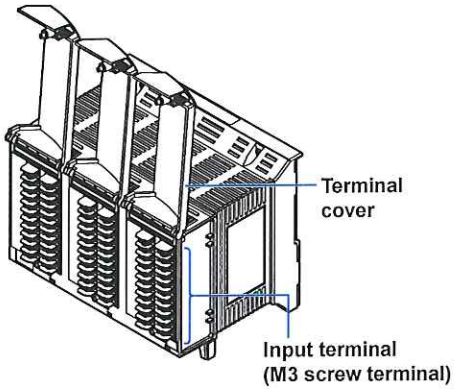
1.5 Functions of the 30-CH, Medium-Speed DCV/ TC/DI Input Module

This module is equipped with 30 inputs and measures DC voltage, Thermocouple, and digital input (DI) at a minimum measurement interval of 500 ms.
It takes up three modules worth of space when attaching to the base plate.

MX110-VTD-L30



MX110-VTD-L30/H3



Input Type and Measurement Range

The following measurements are possible.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	20 mV	–20.000 to 20.000 mV
	60 mV	–60.00 to 60.00 mV
	200 mV	–200.00 to 200.00 mV
	2 V	–2.0000 to 2.0000 V
	6 V	–6.000 to 6.000 V
	20 V	–20.000 to 20.000 V
	100 V	–100.00 to 100.00 V
Thermocouple	R	0.0 to 1760.0°C
	S	
	B	0.0 to 1820.0°C
	K	–200.0 to 1370.0°C
	E	–200.0 to 800.0°C
	J	–200.0 to 1100.0°C
	T	–200.0 to 400.0°C
	N	0.0 to 1300.0°C
	W	0.0 to 2315.0°C
	L	–200.0 to 900.0°C
	U	–200.0 to 400.0°C
	KPvsAu7Fe	0.0 to 300.0K
DI	Level	Vth = 2.4 V
	Contact input	ON: 1 kΩ or less, OFF: 100 kΩ or more (parallel capacitance: 0.01 μF or less)

The following inputs can be used on MXLOGGER or the MX100/DARWIN API (sold separately). These inputs cannot be used with the MX100 Standard Software.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	60 mV (high resolution)	0.000 to 60.000 mV
	1 V	–1.0000 to 1.0000 V
	6 V (high resolution)	0.0000 to 6.0000 V
Thermocouple	PLATINEL	0.0 to 1400.0°C
	PR40-20	0.0 to 1900.0°C
	NiNiMo	0.0 to 1310.0°C
	WRe3-25	0.0 to 2400.0°C
	WWRe26	0.0 to 2400.0°C
	N (AWG14)	0.0 to 1300.0°C
	XK GOST	–200.0 to 600.0°C

Measurement Interval, Integration Time, and Filter

The table below shows the available measurement intervals. The module is equipped with an integrating A/D converter. The selectable integration time varies depending on the measurement interval as shown in the table below. For details about the relationship between noise and integration time, see section 2.7, "Measures against Noise on the MX100" In addition, the type of noise rejection filter switches as shown in the table below.

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

* Since the power supply frequency noise is not rejected, the measured vales may fluctuate especially with temperature measurement. In such cases, set the measurement interval to 1 s or higher, or use the 4-CH, High-Speed Universal Input Module or the 10-CH, Medium-Speed Universal Input Module.

Measurement Synchronization

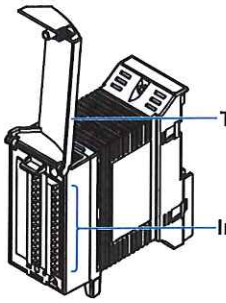
The module is equipped with a single A/D converter, and measurement is made sequentially. Therefore, measurements of each channel are not synchronized.

Common Mode Voltage

The common mode voltage between channels in a single module is 120 VACrms when the signal is applied continuously. The common mode voltage between modules and between a module and earth is 600 VACrms when the signal is applied continuously.

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

This module is equipped with six inputs and measures DC voltage, four-wire RTD, four-wire resistance, and digital input (DI) at a minimum measurement interval of 100 ms.



Input Type and Measurement Range

The following measurements are possible.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	20 mV	–20.000 to 20.000 mV
	60 mV	–60.00 to 60.00 mV
	200 mV	–200.00 to 200.00 mV
	2 V	–2.0000 to 2.0000 V
	6 V	–6.000 to 6.000 V
	20 V	–20.000 to 20.000 V
	100 V	–100.00 to 100.00 V
RTD*1 (Measurement current: 1 mA)	Pt100	–200.0 to 600.0°C
	JPt100	–200.0 to 550.0°C
	Pt100 (high resolution)	–140.00 to 150.00°C
	JPt100 (high resolution)	–140.00 to 150.00°C
	Ni100 SAMA	–200.0 to 250.0°C
	Ni100 DIN	–60.0 to 180.0°C
	Ni120	–70.0 to 200.0°C
	Pt50	–200.0 to 550.0°C
	Cu10 GE	–200.0 to 300.0°C
	Cu10 L&N	–200.0 to 300.0°C
	Cu10 WEED	–200.0 to 300.0°C
	Cu10 BAILEY	–200.0 to 300.0°C
	J263B	0.0 to 300.0K
DI	Level	Vth = 2.4 V
	Contact input	ON: 1 kΩ or less, OFF: 100 kΩ or more (parallel capacitance: 0.01 μF or less)
RTD*1, *2 (Measurement current: 0.25 mA)	Pt500	–200.0 to 600.0°C
	Pt1000	–200.0 to 600.0°C
Resistance*1	20 Ω (Measurement current: 1 mA)	0.000 to 20.000 Ω
	200 Ω (Measurement current: 1 mA)	0.00 to 200.00 Ω
	2 kΩ (Measurement current: 0.25 mA)	0.0 to 2000.0 Ω

*1 RTD and resistance are all 4-wire measurements

*2 The Pt500 resistance table is Pt100 × 5, and the resistance table for Pt1000 is Pt100 × 10

The following inputs can be used on MXLOGGER or the MX100/DARWIN API (sold separately). These inputs cannot be used with the MX100 Standard Software.

Input	Measurement Range Type	Rated Measurement Range
DC voltage	60 mV (high resolution)	0.000 to 60.000 mV
	1 V	–1.0000 to 1.0000 V
	6 V (high resolution)	0.0000 to 6.0000 V
RTD (Measurement current: 1 mA)	Cu10 at 20°C alpha = 0.00392	–200.0 to 300.0°C
	Cu10 at 20°C alpha = 0.00393	–200.0 to 300.0°C
	Cu25 at 0°C alpha = 0.00425	–200.0 to 300.0°C
	Cu53 at 0°C alpha = 0.00426035	–50.0 to 150.0°C
	Cu100 at 0°C alpha = 0.00425	–50.0 to 150.0°C
	Pt25 (JPt100 × 1/4)	–200.0 to 550.0°C
	Cu10 GE (high resolution)	–200.0 to 300.0°C
	Cu10 L&N (high resolution)	–200.0 to 300.0°C
	Cu10 WEED (high resolution)	–200.0 to 300.0°C
	Cu10 BAILEY (high resolution)	–200.0 to 300.0°C
	Pt100 GOST	–200.0 to 600.0°C
	Cu100 GOST	–200.0 to 200.0°C
	Cu50 GOST	–200.0 to 200.0°C
	Cu10 GOST	–200.0 to 200.0°C

Measurement Interval, Integration Time, and Filter

The table below shows the available measurement intervals. The module is equipped with an integrating A/D converter. The selectable integration time varies depending on the measurement interval as shown in the table below. For details about the relationship between noise and integration time, see section 2.7, "Measures against Noise on the MX100" In addition, the type of noise rejection filter switches as shown in the table below.

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

* Since the power supply frequency noise is not rejected, the measured vales may fluctuate especially with temperature measurement and 20 Ω measurement. In such cases, set the measurement interval to 500 ms or higher.

Measurement Synchronization

The module is equipped with a single A/D converter, and measurement is made sequentially. Therefore, measurements of each channel are not synchronized.

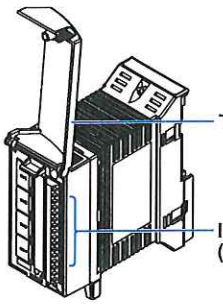
Common Mode Voltage

The common mode voltage between channels in a single module when applied continuously is 120 VACrms, and the resistance for RTD is 50 VACrms.
The common mode voltage between modules and between a module and earth is 600 VACrms when the signal is applied continuously.

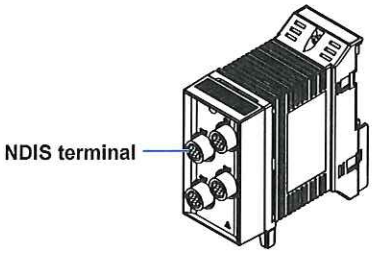
1.7 Functions of the 4-CH, Medium-Speed Strain Input Module (-B12, -B35, and -NDI)

This module is equipped with four inputs and measures strain from strain gauges and from strain gauge type sensors at a minimum measurement interval of 100 ms.

-B12, -B35



-NDI



Measurement Range

Input	Measurement Range Type	Rated Measurement Range
Strain	2000 μ Strain	–2000.0 to +2000.0 μ Strain
	20000 μ Strain	–20000 to +20000 μ Strain
	200000 μ Strain	–200000 to +200000 μ Strain

Measurement Interval, Integration Time, and Filter

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

* Since the power supply frequency noise is not rejected, the measured vales may fluctuate. In such cases, set the measurement interval to 200 ms or higher.

Measurement Synchronization

The module is equipped with a single A/D converter, and measurement is made sequentially. Therefore, measurements of each channel are not synchronized.

Common Mode Voltage

For -B12 or -B35

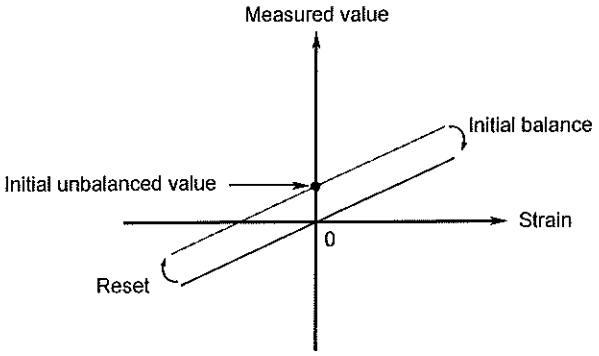
The common mode voltage between channels in a single module when applied continuously is 30 VACrms, or 250 VACrms between input and ground.

For -NDI

The common mode voltage between channels in a single module when applied continuously is 30 VACrms, and 30 VACrms between input and ground (shell is non-isolated).

Initial Balancing (Initial Unbalance Value Adjustment)

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



With the MX100, initial balancing is performed in the ±10000 μ strain range.

Initial balance: The value when the command is executed is taken as the initial unbalanced value, and the measured value is set to zero.

Reset: The value set during initial balancing is reset to zero. The initial unbalanced value is used as-is for the measured value.

Note

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

Scaling Settings When Using a Strain Gauge Type Sensor

The following is an explanation of scaling settings used when measuring physical quantities such as load and length with a strain gauge type sensor.

The basic relational expression is as follows.

1 mV/V = 2000 µstrain (Equation 1)

Two examples are given below: 1) when rated input and output are listed in the user's manual of the strain gauge type sensor, and 2) when listed with the calibration coefficient. (Hereinafter, "µstrain" will be expressed as "µStr.")

When Rated Input and Rated Output Are Given

A specific example is given below.

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

In this case, these figures indicate that if a 200 N load is applied, 0.985 mV/V is output.

From the relationship in equation 1, if 200 N is applied,
an output of 0.985 mV/V=0.985 × 2000=1970 µStr is attained.

In other words, for each 1 N, 1970 µStr/200 N= 9.85 µStr/N is output.
Therefore, the scaling settings are entered as follows.

When Measuring at 50-150 N
Scale minimum: 50 (set to Smin)
Scale maximum: 150 (units: N) (set to Smax)
therefore,

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

can be set.

Thus, the measuring range is 2000 µStr.

Generally, the range is as follows.
Using the symbols that have appeared in the explanation thus far, after setting the scale maximum and minimum, the values are as follows.

Span minimum = [(K(mV/V) × 2000) / Y(unit)] × Smin ([µ]Str)
Span maximum = [(K(mV/V) × 2000) / Y(unit)] × Smax ([µ]Str)

When Listed at the Calibration Coefficient

An example is given with a displacement gauge.

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

Basically, if you can convert the calibration coefficient to the rated output mentioned in "When Rated Input and Rated Output Are Listed,"the following is a calculation following the explanation in "When Rated Input and Rated Output Are Listed."

Using equation 1,

1 µV/V = 0.001 µV/V = 0.001 × 2000 µStr = 2 µStr

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

20 mm ÷ [0.003998 mm/2 [µ]Str] = 10005 µStr

In other words, for each 1 mm, an output of

10005 µStr / 20 mm = 500.25 [µ]Str/mm

can be obtained.

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

Scale minimum: 2

Scale maximum: 15 (units: mm)

therefore,

Span minimum: 2 × 500.25 µStr/mm = 1000.5 µStr

Span maximum: 15 × 500.25 µStr/mm = 7503.75 µStr

would be appropriate settings.

The measuring range becomes 20000 µStr, making the resolution on the MX100 1 mStr, therefore we can round as follows.

Span minimum: 1001 µStr

Span maximum: 7504 µStr

Compensation When the Gauge Factor Differs

If the gauge factor of the gauge being used differs from 2.00, it can be compensated using the following method.

The relationship between the true strain (s) and the measured strain (si) is:

$\varepsilon_i = 2.00/Ks \times \varepsilon_i$

Ks: Gauge factor of the gauge used

Given this, set the following using the scaling function.

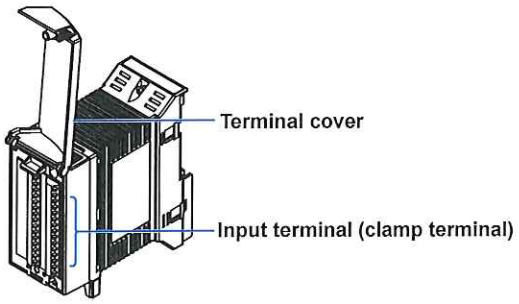
Measurement Span		**Scale**	
Minimum value	Maximum value	Minimum value	Maximum value
X	Y	2.00/Ks × X	2.00/Ks × Y

Ex.: for a gauge factor of 2.1,

Measurement Span		**Scale**	
Minimum value	Maximum value	Minimum value	Maximum value
–1000.0	2000.0	–952.4	1904.8

1.8 Functions of the 10-CH, High-Speed Digital Input Module (-D05, -D24)

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



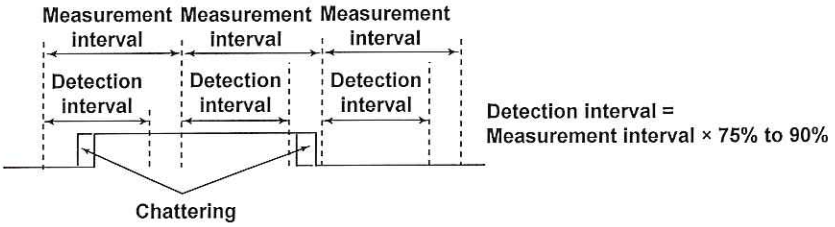
Measurement Interval

You can select a measurement interval of 10 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 20 s, 30 s, or 60 s.

Filters

The module detects ON/OFF as shown below to prevent receiving chattering effects. If the measurement interval is set at a value greater than four times the chattering period, measurement is possible in which chattering effects are avoided.

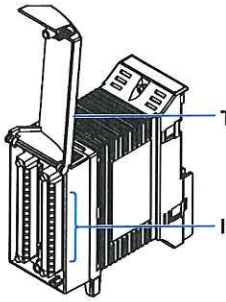
- Measurement interval of 5 s or less: Use the wider of the ON/OFF widths of the detection period (approximately 75 to 90% of the measurement interval)



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

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

This module is equipped with 8 outputs that can output voltage or current. An external power source (24 V) is required for current output. For voltage output only, an external power source is not required.



Output Type

Transmission output: Outputs a voltage or current corresponding to the measured results of the input channel specified on the same unit.

User output: The specified value is output based on the value sent from the PC software. Transmission output of computation channel data or of data from separate units is available.

Output Range

Voltage: –10.000 V to 10.000 V
Current: 0.000 mA to 20.000 mA

Output Update Interval

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

Operation When Errors Occur upon Startup

See section 1.11.

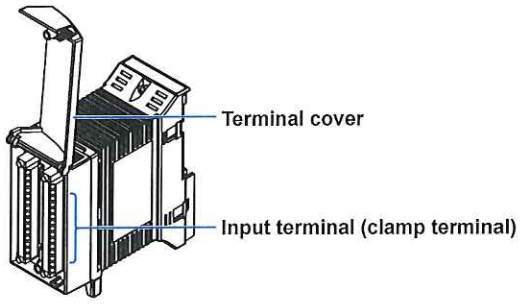
Output Operation During Calibration

Calibration Status	Output Status
Channels being calibrated	User output (output of calibration value)
Calibrated channels	Holds the last calibration user output value*
Non-calibrated channels	Holds the output value (holds the last output value during steady operation (see section 1.11))

* Holds the last calibration user output value until the next output update.

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

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

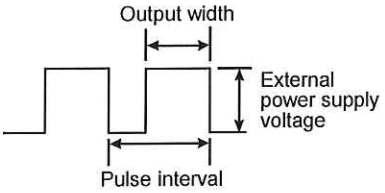


Output Type

Transmission output: Outputs a duty pulse waveform corresponding to the measurement computation results of the input channel specified on the same unit.

User output: The specified value is output based on the data sent from the PC software. Transmission output of computation channel data or of data from separate units is possible.

Output Waveform



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

Pulse Interval

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

1 ms interval setting rng:	1 ms to 30.000 s	Can be set in units of 1 ms
10 ms interval setting rng:	10 ms to 300.00 s	Can be set in units of 10 ms

Output Update Interval

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

Output Range

0.000% to 100.000%

Operation When Errors Occur upon Startup

See section 1.11.

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

This section provides an explanation of the output operation of the analog output and PWM output modules.

Output Selection When Errors Occur upon Startup

- Hold the previous value: Holds the last output value.
- Output the preset value: Outputs an arbitrarily specified output value.

Output Status

The voltage, current (analog output module), or pulse wave duty (PWM output module) is output given the following output conditions.

- Transmission output: Outputs a analog or PWM corresponding to the measured results of the input channel specified on the same unit. The input modules that can be specified are all input modules (excludes output modules).
- User output: When a command is received from a PC software application (MX100 Standard Software, MXLOGGER, or the MX100/DARWIN API), analog or PWM output is performed according to the received value.

After the power is turned ON and communications become available, "User Output" is enabled. For transmission output within a unit, the output value is updated after measurement begins.

Output on Disabled Channels

Types of Disabled Channels	Output
Channels disabled through setting changes	Holds the last output value when channels were active
Channels disabled upon startup	Output according to startup settings

The timing at which setting changes applied to the output module become active is as follows.
(Ex. When changing settings from transmission output within a unit to user output, the last value of transmission output within a unit is held until the user output request is generated.)

Output Operation per Settings and Setting Changes

Status at Power ON and Output Operation

Status When Power Is Turned ON		Output Operation
When the output setting is disabled	Operation upon startup	
For transmission output within units, referenced input channels disabled*	Before meas. start	Operation upon startup
	Measurement start	Operation upon errors
Transmission output within units	Before meas. start	Operation upon startup
	Measurement start	Transmission output
Transmission output between units (User output)	Before meas. start	Operation upon startup
	Measurement start	User output
Manual output (User output)	No output request	Operation upon startup
	Output requested	User output
Pattern output (User output)	Before pattern output starts	Operation upon startup
	Pattern output starts	User output

* Monitor "Off" on the PC software, and "Skip" on the MX100/DARWIN API.

Output Operation per Setting Changes (Common)

Setting Changes (Contents)		Output Operation
Changes to settings for op.	Hold prev. val. → preset val.	Outputs a preset value the next time upon startup the power is turned ON
	Preset val. → hold prev. val.	The last output value from the previous operation is held for the next time the power is turned ON (outputs the output value active when the power was last turned OFF during the previous session)
Changes to settings for op.	Hold prev. val. → preset val.	Outputs a preset value the next time when error occurs an error occurs
	Preset val → hold prev. val.	Holds the last output value active before an error occurs even when the next error occurs.
Changes to the preset value setting*		No change (as above)
Output ch setting changed from Enabled → Disabled		Holds the output val. (last output val.)

* Changes are also applied to inactive channels.

Output Operation through Setting Changes (Individually by Output Setting)

Output Setting	Setting Changes (Contents)		Output Operation
Trans. output within units	Range setting chng.	AO: V↔ mA	Output value held (until next output event)
		PWM: 1 ms ↔10 ms or interval	
	Op. setting chng.	Trans. within units → Trans. between units	
		Trans. within units → manual output	
		Trans. within units → pattern output	
Trans. output between units (user output)	Range setting chng.	AO: V ↔ mA	Output value held (until next output event)
		PWM: 1 ms ↔10 ms or interval	
	Op. setting chng.	Trans. between units → trans. within units	
		Trans. between units → manual output	
		Trans. between units → pattern output	
Manual output (user output)	Range setting chng.	AO: V ↔ mA	Output value held (until next output event)
		PWM: 1 ms ↔10 ms or interval	
	Op. setting chng.	Manual output → trans. within units	
		Manual output → trans. between units	
		Manual output → pattern output	
	Span setting changes		
Pattern output (user output)	Range setting chng.	AO: V ↔ mA	Output value held (until next output event)
		PWM: 1 ms ↔10 ms or interval	
	Op. setting changes	Pattern output → trans. within units	
		Pattern output → trans. between units	
		Pattern output → manual output	
	Span setting changes		

If the PWM output module range setting is changed, the output value is not saved (the interval changes)

Steady Output Operation

Output Operation While Communication Is Connected

Communication Connection Status	Output Operation
Comm. connects (initial connection after power ON)	Operation upon startup
Comm. connects (disconnected and restored for the 2nd or more time)	Holds the output value (last output value)
Communication disconnected normally	Holds the output value (last output value)

Output Operation according to the Measurement Status and Transmission Output Status

Transmission output in the table is ON when Transmission output is selected in the Action menu of the MX100 Standard Software, or when DAQMXTRANSMIT_RUN is executed in the MX100/DARWIN API. Transmission output in the table is OFF when Transmission output is cleared in the Action menu of the MX100 Standard Software, or when DAQMXTRANSMIT_STOP is executed in the MX100/DARWIN API.

Output Setting	Status		Output Operation
Trans. output within units	Meas stop → meas. start		Starts trans. output/holds within units output value (depends on trans. output execution on/off) on: transmission output starts off: holds output value
	Measuring → meas. stop		Holds output value (last output value)
	Meas stopping	Trans. output exec. on* → off*	Holds output val. (no change.)
		Trans. output exec on → off	Holds output val. (no change.)
	Measuring	Trans. output exec off → on	Starts trans. output
		Trans. output exec on → off	Holds output val. (last val.)
Trans. output between units (user output)	Meas stop → meas start		Starts user output or holds output value (depends on trans output exec. on/off status) on: transmission output starts off: output value held
	Measuring → meas stop		Holds output value (last output value)
	Meas stopping	Trans. output exec off → on	Holds output val. (no change.)
		Trans. output exec on → off	Holds output val. (no change.)
	Measuring	Trans. output exec off → on	User output
		Trans. output exec on → off	Holds output val. (last output value)
Manual output (user output)	Meas stop → meas start		No effect
	Measuring → meas stop		No effect
	Meas stopping	Trans. output exec off → on	No effect
		Trans. output exec on → off	No effect
	Measuring	Trans. output exec off → on	No effect
		Trans. output exec on → off	No effect
Pattern output (user output)	Meas stop → meas start		No effect
	Measuring → meas stop		No effect
	Meas stopping	Trans. output exec off → on	No effect
		Trans. output exec on → off	No effect
	Measuring	Trans. output exec off → on	No effect
		Trans. output exec on → off	No effect

* on: enabled off: disabled
Transmission output execute enabled: when "Transmit" under the Action menu of the PC software is selected
Transmission output execute disabled: when "Transmit" under the Action menu of the PC software is not selected

Output When Abnormal, or after Recovery from Abnormality

Output Operation during Abnormality (by Module)

Abnormal Module	Abnrml Display	Abnormal Status	Output Operation
Main Module	b[SQR]*	System error	Operation upon startup
	bF	Dip switches	
	F0	ROM error	
	F1	SRAM error	Operation upon startup
	F2	EEPROM error	
	F3	Battery error	
	F4	Ethernet error	
	P[SQR]*	CF card related error	No effect (normal operation)
	None	Communication timeout error	Transmission within units: no effect (normal operation)
			Transmission between units/manual output/pattern output: operation when error generated
	C1	Comm multiple connect error	No effect (normal operation per the previously connected device)
Output Modules	E0		Range information error Operation upon startup or when output value uncertain
	E1	Calibration value error	
	E2	Error during calibration	Internal communication error occurs, resulting in an error recovery event. If the error recovery time is 10 s or more, output is performed per the operation upon error occurrence, and then output is executed per the operation upon startup.
	E3	Error in writing the calibration value.	
	E4	Unusable modules	Operation upon startup or when output value uncertain
Input Modules	E0	Range information error	Operation upon errors occurrence (except for transmission within units, since the transmission source input channel is illegal)
	E1	Calibration value error	
	E4	Unusable modules	
	E5	Initial balance error	No effect (±Over is likely)

* [SQR] is a placeholder for the number corresponding to the error.

Output Operation during Abnormality (by Output Setting)

Output Setting	Abnormal Status	Output Operation
Trans. output within units	Referenced input channels are +Over	Outputs a value +5% of the specified span of the output channel*2
	Referenced input channels are –Over	Outputs a value –5% of the specified span of the output channel*2
	Referenced input channel is illegal	Operation upon errors (input modules are removed)
	Referenced input channel is disable*3	
	Referenced input channel is Invalid (math error in difference computation)	
	Communication timeout	No effect
	Internal communication error	Output value held (immediately after internal comm error occurs, the output value is held, but there is a recovery operation*1)
	CPU abnormality	Operation upon errors
Trans. output between units (user output)	Referenced input channels are +Over	Outputs a value +5% of the specified span of the output channel (calculated with MXSTANDARD, MXLOGGER, or the API)
	Referenced input channels are –Over	Outputs a value –5% of the specified span of the output channel (calculated with MXSTANDARD, MXLOGGER, or the API)
	Referenced input channel is illegal (input modules are removed)	Operation upon errors (with MXSTANDARD, MXLOGGER, or the API)
	Referenced input channel is disable*3	
	Referenced input channel is Invalid (math error occurs)	
	Communication timeout	Operation upon errors
	Internal communication error	Output value held (immediately after internal comm error occurs, the output value is held, but there is a recovery operation*1)
	CPU abnormality	Operation upon errors
Manual output (user output)	Communication timeout	Operation upon errors
	Internal communication error	Output value held (after internal comm error occurs, the output value is held, but there is a recovery operation*1)
	CPU abnormality	Operation upon errors
Pattern output (user output)	Communication timeout	Operation upon errors
	Internal communication error	Output value held (immediately after internal comm error occurs, the output value is held, but there is a recovery operation*1)
	CPU abnormality	Operation upon errors

*1 See "Output Operation after Recovery from Abnormality" on the next page.

*2 However, only within the range that can be output.
Ex.: If the span for PWM is set to 0-100%, +Over is +100% and –Over is 0%.

*3 Invalid with the MX100 Standard Software. With the API for MX100 and DARWIN, it is "Skip."

Output Operation after Recovery from Abnormality (by Output Setting)

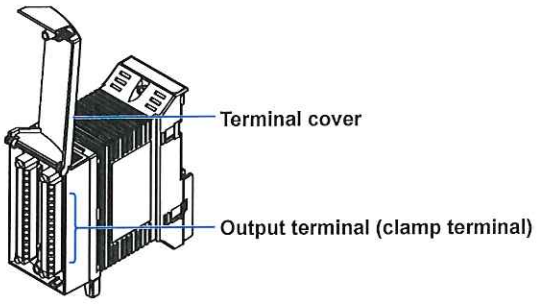
Output Setting	Abnormality Recovery	Output Operation
Trans. output within units	Referenced input module recovers (removed input modules are inserted)	Operation upon errors → transmission output
	Referenced input channel changed from Skip to measurement range	
	Referenced input channel is invalid Recovers to normal from (math error in difference computation)	
	Recover after communication timeout	No effect
	Recover after internal comm error	If the error recovery time is 10 s or more; operation upon error occurrence → operation upon startup -> transmission output
		If the error recovery time is within 10 s; operation upon startup → transmission output
	CPU abnormality (does not recover)	Operation upon errors
Trans. output between units (user output)	Referenced input module recovers (removed input modules are inserted)	Operation upon errors (per PC software → user output*1
	Referenced input channel changed from Skip to measurement range.*2	
	Referenced channel is invalid; recovers to normal value from (math error).	
	Recover after communication timeout	Operation upon errors → user output*1
	Recover after internal comm error	If the error recovery time is 10 s or more; operation upon error occurrence → operation upon startup → user output*1 If the error recovery time is within 10 s, Operation upon startup → user output*1
	CPU abnormality (does not recover)	Operation upon errors
Manual output (user output)	Recover after communication timeout.	Operation upon errors → user output*1
	Recover after internal comm error	If the error recovery time is 10 s or more, Operation upon errors → operation upon startup → user output*1 If the error recovery time is within 10 s, Operation upon startup → user output*1
	CPU abnormality (does not recover)	Operation upon errors
Pattern output (user output)	Recover after communication timeout	Operation upon errors → user output*1
	Recover after internal comm error	If the error recovery time is 10 s or more; operation error occurrence → operation upon startup → user output*1 If the error recovery time is within 10 s, Operation upon startup → user output*1
	CPU abnormality (does not recover)	Operation upon errors

*1 Executes the user output from the PC software after recovery from errors.

*2 Invalid with the MX100 Standard Software. With the API for MX100 and DARWIN, it is "Skip."

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

This module outputs ten contact signals based on the alarm output settings and output settings on the PC software.



Output Type

The MX100 has the following types (output factors) are available.

Type	Description	Relay Action	Output Hold Behavior
Alarm	Alarm output of measurement / computation channels	Energize or deenergize selectable	Hold*2 or non-hold selectable
Manual	Manual DO operation using the software	Energize or deenergize selectable	
Fail	When a failure occurs in the CPU of the MX100 main module	Normal: Energized Failure: Deenergized	
Error	Output when an error*1 is detected in the MX100	Energize or deenergize selectable	Hold*2 or non-hold selectable

*1 Below are the errors that can occur in the MX100.
- A data output request timeout (60 s) occurs while recording data. (except when the /DS option functions are enabled)
- An input module detected at power-on that is able to make measurements is removed.
- A module breaks down.
- An unidentifiable module is attached.

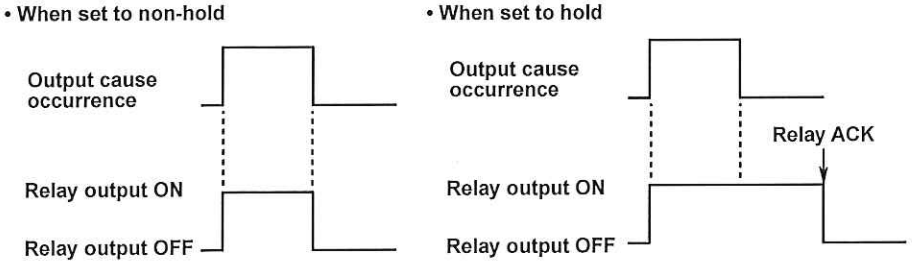
*2 Holds the output until the PC software issues the output release command (relay ACK).

Output Update Interval

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

Relay Action and Hold Behavior

You can select whether to energize or de-energize the output relay when outputting contact signals on the PC software. You can also select whether the output relay is turned OFF (non-hold) or kept ON (hold) until an output release command is received.



2.1 Handling Precautions

This section describes the precautions to be taken when using the MX100. Please read this section carefully before use.

- If you are using this instrument for the first time, make sure to thoroughly read the safety precautions given on pages ii and iii.
- Do not remove the case.
  For internal inspection or adjustment, contact your nearest YOKOGAWA dealer.
- Do not place objects on top of the instrument.
  Never place other instruments or objects containing water on top of the instrument. Doing so can lead to malfunction.
- Take Proper Care When Carrying the Instrument
  First, turn off the DUT and the MX100 and remove all cables including measurement wires and communication cables. Then, remove the power cord from the outlet.
- To prevent internal overheating, do not obstruct the vent holes of the module.
- This instrument uses many plastic parts. When cleaning, wipe using a dry soft cloth. Do not clean with benzine, thinner, or other chemicals, and do not use detergents. Doing so can cause discoloring, deformation, or damage.
- Do not bring charged objects near the signal terminals. Doing so can lead to malfunction.
- Do not pour volatile agents on the MX100 or leave it in contact with rubber or PVC products for an extended time. Doing so can lead to malfunction.
- Do not apply shock to the instrument.
- When not in use, make sure to turn OFF the power.
- If there are any symptoms of trouble such as smoke, strange odors, or strange sounds coming from the instrument, immediately turn OFF the power and stop the power supply. Contact your dealer immediately.
- Do not damage the power cord.
  Nothing should be placed on top of the power cord. The power cord should also be kept away from any heat sources. When unplugging the power cord from the outlet, never pull by the cord itself. Always hold and pull by the plug. If the cord is damaged, contact your dealer for replacement. Refer to "Checking the Contents of the Package" in the MX100 Data Acquisition Unit Operation Guide (IM MX100-02E) for the part number of the appropriate power cord when placing an order.

2.2 Installation

Installation Location

Install the instrument indoors in the following locations.

- **Where the temperature is between 0 to 50°C.**
  Where the relative humidity is between 20 and 80% RH for 0 to 40°C and 10 and 50% RH for 40 to 50°C. However, no condensation should be present.

  Note

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

- **Where the operating altitude is 2000 m or less.**
- **In a well-ventilated location**
  Install the instrument in a well-ventilated location to prevent the temperature inside the instrument from rising.
- **Where mechanical vibration is small**
  Select an installation location with a small amount of mechanical vibration (if any).
- **In a horizontal location**
  Install the instrument on a flat, even surface.

Do not install the instrument in the following places.

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

Installation Procedure

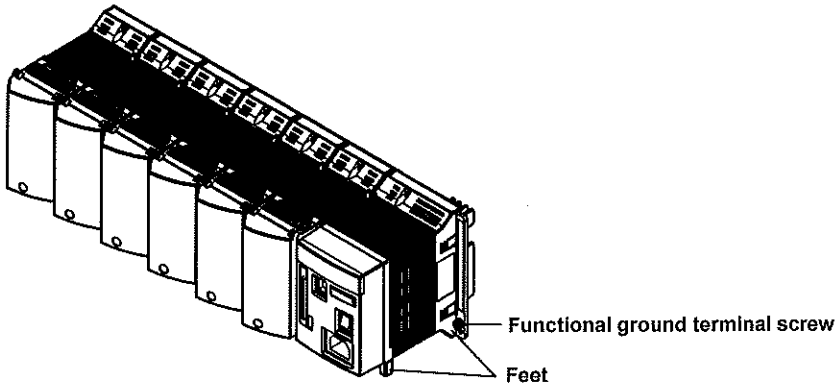
CAUTION

When mounting the instrument on DIN rails, prevent the instrument from falling by securing the DIN rails using a metal plate of 2 mm or more in thickness, fastened with at least three screws.

The MX100 can be used on a desktop, on a floor, in a rack mount, or in a panel mount. In all cases, be sure to install the instrument in a vertical position.

Use on a Desktop or a Floor

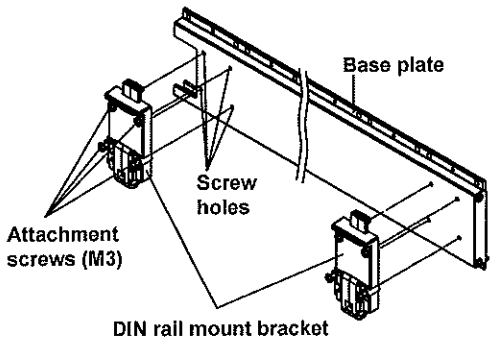
Each module has feet that can be attached to the base plate allowing them to be placed vertically. For the procedure for attaching the modules, see the next page.



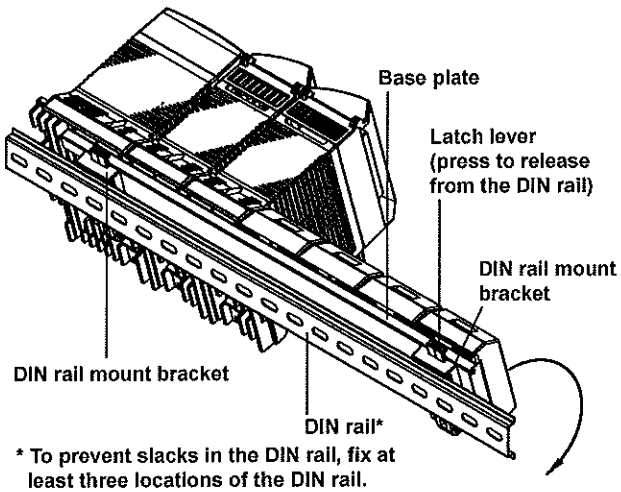
Attachment to a DIN Rail

As shown in the figure below, you can rack-mount or panel-mount the MX100 by attaching a DIN rail mount bracket to the base plate.

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



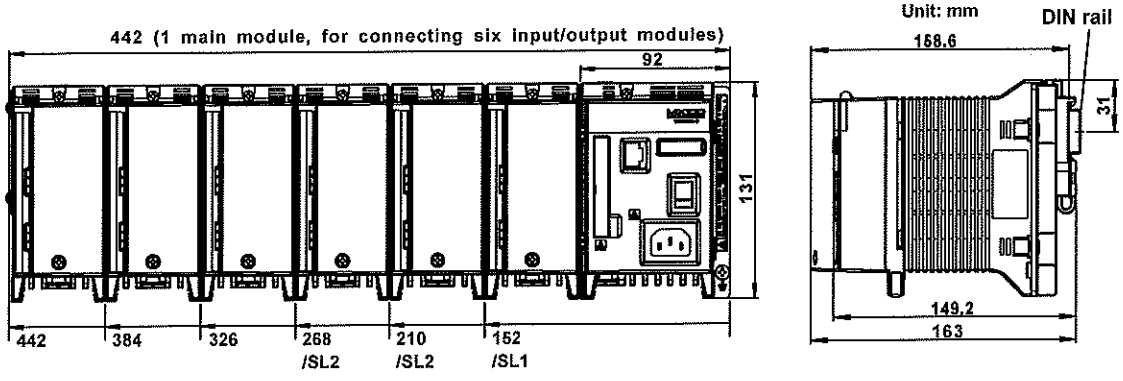
• Attachment of the base plate to the DIN rail



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

• Dimensions when mounted on a DIN rail

Unit: mm



Module pitches 58

2.3 Attaching the Modules

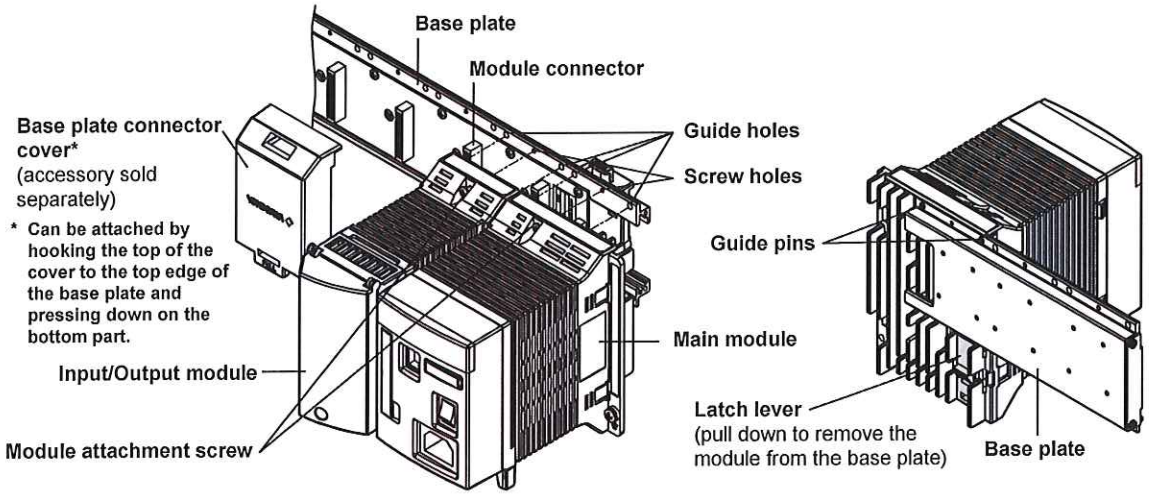
WARNING

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

Attachment Procedure

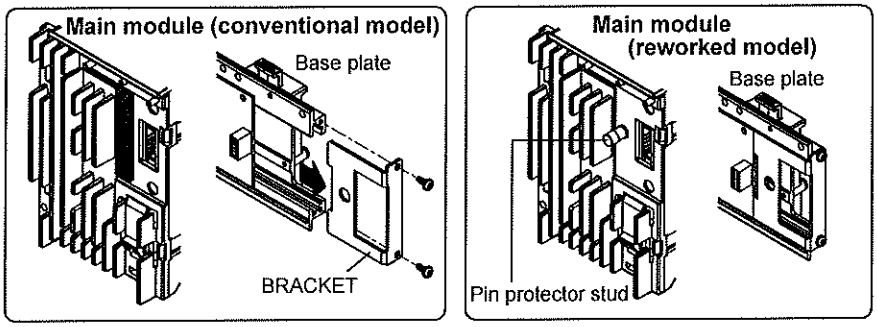
1. Check that the power supply is not connected to the main module.
2. Align the connector on the rear panel of the module to the module connector on the base plate, and insert the connector.
   Attach the main module to the right-most position on the base plate.
   When the connectors are correctly connected, the guide pin on the rear panel of the module is inserted into the guide hole on the base plate. In addition, the module is secured to the base plate with the latch lever locking in place at the bottom section of the base plate.
3. Fasten the top of the module with the attachment screws (M3).

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



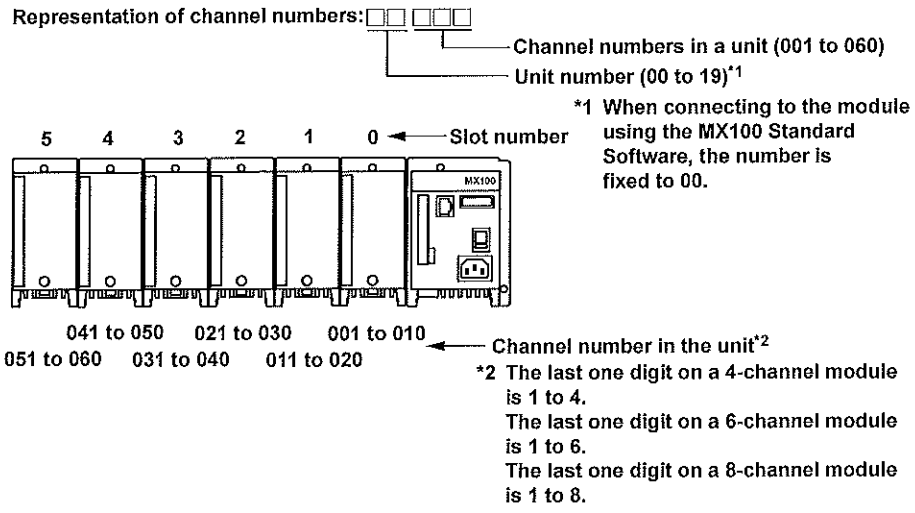
CAUTION

When attaching the main module (conventional model) to the base plate, first remove the two screws from the base plate and remove the BRACKET, then attach the main module (conventional model) to the base plate.



Attachment Positions and Channel Numbers

The figure below shows how the channel numbers are identified on the PC.



CAUTION

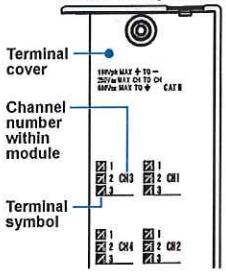
The 30-CH, Medium-Speed DCV/TC/DI Input Module takes up three modules worth of space when attaching to the base plate. If attached incorrectly, damage or malfunction can result.

2.4 Connecting the Signal Wires

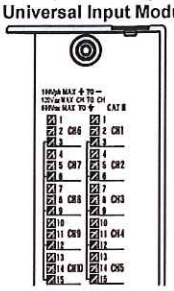
Terminal Arrangement Markings on the Terminal Cover

A character indicating the terminal function and a terminal symbol indicating the type of signal to be input/output at each terminal are written on the back of the terminal cover of each I/O module. For information on the wiring of each terminal signal, see "Connecting the Signal Wires" (this section). The 4-CH, Medium-Speed Strain Module (-NDI) has no terminal cover.

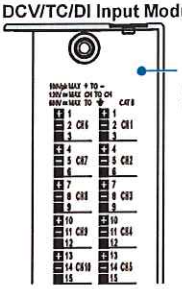
4-CH, High-Speed Universal Input Module



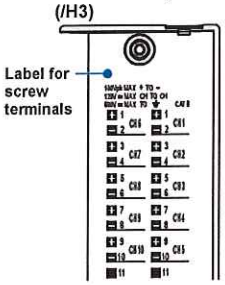
10-CH, Medium-Speed Universal Input Module



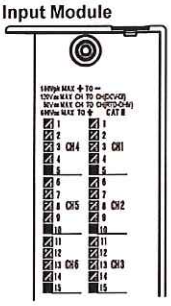
30-CH, Medium-Speed DCV/TC/DI Input Module



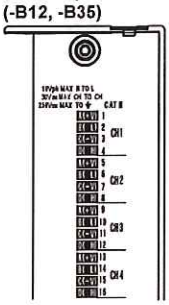
30-CH, Medium-Speed DCV/TC/DI Input Module (/H3)



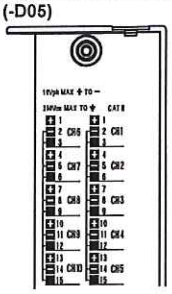
6-CH, Medium-Speed 4-wire RTD Resistance Input Module



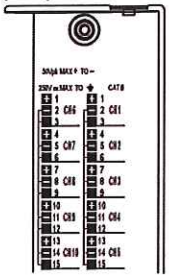
4-CH, Medium-Speed Strain Input Module (-B12, -B35)



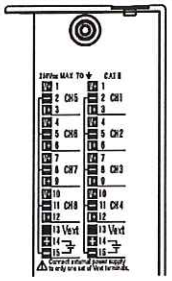
10-CH, High-Speed Digital Input Module (-D05)



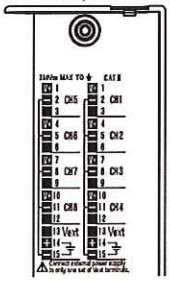
10-CH, High-Speed Digital Input Module (-D24)



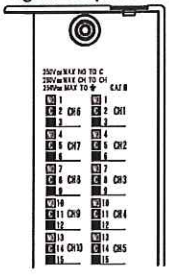
8-CH, Medium-Speed Analog Output Module



8-CH, Medium-Speed PWM Output Module



10-CH, Medium-Speed Digital Output Module

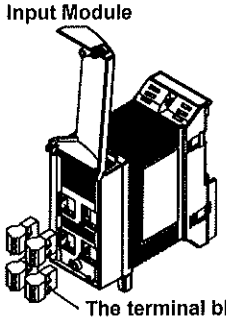


Attaching and Removing the Terminal Block

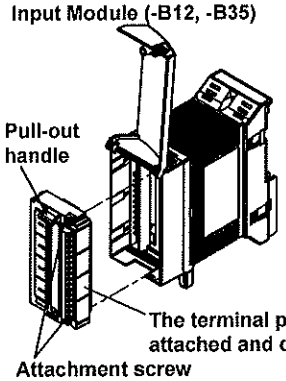
The terminals of the input/output modules in the figure below can be removed. The terminals of the 30-CH, Medium-Speed DCV/TC/DI Input Module (MX110-VTD-L30) cannot be removed.

The terminal cover can be removed by pressing backward with the cover lifted up.

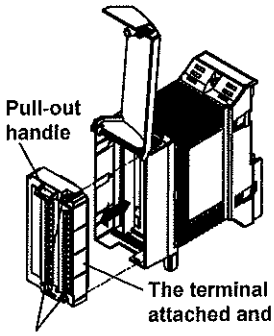
4-CH, High-Speed Universal Input Module



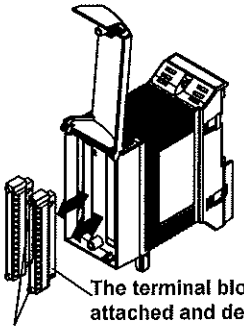
4-CH, Medium-Speed Strain Input Module (-B12, -B35)



10-CH, Medium-Speed Universal Input Module/ 6-CH, Medium-Speed Four-wire RTD ResistanceInput Module/ 10-CH, High-Speed Digital Input Module



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



Attaching Plates with Screw Terminals and Plates with Clamped Terminals for Current

You can attach a plate with screw terminals (sold separately, M3 screws) to the 10-CH, Medium-Speed Universal Input Module and the 10-CH, High-Speed Digital Input Module. You can also attach a plate with clamped terminals for current (sold separately) to the 10-CH, Medium-Speed Universal Input Module.
The plate is attached and removed in the same manner as terminal blocks. Note that the terminal arrangement of the plate with screw terminals differs from that of the plate with clamped terminals. The terminal arrangement is displayed on the back of the terminal cover in the same package. Replace it along with the plate.
For handling of the plate with screw terminals, see the *MX100/MW100 Handling of the Plate with Screw Terminals* (IM MX100-77E), and for the plate with clamped terminals for current, see the *MX100/MW100 Setting Up the Plate with Clamp Terminals for Current* (IM MX100-78E).

Plate with screw terminals (model 772080)

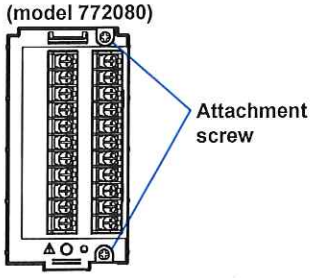
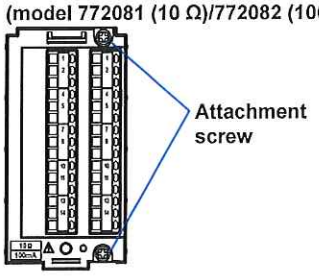


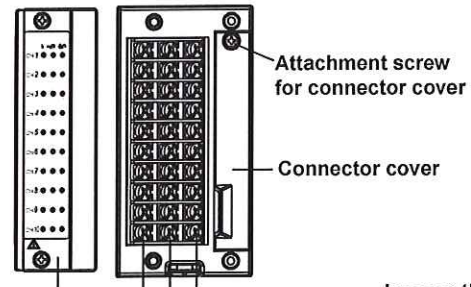
Plate with clamp terminals for current (model 772081 (10 Ω)/772082 (100 Ω)/772083 (250 Ω))

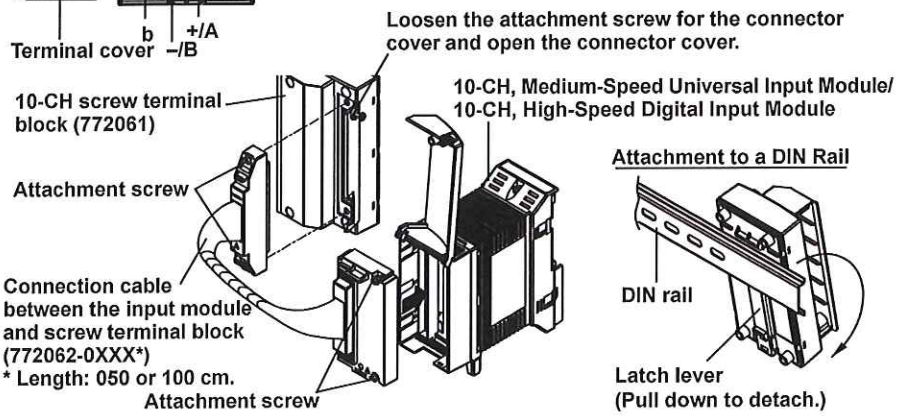


Screw Terminal Block

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

10-CH screw terminal block (772061)





General Precautions When Wiring the Input/Output Signal Wires

WARNING

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

Applied Voltage (Vrms or VDC)	Basic Insulation	Double (Reinforced) Insulation
30 (60 VDC)-100	620 V rms	1000 V rms
101-150	840 V rms	1400 V rms
151-300	1390 V rms	2300 V rms
301-600	2210 V rms	3700 V rms

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

Module Type	Temp. Rating
Screw terminal block	75°C
Universal input module, DCV/TC/DI input module, four-wire RTD resistance input module, strain input module, digital input module, and digital output module	80°C
Analog output module, PWM output module	85°C

CAUTION

- If a large pulling force is applied to the input/output signal wires connected to the MX100, the terminal or signal wire may break. To prevent this from happening, fix all the wiring cables to the installation panel.
- Wiring of the Strain Input Module (-NDI)
  When connecting a bridge head, in order that the empty weight of the cable does not exceed 5 kg, ensure that the cable does not hang down more than 1.5 m (the distance to the floor). If it does, secure the cable to the installation panel or some other location.
- Do not apply a voltage exceeding the value indicated below to the input terminals of the input module. The module may become damaged.

Module Type	Max. Input Voltage	Max. Common Mode Voltage	
		Between Channels	Input to Ground
Universal input module	± 10 VDC: Voltage range of 1 VDC or less, TC, RTD, and DI (contact)	-H04: 250 VACrms (50/60 Hz)	600 VACrms (50/60 Hz)
	± 120 VDC: Voltage range of 2 VDC or more, and DI (LEVEL)	-M10: 120 VACrms (50/60 Hz)	

Module Type	Max. Input Voltage	Max. Common Mode Voltage	
		Between Channels	Input to Ground
DCV/TC/DI input module	± 10 VDC: Voltage range of 1 VDC or less, TC, and DI (contact)	120 VACrms (50/60 Hz)	600 VACrms (50/60 Hz)
	± 120 VDC: Voltage range of 2 VDC or more, and DI (LEVEL)		
Four-wire RTD resistance input module	± 10 VDC: Voltage range of 1 VDC or less, RTD, resistance, and DI (contact)	Voltage: 120 VACrms (50/60 Hz) RTD and resistance: 50 VACrms (50/60 Hz)	600 VACrms (50/60 Hz)
	± 120 VDC: Voltage range of 2 VDC or more, and DI (LEVEL)		
Strain input module	± 10 VDC	30 VACrms (50/60 Hz)	-B12 and -B35: 250 VACrms (50/60Hz) -NDI: 30 VACrms (50/60Hz)
Digital input module	-D05: ± 10 VDC -D24: ± 50 VDC	-	250 VACrms (50/60 Hz)

Module Type	Max. Input Voltage	Max. Common Mode Voltage	
		Between Channels	Output to Ground
Analog/PWM output module	-	-	250 VACrms (50/60 Hz)
Digital output module	250 VAC or 250 VDC	-	250 VACrms (50/60 Hz)

- The MX100 is a measurement category II (IEC61010-1) and installation category II (CSA1N.61010-1) instrument.

Consider the points indicated below to prevent noise from entering the measurement circuit. For a description of the measures against noise on the MX100, see section 2.7.

- Keep the measurement circuit away from the power supply cable (power supply circuit) and ground circuit.
- It is desirable that the object under measurement is not a noise source. However, if this is not avoidable, insulate the object under measurement and the measurement circuit. In addition, ground the object under measurement.
- Shielded wires are effective against noise caused by electrostatic induction. As necessary, connect the shield to the ground terminal of the MX100 (make sure this does not lead to grounding at two points).
- Twisting the measurement circuit wires at short intervals is relatively effective against noise caused by electromagnetic induction.
- Make sure to ground the protective ground terminal through a small grounding resistance (less than or equal to 100 Ω).

When using the reference junction compensation of the MX100 through thermocouple input, take measures to stabilize the temperature at the terminal section.

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

Connecting the input wires in parallel with other instruments may mutually affect the measured values.

If you need to make a parallel connection:

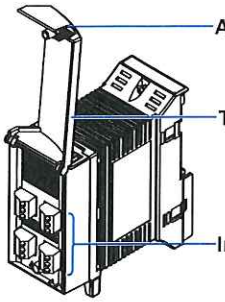
- Turn OFF burnout.
- Ground each instrument at a single common point.
- Do not turn ON/OFF the instrument while measurement is in progress. It may cause adverse affects on the other instrument.

Note that RTDs and resistors cannot be connected in parallel.

Wiring Procedure

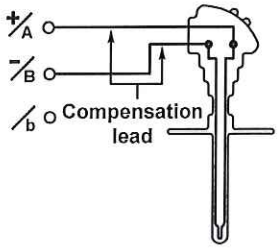
1. Turn OFF the power to the MX100.
2. Loosen the terminal cover attachment screw and lift up the terminal cover.
3. Connect the signal wires to the terminals.
4. Return the terminal cover to the original position and secure it with the screw.
   The appropriate screw tightening torque is 0.6 N·m.

For 4-CH, High-Speed Universal Input Module

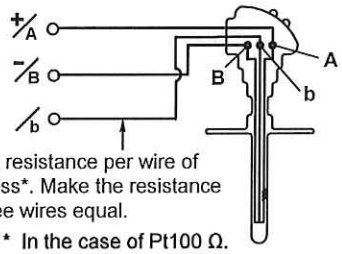


Wiring the Universal Input Module and DCV/TC/DI Input Module

• Thermocouple input



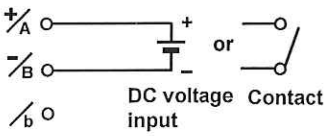
• RTD input



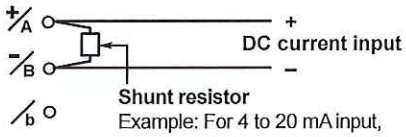
Lead wire resistance per wire of 10 Ω or less*. Make the resistance of the three wires equal.

* In the case of Pt100 Ω.
5 Ω max for Pt50 Ω. 1 Ω max. for Cu10 Ω.

• DC voltage input/DI input (contact)



• DC current input



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

A plate with clamp terminals for current with built-in shunt resistance can be attached to the 10-CH, Medium-Speed Universal Input Module.

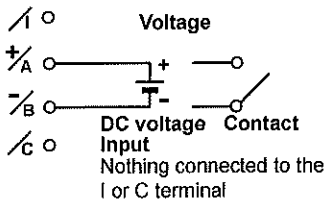
Terminal type:	Clamp, or screw (in the case of M3: -L30/H3)
Applicable wire size:	For -H04, 0.2 to 2.5mm^2 (AWG24 to 12)
	For -M10 and -L30 (clamp), 0.14 to 1.5mm^2 (AWG26 to 16)

Note

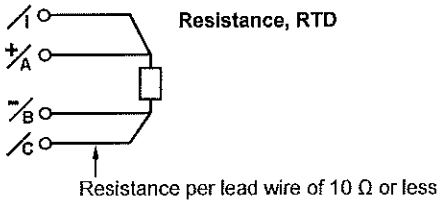
- On the 10-CH, Medium-Speed Universal Input module, RTD input terminals A and B are isolated on each channel. Terminal b is shorted internally across all channels.
- Measurement using RTDs cannot be performed with the 30-CH, Medium-Speed DCV/TC/DI Input Module.
- When the screw terminal plate (model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

Wiring the Four-Wire RTD Resistance Input Modules

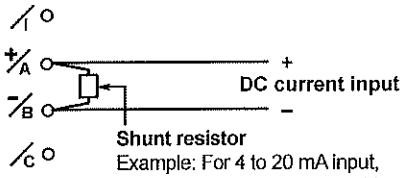
• DC voltage input/DI (contact) input



• RTD input, resistance input



• DC current input



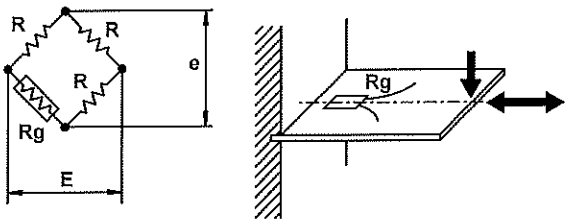
Terminal type: Clamp
Applicable wire size: 0.14 to 1.5mm^2 (AWG26 to 16)

Wiring the Strain Input Modules

Note

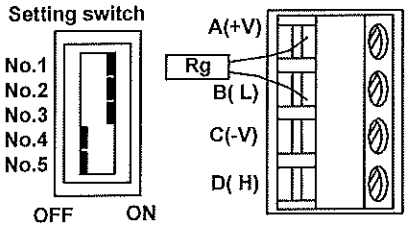
When using a sensor without a remote sensing wire, use the DV450-001 (conversion cable).

• **One-Gauge Method**



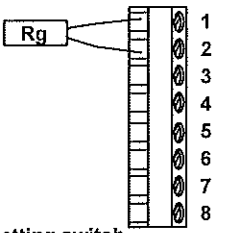
R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge

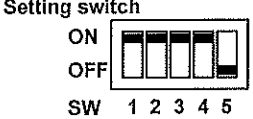
-B12, -B35



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

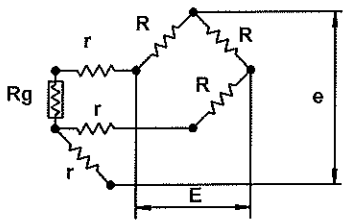
-NDI Bridge head (701955 or 701956)

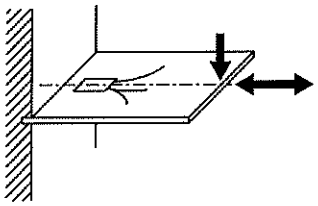




SW1	SW2	SW3	SW4	SW5
ON	ON	ON	ON	OFF

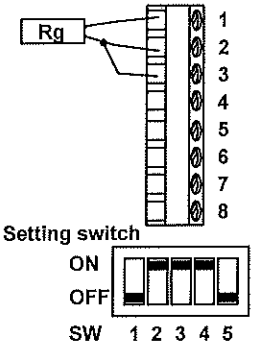
• One-Gauge Three-Wire Method





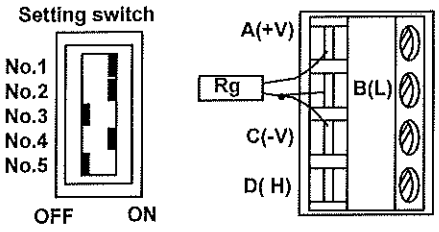
R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge

-NDI Bridge head (701955 or 701956)



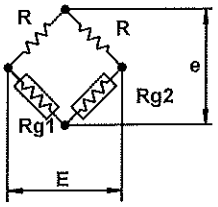
SW1	SW2	SW3	SW4	SW5
OFF	ON	ON	ON	OFF

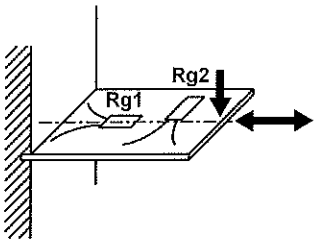
-B12, -B35



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

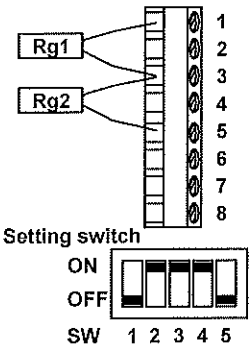
• Adjacent Two-Gauge Method





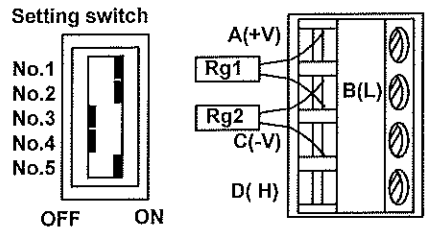
R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge

-NDI Bridge head (701955 or 701956)



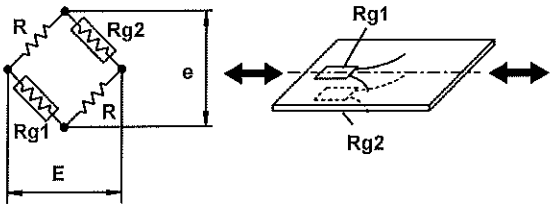
SW1	SW2	SW3	SW4	SW5
OFF	ON	ON	ON	OFF

-B12, -B35



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

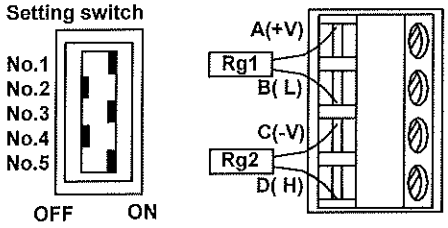
• Opposing Two-Gauge Method



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

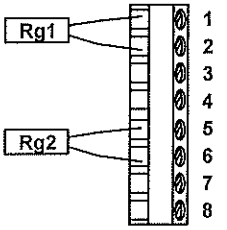
-B12, -B35

Setting switch

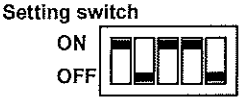


No.1	No.2	No.3	No.4	No.5
ON	OFF	ON	OFF	ON

-NDI **Bridge head (701955 or 701956)**

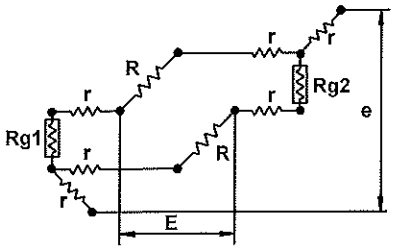


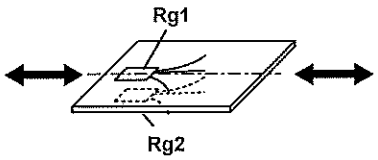
Setting switch



SW1	SW2	SW3	SW4	SW5
ON	OFF	ON	ON	OFF

• Opposing Two-Gauge Three-Wire Method



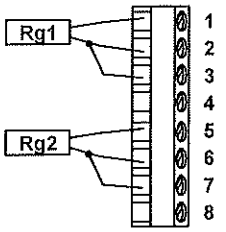


R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge

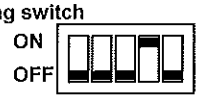
-B12, -B35

Cannot be connected. Use -NDI.

-NDI **Bridge head (701955 or 701956)**

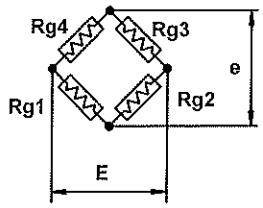


Setting switch

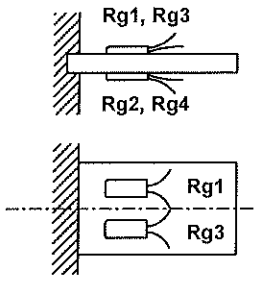


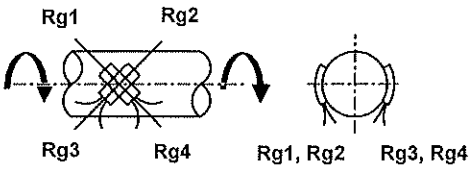
SW1	SW2	SW3	SW4	SW5
OFF	OFF	OFF	ON	OFF

- **Four-Gauge Method**

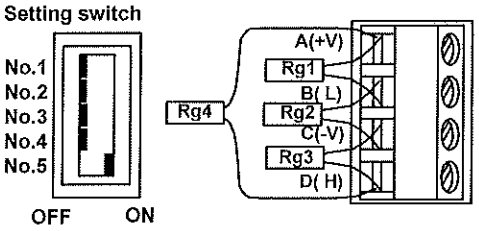


R: fixed resistance
r: resistance value of lead wire
Rg: resistance value of strain gauge
e: output voltage from bridge
E: voltage applied to bridge





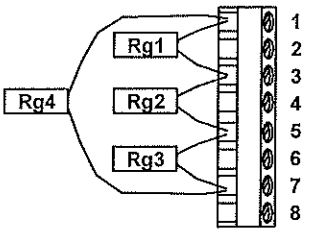
-B12, -B35



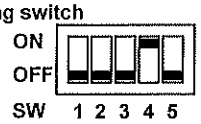
No.1	No.2	No.3	No.4	No.5
OFF	OFF	OFF	OFF	ON

-NDI

Bridge head
(701955 or 701956)



Setting switch



SW1	SW2	SW3	SW4	SW5
OFF	OFF	OFF	ON	OFF

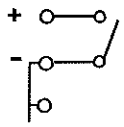
Wiring the Digital Input Modules (-D05, -D24)

Note

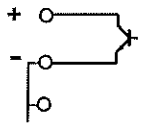
- With the digital input module, the (–) terminal and unassigned terminals on all channels are shorted internally.
- When the screw terminal plate (model 772080) is connected to the digital input module, the terminal arrangement differs from that of clamp terminals, therefore wire according to the markings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

Wiring with the -D05 Option

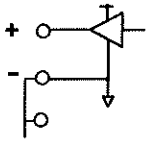
• Contact input



• Transistor input



• 5V logic input



Main Input Specifications (-D05)

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

Input format: Pull-up at approximately 5 V/approximately 5 kΩ, common electric potential between channels

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

Input threshold level:
Non-voltage contact, open collector: ON at 100 Ω or less and OFF at 100 kΩ or greater
5-V logic: OFF at 1 V or less and ON at 3 V or greater

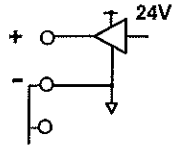
Contact/transistor rating:
Contact with a rating of 15 VDC or greater and 30 mA or greater
Vce and Ic are transistors with ratings of 15 VDC or more, and 30 mA or more, respectively.

Terminal type: Clamp

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

Wiring with the -D24 Option

• 24 V logic input



Main Input Specifications (-D24)

Input type: DI (24 V logic)

Input format: Common potential between ch

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

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

Terminal type: Clamp

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