

Motion Controller

GM1 Series

Reference Manual

Serial Communication Unit Edition

[Applicable models]

AGM1NSCS2

AGM1NSCM2

AGM1NSCS1M1

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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 Manuals

- There are different types of manuals for the GM1 series, as listed below. Please refer to a relevant manual for the unit and purpose of your use.

These manuals can be downloaded from our website: <https://industry.panasonic.com/global/en/products/fasys/plc/mc/gm1>

Manuals for GM1 series

Manual name	Manual code	Manual description
GM1 Series Reference Manual (Hardware Edition)	WUME-GM1H	Explains the functions and performance of each GM1 unit.
GM1 Series Reference Manual (Instructions 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 Edition)	WUME-GM1AIO	Explains the functions and performance of the GM1 Analog Expansion Unit.
GM1 Series Reference Manual (Pulse Output Unit Edition)	WUME-GM1PG	Explains the functions and performance of the GM1 Pulse Output Unit.
GM1 Series Reference Manual (Serial Communication Unit Edition)	WUME-GM1SC	Explains the functions and performance of the GM1 Serial Communication Unit.
GM1 Series User's Manual (Operation Edition)	WUME-GM1OP	Explains how to use GM Programmer and PANATERM Lite for GM, set up each function, create projects, and perform other operations.

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1 Before Using This Product



1.1 Safety Precautions.....	1-2
1.2 Handling Precautions.....	1-3



1.1 Safety Precautions





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	
	<ul style="list-style-type: none"> • 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.
	<ul style="list-style-type: none"> • Do not use this product in atmospheres that contain flammable gases. Doing so may result in explosion.
	<ul style="list-style-type: none"> • Do not throw this product into the fire. Doing so may cause the batteries or other electronic parts to explode.

 CAUTION	
	<ul style="list-style-type: none"> • To prevent abnormal heat generation or smoke generation, use this product with some leeway from the guaranteed characteristics and performance values of the product.
	<ul style="list-style-type: none"> • Do not disassemble or modify this product. Doing so may result in abnormal heat generation or smoke generation.
	<ul style="list-style-type: none"> • Do not touch any terminals while the power is on. Doing so may result in electrical shock.
	<ul style="list-style-type: none"> • Configure emergency stop and interlock circuits outside this product.
	<ul style="list-style-type: none"> • Connect wires and connectors properly. Failure to do so may result in abnormal heat generation or smoke generation.
	<ul style="list-style-type: none"> • Do not perform work (such as connection or removal) with the power turned on. Doing so may result in electrical shock.
	<ul style="list-style-type: none"> • If this product is used in any way that is not specified by Panasonic, its protection function may be impaired.
	<ul style="list-style-type: none"> • 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.

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

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2 Functions of Unit and Restrictions on Combination

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2.1 Unit Functions and How They Work

2.1 Unit Functions and How They Work

2.1.1 Unit Functions

■ Features of the Serial Communication Unit

- The serial communication unit is a serial communication device.
- It supports the RS-232C and RS-422A/485 serial interfaces to enable connection to various serial communication devices.

■ Support for two communication modes

- The serial communication unit supports MODBUS-RTU and general-purpose communication modes.

2.1.2 Unit Type and Product Number

Port type	Product No.
RS-232C × 2 ports	AGM1NSCS2
RS-422A/485 × 2 ports	AGM1NSCM2
RS-232C × 1 port, RS-422A/485 × 1 port	AGM1NSCS1M1

2.2 Restrictions on Combinations of Units

2.2.1 Applicable Versions of Unit and Software

For using the GM1 Serial Communication Unit, the GM1 Controller and GM Programmer with the following versions are required.

Name		Applicable version
RTEX-compatible GM1 Controller (Sink type)	AGM1CSRX16T	Ver.1.5.0.0 or later
EtherCAT-compatible GM1 Controller (Sink type)	AGM1CSEC16T	Ver.1.5.0.0 or later
EtherCAT-compatible GM1 Controller (Source type)	AGM1CSEC16P	Ver.1.5.0.0 or later
GM Programmer		Ver.1.5.1.0 or later

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3 Addition of Expansion Units and Explanation of Parameters

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3.1 Adding Expansion Units

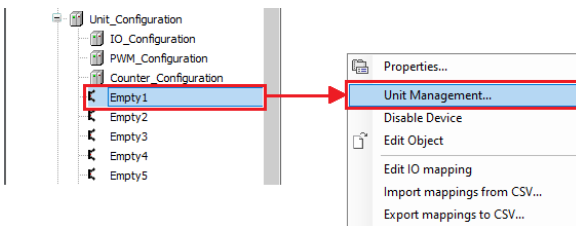
3.1 Adding Expansion Units

This section explains how to add device objects for expansion units to a project. After the addition, the parameters can be checked or changed.

The following explanation is provided for a case where a serial communication unit (part number: AGM1NSCS1M1) is added to Empty1.

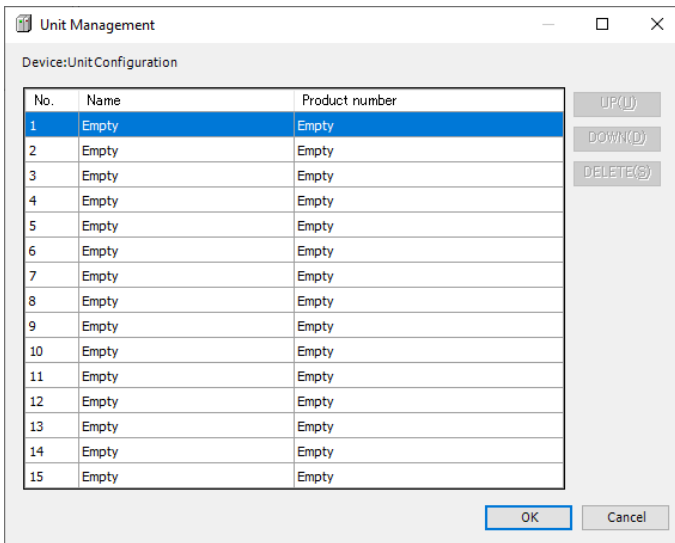
1 2 Procedure

1. Right-click the [Empty1] object in the navigation pane and then select "Unit Management" from the context-sensitive menu that is displayed.

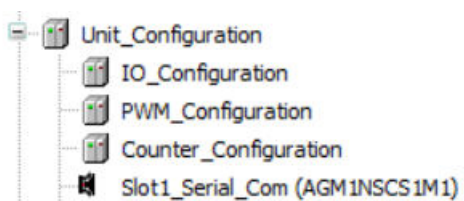


The "Unit Management" dialog box will be displayed.

2. Double-click the first row in the "Device: Unit Configuration" table.



3. In the "Select Device" dialog box, select "AGM1NSCS1M1".
4. In the "Unit Management" dialog box, click the [OK] button.
The selected device object of the expansion unit will be added to the navigation pane.



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- To remove the device object of an expansion unit that has been added, select the expansion unit to be removed in the "Unit Management" dialog box and press the "Delete" key or click the [Delete] button.

3.2 Setting Parameters

3.2 Setting Parameters

Specify the operation of the serial communication unit by setting parameters.

- After adding a serial communication unit to the project, select the unit from the device pane to set its parameters.
- The serial communication units are displayed as follows in the device pane.

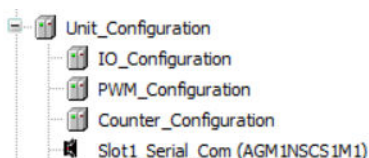
Serial communication unit (RS-232C × 2ch)	Slot*_Serial_Com (AGM1NSCS2) ^(Note 1)
Serial communication unit (RS-422A/485 × 2ch)	Slot*_Serial_Com (AGM1NSCM2) ^(Note 1)
Serial communication unit (RS-232C × 1ch, RS-422A/485 × 1ch)	Slot*_Serial_Com (AGM1NSCS1M1) ^(Note 1)

(Note 1) The segments indicated by * differ according to the expansion location.

The following is an example of setting parameters of the serial communication unit connected to the 1st unit.

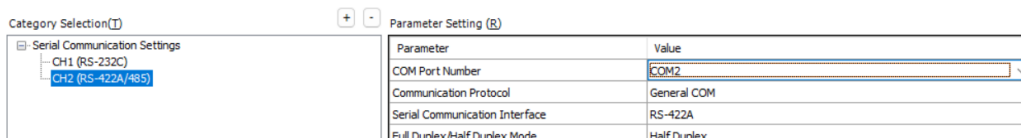
1 2 Procedure

1. Double-click "Slot1_Serial_Com(AGM1NSCS1M1)" in the device pane.



2. Click the "Serial_Com" tab.
3. Set parameters for each channel.

Parameter setting example



(Note 1) In this example, the COM port number for channel 2 is set to "COM2".

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- For the description of parameters to be set and channels, see the next page.

3.3 Setting Up RS-232C

3.3.1 List of RS-232C Parameters

The following table shows a list of RS-232C parameters for the GM1 Serial Communication Unit.

Setting item	Default	Range	Description
COM Port Number	None	None/COM2~COM31	Select the COM port number. Select a number that does not overlap with other channels. Select "None" for ports that are not used. Make sure that the COM port number matches the COM port number specified for the Modbus_COM device and the CAA_Serial instruction.
Communication Protocol	General COM	General COM / Modbus RTU	Select the communication protocol. When Modbus RTU is selected, the end of message is detected at time intervals of 3.5 characters or more.
Serial Communication Interface	RS-232C	RS-232C	Select the interface. This default value cannot be changed.
Flow Control	None	None / RS/CS Control	Select No Flow Control, RS, or CS Control.

3.4 Setting RS-422A/485 Parameters

3.4 Setting RS-422A/485 Parameters

3.4.1 List of RS-422A/485 Parameters

The following table shows a list of RS-422A/485 parameters for the GM1 Serial Communication Unit.

Setting item	Default	Range	Description
COM Port Number	None	None/COM2~COM31	Select the COM port number. Select a number that does not overlap with other channels. Select "None" for ports that are not used. Make sure that the COM port number matches the COM port number specified for the Modbus_COM device and the CAA_Serial instruction.
Communication Protocol	General COM	General COM / Modbus RTU	Select the communication protocol. When Modbus RTU is selected, the end of message is detected at time intervals of 3.5 characters or more.
Serial Communication Interface	RS-485	RS-422A / RS-485	Select the interface.
Full Duplex / Half Duplex Mode	Half Duplex	Half Duplex / Full Duplex	Select the communication mode. For RS-485, half-duplex communication mode cannot be used.

4 Communication Function

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4.1 General-purpose Communication

4.1 General-purpose Communication

4.1.1 General-purpose Communication (Serial)

This section explains how to use the CAA_Serial library.

■ COM transmission/reception processing example

Data is sent and received via SerialCom.

Make the communication settings as follows.

Setting item	Description
COM no.	2 - 31 (Note 1)
Baud rate	115200 bps
Data bit	8
Parity bit	ODD
Stop bit	1

(Note 1) Set this number to match the COM port number set in the **Serial Communication Unit>Serial_COM Parameters** tab.

■ Processing for data transmission / reception

The processing for data transmission / reception is as follows:

- Serial port open processing
- Serial port close processing
- Reception processing
- Transmission processing

■ Explanation of variables

Variable name	Description
Process	When the value is rewritten, the following processing is executed. After the execution is completed, the variable is set to 0 (invalid value). 1 = Serial port open processing 2 = Reception processing 3 = Transmission processing 4 = Serial port close processing
SendBuf	Data to be sent is set.
SendBufLen	The length of send data is set.
RecvBuf	Set the buffer in which the received data will be stored.
ReadBufLen	The length of receive buffer is set.
ReadSize	The size of received data is stored.
Result	The result of processing execution is stored. (TRUE: Error occurrence, FALSE: Normal termination) If the result of processing execution is abnormal, check the following error code. ComErr: Result of COM processing

Variable name	Description
Unit_Status	<p>The COM port status of the serial communication unit is stored. (TRUE: Error occurrence, FALSE: Normal)</p> <p>If the COM port status is abnormal, check the following error code.</p> <ul style="list-style-type: none">• OpenErr: Result of open processing• CloseErr: Result of close processing• WriteErr: Result of write processing• ReadErr: Result of read processing

4.1 General-purpose Communication

■ Example of operation

Opens the serial port.

- The value of "Process" is changed to 1.

Reads the received data.

- The value of "Process" is changed to 2.

Sends 10-byte data.

- The value of "Process" is changed to 3.

Closes the serial port.

Declaration section

```
1 PROGRAM ST_PRG
2 VAR
3   Process      : UINT := 0;    // 1=COM_OPEN 2=RCV 3=SEND 4=COM_CLOSE
4   Result       : BOOL;        // Implementation result (FALSE=normal / TRUE=abnormal)
5
6   ComOpen      : COM.Open;
7   ComClose     : COM.Close;
8   ComSend      : COM.Write;
9   ComRecv      : COM.Read;
10  ComHandle    : COM.CAA.HANDLE := 0;    // COM device handle
11  ComErr       : COM.ERROR;           // COM error code
12
13  // Communication parameters
14  OpenParam : ARRAY [1..7] OF COM.PARAMETER := [
15    (udiParameterId := COM.CAA_Parameter_Constants.udiPort,      udiValue := 1),
16    (udiParameterId := COM.CAA_Parameter_Constants.udiBaudrate,  udiValue := 115200),
17    (udiParameterId := COM.CAA_Parameter_Constants.udiParity,    udiValue := INT_TO_UDINT(COM.PARITY.ODD)),
18    (udiParameterId := COM.CAA_Parameter_Constants.udiStopBits,  udiValue := INT_TO_UDINT(COM.STOPBIT.ONESTOPBIT)),
19    (udiParameterId := COM.CAA_Parameter_Constants.udiTimeout,   udiValue := 0),
20    (udiParameterId := COM.CAA_Parameter_Constants.udiByteSize,  udiValue := 8),
21    (udiParameterId := COM.CAA_Parameter_Constants.udiBinary,    udiValue := 0)
22  ];
23
24  OpenExe      : BOOL := FALSE;
25  RecvExe      : BOOL := FALSE;
26  SendExe      : BOOL := FALSE;
27  CloseExe     : BOOL := FALSE;
28
29  ReadBuf      : ARRAY [1..10] OF BYTE;    // Read buffer
30  ReadSize     : UDINT;                    // Read data size
31
32  SendBuf      : ARRAY [1..10] OF BYTE := [1,2,3,4,5,6,7,8,9,10]; // Transmission data
33 END VAR
```


Implementation section

```

1 // Serial port open processing
2 IF Process = 1 THEN // Open processing started
3     Result := FALSE;
4     OpenExe := TRUE;
5     Process := 101;
6 END IF
7 ComOpen( xExecute:=OpenExe , pParameterList:=ADR(OpenParam) , usiListLength:=SIZEOF(OpenParam)/SIZEOF(COM.PARAMETER));
8 IF Process = 101 THEN // Opening process
9     IF ComOpen.xDone = TRUE OR ComOpen.xError = TRUE THEN
10        IF ComOpen.xError = FALSE THEN // Opening completed
11            ComHandle := ComOpen.hCom; // Get COM handle
12        ELSE // Error occurred
13            ComErr := ComOpen.eError; // Error information storage
14            Result := TRUE;
15        END IF
16        OpenExe := FALSE; // Stop open processing
17        Process := 0;
18    END IF
19 END_IF
20
21 // Reception processing
22 IF Process = 2 THEN // Start receiving process
23     Result := FALSE;
24     RecvExe := TRUE;
25     Process := 102;
26 END IF
27 ComRecv( xExecute:=RecvExe , hCom:=ComHandle , szBuffer:=SIZEOF(ReadBuf) , pBuffer := ADR(ReadBuf));
28 IF Process = 102 THEN // Receive processing
29     IF ComRecv.xDone = TRUE THEN // Message received
30         ReadSize := ComRecv.szSize; // Get reception size
31         RecvExe := FALSE; // Stop receiving
32         Process := 0;
33     ELSIF ComRecv.xError = TRUE THEN // Error occurred
34         ComErr := ComRecv.eError; // Error information acquisition
35         RecvExe := FALSE; // Stop receiving
36         Result := TRUE;
37         Process := 0;
38     END IF
39 END_IF
40
41 // Transmission process
42 IF Process = 3 THEN // Start transmission process
43     Result := FALSE;
44     SendExe := TRUE;
45     Process := 103;
46 END IF
47 ComSend( xExecute:=SendExe , hCom:=ComHandle , szSize:=SIZEOF(SendBuf) , pBuffer:=ADR(SendBuf));
48 IF Process = 103 THEN // Sending in progress
49     IF ComSend.xDone = TRUE THEN // send completely
50         SendExe := FALSE; // Stop sending
51         Process := 0;
52     ELSIF ComSend.xError = TRUE THEN // Error occurred
53         ComErr := ComSend.eError; // Error information acquisition
54         SendExe := FALSE; // Stop sending
55         Result := TRUE;
56         Process := 0;
57     END IF
58 END_IF
59
60 // Serial port closed
61 IF Process = 4 THEN // Serial port close processing started
62     Result := FALSE;
63     CloseExe := TRUE;
64     Process := 104;
65 END IF
66 ComClose( xExecute:=CloseExe , hCom:=ComHandle);
67 IF Process = 104 THEN // closing in progress
68     IF ComClose.xDone = TRUE OR ComClose.xError = TRUE THEN
69         IF ComClose.xError = FALSE THEN // Close processing completed
70             ComHandle := 0;
71         ELSE // Error occurred
72             ComErr := ComClose.eError; // Error information storage
73             Result := TRUE;
74         END IF
75         CloseExe := FALSE; // Stop closing process
76         Process := 0;
77     END IF
78 END_IF
79 END_IF

```

4.1 General-purpose Communication

Note

- The number of COM.Open, COM.Close, COM.Write, and COM.Read that can be executed simultaneously is 20 in total.
 - The maximum size of data that can be sent in a single session is 1024 bytes.
 - The maximum size of data that can be received in a single session is 1024 bytes.
- * The Motion Controller GM1 Series can buffer up to 8096 bytes of received data per port.

4.2 MODBUS

4.2.1 MODBUS-RTU Master / Slave Communication

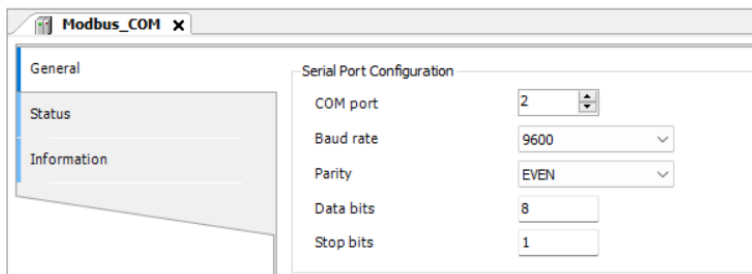
There are two ways to send and receive commands using MODBUS-RTU functions as shown below.

For details on the setting procedure, refer to the "GM1 Controller User's Manual (Operation Edition)".

1. Sending commands to slave devices using the MODBUS-RTU master function
2. Receiving commands from the master device using the MODBUS-RTU slave function

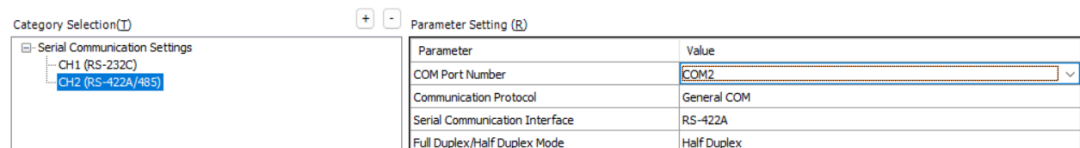
Match the "COM port" setting value in the **Modbus_COM object>General** tab with the value of the "COM port number" in the **Serial Communication Unit>Serial_COM Parameters** tab.

Modbus_COM object>General tab



Serial Port Configuration	
COM port	2
Baud rate	9600
Parity	EVEN
Data bits	8
Stop bits	1

Serial Communication Unit> Serial_COM Parameters tab



Parameter	Value
COM Port Number	COM2
Communication Protocol	General COM
Serial Communication Interface	RS-422A
Full Duplex/Half Duplex Mode	Half Duplex

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5 What to Do If an Error Occurs

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5.1 What to Do If an Error Occurs

5.1 What to Do If an Error Occurs

5.1.1 Unable to Communicate (SD/RD LED Is Unlit)

■ Situation

Serial data is not being input to the COM port. Or serial data is not being output from the COM port.

■ Solution

1. Check if the wiring is correct.
2. Check if there are any problems such as noise in the surrounding environment. Check the shielding processing.
3. Check the parameter settings for the serial communication unit.
4. For general-purpose communication, check the COM port communication setting parameters specified by the COM.Open (Open COM port) instruction.
5. For MODBUS communication, check the settings of the Modbus_COM Serial Port configuration.
6. Check the COM port status of the serial communication unit using the NSC_ReadComStatus instruction.

5.1.2 Unable to Communicate (SD/RD LED Is Flashing)

■ Situation

Serial data is being input to and output from the COM port, but the serial communication unit is unable to communicate.

■ Solution

1. For general-purpose communication, check the COM port communication setting parameters specified by the COM.Open (Open COM port) instruction.
2. For MODBUS communication, check the settings of the Modbus_COM Serial Port configuration.
3. Check the COM port status of the serial communication unit using the NSC_ReadComStatus instruction.

5.1.3 Unable to Send Data

■ Situation

The serial communication unit failed to send serial data.

■ Solution

1. Check if the set communication conditions are the same as those of the destination.
2. If using RS-232C (5-wire type), check if transmission is not inhibited by the CTS signal.
3. For general-purpose communication, check if normal condition is restored by closing and opening the port using the COM.Close (Close COM port) and COM.Open (Open COM port) instructions, respectively.
4. For MODBUS communication, check if normal condition is restored by setting auto-restart communication in Modbus_Master COM_Port.
5. Check the COM port status of the serial communication unit using the NSC_ReadComStatus instruction.

5.1.4 Unable to Receive

■ Situation

The serial communication unit failed to receive serial data.

■ Solution

1. Check if the set communication conditions are the same as those of the source.
2. For general-purpose communication, check if normal condition is restored by closing and opening the port using the COM.Close (Close COM port) and COM.Open (Open COM port) instructions, respectively.
3. For MODBUS communication, check if normal condition is restored by setting auto-restart communication in Modbus_Master COM_Port.
4. Check the serial communication unit for COM port error using the NSC_ReadComStatus instruction.

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Appendix Warranty / Cautions for Proper Use

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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 Product.

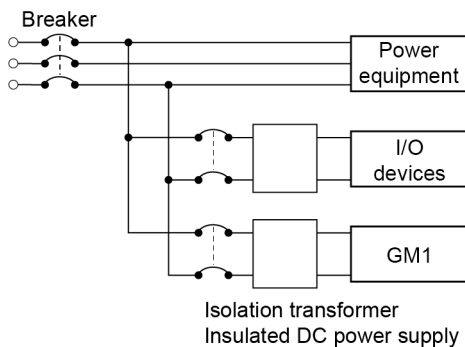
Cautions for Proper Use

■ 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.

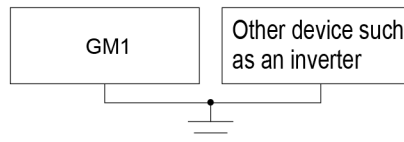
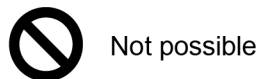
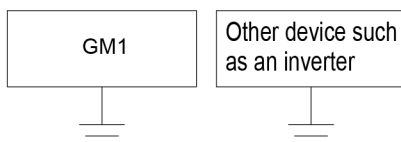


■ Power supply sequence

- 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.

Cautions for Proper Use

■ 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
August 2024	WUME-GM1SC-01	1st Edition

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