Panasonic

Motion Controller

Reference Manual

Hardware

WUME-GM1H-07

2023.10

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Introduction

Thank you for purchasing a Panasonic product. Before you use the product, please carefully read through the installation instructions and the manuals, and understand them in detail to use the product properly.

Types of Manual

- There are different types of manuals for the GM1 series. Refer to the appropriate manual according to your need.
- These manuals can be downloaded from our website:https://industrial.panasonic.com/ac/e/motor/motion-controller/mc/gm1/index.jsp.

Manuals for GM1 series

Manual name	Manual code	Description
GM1 Controller RTEX User's Manual (Setup Edition)	WUME-GM1RTXSU	Explains wiring between the GM1 and its peripheral devices, installation method, and operation check method.
GM1 Controller EtherCAT User's Manual (Setup Edition)	WUME-GM1ETCSU	
GM1 Controller RTEX User's Manual (Operation Edition)	WUME-GM1RTXOP	Explains how to use GM Programmer and PANATERM Lite for GM, set up each function, create projects, and perform other operations.
GM1 Controller EtherCAT User's Manual (Operation Edition)	WUME-GM1ETCOP	
GM1 Series Reference Manual (Hardware Edition)	WUME-GM1H	Explains the functions and performance of each GM1 unit.
GM1 Series Reference Manual (Instruction Edition)	WUME-GM1PGR	Explains the specifications of each instruction that can be used with the GM1 Series.
GM1 Series Reference Manual (Analog I/O Unit)	WUME-GM1AIO	Explains the functions and performance of the GM1 Analog Expansion Unit.
GM1 Series Reference Manual (Pulse Output Unit)	WUME-GM1PG	Explains the functions and performance of the GM1 Pulse Output Unit.

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Table of Contents

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1 Before Using This Product

1.1 Safety Precautions

This section explains important rules that must be observed to prevent personal injury and property damage.

- Injuries and damages that may occur as a result of incorrect use are classified into the following levels and safety precautions are explained according to the level.

⚠ **WARNING**	Indicates that there is a risk of death or serious injury
⚠ **CAUTION**	Indicates that there is a risk of minor injury or property damage

⃠	Indicates an action that is prohibited
❗	Indicates an action that must be taken

⚠ **WARNING**	
❗	• Take safety measures outside this product to ensure the safety of the entire system even if this product fails or an error occurs due to external factors.
⃠	• Do not use this product in atmospheres that contain flammable gases. Doing so may result in explosion.
⃠	• Do not throw this product into the fire. Doing so may cause the batteries or other electronic parts to explode.

⚠ **CAUTION**	
❗	• To prevent abnormal heat generation or smoke generation, use this product with some leeway from the guaranteed characteristics and performance values of the product.
⃠	• Do not disassemble or modify this product. Doing so may result in abnormal heat generation or smoke generation.
⃠	• Do not touch any terminals while the power is on. Doing so may result in electrical shock.
❗	• Configure emergency stop and interlock circuits outside this product.
❗	• Connect wires and connectors properly. Failure to do so may result in abnormal heat generation or smoke generation.
⃠	• Do not perform work (such as connection or removal) with the power turned on. Doing so may result in electrical shock.
❗	• If this product is used in any way that is not specified by Panasonic, its protection function may be impaired.
❗	• This product has been developed and manufactured for industrial use only.

1.2 Handling Precautions

■ **In this manual, the following symbols are used to indicate safety information that must be observed.**

Stop	Indicates an action that is prohibited or a matter that requires caution.
!	Indicates an action that must be taken.
Info.	Indicates supplemental information.
Note	Indicates details about the subject in question or information useful to remember.
1 2 Procedure	Indicates operation procedures.

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2 Product Lineup

2.1 GM1 controller

Name	Specifications						Product No.
	Communication	High-speed counter	PWM output	Input	Output	Number of axes controlled	
GM1controller	Ethernet : 2 ports RS-232C : 1 port	2 ch	4 ch	16 points	16 points Transistor outpu Sink Type (NPN)	RTEX Max. 32 axis	AGM1CSRX16T
					Transistor outpu Sink Type(NPN)	EtherCAT Max. 32 axis	AGM1CSEC16T
					Transistor outpu Source Type(PNP)		AGM1CSEC16P

2.2 Expansion Unit

2.2.1 Digital I/O Unit

Name	Specifications		Product No.
	Input	Outpt	
GM1 Digital Input Unit	64 points	—	AGM1X64D2
GM1 Digital Output Unit	—	64 points Transistor output Sink Type (NPN)	AGM1Y64T
		64 points Transistor output Source Type (PNP)	AGM1Y64P
GM1 Digital I/O Unit	32 points	32 points Transistor output Sink Type(NPN)	AGM1XY64D2T
		32 points Transistor output Source Type (PNP)	AGM1XY64D2P

2.2.2 Analog I/O Unit

Name	Specifications	Product No.
GM1 Analog Input Unit	8 ch voltage input / current input	AGM1AD8
GM1 Analog Output Unit	4 ch voltage output / current output	AGM1DA4

2.2.3 Pulse Output Unit

Name	Specifications	Product No.
Pulse Output Unit	4 axis Transistor output	AGM1PG04T
	4 axis Line driver output	AGM1PG04L

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3 Overview

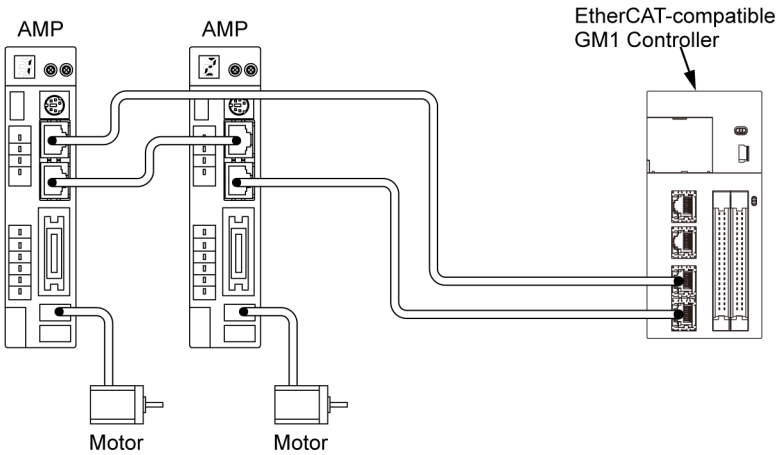
3.1 Basic System Configuration

3.1.1 Outline of the GM1 System

■ Network control

With the RTEX-compatible GM1 Controller, a MINAS series A6N/A5N servomotor network system can be easily configured using the RTEX network dedicated to motion control.

The EtherCAT-compatible GM1 Controller is a MINAS series servomotor network system can be easily configured by adopting EtherCAT communication.



■ Two LAN ports

There are two Ethernet connection ports.

Each port can have a unique IP address. They can be used for different purposes, such as for an in-device network or for a host system network.

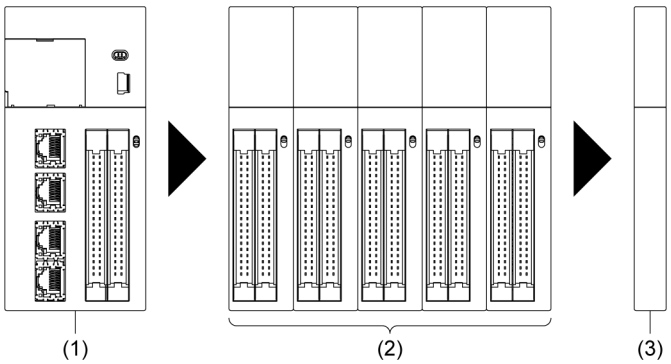
■ Equipped with the high-speed counter input and PWM output

The RTEX-compatible GM1 Controller / EtherCAT-compatible GM1 Controller is equipped with a 2-ch high-speed counter input for 16 MHz (multiplied by 4) and a 4-ch PWM output that can output a maximum of 100 kHz. These functions can be used without adding expansion units.

3.1.2 Restrictions on the Number of Expansion Units

Up to 15 expansion units can be mounted on the right side of the GM1 Controller (RTEX-compatible / EtherCAT-compatible).

Example: For RTEX-compatible GM1 Controller



(1)	RTEX-compatible GM1 Controller	(2)	Expansion units	(3)	End unit(Note 1)

(Note 1) Make sure to connect an end unit to the end of the system.

3.2 Restrictions on the GM1 Controller and Servo Amplifiers

3.2.1 Restrictions on the Combination of the GM1 Controller and Servo Amplifiers

As for the combination of the GM1 Controller (RTEX-compatible / EtherCAT-compatible) and each MINAS series, confirm the following restrictions.

Combination of the RTEX-compatible GM1 Controller and servo amplifiers

Connectable servo amplifier		Description
A5N	A6N	
●	●	A5N and A6N can be connected to the same network.

Combination of the EtherCAT-compatible GM1 Controller and servo amplifiers

Connectable servo amplifier		Description
A5B	A6B	
●	●	A5B and A6B can be connected to the same network.

Note

- When using servo amplifiers in combination with the GM1 Controller, use the ones with the latest software version

■ **Setting ranges of movement amount and speed**

The input range of the movement amount or speed specified in the GM1 Controller (RTEX-compatible / EtherCAT-compatible) may differ from the upper and lower setting limits of the servo amplifier.

Info.

- The communication cycle and command update cycle supported by the RTEX-compatible GM1 Controller and servo amplifiers A5N and A6N are as follows.
  - RTEX-compatible GM1 Controller: Communication cycle: 500 µs to 2 ms, Command update cycle: 500 µs to 4 ms
  - Servo amplifier A5N: Communication cycle: 500 µs to 1 ms, Command update cycle: 500 µs to 1 ms
  - Servo amplifier A6N: Communication cycle: 500 µs to 2 ms, Command update cycle: 500 µs to 4 ms
- The control cycles supported by the EtherCAT-compatible GM1 Controller and servo amplifiers A5B or A6B are as follows.
  - EtherCAT-compatible GM1 Controller: Control cycle: 500 µs to 4 ms
  - Servo amplifier A5B: Control cycle: 500 µs to 4 ms
  - Servo amplifier A6B: Control cycle: 500 µs to 4 ms

3.2.2 Restrictions on Servo Amplifier Parameters

■ Parameters for servo amplifiers on the A5N/A6N

Some parameters for servo amplifiers on the A5N/A6N side affect the behaviors of the RTEX-compatible GM1 Controller. Use the following parameters.

No.	Name	Settings	Standard factory default setting
Pr5.04	Over-travel inhibit input setup	Use setting value “1 (Disable the over-travel inhibit input)”. (Recommended)	1(Note 1)
Pr7.22	RTEX function extended setup 1	With a setting of 0 (16-byte mode), the maximum connection is 32 axes. With setting 1 (32-byte mode), the maximum number of connections is 16 axes. (Default setting value: 0)	0(Note 2)
Pr7.23	RTEX function extended setup 2	Use setting value “18”. (Mandatory) This parameter sets each function in bits. **bit 0: Allow parameter values to be written via RTEX communication** 0: Allow, 1: Disallow **bit 1: Set a sub-number for alarm code** 0: Fixed at 0, 1: Enable sub-number **bit 2: Set RTEX status response conditions when "Over-travel inhibit input setup" is disabled (Pr5.04 = 1)** 0: Enable status, 1: Fixed at 0 **bit 3: Set RTEX status bit assignment for POT and NOT** 0: POT corresponds to bit 1 and NOT corresponds to bit 0, 1: NOT corresponds to bit 1 and POT corresponds to bit 0 0: POT corresponds to bit 1 and NOT corresponds to bit 0, 1: NOT corresponds to bit 1 and POT corresponds to bit 0 **bit4:Set display mode for "COM" LED** 0: Mode 1, 1: Mode 2 **bit 5: Set non-cyclic command start mode** 0: When a change from base command occurs 1: When command code or command argument changes **bit 6: Set RTEX status logic for POT and NOT** 0: Do not reverse, 1: Reverse **bit 7: Set RTEX status logic for PSL and NSL** 0: Do not reverse, 1: Reverse **bit 8: Select RTEX status from In_Progress / AC_OFF** 0: In_Progress, 1: AC_OFF （It is linked to the setting in bit 15.） **bit 9: Select whether to return a command error when a command for motion toward the direction of over-travel**	18(Note 2)

No.	Name	Settings	Standard factory default setting
		prohibition is received after deceleration stop is executed by "Over-travel inhibit input setup" 0: Do not return a command error 1: Return a command error **Bit 10 to bit 13 are not used.** Fix to "0". **bit 14: Set position deviation [command unit] output** 0: Internal commanded position (after filtering) [command unit] - Actual position [command unit] 1: Internal commanded position (before filtering) [command unit] - Actual position [command unit] **Bit 15: Select extended RTEX status from In_Progress / AC_OFF / Pr7.112 settings** 0: Follow the setting of Pr7.23 bit 8 (In_Progress / AC_OFF) 1: Follow the setting of Pr7.112.	
Pr7.25	RTEX speed unit setup	Use setting value “1 (command unit/s)”. (Mandatory)	0(Note 2)

(Note 1) We recommend that the set value should not be changed judging from the characteristics of the GM1 and MINAS.

(Note 2) Do not change the set value. If the set value is changed, the RTEX-compatible GM1 Controller will make an error stop.

■ Parameters for servo amplifiers on the A5B/A6B

Some parameters for servo amplifiers on the A5B/A6B side affect the behaviors of the EtherCAT-compatible GM1 Controller. Use the following parameters.

No.	Name	Settings	Standard factory default setting
Pr5.04	Over-travel inhibit input setup	Use setting value 1. (Recommended)	1(Note 1)

(Note 1) We recommend that the set value should not be changed judging from the characteristics of the GM1 and MINAS.

3.3 Programming Tools

3.3.1 Software Usage Environment and Applicable Cables

Programming software

Product name	Applicable version	Product No.
GM Programmer	Japanese / English / Chinese	AGMSMP

(Note 1) When the GM Programmer is installed, MINAS setup support software ""PANATERM Lite for GM"" is installed at the same time.

Software operating environment

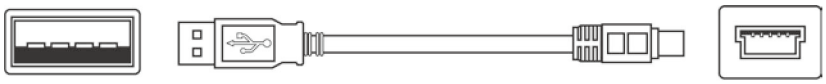
Item	Description
OS	Microsoft(R) Windows(R) 10 : 32bit/64bit Microsoft(R) Windows(R) 11 : 64bit
PC	PC with the following installed: ● Microsoft.NET Framework4.6.1or higher ● Microsoft Visual C++ 2010 SP1 Redistributable Package (x86) ● Microsoft Visual C++ 2010 SP1 Redistributable Package (x64) ● Microsoft Visual C++ 2013 Redistributable Package (x86) ● Microsoft Visual C++ 2013 Redistributable Package (x64) ● Microsoft Visual C++ 2015 Update 3 Redistributable Package (x86) ● Microsoft Visual C++ 2015 Update 3 Redistributable Package (x64)
HDD	At least 4 GB of free space
Memory	At least 8 GB
Communication port	LAN port (for Ethernet connection) USB 2.0 port (for USB connection)

PC connection cable

- Use a commercial USB cable.

Cable type	Length
USB 2.0 cable (A: miniB)(Note 1)	Max. 5 m

(Note 1) Match the connection terminal shape of the USB2.0 cable on the PC side with the specifications of the PC side.



USB A type (male) - USB miniB type (5-pin, male)

(PC side) (GM1 side)

Info.

For the tool operation, refer to the*, GM1 Controller RTEX User's Manual (Operation)*or *GM1 Controller EtherCAT User's Manual (Operation)*.

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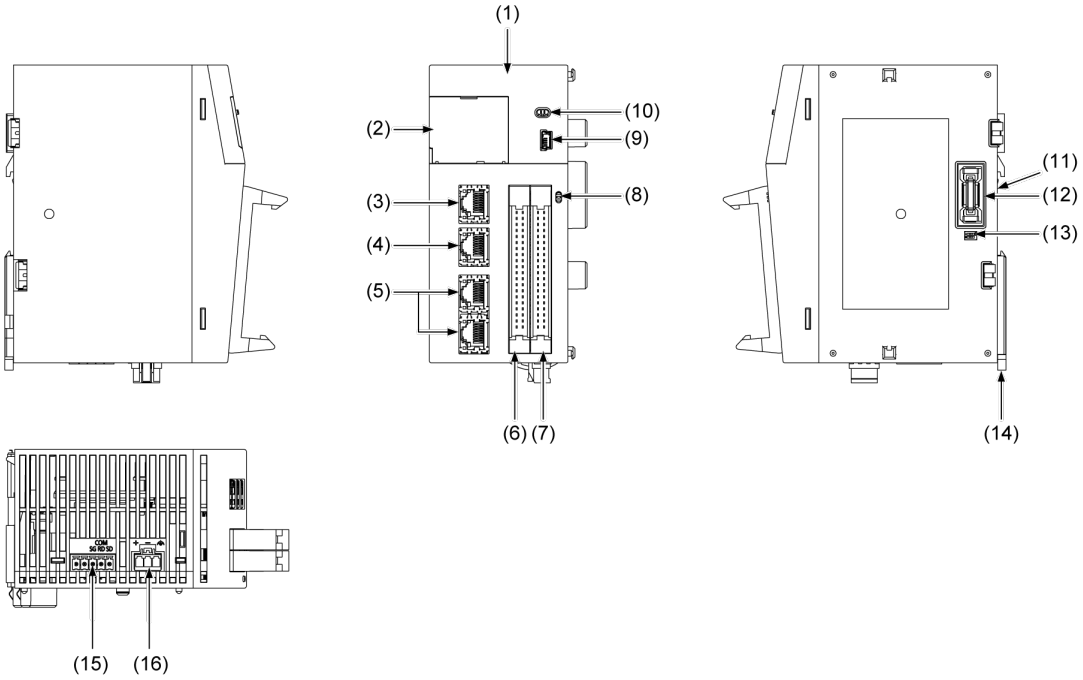
4 Names and Functions of Components

4.1 Names and Functions of Components of the GM1 Controller

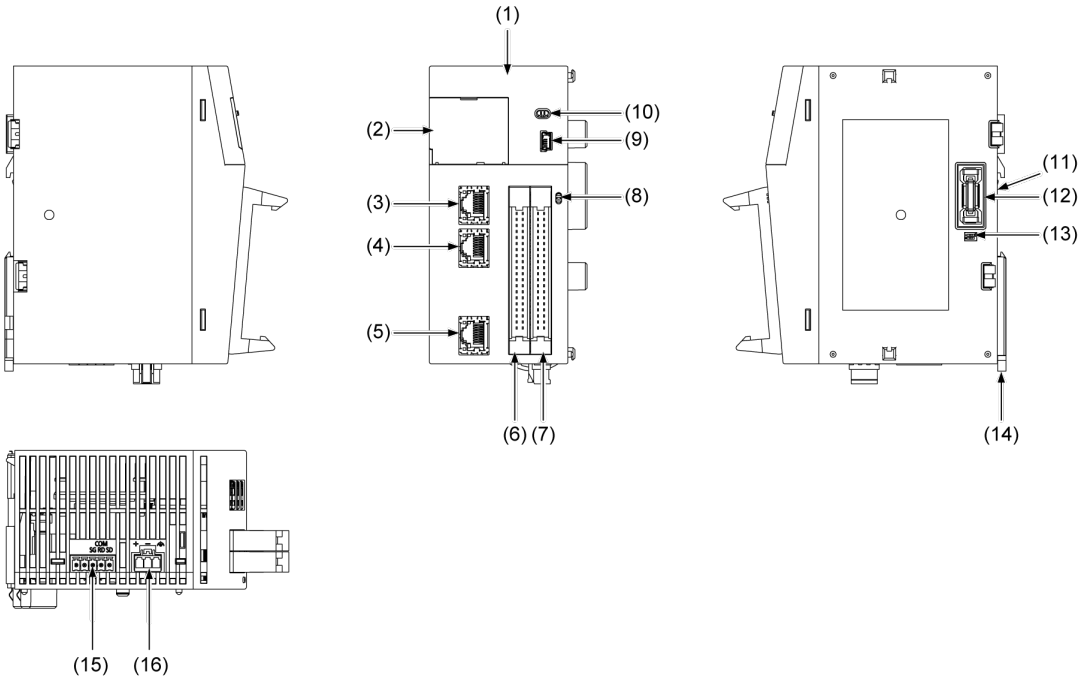
4.1.1 GM1 controller

■ Names and Functions of Components

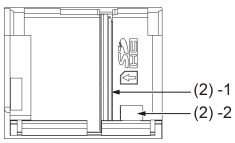
GM1 controller RTEX Type



GM1 controller EtherCAT Type



■ Function

No.	Name	Function
(1)	Operation monitor LEDs	LEDs indicate the RTEX-compatible GM1 Controller state.
(2)	Card cover(Note 1) Inside the card cover  	Stores the SD memory card. The following are contained inside the cover. (2) -1 SD memory card slot (2) -2 Cover switch
(3)	LAN port 1	Ethernet connector
(4)	LAN port 2	Ethernet connector
(5)-1	RTEX port	Motion network connector dedicated for connecting the MINAS A6N or A5N series ● "RX" reception side ● "TX" transmission side
(5)-2	EtherCAT port	Motion network connector dedicated for connecting the MINAS A6B or A5B series
(6)	High-speed counter input connector	High-speed counter input connect parts
(7)	General-purpose I/O connector	General-purpose I/O connector parts
(8)	Display selector switch	Used to select either the input state (X) or the output state (Y) of operation monitor LEDs

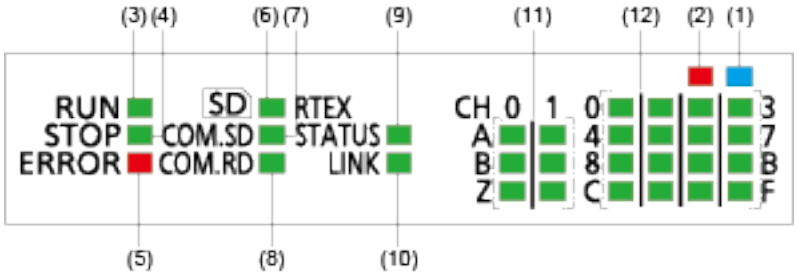
No.	Name	Function
(9)	USB port	Used to connect to a personal computer that uses a tool software. (miniB type)
(10)	Mode selector switch	Used to change the mode to RUN or STOP. Regardless of whether the switch is set to RUN or STOP, the mode can be switched through remote operation from the GM Programmer. When power is turned ON, it operates in the mode set on the switch.
(11)	DIN rail attachment part	This is the part which is attached to the DIN rail.
(12)	Unit connector	This is a connector to which each expansion unit is connected. An end unit is fitted when the unit is shipped.
(13)	Dip switches 	SW1 : Do not change the setting. It is set to ON as the factory default. SW2 : Reset bit This is the switch used to reset the devices. If the power supply is turned ON with the mode selector switch set to STOP and the reset bit set to ON, the “Device reset (GM1 initialization)” function is implemented
(14)	DIN hook	Used to fix the Controller to a DIN rail
(15)	COM port terminal	Serial (RS-232C) connector
(16)	Power supply connector	24 V DC power supply connector

(Note 1) Do not apply an excessive force to the card cover when opening or closing it or when the cover is left open.

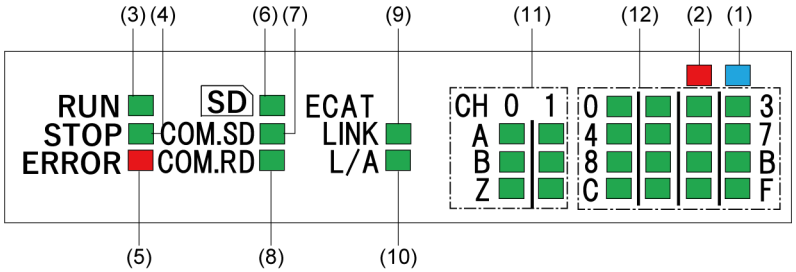
Otherwise, the cover attachment part will be deformed to cause malfunction in the cover switch mounted inside the product.

■ Names and functions of operation monitor LEDs

GM1 controller RTEX Type



GM1 controller EtherCAT Type



■ Functions of operation monitor LEDs

No.	Name	LED color	Function
(1)	Power	Blue	Indicates the power state of the unit. Lit: Power supply of the unit is started normally. Unlit: Power is not supplied. Or, there is an error in the power supply to the system.
(2)	Alarm	Red	Indicates that an alarm has occurred in the system. Lit: System error Unlit: Normal
(3)	RUN	Green	Indicates the operating state of the application. RUN (Lit) and STOP (Unlit): The application is in the operating state. RUN (Unlit) and STOP (Lit): The application is in the stopped state. RUN (Unlit) and STOP (Unlit): No application exists.
(4)	STOP	Green	
(5)	ERROR	Red	Indicates that an error has occurred in the system. Flashing: An error occurred. (Flashing cycle: ON for 0.5 sec and OFF for 0.5 sec) Unlit: Normal
(6)	SD	Green	Indicates an access state to the SD memory card. Lit: Currently accessing to the SD memory card Unlit: No access to the SD memory card
(7)	COM.SD	Green	Flashes while data is transmitted from the COM port.
(8)	COM.RD	Green	Flashes while data is received by the COM port.
(9)-1	RTEX STATUS	Green	Indicates the packet transmission / reception state through motion communication. Lit: Communication is established with normal communication. Flashing: Starting up Unlit: Communication is not established.
(9)-2	ECAT LINK	Green	Indicates the LINK state of EtherCAT communication. Lit: EtherCAT communication LINK is established. (= Operational mode) (All slave devices connected to the master device are in the Active state.) Flashing: EtherCAT is starting up. (When the Active state turns OFF due to wire disconnection or other reasons while the master device is in the Active state) Unlit: EtherCAT communication is not established. (When the master device is invalid or does not exist)
(10)-1	RTEX LINK	Green	Indicates the LINK state of motion communication. Lit: Normal connection (The TX of the sending node and the RX of the local node are electrically connected normally.) Unlit: Not connected
(10)-2	ECAT L/A	Green	ndicates the state of the physical port of EtherCAT communication. Lit: PHY LINK is established and data are transmitted / received. Flashing: PHY LINK is established and data are not transmitted / received. Unlit: PHY LINK is not established.
(11)	CH0 A、B、Z	Green	Indicates the status of the high-speed counter input signal

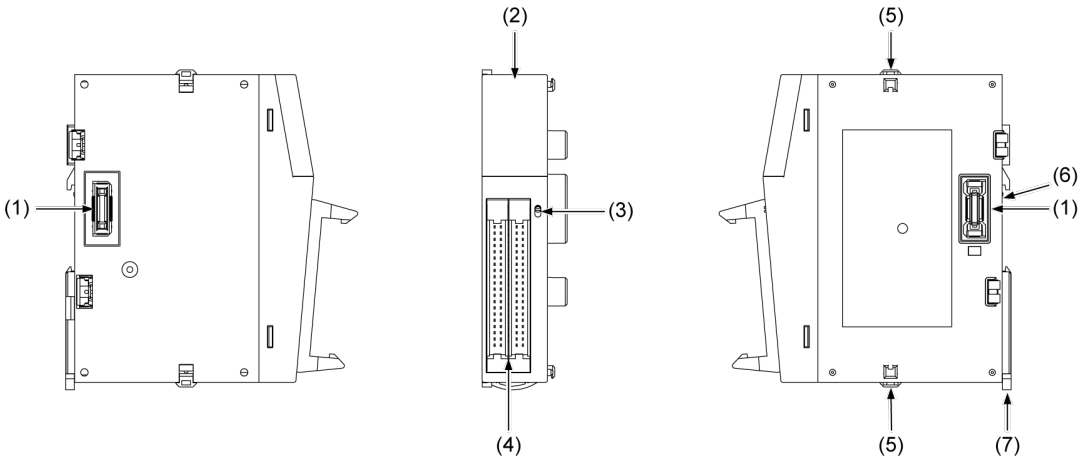
No.	Name	LED color	Function
	CH1 A、B、Z		(Note 1)
(12)	0-F	Green	Indicates the ON/OFF state of the Controller I/O depending on the state of the display selector switch. Display selector switch X Lit: Each terminal of the input contacts X0-XF is ON. Unlit: Each terminal of the input contacts X0-XF is OFF. Display selector switch Y Lit: Each terminal of the output contacts Y0-YF is ON. Unlit: Each terminal of the output contacts Y0-YF is OFF.

(Note 1) The LEDs for the high-speed counter input signal flash according to the input statuses. Thus look as if they are continuously lit if the input frequencies are high.

4.2 Names and Functions of Components of the Expansion Units

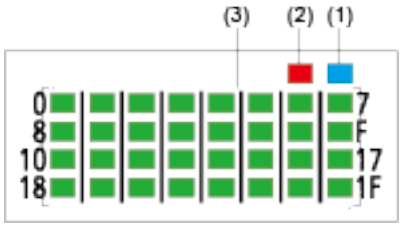
4.2.1 Digital I/O Unit

■ Names and Functions of Components



No.	Name	Function
(1)	Unit connector	This is a connector to which each expansion unit is connected.
(2)	Operation monitor LEDs	These LEDs indicate the status of expansion units.
(3)	Display selector switch	This is a switch used to select I/O information to be displayed on LEDs.
(4)	I/O connector	Used to connect input devices to output devices.
(5)	Expansion hook	This is a hook used to fix each expansion unit to another
(6)	DIN rail attachment part	This is the part which is attached to the DIN rail.
(7)	DIN hook	Used to fix the Controller to a DIN rail

■ Names and functions of each operation monitor LED

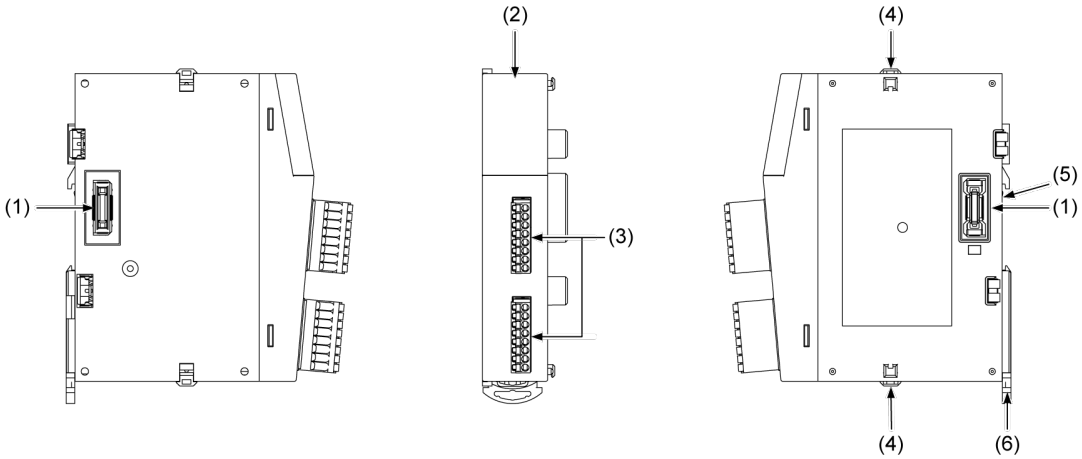


No.	Name	LED color	Function
(1)	Power	Blue	Indicates the power state of the unit. Lit: Power supply of the unit is started normally Unlit: Power is not supplied. Or, there is an error in the power supply to the system.

No.	Name	LED color	Function
(2)	Alarm	Red	Indicates that an alarm has occurred in the unit. Lit: Unit error Unlit: Normal
(3)	0-1F	Green	Indicates the ON / OFF state of the expansion unit depending on the state of the display selector switch. ● 64-point digital input unit • Display selector switch CN1 Lit: Each terminal of the X0-1F is ON. Unlit: Each terminal of the X0-1F is OFF. • Display selector switch CN2 Lit: Each terminal of the X20-3F is ON. Unlit: Each terminal of the X20-3F is OFF. ● 64-point digital output unit • Display selector switch CN1 Lit: Each terminal of the Y0-1F is ON. Unlit: Each terminal of the Y0-1F is OFF. • Display selector switch CN2 Lit: Each terminal of the Y20-3F is ON. Unlit: Each terminal of the Y20-3F is OFF. ● 64-point digital I/O unit • Display selector switch CN1 Lit: Each terminal of the X0-1F is ON. Unlit: Each terminal of the X0-1F is OFF. • Display selector switch CN2 Lit: Each terminal of the Y0-1F is ON. Unlit: Each terminal of the Y0-1F is OFF.

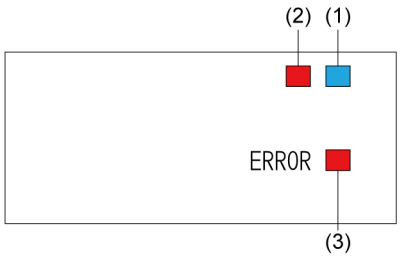
4.2.2 Analog I/O Unit

■ Names and Functions of Components



No.	Name	Function
(1)	Unit connector	This is a connector to which each expansion unit is connected.
(2)	Operation monitor LEDs	These LEDs indicate the status of expansion units.
(3)	I/O connector	Used to connect input devices or output devices.
(4)	Expansion hook	This is a hook used to fix each expansion unit to another.
(5)	DIN rail attachment part	This is the part which is attached to the DIN rail.
(6)	DIN hook	Used to fix the Controller to a DIN rail

■ Names and functions of each operation monitor LED

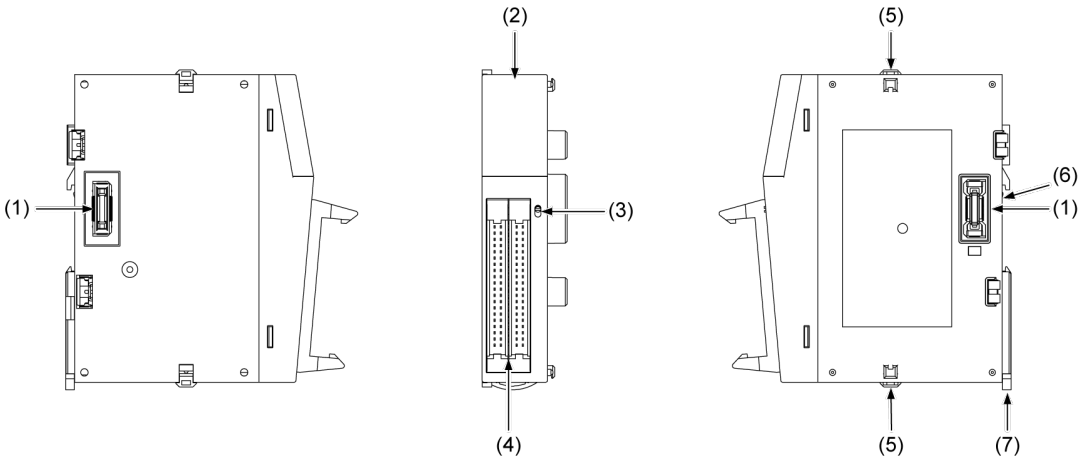


No.	Name	LED color	Function
(1)	Power	Blue	Indicates the completion of power processing of the unit. Lit: Power supply of the unit is started normally. Unlit: Power is not supplied. Or, there is an error in the power supply to the system.
(2)	Alarm	Red	Indicates that an alarm has occurred in the unit. Lit: Unit error Unlit: Normal
(3)	ERROR	Red	Indicates that an alarm has occurred in the unit. Lit: Unit error

No.	Name	LED color	Function
			Unlit: Normal

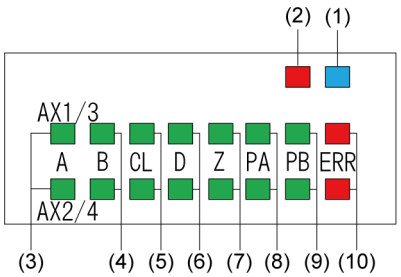
4.2.3 Pulse Output Unit

■ Names and Functions of Components



No.	Name	Function
(1)	Unit connector	This is a connector to which each expansion unit is connected.
(2)	Operation monitor LEDs	These LEDs indicate the status of expansion units.
(3)	Operation monitor selection switch	This switches operation display between the display for axes 1 and 2, and that for axes 3 and 4.
(4)	Output connector	This is used to connect an output device.
(5)	Expansion hook	This is a hook used to fix each expansion unit to another.
(6)	DIN rail attachment part	This is the part which is attached to the DIN rail.
(7)	DIN hook	Used to fix the Controller to a DIN rail

■ Names and functions of each operation monitor LED



No.	Name	LED color	Function
(1)	Power	Blue	Indicates the completion of power processing of the unit. Lit: Power supply of the unit is started normally.

No.	Name	LED color	Function
			Unlit: Power is not supplied. Or, there is an error in the power supply to the system.
(2)	Alarm	Red	Indicates that an alarm has occurred in the unit. Lit: Unit error Unlit: Normal
(3)	A	Green	Indicates the pulse output A signal.(Note 1) ● When set to pulse / sign output method Flashing: During pulse output Unlit: During stop ● When set to CW / CCW output method Flashing: During pulse output (Forward) Unlit: During stop (Forward)
(4)	B	Green	Indicates the pulse output B signal.(Note 1) ● When set to pulse / sign output method Lit: Reverse direction command Unlit: Forward direction command ● When set to CW / CCW output method Flashing: During pulse output (Reverse) Unlit: During stop (Reverse)
(5)	CL	Green	Indicates the counter clear signal output. Lit: Output ON Unlit: Output OFF
(6)	D	Green	Indicates the near home status.(Note 2) Lit: ON Unlit: OFF
(7)	Z	Green	Indicates the home input state.(Note 2) Lit: ON Unlit: OFF
(8)	PA	Green	Indicates the pulse input A signal.(Note 3)
(9)	PB	Green	Indicates the pulse input B signal.(Note 3)
(10)	ERR	Red	Indicates that an error has occurred in the unit. Lit: Error occurred. Unlit: Normal

(Note 1) The pulse output signal display LEDs (A and B) blink at the output frequency (speed). For this reason they may appear to light steadily at high-speed output.

(Note 2) The near home (D) and home input (Z) LEDs light when the respective input becomes valid.

(Note 3) Pulse input signal (PA) and (PB) display the pulse signal input status.

(MEMO)

5 Installation

5.1 Installation of the GM1 Series

5.1.1 Installation Environment

■ Installation environment

Use the unit within the range of the general specifications when installing.

- Ambient temperature: 0 to +55°C
- Ambient humidity: 10 to 95% RH (at 25°C, non-condensing)
- Pollution degree: 2
- Altitude: 2,000 m above sea level or lower
- Overvoltage category: II or less
- Installation place: It is assumed to be used in an environment inside a control panel (metal panel with sufficient strength) that provides a protection rating of IP54 or higher.

Do not use it in the following environments.

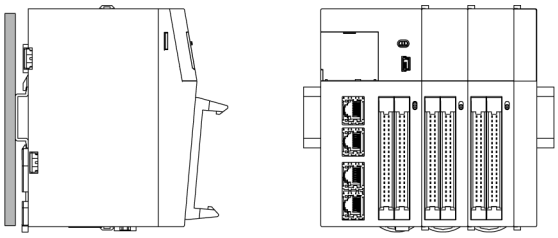
- Direct sunlight
- Sudden temperature changes causing condensation.
- Inflammable or corrosive gas.
- Excessive airborne dust, metal particles or saline matter.
- Benzine, paint thinner, alcohol or other organic solvents or strong alkaline solutions such as ammonia or caustic soda.
- Direct vibration, shock or direct drop of water.
- Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters, or any other equipment that would generate high switching surges. (100 mm or more)

■ Handling instructions

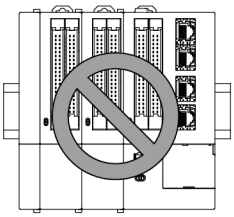
- Do not directly touch connector pins directly to prevent electrostatic discharge failure.
- Always rid yourself of any static electricity before handling this product.
- Do not connect a unit other than our GM1 series to the side connector on the unit.
- Use copper wires with a temperature rating of 90°C.

■ Measures regarding heat radiation

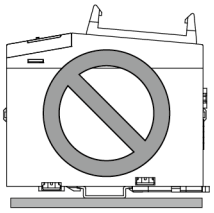
- As countermeasures against heat radiation, install the unit in the direction shown below.



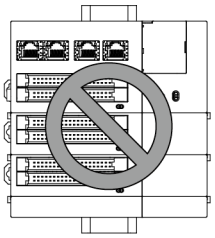
- Do not install the unit stacked up, horizontally or upside down. Doing so will prevent proper cooling of the unit and cause overheating inside.

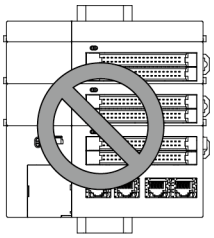


Installing the unit upside down



Installing the unit so that it stays in a horizontal position





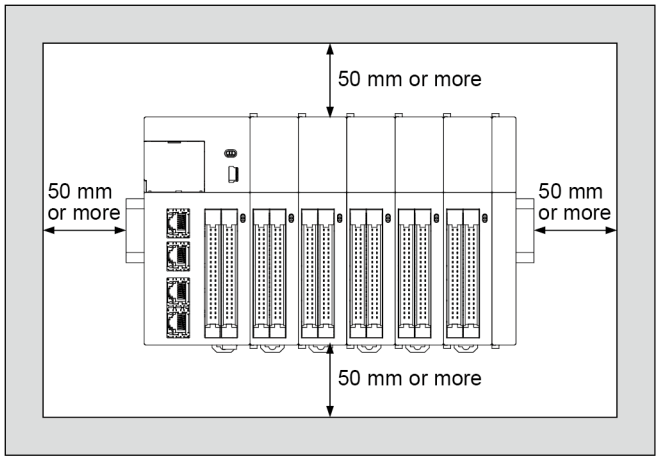
Installing the unit so that the DIN rail is mounted vertically

- Do not install the unit above devices which generate heat such as heaters, transformers or large scale resistors.

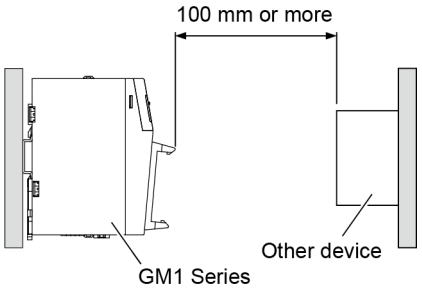
5.1.2 Mounting direction and space

- Install the unit at least 50 mm away from other devices or wiring duct on the left and right sides and top and bottom sides of the unit to provide a ventilation space.

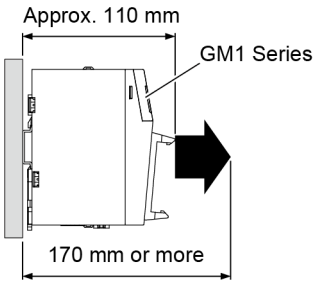
  As countermeasures against heat radiation, install the unit in the direction shown below.



- Do not install the unit above devices which generate heat such as heaters, transformers or large scale resistors.
- In order to eliminate any effects from noise emission, power wires and electromagnetic devices should be kept at least 100 mm away from the surfaces of the unit. When installing the unit behind the doors of the control board, be especially careful to secure clearances as above.



- Secure a clearance of at least 170 mm from the mounting surface of the GM1Series for connecting tool software cables.

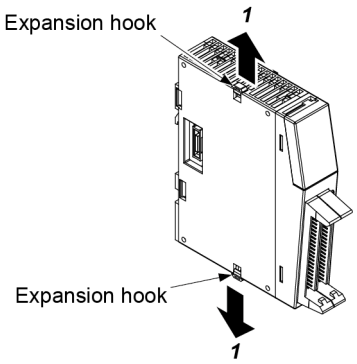


5.1.3 Unit Installation Procedure

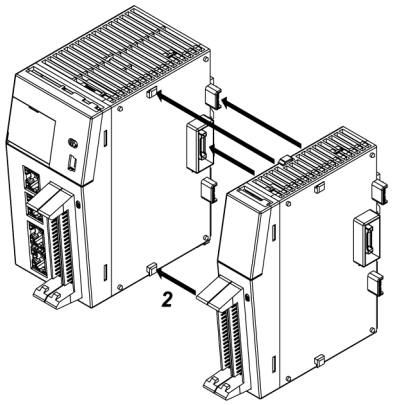
- Install the expansion unit between the GM1 Controller (RTEX-compatible / EtherCAT-compatible) and the end unit.
- Make sure to connect an end unit.
- Make sure to turn OFF the power supply before installing the unit.
- Do not directly touch the connector part of the unit.
- Make sure that the connector parts are not stressed when and after installing the unit.

1 2 Procedure

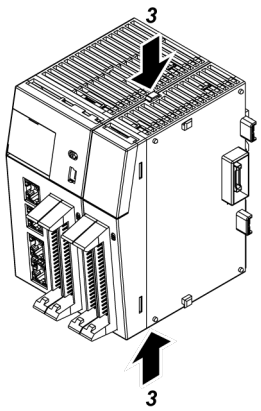
1. Raise the expansion hooks on the sides of the unit with a screwdriver to release them.



2. Attach the unit connectors on the side of the unit to those on the the other unit.



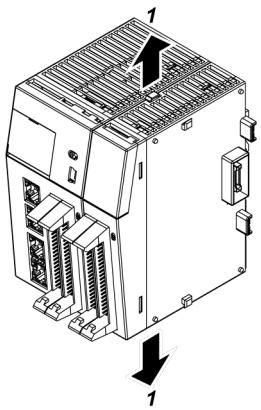
3. Lower the expansion hooks to lock the units in place.



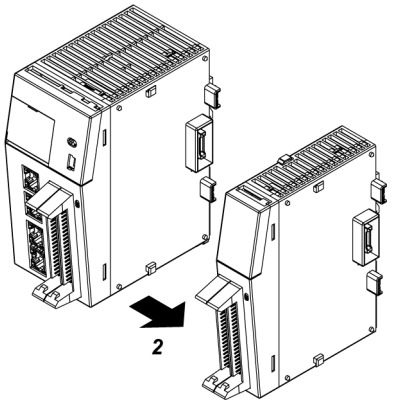
5.1.4 Removing the Unit

Procedure

1. Raise expansion hooks on the sides of the unit with a screwdriver to release them.



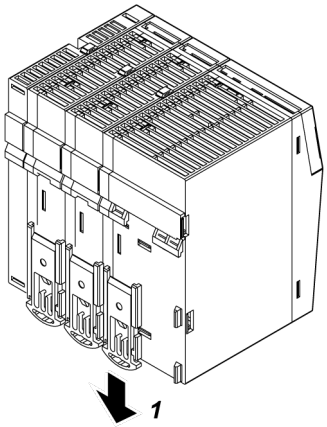
2. Slide the unit sideways to remove it.



5.1.5 Attaching to DIN Rail

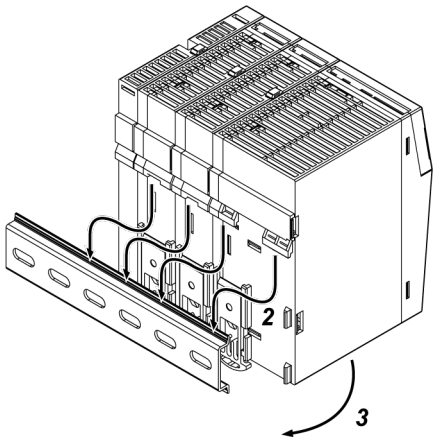
1 2 Procedure

1. Using a screwdriver, push down the DIN rail attachment lever on the back of each unit.

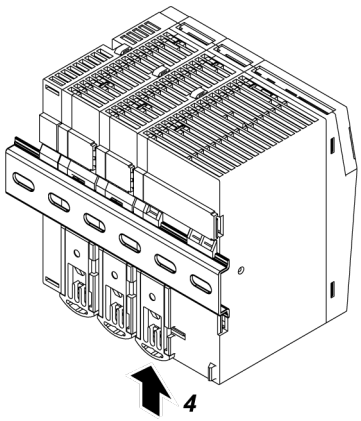


2. Fit the top of the unit attachment part into the DIN rail.

3. While pressing down the unit attachment part onto the DIN rail, fit the bottom of the unit attachment part into the DIN rail.



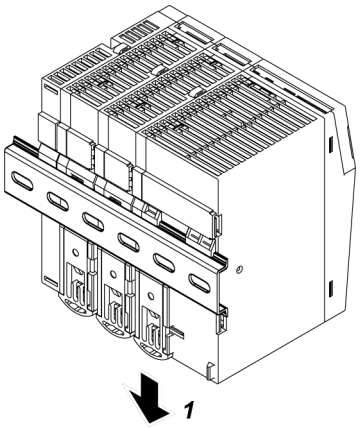
4. Push up the DIN rail attachment lever on the back of the unit until it "clicks" to lock.



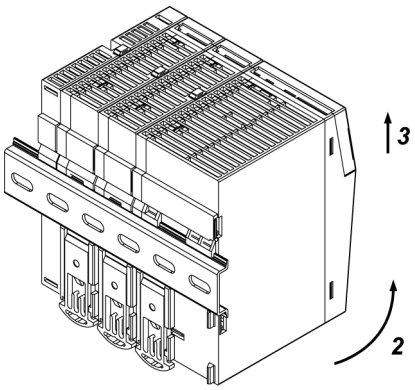
5.1.6 Removing from DIN Rail

1 2 Procedure

1. Using a screwdriver, push down the DIN rail attachment lever on the back of each unit.



2. Pull the bottom of the unit toward you.
3. While holding up the unit, remove it from the DIN rail.



6 Wiring

6.1 Wiring the Power Supply

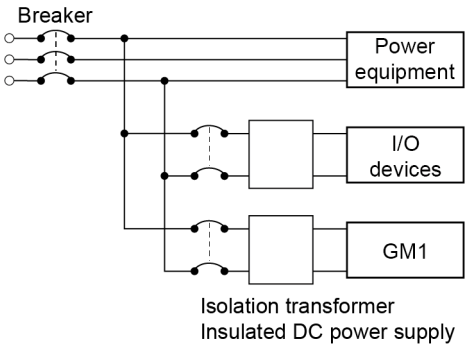
6.1.1 Common Precautions

■ Selection of a power supply

- Use a low noise power supply.
- The inherent noise resistance is sufficient for the noise superimposed on the power wires, however, the noise can be attenuated further by using the isolation transformer / insulated power supply.

■ Isolation of power supply systems

Wiring to the units, I/O devices, and other power devices should have separate wiring systems.

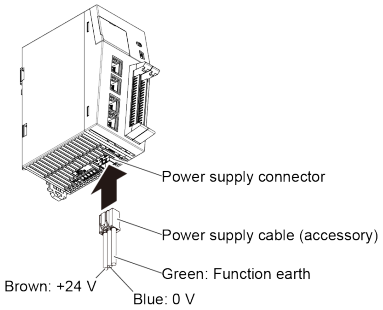


■ Power supply sequence

- Have the power supply sequence such that the power supply of the GM1 Controller (RTEX-compatible / EtherCAT-compatible) turns OFF before the power supply for input and output.
- If the I/O power supplies are turned OFF before the power to the GM1 Controller (RTEX-compatible / EtherCAT-compatible), the GM1 Controller (RTEX-compatible / EtherCAT-compatible) will detect the input fluctuations and may begin an unscheduled operation.

6.1.2 Power Supply for the GM1 Controller (RTEX-compatible / EtherCAT-compatible)

■ Wiring the Power Supply

Units	Wiring diagram
GM1Controller (RTEX,EtherCAT)	

■ Selection of a power supply

- To protect the system against erroneous voltage from the power supply line, use an insulated power supply with an internal protective circuit (power supply with reinforced insulation or double insulation).
- The regulator on the unit is a non-insulated type.
- Select a power supply larger than the capacity of the units to be connected. In the minimum configuration, select a power supply of 24 W or larger.

■ Power supply voltage

- Confirm that the voltage of the power supply to be connected is within the allowable range.

Rated input voltage	Allowable voltage range	Rated output capacity
24 V DC	20.4 to 28.8 V DC	24 W or more

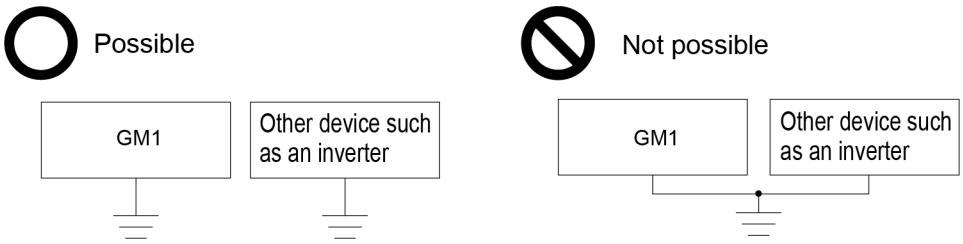
■ Power supply cable

- Use the power supply cable (Part No.:AFPG805) that comes with the unit to connect the power supply.
  Brown: 24 V DC, Blue: 0 V, Green: Function earth
- Also, twist the power supply cables to minimize adverse effects from noise.

6.1.3 Grounding

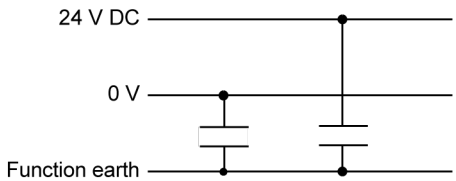
■ Use dedicated grounding

- The grounding connection should have a resistance of 100 Ω or less.
- The point of grounding should be as close to the GM1 as possible. The ground wire should be as short as possible.
- Sharing the ground with another device may have an adverse effect. Therefore, be sure that grounding is dedicated.



- **Conversely, depending on your environment, grounding may cause a problem.**

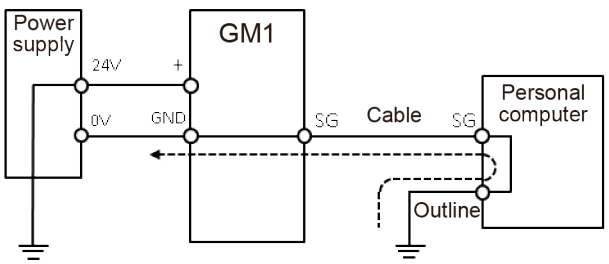
  As for the GM1 Controller (RTEX-compatible / EtherCAT-compatible), since its power supply line is connected to the function earth through a high-voltage capacitor, it is no problem.



Power supply line to the GM1 expansion unit

- **Do not ground the function earth when grounding a plus (+) terminal of the power.**

  When grounding a plus terminal of the power supply, prepare a power supply dedicated to the GM1 and do not ground the plus terminal of the GM1 power supply. In some personal computers, the SG terminal of the internal circuit and shielding are connected. Furthermore, since the power supply circuit for the GM1 is not isolated, if the plus terminal of the power supply is grounded, the power supply will be short circuited to cause a breakdown.



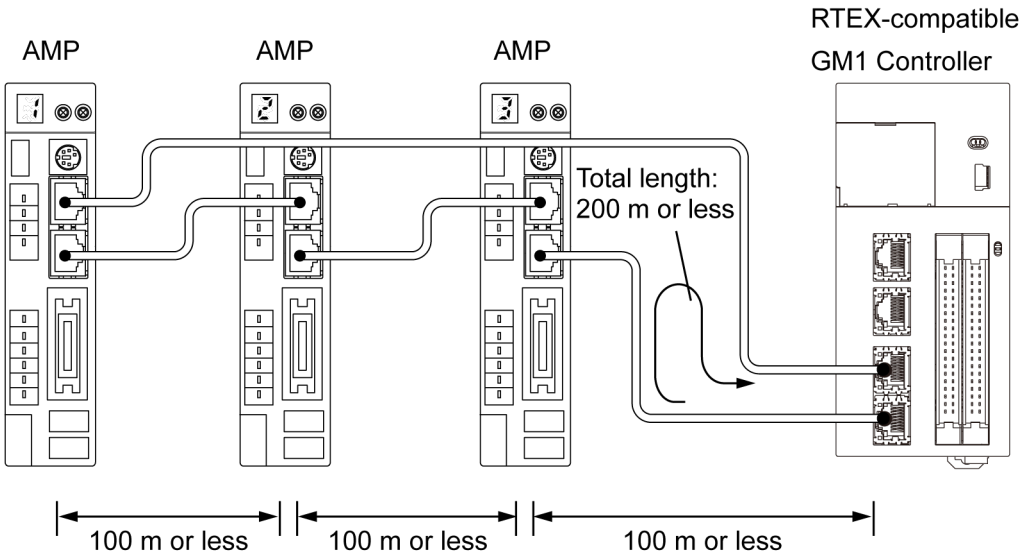
6.2 Wiring of Network

6.2.1 Common Precautions of Network

For the wiring of the network, use the LAN cable of the Category 5e shielded cable type. To prevent the cable from coming off, securely connect the connector of the cable to the network connector (RJ45 connector) of the unit.

For RTEX communication

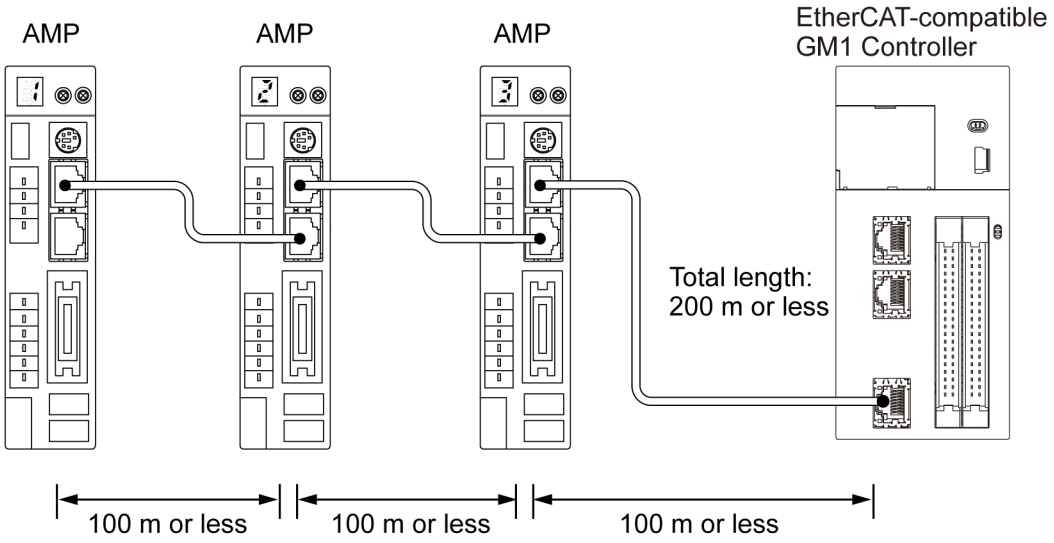
The length between each node should be within 100 m, and the total length of the communication loop should be within 200 m.



- Connect the cable that is connected to the "TX" of the GM1 Controller (RTEX) to the "X2A Connector (RX) "of the servo amplifier. In the same way,connect between amplifiers from X2B (TX) to X2A (RX).Connect them in a loop in such a way that X2B (TX) of the end amplifier is connected to the "RX" of the GM1 Controller (RTEX)

For EtherCAT communication

The length between each node should be within 100 m, and the total length should be within 200 m.



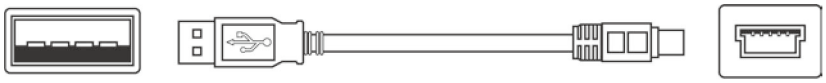
- Connect the cable that is connected to the "EtherCAT port" of the GM1 Controller (EtherCAT) to the "X2A Connector (RX) "of the servo amplifier. In the same way,connect between amplifiers from X2B (TX) to X2A (RX).

- Always use shielded twisted pair (STP) cables that are compatible with category 5e or higher.
- Turn OFF the power to the system before wiring cables.
- The Ethernet hub cannot be used.
- For detailed information of cable specifications and precautions, refer to the data"RTEX Cable"listed on the web page.
  https://industrial.panasonic.com/ac/e/dl_center/manual/

6.2.2 USB Port

Cable type	Length
USB 2.0 cable (A: miniB)(Note 1)	Max. 5 m

(Note 1) Match the connection terminal shape of the USB2.0 cable on the PC side with the specifications of the PC side.



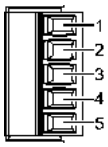
USB A type (male) - USB miniB type (5-pin, male)

(PC side) (GM1 side)

6.2.3 COM Port(RS-232C)

Item	Specifications
Transmission distance	MAX. 15 m
Transmission line	Multicore shielded wire
Connector shape	Removable terminal block (5-pin)

■ Terminal layout



Terminal no.	Signal name	Function
1	SD	Send data
2	RD	Receive data
3	SG	Signal ground
4	N.C.	—
5	N.C.	—

■ Compatible wires (stranded wire)

Size	Nominal cross-sectional area	Tightening torque for terminal block
AWG 28 to 16	0.08 to 1.25 mm^2	0.22 to 0.25 N・m

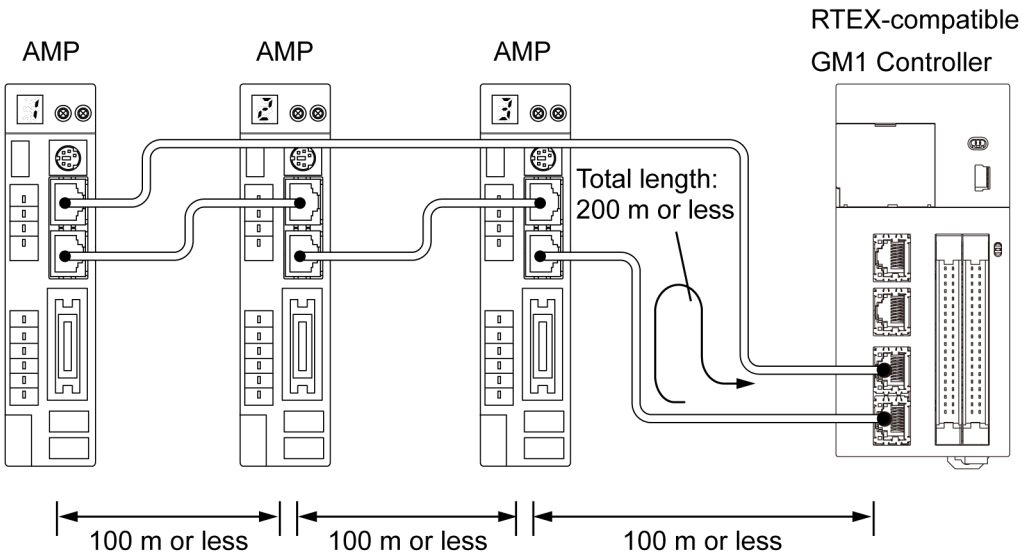
6.2.4 LAN Port

Item	Specifications
Max. segment length	100 m(Note 1)
Max. distance between nodes	100BASE-TX 2 segments
	10BASE-T 5 segments
Communication cable	Shielded twisted pair (TIA/EIA-568B CAT5e or higher)

(Note 1) The standards cite 100m as the maximum, but noise resistance measures such as attaching a ferrite core may be necessary in some cases, depending on the usage environment. Also, it is recommended to position a hub near the control board, and limit the length within 10m.

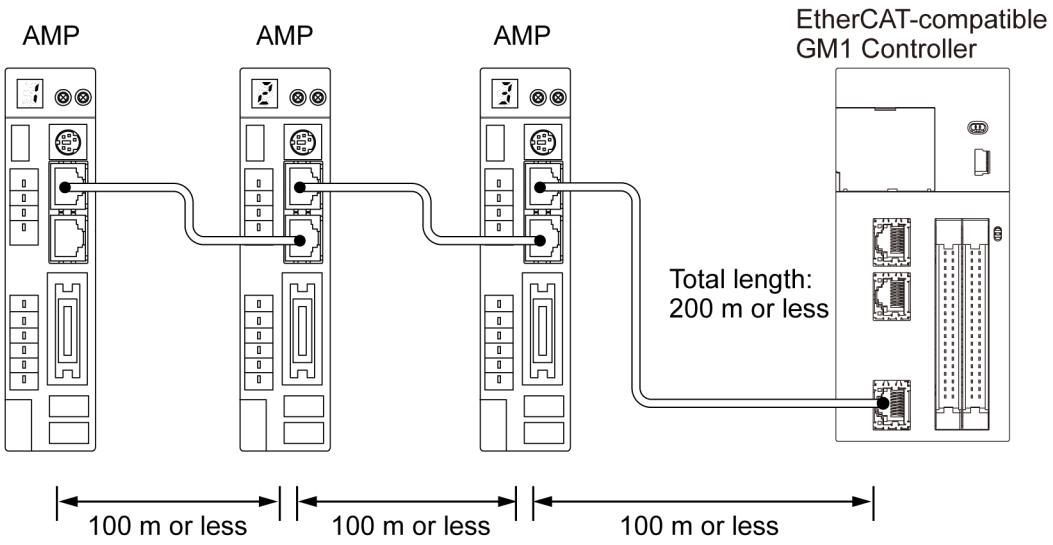
6.2.5 RTEX Port

Item	Specifications
Cable	Shielded twisted pair (TIA/EIA-568B CAT5e or higher)
Topology	Ring
Connector	8-pin RJ45
Maximum cable length	Between nodes: 100 m, total length: 200 m



6.2.6 EtherCAT Port

Item	Specifications
Cable	Shielded twisted pair (TIA/EIA-568B CAT5e or higher)
Topology	Daisy chain (No branching)
Connector	8-pin RJ45
Maximum cable length	Between nodes: 100 m, total length: 200 m



6.3 Wiring of Input and Output

6.3.1 Precautions Common to Input and Output

■ Wiring arrangement

- Arrange the wiring so that the input and output wiring are separated, and these wirings are separated from the power wiring, as much as possible.
- Do not route them through the same duct or tie them in a bundle.
- Separate the I/O wires from the power and high voltage wires by at least 100 mm.

■ Selection of wires

- Be sure to select the thickness (dia.) of the input and output wires while taking into consideration the required current capacity.

■ The NC terminals

- The NC terminals on the terminal block are unused. Do not use these terminals to relay wires because the terminals include those connected internally.

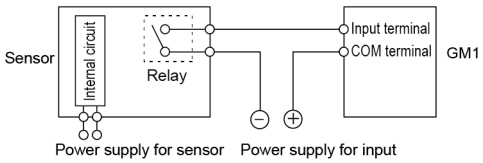
■ Power supply

- Wiring should be carried out after the power supply to the GM1 was turned OFF. Also turn OFF the power supply when connecting the GM1 Controller (RTEX-compatible / EtherCAT-compatible) to expansion units. If they are connected during the power supply is on, it may cause the fault or malfunction.

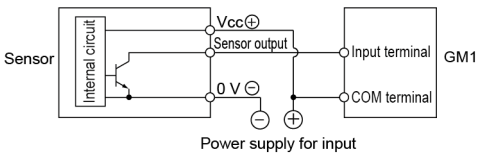
6.3.2 Input Wiring

■ Connection of photoelectric sensor and proximity sensor

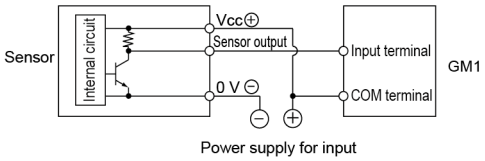
Relay output type



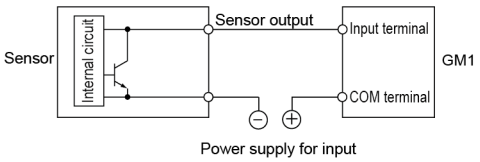
NPN open collector output type



Voltage output type

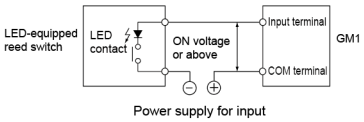


Two-wire output type



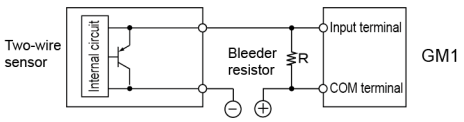
■ Precaution when using LED-equipped reed switch

When a LED is connected in series to an input contact such as LED-equipped reed switch, make sure that the voltage applied to the GM1 input terminal is greater than the ON voltage. In particular, take care when connecting a number of switches in series.



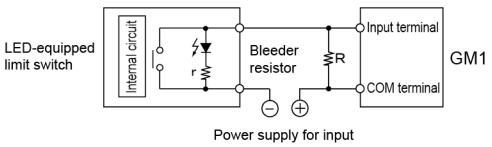
■ Precaution when using two-wire type sensor

If the input to the GM1 does not turn OFF because of leakage current from the two-wire type photoelectric sensor or proximity sensor, connect a bleeder resistor as shown below.



■ Precaution when using LED-equipped limit switch

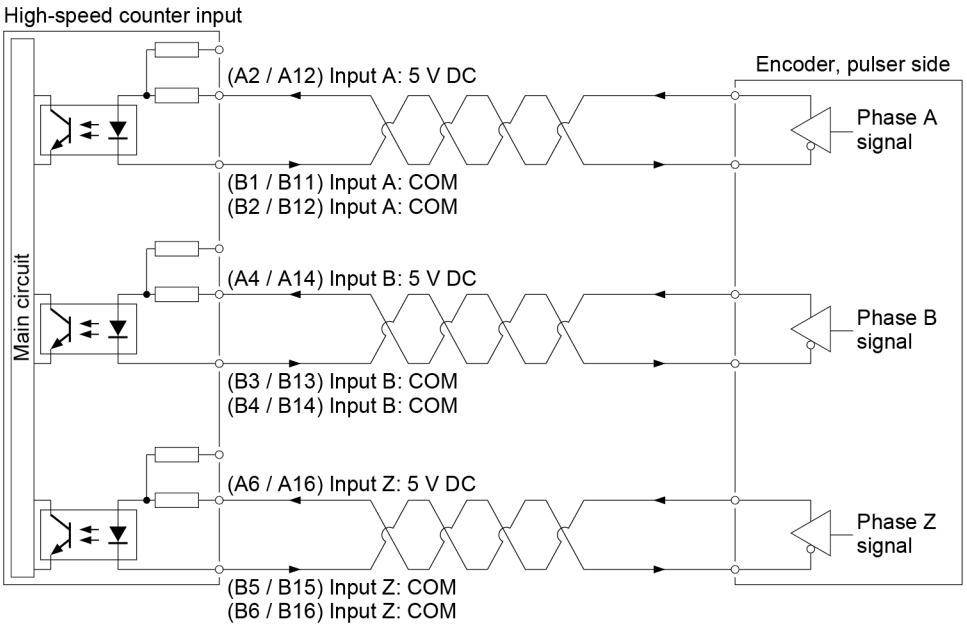
If the input to the GM1 does not turn OFF because of leakage current from the LED-equipped limit switch, connect a bleeder resistor as shown on below.



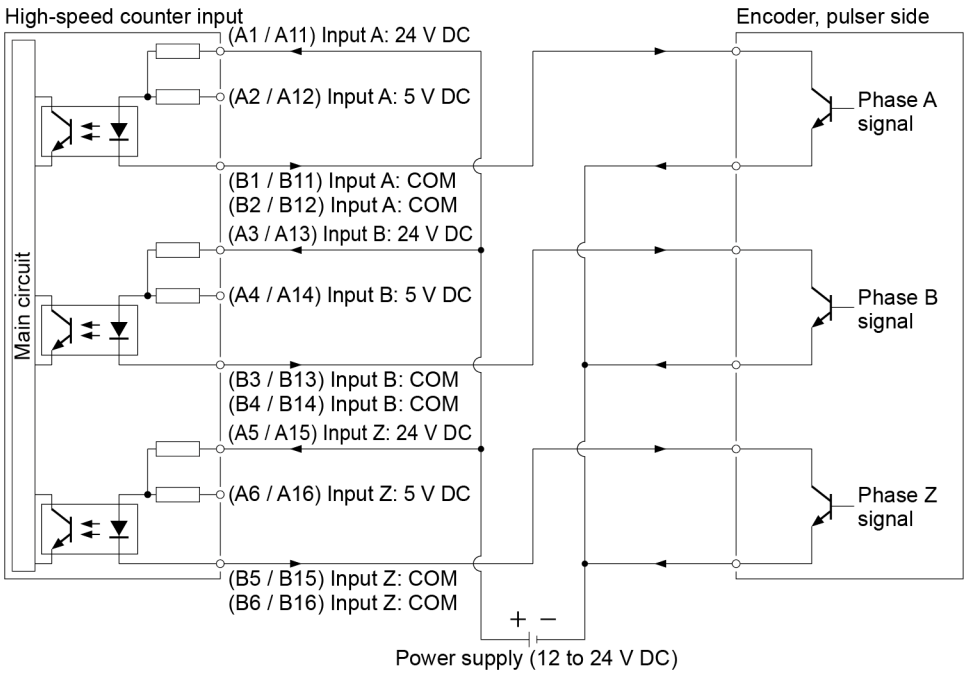
6.3.3 High-speed Counter Input Wiring

- For the connection between the count input (phases A, B, Z) and encoder, etc., use shielded twisted-pair cables.
- The length of connected wires should be 10 m or below.

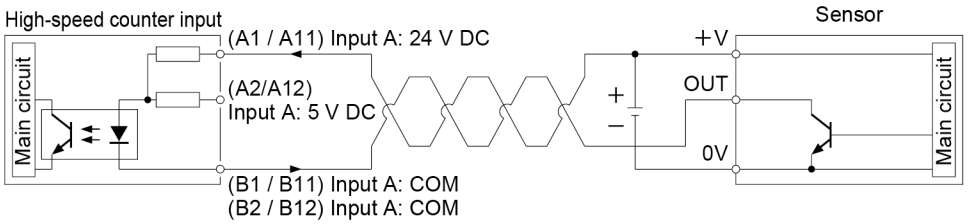
■ For line driver of encoder input



■ For transistor open collector type of encoder input



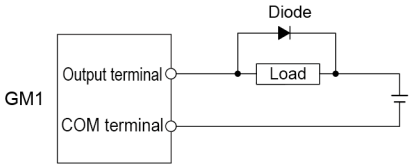
■ For sensor input



6.3.4 Output Wiring

■ Protective circuit for inductive loads

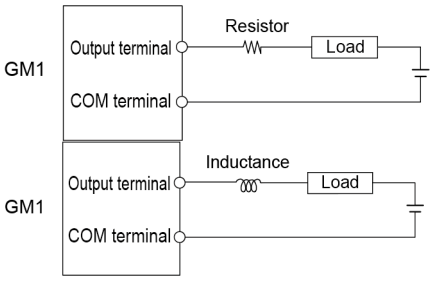
With an inductive load, a protective circuit should be installed in parallel with the load.



Diode	Reverse breakdown voltage	Three times higher than load voltage or more
	Average rectified current	Higher than load current

■ Precautions when using capacitive loads

When connecting loads with large in-rush currents, to minimize their effect, connect a protection circuit as shown below.



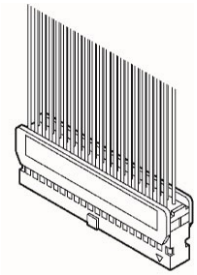
6.4 Connection Using the Discrete-wire Connector

No discrete-wire connector is provided with the unit. Purchase it separately.

6.4.1 Specifications of the Discrete-wire Connector

This is a connector that allows loose wires to be connected without removing the wire's insulation. Use a special tool for wire connection.

Discrete-wire connector (40P)



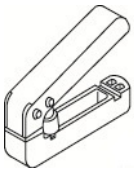
■ **AFP2801 Discrete-wire Connector (Purchase separately)**

Composition of parts	Quantity (2 sets)
Housing (40P)	1 pc.
Semi-cover (40P)	2 pc.
Contact (For AWG22 and AWG24 5 pins	8 pc.

■ **Compatible wires (stranded wire)**

Size	Nominal cross-sectional area	Insulation thickness	Rated current
AWG22	0.3 mm^2	Φ1.5 to Φ1.1	3 A
AWG24	0.2 mm^2		

■ **AXY52000FP Dedicated crimping tool (Purchase separately)**

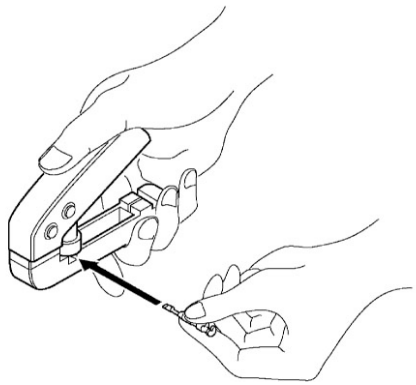


6.4.2 Wiring the Discrete-wire Connector

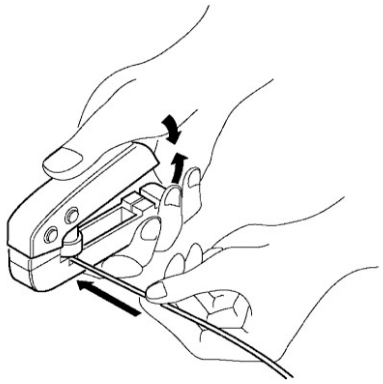
- When performing wiring work, refer to the instruction manual of the crimping tool in order to prevent faulty wiring.

Procedure

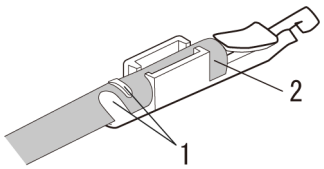
1. Bend and break the contact, and set it in the crimping tool.



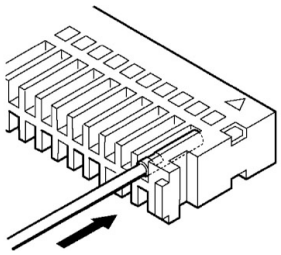
2. Insert the wire without removing its insulation until it stops, and lightly grip the crimping tool.



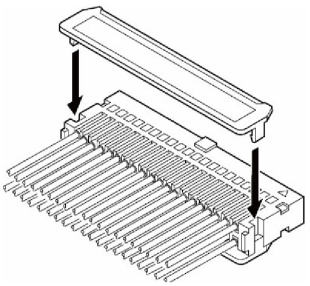
3. The contact appears as shown below after it is crimped. Confirm the following two points.
   1. The wire must be embraced inside the clamped part.
   2. The wire must be inserted to the end.

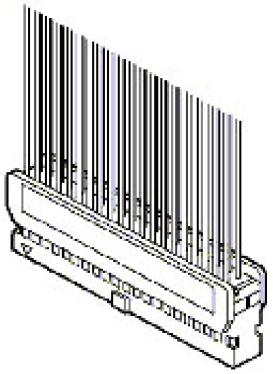


4. Insert the wire with the contact into the housing.



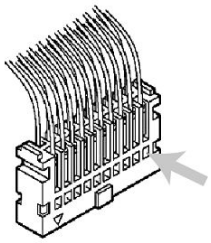
5. When all the wires have been inserted, fit the semi-cover into place.



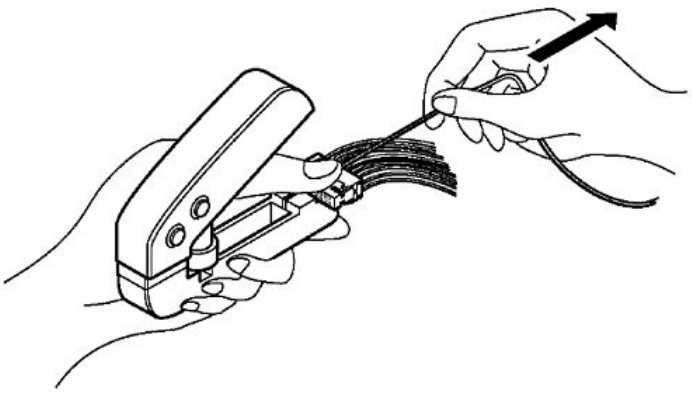


Info.

- If there is a wiring mistake or the wire is incorrectly press-fit, use the crimping tool to remove the contact.
  1. Set the pin of the crimping tool at the position indicated by an arrow.



  2. Hold the housing with fingers and pull the wire.



6.5 Safety Measures

6.5.1 General Safety Measures

■ Precautions regarding system design

- In the system where the GM1 is used, malfunction may occur for the following reasons:
  - Power on timing differences between the GM1 system and I/O devices or power devices.
  - Response time lag when a momentary power failure occurs.
  - Abnormality in the GM1 Controller, external power supply, or other devices.

  In order to prevent a malfunction resulting in an error or accident of the overall system, take adequate safety measures.

■ Installation of an interlock circuit

- When controlling conflicting operations such as the motor rotation in clockwise or counter-clockwise direction, provide an interlock circuit external to the GM1.

■ Installation of an emergency stop circuit

- Provide an emergency stop circuit external to the GM1 to turn OFF the power supply of the output device.

■ Power supply sequence

- Start the GM1 only after I/O devices and power devices are energized.
- In case of stopping the operation of the GM1, have the I/O devices or power devices turned OFF after the GM1 has stopped operating.

■ Grounding

- When installing the GM1 next to devices that generate high voltages from switching, such as inverters, do not ground them together. Connect an exclusive ground with a resistance of 100 Ω or less.

6.5.2 Momentary Power Failure

■ Operations when a momentary power failure occurs

- If the duration of the momentary power failure is less than 10 ms, the GM1 continues to operate. If the power is off for 10 ms or longer, operation changes depending on the combination of units, the power supply voltage, and other factors. (In some cases, operation may be the same as that for a power supply reset.)

6.5.3 Watchdog Timer

- The watchdog timer is a program error and hardware error detection timer.

- When the watchdog timer is activated, the "Alarm" LED on the front of the Controller is lit. When this occurs, all outputs to the output units are turned OFF and the unit is put in halted state.

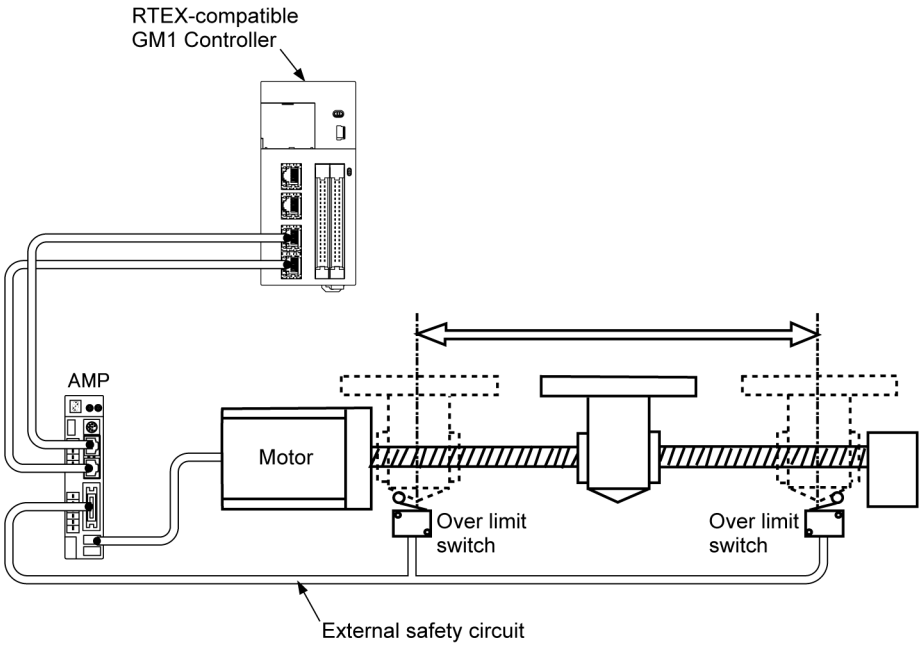
7 Checking Wiring

7.1 Safety Circuit Design

■ Example of a safety circuit

Be sure to create a safety circuit when using this product.

Installation of over limit switches

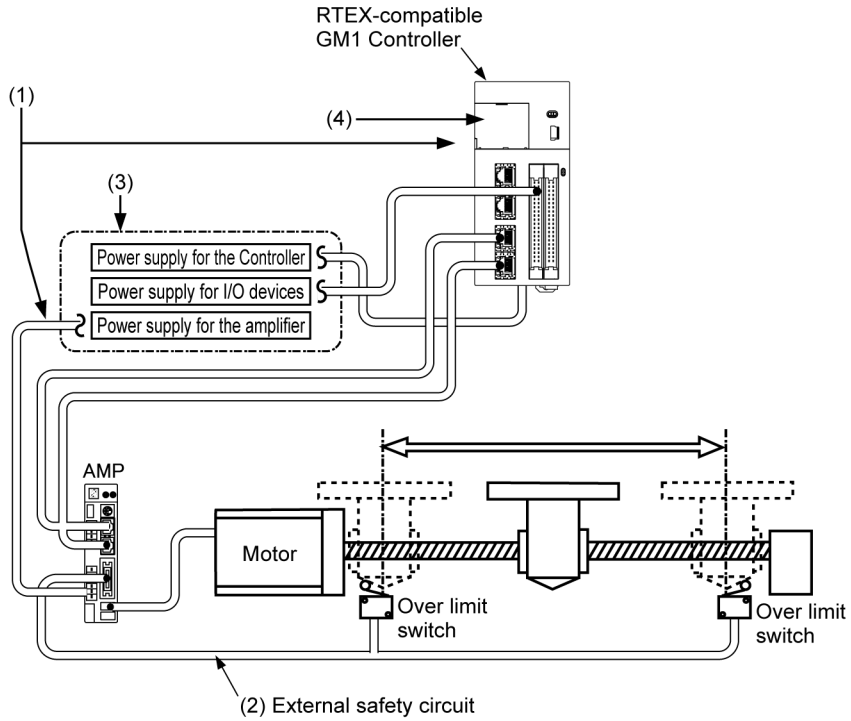


- Install over limit switches as shown above.
- Connect them to the CW and CCW over-travel inhibit inputs of the parallel I/O connector of the servo amplifier. For the GM1 Controller (RTEX-compatible / EtherCAT-compatible), connect them to the limit input (+) and limit input (-) through the network.

- Install the safety circuit recommended by the manufacturer of the motor being used.

7.2 Items to Check during Wiring

■ System configuration example



(1) Checking connections of each device

Check to make sure that each device has been connected as indicated by the design.

(2) Checking the installation of the external safety circuit

Check to make sure the safety circuit (wiring and installation of over limit switch) based on the external circuit has been installed properly.

(3) Checking the settings for power ON sequence

Make sure that settings have been entered so that power supplies will be turned ON according to the procedure outlined in "Power ON Operation".

(4)Checking the GM1 Controller (RTEX-compatible / EtherCAT-compatible) mode selector switch

Set the GM1 Controller (RTEX-compatible / EtherCAT-compatible) to the STOP mode. Setting it in the RUN mode can cause inadvertent operation.

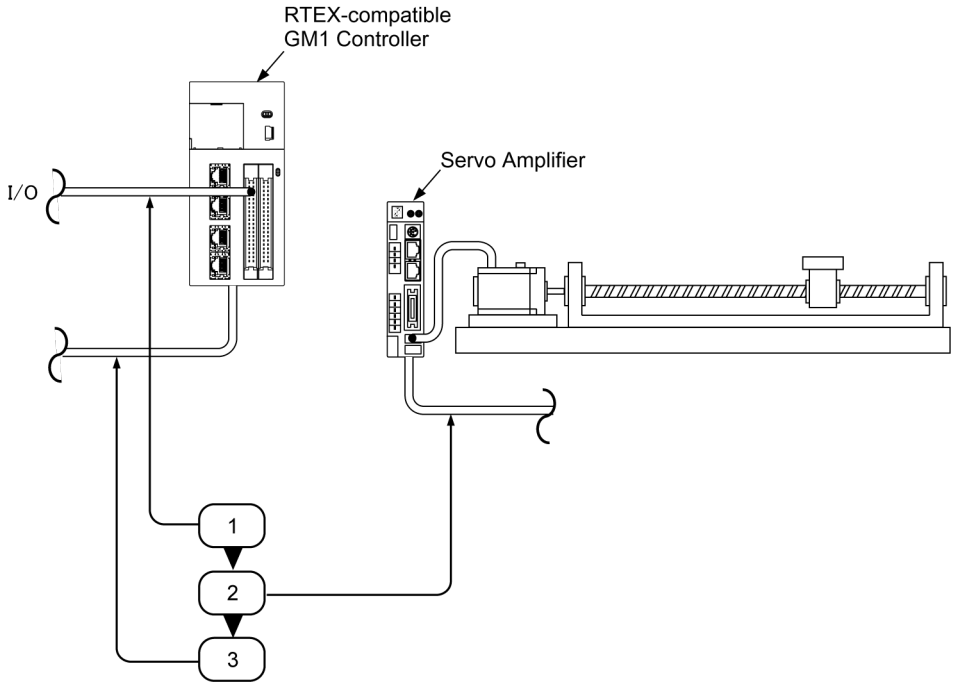
7.3 Power ON Operation

When turning ON the power supply to the system incorporating the GM1 Controller (RTEX-compatible / EtherCAT-compatible), turn ON the power supply in the following order.

- Consider the nature and statuses of any external devices connected to the system, and take sufficient care so that turning ON the power supply will not initiate unexpected movements.

Procedure

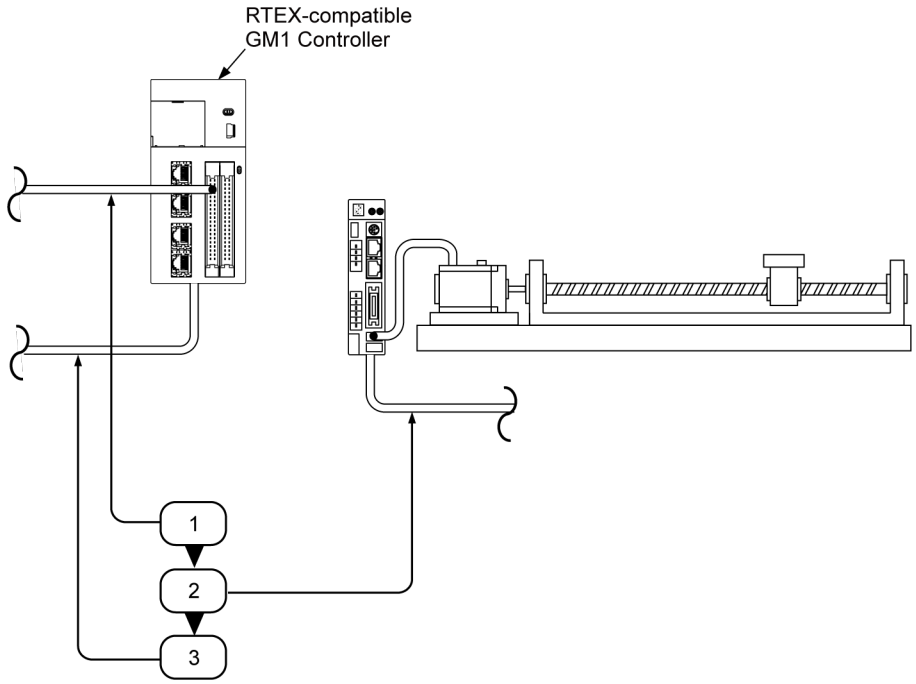
1. Turn ON the power supplies to the I/O devices connected to the GM1 Controller (RTEX-compatible / EtherCAT-compatible).
2. Turn ON the power supply to the servo amplifier.
3. Turn ON the power supply to the GM1 Controller (RTEX-compatible / EtherCAT-compatible).



7.4 Power OFF Operation

Procedure

1. Check to make sure the rotation of the motor has stopped, and then turn OFF the power supply to the GM1 Controller (RTEX-compatible / EtherCAT-compatible).
2. Turn OFF the power supply to the servo amplifier.
3. Turn OFF the power supplies to the I/O devices connected to the GM1 Controller (RTEX-compatible / EtherCAT-compatible).



(MEMO)

8 Using the SD Memory Card and SDHC Memory Card

8.1 Preparation of the SD Memory Card and SDHC Memory Card

■ Usable SD memory card and SDHC memory cards

We recommend SLC SD Memory Cards and SLC SDHC Memory Cards.

Logo printed on the GM1 Controller (RTEX-compatible / EtherCAT-compatible)	Usable SD (SDHC) memory cards	
	Card type	Capacity
	SD memory card	2 GB
	SDHC memory card	4 GB to 32 GB

■ Precautions on handling the SD memory card and SDHC memory card

The data saved in the SD memory card or in the SDHC memory card may be lost in the following cases. We assume no responsibility whatsoever for the loss of saved data.

- When the user or a third party has misused the SD memory card or SDHC memory card
- When the SD memory card or SDHC memory card was affected by any static electricity or electrical noise
- When the SD memory card or SDHC memory card was taken out, or the power supply to the GM1 Controller (RTEX-compatible / EtherCAT-compatible) was turned OFF, while the card was being accessed to save or delete data

- It is recommended to save important data in another media for backup.
- Never remove the card or turn OFF the power supply to the GM1 Controller (RTEX-compatible / EtherCAT-compatible) while the"SD" LED on the GM1 Controller (RTEX-compatible / EtherCAT-compatible) is lit (data is being read from or written into the card). Data may be damaged.
- Do not use an SD memory card or SDHC memory card that has a memory capacity larger than the usable capacity. Data in the card may be damaged.
- Implements SD memory card or SDHC memory card management to prevent data in the card from being leaked to third parties.

■ Formatting the SD memory card and SDHC memory card

In principle, the SD memory card and SDHC memory card have been formatted by the time of purchase, and no formatting by the user is required. If formatting becomes necessary, download the SD formatter software from the SD association site and format the memory card.

Info.

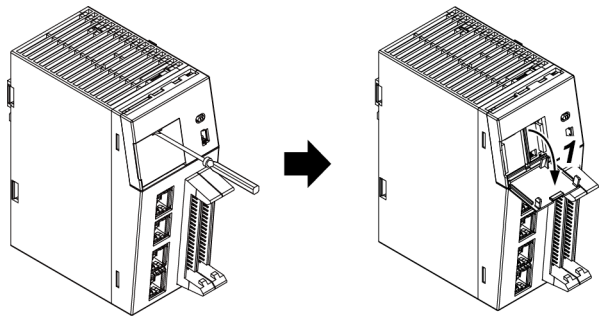
- The SD memory card or SDHC memory card file system formatted by PC's standard formatting software does not satisfy the SD memory card or SDHC memory card specifications. Please use the dedicated formatting software.

8.2 Inserting the SD Memory Card and SDHC Memory Card

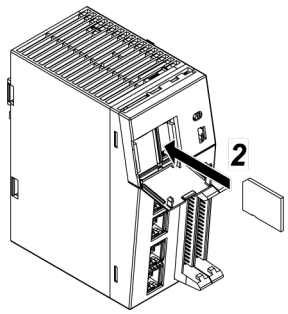
- Do not apply an excessive force to the card cover when opening or closing it or when the cover is left open. Otherwise, the cover attachment part will be deformed to cause malfunction in the cover switch mounted inside the product.

Procedure

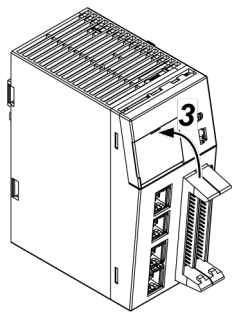
1. Insert the tip of a flat blade screw driver into the cavity on the card cover to open the cover.



2. Insert the SD memory card or SDHC memory card into the SD memory card slot until it is locked in place.



3. Close the SD memory card cover.



Info.

- When removing the SD memory card or SDHC memory card, make sure that the の"SD" LED on the GM1 Controller (RTEX-compatible / EtherCAT-compatible) is not lit.

9 Device Reset

9.1 Device Reset by GM1 Controller Operation

Controller information on the GM Programmer can be deleted (initialized) from the GM1 Controller.

Procedure

1. Confirm that the power supply is turned OFF, set the mode selector switch to "STOP", and set SW2 (reset bit) of the DIP switch to "ON".
2. When the power supply is turned ON, the [RUN] [STOP] [ERROR] LEDs are lit and a device reset is executed.
3. When the [RUN][STOP][ERROR] LEDs are lit and a device reset is executed.
   When the device reset is completed, turn"OFF"the power supply, and set the reset bit to "OFF".

Note

Device reset can be executed from the GM1 Controller as well as from GM Programmer. For details on the device reset, refer to the *GM1 Controller RTEX User's Manual (Operation)* or *GM1 Controller EtherCAT User's Manual (Operation)*.

10 Troubleshooting

10.1 Self-diagnostic Function

The GM1 Controller (RTEX-compatible / EtherCAT-compatible) has a self-diagnostic function which identifies errors and stops operation if necessary.

Indications concerning self-diagnosis are as follows.

■ LEDs related to self-diagnostic errors

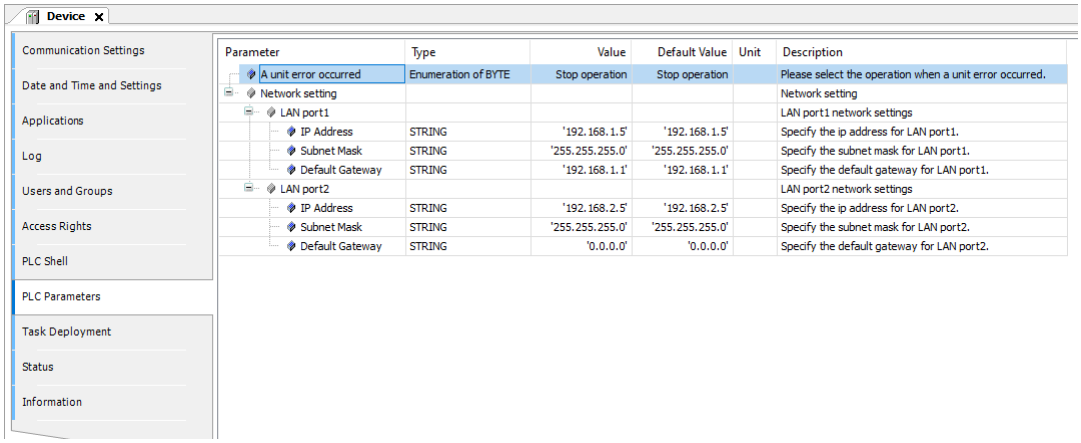
●: Lit, ▲: Flashing, ○: Unlit, —: Indefinite (Lit or unlit)

	LED display				Description	Operation status
	RUN	STOP	ERROR	ALARM		
Normal	●	○	○	○	Normal operation	Operating
	○	●	○	○	STOP mode	Stopped
Error	●	○	▲	○	When a self-diagnostic error occurs (Operation continues.)	Operating
	○	●	▲	○	When a self-diagnostic error occurs (Operation stops.)	Stopped
	○	●	—	●	System error	Stopped

10.2 Operation Status at the Time of Error

■ PLC parameter setting

Operation mode at the time of error can be set to continue operation or stop operation in the PLC parameter setting.



10.3 What to Do If an Error Occurs

10.3.1 ERROR LED Flashes on the Control Unit

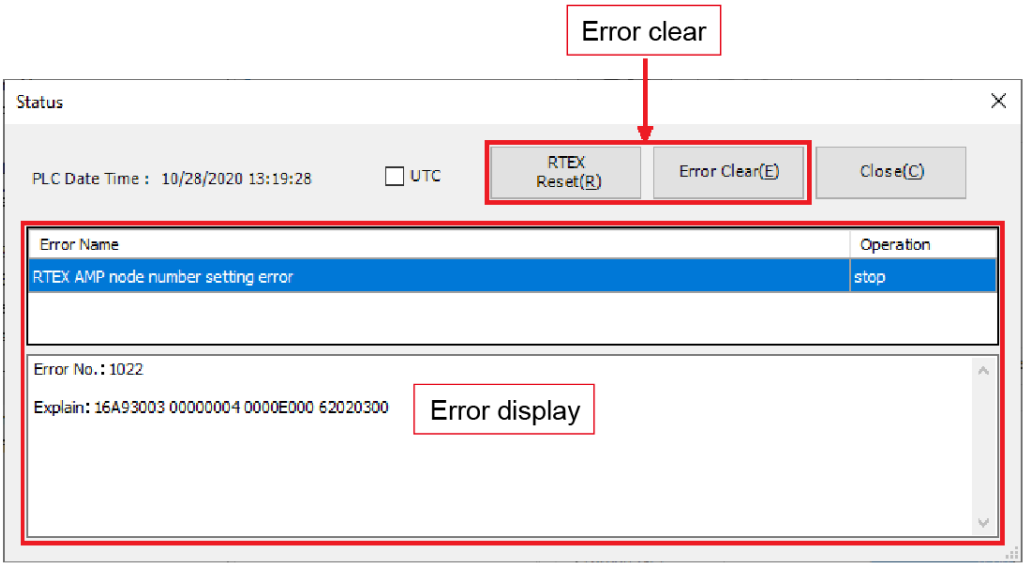
■ Condition

A self-diagnostic error has occurred.

■ Solution

Check the condition according to the following procedure.

1. On the GM Programmer, select**Online**>**Status** and check the error content (error code).
2. Switch to the STOP mode.
3. On the Status screen of the GM Programmer, check the error information.
   In case of an operation continue error, the error can be resolved by RTEX Reset / Error Clear.



4. Cancel the situation in accordance with the error code.

Info.

- For the error codes, refer to the , *GM1 Controller RTEX User's Manual (Operation)* or *GM1 Controller EtherCAT User's Manual (Operation)*.

10.3.2 POWER LED Does not Light on the Control Unit

■ Condition

It is possible that sufficient power is not supplied.

■ Solution

1. Power off the unit and double-check the wiring status. (e.g. Is there any loose terminal?)
2. Check if the output of the power supply to the control unit does not exceed the rating.
   If the 24-V power supply is not sufficient, review the power supply configuration.
   Disconnect the power supply wiring to the other devices if the power supplied to the control unit is shared with them.

10.3.3 Desired Output Is Not Obtained: Checking when the Output Does Not Turn ON / OFF

■ Condition

Both software factors such as program or I/O allocation and hardware factors such as wiring or power supply can be assumed.

■ Solution

1. Check if the output display LED of the unit is lit.
   If it is lit, proceed to the following step. If it is not lit, proceed to step 4.
2. Recheck the wiring of the loads for loose terminals, etc.
3. Check if proper voltage is applied to the loads.
   If the voltage is properly applied to the load, there is probably an abnormality in the load.
   If the voltage is not applied to the load, there is probably an abnormality in the output section of the unit.
4. Using the GM Programmer, check the monitor function by forcibly setting or resetting the output.
   If the output LED of the unit changes, it is possible that the output has been overwritten in the program.
   If the LED does not change, there is probably an abnormality in the output section of the unit.

10.3.4 If the ALARM LED Is Lit on the Expansion Unit

■ Condition

If the ALARM LED is lit on the expansion unit, there may be a system failure.

■ Solution

1. Turn the system OFF and then ON.
2. If the system is not reset, there may be a hardware failure. Please consult your Panasonic representative.

10.3.5 If the ALARM LED Is Unlit on the Expansion Unit

■ Condition

It can be assumed that a system error has occurred in the expansion unit connected to the control unit or in the control unit.

■ Solution

Clarify the situation in the following procedure.

1. Check if an end unit is connected to the last expansion unit.
2. Check the wiring of the cables connected to the expansion units and wiring of the power supply.
3. Clear the self-diagnosis error of the control unit.
4. Restart the power supply of the control unit.

11 Maintenance and Inspection

11.1 Inspection

To always use the unit in optimal conditions, carry out routine or periodic inspections.

Inspection items

Inspection item	Inspection details	Criterion	Related page
Installation status	Mounting on DIN rail, looseness, and unit looseness and backlash	The unit must have been installed properly.	"P.5-6"
Connection status	Connector looseness	Each connector must not be loose.	"P.7-3"
Usage conditions	Ambient temperature (in-panel temperature) Ambient humidity (in-panel humidity) Atmosphere	0 to +55℃ 10 to 95%RH Free of dust and corrosive gases	"P.12-2"

12 Specifications and Dimensions

12.1 Specifications of the GM1 Series

Item	Specifications		
Rated voltage	24 V DC		
Operating voltage range	20.4 to 28.8 V DC		
Allowable momentary power failure time	24 V DC 10 ms or less (at Product shipment)		
Dielectric strength	GM1 Controller	● Between all LAN ports and Power supply terminals ,all Function earths ● Between all High-speed counter input terminals, Input terminals and Output terminals and Power supply terminal,all Function earths ● Between Input terminals ,Output terminals and all High-speed counter input terminals ● Between all Input terminals and all Output terminal	500 V AC for one minute (Leakage current: 5 mA)
	Digital I/O Unit	● Between Input terminal,all Output terminals and Controller supply terminal , all Function earths ● Between all Input terminals and all Input terminals (different common terminals) ● Between all Output terminals and all Output terminals⇔ (different common terminals) ● Between all Input terminals and all Output terminals	
	Analog I/O Unit	● Between Input terminals and Controller supply , all Function earths ● Between Output terminals and Controller supply , all Function earths	
	Pulse Output Unit	● Between all External connector terminal and Controller supply terminal, all Function earths	
Insulation resistance	GM1 Controller	● Between all LAN ports and Power supply terminals ,all Function earths ● and all High-speed counter input terminals, Input terminals,Output terminals and Power supply terminal,All Function earth ● Between Input terminals ,all Output terminals and all High-speed counter input terminals ● Between all Input terminals and all Output terminals	100 MΩ or more (Test voltage: 500 V DC)
	Digital I/O Unit	● Between Input terminals ,all Output terminals and Controller supply , all Function earths	

Item	Specifications		
		● Between all Input terminals and all Input terminals (different common terminals) ● Between all Output terminals and all Output terminals⇔ (different common terminals) ● Between all Input terminals and all Output terminals	
	Analog I/O Unit	● Between Input terminals and Controller supply , all Function earths ● Between Output terminals and Controller supply , all Function earths	
	Pulse Output Unit	● Between all External connector terminal and Controller supply terminal , all Function earths	
Vibration resistance	5 to 8.4 Hz, half amplitude 3.5 mm, 8.4 to 150 Hz acceleration 9.8 m/s^2 10 sweeps each in X, Y and Z directions (1 octave/min)		
Shock resistance	147 m/s^2 , 3 times each in the X, Y, Z directions		
Noise resistance	1000 V [p-p] with pulse widths of 1 μs and 50 ns (using a noise simulator) (Power supply terminal)		
Operating ambient temperature	0 to +55℃		
Storage ambient temperature	-40 to +70℃		
Operating ambient humidity	10 to 95% RH (at +25℃, no condensation or icing)		
Storage ambient humidity	10 to 95% RH (at +25℃, no condensation or icing)		
Pollution degree	Pollution degree 2 or less		
Atmosphere	Free of corrosive gases No excessive dust		
Altitude	2,000 m above sea level or lower		
Overvoltage category	Category II		
Installation place 所	Inside a control panel that provides a protection rating of IP54 or higher.(metal panel with sufficient strength)		
weights	GM1 Controller	AGM1CSRX16T	Approx. 370 g (including the terminal block and end cover)
		AGM1CSEC16T	
		AGM1CSEC16P	
	Digital I/O Unit	AGM1X64D2	Approx. 160 g (including the terminal block)
		AGM1Y64T	

Item	Specifications		
		AGM1Y64P	
		AGM1XY64D2T	
		AGM1XY64D2P	
	Analog I/O Unit	AGM1AD8	Approx. 150 g (including the terminal block)
		AGM1DA4	
	Pulse Output Unit	AGM1PG04T	Approx. 160 g (including the terminal block)
		AGM1PG04L	
consumption current	GM1 Controller	AGM1CSRX16T	400 mA or less
		AGM1CSEC16T	
		AGM1CSEC16P	
	Digital I/O Unit	AGM1X64D2	90 mA or less(Note 1)
		AGM1Y64T	160 mA or less(Note 1)
		AGM1Y64P	
		AGM1XY64D2T	120 mA or less(Note 1)
		AGM1XY64D2P	
	Analog I/O Unit	AGM1AD8	160 mA or less(Note 1)
		AGM1DA4	320 mA or less(Note 1)
	Pulse Output Unit	AGM1PG04T	120 mA or less(Note 1)
		AGM1PG04L	

(Note 1) This value is the increase in the GM1 controller current consumption.(Operating voltage range : 20.4 to 28.8 V DC)

12.2 Specifications of the GM1 Controller

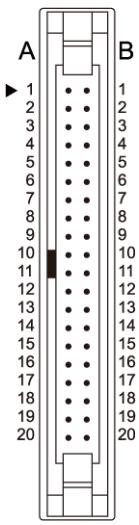
12.2.1 I/O specifications

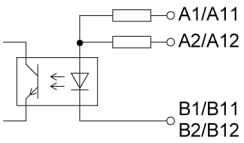
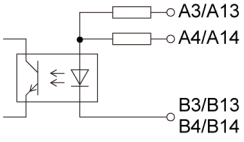
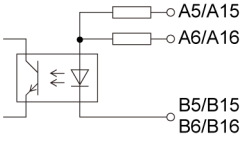
High-speed counter input part

■ **Input specifications**

Item	Specifications		
	Input A, B, Z signals		
	24 V DC	5 V DC	
		Open collector connection	Line driver connection
Insulation method	Optical coupler		
Rated input voltage	12 V DC to 24 V DC	5 V DC	Equivalent to AM26LS31
Operating voltage range	10.8 V DC to 26.4 V DC	3.5 V DC to 5.5 V DC	
Input points per common	Independent common for each point		
Min. ON voltage / Min. ON current	10 V DC/4 mA	3 V DC/4 mA	
Max. OFF voltage / Max. OFF current	2 V DC/2 mA	1 V DC/0.5 mA	
Input impedance	Approx. 3.9 kΩ	Approx. 560 Ω	
Operating mode indicator	6-point LED display		

■ **Internal circuit diagram / Terminal layout diagram**



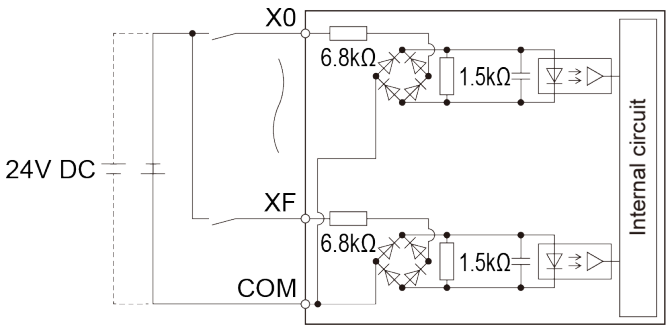
Pin No.		Circuit	Signal name
Ch0	Ch1		
A1	A11		Input A : 24 V DC (12 V DC to 24 V DC)
A2	A12		Input A : 5 V DC (3.5 V DC to 5 V DC)
B1	B11		Input A : COM
B2	B12		Input A : COM
A3	A13		Input B : 24 V DC (12 V DC to 24 V DC)
A4	A14		Input B : 5 V DC (3.5 V DC to 5 V DC)
B3	B13		Input B : COM
B4	B14		Input B : COM
A5	A15		Input Z : 24 V DC (12 V DC to 24 V DC)
A6	A16		Input Z : 5 V DC (3.5 V DC to 5 V DC)
B5	B15		Input Z : COM
B6	B16		Input Z : COM
A7 to A10	B7 to B10	—	—
A17 to A20	B17 to B20	—	—

General-purpose I/O part

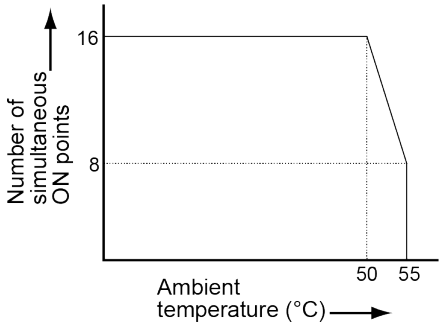
■ Input specifications

Item		Specifications
Insulation method		Optical coupler
Rated input voltage		24 V DC
Rated input current		Approx. 3 mA (at 24 V DC)
Input impedance		Approx. 6.8 kΩ
Operating voltage range		21.6 V DC to 26.4 V DC
Min. ON voltage / Min. ON current		19.2 V DC/6 mA
Max. OFF voltage / Max. OFF current		2.4 V DC/1 mA
Response time	OFF→ON	135 µs or less (Possible to change by using the input time constant selection function)
	ON→OFF	135 µs or less (Possible to change by using the input time constant selection function)
Input points per common		16 points/common
Operating mode indicator		16-point LED display (Lit when ON, SW selection)
External connection method		Connector connection (Compliant with the MIL standard, 40P)

■ Internal circuit diagram



■ Limitations on the number of simultaneous input ON points

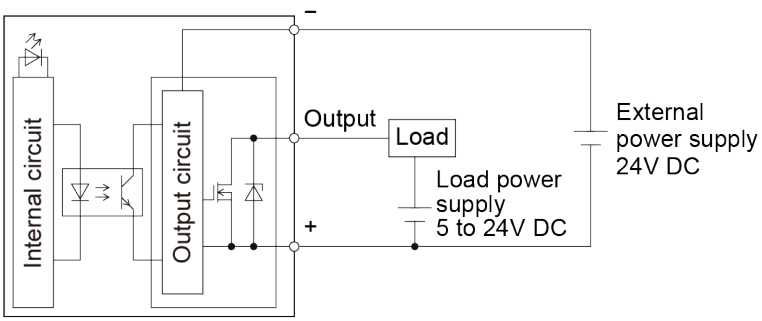


■ Output specifications (Sink type)

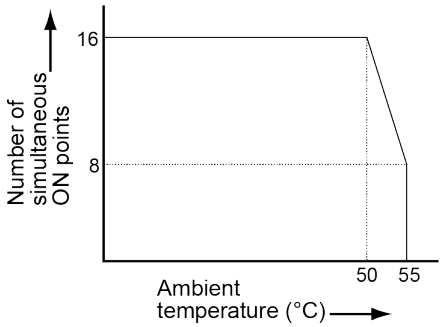
Item		Specifications
Insulation method		Optical coupler
Output type		NPN open collector
Rated load voltage		5 V DC to 24 V DC
Allowable load voltage range		4.75 V DC to 26.4 V DC
Max. load current		0.1 A
Common restrictions		1.6 A/Common
Max. inrush current		1.0 A
OFF state leakage current		1 μA or less
ON state max. voltage drop		0.7 V or less
Response time	OFF→ON	6 μs or less (at +25 ℃)
	ON→OFF	15 μs or less (at +25 ℃)
External power supply	Voltage	4.75 V DC to 26.4 V DC
	Current	35 mA/common (at 24 V)
Surge absorber		Zener diode
Short-circuit protection		Provided (to automatically protect every eight points) (Note 1)
Input points per common		16 points/common
Operating mode indicator		16-point LED display (Lit when ON, SW selection)
External connection method		Connector connection (Compliant with the MIL standard, 40P)

(Note 1) When the maximum inrush current is exceeded, eight output points in the same protection block are turned OFF simultaneously.

■ Internal circuit diagram



■ **Limitations on the number of simultaneous output ON points**

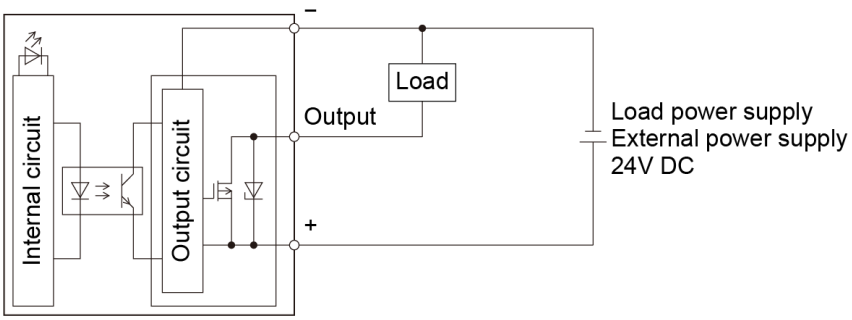


■ Output pecifications (Source Type) (EtherCAT compatible GM1 Controller only)

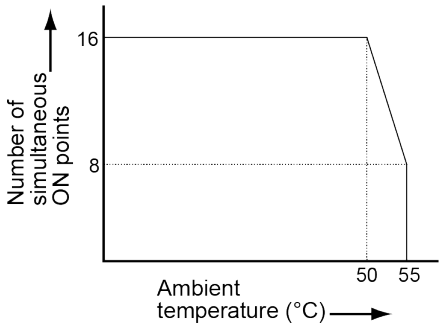
Item		Specifications
Insulation method		Optical coupler
Output type		PNP open collector
Rated load voltage		24 V DC
Allowable load voltage range		21.6 V DC to 26.4 V DC
Max. load current		0.1 A
Common restrictions		1.6 A/Common
Max. inrush current		1.0 A
OFF state leakage current		2 μA or less
ON state max. voltage drop		0.7 V or less
Response time	OFF→ON	6 μs or less (at +25 ℃)
	ON→OFF	15 μs or less (at +25 ℃)
External power supply	Voltage	21.6 V DC to 26.4 V DC
	Current	30 mA/common (at 24 V)
Surge absorber		Zener diode
Short-circuit protection		Provided (to automatically protect every eight points) (Note 1)
Input points per common		16 points/common
Operating mode indicator		16-point LED display (Lit when ON, SW selection)
External connection method		Connector connection (Compliant with the MIL standard, 40P)

(Note 1) When the maximum inrush current is exceeded, eight output points in the same protection block are turned OFF simultaneously.

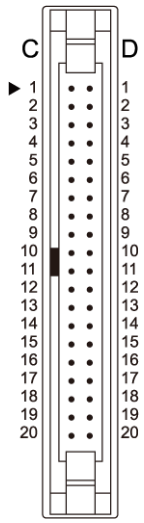
■ Internal circuit diagram



■ Limitations on the number of simultaneous output ON points



■ Terminal layout diagram



Pin No.	General purpose I/O	Signal name
C1	X0	High-speed Counter ch0 Control 0 signal
C2	X1	High-speed Counter ch0 Control 1 signal
C3	X2	High-speed Counter ch1 Control 0 signal
C4	X3	High-speed Counter ch1 Control 1 signal
C5	X4	—
C6	X5	—
C7	X6	—
C8	X7	—
C9	COM(Note 1)	COM
C10	COM(Note 1)	COM
C11	Y0	High-speed Counter ch0 External output 0 signal
C12	Y1	High-speed Counter ch0 External output 1 signal

Pin No.	General purpose I/O	Signal name
C13	Y2	High-speed Counter ch1 External output 0 signal
C14	Y3	High-speed Counter ch1 External output 1 signal
C15	Y4	PWM output 0
C16	Y5	PWM output 1
C17	Y6	PWM output 2
C18	Y7	PWM output 3
C19	+(Note 2)	+V
C20	-(Note 3)	-V
D1	X8	—
D2	X9	—
D3	X10	—
D4	X11	—
D5	X12	—
D6	X13	—
D7	X14	—
D8	X15	—
D9	COM(Note 1)	COM
D10	COM(Note 1)	COM
D11	Y8	—
D12	Y9	—
D13	Y10	—
D14	Y11	—
D15	Y12	—
D16	Y13	—
D17	Y14	—
D18	Y15	—
D19	+(Note 2)	+V
D20	-(Note 3)	-V

(Note 1) The COM terminals (4 places) of the general-purpose input are connected within the unit.

(Note 2) The positive terminals (2 places) of the general-purpose output are connected within the unit.

(Note 3) The negative terminals (2 places) of the general-purpose output are connected within the unit.

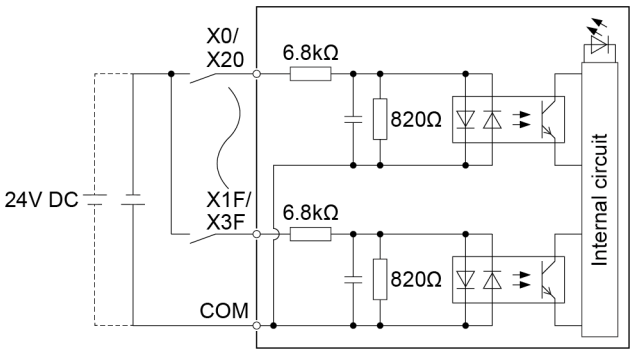
12.3 Specifications of the Digital I/O Unit

12.3.1 64-point Digital Input Unit

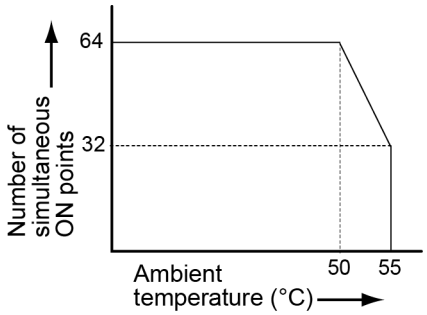
■ Input specifications

Item		Specifications
Insulation method		Optical coupler
Rated input voltage		24 V DC
Rated input current		Approx. 2.7 mA (at 24 V DC)
Input impedance		Approx. 6.8 kΩ
Operating voltage range		20.4 V DC to 26.4 V DC
Min. ON voltage / Min. ON current		19.2 V DC/2.5 mA
Max. OFF voltage / Max. OFF current		5.0 V DC/1.5 mA
Response time	OFF→ON	0.2 ms max. (Possible to change by using the input time constant selection function)
	ON→OFF	0.2 ms max. (Possible to change by using the input time constant selection function)
Input points per common		32 points/common
Operating mode indicator		32-point LED display (Lit when ON, selection using the display selector switch)
External connection method		Connector connection (Compliant with the MIL standard, 40P, two pieces used)

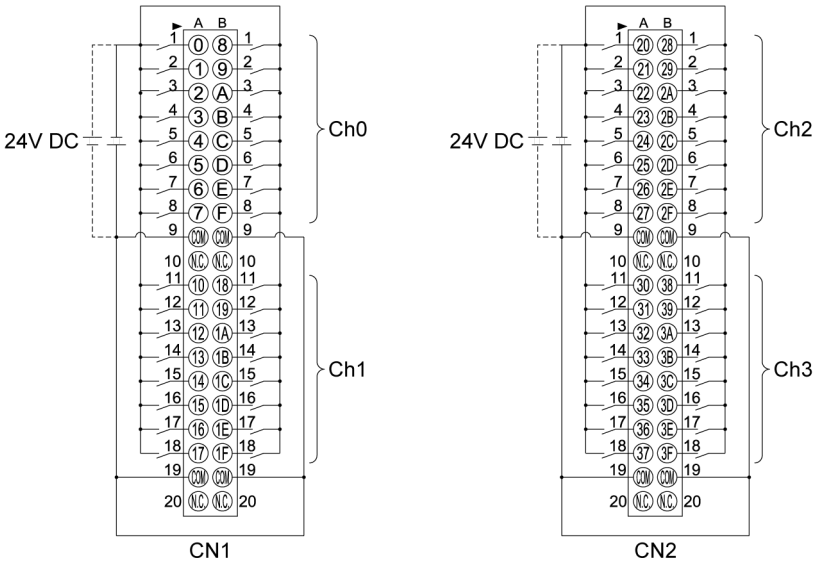
■ Internal circuit diagram



■ Limitations on the number of simultaneous input ON points



■ Terminal layout diagram



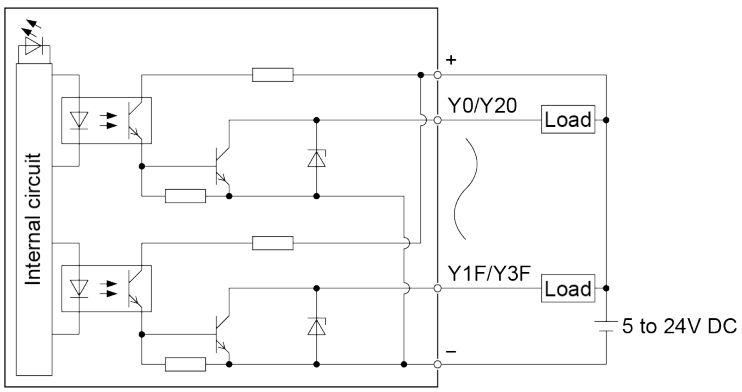
(Note 1) The COM terminals in the same connector are connected internally.

12.3.2 64-point Digital Output Unit (Sink Type)

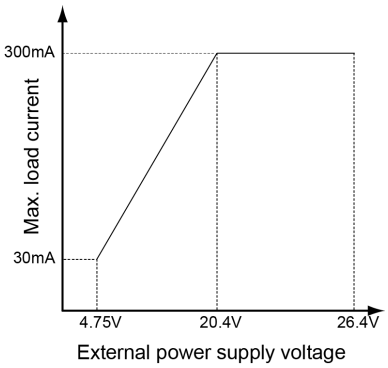
■ Output specifications

Item		Specifications
Insulation method		Optical coupler
Output type		Open collector
Rated load voltage		5 V DC to 24 V DC
Allowable load voltage range		4.75 V DC to 26.4 V DC
Max. load current		0.3 A (20.4 V DC to 26.4 V DC) 30 mA (4.75 V DC)
Common restrictions		3.2 A/common
Max. inrush current		0.6 A
OFF state leakage current		1 μA or less
ON state max. voltage drop		0.5 V or less
Response time	OFF→ON	0.1 ms or less (Load current: 2 mA or more)
	ON→OFF	0.3 ms or less (Load current: 2 mA or more)
External power supply	Voltage	4.75 V DC to 26.4 V DC
	Current	70 mA/common (at 24 V)
Surge absorber		Zener diode
Short-circuit protection		None
Input points per common		32 points/common
Operating mode indicator		32-point LED display (Lit when ON, selection using the display selector switch)
External connection method		Connector connection (Compliant with the MIL standard, 40P, two pieces used)

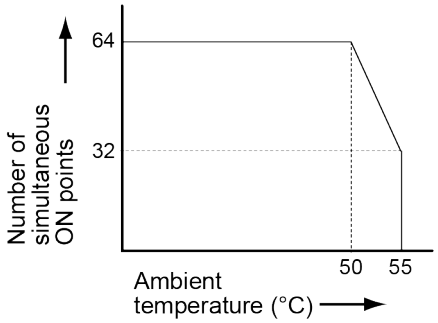
■ Internal circuit diagram



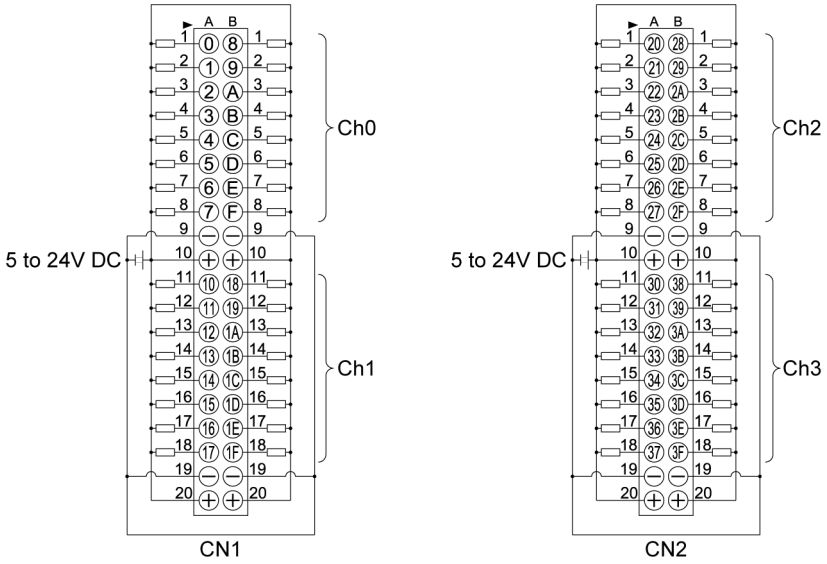
■ Limitations on the load current



■ Limitations on the number of simultaneous output ON points



■ Terminal layout diagram



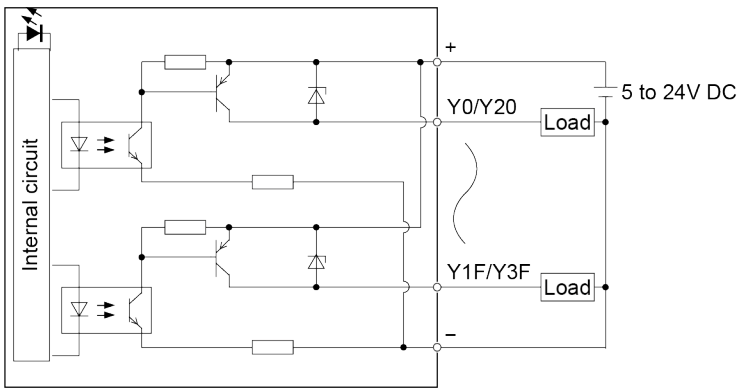
(Note 1) Although the positive and negative terminals are connected internally, connect these terminals externally as well.

12.3.3 64-point Digital Output Unit (Source Type)

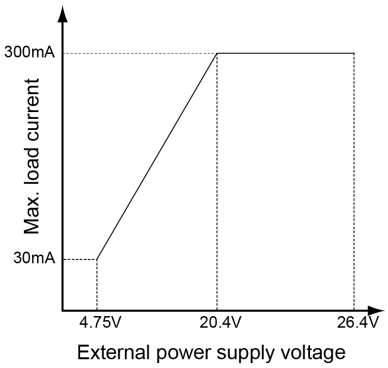
■ Output specifications

Item		Specifications
Insulation method		Optical coupler
Output type		Open collector
Rated load voltage		5 V DC to 24V DC
Allowable load voltage range		4.75 V DC to 26.4V DC
Max. load current		0.3A (20.4 V DC to 26.4V DC) 30mA (4.75V DC)
Common restrictions		3.2 A/common
Max. inrush current		0.6 A
OFF state leakage current		1 μA or less
ON state max. voltage drop		0.5 V or less
Response time	OFF→ON	0.1 ms or less (Load current: 2 mA or more)
	ON→OFF	0.5 ms or less (Load current: 2 mA or more)
External power supply	Voltage	4.75 V DC to 26.4V DC
	Current	90 mA/common (at 24 V)
Surge absorber		Zener diode
Short-circuit protection		None
Input points per common		32 points / common
Operating mode indicator		32-point LED display (Lit when ON, selection using the display selector switch)
External connection method		Connector connection (Compliant with the MIL standard, 40P, two pieces used)

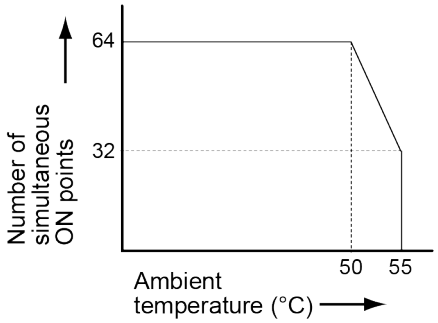
■ Internal circuit diagram



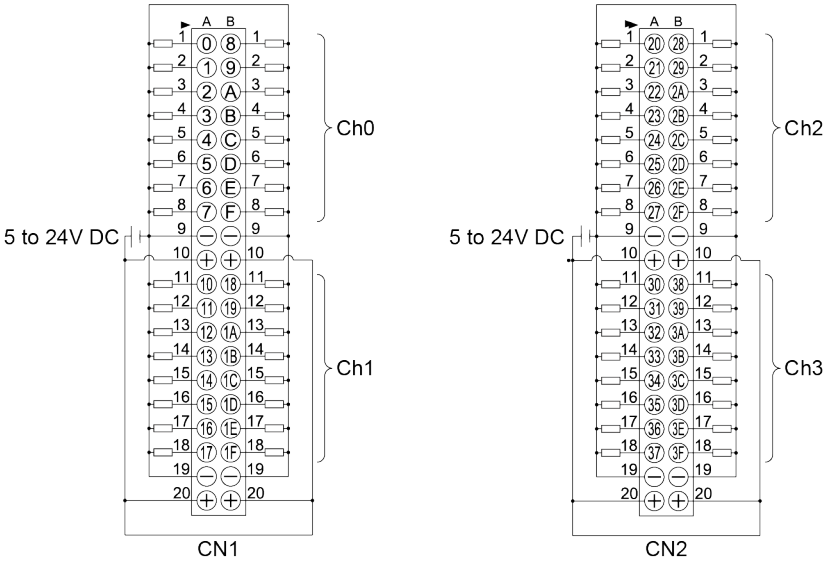
■ Limitations on the load current



■ Limitations on the number of simultaneous output ON points



■ Terminal layout diagram



(Note 1) Although the positive and negative terminals are connected internally, connect these terminals externally as well.

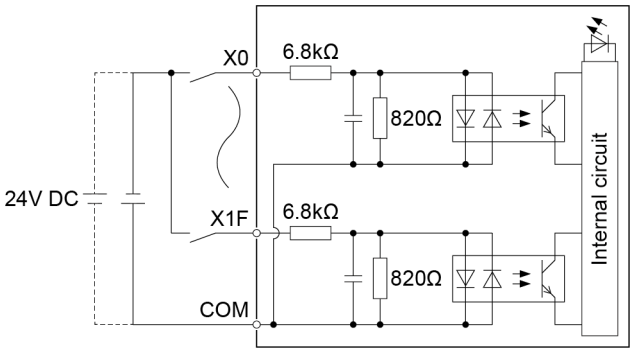
12.3.4 64-point Digital I/O Unit (Sink Type)

■ I/O specifications

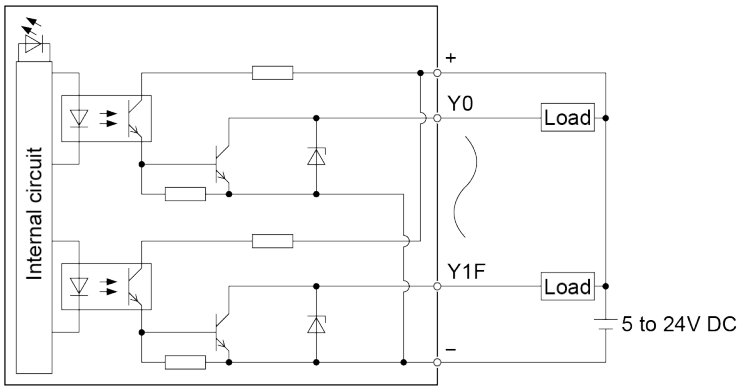
Item			Specifications
Input specifications	Insulation method		Optical coupler
	Rated input voltage		24 V DC
	Rated input current		Approx. 2.7 mA (at 24 V DC)
	Input impedance		Approx. 6.8 kΩ
	Operating voltage range		20.4 V DC to 26.4 V DC
	Min. ON voltage / Min. ON current		19.2 V DC/2.5 mA
	Max. OFF voltage / Max. OFF current		5 V DC/1.5 mA
	Response time	OFF→ON	0.2 ms max. (Possible to change by using the input time constant selection function)
		ON→OFF	0.2 ms max. (Possible to change by using the input time constant selection function)
	Input points per common		32 points/common
Output specifications	Insulation method		Optical coupler
	Output type		Open collector
	Rated load voltage		5 V DC to 24 V DC
	Allowable load voltage range		4.75 V DC to 26.4 V DC
	Max. load current		0.3 A (20.4 V DC to 6.4 V DC) 30 mA (4.75 V DC)
	Common restrictions		3.2 A/common
	Max. inrush current		0.6 A
	OFF state leakage current		1 μA or less
	ON state max. voltage drop		0.5 V or less
	Response time	OFF→ON	0.1 ms or less (Load current: 2 mA or more)
		ON→OFF	0.3 msor less (Load current: 2 mA or more)
	External power supply	Voltage	4.75 V DC to 26.4 V DC
		Current	70 mA/common (at 24 V)
	Surge absorber		Zener diode
	Short-circuit protection		None
	Input points per common		32 points/ common
Operating mode indicator			32-point LED display (Lit when ON, selection using the display selector switch)
External connection method			Connector connection (Compliant with the MIL standard, 40P, two pieces used)

■ Internal circuit diagram

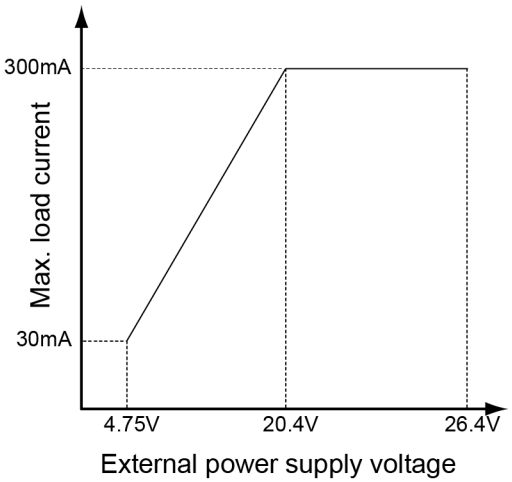
Input section (32 points)



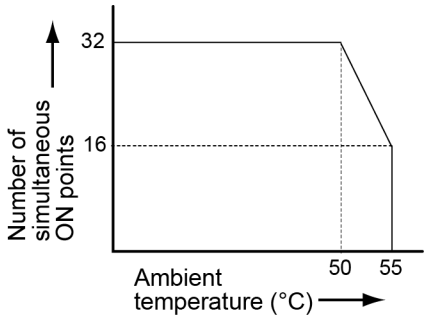
Output section (32 points)



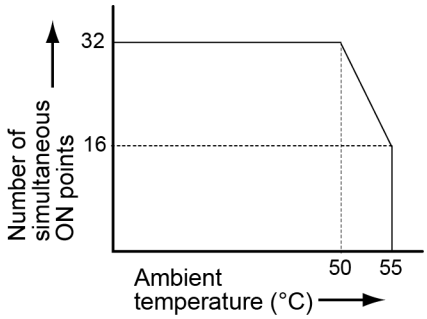
■ Limitations on the load current



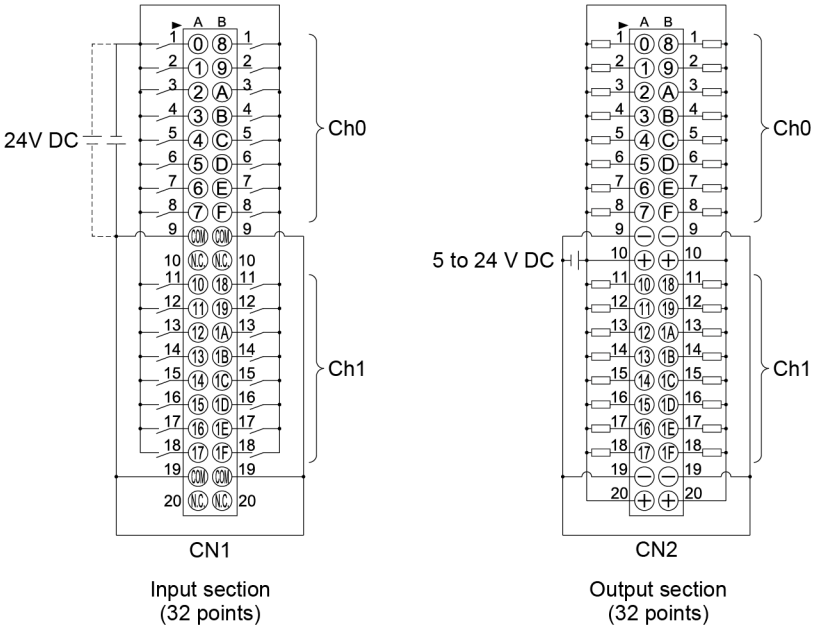
■ **Limitations on the number of simultaneous input ON points**



■ **Limitations on the number of simultaneous output ON points**



■ **Terminal layout diagram**



(Note 1) The COM terminals in the same connector are connected internally.

(Note 2) Although the positive and negative terminals are connected internally, connect these terminals externally as well.

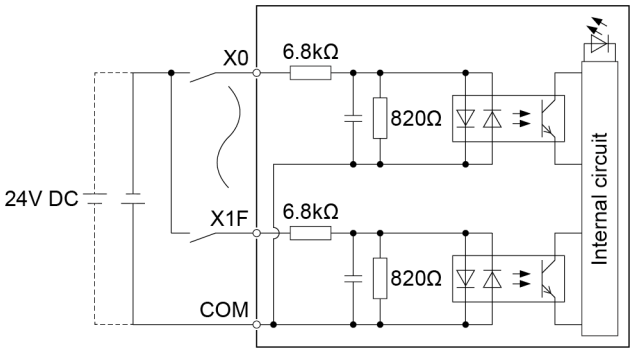
12.3.5 64-point Digital I/O Unit (Source Type)

■ I/O specifications

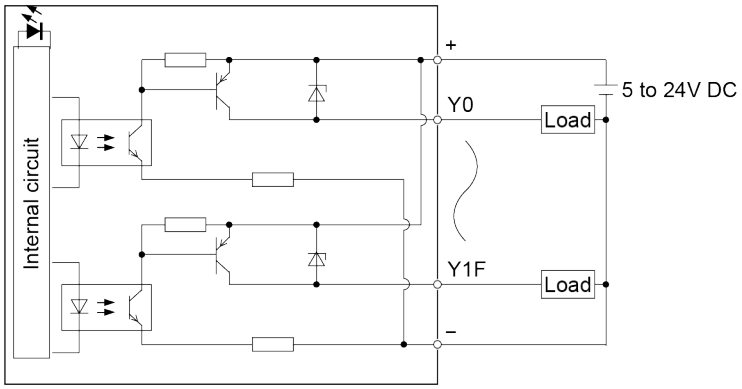
Item			Specifications
Input specifications	Insulation method		Optical coupler
	Rated input voltage		24 V DC
	Rated input current		Approx. 2.7 mA (at 24 V DC)
	Input impedance		Approx. 6.8 kΩ
	Operating voltage range		20.4 V DC to 26.4 V DC
	Min. ON voltage / Min. ON current		19.2 V DC/2.5 mA
	Max. OFF voltage / Max. OFF current		5 V DC/1.5 mA
	Response time	OFF→ON	0.2 ms max. (Possible to change by using the input time constant selection function)
		ON→OFF	0.2 ms max. (Possible to change by using the input time constant selection function)
	Input points per common		32 points/common
Output specifications	Insulation method		Optical coupler
	Output type		Open collector
	Rated load voltage		5 V DC to 24 V DC
	Allowable load voltage range		4.75 V DC to 26.4 V DC
	Max. load current		0.3 A (20.4 V DC to 26.4 V DC) 30 mA (4.75 V DC)
	Common restrictions		3.2 A/common
	Max. inrush current		0.6 A
	OFF state leakage current		1 μA or less
	ON state max. voltage drop		0.5 V or less
	Response time	OFF→ON	0.1 ms or less (Load current: 2 mA or more)
		ON→OFF	0.5 ms or less (Load current: 2 mA or more)
	External power supply	Voltage	4.75 V DC to 26.4 V DC
		Current	90 mA/common (at 24 V)
	Surge absorber		Zener diode
	Short-circuit protection		None
	Input points per common		32 points/ common
Operating mode indicator			32-point LED display (Lit when ON, selection using the display selector switch)
External connection method			Connector connection (Compliant with the MIL standard, 40P, two pieces used)

■ Internal circuit diagram

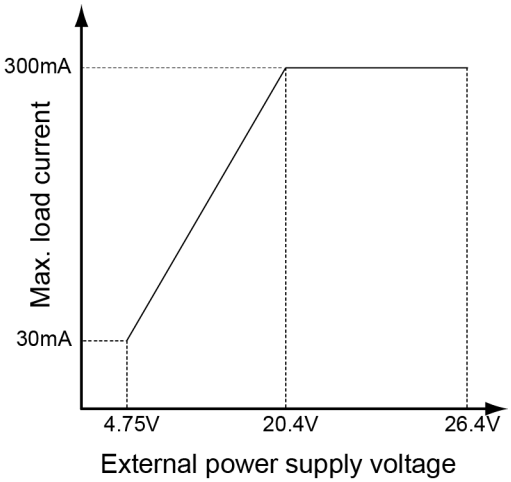
Input section (32 points)



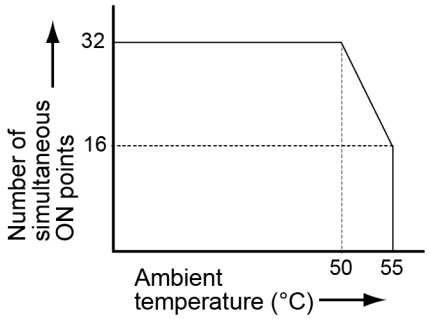
Output section (32 points)



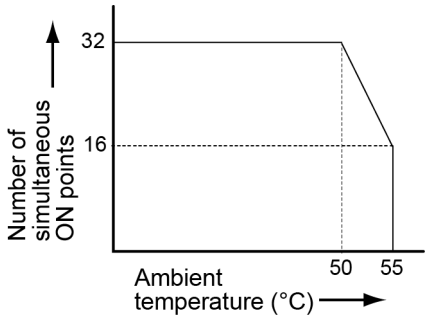
■ Limitations on the load current



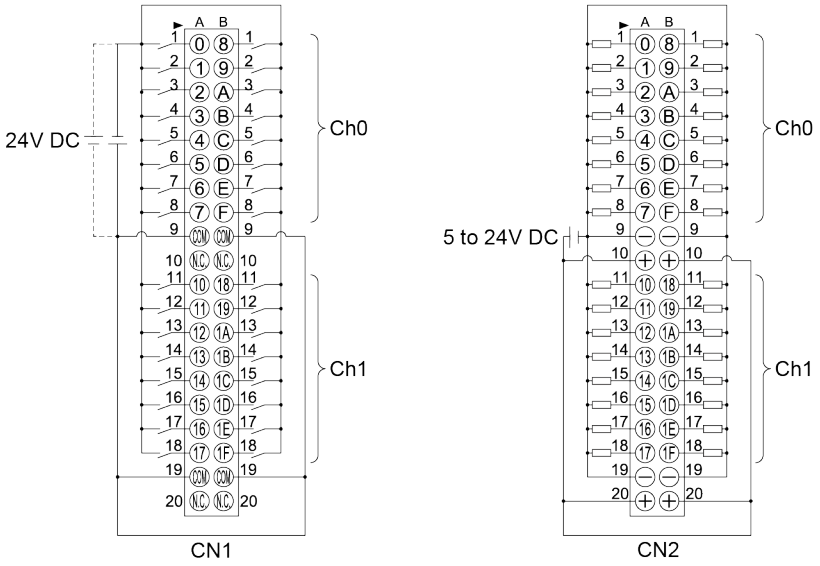
■ **Limitations on the number of simultaneous input ON points**



■ **Limitations on the number of simultaneous output ON points**



■ **Terminal layout diagram**



Input section (32 points)

Output section (32 points)

(Note 1) The COM terminals in the same connector are connected internally.

(Note 2) Although the positive and negative terminals are connected internally, connect these terminals externally as well.

12.4 Specifications of the Analog I/O Unit

12.4.1 Analog Input Unit

■ Input specifications

Item		Specifications
No. of input points		8 ch
Input range (resolution)	Voltage	-10 to +10 V DC (Resolution: 1/64,000) 0 to +10 V DC (Resolution：1/32,000) -5 to +5 V DC (Resolution：1/64,000) 0 to +5 V DC (Resolution：1/32,000) +1 to +5 V DC (Resolution：1/25,600) (Note 1)
	Current	0 to +20 mA (Resolution：1/32,000) +4 to +20 mA (Resolution：1/25,600) (Note 1)
Conversion speed		50 μs/ch
Exceeding the rated range		Input is possible up to ± 2% of the input range(Note 2)
Total accuracy		±0.2 % F.S.or less (at +25 °C) ±0.4 % F.S. or less (at 0 to +55 °C)
Input impedance		Voltage input: Approximately 1 MΩ; current input: Approximately 250 Ω
Absolute max. input		Voltage input: -15 V to +15 V; current input: -30 mA to +30 mA
Insulation method		Between input terminals and internal circuit: Photocoupler and isolated DC/DC converter Between channels: Non-insulated
Execution / Non-execution channel settings		Possible to make non-converted channel settings.
Input range selection		Possible to make settings on a channel-by-channel basis
Average processing	Number of averaging times	Setting range of 2 to 60,000 times
	Time average	Time setting range of 1 to 1,500 ms
	Moving average	Setting range of 2 to 2,000 times
Offset / Gain settings		A desired value within the digital output range can be set for the offset value. Setting range: -3000 to +3000 A desired value within the digital output range can be set for the gain value. Setting range：+9000 to +11000 (90 % to 110 %)
Scale conversion settings		A desired value within the digital output range can be set for the scale conversion setting value. Setting range：-32768 to +32767
Upper limit / lower limit comparison		Output if the value is outside the preset upper limit or lower limit.

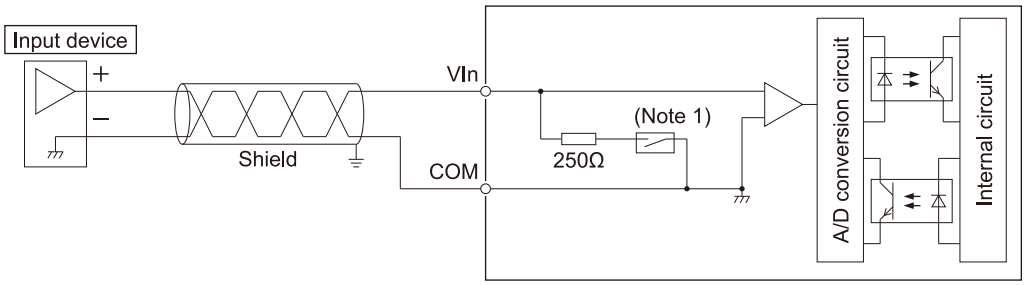
Item	Specifications
	Setting range：-32768 to +32767
Max. / Min. hold	Holding max. / min. values sampled
Disconnection detection	Disconnection detection is possible for the following ranges. Possible to select auto or manual resetting ● 1 to 5 V range (Detection level: 0.7 V or less) ● 4 to 20 mA range (Detection level: 2.8 mA or less.)

(Note 1) The full scale (F.S.) on the accuracy of an analog voltage input range from +1 to +5 V and that of an analog current input range from +4 to +20 mA are 0 to +5 V and 0 to +20 mA, respectively.

(Note 2) If a value that exceeds the input range ± 2% is entered, it will be rounded to the input range ± 2%. However, 0 to 20.4 mA is possible in the 0 to 20 mA range.

■ Internal circuit diagram

- Analog voltage input(-10 to +10 V、0 to +10 V、-5 to +5 V、0 to +5 V、+1 to +5 V)
- Analog current input(0 to +20 mA、+4 to +20 mA)

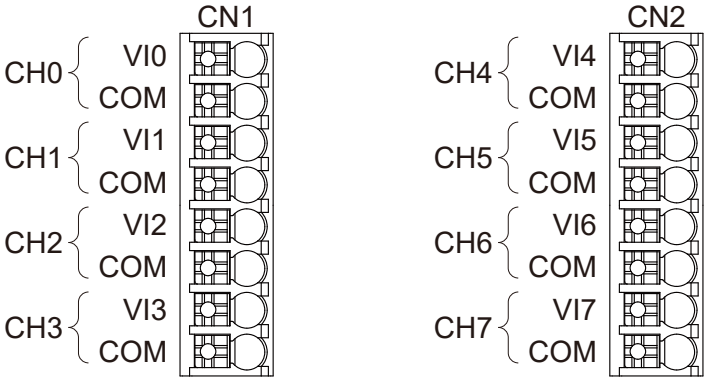


(Note 1) The circuit connection varies depending on parameter settings.

(Note 2) "n" indicates the channel number.

■ Terminal layout diagram

The terminal used by the analog voltage input is common to that used by the analog current input.



- Terminal layout diagram to CN1

Pin No.	Signal name	Specifications
1	VI0	Analog input CH0 voltage / current signal

Pin No.	Signal name	Specifications
2	COM(Note 1)	COM
3	VI1	Analog Input CH1 voltage / current signal
4	COM(Note 1)	COM
5	VI2	Analog Input CH2 voltage / current signal
6	COM(Note 1)	COM
7	VI3	Analog Input CH3 voltage / current signal
8	COM(Note 1)	COM

- Terminal layout diagram to CN2

Pin No.	Signal name	Specifications
1	VI4	Analog Input CH4 voltage / current signal
2	COM(Note 1)	COM
3	VI5	Analog Input CH5 voltage / current signal
4	COM(Note 1)	COM
5	VI6	Analog Input CH6 voltage / current signal
6	COM(Note 1)	COM
7	VI7	Analog Input CH7 voltage / current signal
8	COM(Note 1)	COM

(Note 1) All COM terminals are connected within the unit.

12.4.2 Analog Output Unit

■ Output specifications

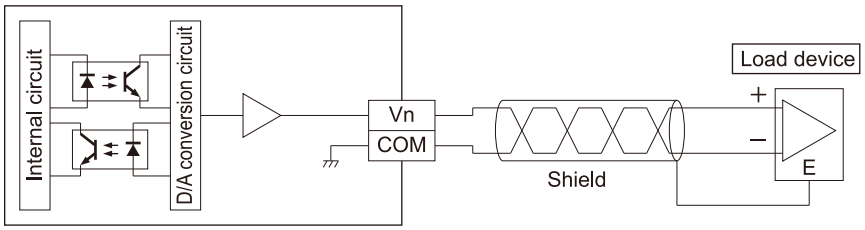
Item		Specifications
No. of output points		4 ch
Output range (Resolution) (Note 1)	Voltage	-10 to +10 V DC (Resolution：1/64,000) 0 to +10 V DC (Resolution：1/32,000) -5 to +5 V DC (Resolution：1/64,000) 0 to +5 V DC (Resolution：1/32,000) +1 to +5 V DC (Resolution：1/25,600) (Note 1)
	Current	0 to +20 mA (Resolution：1/32,000) +4 to +20 mA (Resolution：1/25,600) (Note 1)
Conversion speed		50 μs/ch
Exceeding the rated range		Output is possible up to ± 2% of the output range(Note 2)
Total accuracy		±0.2 % F.S.or less (at +25 ℃) ±0.4 % F.S or less (at 0 to +55 ℃)
Output impedance (voltage output)		0.5 Ω or less
Maximum output current (voltage output)		10 mA
Output allowable load resistance (current output)		500 Ω or less
Insulation method		Between output terminals and internal circuit: Photocoupler and isolated DC/DC converter Between channels: Non-nsulated
Execution / Non-execution channel settings		Possible to make non-converted channel settings.
Clipping function		Upper and lower output limits can be set for digital input values. Setting range：-32,640 to +32,640
Offset / Gain settings		A desired value within the digital output range can be set for the offset value. Setting range：-3,000 to +3,000 A desired value within the digital output range can be set for the gain value. Setting range：+9000 to +11000 (90 % to 110 %)
Scale conversion settings		A desired value within the digital output range can be set for the scale conversion setting value. Setting range：-32768 to +32767
Analog output hold (in STOP mode)		A desired output value while in STOP mode can be set as a digital value. Setting range：-32640 to +32640

(Note 1) The full scale (F.S.) on the accuracy of an analog voltage input range from +1 to +5 V and that of an analog current input range from +4 to +20 mA are 0 to +5 V and 0 to +20 mA, respectively.

(Note 2) If a value that exceeds the input range ± 2% is entered, it will be rounded to the input range ± 2%.
However, 0 to 20.4 mA is possible in the 0 to 20 mA range.

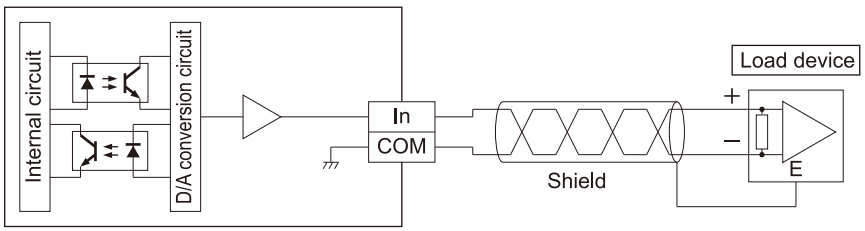
■ Internal circuit diagram

● Analog voltage input (-10 to +10 V、0 to +10 V、-5 to +5 V、0 to +5 V、+1 to +5 V)



(Note 1) "n" indicates the channel number.

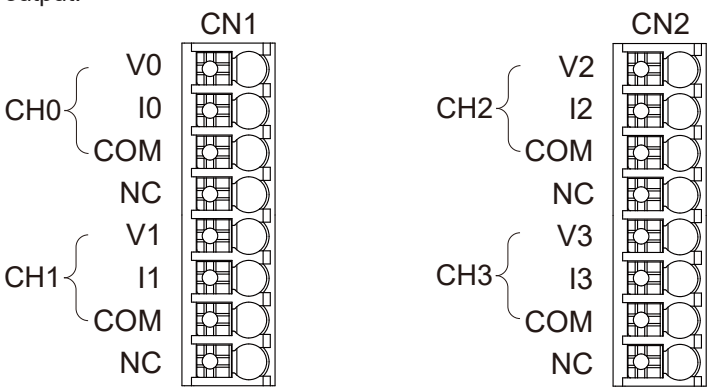
● Analog current input (0 to +20 mA、+4 to +20 mA)



(Note 1) "n" indicates the channel number.

■ Terminal layout diagram

The terminal used by the analog voltage output is different from that used by the analog current output.



● Terminal layout diagram to CN1

Pin No.	Signal name	Specifications
1	V0	Analog output CH0 voltage signal
2	I0	Analog output CH0 current signal
3	COM(Note 1)	COM
4	N.C.	—

Pin No.	Signal name	Specifications
5	V1	Analog output CH1 voltage signal
6	I1	Analog output CH1 current signal
7	COM(Note 1)	COM
8	N.C.	-

- Terminal layout diagram to CN2

Pin No.	Signal name	Specifications
1	V2	Analog output CH2 voltage signal
2	I2	Analog output CH2 current signal
3	COM(Note 1)	COM
4	N.C.	-
5	V3	Analog output CH3 voltage signal
6	I3	Analog output CH3 current signal
7	COM(Note 1)	COM
8	N.C.	-

(Note 1) All COM terminals are connected within the unit.

12.5 Specifications of the Pulse Output Unit

12.5.1 Pulse Output Unit

■ Performance specifications

Item		Specifications	
Product No.		**AGM1PG04T**	**AGM1PG04L**
Output type		Transistor	Line driver
Number of axes controlled		4 axis, independent	
Position command	Command unit	Pulse unit (for increment or absolute)	
	Max. pulse count	Signed 32 bits (-2,147,483,648 to +2,147,483,647 pulses)	
Speed command	Command range	1 pps to 500 kpps (can be set in 1 pps.)	1 pps to 4 Mpps (can be set in 1 pps.)
Acceleration / deceleration command	Acceleration / deceleration method	Linear acceleration / deceleration, S-shaped acceleration / deceleration control	
	S-shape pattern	Sine curve, Cubic curve (can be select)	
Home return	Home return speed	Speed setting possible (changes return speed and search speed)	
	Input signal	Home input, near home input, over limit input (+), over limit input (-)	
	Output signal	Deviation counter clear signal	
Operation mode		● E-point control (Linear and S-shaped acceleration / deceleration) ● P-point control (Linear and S-shaped acceleration / deceleration) ● Home return (Home search) ● JOG operation(Note 1) ● JOG positioning ● Pulser input operation(Note 2) Transfer multiplication ratio (x1, x2, x5, x10, x50, x100, x500, x1000) ● Real-time frequency change function	
Startup time		0.001 ms / 0.005 ms / 0.02 ms	
Output interface	Output mode	Pulse/Sign,CW/CCW	
Feedback counter function(Note 2)	Counting range	Signed 32 bits (-2,147,483,648 to +2,147,483,647 pulses)	
	Input mode	2-phase input, direction identification input, individual input (transfer multiple available for each mode)	
	Max. counting speed	4 MHz (2-phase input) 1 MHz (Direction distinction input and individual input)	
Other functions		● Built-in over limit input (+) and over limit input (-) ● Servo ON output incorporated	

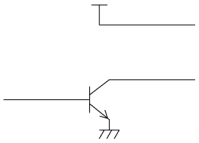
(Note 1) When Linear acceleration/deceleration operation is selected, the target speed can be changed during an operation.

(Note 2) "Pulser input operation" and "Feedback counter" use the same pulse input terminal. Either function of the two can only be used.

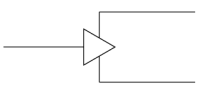
■ I/O specifications

- The Pulse Output Unit uses two connectors. The signal pins for two axes are assigned to one connector.
- AX1 and 2, and AX3 and 4 connectors have the completely same pin assignments. Therefore, the same pin number functions the same.
- Between the Transistor type and the Line driver type, the output terminal performance is different. However, the specifications of the input terminal and the power supply terminal are the same for both types.

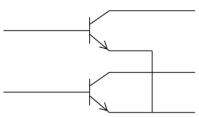
■ output terminals (Transistor output type)

Pin No.		Signal name	Circuit		Item	Specifications
Axis 1 / 3	Axis 2 / 4					
A1	A10	Pulse output A : 5V DC output		Output Specifications	Output type	Open collector
B1	B10	Pulse output A : Open collector			Operating voltage range	4.75 to 26.4 V DC
A2	A11	Pulse output B : 5V DC output			Max. load current	15 mA
B2	B11	Pulse output B : Open collector			ON state max. voltage drop	0.6 V

■ output terminals (Line driver output type)

Pin No.		Signal name	Circuit		Item	Specifications
Axis 1 / 3	Axis 2 / 4					
A1	A10	Pulse output A : Line driver (+)		Output Specifications	Output type	● Line driver output Equivalent to AM26C31
B1	B10	Pulse output A : Line driver (-)				
A2	A11	Pulse output B : Line driver (+)				
B2	B11	Pulse output B : Line driver (-)				

■ output terminals (Common)

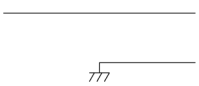
Pin No.		Signal name	Circuit		Item	Specifications
Axis 1 / 3	Axis 2 / 4					
B5	B14	Servo ON output(+)		Output Specifications	Output type	Open collector
A7	A16	Deviation counter clear (+) (Note 1)			Operating voltage range:	4.75 to 26.4 V DC
B7	B16	COM			Max. load current	10 mA
					ON state max. voltage drop	1.0 V

(Note 1) The deviation counter clear signal is output when the power supply is turned ON for about 1 ms. When the home return is complete,

the signal is output for about 1 ms or 10 ms.

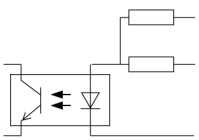
The time can be specified using the""Parameter"

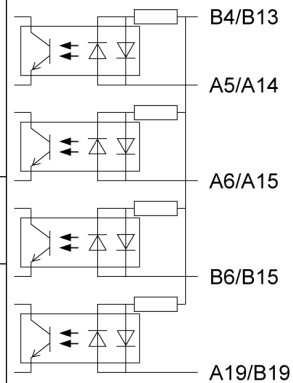
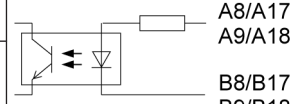
■ Power supply terminal (Common)

Pin No.	Signal name	Circuit		Item	Specifications
A20	External power supply input: 24 V DC, SELV and LIM (+) (Note 1)		Power supply Specifications	Supplied power range	21.4 to 26.4 V DC
B20	External power supply input: 24 V DC, SELV and LIM (-) (Note 1)			Consumption current	90 mA or less

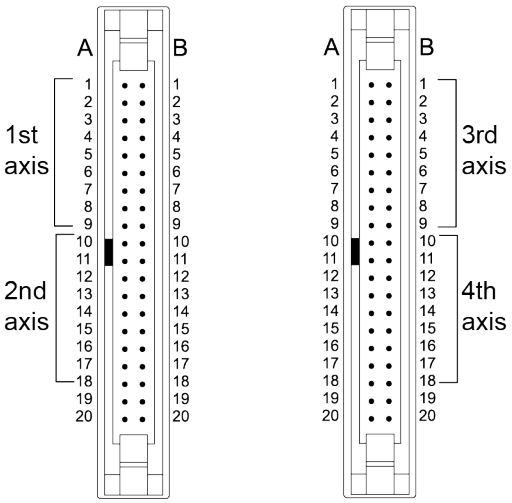
(Note 1) The external power supply input terminals between two connectors are connected internally.

■ Input Specifications (Common)

Pin No.		Signal name	Circuit		Item	Specifications
Axis 1 / 3	Axis 2 / 4					
A3	A12	Home input: 24 VDC, SELV and LIM (+)		Input Specifications (24 V DC)	Operating voltage range	21.6 to 26.4 V DC
					Min. ON voltage / current	19.2 V DC/5.5 mA
					Max. OFF voltage / current	2.0 V DC/2.0 mA

Pin No.		Signal name	Circuit		Item	Specifications
Axis 1 / 3	Axis 2 / 4					
					Input impedance	Approx. 3.9 kΩ
					Pulse width	100 µs or more
A4	A13	Home input: 5 VDC, SELV and LIM (+)		Input Specifications (5 V DC)	Operating voltage range	3.5 to 5.25 V DC (5 V DC, Line driver specifications)
					Min. ON voltage / current	3.0 V DC/4 mA
B3	B12	Home input (-)			Max. OFF voltage / current	1.0 V DC/0.5 mA
					Input impedance	Approx. 560 Ω
					Pulse width	100 µs or more
B4	B13	COM [24V DC SELV and LIM (+)]		Input Specifications	Operating voltage range	21.6 to 26.4 V DC
A5	A14	Near home input (DOG)			Min. ON voltage / current	Near home input (DOG) 19.2 V DC/5.0 mA Limit input (+) Limit input (-) Positioning control start input 19.2V DC/2.6 mA
A6	A15	Limit input (+)			Max. OFF voltage / current	2.0V DC/1.5 mA
B6	B15	Limit input (-)			Input impedance	Near home input (DOG) Approx. 3.6 kΩ Limit input (+) Limit input (-) Positioning control start input Approx. 6.8 kΩ
A19	B19	Timing input			Pulse width	500 µs or more
A8	A17	Pulse input A (+)		Input Specifications	Operating voltage range	3.5 to 5.25 V DC (5 V DC,Line driver specifications)
B8	B17	Pulse input A (-)			Min. ON voltage / current	3.0 V DC/3.2 mA
A9	A18	Pulse input B (+)			Max. OFF voltage / current	1.0 V DC/0.5 mA
B9	B18	Pulse input B (-)			Input impedance	Approx. 560 Ω
					Pulse width	0.5 µs or more (Each phase Max. 1 MHz)

■ **Terminal Layout Diagram**



12.6 Communication Specifications

12.6.1 Specifications of the USB Port

Item	Specifications
Standard	USB2.0 Fullspeed
Connector shape	USB MiniB type

12.6.2 Specifications of the COM Port (RS-232C)

Item		Specifications
No. of channels		1
Physical layer		RS-232C, three-wire system (non-isolated)
Communication mode		1:1 communication
Communication method		Half-duplex transmission
Baud rate		9600/19200/38400/57600/115200 bps
Communication format	Data length	7 bit/8 bit
	Parity	None, odd, even
	Stop bit	1 bit/2 bit
	Start code	None
	End code	None

12.6.3 Specifications of the RTEX Port

Item	Specifications
Baud rate	100 Mbps
Physical layer	100BASE-TX full duplex (IEEE 802.3u)
Insulation method	Pulse transformer
Communication cycle	500 µs to 2 ms
Command update period	500 µs to 4 ms
Number of connectable axes	32 real axes , 20 virtual axes (Total 52 axes)

12.6.4 Specifications of the EtherCAT Port

Item	Specifications
Baud rate	100 Mbps
Physical layer	100BASE-TX full duplex (IEEE 802.3u)
Insulation method	Pulse transformer
Communication cycle	500 us or more
Number of connectable axes	32 real axes , 20 virtual axes (Total 52 axes)

12.7 Performance Specifications

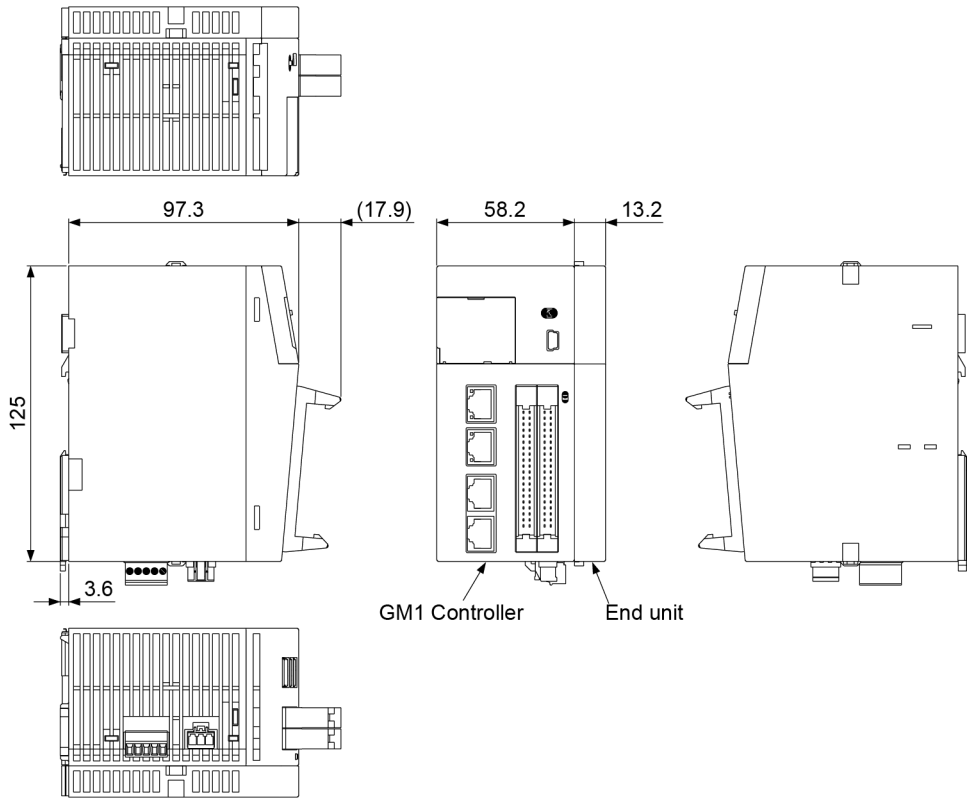
Item		Specifications
SD (SDHC) memory card	Support media	SD memory card, SDHC memory card Max.32 GB
	Supported format standard	Conforms to SD standard.
	Operating mode indicator	LED display (Flashes when accessed.)
	Detection when the cover is open	Available
Memory capacity	Program	16 MB
	Variable (non-hold)	16 MB
	Variable (hold)	192 kB
Clock / calender	Clock accuracy	95 seconds max. per month (at 0℃) 15 seconds max. per month (at +25℃) 130 seconds max. per month (at +55℃
	Holding time maintained by the internal capacitor when a power failure occurs	14 days or more (at +25°C)(Note 1)

(Note 1) The power-ON time of five minutes or longer is required.

12.8 Dimensions

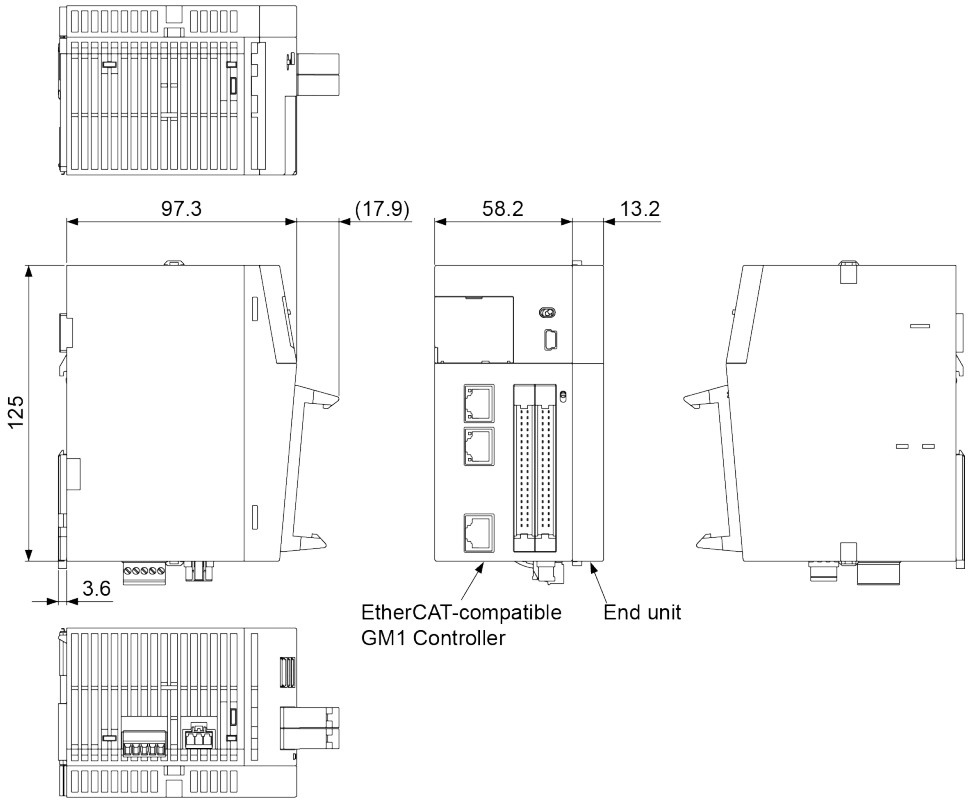
12.8.1 GM1 controller

■ **GM1 controller RTEX type**



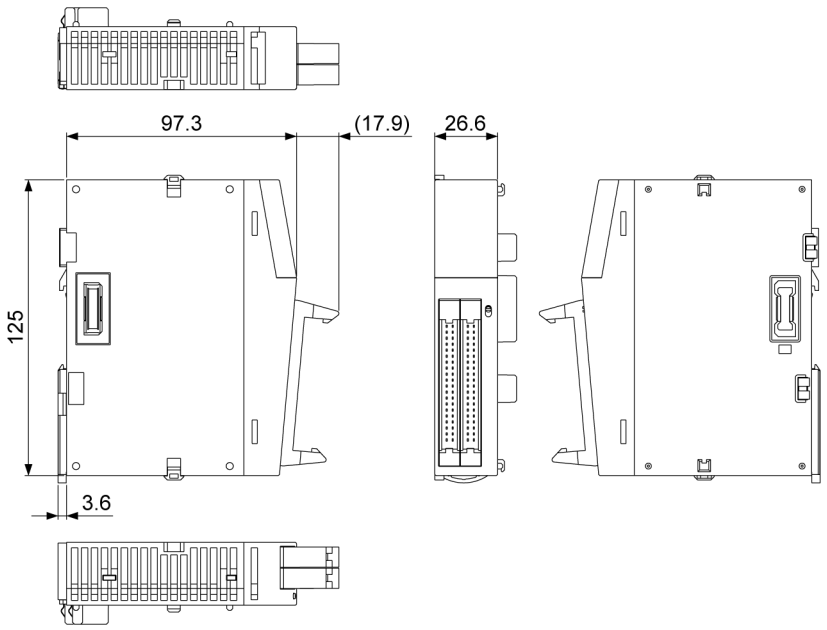
Unit : mm

■ GM1 controller EtherCAT type



Unit : mm

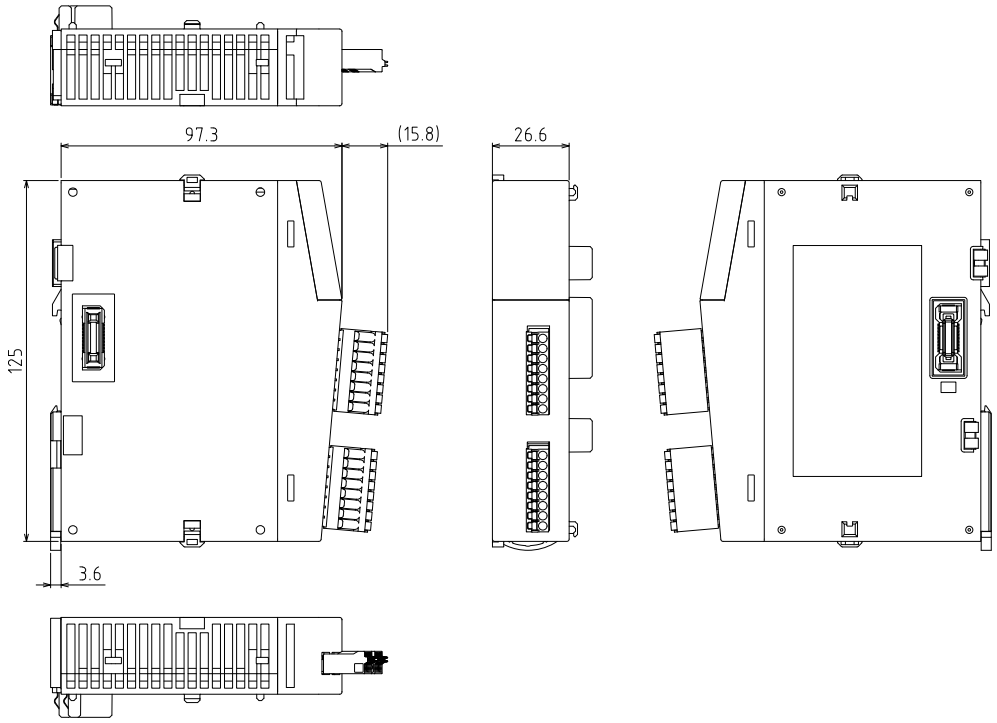
12.8.2 Digital I/O Unit



Unit : mm

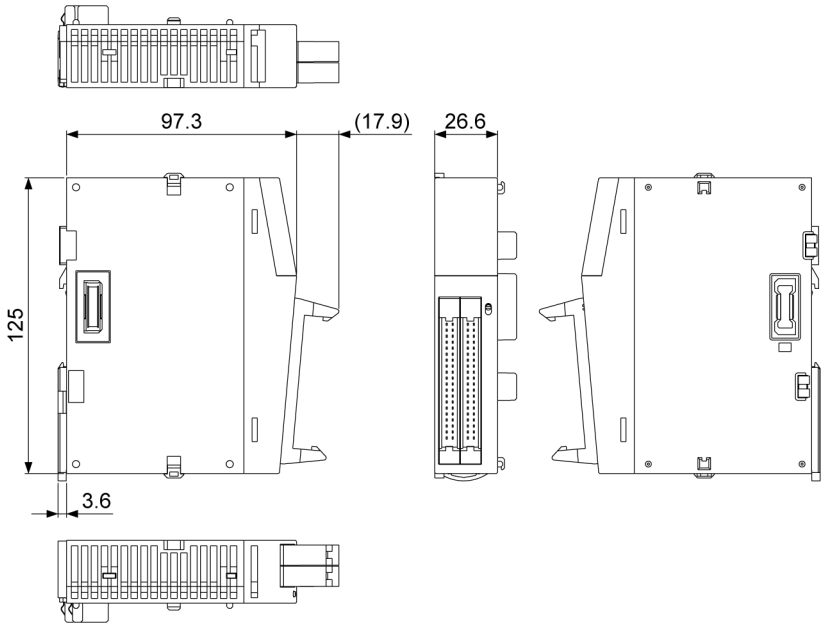
12.8.3 Analog I/O Unit

Applicable model: AGM1AD8、AGM1DA4



Unit ： mm

12.8.4 Pulse Output Unit



Unit : mm

12.9 Conformance to international standards

12.9.1 List of conformed standards for motion controllers

conformed standards		Standard number
EU/UK Standards	EMC	EN 61131-2
	RoHS	EN IEC 63000
UL Standards		UL61010-1, UL61010-2-201
CSA Standards		C22.2 No.61010-1-12, C22.2 No.61010-2-201
Radio Waves Act (South Korea) (KC)(Note 1)		KN 61131-2

(Note 1) AGM1CSEC16P, AGM1Y64P and AGM1XY64D2P has not obtained the KC standard.

EMC : Electromagnetic Compatibility

RoHS : Restriction of Hazardous Substances

IEC : International Electrotechnical Commission

EN : Europaischen Norman

UL : Underwriters Laboratories

CSA : Canadian Standards Association

KC : Radio Waves Act (South Korea)

12.9.2 About Radio Waves Act(South Korea)

The motion controller is a Class A device (commercial broadcasting communication device) under Radio Waves Act(South Korea).

Please use this product after recognizing the following precautions.

A 급 기기 (업무용 방송통신기자재)

이 기기는 업무용(A 급) 전자파적합기기로서 판매자

또는 사용자는 이 점을 주의하시기 바라며, 가정외의

지역에서 사용하는 것을 목적으로 합니다.

(대상기종 Motion controller)

[Reference English translation]

Class A equipment (commercial broadcasting communication equipment)

This device is a commercial electromagnetic wave generator (ClassA) and is intended for use outside the home.

Sellers and users should be aware of this.

（Applicable model Motion Controller)

(MEMO)

Appendix Warranty / Cautions for Proper Use

Warranty

Warranty Period

The warranty period of the Product shall be 12 months from the ex-factory date or 18 months from the date of manufacturing unless otherwise specified between both parties.

Warranty Scope

Panasonic warrants the replacement of the defected parts of the Product or repair of them when the defects of the Product occur during the Warranty Period, and when the defects are under Panasonic responsibility. This Warranty only covers the Product itself and does not cover any damage to your company and the third party incurred by the Product, such as damage that is induced by an object machined or produced using the Product or by the defects of the Product. This Warranty shall be exempted in the following cases,

1. Defects resulting from misuse and/or repair or modification by the customer.
2. Defects resulting from drop of the Product or damage during transportation.
3. Defects resulting from improper usage of the Product beyond the Specifications.
4. Defects resulting from fire, earthquake, lightening, flood, damage from salt, abnormal voltage or other Act of God, or other disaster.
5. Defects resulting from the intrusion of foreign material to the Product, such as water, oil or metallic particles.
6. Parts exceeding their standard lifetime specified in this document.
7. The machines are not assembled in accordance with the instructions or precautions noted in this specification.
8. When the machine does not match the Product assembled in the machine.
9. When the machine condition is not caused by Panasonic reasons.
10. Defects that Panasonic could not foresee at the time of delivery of the Prodcuct.

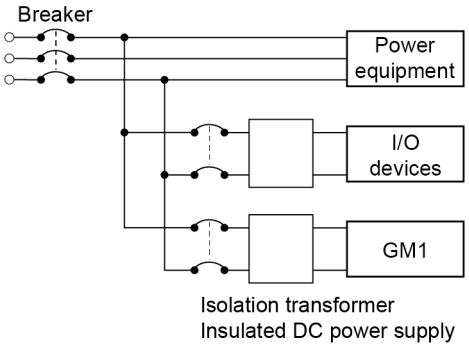
Cautions for Proper Use

■ Selection of a power supply

- Use a low noise power supply.
- The inherent noise resistance is sufficient for the noise superimposed on the power wires, however, the noise can be attenuated further by using the isolation transformer / insulated power supply.

■ Isolation of power supply systems

- Wiring to the units, I/O devices, and other power devices should have separate wiring systems.

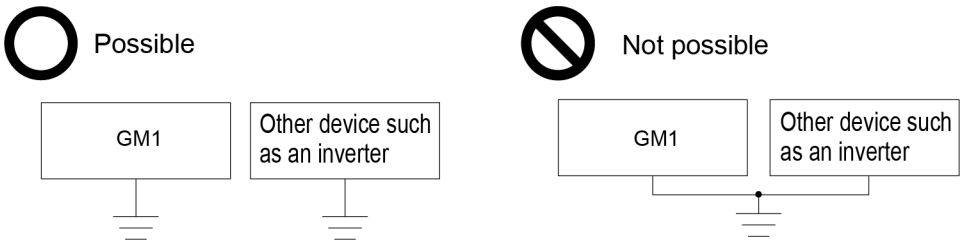


■ Power supply sequence

- Start the GM1 controller only after I/O devices and power devices are energized.
  In case of stopping the operation of the GM1 controller, have the I/O devices or power devices turned OFF after the GM1 controller has stopped operating.

■ Grounding

- The grounding connection should have a resistance of 100 Ω or less.
- The point of grounding should be as close to the GM1 controller as possible. The ground wire should be as short as possible.
- Sharing the ground with another device may have an adverse effect. Therefore, be sure that grounding is dedicated.



Conversely, depending on your environment, grounding may cause a problem. Do not ground the function earth when grounding a plus (+) terminal of the power.

■ Wiring

- Turn OFF the power supply when carry out wiring or connecting the GM1 controller to expansion units.
- Noise resistance measures such as attaching a noise filter, a surge absorber or a ferrite core may be necessary in some cases, depending on the usage environment.

■ Installation of an interlock circuit

- When controlling conflicting operations such as the motor rotation in clockwise or counter-clockwise direction, provide an interlock circuit external to the GM1 controller.

■ Installation of an emergency stop circuit

- Provide an emergency stop circuit external to the GM1 controller to turn OFF the power supply of the output device.

■ Installation environment

Do not use it in the following environments.

- Direct sunlight
- Sudden temperature changes causing condensation.
- Inflammable or corrosive gas.
- Excessive airborne dust, metal particles or saline matter.
- Benzine, paint thinner, alcohol or other organic solvents or strong alkaline solutions such as ammonia or caustic soda.
- Direct vibration, shock or direct drop of water.
- Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters, or any other equipment that would generate high switching surges. (100 mm or more)

■ Handling instructions

- Before touching the unit, always touch a grounded piece of metal in order to discharge static electricity.
- Always rid yourself of any static electricity before handling this product.
- Do not connect a unit other than our GM1 series to the side connector on the unit.
- Use copper wires with a temperature rating of 90°C or higher.

Revision History

The manual code is shown at the bottom of the cover page.

Date of issue	Manual code	Revision details
February 2021	WUME-GM1H-01	First edition
August 2021	WUME-GM1H-02	2rd edition ● Added the following models. • EtherCAT-compatible GM1Controller • Digital I/O unit (Source type) • Analog I/O Unit • Pulse Output Unit
March 2022	WUME-GM1H-03	3rd edition ● Clerical corrections
April 2022	WUME-GM1H-04	4th edition ● Changed the Company name
June 2022	WUME-GM1H-05	5th edition ● Clerical corrections ● Added conformance to international standards
August 2023	WUME-GM1H-06	6th edition ● Chapter structure corrections ● Clerical corrections ● Added conformance to international standards
November 2023	WUME-GM1H-07	7th edition ● Made changes associated with RTEX maximum 32 axes ● Clerical corrections ● Windows(R) 11：64bit support

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Please contact .....

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