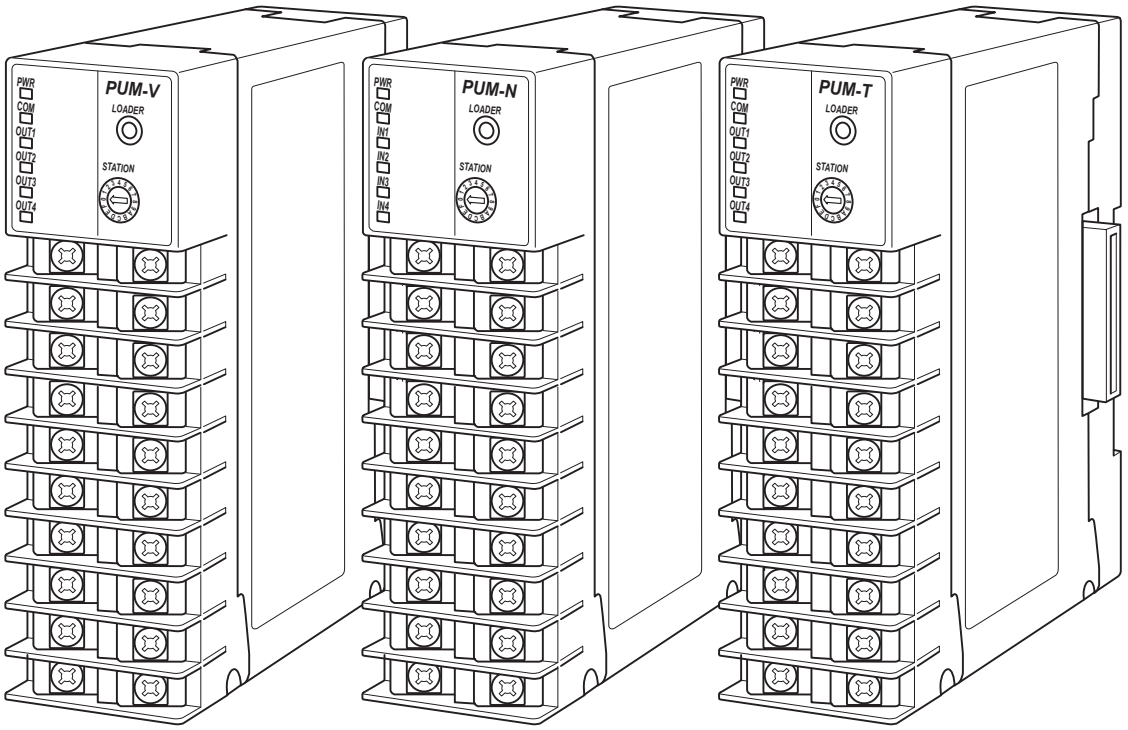
e-Front runners

User's Manual

MULTI-LOOP MODULE TYPE TEMPERATURE CONTROLLER <Analog IO/I/O Module>

TYPE: PUMV/N/T



Fuji Electric Co., Ltd.

INP-TN5A0203a-E

Please Read First (Safety Warnings)

Please read this section thoroughly before using and observe the mentioned safety warnings fully.

Safety warnings are categorized as “Warning” or “Caution”.

⚠Warning	Improper use of the equipment may result in death or serious injuries.
⚠Caution	Improper use of the equipment may cause injury to the user or property damage.

⚠Warning

Installation and Wiring

- This equipment is intended to be used under the following conditions.

Ambient temperature	–10 to 50 degree C
Ambient humidity	90% RH or below (with no condensation)
Vibration	10 to 70Hz less than 9.8m/s² (1G)
Warm-up time	30 min. or more
Installation category	IEC1010-1: class II
Pollution level	IEC1010-1: degree 2

- Between the temperature sensor and the location where the voltage reaches or generates the values described below, secure clearance space and creepage distance as shown in the table below.

  If such space cannot be secured, the EN61010 safety compliance may become invalid.

Voltage used or generated by any assemblies	Clearance Space [mm]	Creepage Space [mm]
Up to 50 Vrms or Vdc	0.2	1.2
Up to 100 Vrms or Vdc	0.2	1.4
Up to 150 Vrms or Vdc	0.5	1.6
Up to 300 Vrms or Vdc	1.5	3.0
Above 300 Vrms or Vdc	Please consult our distributor	

- For the above, if voltage exceeds 50Vdc (called danger voltage), basic insulation is required between the earth and all terminals of the equipment.

  Note that the insulation class for this equipment is as follows. Before installing, please confirm that the insulation class for equipment meets usage requirements.

Power	Ai1
	Ai2
	Ai3
	Ai4
Loader Communication RS-485 Communication	OUT1 (Current)
	OUT2 (Current)
	OUT3 (Current)
	OUT4 (Current)

Functional insulation (1000Vac) — Functional insulation (500Vac)

- In cases where damage or problems with this equipment may lead to serious accidents, install appropriate external protective circuits.
- To prevent damage and failure of the equipment, provide the rated power voltage.
- To prevent electric shock and equipment failure, do not turn the power ON until all wiring is complete.
- Before turning the power ON, confirm that clearance space has been secured to prevent shock or fire.
- Do not touch the terminal while the machine is ON. Doing so risks shock or equipment errors.
- Never disassemble, convert, modify or repair this equipment. Doing so risks abnormal operation, shock or fire.

Maintenance

- When installing or removing the equipment, turn the power OFF. Otherwise, shock, operational errors or failures may be caused.
- Periodic maintenance is recommended for continuous and safe use of this equipment.
- Some parts installed on this equipment have a limited life and/or may deteriorate with age.
- The warranty period for this unit (including accessories) is one year, if the product is used properly.

⚠Caution

Cautions when Installing

Please avoid installing in the following locations.

- Locations in which the ambient temperature falls outside the range of 0 to 50 degrees C when equipment is in use.
- Locations in which the ambient humidity falls outside the range of 45 to 85% RH when equipment is in use.
- Locations with rapid temperature changes, leading to dew condensation.
- Locations with corrosive gases (especially sulfide gas, ammonia, etc.) or flammable gases.
- Locations with vibration or shock directly.

- Locations in contact with water, oil, chemicals, steam or hot water.
  (If the equipment gets wet, there is a risk of electric shock or fire, so have it inspected by Fuji distributor.)
- Locations with high concentrations of atmospheric dust, salt or iron particles.
- Locations with large inductive interference, resulting in static electricity, magnetic fields or noise.
- Locations in direct sunlight.
- Locations that build up heat from radiant heat sources, etc.

Cautions when Mounting to Cabinets / DIN Rails

- In case of mounting the temperature controllers to DIN rails, remember to push up the locking tabs to fasten the controllers onto DIN rail.
- To connect controllers, first release all locking tabs. Then, connect controllers and push up all locking tabs. Make sure that all locking tabs are fastened.
- Never fail to turn the power OFF, before detaching the terminal block or removing the main unit from the base part.
- In order to aid heat dissipation, do not block the top and the bottom of the equipment.
- When mounting / dismounting controllers to / from DIN rails, 30mm of clearance above and under the controllers should be provided.

Cautions for Wiring

- For thermocouple input, use the designated compensation lead. For resistance bulb input, use wires with small lead wire resistance and without any resistance difference among three wires.
- Input signal wire and output signal wire should be separated from each other. And both should be shielded.
- To comply with CE marking (EMC), we recommend to attach ferrite core to communication cable and power cable.
- For wiring to the terminal block, apply crimp type terminals size M3.
  Use terminal screws in this product only.
  Screw size: M3×7 (with square washer)
  Screw tightening torque: 0.78N•m (8kgf•cm)
- To avoid the influence of inductive noise, input signal wires should be separated from electric power lines or load lines. (Analog IO/I module only)

Error Operation

- The alarm function does not work properly when an error occurs unless the settings are made correctly. Always verify its setting before operation.
- In case of error input, PWR LED will flash. When replacing the sensor, make sure to turn the power OFF.

Others

- Please do not wipe the equipment with organic solvents such as alcohol or benzene, etc. If wiping is necessary, use a neutral cleaning agent.
- Do not use mobile phones near this equipment (within 50cm). Otherwise a malfunction may result.
- Malfunctions may occur if the equipment is used near a radio, TV, or wireless device.
- This equipment requires approx. 20 seconds before it starts to output.
- Before installing and wiring, take necessary measures for electrostatic discharge (ESD).
- The power supply for this product is 24V DC. Please use the power source of appropriate volume depending on the number of units you connect.
  Recommended power supply :
  Cosel Electronics Co., Ltd. PBA Series
  Omron Corporation S8VM Series

Contents

Please Read First (Safety Warnings) 3
⚠Warning 3
Installation and Wiring 3
Maintenance 3
⚠Caution 3
Cautions when Installing 3
Cautions when Mounting to Cabinets / DIN Rails 4
Cautions for Wiring 4
Error Operation 4
Others 4

1 Overview 1-1
1.1 Overview 1-3
1.2 Model Code 1-4
Analog IO/I/O Module 1-4
Accessories (Optional) 1-4
1.3 Part Names and Functions 1-5
External View 1-5
Front Terminal Block 1-6
Base Part 1-8

2 System Configuration Example..... 2-1
2.1 System Configuration Example 2-3
Stand Alone 2-3
Multi-channel, Stand Alone System 2-4
System Configuration Using Event Input/Output Module Controllers 2-5
System Configuration Using Control Module 2-7
System Configuration Using Enhanced Communication Module 2-8

3 Installation 3-1
3.1 Installation Procedure 3-3
Stand Alone System 3-3
Multi-channel, Stand Alone System 3-4
Multi-channel, Master/Slave System 3-5
System Configuration Using Enhanced Communication Module 3-6
Setting on RS-485 Host Communication Equipment 3-7
3.2 Dimensions 3-8
Dimensions 3-8
3.3 Mounting Controllers 3-9
How to Remove Front Terminal Block / Base Part from the Main Unit 3-9
Mounting to DIN Rails 3-11
Order of Controllers 3-13
3.4 Attaching Accessories (Optional) 3-14
Attaching Side Connecting Terminal Covers 3-14
Attaching End Plates 3-14
3.5 Mounting with Screws 3-15
3.6 Terminal Block Diagram 3-16
Wiring 3-16
Wiring for Power Supply / RS-485 3-17

4 System Setting 4-1
4.1 Operating Method 4-3
Operating Method 4-3
RUN/Standby Switch 4-4
Digital Output Latch Release 4-5
Start-up Operation Mode Setting 4-6
4.2 Input Setting 4-7
Input Setting 4-7
Analog input Basic Setting 4-8
Analog Input Filter Setting 4-11
Analog Input Shift Setting 4-12
Analog Input Display Zero & Span Adjustment Setting 4-13
Cold Junction Compensation Setting 4-14
4.3 Output Setting 4-15
Output Setting 4-15
Current Output Range Setting 4-16
Output Source Setting 4-17
Output Scaling Base and Span Setting 4-20
Output Shutdown Setting 4-21

Analog Output Limiter Setting 4-22
Standby Analog Output Setting 4-23
Internal Analog Output Field Setting 4-23
4.4 Event Output Setting 4-25
Event Output 4-25
DO Event Type 4-27
ALM Set Value1 / ALM Set Value2 4-30
Operation Before and After Events Output Setting ... 4-32
DO Option Function 4-36
Digital Output Latch Release 4-38
Interchannel Deviation Alarm 4-39
4.5 Communication Setting 4-41
Communication Setting 4-41
RS-485 Communication Speed Setting and RS-485 Parity Setting 4-41
RS-485 Communication Permission Setting 4-42
Enhanced Communication Module (PUMC) Communication Permission Setting 4-42
Master/Slave Setting in Connected Modules 4-43
RS-485 Response Interval Time Setting 4-44
4.6 Optional Functions Setting 4-45
Optional Functions Setting 4-45
Digital Input Function Setting 4-46
Linkage Operation Setting 4-49
Input/Ouput Monitor Setting 4-53
LED Display Setting 4-57
User Address Specification Communication 4-60
Reset Main Unit 4-61

5 Communication 5-1
5.1 Communication Functions 5-3
Connecting to a Programmable Controller 5-4
Connecting to a Personal Computer 5-4
5.2 Communication Specifications 5-5
RS-485 5-5
Loader Interface 5-6
5.3 Connection 5-7
Assignment of Communication Terminals 5-7
Connection with RS-485 5-8
Connection with Loader Interface 5-9
5.4 Setting Communication Parameters 5-10
Setup Items for RS-485 (PUM Side) 5-10
Setup Items on Loader Interface (PUM Side) 5-11
5.5 Modbus RTU Communication Protocol 5-12
Message Composition 5-14
Calculating Error Check Code (CRC-16) 5-17
Transmission Control Steps 5-18
5.6 Command and Transmission Frame Details 5-20
Reading Date 5-20
Writing Data 5-25
5.7 Address Map and Data Format 5-29
Operation Parameters 5-29
Setup Parameters 5-30
System Parameters 5-31
Alarm Parameter 5-34
Communication Parameters 5-35
Configuration Parameters 5-37
Monitor Parameters 5-38
Order of Register Numbers 5-39
5.8 Sample Program 5-45

6 Troubleshooting 6-1
6.1 Troubleshooting Procedures 6-3
Troubles that May Occur when the Loader Software is Connected 6-3
Troubles during Operation 6-4
Troubles with RS-485 Communication 6-7

Index

1 Overview

1.1 Overview 1-3

1.2 Model Code 1-4

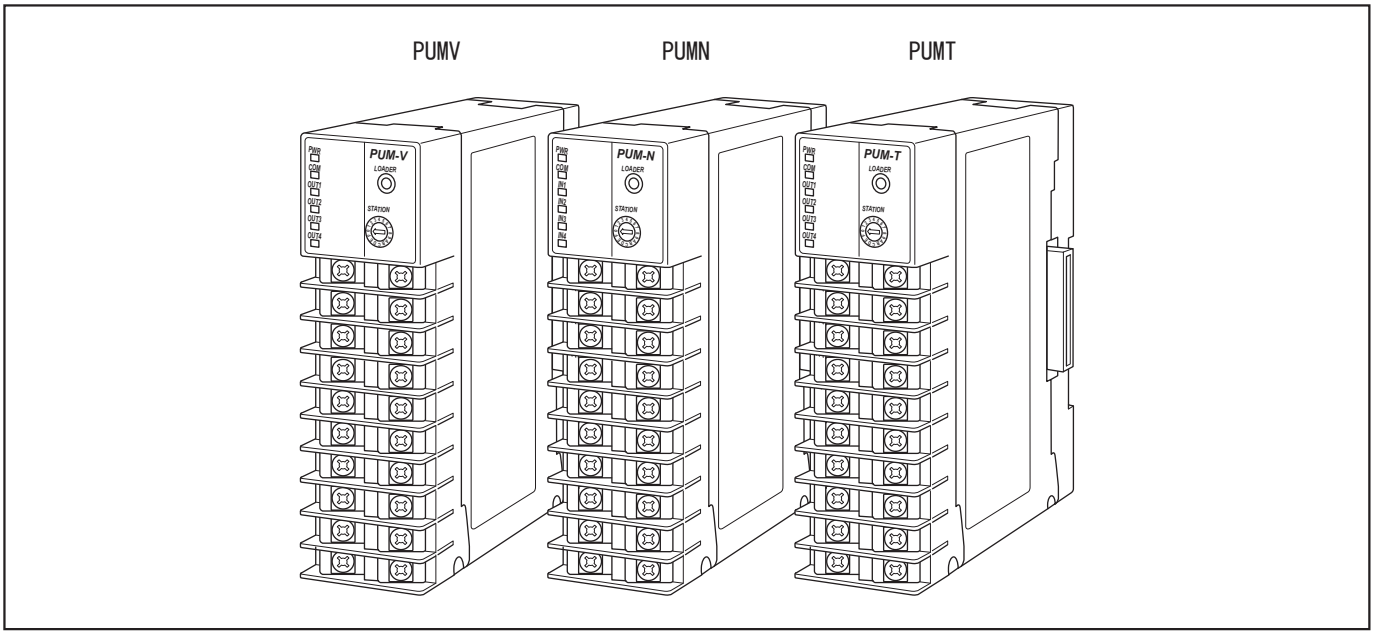
1.3 Part Names and Functions 1-5

1.1 Overview

Analog IO (PUM-V) / I (PUM-N) / O (PUM-T) module is for analog I/O with connecting to the control module.

PUM-V:	Model with 4 I/O functions
PUM-N:	Model with 4 input functions
PUM-T:	Model with 4 output functions

- When making up the temperature control systems of the module-type temperature controller, PUM series, it is used for input during remote operation of the control module, or when re-transmission output or power distribution from the control module is necessary.
- The type of input signal can be selected from thermocouple/resistance bulb and voltage/current.
- Space and labor saving wiring; with only one unit directly connected to power supply and RS-485, all connected controllers are also connected to them internally via side connectors.



Hereinafter, PUM-V/PUM-N/PUM-T will be referred to as “this equipment” or “analog IO/I/O module”.

Confirming accessories

Before using the product, please confirm that all of following accessories are included.

Description	Quantity
Temperature Controller Analog IO/I/O Module (this equipment)	1
Instruction manual (Installation)	1
I/V unit (250Ω resistance)	1 unit per voltage/current input

1.2 Model Code

Analog IO/I/O Module

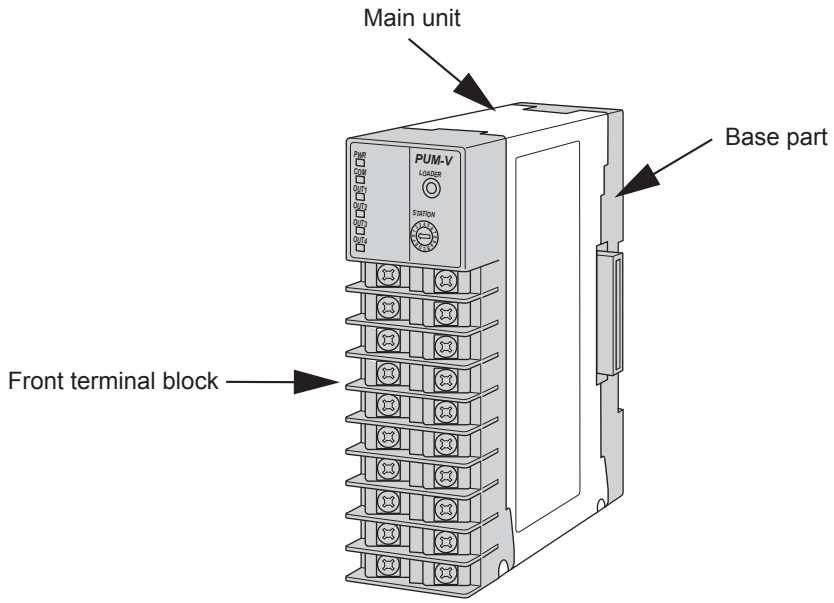
1	2	3	4	5	6	7	8		9	10	11	12	13	Contents
P	U	M					1	–	0		0	0	0	
														Module type
			V											Analog I/O module AI4/AO4
			N											Analog Input module AI4
			T											Analog Output module AO4
														Input type
				T										Thermocouple/resistance bulb
				A										Voltage/current
				C										Thermocouple/resistance bulb [ch1, 2] Voltage/current [ch3, 4]
				Y										Analog output module
														Output type
					Y	Y								None
					E	E								Current output 4 to 20mA
														Operation Manual
										A				Japanese
										B				English

Accessories (Optional)

1	2	3	4	5	6	7	8	Contents
P	U	M	Z	*				
					A	0	1	RS-485 terminating resistance
					A	0	2	DIN rail mounting end plate
					A	0	3	Side connecting terminal cover (right & left 1 set)
					A	0	4	Front face screw terminal cover
					L	0	1	Loader connecting cable (RS-232C)

1.3 Part Names and Functions

External View



Front terminal block

The front terminal block is equipped with loader communication port, station No. configuration switch, and LED indicator lamps.

- Removable from the main body without tools in seconds.

Main unit

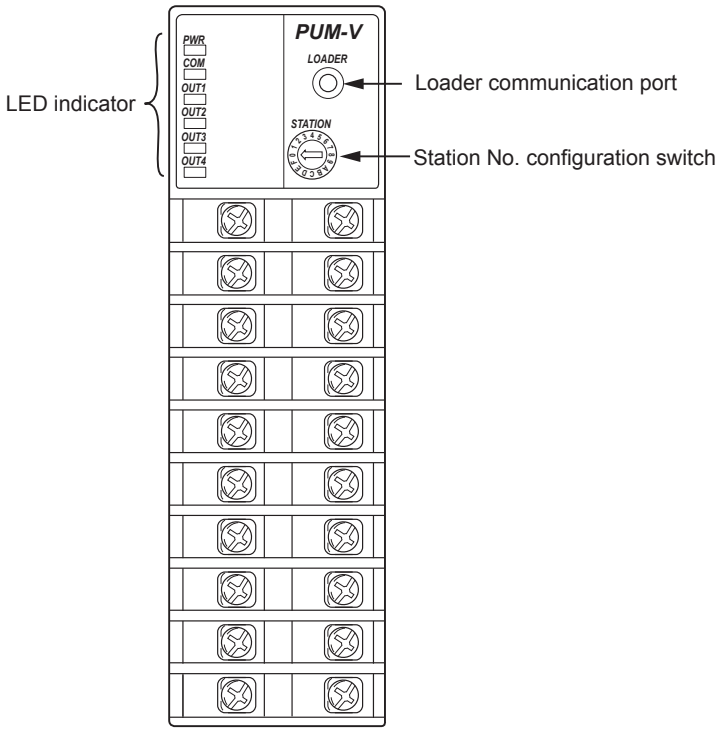
The main unit of the controller

The main unit can be removed from the base part without tools in seconds.

Base part

The base part incorporates power terminal, RS-485 terminal and lateral connection connectors with a DIN-rail mounting structure.

Front Terminal Block



LED indicator

LED (6 points) indicates the equipment status.

■ **Analog I/O module**

LED	LED Status	Color	Operational condition
PWR	ON	Green	Normal operation (Slave station of internal communication)
	Blinking	Green	Normal operation (Master station of internal communication)
	ON	Red	System FAULT (A/D converter error, internal communication error)
	Blinking	Red	Input error
COM	ON	Green	RS-485 being received
	ON	Orange	RS-485 being sent
OUT1 to OUT4	ON	Green	Corresponding channel outputting
	ON	Red	Corresponding channel input error

*Actions to be displayed for COM and OUT1 to 4 can be allocated by programming

■ **Analog input module**

LED	LED Status	Color	Operational condition
PWR	ON	Green	Normal operation (Slave station of internal communication)
	Blinking	Green	Normal operation (Master station of internal communication)
	ON	Red	System FAULT (A/D converter error, internal communication error)
	Blinking	Red	Input error
COM	ON	Green	RS-485 being received
	ON	Orange	RS-485 being sent
IN1 to IN4	ON	Red	Corresponding channel input error

*Actions to be displayed for COM and IN1 to 4 can be allocated by programming

■ **Analog output modul**

LED	LED Status	Color	Operational condition
PWR	ON	Green	Normal operation (Slave station of internal communication)
	Blinking	Green	Normal operation (Master station of internal communication)
	ON	Red	System FAULT (A/D converter error, internal communication error)
COM	ON	Green	RS-485 being received
	ON	Orange	RS-485 being sent
OUT1 to OUT4	ON	Green	Corresponding channel outputting

*Actions to be displayed for COM and OUT1 to 4 can be allocated by programming

Loader communication port

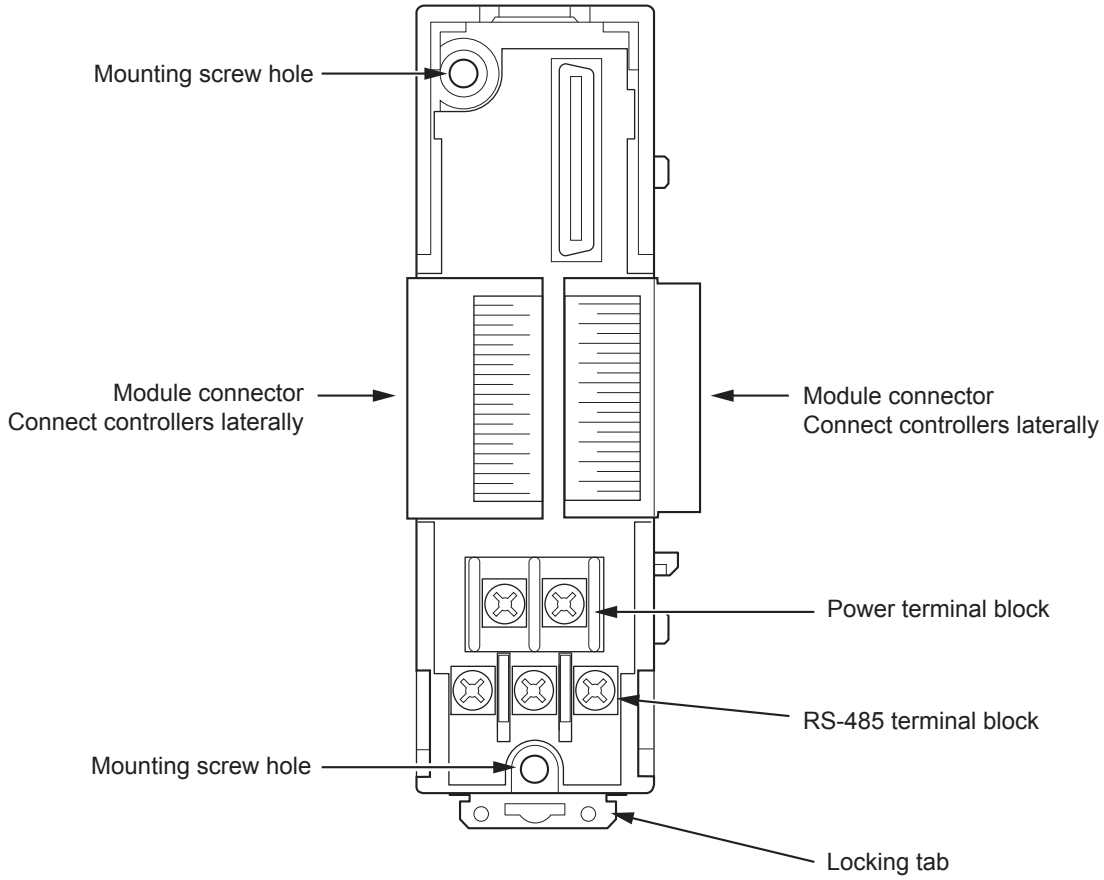
Loader communication port is an interface to connect PUM with a PC with parameter loader software installed using an optional loader connecting cable.

Station number configuration switch

Station number configuration switch sets the station number of each controller. Apply a fine tip flat-head screwdriver to turn the Station No. configuration switch. Each of connected controllers must have a different Station number from other controllers. Duplicate station numbers may cause malfunction of the equipment.

SW setting	Station No.
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
A	11
B	12
C	13
D	14
E	15
F	16

Base Part



Module connector

Module connectors connect controllers laterally.

Power terminal block

Power terminal block connects power supply to PUMA/B.

If any one of connected controllers is directly connected with power supply, power will be provided to all of controllers via side connectors.

RS-485 terminal block

RS-485 terminal block connects an RS-485 communication cable to perform serial communication with PLC, operation display, and PC, etc.

If any one of connected controllers is directly connected with RS-485, all of controllers will be also connected via side connectors.

Locking tab

Locking tab fastens a controller onto DIN rail when mounting controllers to a DIN rail. Locking tabs also fasten controllers onto each other.

2 System Configuration Example

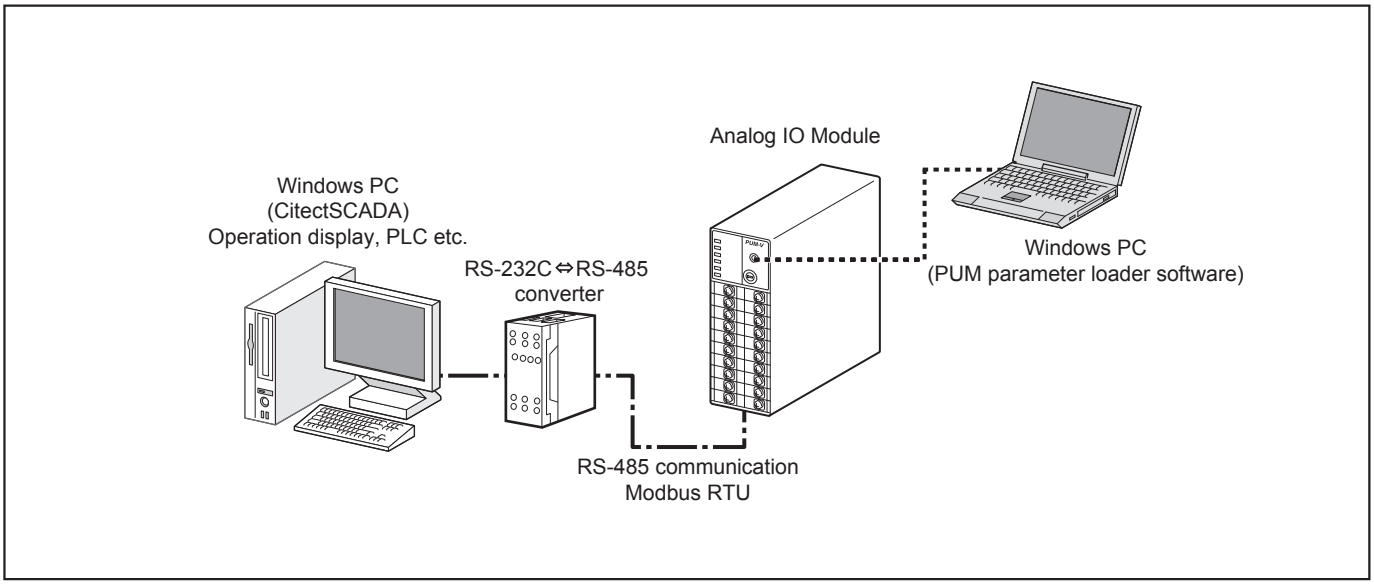
2.1 System Configuration Example … 2-3

2.1 System Configuration Example

The followings are examples of a temperature controller system of multi-loop module type temperature controller PUM series.

Stand Alone

- This is the minimum configuration consisting of one Analog IO Module controller only.
- Analog I/O can be performed with using maximum 4 channels.
- Configuration and operation can be done via PUM parameter loader software connected with loader communication port. Configuration and operation are performed using PC, PLC, and Operation display connected by RS-485 communication.



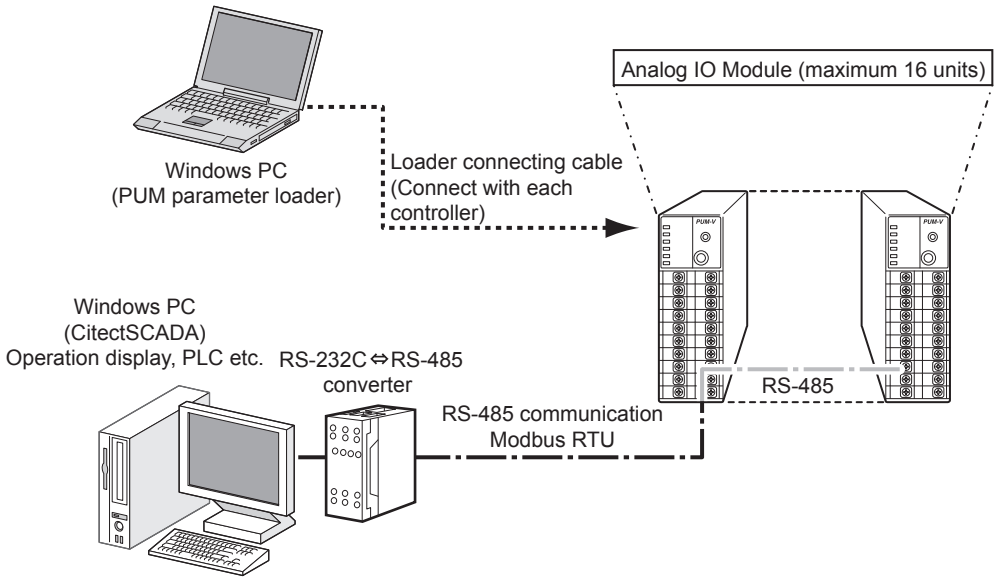
Basic setting items

In case of this example, the following settings are required.

- RS-485 communication setting ▶▶ 4-41

Multi-channel, Stand Alone System

- When more channels are required for analog IO, maximum 64 channels are available by connecting up to 16 units of control module.
- RS-485 and power supply can be shared among all connected controllers if one of connected controllers is directly connected to them, which saves time, labor and space for wiring.
- To configure controllers via loader communication port, connect all controllers one by one with a loader connecting cable and configure each controller separately.



Basic setting items

In case of this example, the following settings are required.

- Station number setting ▶▶ 1-7
- RS-485 communication setting ▶▶ 4-41

Point

- Station number of Analog I/O module (1 to 16)

  In order to perform communication correctly, setting station number ▶▶ 1-7 is required. Set the leftmost controller to “1”. Number the rest of controllers consecutively as “2”, “3”, ...”16”. Make sure that there is no duplicate station number in the same system.

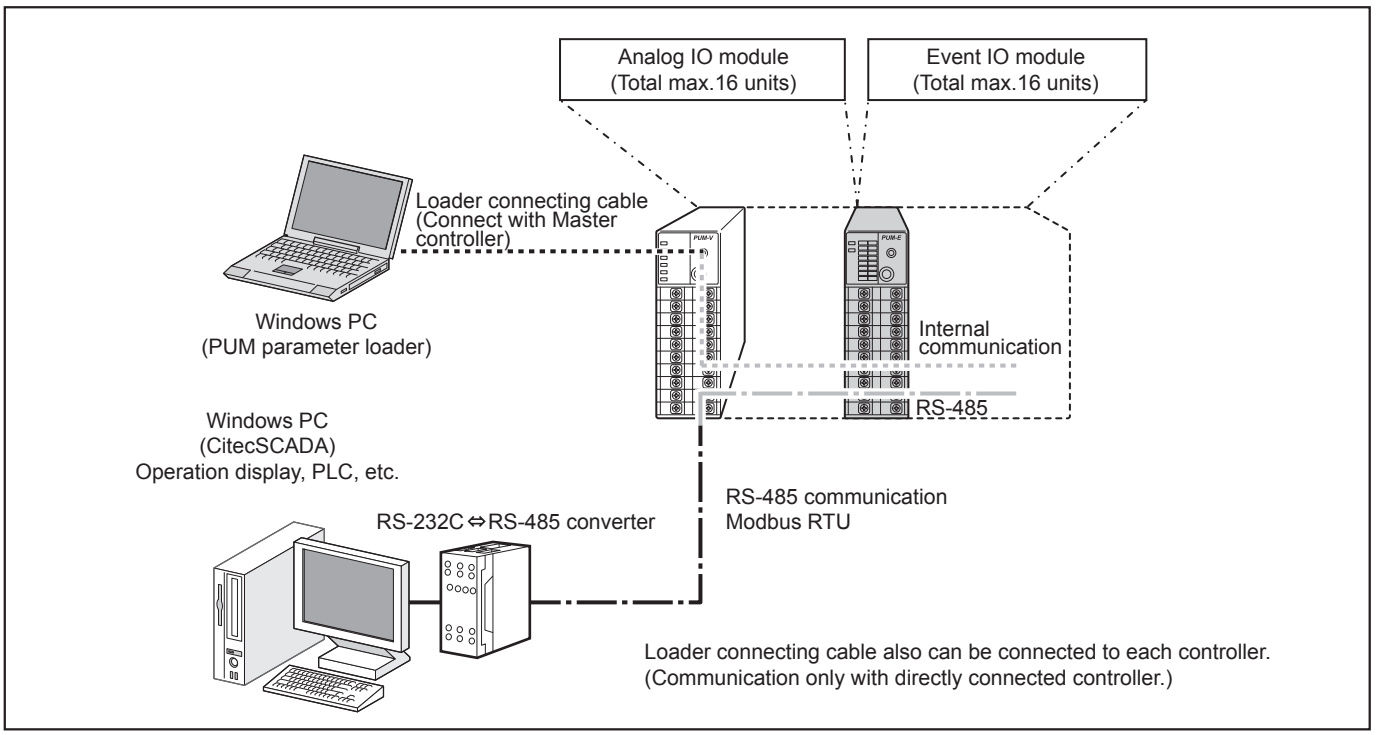
System Configuration Using Event Input/Output Module Controllers

The following functions are added if event input/output module are included in the system.

- Analog IO modules are operated by digital input.
- Event output such as alarm and distributed output are possible.

Note

- As for digital input (DI) function, setting source module is designated on the Analog IO module.
- As for digital output (DO) function, Analog IO module is designated on the event input/output module.



Point

- Master/slave setting
  Set the leftmost unit of connected Analog IO Module as “Master” and the rest of them as “Slave”. Each controller needs to be set as “Master” or “Slave” via a loader communication port only one. When connecting parameter loader software via loader communication port, it is only necessary to connect it with the master controller and all of slave controllers can be also configured. (If a slave controller is directly connected, the setting for other controllers cannot be done.)
  PWR indicator lamp shows whether the unit is “Master” or “Slave”.

PWR indicator	Action
Master controller	Green lamp will blink at startup and during operation.
Slave controller	Green lamp will be illuminated at startup and during operation.

- Station number of event input/output module controller (17 to 32)
  The station number of event input/output module must start with “17”. Number the rest of controllers consecutively as “17”, “18”, ...”32”. Make sure that there is no duplicate station number in the same system.

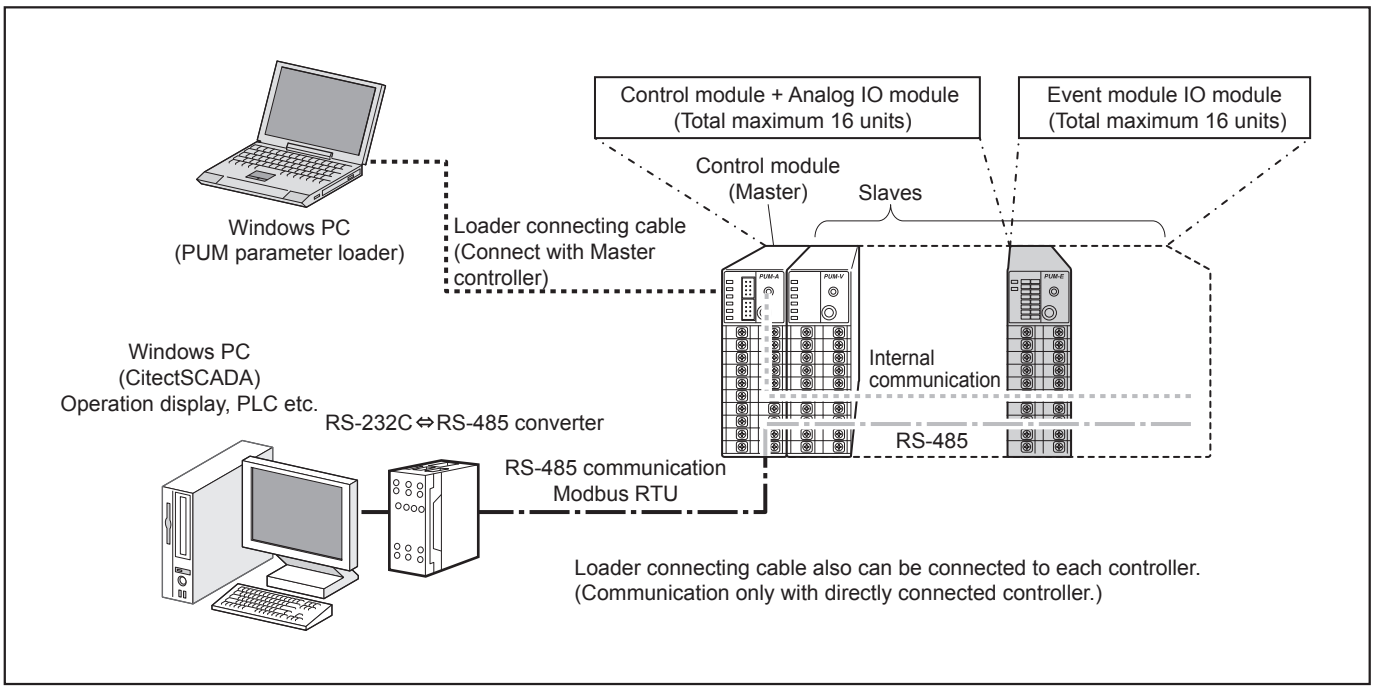
Basic setting items

In case of this example, the following settings are required.

- Station number setting ▶▶ 1-7
- Master/slave setting ▶▶ 4-43
- RS-485 communication setting ▶▶ 4-41
- DI input function ▶▶ 4-46
- Event output setting ▶▶ 4-25
- Output source setting ▶▶ Event Input/Output Module user's manual

System Configuration Using Control Module

- By adding Control module to the system, re-transmission output and remote SV functions can be used as extended input/output of control module. They can be also used as analog input/output from the host equipment.
- Total maximum 16 units (64 channels) of control module and analog IO module controllers can be connected.



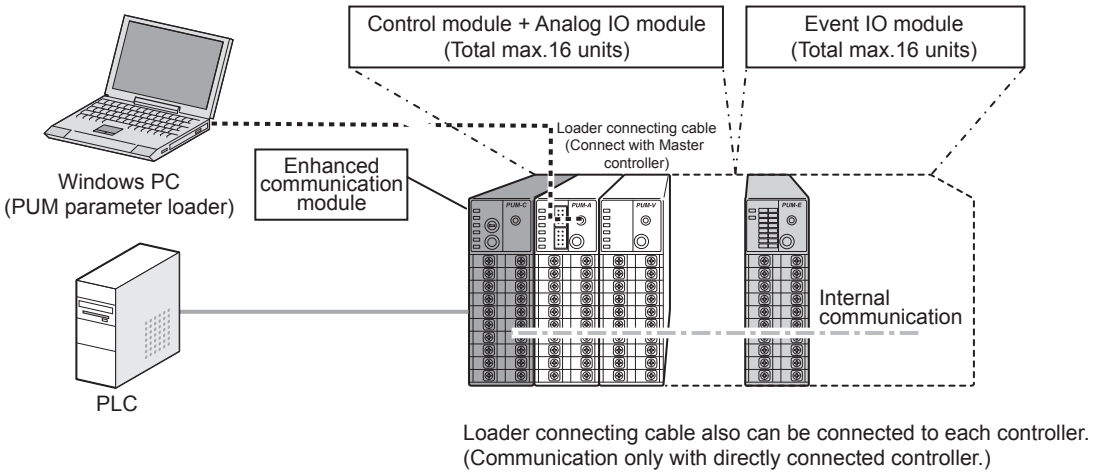
Basic setting items

In case of this example, the following settings are required.

- Station number setting ▶▶ 1-7
- Master/slave setting ▶▶ 4-43
- RS-485 communication setting ▶▶ 4-41
- Output source setting ▶▶ 4-17
- Remote SV ▶▶ Control Module user's manual

System Configuration Using Enhanced Communication Module

• By adding enhanced communication module to the system, communication with PLC of various manufactures is possible.



Basic setting items

In the case of communication via CC-Link, the following settings are required.

- Station number setting ▶▶ 1-7
- Master/slave setting ▶▶ 4-43
- Programless communication module Station number setting
  ▶▶ Mitsubishi's PLC Programless Communication user's manual
- Programless communication module Communication setting
  ▶▶ Mitsubishi's PLC Programless Communication user's manual

Point

To use enhanced communication module, change the setting of "Enhanced communication module (PUMC) communication permission" ▶▶ 4-42 to "1: PUMC connected (RS-485 Disable)" on all of connected control module, analog input/output module, and event input/output module.

Note

Only control module and event module can be connected to the enhanced communication module (CC-Link).

3

Installation

3.1 Installation Procedure 3-3
3.2 Dimensions 3-8
3.3 Mounting Controllers 3-9
3.4 Attaching Accessories (Optional) 3-14
3.5 Mounting with Screws 3-15
3.6 Terminal Block Diagram 3-16

3.1 Installation Procedure

The procedures from installation to startup via PUM parameter loader software are shown below by each configuration system. Then, the procedures of communication setting of host equipment and trial run are shown.

Stand Alone System

Legend 1 Necessary step 1 Step necessary depending on conditions

1 Installation

Confirm installation dimensions.
- ●External dimensions ▶▶ 3-8

Decide installation method
- ●DIN-rail mounting ▶▶ 3-11
- ●Mounting with screws ▶▶ 3-15

2 Wiring

Please do not turn the power ON until all wiring is complete.
- ●Power / RS-485 communication ▶▶ 3-17
- ●Front terminals ▶▶ 3-16

3 Preparing loader software

- ●Connect PC on which PUM loader software is installed with a controller using loader connecting cable. ▶▶ 5-7
- ●Start the loader software. ▶▶ PUM parameter loader instruction manual

4 Communication parameter setting

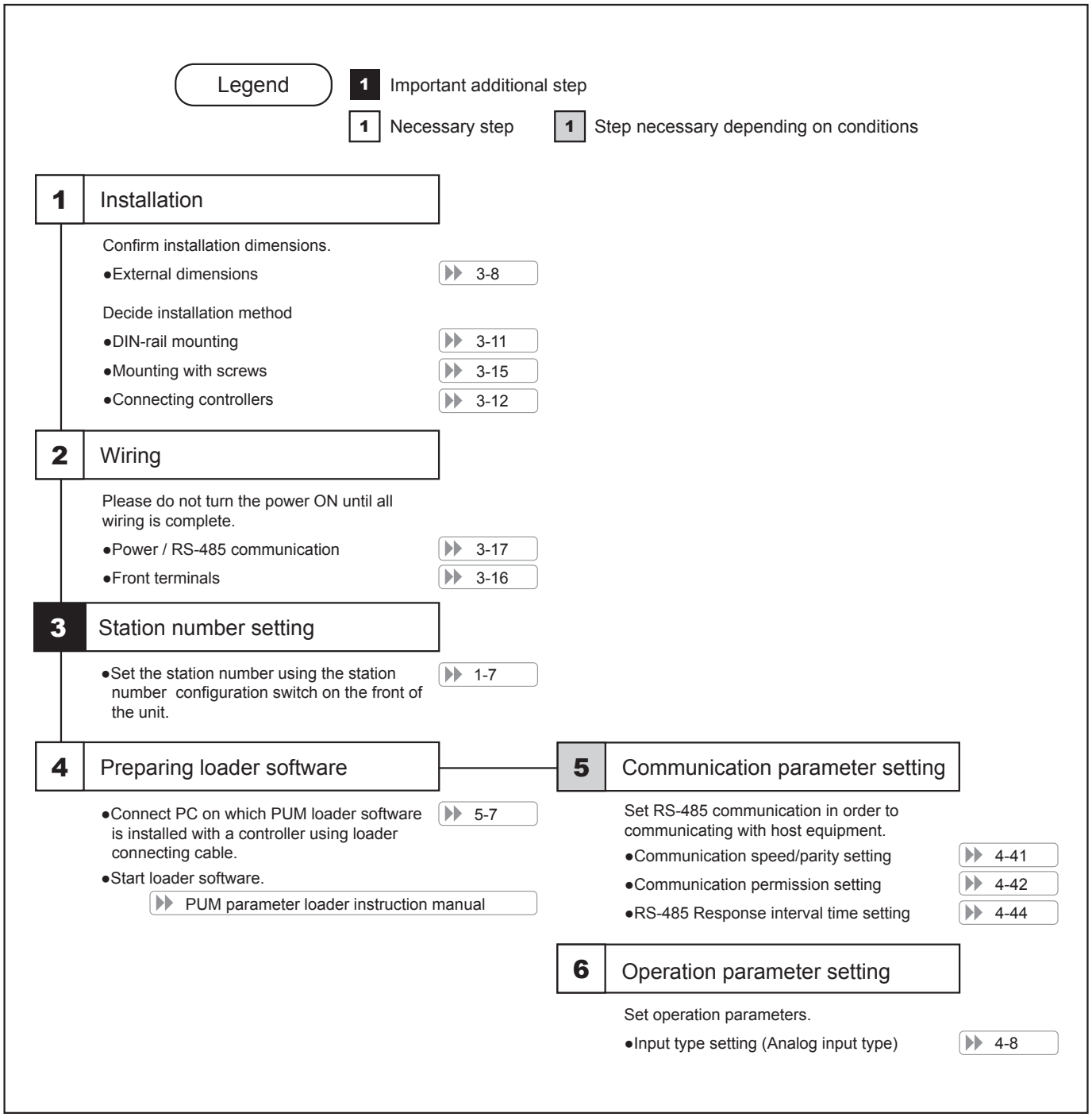
Set RS-485 communication in order to communicating with host equipment.
- ●Communication speed/parity setting ▶▶ 4-41
- ●Communication permission setting ▶▶ 4-42
- ●RS-485 Response interval time setting ▶▶ 4-44

5 Operation parameter setting

Set operation parameters.
- ●Input type setting (Analog input type) ▶▶ 4-8

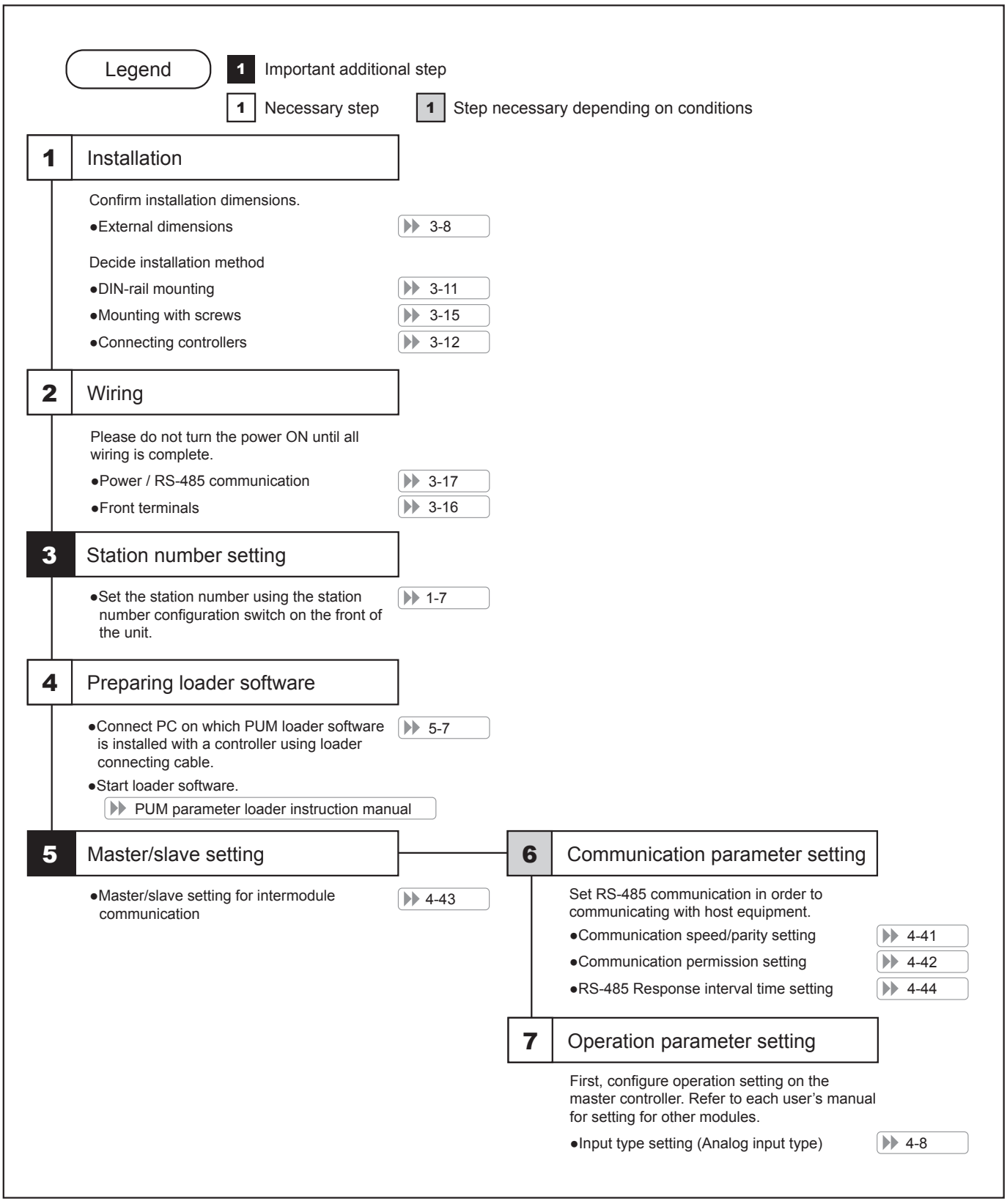
Multi-channel, Stand Alone System

- Station number setting is added.
- To configure parameter, connect each controller with PUM parameter loader software.



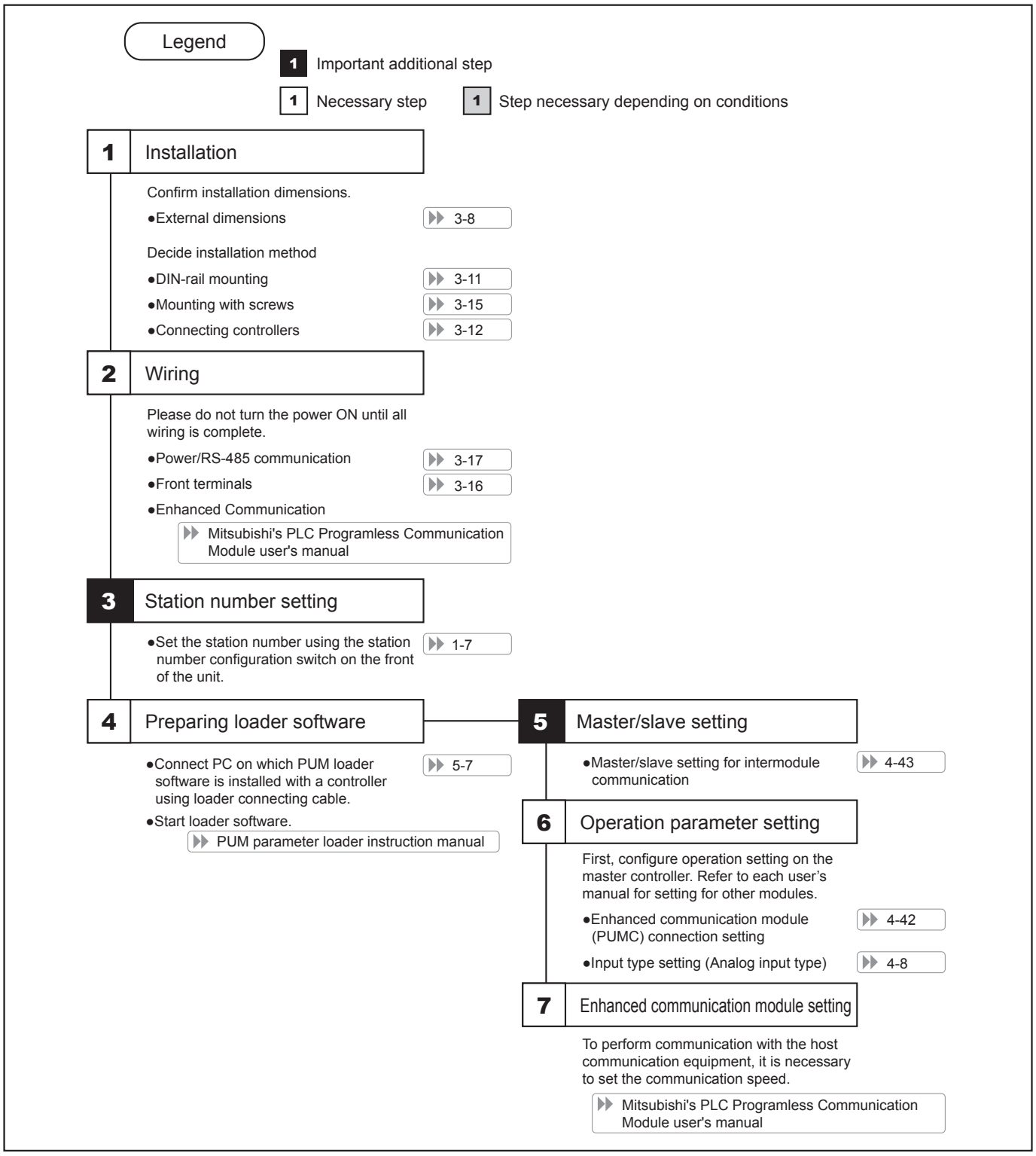
Multi-channel, Master/Slave System

- Station number setting and master/slave setting are added.
- Connect the master controller with PUM parameter loader to configure all controllers at the same time.
- When adding Control module or event input/output module, follow the procedure shown below.



System Configuration Using Enhanced Communication Module

- Station number setting and master/slave setting are added.
- “Enhanced communication module (PUMC) connection permission” parameter setting on all of the control/event/analog module in the system is required to set to “1: PUMC connected (RS-485 Disable)”.
- Connect the master controller with PUM parameter loader to configure all controllers at the same time.



Setting on RS-485 Host Communication Equipment

- The settings on the host communication equipment and PUM must be the same to perform communication correctly.
- Do not turn the power of any controllers ON until all the wiring is complete.

1 Wiring for communication line

Please do not turn the power of any controllers ON until all wiring is complete. Refer to “3.6 Terminal block diagram” and install wiring for communication line.

▶▶ 3-16

2 Preparation of communication program

- ●Prepare host equipment with a communication program installed.
- ●Start the communication program.

3 Communication port setting

4 Communication condition setting

Set communication speed, etc. Setting must be the same as the PUM.

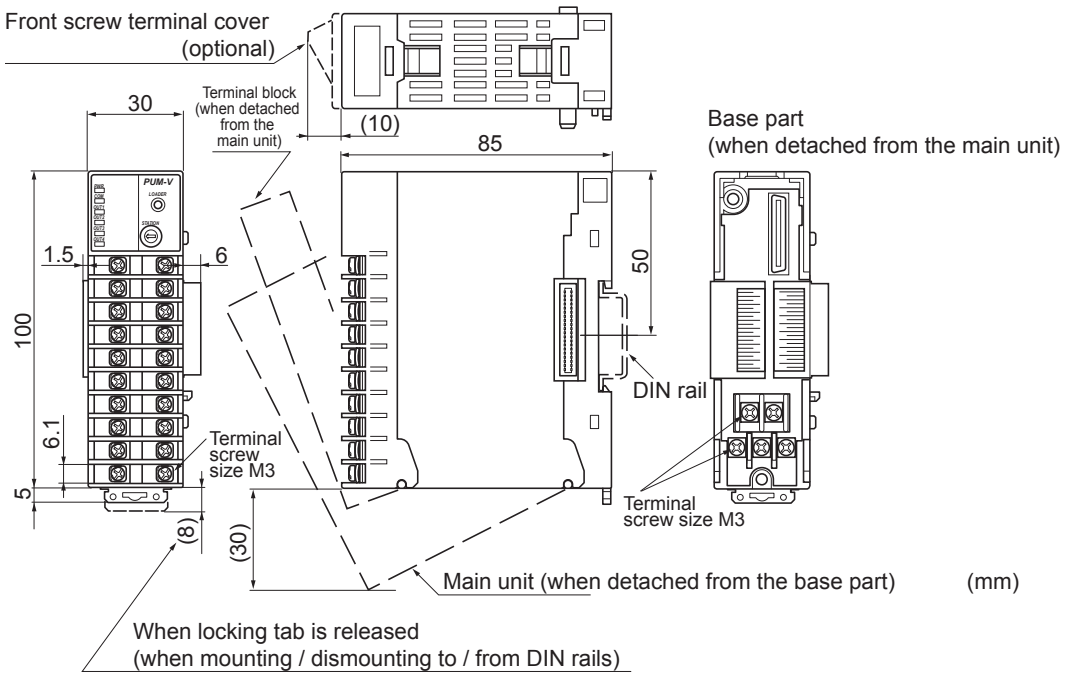
5 Power ON

Turn the power ON after all wiring is completed.

3.2 Dimensions

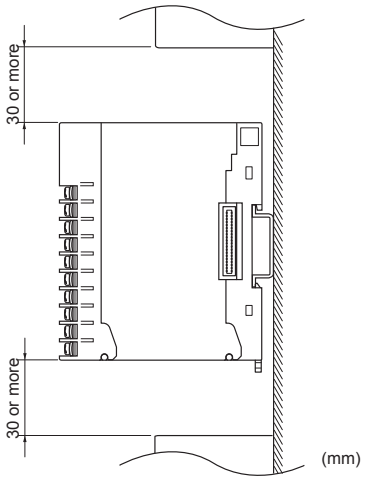
Dimensions

Refer to the dimensions shown below and provide enough clearance space when installation controllers.



Cautions when mounting

In order to aid heat dissipation, 30mm of clearance (50mm recommended) above and under the controllers should be provided.



Point

When mounting / dismounting controllers to / from DIN rails, 30mm of clearance above and under the controllers should be provided.

3.3 Mounting Controllers

How to Remove Front Terminal Block / Base Part from the Main Unit

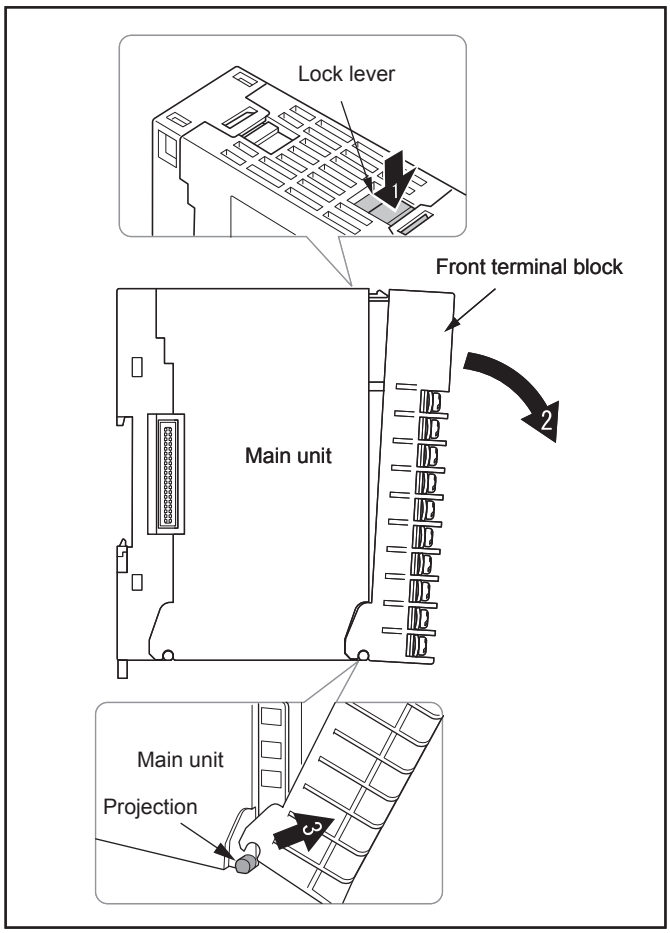
Front terminal block and base part of this equipment are removable from the main unit without tools in seconds, which enables easy mounting and maintenance.

How to remove front terminal block

1. Press the lock lever on the top of the main unit.
2. Pull down the front terminal block.
3. Detach the cutout on the lower end of the front terminal block from the projection on the main unit.

Point

- When attaching the front terminal block to the main unit, take the reverse procedure to removing the front terminal block from the main unit.
- Make sure that the lock lever of the main unit is fitted into the front terminal block.

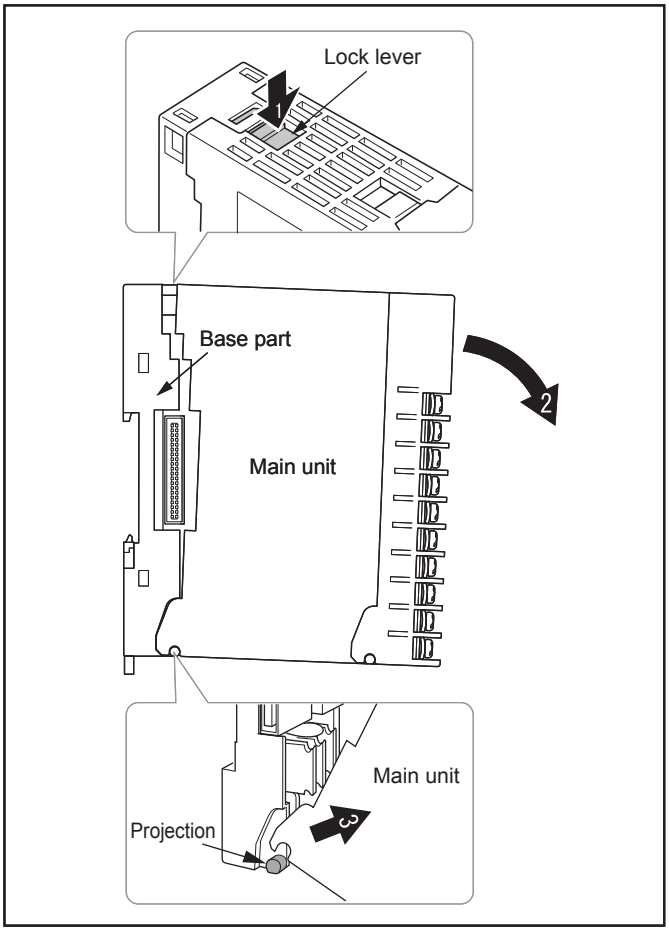


How to remove base part

1. Press the lock lever on the top of the main unit.
2. Pull down the upper part of main unit.
3. Detach the cutout on the lower end of back of main unit from the projection on the base part.

Point

- When attaching the base part to the main unit, take the reverse procedure to removing the base part from the main unit.
- Make sure that the lock lever of the main unit is fitted into the base part.

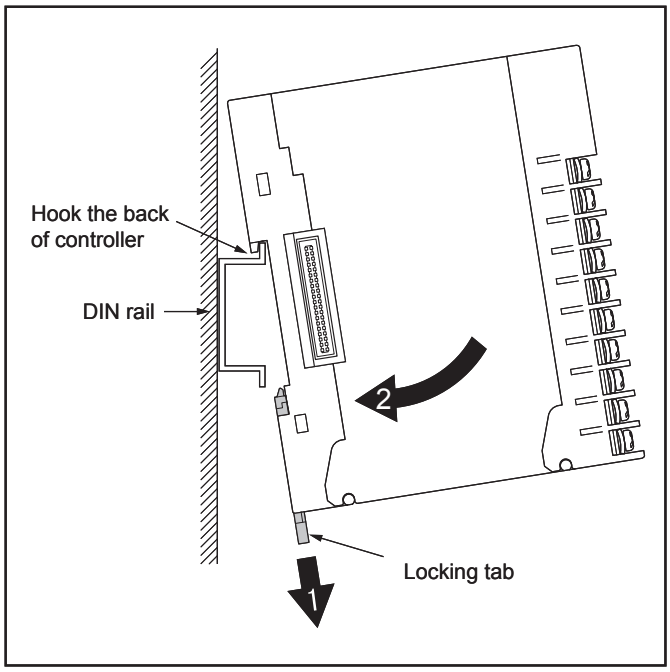


Mounting to DIN Rails

Mount controllers

1. Pull down the locking tab of the base part.

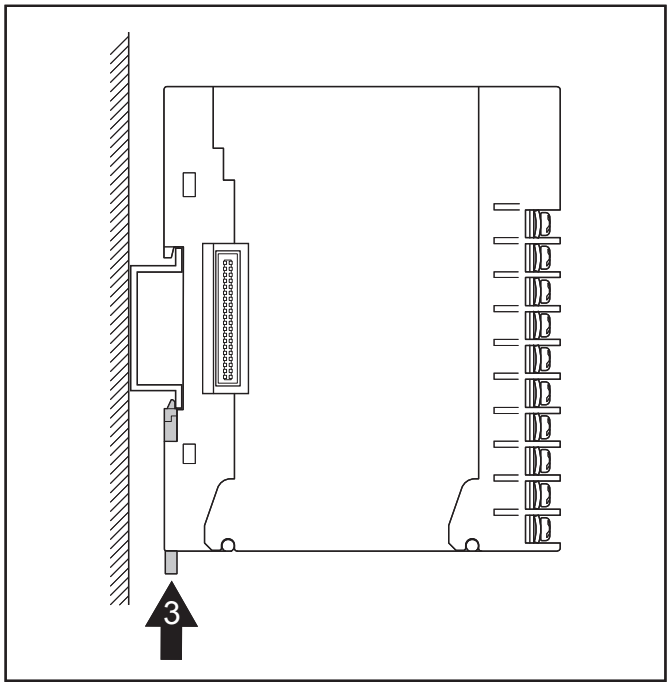
   Hook the back of the controller onto the upper part of DIN rail.
2. Push the controller in the direction of arrow 2.



3. Push up the locking tab to fasten the controller onto DIN rail.

Point

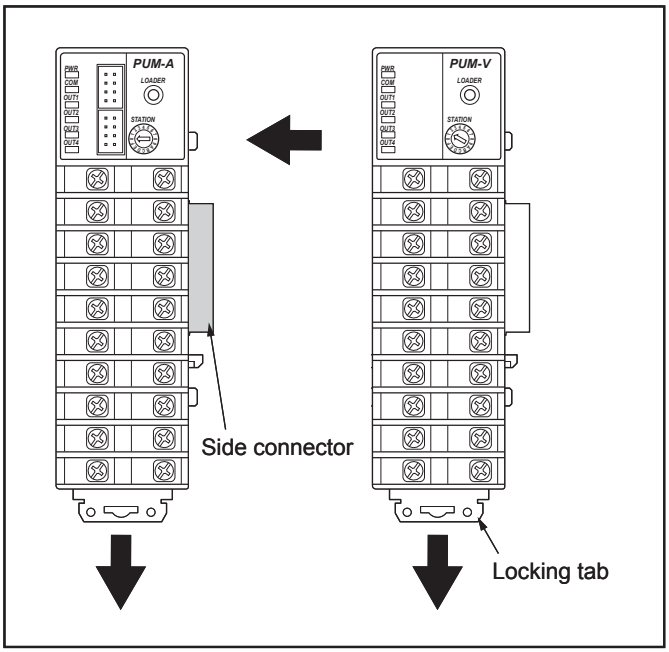
- When connecting controllers after mounting to DIN rail, push up the locking tab after doing so.



Connecting controllers

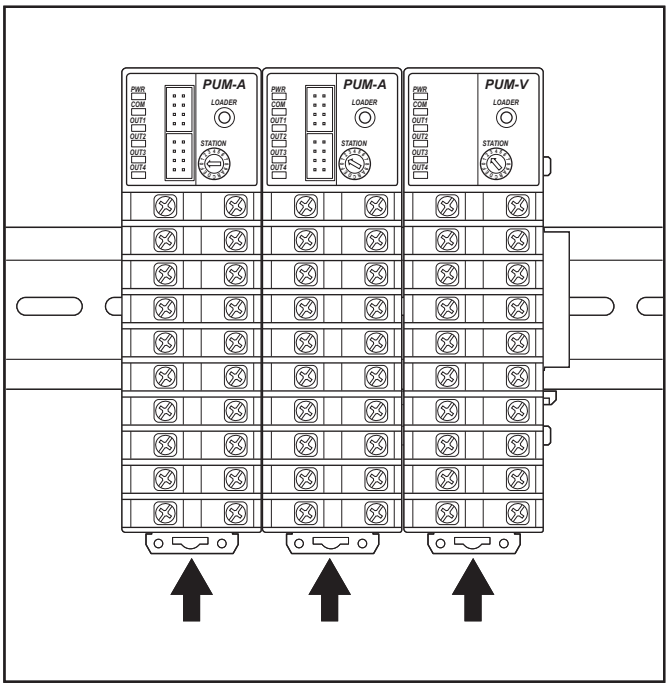
1. Check that locking tabs are pulled down (released).

2. Connect controllers with each other using side connectors.



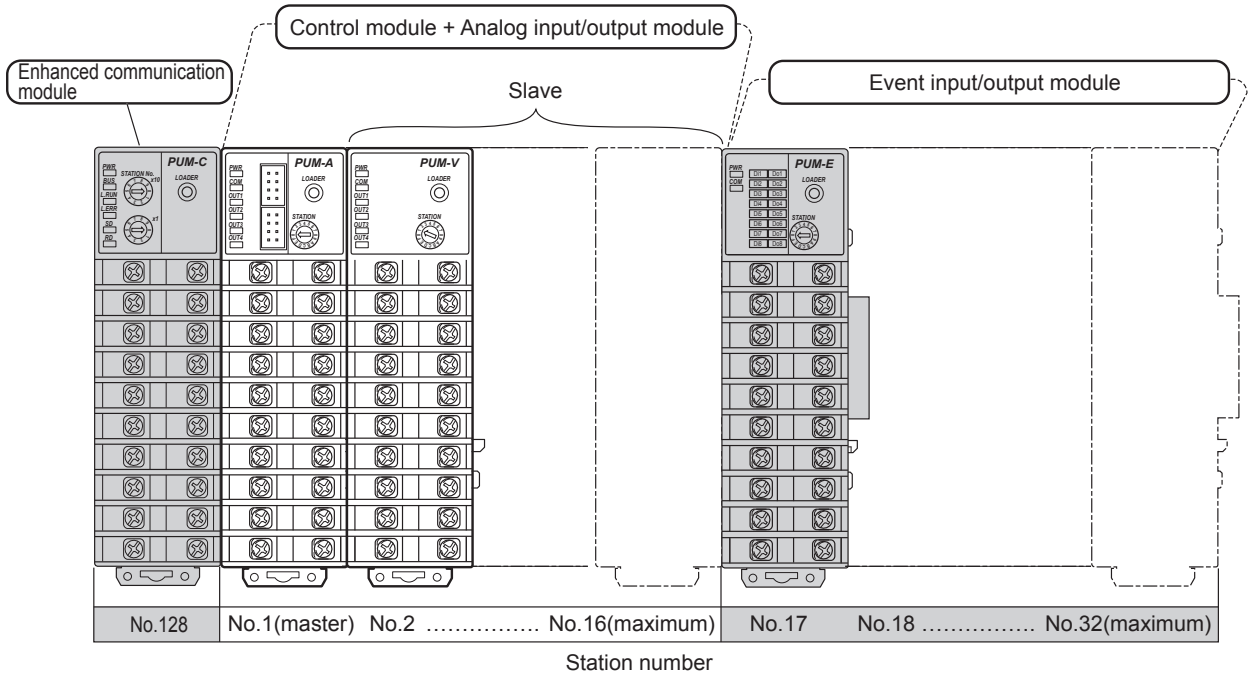
3. After mounting connected controllers onto DIN rail, make sure to push up all locking tabs. Controllers are fastened to DIN rail and to each other.

4. All connected controllers are connected to power supply and RS-485 via side connectors if one of controllers is directly connected to them.



Order of Controllers

PUM series module type temperature controllers should be connected in the order shown below.



Point

Basically connect controllers from left to right in the order of station number.

- Assign station numbers 1 to 16 to control module and analog input/output module. Maximum 16 units in total can be connected. Make sure that there is no duplicate station number in the same system.
- When setting slave or master, set the control module controller of station No.1 as the master controller. The master controller should be on the extreme left if an enhanced communication module is not used.
- Assign station numbers 17 to 32 to event input/output module. Maximum 16 units can be connected. Make sure that there is no duplicate station number in the same system.

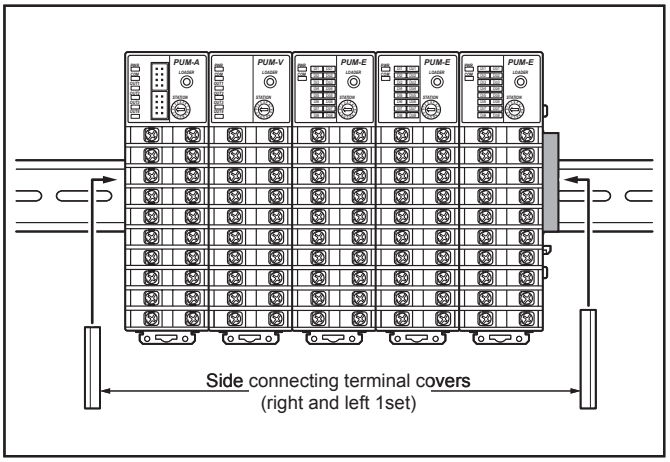
When using an enhanced communication module, always remember to place it on the extreme left.

- An enhanced communication module should be on the left of the master control module controller, which places it at the far left end of connected controllers.

3.4 Attaching Accessories (Optional)

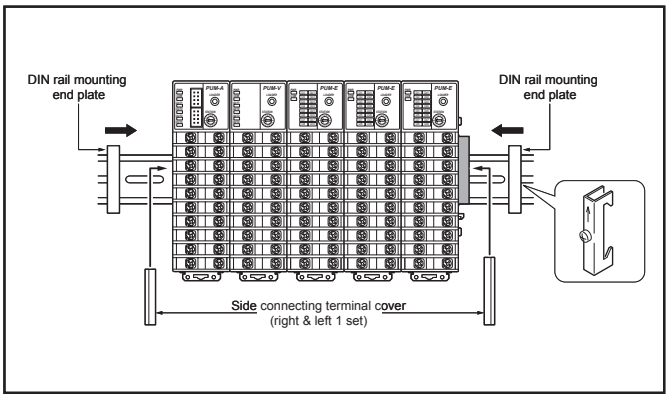
Attaching Side Connecting Terminal Covers

Side connectors on the both ends of connected controllers are exposed. To prevent accidents and to protect them, we recommend to attach side connecting terminal covers (PUMZ*A03) to the ends of the rightmost and leftmost controllers.



Attaching End Plates

In order to secure controllers onto DIN rail more tightly, end plates (PUMZ*A02) are also available.



Note

- When attaching end plates, make sure to attach side connecting terminal covers first.

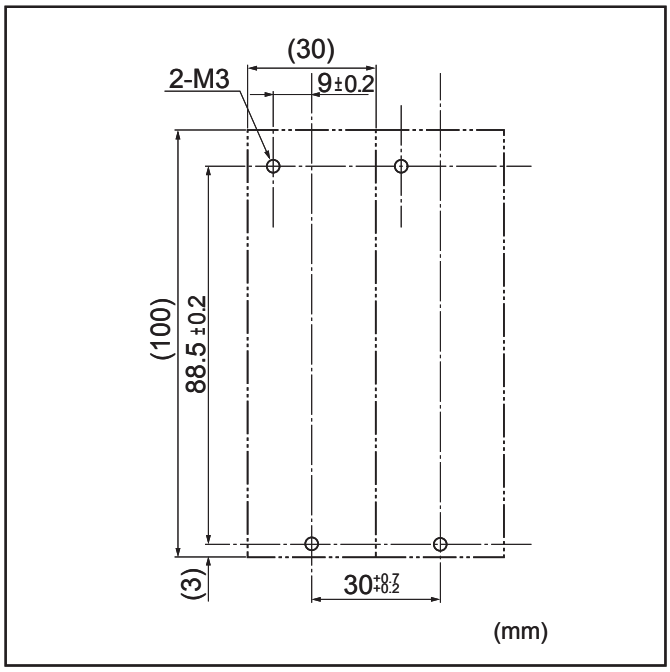
3.5 Mounting with Screws

When mounting controllers with screws inside a cabinet, check the screw hole size of the base part and the mounting position beforehand.

Point

- Mounting screws are not included in the product. Prepare two M3 screws per unit.

1. Refer to the right figure for the mounting screw hole size and the pitch to decide the mounting position.



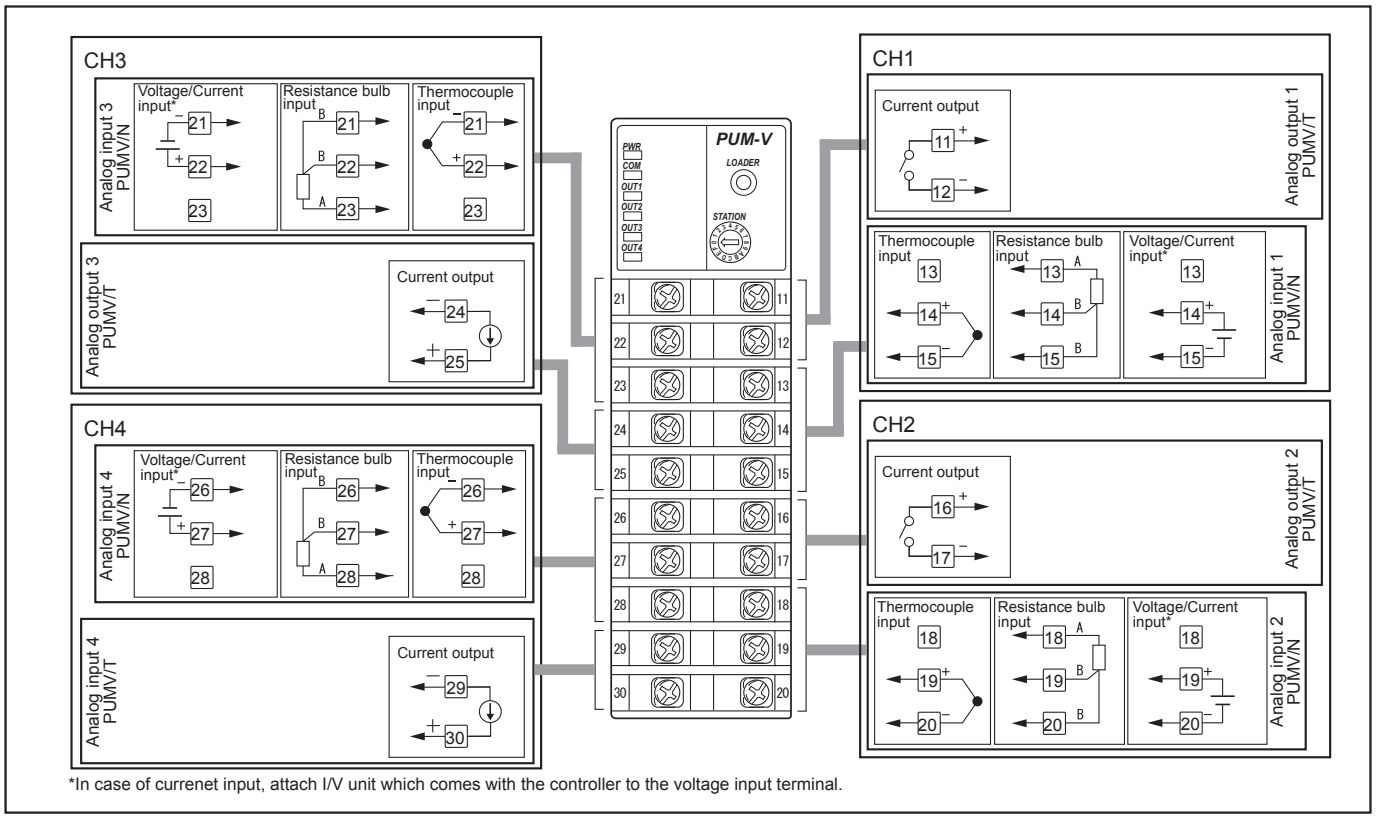
2. Remove the main units from the base parts.

   (3.3 Mounting controllers) ▶▶ 3-9

3. Connect base parts. Push up to fasten all the locking tabs.
4. Fixate the base parts onto the mounting position inside the cabinet with screws.
5. Attach the main units to the base parts.

3.6 Terminal Block Diagram

Wiring



*In case of currenet input, attach I/V unit which comes with the controller to the voltage input terminal.

Point

- Note that the insulation class for this equipment is as follows. Before installing, please confirm that the insulation class for the equipment meets usage requirements.

Power	Ai1
Loader Communication RS-485 Communication	Ai2
	Ai3
	Ai4
	OUT1 (Current) OUT2 (Current) OUT3 (Current) OUT4 (Current)

Functional insulation (1000Vac) ——— Functional insulation (500Vac)

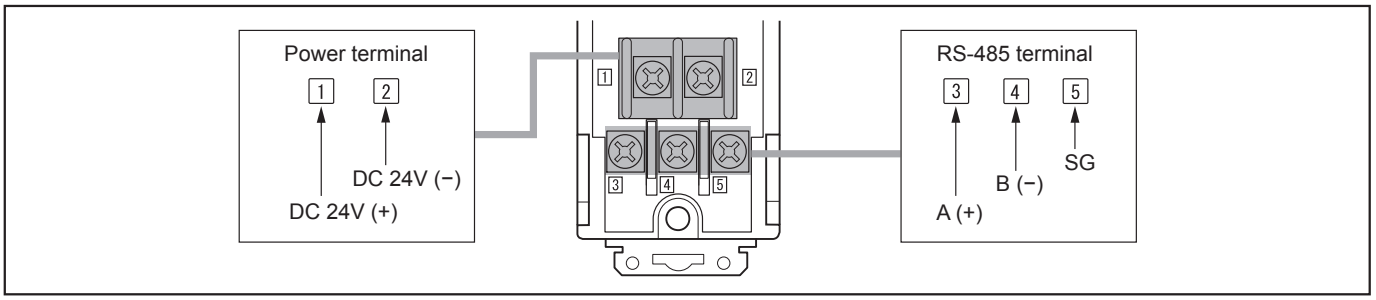
Wiring for Power Supply / RS-485

Terminal layout

Power terminal and RS-485 terminal are on the base part of each controller.

The terminal layout of all controllers is the same.

Power supply and RS-485 are connected to connected controllers via side connectors if one of controllers is directly connected to them.



Note

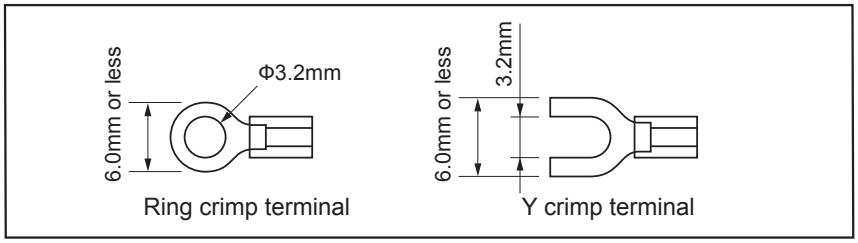
- For wiring to the terminal block, apply crimp type terminals size M3.
  Make sure to use screws included in this product only.
  Screw size : M3 x 7 (with square washer)
  Screw tightening torque : 0.78N•m (8kgf•cm)
- Apply power cable with allowable current capacity larger than the total consumption current of all connected controllers.
- For wiring to RS-485, a cable equivalent to KPEV-SB 0.5sq should be used.
- For wiring to power terminal, do not apply more than two cables to one terminal.
  (Power cable should be connected to power terminal directly from the power unit.)
- Please prepare power cables and crimp terminals of the size indicated below.

Power cable

Cable type	Size
Thermocouple (Compensation lead wire)	1.25mm^2 or less
Power supply	1.25mm^2 or less

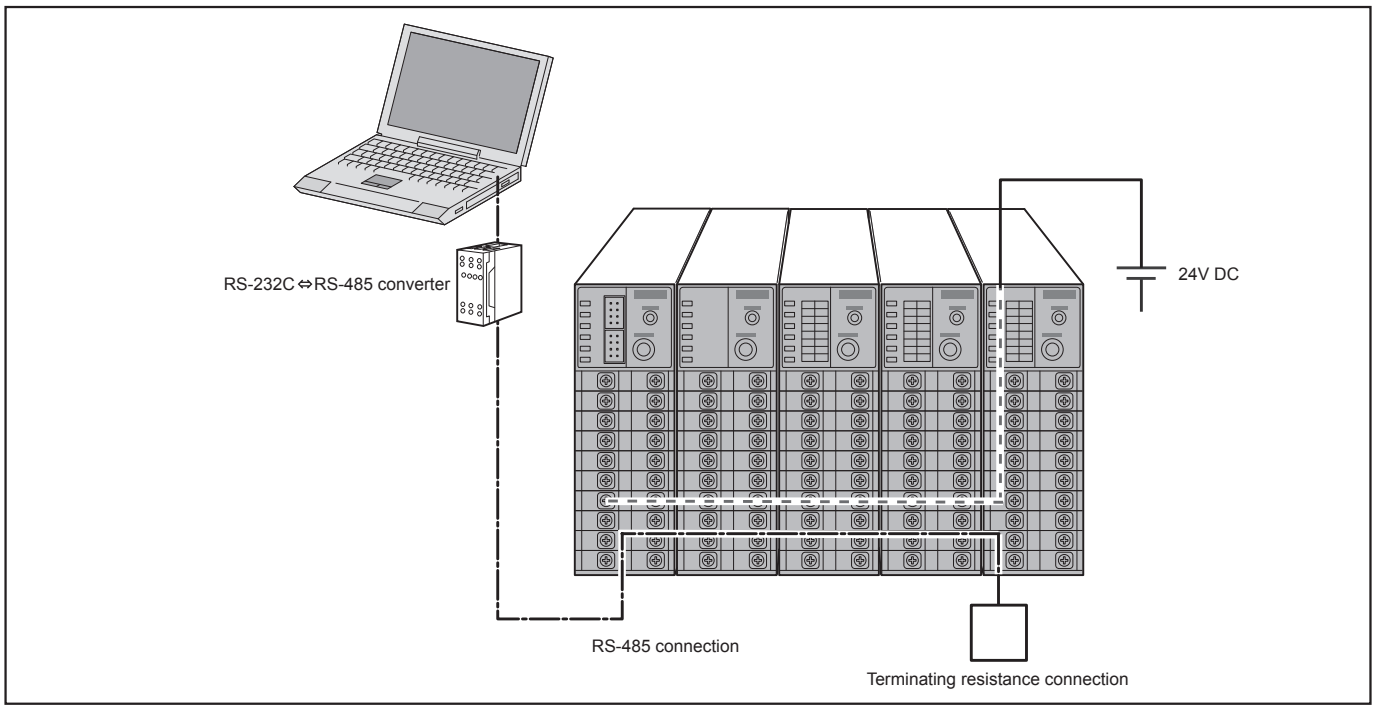
Crimp terminal

Cable size	Screw tightening torque
0.25 to 1.25mm^2	0.8 N•m



Connection of RS-485 terminating resistance

RS-485 terminating resistance should be connected to the controller at the opposite end from the controller to which RS-485 communication line is connected.



4

System Setting

4.1 Operating Method 4-3

4.2 Input Setting 4-7

4.3 Output Setting 4-15

4.4 Event Output Setting 4-25

4.5 Communication Setting 4-41

4.6 Optional Functions Setting.....4-45

4.1 Operating Method

Operating Method

Followings can be performed on this equipment during operation.

Icons according to each compliant analog IO module are put down with each explanation.

- Analog IO module ..... Aio
- Analog input module ..... Ai
- Analog output module ..... Ao

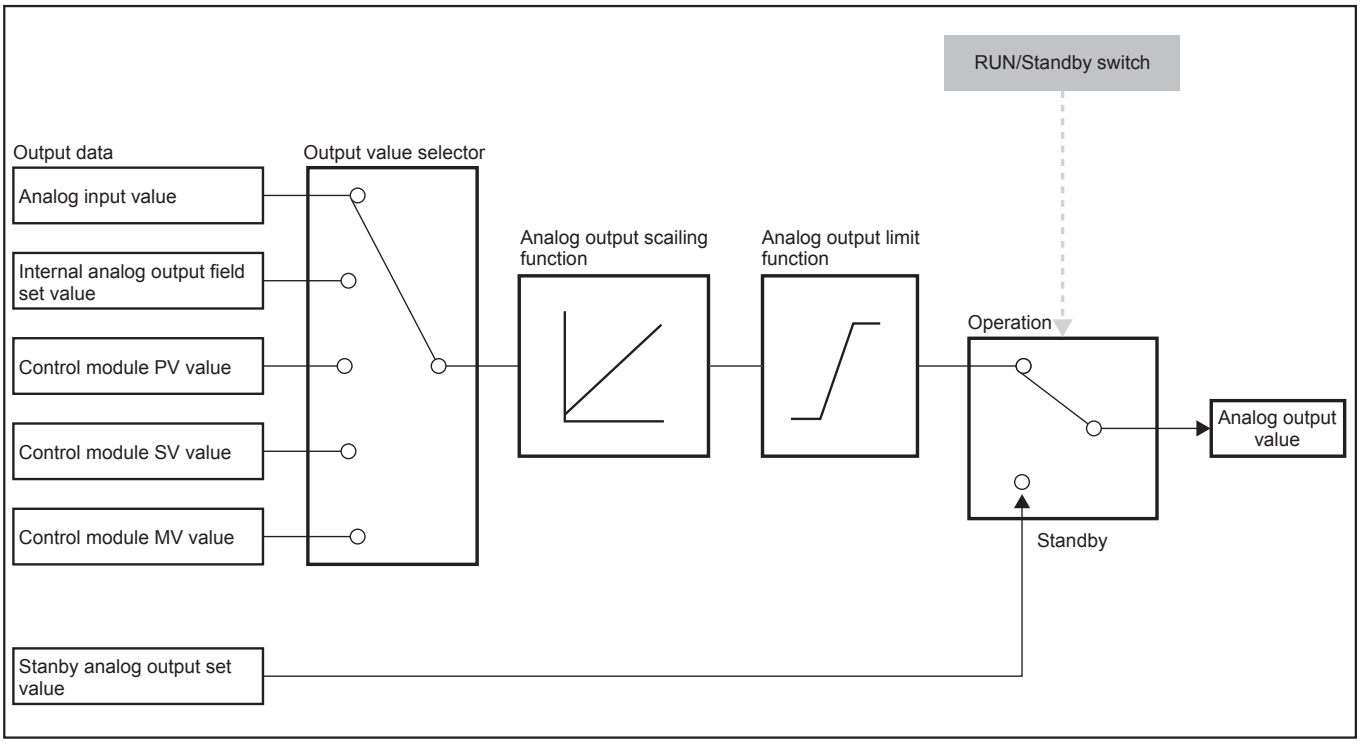
Operation mode switching

- RUN/Standby switch ▶▶ 4-4
- Digital Output Latch Release ▶▶ 4-5

Operation control setting

- Start-up Operation Mode Setting ▶▶ 4-6

Output values during operation



RUN/Standby Switch Aio Ai Ao

The setting of whether the operation mode should be RUN or Standby is performed.

Each channel (Ch1 to Ch4) has parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
RUN/Standby switch	0: RUN 1: Standby	None	0	R/W	Ch1: 40017 (0010h) 41004 (03EBh)
					Ch2: 40018 (0011h) 42004 (07D3h)
					Ch3: 40019 (0012h) 43004 (0BBBh)
					Ch4: 40020 (0013h) 44004 (0FA3h)

Refer to Standby Analog output value setting ▶▶ 4-23 for setting detail of output value and alarm output in Standby operation.

Point

When DI function No.1 (See DI function select ▶▶ 4-46) is assigned, RUN/Standby switch can be activated by digital input.

Note

When Standby mode, the delay on timer will be reset. It will be activated again when the mode is switched to “0:RUN”.

Digital Output Latch Release Aio Ai

The setting of whether to release digital output latch or not is performed.

Each channel (Ch1 to Ch4) has parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Digital output latch release command	0: OFF 1: Release latch	None	0	R/W	Ch1: 41031 (0406h)
					Ch2: 42031 (07EEh)
					Ch3: 43031 (0BD6h)
					Ch4: 44031 (0FBEh)

When the set value is “1:Release latch”, digital output (DO1 to DO5) latch will be released simultaneously.

Note

– When DI function No.17 (See DI function select ▶▶ 4-46) is assigned, Digital output latch release command can be activated by digital input.

– When DI function No.18 to 22 (See DI function select ▶▶ 4-46) are assigned, Digital output (DO1 to DO5) latch will be released separately.

Start-up Operation Mode Setting Aio Ai Ao

Set the start-up operation mode for each channel.

Each channel (Ch1 to Ch4) has the parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Start-up mode	0 to 3	None	0	R/W	Ch1: 41304(0517h)
					Ch2: 42304(08FFh)
					Ch3:43304(0CE7h)
					Ch4:44304(10CFh)

About the start-up mode setting

Select the set value referring to the table.

Set value	Operation mode
0	Auto mode
1	Standby mode
2	Standby mode
3	Standby mode

If change the operation mode, refer to the method how to switch to each mode.

4.2 Input Setting

Input Setting

Followings are settable to the analog input on this equipment.

Icons according to each compliant analog IO module are put down with each explanation.

- Analog IO module..... Aio
- Analog input module..... Ai
- Analog output module..... Ao

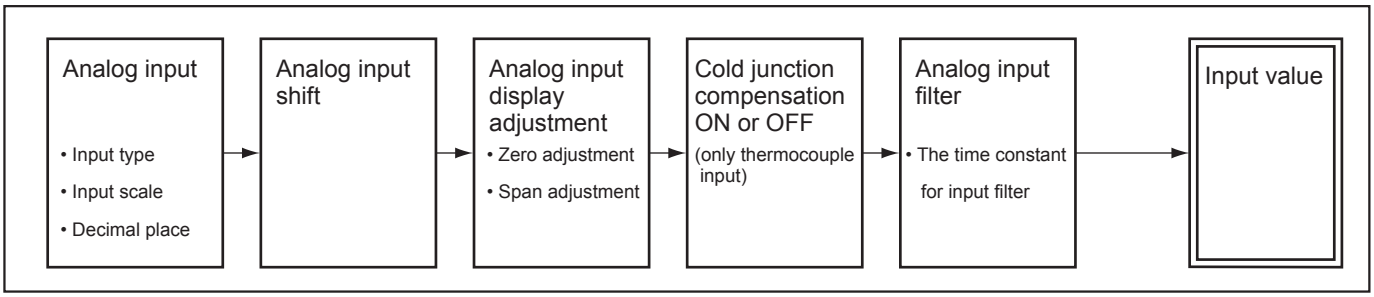
The following setting is inevitable.

- Analog Input Basic Setting ▶▶ 4-8

The following settings are configured as needed.

- Analog Input Filter Setting ▶▶ 4-11
- Analog Input Shift Setting ▶▶ 4-12
- Analog Input Display Zero & Span Adjustment Setting ▶▶ 4-13
- Cold Junction Compensation Setting ▶▶ 4-14

Flow of input functions



Analog input Basic Setting Aio Ai

Type of Analog input signal (Resistance bulb, thermocouple, voltage) has to be set for each channel.

As the type of Analog input signal is specified, parameters such as Analog input scale lower, Analog input scale upper, and decimal place.

Each channel (Ch1 to Ch4) has parameters shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Analog input type	0 to 25	None	7 (Thermocouple/ Resistance bulb input type)	R/W	Ch1: 40151 (0096h) 41029 (0404h)
					Ch2: 40152 (0097h) 42029 (07ECh)
			22 (Voltage input type)		Ch3: 40153 (0098h) 43029 (0BD4h)
					Ch4: 40154 (0099h) 44029 (0FBCh)
Analog input scale lower	−1999 to 9999	None	0 (Thermocouple/ Resistance bulb input type)	R/W	Ch1: 41212 (04BBh)
					Ch2: 42212 (08A3h)
			0.0 (Voltage input type)		Ch3: 43212 (0C8Bh)
					Ch4: 44212 (1073h)
Analog input scale upper	−1999 to 9999	None	400 (Thermocouple/ Resistance bulb input type)	R/W	Ch1: 41213 (04BCh)
					Ch2: 42213 (08A4h)
			100.0 (Voltage input type)		Ch3: 43213 (0C8Ch)
					Ch4: 44213 (1074h)
Decimal place	0 to 2	None	0 (Thermocouple/ Resistance bulb input type)	R/W	Ch1: 41214 (04BDh)
					Ch2: 42214 (08A5h)
			1 (Voltage input type)		Ch3: 43214 (0C8Dh)
					Ch4: 44214 (1075h)

Measurement range and decimal place limit according to the input type code

Input type		Setting code	Measurement range		Decimal place	
			[degree C]	[degree F]	[degree C]	[degree F]
Resistance bulb	JPT100Ω	0	0 to 150	32 to 302	1	1
		1	–150 to 600	–238 to 1112	1	0
	Pt100Ω	2	0 to 150	32 to 302	1	1
		3	–150 to 300	–238 to 572	1	1
		4	–150 to 850	–238 to 1562	1	0
Thermocouple	J	5	0 to 400	32 to 752	1	1
		6	0 to 800	32 to 1472	1	0
	K	7	0 to 400	32 to 752	1	1
		8	0 to 800	32 to 1472	1	0
		9	0 to 1200	32 to 2192	0	0
	R	10	0 to 1600	32 to 2912	0	0
	B	11	0 to 1800	32 to 3272	0	0
	S	12	0 to 1600	32 to 2912	0	0
	T	13	–199 to 400	–326 to 752	1	0
	E	14	–199 to 800	–326 to 1472	1	0
	N	18	0 to 1300	32 to 2372	0	0
	PL-II	19	0 to 1300	32 to 2372	0	0
DC voltage	DC0-5V	21	–1999 to 9999 (scaling range)		2	2
	DC1-5V	22			2	2
	DC0-10V	23			2	2
	DC2-10V	24			2	2

When the input type has been changed, the measurement range will be re-written. Meanwhile, the decimal place will remain unchanged if it is within the limit of the new input type. If it is over the limit, the upper limit of the new input type will be automatically set. If the decimal place has to be changed, change the setting of “Decimal place” to a new value.

Note

– When Analog input type is resistance bulb or thermocouple, input range cannot be changed.

– When Analog input type is voltage, make sure to set input range.

– Note that there may be a sudden change in input value at the moment input type has been changed.

– When the range of Analog input scale lower and upper has been set to 10000 or over, the operation mode will switch to standby.

Note

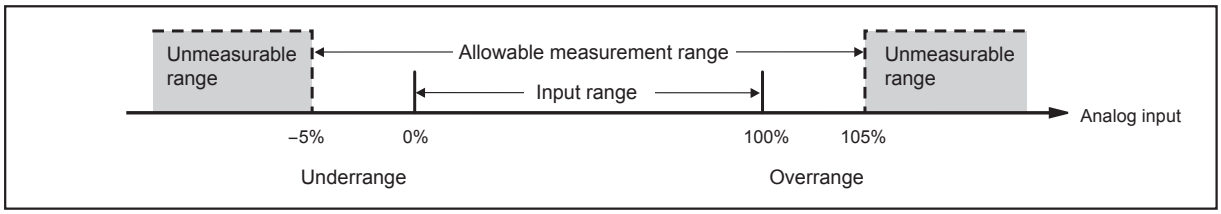
Normally, Analog input signal is input as a value without decimal place. Set the decimal place if necessary within the setting limit.

Ex) Handle the value “400” as “400.0” to control values to one decimal place.

-> Set the decimal place at “1”

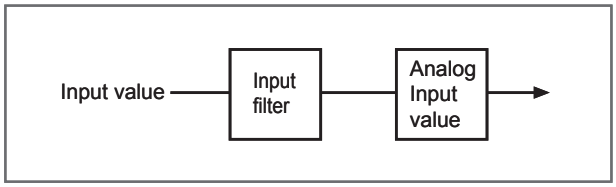
Overrange and underrange

Analog input signal also has ±5% of allowable measurement range besides the lower and upper range.



Analog Input Filter Setting Aio Ai

Set the input filter damping of low-pass filter, which reduces noise and signal waver.

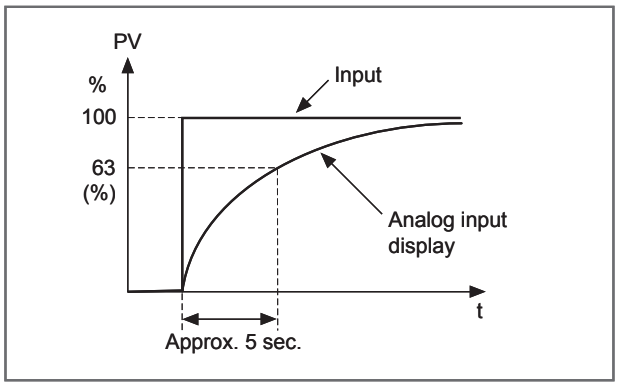


Each channel (Ch1 to Ch4) has parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Analog input filter	0.0 to 120.0	Sec.	2.0	R/W	Ch1: 41220 (04C3h)
					Ch2: 42220 (08ABh)
					Ch3: 43220 (0C93h)
					Ch4: 44220 (107Bh)

Set the number of seconds which Analog input signal takes to change to 63.2%.

For example, when the input suddenly steps from 0% to 100% with the input filter constant set to 5 seconds, the Analog input value will change from 0% to 63.2% in 5 seconds in a gentle curve.



Analog Input Shift Setting Aio Ai

Sets the shift amount in order to adjust the Analog input value before it is displayed.

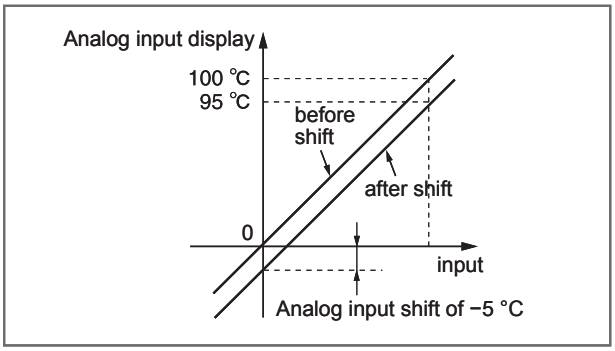
Each channel (Ch1 to Ch4) has parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Analog input shift	−10 to 10	%FS	0	R/W	Ch1: 41216 (04BFh)
					Ch2: 42216 (08A7h)
					Ch3: 43216 (0C8Fh)
					Ch4: 44216 (1077h)

This is used when combining Analog input with other instruments.

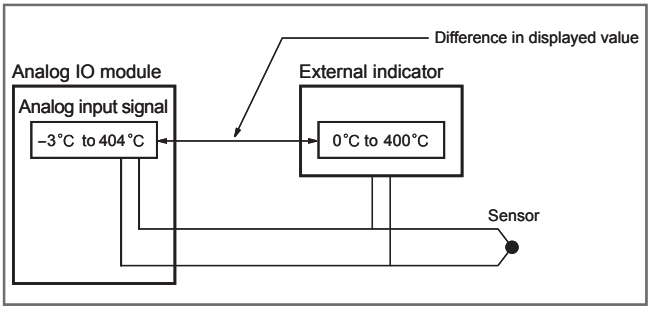
For example, to shift Analog input −5°C, set the value of “Analog input shift” to “−5”

Analog input display will be the value after −5°C shift as shown in the right figure.



Analog Input Display Zero & Span Adjustment Setting Aio Ai

Sets the shift amount in order to adjust Analog display zero and span. The shift amount should be the actual difference value with the opposite sign.



Each channel (Ch1 to Ch4) has parameters shown below.

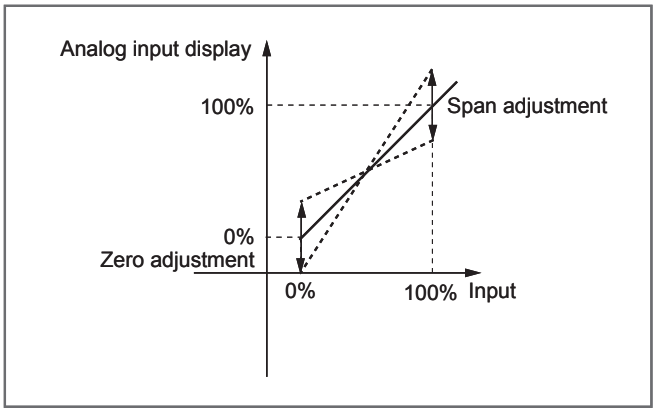
Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Analog input display zero adjustment	–50 to 50	%FS	0	R/W	Ch1: 41221 (04C4h)
					Ch2: 42221 (08ACh)
					Ch3: 43221 (0C94h)
					Ch4: 44221 (107Ch)
Analog input display span adjustment	–50 to 50	%FS	0	R/W	Ch1: 41222 (04C5h)
					Ch2: 42222 (08ADh)
					Ch3: 43222 (0C95h)
					Ch4: 44222 (107Dh)

Set the following equipment before using these parameters or starting revisions.

– mV Generator
  1V to 5V (for voltage input)
  0mV to 100mV (for thermocouple input)
– Dial resistance unit
  100.0 to 400.0 Ω (for resistance thermometer bulb input)

Set the difference value which has been caused when 0% Analog input signal is sent to “Analog input display zero adjustment” with the opposite sign, and the difference value caused when 100% Analog input signal is sent to “Analog input display span adjustment” with the opposite sign.

For example, if a zero deviation is –3°C and a span deviation is 4°C, set Analog input display zero adjustment value to 3°C, and set Analog input display span adjustment value to –4°C



Note

In case of thermocouple input, be sure to set the cold junction compensation 4-14 to OFF before checking the displayed value. Remember to set it back to ON when adjustment is complete.

Point

Analog input display zero and span adjustment function is independent from the controller adjustment value. Set the value to 0 to restore the factory settings.

Cold Junction Compensation Setting Aio Ai

In case of thermocouple input, decide whether to set turning cold junction compensation to ON or OFF.

Each channel (Ch1 to Ch4) has parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Cold junction compensation	0: OFF 1: ON	None	1	R/W	Ch1: 41223 (04C6h)
					Ch2: 42223 (08AEh)
					Ch3: 43223 (0C96h)
					Ch4: 44223 (107Eh)

This setting should be “1:ON” during normal operation. Set to "0:OFF" when cold junction compensation is being performed externally, when checking temperature deviation or when cold junction compensation function is not necessary.

4.3 Output Setting

Output Setting

The output type of this equipment is only current output.

Icons according to each compliant analog IO module are put down with each explanation.

- Analog IO module ..... Aio
- Analog input module ..... Ai
- Analog output module ..... Ao

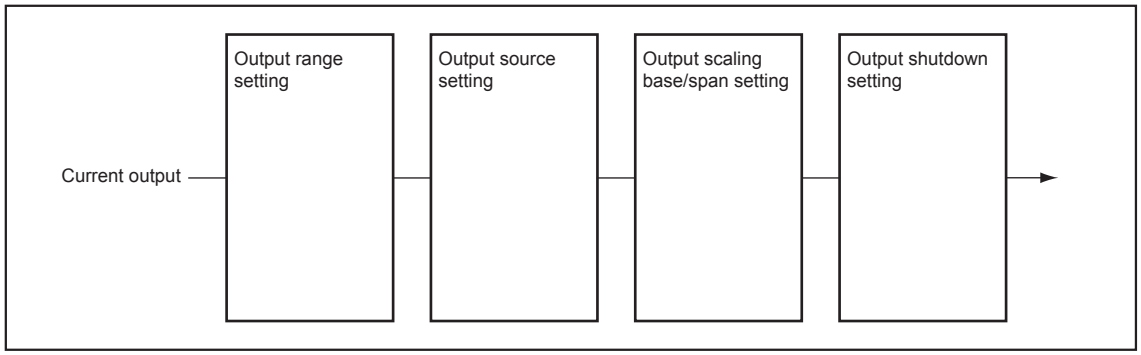
Output setting for current output type

- Current Output Range Setting ▶▶ 4-16
- Output Source Setting ▶▶ 4-17
- Output Scaling Base and Span Setting ▶▶ 4-20
- Output Shutdown Setting ▶▶ 4-21

Analog output setting

- Analog Output Limiter Setting ▶▶ 4-22
- Standby Analog Output Setting ▶▶ 4-23
- Internal Analog Output Field Setting ▶▶ 4-23

Flow of output functions



Current Output Range Setting Aio Ao

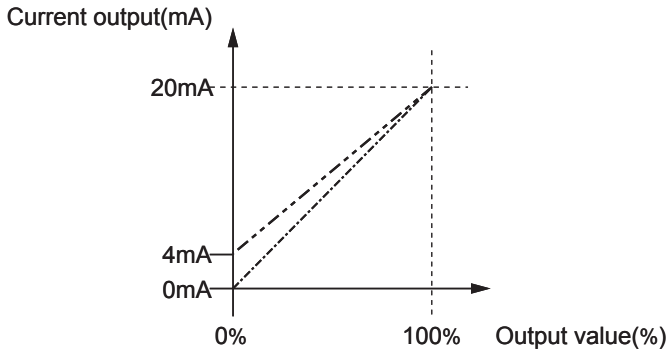
Set the output range when current output is used.

Each output channel (Ch1 to Ch4) has parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Current output range	4 (0 to 20mA) 5 (4 to 20mA)	None	5	R/W	Ch1: 40166 (00A5h) 41801 (0708h)
					Ch2: 40167 (00A6h) 42801 (0AF0h)
					Ch3: 40168 (00A7h) 43801 (0ED8h)
					Ch4: 40169 (00A8h) 44801 (12C0h)

Current output range differs according to the set value as follows;

Set value	0% output	100% output
4	0mA	20mA
5	4mA	20mA



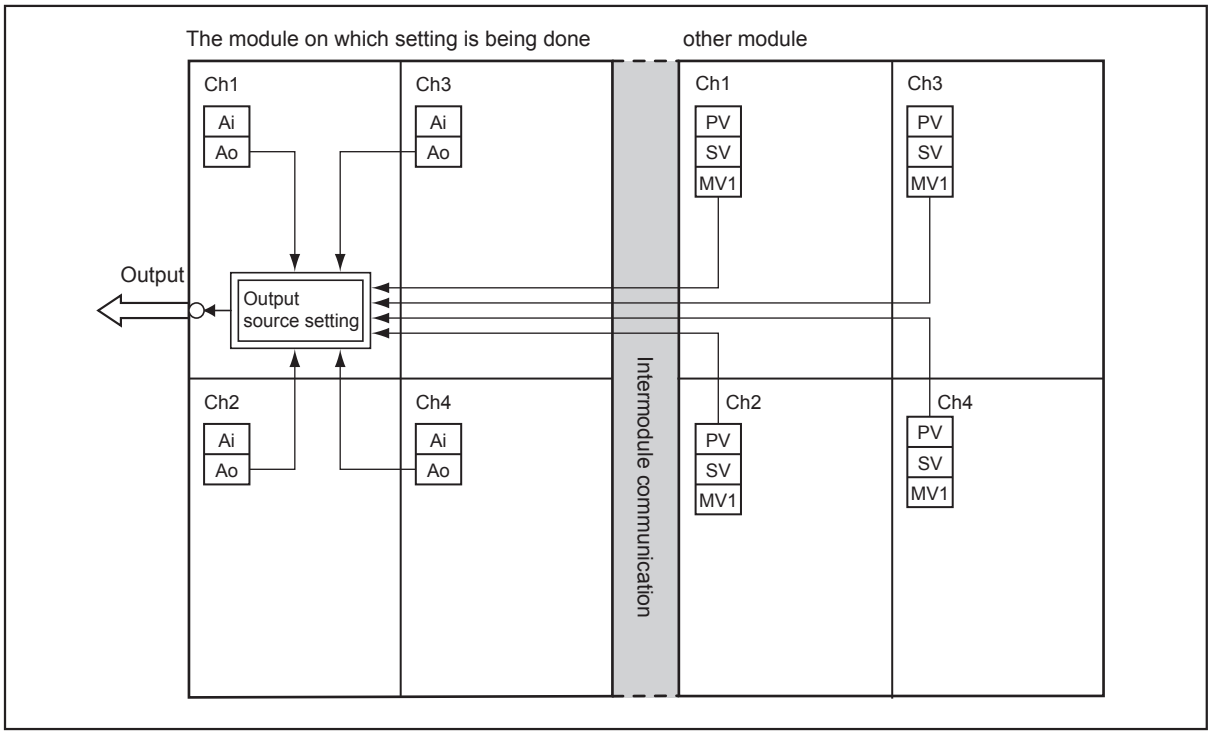
Output Source Setting Aio Ao

Sets the master station No., master Ch No., and output type for each output channel.

Each output channel (Ch1 to Ch4) has parameters shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Output master Station No.	0 to 255	None	0	R/W	Ch1: 40172 (00ABh) 41804 (070Bh)
					Ch2: 40178 (00B1h) 42804 (0AF3h)
					Ch3: 40184 (00B7h) 43804 (0EDBh)
					Ch4: 40190 (00BDh) 44804 (12C3h)
Output master Ch No.	1 to 4	None	1 to 4 (Ch No. of the module being set)	R/W	Ch1: 40173 (00ACh) 41805 (070Ch)
					Ch2: 40179 (00B2h) 42805 (0AF4h)
					Ch3: 40185 (00B8h) 43805 (0EDCh)
					Ch4: 40191 (00BEh) 44805 (12C4h)
Output type	0 to 7	None	3 (Output 0%)	R/W	Ch1: 40171 (00AAh) 41803 (070Ah)
					Ch2: 40177 (00B0h) 42803 (0AF2h)
					Ch3: 40183 (00B6h) 43803 (0EDAh)
					Ch4: 40189 (00BCh) 44803 (12C2h)

Image of output source setting (for output Ch1)



Setting output master station and output master Ch

– When using values of the same module

Set the output master station No. to “0” or the station No. of the module being set. Set the output master Ch No. to the Ch No. which has the values to be used.

– When using values of another module

Set the output master station No. to the station No. (station no. configuration switch) of the output source + 1. Set the output master Ch No. to Ch No. of the output master station which has the values to be used.

Output type setting

Types of values which can be used as output values are as shown in the right figure.

Set value	Output values	
0	Own module	Analog input value
1		No function （output 0%）
2		No function （output 0%）
3		No function （output 0%）
4		Internal analog output field
5	Other modules	PV
6		SV
7		MV1 (heating output)

Note

– When the value of the module on which setting is being done is selected, the setting of master station No. will be ignored. The module being set will be automatically selected.

– Cooling output value or DV value of the control module cannot be output. When output of MV2 and DV is necessary, select them as for "Output type" of another channel of the same module.

– In case Remote SV master station No. , DI master station No. and linkage operation master station No. have been also set as well as output master station No., the red lamp of PWR LED will be illuminated (system FAULT) if none of the station numbers exist. PWR LED lamp will not be illuminated if any of the station numbers exists.

– When outputting the other module on the "Output master St.", only control module output is settable.

Output Scaling Base and Span Setting Aio Ao

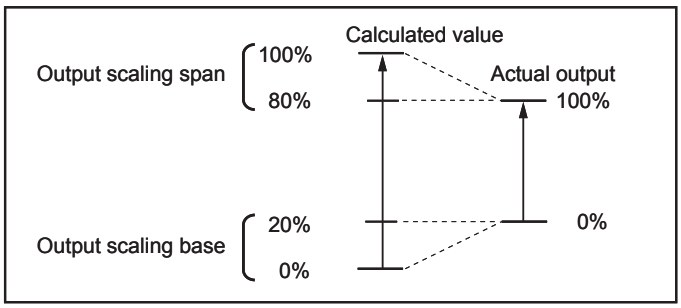
Sets the amount which the output scaling base and span should shift to adjust output signal.

Each output channel (Ch1 to Ch4) has parameters shown below.

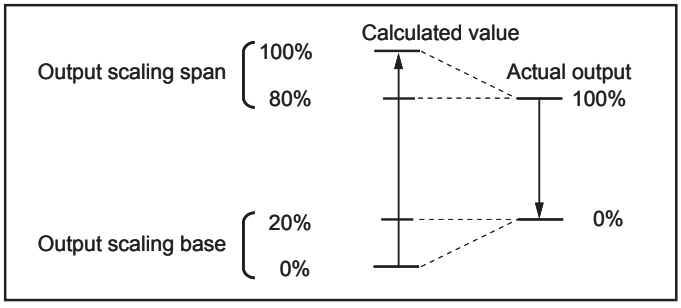
Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Output scaling base	−100.0 to 100.0	%	0	R/W	Ch1: 40175 (00AEh) 41807 (070Eh)
					Ch2: 40181 (00B4h) 42807 (0AF6h)
					Ch3: 40187 (00BAh) 43807 (0EDEh)
					Ch4: 40193 (00C0h) 44807 (12C6h)
Output scaling span	−100.0 to 1000.0	%	100	R/W	Ch1: 40174 (00ADh) 41806 (070Dh)
					Ch2: 40180 (00B3h) 42806 (0AF5h)
					Ch3: 40186 (00B9h) 43806 (0EDDh)
					Ch4: 40192 (00BFh) 44806 (12C5h)

The value to be set to the output scaling base will be 0%, and the value to be set to the output scaling span will be 100%.

For example, to change the output scaling to 20% to 80%, by setting the output scaling base to “20” and the output scaling span to “80”, 20% to 80% of values to be output will be 0% to 100% output.



Also, if set "80" to "Output scaling base" and "20" to "output scaling span", the output from 20% to 80% is output as from 100% to 0% as shown.



Output Shutdown Setting Aio Ao

Sets the Ch No. of own station to stop output.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Output shutdown	0 to 15 (0000 to 11111)	None	0(0000b)	R/W	40201(00C8h)

Output shutdown setting for each Ch

Set “1” to each bit No. corresponding to each channel to stop output.

Set value					Ch No. to stop output			
	bit3 (Ch4)	bit2 (Ch3)	bit1 (Ch2)	bit0 (Ch1)	Ch1	Ch2	Ch3	Ch4
0	0	0	0	0				
1	0	0	0	1	○			
2	0	0	1	0		○		
3	0	0	1	1	○	○		
4	0	1	0	0			○	
5	0	1	0	1	○		○	
6	0	1	1	0		○	○	
7	0	1	1	1	○	○	○	
8	1	0	0	0				○
9	1	0	0	1	○			○
10	1	0	1	0		○		○
11	1	0	1	1	○	○		○
12	1	1	0	0			○	○
13	1	1	0	1	○		○	○
14	1	1	1	0		○	○	○
15	1	1	1	1	○	○	○	○

Note

Bit numbers and Ch number are in reverse order.

Point

Output shutdown also can be performed by digital input from even input/output module. Refer to the section “Digital input function setting ▶▶ 4-46 ” in “4.6 Optional functions setting”.

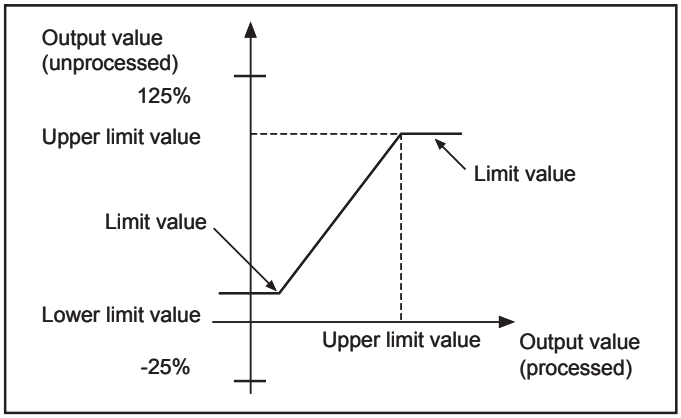
Analog Output Limiter Setting Aio Ao

Set the upper/lower limit for analog output.

Each channel (Ch1 to Ch4) has the parameters below.

Parameter	Setting range	Unit	Factory-set value	Attribute	MODBUS register No (Relative address)
Analog output lower limit	–25.0 to 125.0	%	–3.0	R/W	Ch1: 41255(04E6h)
					Ch2: 42255(08CEh)
					Ch3: 43255(0CB6h)
					Ch4: 44255(109Eh)
Analog output upper limit	–25.0 to 125.0	%	103	R/W	Ch1: 41256(04E7h)
					Ch2: 42256(08CFh)
					Ch3: 43256(0CB7h)
					Ch4: 44256(109Fh)

The control output changes as below according to the setting.



Standby Analog Output Setting Aio Ai Ao

Set the output value of analog output and if the alarm output executes or not when it comes to be in the standby status.

Each channel (Ch1 to Ch4) has the parameters shown below.

Parameter	Setting range	Unit	Factory-set value	Attribute	MODBUS register No (Relative address)
Standby analog output set value	–3.0 to 103.0	%	–3.0	R/W	Ch1: 41268(04F3h)
					Ch2: 42268(08DBh)
					Ch3: 43268(0CC3h)
					Ch4: 44268(10ABh)
Standby mode setting	0: ALM=OFF 1: ALM=ON	None	0	R/W	Ch1: 41270(04F5h)
					Ch2: 42270(08DDh)
					Ch3: 43270(0CC5h)
					Ch4: 44270(10ADh)

"Standby analog output set value" is the parameter that can set only analog I/O or output module, and "standby mode setting" is the parameter that can set an analog I/O or input module.

Note

The output set value set here is output, when analog output or MV (only when selected "4" or "7") for "output type" by the "output source setting". When selected other than analog output or MV, the values of output source is output without change.

Internal Analog Output Field Setting Aio Ao

Set the output value when specified the "Internal analog output field" for the output type. ▶▶ 4-19

Each channel (Ch1 to Ch4) has the parameter shown below.

Parameter	Setting range	Unit	Factory-set value	Attribute	MODBUS register No (Relative address)
Internal analog output field	-327.6 to 327.6	%	0	R/W	Ch1: 40251(00FAh)
					Ch2: 40252(00FBh)
					Ch3: 40253(00FCh)
					Ch4: 40254(00FDh)

4.4 Event Output Setting

Event Output

Followings are types of events this equipment can output.

Event type	Description
Alarm	Analog I/O (Ai/Ao), or the status of loads connected to each channel. Activates alarms when monitored values exceeded the preset values.
Timer code	Switches ON/OFF when it detects the timer which has been set at “ALM delay time” having activated or stopped. ▶▶ 4-32
Status	Indicates the operation status of this equipment in bits.

Each channel of this module has output registers (DO1 to DO5) for 5 event outputs.

Event output setting

To output events, make sure to complete the following settings. Some event types requires DO event type and DO option function settings only.

- DO Event Type ▶▶ 4-27
- DO Option Function ▶▶ 4-36
- ALM Set Value ▶▶ 4-30
- ALM Delay Time ▶▶ 4-33
- ALM Delay Time Units ▶▶ 4-34
- ALM Hysteresis ▶▶ 4-35

Confirming event switching ON/OFF

When this equipment is used stand-alone, or with control modules only, events assigned to DO1 to DO5 can be confirmed by checking LED lamps on the front face of this equipment.

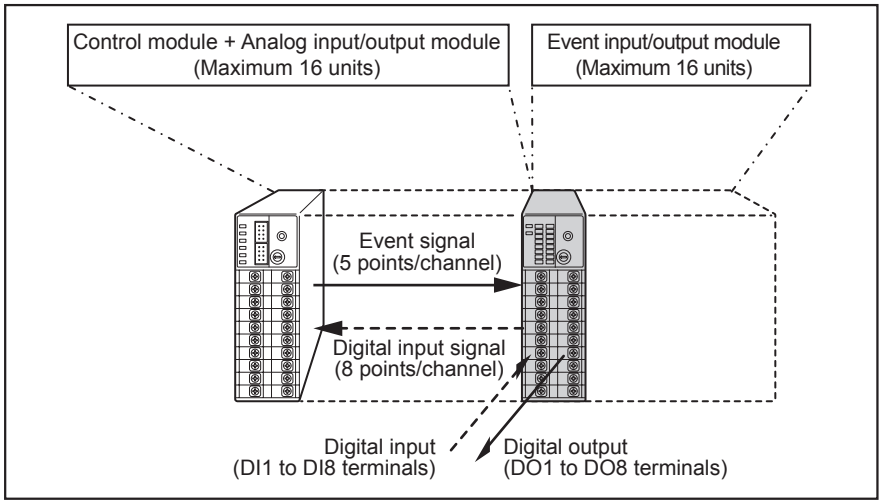
How to output event signal of Analog I/O module into event input/output module

In order to output event signal of control module into event input/output module, connect this module to use as event input/output module.

Note

– With digital input (DI), event module used as input source is configured on Analog I/O module. ▶▶ 4-46

– With digital output (DO), Analog I/O module used as output source and its output channels are configured on event input/output module.



Basic setting items

- Communication settings ▶▶ 4-41
- Output source setting ▶▶ Event input/output module user's manual

DO Event Type Aio Ai

Assign triggers such as alarms, timer, or the status of this equipment to each DO.

Event types assigned to DO1 to DO5 are as shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)	
DO1 event type	0 to 102	None	0	R/W	Ch1	41032(0407h)
					Ch2	42032(07EFh)
					Ch3	43032(0BD7h)
					Ch4	44032(0FBFh)
DO2 event type	0 to 102	None	0	R/W	Ch1	41040(040Fh)
					Ch2	42040(07F7h)
					Ch3	43040(0BDFh)
					Ch4	44040(0FC7h)
DO3 event type	0 to 102	None	0	R/W	Ch1	41048(0417h)
					Ch2	42048(07FFh)
					Ch3	43048(0BE7h)
					Ch4	44048(0FCFh)
DO4 event type	0 to 102	None	0	R/W	Ch1	41056(041Fh)
					Ch2	42056(0807h)
					Ch3	43056(0BEFh)
					Ch4	44056(0FD7h)
DO5 event type	0 to 102	None	0	R/W	Ch1	41064(0427h)
					Ch2	42064(080Fh)
					Ch3	43064(0BF7h)
					Ch4	44064(0FDFh)

Point

– When an alarm event is assigned, alarm signal is output in the range highlighted in grey of the behavior diagram.

– When alarm hold function is required, select an alarm event with hold function. ▶▶ 4-37

Note

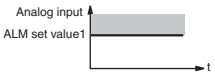
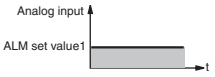
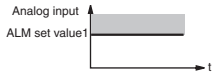
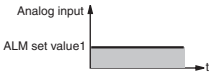
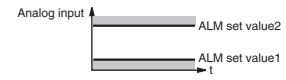
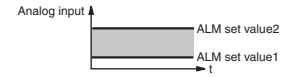
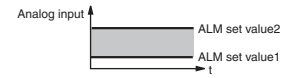
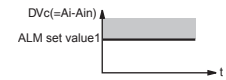
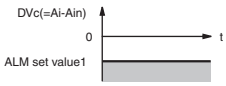
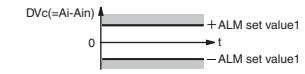
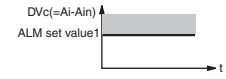
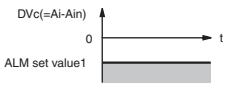
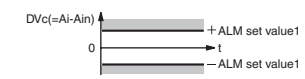
Please do not set values other than event numbers indicated in the table below.

Select event number from the table below.

– No event

Event category	Event No.	Event type	Behavior diagram	Reference
—	0	None	—	—

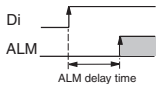
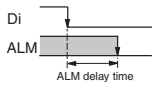
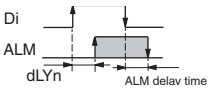
– Alarm event

Event category	Event No.	Event type	Behavior diagram	Reference
Analog input absolute alarm	1	Upper limit absolute		—
	2	Lower limit absolute		—
	3	Upper limit absolute with hold		—
	4	Lower limit absolute with hold		—
Upper / lower limit alarm	16	Upper/lower limit absolute		—
	20	Upper/lower limit absolute with hold		—
Range alarm2	24	Range upper/lower limit absolute		—
	28	Range upper/lower limit absolute with hold		—
Interchannel Analog input deviation alarm	41	Interchannel upper limit deviation		▶▶ 4-39
	42	Interchannel lower limit deviation		
	43	Interchannel upper/lower limit deviation		
	44	Interchannel upper limit deviation with hold		
	45	Interchannel lower limit deviation with hold		
	46	Interchannel upper/lower limit deviation with hold		

Point

– When selecting an event type with either of upper limit or lower limit only, the event always refers to “ALM set value 1”.

– Events other than alarms

Event category	Event No.	Event type	Behavior diagram	Reference
Timer code	52	ON delay timer		▶▶ 4-33 ▶▶ 4-34
	53	OFF delay timer		
	54	ON/OFF delay timer		
Condition output	73	Standby	—	▶▶ 4-4

Relevant parameters

- ALM set value1 / ALM set value2 ▶▶ 4-30
- ALM delay time ▶▶ 4-33
- ALM delay time units ▶▶ 4-34
- ALM hysteresis ▶▶ 4-35
- DO option functions ▶▶ 4-36

ALM Set Value1 / ALM Set Value2 Aio Ai

Two different values can be set for alarm event output registers DO1 to DO5. Values set to ALM1 to 5 are applied to DO1 to DO5 respectively.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)	
ALM1 set value1	0 to 100%FS (Absolute alarm) −100 to 100%FS (Deviation alarm)	%FS	2.5	R/W	Ch1	41033(0408h)
					Ch2	42033(07F0h)
					Ch3	43033(0BD8h)
					Ch4	44033(0FC0h)
ALM1 set value2	0 to 100%FS (Absolute alarm) −100 to 100%FS (Deviation alarm)	%FS	2.5	R/W	Ch1	41034(0409h)
					Ch2	42034(07F1h)
					Ch3	43034(0BD9h)
					Ch4	44034(0FC1h)
ALM2 set value1	0 to 100%FS (Absolute alarm) −100 to 100%FS (Deviation alarm)	%FS	2.5	R/W	Ch1	41041(0410h)
					Ch2	42041(07F8h)
					Ch3	43041(0BE0h)
					Ch4	44041(0FC8h)
ALM2 set value2	0 to 100%FS (Absolute alarm) −100 to 100%FS (Deviation alarm)	%FS	2.5	R/W	Ch1	41042(0411h)
					Ch2	42042(07F9h)
					Ch3	43042(0BE1h)
					Ch4	44042(0FC9h)
ALM3 set value1	0 to 100%FS (Absolute alarm) −100 to 100%FS (Deviation alarm)	%FS	2.5	R/W	Ch1	41049(0418h)
					Ch2	42049(0800h)
					Ch3	43049(0BE8h)
					Ch4	44049(0FD0h)
ALM3 set value2	0 to 100%FS (Absolute alarm) −100 to 100%FS (Deviation alarm)	%FS	2.5	R/W	Ch1	41050(0419h)
					Ch2	42050(0801h)
					Ch3	43050(0BE9h)
					Ch4	44050(0FD1h)
ALM4 set value1	0 to 100%FS (Absolute alarm) −100 to 100%FS (Deviation alarm)	%FS	2.5	R/W	Ch1	41057(0420h)
					Ch2	42057(0808h)
					Ch3	43057(0BF0h)
					Ch4	44057(0FD8h)
ALM4 set value2	0 to 100%FS (Absolute alarm) −100 to 100%FS (Deviation alarm)	%FS	2.5	R/W	Ch1	41058(0421h)
					Ch2	42058(0809h)
					Ch3	43058(0BF1h)
					Ch4	44058(0FD9h)

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)	
ALM5 set value1	0 to 100%FS (Absolute alarm) −100 to 100%FS (Deviation alarm)	%FS	2.5	R/W	Ch1	41065(0428h)
					Ch2	42065(0810h)
					Ch3	43065(0BF8h)
					Ch4	44065(0FE0h)
ALM5 set value2	0 to 100%FS (Absolute alarm) −100 to 100%FS (Deviation alarm)	%FS	2.5	R/W	Ch1	41066(0429h)
					Ch2	42066(0811h)
					Ch3	43066(0BF9h)
					Ch4	44066(0FE1h)

* FS represents Analog input input range (full scale).

Point

– When selecting an event type with either of upper limit or lower limit only, the event always refers to "ALM set value 1".

– For an event which has both upper and lower limits such as Range alarm event, both "ALM set value 1" and "ALM set value2" are referred to.

Relative parameters

- DO event types ▶▶ 4-27
- ALM delay time ▶▶ 4-33
- ALM delay time units ▶▶ 4-34
- ALM hysteresis ▶▶ 4-35
- DO option functions ▶▶ 4-36
- Interchannel Deviation Alarm ▶▶ 4-39

Operation Before and After Events Output Setting Aio Ai

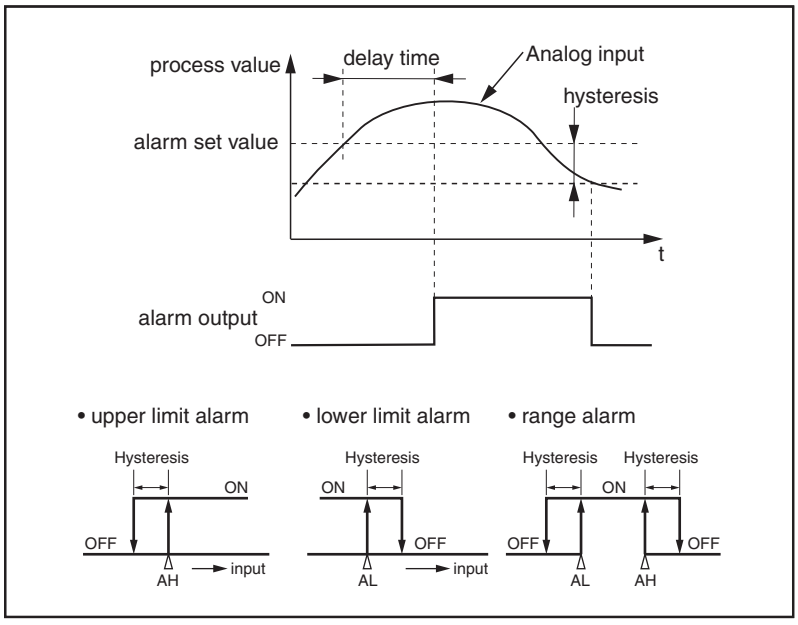
As an example, the operation of alarm event output is explained.

Following parameters can be set to specify operations before and after alarm events output.

Setting items	Description
ALM delay time / ALM delay time units	Specifies the amount of time from the occurrence of the alarm event to the ON output. Also specifies the unit of time (alarm delay time unit) used to measure the alarm delay.
ALM hysteresis	Specifies alarm detection and recovery width.
DO output latch function	Can be added by DO option functions. Latches (maintains) the state when an event occurs until the latch is released.

The alarm settings, ALM delay time and hysteresis are related as follows.

Example of an Upper Limit Alarm



ALM delay time

Is the amount of time from the occurrence of the alarm event to the ON output. The set values are applied to events other than alarm events. Values set to ALM1 to 5 are applied to DO1 to DO5 respectively.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)	
ALM1 delay time	00:00 to 99.59	Separate setting	00:00	R/W	Ch1	41037 (040Ch)
					Ch2	42037 (07F4h)
					Ch3	43037 (0BDCh)
					Ch4	44037 (0FC4h)
ALM2 delay time	00:00 to 99.59	Separate setting	00:00	R/W	Ch1	41045 (0414h)
					Ch2	42045 (07FCh)
					Ch3	43045 (0BE4h)
					Ch4	44045 (0FCCh)
ALM3 delay time	00:00 to 99.59	Separate setting	00:00	R/W	Ch1	41053 (041Ch)
					Ch2	42053 (0804h)
					Ch3	43053 (0BECh)
					Ch4	44053 (0FD4h)
ALM4 delay time	00:00 to 99.59	Separate setting	00:00	R/W	Ch1	41061 (0424h)
					Ch2	42061 (080Ch)
					Ch3	43061 (0BF4h)
					Ch4	44061 (0FDCh)
ALM5 delay time	00:00 to 99.59	Separate setting	00:00	R/W	Ch1	41069 (042Ch)
					Ch2	42069 (0814h)
					Ch3	43069 (0BFCh)
					Ch4	44069 (0FE4h)

* When the time units is “min./sec.”, the maximum time is 99 min.59 sec., and when the time unit is hr./min, the maximum time is 99 hr.59 min.

ALM delay time units

Specifies the unit of time “sec./min.” or “hr./min.” used to measure the alarm delay. Values set to ALM1 to 5 are applied to DO1 to DO5 respectively.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)	
ALM1 delay time units	0: sec. 1: min.	—	0	R/W	Ch1	41038 (040Dh)
					Ch2	42038 (07F5h)
					Ch3	43038 (0BDDh)
					Ch4	44038 (0FC5h)
ALM2 delay time units	0: sec. 1: min.	—	0	R/W	Ch1	41046 (0415h)
					Ch2	42046 (07FDh)
					Ch3	43046 (0BE5h)
					Ch4	44046 (0FCDh)
ALM3 delay time units	0: sec. 1: min.	—	0	R/W	Ch1	41054 (041Dh)
					Ch2	42054 (0805h)
					Ch3	43054 (0BEDh)
					Ch4	44054 (0FD5h)
ALM4 delay time units	0: sec. 1: min.	—	0	R/W	Ch1	41062 (0425h)
					Ch2	42062 (080Dh)
					Ch3	43062 (0BF5h)
					Ch4	44062 (0FDDh)
ALM5 delay time units	0: sec. 1: min.	—	0	R/W	Ch1	41070 (042Dh)
					Ch2	42070 (0815h)
					Ch3	43070 (0BFDh)
					Ch4	44070 (0FE5h)

Point

ALM delay ON/OFF can be used as triggers for different kinds of events. ▶▶ 4-27

ALM hysteresis

Specifies alarm detection and recovery width.

Values set to ALM1 to 5 are alarm hysteresis which are applied to DO1 to DO5 respectively.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)	
ALM1 hysteresis	0 to 50%FS	%FS	0.25	R/W	Ch1	41035 (040Ah)
					Ch2	42035 (07F2h)
					Ch3	43035 (0BDAh)
					Ch4	44035 (0FC2h)
ALM2 hysteresis	0 to 50%FS	%FS	0.25	R/W	Ch1	41043 (0412h)
					Ch2	42043 (07FAh)
					Ch3	43043 (0BE2h)
					Ch4	44043 (0FCAh)
ALM3 hysteresis	0 to 50%FS	%FS	0.25	R/W	Ch1	41051 (041Ah)
					Ch2	42051 (0802h)
					Ch3	43051 (0BEAh)
					Ch4	44051 (0FD2h)
ALM4 hysteresis	0 to 50%FS	%FS	0.25	R/W	Ch1	41059 (0422h)
					Ch2	42059 (080Ah)
					Ch3	43059 (0BF2h)
					Ch4	44059 (0FDAh)
ALM5 hysteresis	0 to 50%FS	%FS	0.25	R/W	Ch1	41067 (042Ah)
					Ch2	42067 (0812h)
					Ch3	43067 (0BFAh)
					Ch4	44067 (0FE2h)

* FS represents Analog input range (full scale).

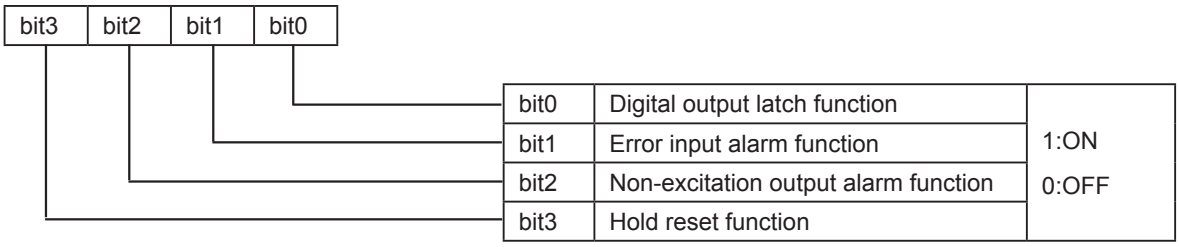
Relative parameters

- DO event types ▶▶ 4-27
- ALM set value1 / ALM set value2 ▶▶ 4-30
- DO option functions ▶▶ 4-36

DO Option Function Aio Ai

DO1 to DO5 can each have four types of option functions. The four types of option functions (ON/OFF) are assigned in bit units. Option functions used for DO1 to DO are as follows,

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)	
DO1 option function setting	0000 to 1111 bit data (0 to 15)	None	0000 (No setting)	R/W	Ch1	41036(040Bh)
					Ch2	42036 (07F3h)
					Ch3	43036 (0BDBh)
					Ch4	44036 (0FC3h)
DO2 option function setting	0000 to 1111 bit data (0 to 15)	None	0000 (No setting)	R/W	Ch1	41044 (0413h)
					Ch2	42044 (07FBh)
					Ch3	43044 (0BE3h)
					Ch4	44044 (0FCBh)
DO3 option function setting	0000 to 1111 bit data (0 to 15)	None	0000 (No setting)	R/W	Ch1	41052 (041Bh)
					Ch2	42052 (0803h)
					Ch3	43052 (0BEBh)
					Ch4	44052 (0FD3h)
DO4 option function setting	0000 to 1111 bit data (0 to 15)	None	0000 (No setting)	R/W	Ch1	41060 (0423h)
					Ch2	42060 (080Bh)
					Ch3	43060 (0BF3h)
					Ch4	44060 (0FDBh)
DO5 option function setting	0000 to 1111 bit data (0 to 15)	None	0000 (No setting)	R/W	Ch1	41068 (042Bh)
					Ch2	42068 (0813h)
					Ch3	43068 (0BFBh)
					Ch4	44068 (0FE3h)



DO output latch function

Latches (maintains) the state when an event occurs. The latch functions will remain ON until the digital output latch release command is set. ▶▶ 4-38

Error input alarm function

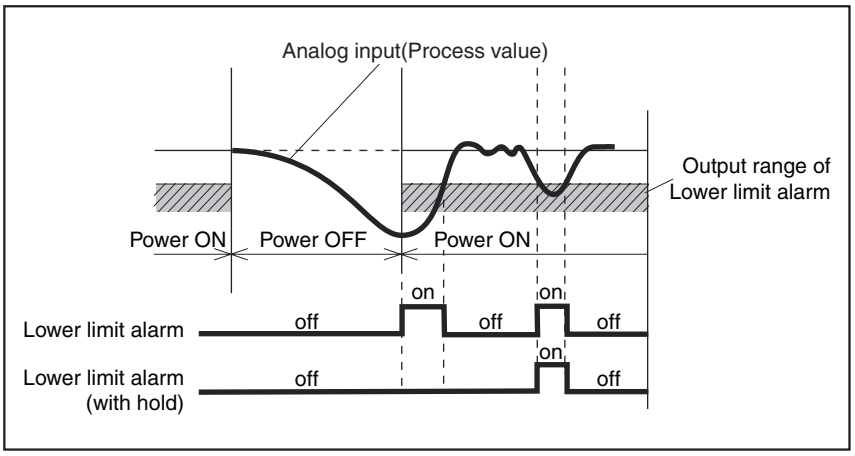
Outputs an event when an error input enters the unit. Set the DO event type ▶▶ 4-27 to "0" to use this function.

Non-excitation output function

Inverts the output and outputs from the DO terminal when an event occurs.

Hold and hold reset function

When alarm events are assigned, sometimes alarms are faultily detected soon after the power was turned ON. When an alarm event with hold function is assigned for a DO event type ▶▶ 4-27, the alarm first to occur after the power was turned ON will be ignored to avoid unnecessary alarm outputs.



When an alarm with hold is applied, the hold function is reset when any of the following actions occur.

- Change alarm type	- Change alarm settings	- Cancel standby	- Turn power ON/OFF

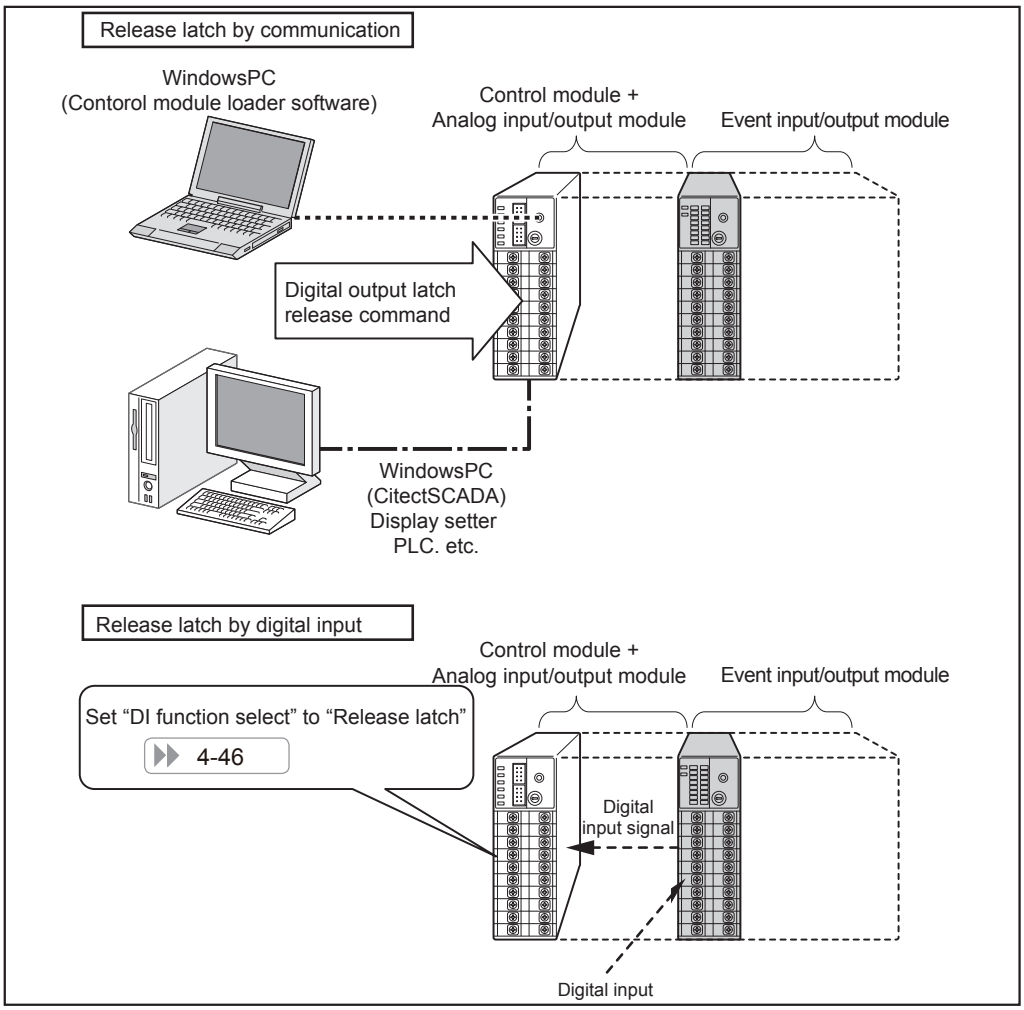
When both hold reset and digital output latch functions are set, digital output latch function is applied prior to hold reset.

Relative parameters

- ALM set value1 / ALM set value2 ▶▶ 4-30
- ALM delay time ▶▶ 4-33
- ALM delay time units ▶▶ 4-34
- ALM hysteresis ▶▶ 4-35

Digital Output Latch Release Aio Ai

There are two ways of releasing event latch as shown below.



Point

– To enable digital output latch function, set “DO option functions”. 4-36

– When “DI function select” is set to “Release latch”, digital output latch can be released by digital input from an event input/output module. 4-46

To release latch by communication, set the parameter below to “1: Release latch”.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)	
Digital output latch release command	0: OFF 1: Release latch	None	0	R/W	Ch1	41031 (0406h)
					Ch2	42031 (07EEh)
					Ch3	43031 (0BD6h)
					Ch4	44031 (0FBEh)

Interchannel Deviation Alarm Aio Ai

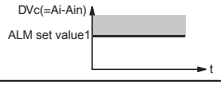
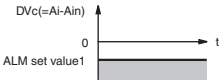
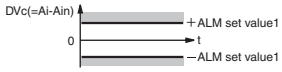
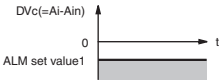
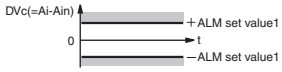
Monitors deviation of Analog input between channels 1 to 4.

Note

When using interchannel deviation ALM, Analog input range setting should be the same on the object two channels of which Analog input values are to be compared. 4-8

– Event No.

To set interchannel deviation ALM functions, assign the following event numbers when configuring “DO event types” setting. 4-27

Event No.	Event type	Behavior diagram
41	Interchannel upper limit deviation	
42	Interchannel lower limit deviation	
43	Interchannel upper/lower limit deviation	
44	Interchannel upper limit deviation with hold	
45	Interchannel lower limit deviation with hold	
46	Interchannel upper/lower limit deviation with hold	

– Object Ch No. for interchannel ALM

Set “Object Ch No. for interchannel ALM1 to 5” to the desired object channel numbers of which Ai values are to be compared. Values set to ALM1 to 5 are object Ch No. for interchannel ALM which are applied to DO1 to DO5 respectively.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)	
Object Ch No. for interchannel ALM1	1 to 4 (Ch No.)	None	1	R/W	Ch1	41039 (040Eh)
					Ch2	42039 (07F6h)
					Ch3	43039 (0BDEh)
					Ch4	44039 (0FC6h)
Object Ch No. for interchannel ALM2	1 to 4 (Ch No.)	None	1	R/W	Ch1	41047 (0416h)
					Ch2	42047 (07FEh)
					Ch3	43047 (0BE6h)
					Ch4	44047 (0FCEh)

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)	
Object Ch No. for interchannel ALM3	1 to 4 (Ch No.)	None	1	R/W	Ch1	41055 (041Eh)
					Ch2	42055 (0806h)
					Ch3	43055 (0BEEh)
					Ch4	44055 (0FD6h)
Object Ch No. for interchannel ALM4	1 to 4 (Ch No.)	None	1	R/W	Ch1	41063 (0426h)
					Ch2	42063 (080Eh)
					Ch3	43063 (0BF6h)
					Ch4	44063 (0FDEh)
Object Ch No. for interchannel ALM5	1 to 4 (Ch No.)	None	1	R/W	Ch1	41071 (042Eh)
					Ch2	42071 (0816h)
					Ch3	43071 (0BFEh)
					Ch4	44071 (0FE6h)

– Other settings

Settings of the relative parameters shown below are the same as other alarm events.

Relative parameters

- ALM set value1 / ALM set value2 ▶▶ 4-30
- ALM delay time ▶▶ 4-33
- ALM delay time units ▶▶ 4-34
- ALM hysteresis ▶▶ 4-35
- DO option functions ▶▶ 4-36

4.5 Communication Setting

Communication Setting

The following communication settings can be performed on this module.

- RS-485 Communication Speed Setting and RS-485 Parity Setting ▶▶ 4-41
- RS-485 Communication Permission Setting ▶▶ 4-42
- Enhanced Communication Module (PUMC) Connection Permission ▶▶ 4-42
- Master/Slave Setting in Connected Modules ▶▶ 4-43
- RS-485 Response Interval Time Setting ▶▶ 4-44

The parameters reset the main unit is necessary when change the setting are marked (RST) in each setting explanation or parameter.

RS-485 Communication Speed Setting and RS-485 Parity Setting Aio Ai Ao

It is for setting transmission speeds and parity checks of external communication using RS-485.

Each module has the parameters shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
RS-485 Communication speed	0: 9.6kbps 1: 19.2kbps 2: 38.4kbps 3: No Setting 4: 115.2kbps	None	1	R/W	40115(0072h)
RS-485 Parity setting	0: None 1: Odd 2: Even	None	0	R/W	40111(006Eh)

Note

The communication speed and parity settings of the master and all slaves on the same communication system should be the same. If these settings are not the same, communication can not be performed.

RS-485 Communication Permission Setting Aio Ai Ao

It is for setting Read/Write permission of external communication using RS-485/loader communication.

Each module has the parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
RS-485 Communication permission	0: Read only 1: Read/Write	None	1	R/W	40114(0071h)

Note

– When connecting an enhanced communication module (CC-Link, etc.), “RS-485 Communication permission” is set to “1: Read/Write” on all module.

– Once “0: Read only” is set, parameters except for “RS-485 Communication permission” can not be changed (to Write). A response will be returned to Write, however, actual Write will not be performed.

Enhanced Communication Module (PUMC) Communication Permission Setting Aio Ai Ao

It is for setting permission of inter-module communication when the enhanced communication module (PUMC) is connected.

Each module has the parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Enhanced communication module (PUMC) connection	0: PUMC not connected (RS-485 Enable) 1: PUMC connected (RS-485 Disable)	None	0	R/W	40116(0073h)

Note

Even if “0: PUMC not connected (RS-485 Enable)” is set to one of the multiple modules, this communication setting does not influence the settings of the modules after this module. The permission setting is valid only for the module to which the permission setting is given.

Master/Slave Setting in Connected Modules Aio Ai Ao

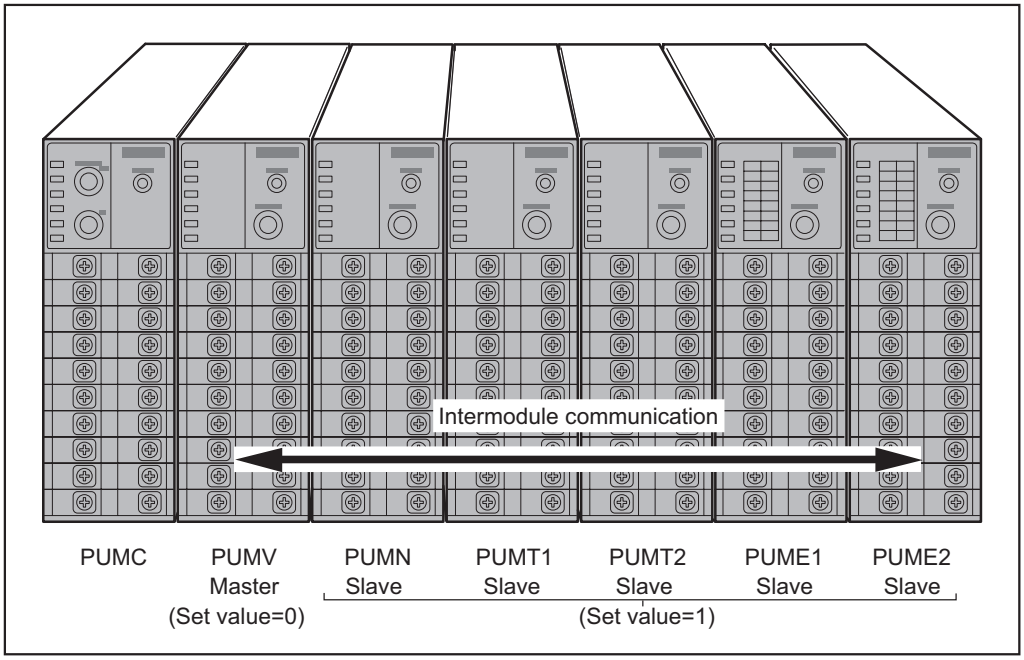
Specifies whether each of connected modules is master or slave.

Each module has the parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Master/slave setting in connected modules	0: Master 1: Slave	None	1	R/W	40117(0074h)

By setting one of connected Analog I/O module (PUMV/PUMN/PUMT) as the master (“0: Master”), intermodule communication between all connected module will be enable.

Example of system configuration



Note

– When connecting an analog I/O module and a control module, the module set "0 (Master)" is only one unit.

– Setting change is valid only after resetting the main unit.

RS-485 Response Interval Time Setting Aio Ai Ao

It is for setting response interval time of RS-485 communication.

Point

In RS-485 communication, transmitting and receiving are performed only on a single transmission line, therefore, switching between transmitting and receiving must be performed with precise timing. For this reason, response interval time must be set to secure the time after transmission of a host, that is a communication partner, is completed until the transmission line is switched to receiving.
The length of interval time should be set to suit a host that is a communication partner.

Each module has the parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
RS-485 Response interval time	0 to 25	20ms/1digit	1	R/W	40113(0070h)

Note

– Note that the response interval time is 20ms for every set value 1. The response interval time up to 500 ms can be set.

– The response interval time setting for the master and all slaves on the same communication system must be the same.

4.6 Optional Functions Setting

Optional Functions Setting

The following functions can be added to this module.

The parameters reset the main unit is necessary when change the setting are marked (RST) in each setting explanation or parameter.

DI function

- Digital Input Function Setting ▶▶ 4-46
- Linkage Operation Setting ▶▶ 4-49

Monitoring function for this module

- Input/Output Monitor Setting ▶▶ 4-53
- LED Display Setting ▶▶ 4-57

Other functions

- User Address Specification Communication ▶▶ 4-60
- Reset Main Unit ▶▶ 4-61

Digital Input Function Setting Aio Ai Ao

Assigns the function which activates when a digital signal is input from DI1 to DI 8 in cases event input/output module are connected.

Note

Each channel can use only one unit of event input/output module.

Each channel (Ch1 to Ch4) has parameters shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
DI master Station setting RST	0 to 255	None	0	R/W	Ch1: 41011 (03F2h)
					Ch2: 42011 (07DAh)
					Ch3: 43011 (0BC2h)
					Ch4: 44011 (0FAAh)
DI-1 function select	0 to 52	None	0	R/W	Ch1: 41013 (03F4h)
					Ch2: 42013 (07DCh)
					Ch3: 43013 (0BC4h)
					Ch4: 44013 (0FACh)
DI-2 function select	0 to 52	None	0	R/W	Ch1: 41014 (03F5h)
					Ch2: 42014 (07DDh)
					Ch3: 43014 (0BC5h)
					Ch4: 44014 (0FADh)
DI-3 function select	0 to 52	None	0	R/W	Ch1: 41015 (03F6h)
					Ch2: 42015 (07DEh)
					Ch3: 43015 (0BC6h)
					Ch4: 44015 (0FAEh)
DI-4 function select	0 to 52	None	0	R/W	Ch1: 41016 (03F7h)
					Ch2: 42016 (07DFh)
					Ch3: 43016 (0BC7h)
					Ch4: 44016 (0FAFh)
DI-5 function select	0 to 52	None	0	R/W	Ch1: 41017 (03F8h)
					Ch2: 42017 (07E0h)
					Ch3: 43017 (0BC8h)
					Ch4: 44017 (0FB0h)

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
DI-6 function select	0 to 52	None	0	R/W	Ch1: 41018 (03F9h)
					Ch2: 42018 (07E1h)
					Ch3: 43018 (0BC9h)
					Ch4: 44018 (0FB1h)
DI-7 function select	0 to 52	None	0	R/W	Ch1: 41019 (03FAh)
					Ch2: 42019 (07E2h)
					Ch3: 43019 (0BCAh)
					Ch4: 44019 (0FB2h)
DI-8 function select	0 to 52	None	0	R/W	Ch1: 41020 (03FBh)
					Ch2: 42020 (07E3h)
					Ch3: 43020 (0BCBh)
					Ch4: 44020 (0FB3h)

DI master Station No. Setting

The set value of “DI master Station No. setting” is the number of station number configuration switch of the object event input/output module plus “17”.

For example, when the station number configuration switch is set to “1”;

The set value of “DI master Station No. setting” should be “18”.

The set value for “DI function select”

See the table below to decide which function to assign DI 1 to DI 5.

Set value	Function name	Description	ON	OFF	Judgment condition
0	No function	No function	-	-	-
1	RUN/Standby switch	Switches between Standby ON and OFF(RUN)	Standby	RUN (Standby OFF)	Edge
2-16	No function	Do not set	-	-	-
17	Latch release (all)	Cancels all of the sources currently acting as latches	Release	-	Edge
18	Latch release (DO1)	Cancels the source currently acting as a latch on DO1	Release	-	Edge
19	Latch release (DO2)	Cancels the source currently acting as a latch on DO2	Release	-	Edge
20	Latch release (DO3)	Cancels the source currently acting as a latch on DO3	Release	-	Edge
21	Latch release (DO4)	Cancels the source currently acting as a latch on DO4	Release	-	Edge
22	Latch release (DO5)	Cancels the source currently acting as a latch on DO5	Release	-	Edge
23-25	No function	Do not set	-	-	-
26	Start timer (DO1)	Starts the specified timer for DO1	Timer ON	Timer OFF	Level
27	Start timer (DO2)	Starts the specified timer for DO2	Timer ON	Timer OFF	Level
28	Start timer (DO3)	Starts the specified timer for DO3	Timer ON	Timer OFF	Level
29	Start timer (DO4)	Starts the specified timer for DO4	Timer ON	Timer OFF	Level
30	Start timer (DO5)	Starts the specified timer for DO5	Timer ON	Timer OFF	Level
31-48	No function	Do not set	-	-	-
49	Output 1 shutdown	Output 1 is set to 0%	Output 0%	-	Level
50	Output 2 shutdown	Output 2 is set to 0%	Output 0%	-	Level
51	Output 3 shutdown	Output 3 is set to 0%	Output 0%	-	Level
52	Output 4 shutdown	Output 4 is set to 0%	Output 0%	-	Level

Note

When the DI function for edge operations is selected, please note the followings.

– The power to the unit is turned on with DI turned on, the ON edge is accepted and the selected function is performed.

– The power to the unit is turned ON with DI turned OFF, the OFF edge is rejected and the selected function is not performed. To perform the selected function, switch DI OFF, ON, and OFF again to put DI into the OFF edge.

– In case Remote input master station No. , output master station No. and linkage operation master station No. have been also set as well as DI master station No., the red lamp of PWR LED will be illuminated (system FAULT) if none of the station numbers exist. PWR LED lamp will not be illuminated if any of the station numbers exists.

Linkage Operation Setting Aio Ai Ao

Switches the operation mode of multiple channels in response to that of the master channel.

Each channel (Ch1 to Ch4) has parameters below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Linkage operation master Station No.	0 to 255	None	0 (own station No.)	R/W	Ch1: 41536 (05FFh)
					Ch2: 42536 (09E7h)
					Ch3: 43536 (0DCFh)
					Ch4: 44536 (11B7h)
Linkage operation master Ch No.	1 to 4	None	own Ch No.	R/W	Ch1: 41537 (0600h)
					Ch2: 42537 (09E8h)
					Ch3: 43537 (0DD0h)
					Ch4: 44537 (11B8h)
DI-9 function select	0 to 52	None	0	R/W	Ch1: 41021 (03FCh)
					Ch2: 42021 (07E4h)
					Ch3: 43021 (0BCCh)
					Ch4: 44021 (0FB4h)
DI-10 function select	0 to 52	None	0	R/W	Ch1: 41022 (03FDh)
					Ch2: 42022 (07E5h)
					Ch3: 43022 (0BCDh)
					Ch4: 44022 (0FB5h)
DI-11 function select	0 to 52	None	0	R/W	Ch1: 41023 (03FEh)
					Ch2: 42023 (07E6h)
					Ch3: 43023 (0BCEh)
					Ch4: 44023 (0FB6h)
DI-12 function select	0 to 52	None	0	R/W	Ch1: 41024 (03FFh)
					Ch2: 42024 (07E7h)
					Ch3: 43024 (0BCFh)
					Ch4: 44024 (0FB7h)
DI-13 function select	0 to 52	None	0	R/W	Ch1: 41025 (0400h)
					Ch2: 42025 (07E8h)
					Ch3: 43025 (0BD0h)
					Ch4: 44025 (0FB8h)

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
DI-14 function select	0 to 52	None	0	R/W	Ch1: 41026 (0401h)
					Ch2: 42026 (07E9h)
					Ch3: 43026 (0BD1h)
					Ch4: 44026 (0FB9h)
DI-15 function select	0 to 52	None	0	R/W	Ch1: 41027 (0402h)
					Ch2: 42027 (07EAh)
					Ch3: 43027 (0BD2h)
					Ch4: 44027 (0FBAh)
DI-16 function select	0 to 52	None	0	R/W	Ch1: 41028 (0403h)
					Ch2: 42028 (07EBh)
					Ch3: 43028 (0BD3h)
					Ch4: 44028 (0FBBh)

Master Ch No. setting

Set “Linkage operation master station No.” to the No. of module (station no. configuration switch) which acts as a trigger of linkage operation plus 1 and set “Linkage operation Ch No.” to its Ch No.

To perform linkage operation intramodule, set “Linkage operation master station No.” to “0” or to own No. (station no. configuration switch plus 1). Please note that if “Linkage operation master Ch No.” is set to own No., linkage operation is not operated.

How Linkage operation works

Switching the operation mode of the master channel of the master station turns ON the corresponding DI function No. of own channel, which activates the designated DI function.

Operation mode of master Ch and corresponding DI No.

Operation mode of master channel of master station	Corresponding DI function No. of others
Remote	DI-11 *Note1
Standby	DI-13
Manual	DI-14 *Note1
Local	DI-15 *Note1
Error input	DI-16

*Note1...Settable only when the control module is master.

Refer to “The set value for “DI function select”” for types of DI functions to be designated. ▶▶ 4-48

Note

– In case Remote input master station No. , DI master station No., and output master station No. have been also set as well as linkage operation master station No., the red lamp of PWR LED will be illuminated (system FAULT) if none of the station numbers exist. PWR LED lamp will not be illuminated if any of the station numbers exists.

Ex. Switching all Ch of 2 units Analog I/O module to Standby mode when the master Ch switched to Standby mode.

– The station numbers are “1” and “3”.

– Set Ch1 of the station No.1 as the master. (No need to designate DI function when own Ch is the master Ch.)

– Set Ch1 of own station as the master for Ch 2, 3 and 4 of the station No.1. Assign the DI function, “1: RUN/Standby switch” , to the corresponding DI function No. 13.

– As for station No.3, set Ch1 of the station No.1 as the master. Assign the DI function, “1: RUN/Standby switch” , to the corresponding DI function No. 13.

The setting details are as follows.

	Ch	Parameter name	Set value
Station No.1			
	Ch1	Linkage operation master Station No.	0
		Linkage operation master Ch No.	1
	Ch2	Linkage operation master Station No.	0
		Linkage operation master Ch No.	1
		DI function No.13 designation	1
	Ch3	Linkage operation master Station No.	0
		Linkage operation master Ch No.	1
		DI function No.13 designation	1
	Ch4	Linkage operation master Station No.	0
		Linkage operation master Ch No.	1
		DI function No.13 designation	1
Station No.3			
	Ch1	Linkage operation master Station No.	1
		Linkage operation master Ch No.	1
		DI function No.13 designation	1
	Ch2	Linkage operation master Station No.	1
		Linkage operation master Ch No.	1
		DI function No.13 designation	1
	Ch3	Linkage operation master Station No.	1
		Linkage operation master Ch No.	1
		DI function No.13 designation	1
	Ch4	Linkage operation master Station No.	1
		Linkage operation master Ch No.	1
		DI function No.13 designation	1

By this setting, switching Ch1 of the station No.1 to Standby mode automatically switches all channels of the stations No.1 and 3 to Standby mode operation.

Input/Ouput Monitor Setting Aio Ai Ao

The monitor allows you to verify the current input and output conditions of the module.

The monitor can display the following items.

Each channel (Ch1 to Ch4) has parameters shown below.

Parameter	Unit	Attribute	Modbus register number (relative address)
Input value (Analog input)	%FS	R	Ch1: 30002 (0001h) 31001 (03E8h)
			Ch2: 30003 (0002h) 32001 (07D0h)
			Ch3: 30004 (0003h) 33001 (0BB8h)
			Ch4: 30005 (0004h) 34001 (0FA0h)
Cold junction compensation temperature	degree C (0.1 degree C /1digit)	R	Ch1: 30110 (006Dh) 31016 (03F7h)
			Ch2: 30111 (006Eh) 32016 (07DFh)
			Ch3: 30112 (006Fh) 33016 (0BC7h)
			Ch4: 30113 (0070h) 34016 (0FAFh)
Output value (Analog output)	%	R	Ch1: 30120 (0077h)
			Ch2: 30121 (0078h)
			Ch3: 30122 (0079h)
			Ch4: 30123 (007Ah)
Error source display	None	R	Ch1: 31008 (03EFh)
			Ch2: 32008 (07D7h)
			Ch3: 33008 (0BBFh)
			Ch4: 34008 (0FA7h)
Alarm 1-5 status	None	R	Ch1: 31007 (03EEh)
			Ch2: 32007 (07D6h)
			Ch3: 33007 (0BBEh)
			Ch4: 34007 (0FA6h)

Parameter	Unit	Attribute	Modbus register number (relative address)
Event input status	None	R	Ch1: 31061 (0424h)
			Ch2: 32061 (080Ch)
			Ch3: 33061 (0BF4h)
			Ch4: 34061 (0FDCh)
Remaining time on timer 1	min:sec. / hr:min.	R	Ch1: 31011 (03F2h)
			Ch2: 32011 (07DAh)
			Ch3: 33011 (0BC2h)
			Ch4: 34011 (0FAAh)
Remaining time on timer 2	min:sec. / hr:min.	R	Ch1: 31012 (03F3h)
			Ch2: 32012 (07DBh)
			Ch3: 33012 (0BC3h)
			Ch4: 34012 (0FABh)
Remaining time on timer 3	min:sec. / hr:min.	R	Ch1: 31013 (03F4h)
			Ch2: 32013 (07DCh)
			Ch3: 33013 (0BC4h)
			Ch4: 34013 (0FACh)
Remaining time on timer 4	min:sec. / hr:min.	R	Ch1: 31014 (03F5h)
			Ch2: 32014 (07DDh)
			Ch3: 33014 (0BC5h)
			Ch4: 34014 (0FADh)
Remaining time on timer 5	min:sec. / hr:min.	R	Ch1: 31015 (03F6h)
			Ch2: 32015 (07DEh)
			Ch3: 33015 (0BC6h)
			Ch4: 34015 (0FAEh)

"Input value (Analog input)" is the parameter referable only on the analog I/O or input module.

"Output value (Analog output)" is the parameter referable only on the analog I/O or output module.

Explanation on parameters

- Input value (Analog input)

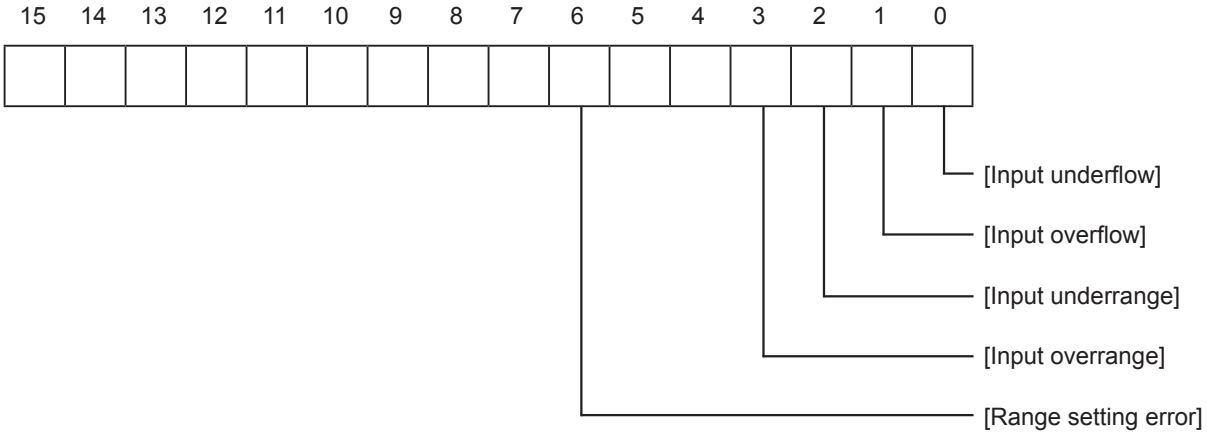
  The current input value is stored (See “Analog input basic setting” ▶▶ 4-8)

- Cold junction compensation temperature

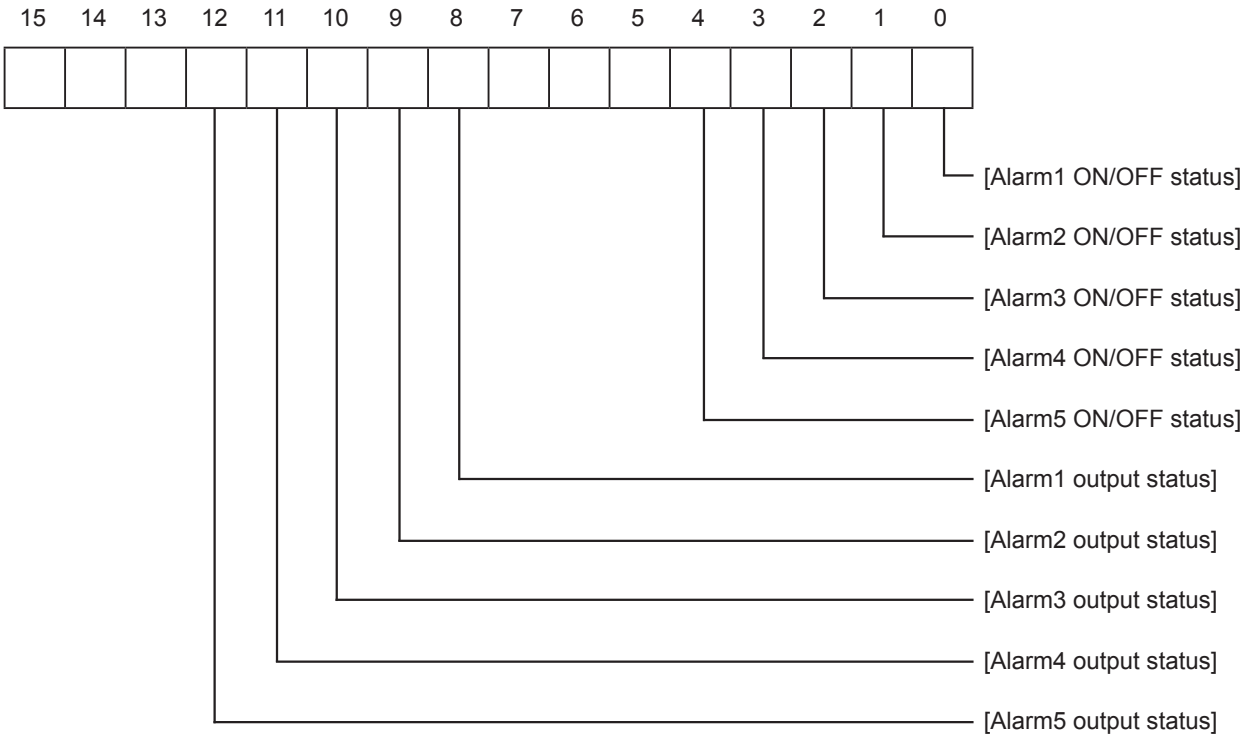
  When “Cold junction compensation” ▶▶ 4-14 is set to “1:ON” , the compensation value which is added to the input value is stored. In the case of thermocouple input only, the valid value is stored.

- Output value (Analog output)
  Value of output which is currently output from the output terminal is stored.

- Error source display
  Input error status of Analog iutput is stored in bits. When an input error occurred, the corresponding bit turns ON.



- Alarm 1-5 status
  ON/OFF and the output status of alarms is stored in bits. As for high 8 bits, if an error occurred the corresponding bit turns ON.
  As for low 8 bits, if an alarm output is ON the corresponding bit turns ON.

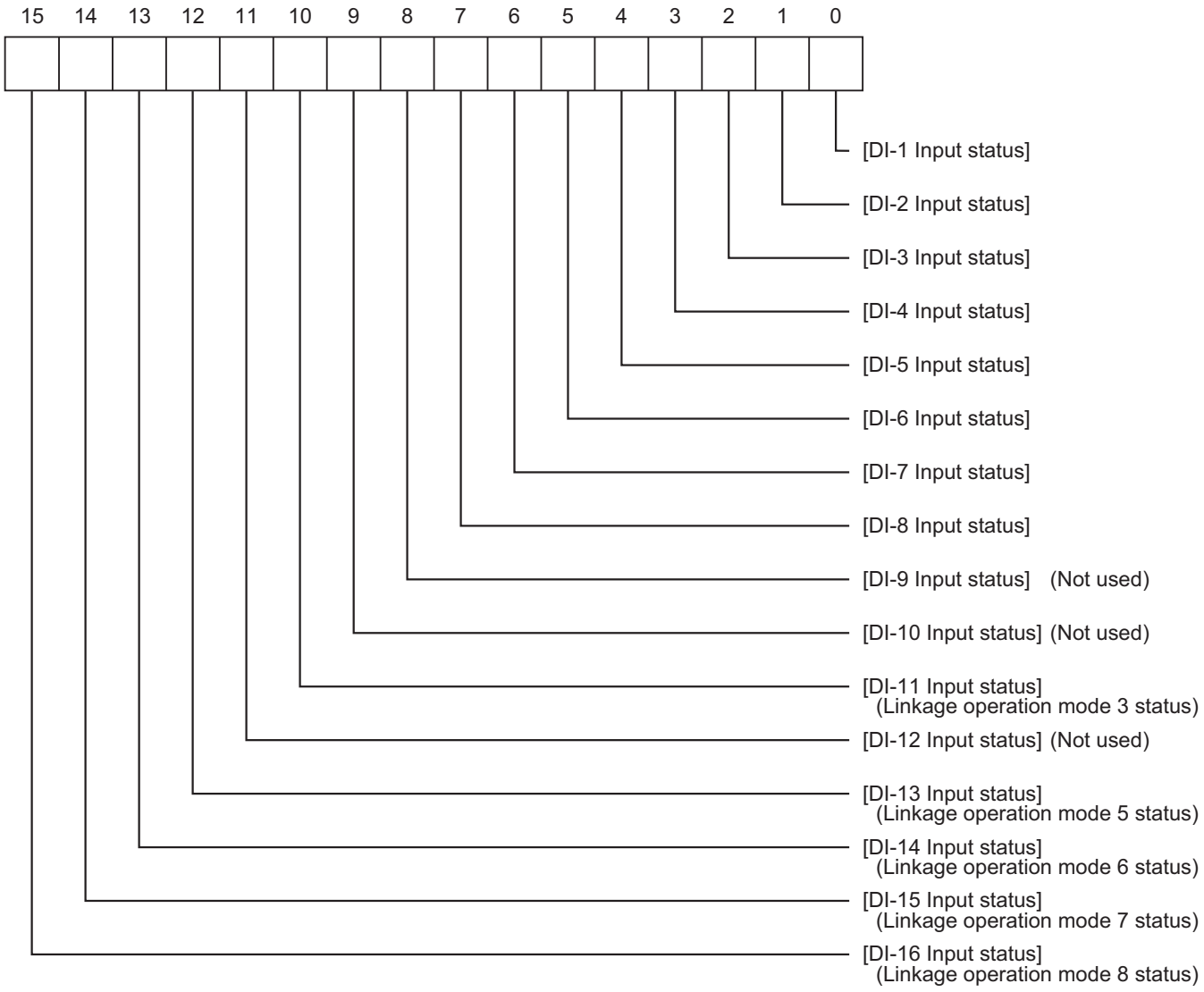


When non-excitation output alarm function is selected for DO option functions setting ▶▶ 4-36, the output status is contrary to Alarm ON/OFF status.

- Event input status display

  DI input status of event input/output module specified when setting digital input functions ▶▶ 4-46 is stored.

  When digital input is ON, the corresponding bit turns ON.



- Remaining time on timer 1/2/3/4/5

  Remaining time of delay timer is stored when “DO event type” ▶▶ 4-27 is set to “ALM delay time” ▶▶ 4-33 .

LED Display Setting Aio Ai Ao

Specifies the lighting conditions of the LED lamps on the front terminal block of this module.

Each module has the parameter shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
LED2 Lamp Allocation	0 to 5	None	1	R/W	40222 (00DDh)
LED3 Lamp Allocation	0,8,12,16,41 to 46, 50 to 58	None	12	R/W	40223 (00DEh)
LED4 Lamp Allocation	0,9,13,17,71 to 76, 80 to 88	None	13	R/W	40224 (00DFh)
LED5 Lamp Allocation	0,10,14,18,101 to 106, 110 to 118	None	14	R/W	40225 (00E0h)
LED6 Lamp Allocation	0,11,15,19,131 to 136, 140 to 148	None	15	R/W	40226 (00E1h)

LED Lamps

On the front terminal block, there are 6 LED lamps which are from the top; “LED1”, “LED2”, “LED3”, “LED4”, “LED5”, and “LED6” to indicate the operation state of this module. According to the state of this module, the lamps illuminate as shown below.

Operation State		LED Lamp					
		LED1	LED2	LED3	LED4	LED5	LED6
Start up		Green light ON *1					
After initial processing							
	Normal processing	Green light ON *1	Operates to the designated lighting condition.				
	Communication error	Red light ON	Operates to the designated lighting condition.				
	Input error (Unit minor failure)	Red light blinking	Operates to the designated lighting condition.				

*1 If the module is set as the master module for intermodule communication, the green light blinks.

LED lighting condition setting

Lighting conditions can be set to all of the lamps except “LED1.”

– "LED2" lamp lighting condition setting

Lighting Condition		LED Color	Set Value
None		Light OFF	0
RS485 Communication state	While receiving	Green	1
	While transmitting	Orange	
All channels Standby *2		Green	2
All channels error input state *2		Orange	3
All channels DO output *2		Orange	5

*2 LED lamp will be illuminated if any channel applies to the condition.

– ”LED3” to “LED6” lamp lighting condition setting

Lighting condition	LED color	Set value			
		LED3	LED4	LED5	LED6
None	Light OFF	0	0	0	0
Being output / Error input	Green/ Red *3	12	13	14	15
DO 1 to DO8 output *4	Red	16	17	18	19
Error input	Red	41	71	101	131
Standby	Green	43	73	103	133
DO1 output	Red	51	81	111	141
DO2 output	Red	52	82	112	142
DO3 output	Red	53	83	113	143
DO4 output	Red	54	84	114	144
DO5 output	Red	55	85	115	145

*3 LED lamps will illuminate as shown below according to the status of input error/analog output.

Output status		Input error status	
		Abnormal	Normal
Analog output	ON	Red light ON	Green light ON
	OFF	Red light ON	Light OFF

*4 LED lamps illuminate if any of DO1 to DO5 output has been switched ON.

User Address Specification Communication Aio Ai Ao

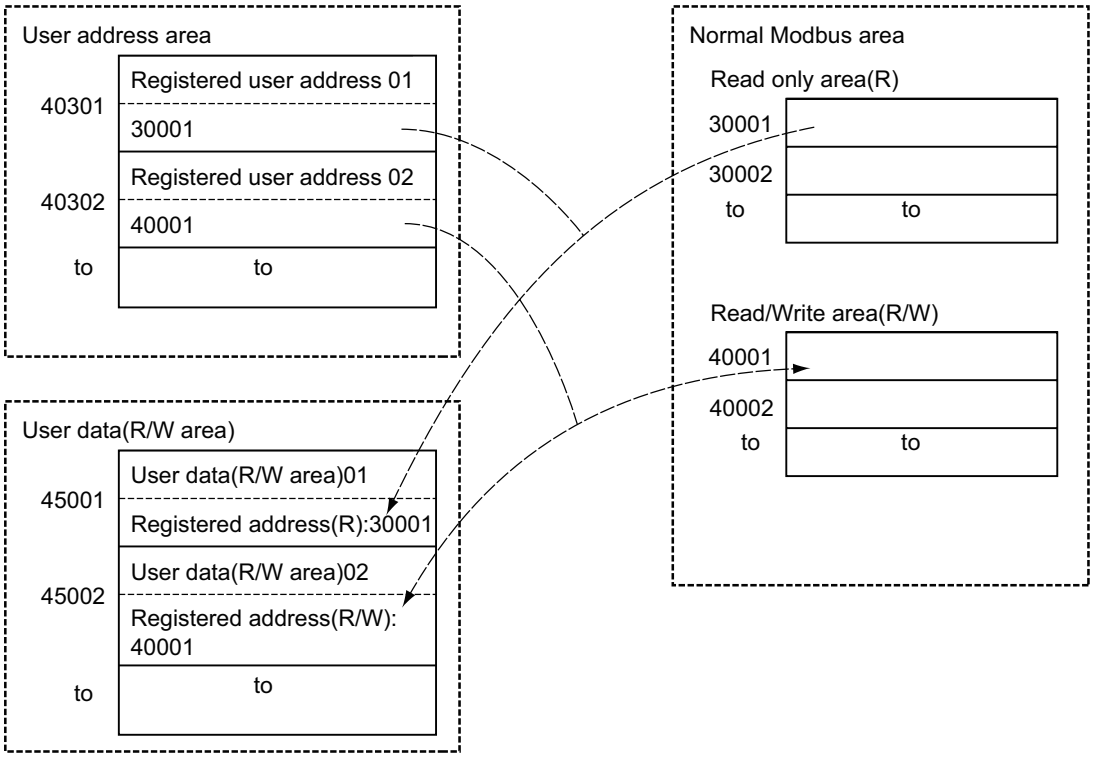
Random addresses can be set to the user address area. Maximum 32 addresses can be registered.

The relative parameters are as shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
User address 01: Register number specification	30001 to 44999	None	30002	R/W	40301 (012Ch)
to					
User address 32: Register number specification	30001 to 44999	None	30002	R/W	40332 (014Bh)
User data 01: (R/W area)	Depends on “User address 01”				45001 (1388h)
to					
User data 32: (R/W area)	Depends on “User address 32”				45032 (13A7h)

The addresses specified for “User address 01 to 32” can be used for the corresponding “User data 01 to 32.”

Random or nonconsecutive addresses can be treated as successive areas by using “User data 01 to 32” parameters.



Note

– If an abnormal Modbus address is set as “User address”, it cannot read or write data using “User data (R/W area).

– If a Modbus address of Read only area is set as “User address”, it cannot write data to the corresponding “User data (R/W area).”

Reset Main Unit Aio Ai Ao

Resets (restarts) the main unit.

The relative parameter is as shown below.

Parameter	Range	Unit	Factory default	Attribute	Modbus register number (relative address)
Reset main unit	0: Do nothing 1: Reset main unit	None	0	R/W	40101 (0064h)

The main unit is reset if this parameter is set to (“1: Reset main unit”). As “Reset main unit” is the same operation as supplying the power to the main unit, changed parameters which requires restarting of the main unit can be reflected without doing so.

Point

RST mark is on the parameters which requires restarting of the main unit after setting change.

5 Communication

5.1 Communication Functions **5-3**

5.2 Communication Specifications **5-5**

5.3 Connection **5-7**

5.4 Setting Communication Parameters **5-10**

5.5 Modbus RTU Communication Protocol.....**5-12**

5.6 Command and Transmission Frame Details **5-20**

5.7 Address Map and Data Format.....**5-29**

5.8 Sample Program.....**5-45**

5.1 Communication Functions

PUM is equipped with communication functions from the RS-485 interface and loader interface, which enables the transmission and reception of data between such devices as the personal computer, programmable controller, and graphic panel.

The communication system is composed of a master and slave relationship. Up to thirty-two slaves (PUMs) may be connected to one master (such as a personal computer) based on a “single master/multiple slave” method.

However, the master can only communicate with one slave at a time. Therefore, each slave is specified by the “Station No.” setting. With loader communication, only one slave can be connected to one master.

Note

- Systems constructed with the PUM as slaves do not respond to messages issued by the master with broadcast queries where the station number is “0”.
- Communication with loader interface should not be attempted during production operation or during RS-485 communication.

In order to have proper communication between master and slave, the transmission data must be in the same format. This document explains how to transmit data using the Modbus RTU protocol format.

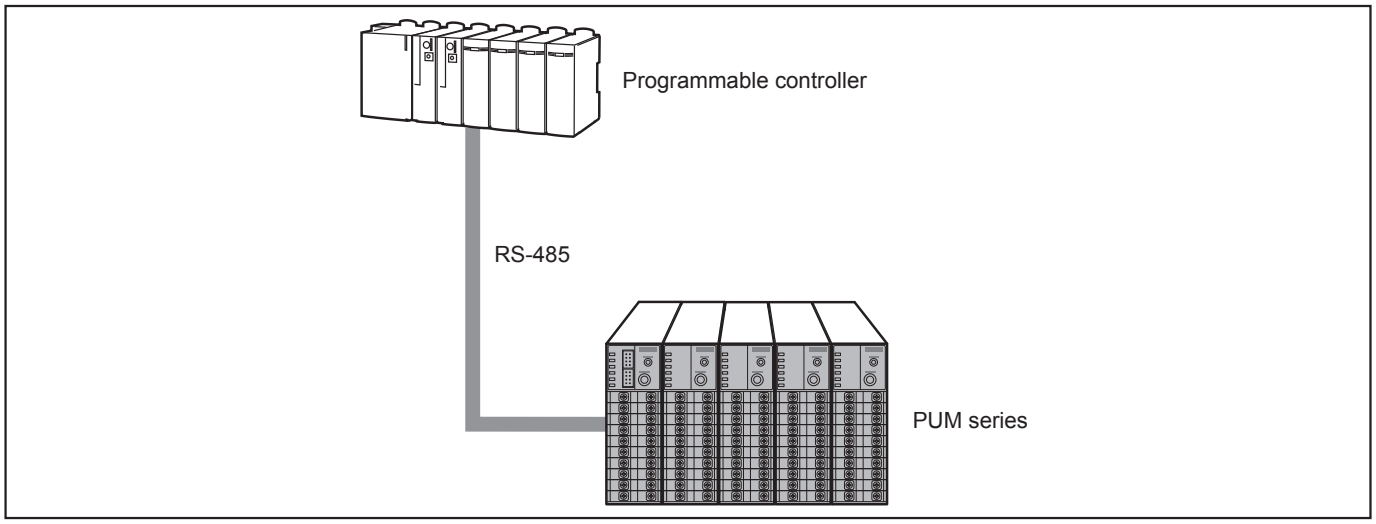
When using equipment with an RS-232C interface, such as a personal computer, as the master, make sure to use an RS-232C to RS-485 converter.

When using loader communication, you can use RS-232C communication with the personal computer by connecting the loader interface located on the main unit front face with the loader connecting cable (model: PUMZ*L01, optional).

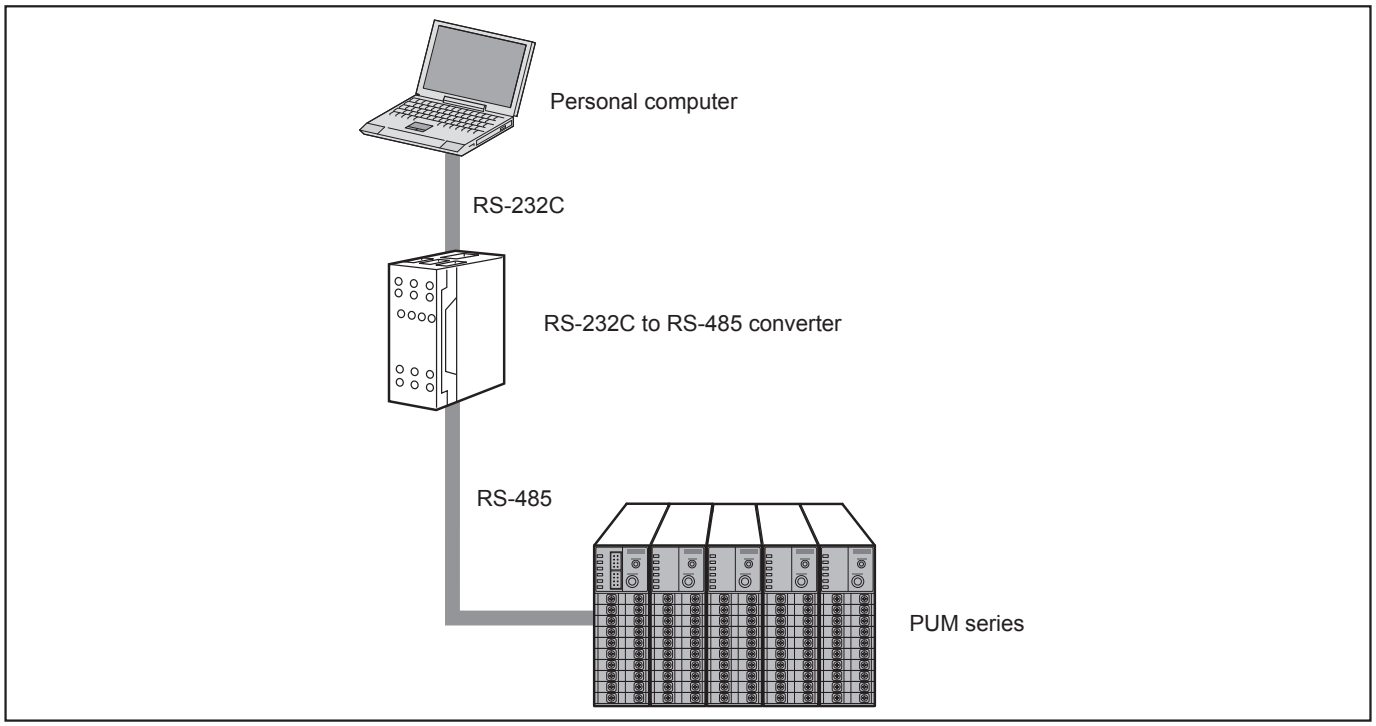
[RS-232C to RS-485 converter] (Recommended)

Model number/Type	Manufacturer	Max. communication speed	URL
KS3C-10	Omron	38.4kbps	http://www.omron.co.jp
RC-770X	Sysmex RA	115.2kbps	http://www.sysmex-ra.co.jp

Connecting to a Programmable Controller



Connecting to a Personal Computer



Note

- When using the RS-232C to RS-485 converter, check to make sure that the cable is properly connected between the converter and master.
  Communication will not work properly if the connection is incorrect.
- Be sure to correctly set the communication settings (such as communication speed and parity) on the RS-232C to RS-485 converter. Communication will not work properly if the settings are incorrect.

5.2 Communication Specifications

RS-485

Item	Specifications	
Electrical specifications	EIA RS-485 compliant	
Communication method	2-wire system, half duplex, serial	
Synchronous method	Asynchronous	
Connection status	1 : N	
Max. no. of connections	32 units	
Communication distance	Max 1000m (at 38.4kbps or less), Max 250m (at 115.2kbps)	
Communication speed	9.6kbps, 19.2kbps, 38.4kbps, 115.2kbps	
Data format	Data length	8 bits
	Stop bit	1 bit
	Parity	None/Even/Odd (Selectable)
Transmission code	HEX value (Modbus RTU mode)	
Error detection	CRC-16	
Insulation	No insulation with loader communication port, CT input. Functional insulation with any other input/output.	

Loader Interface

Item	Specifications	
Electrical specifications	EIA RS232C	
Communication method	3-wire system, half duplex, serial	
Synchronous method	Asynchronous	
Connection status	1 : 1	
Station No.	1 to 16	
Communication speed	19.2kbps (Fixed)	
Data format	Data length	8 bits
	Stop bit	1 bit
	Parity	None (Fixed)
Transmission code	HEX value (Modbus RTU mode)	
Error detection	CRC-16	
Insulation	No insulation with RS-485, CT input. Functional insulation with any other input/output.	

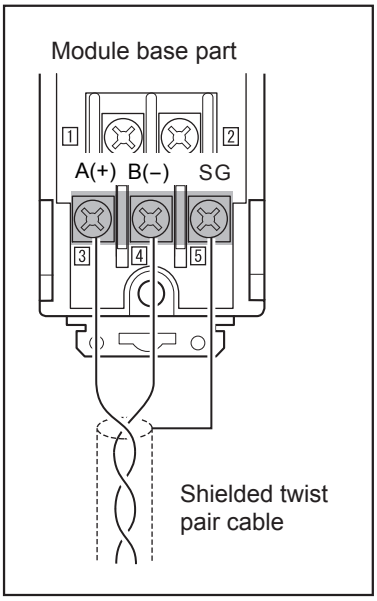
5.3 Connection

⚠ Warning

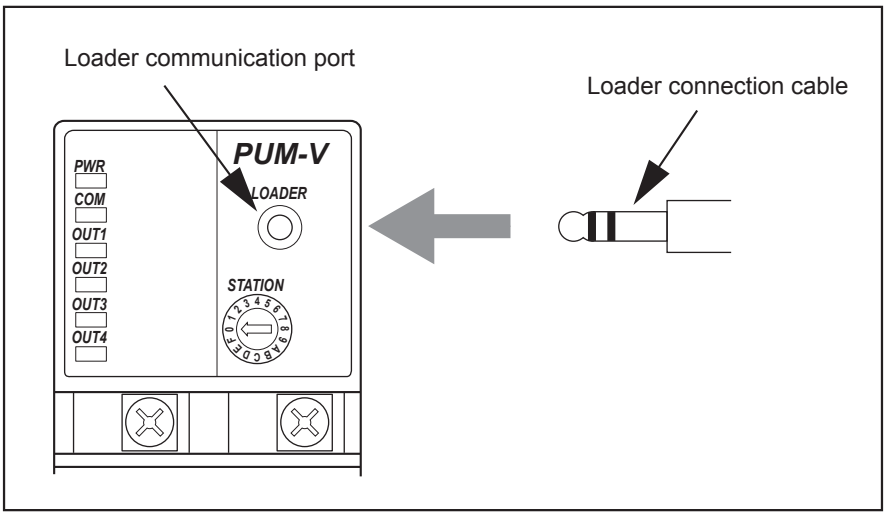
Do not turn on power until all of the wiring is completely finished.
There is a risk of electrical shock or damage.

Assignment of Communication Terminals

RS-485 (terminals on base part)

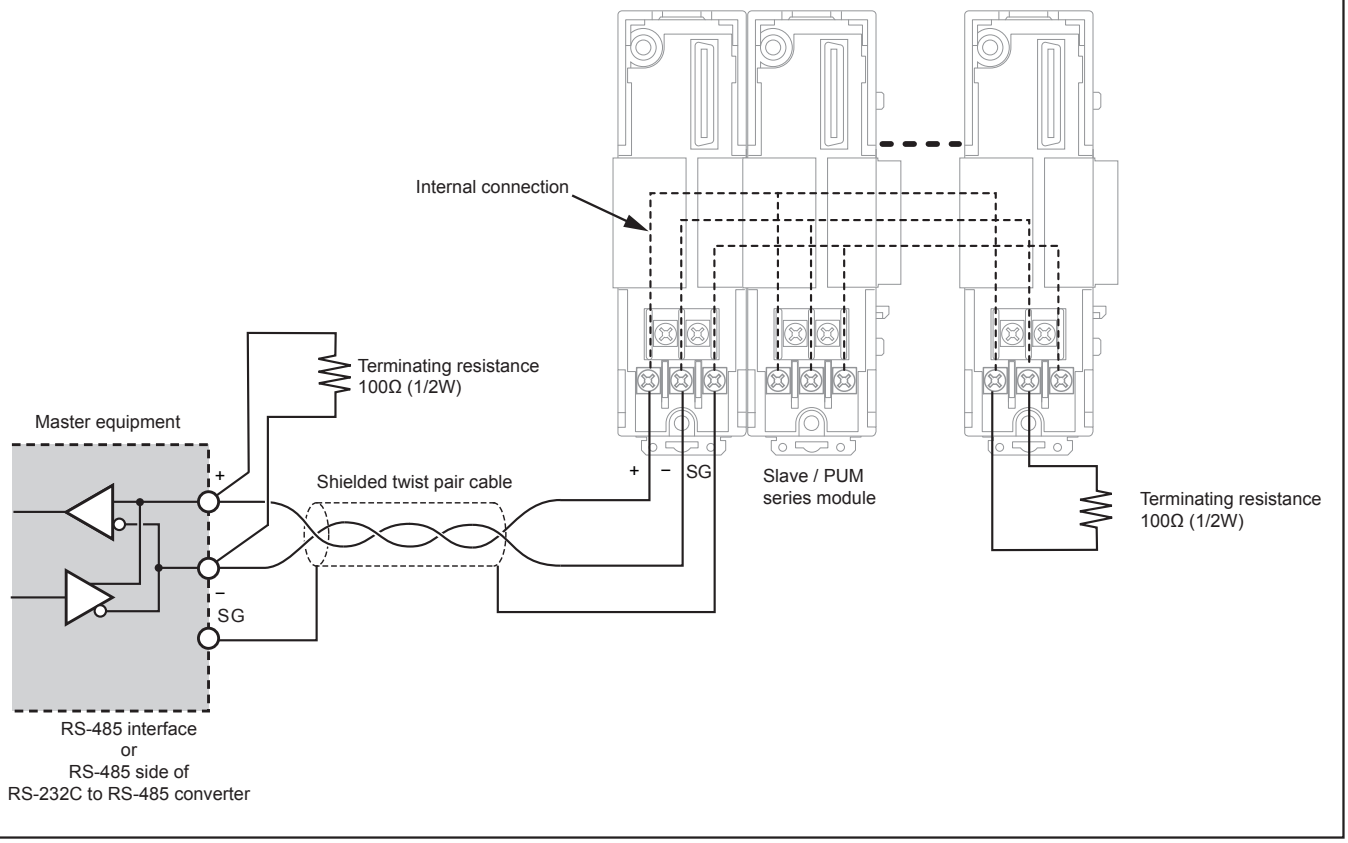


Loader interface (terminals on front face)



Connection with RS-485

- Please use a shielded twist pair cable. (Recommended cable: KPEV-SB 0.5sq (made by The Furukawa Electric Co., Ltd.))
- The maximum cable length should be 1000m at 38.4kbps or less, 250m at 115.2kbps. One master and up to thirty-two PUMs (slaves) can be connected per circuit.
- Terminate both ends of the circuit with a terminating resistance of 100Ω (1/2W or more).
- Ground the shielded cable once towards the master side.



- SG does not have to be connected, but it can be used as an effective countermeasure against communication errors due to noise.
- If there are problems with EMC during communication, the noise level can be reduced by using a communication cable with a ferrite core.

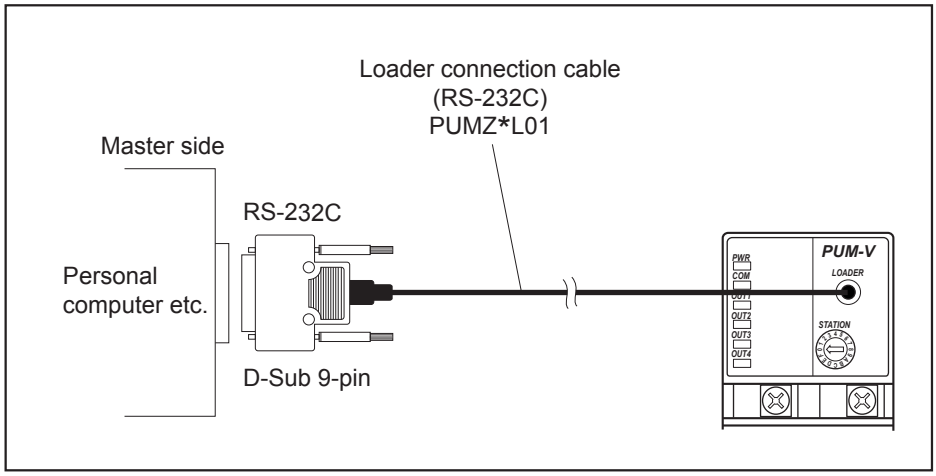
  Ferrite core (recommended):

  For communication cable : H04SR211132 made by Seiwa Electric MFG. or equivalent

  For power cable : E04SR241336A made by Seiwa Electric MFG. or equivalent

Connection with Loader Interface

• Use the loader communication cable (RS-232C) sold separately.



5.4 Setting Communication Parameters

The following settings are required for proper communication between the master and all slaves units (this eqipument).

- The communication parameters for the master and all of the units must be set the same.
- All of the slaves on a circuit must be set with different “Station No.” other than “0 (zero)”. (Multiple PUMs must not have the same “Station No.”.)

Setup Items for RS-485 (PUM Side)

Parameter (name)	Setup range	Factory default	Remarks
Station number	1 to 16	1	Setting value is [St. No. configuration switch + 1]
RS-485 Communication speed	0 (9.6kbps) 1 (19.2kbps) 2 (38.4kbps) 4 (115.2kbps)	1	“3” is forbidden.
RS-485 Parity setting	0 (None) 1 (Odd) 2 (Even)	0	
Data length	8 bits	–	Cannot be changed.
Stop bit	1 bit	–	Cannot be changed.
RS-485 Communication permittion	0: Read only 1: Read / Write	1	
RS-485 Response interval time	0 to 25	1	The response interval time can be set by set value x 20 ms.
Enhanced communication module (PUMC) connection	0: PUMC not connected (RS485 Enable) 1: PUMC connected (RS485 Disable)	0	Set at “0” for use of RS-485 communication.

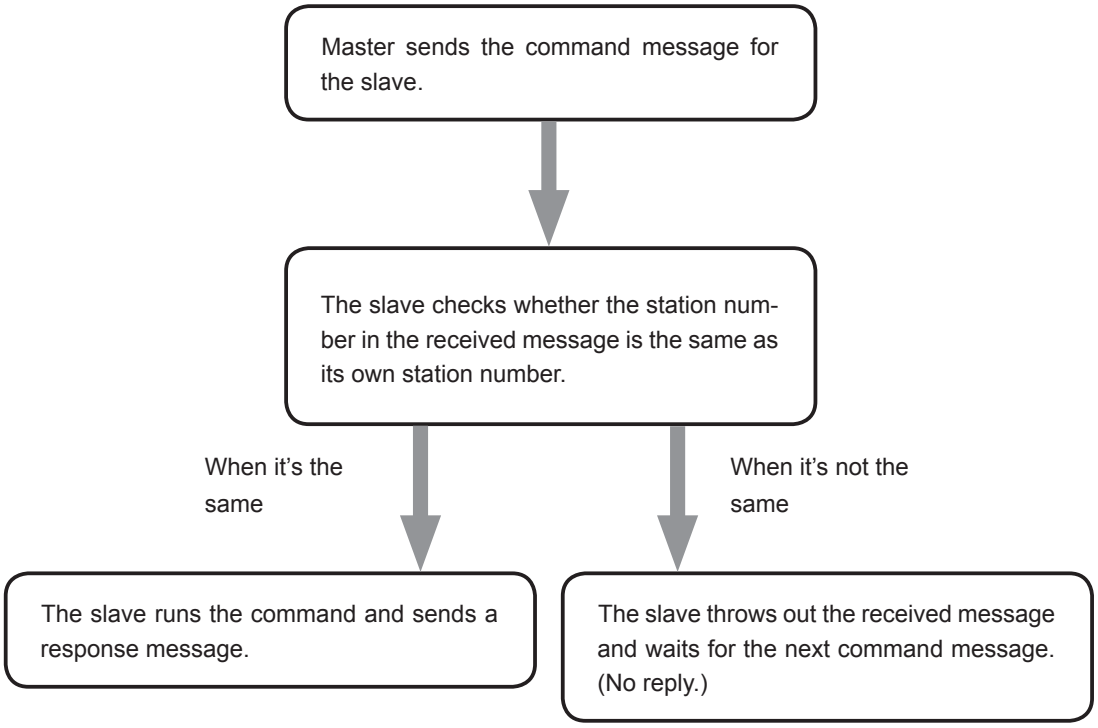
Setup Items on Loader Interface (PUM Side)

Parameter (name)	Setup range	Factory default	Remarks
Station number	0 to Fh (1 to 16)	1	Setting value is [St. No. configuration switch + 1]
Communication speed	19.2kbps (fixed)	–	Cannot be changed.
Data length	8 bits	–	Cannot be changed.
Parity	None	–	Cannot be changed.
Stop bit	1 bit	–	Cannot be changed.
Master/slave setting in connected modules	0 (Master) 1 (Slave)	1	Set one as the master and set others as slaves.

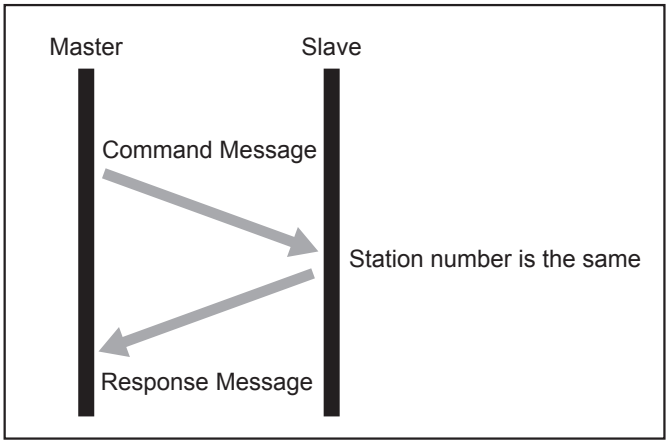
5.5 Modbus RTU Communication Protocol

The communication system with the MODBUS protocol always operates using a method where the master first sends a command message and the applicable slave replies with a response message.

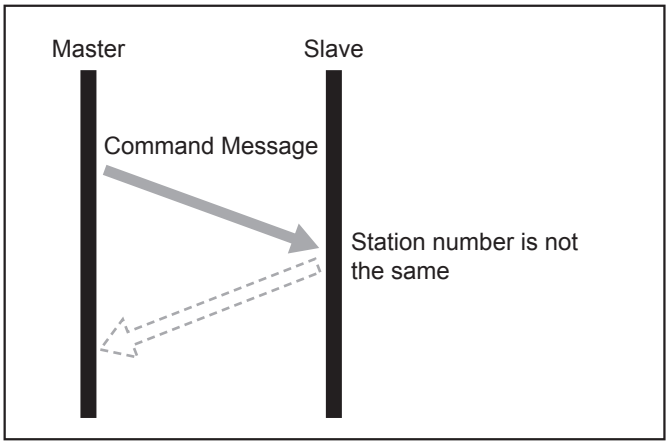
The following describes the communication steps.



When the station number in the command message is the same as the unit's station number



When the station number in the command message is not the same as the unit's station number



Point

The master can communicate with an individual slave when multiple slaves are connected on the same circuit by the station number specified in the master's command message.

Message Composition

The command message and response message are composed of four parts: the station number, function code, data part, and error check code. These four parts are sent in that order.

Field name	Number of bytes
Station No.	1 byte
Function code	1 byte
Data part	2 to 64 bytes
Error check code (CRC-16)	2 bytes

Station No.

This is the number specifying the slave. Commands can only be processed by slaves that have the same value set with St. No. configuration switch (setting position + 1) located on the terminal block on the front face .

Function Code

This code specifies the function for the slave to perform.

Data Part

This data is required to run the function code. The composition of the data part is different depending on the function code.

The data in the PUM is assigned a coil number or register number. This coil number or register number is specified when the data is read or written through communication.

The coil number or register number used by the message employs a relative address.

The relative address is calculated using the following formula.

Relative address = (last 4 digits of the coil number or register number) – 1

(Ex.) When a function code specifies register number “40003”

Relative address = (the last four digits of 40003) – 1

= 0002

is used in the message.

Error Check Code

This code detects whether there are errors (changes in the bits) during the signal transmission processes. MODBUS protocol (RTU mode) uses CRC-16 (Cyclic Redundancy Check).

Slave Response

- **Normal Slave Response**

  The slave creates and replies with a response message for each command message. The response message has the same format as the command message.

  The contents of the data part are different depending on the function code.

- **Irregular Slave Response**

  If there are problems (such as specification of a nonexistent function code) with the contents of the command message other than transmission error, the slave creates and replies with an error response message without following the command.

  The composition of the error response message uses the value of the function code in the command message plus 80H, as seen below.

Field name	Number of bytes
Station No.	1 byte
Function code + 80H	1 byte
Error Code	1 byte
Error check code (CRC-16)	2 bytes

The error code is shown as follows.

Error Code	Contents	Explanation
01H	Faulty function code	A nonexistent function code was specified. Please check the function code.
02H	Faulty address for coil or register	The specified relative address for the coil number or register number cannot be used by the specified function code.
03H	Faulty coil number, register number or data limit.	The specified number is too large and specifies a range that does not contain coil numbers or register numbers. Furthermore, the specified data value is beyond the limit that is set in the specified parameter.
06H	Busy state	Data is being written to the internal memory. Wait 100 msec or more before retrying communication.

- **No Response**

  In the following situations, the slave will ignore the command message and not send a response message.

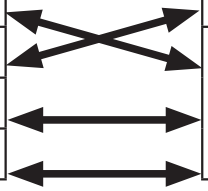
  - The station number specified by the command message is not the same as the slave's specified station number.
  - The error check code does not correspond, or a transmission error (such as parity error) is detected.
  - The interval between the data comprising the message is empty for more than 24 bit time.

Function Code

For MODBUS protocol, coil numbers or register numbers are assigned by the function code, and each function code only works for the assigned coil number or register number.

The correspondence between the function code and the coil number or register number is as follows.

Function Code			Coil Number, Register number	
Code	Function	Target	Number	Contents
03H	Read (continuous)	Hold register	3xxxx	Read word data
04H	Read (continuous)	Input register	4xxxx	Read /write word data
06H	Write	Hold register		
10H	Write (continuous)	Hold register		



The message length for each function is as follows.

Code	Contents	Assignable Data Number	Command Message		Response Message	
			Minimum	Maximum	Minimum	Maximum
03H	Read word data	32 words *	8 bytes	8 bytes	7 bytes	69 bytes
04H	Read word data (Read only)	32 words *	8 bytes	8 bytes	7 bytes	69 bytes
06H	Write word data	1 word	8 bytes	8 bytes	8 bytes	8 bytes
10H	Continuously write word data	32 words *	11 bytes	73 bytes	8 bytes	8 bytes

* : “Assignable Data Number” above is limited by the data number that the PUM assigned to the coil number or register number. (Excluding function code 06H).

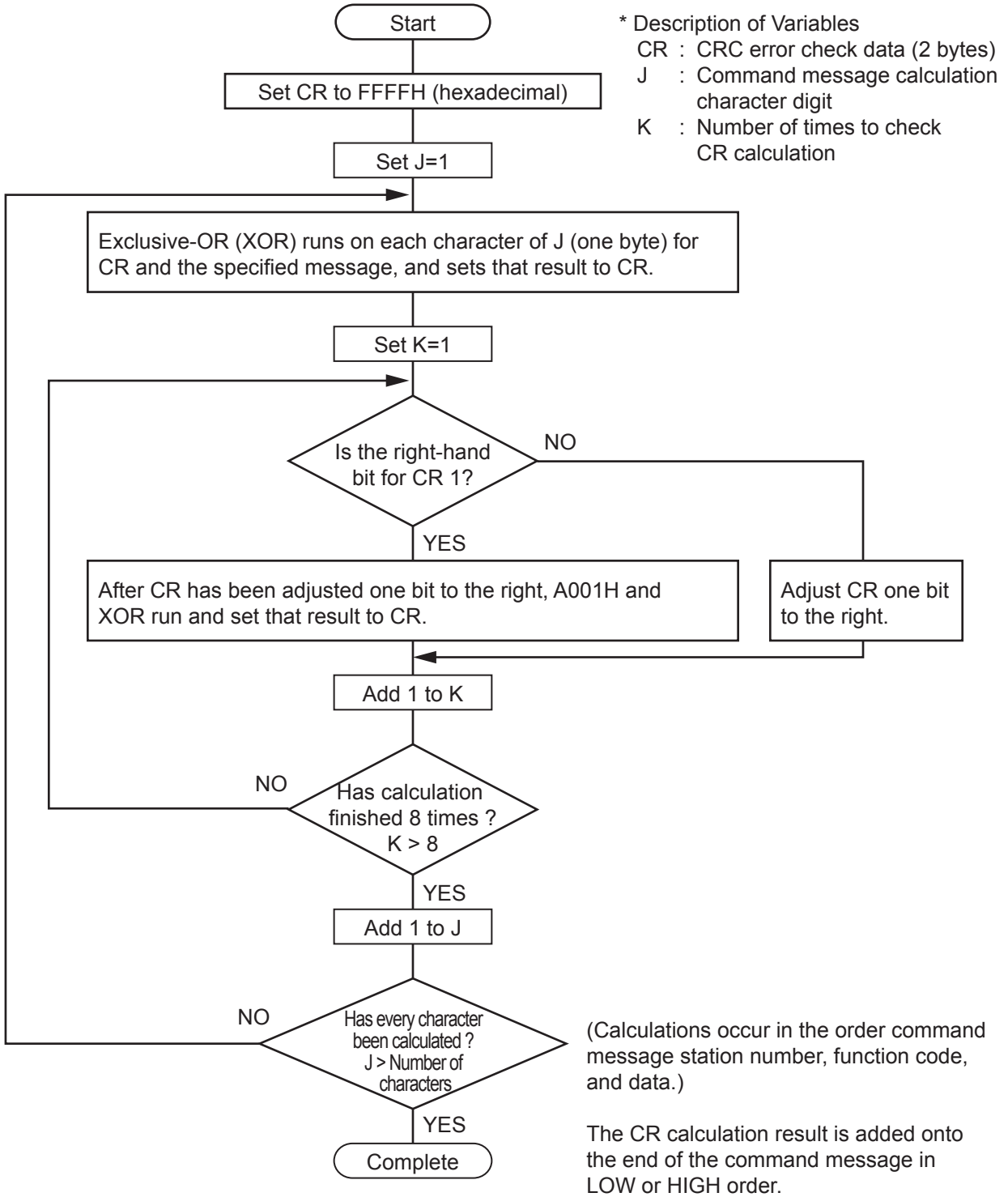
Calculating Error Check Code (CRC-16)

CRC-16 is a 2-byte (16-bit) error check code.

The calculation range extends from the start of the message (station number) to the end of the data part.

The slave calculates the CRC of the received message and ignores the message if this value is not the same as the received CRC code.

CRC-16 is calculated as follows.



Transmission Control Steps

Master Communication Method

Start communication from the master while following the rules below.

1. The command message, must be sent after an empty space of at least 48 bits time.
2. The interval between each byte in a command message should be less than 24 bits time.
3. After sending a command message, for less than 24 bits time the master will enter receiving standby.
4. After receiving the response message, the next command message must be sent after at least 48 bits time. (Similar to 1 above.)
5. For safety reasons, create a framework where the master checks the response message, and if there is no response or an error occurs, retry at least three times.

Note

The definitions written above are for the minimum required value. For safety reasons, we recommend creating a master side program that keeps margins two to three times as large. For a concrete example, with 19.2kbps, we recommend programming a blank state (1 above) of at least 10ms, and the interval between bytes (2 above) and switching time from sending to receiving (3 above) within 1 ms.

Frame Detection

This communication system uses a two-wire RS-485 interface, and the circuit can therefore enter one of the following two states.

- Empty state (no data on the circuit)
- Communication state (data running on the circuit)

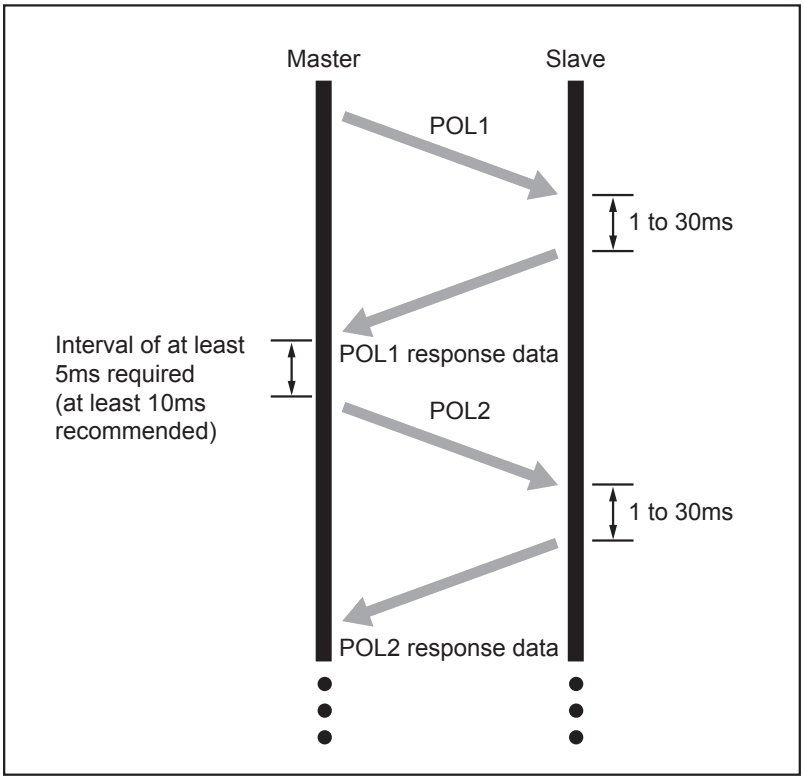
The units connected on the circuit start in receiving state and monitor the circuit. When a blank state appears on the circuit for at least 24 bits time, the unit detects the end of the previous frame, and within the next 24 bits time, enters receiving standby. When data appears on the circuit, the unit begins receiving data, and once another blank state of at least 24 bits time is detected, that frame is ended. In other words, the data on the circuit from the first time that a 24 bits time blank state appears to the second time one appears is loaded as one frame (a bundle of data). Therefore, one frame (command message) must be sent while following the rules below.

- Before sending the command message, leave an empty space of at least 48 bits time.
- The interval between each byte in a command message should be less than 24 bits time.

PUM Response

After the PUM detects the frame (detects blank states at least 24 bits time long), that frame is used to send a command message. When a command message is sent locally, the response message is returned, but the processing time is about 1 to 30 ms. (The time may change depending on the contents of the command message.) Therefore, one frame (command message) must be sent while following the rules below.

- After sending a command message, for less than 24 seconds the master will enter receiving standby.



5.6 Command and Transmission Frame Details

Reading Date

Reading Word Data (Function Code: 03H)

The unit reads word data continuously for the specified number of words from the first number to start reading from.

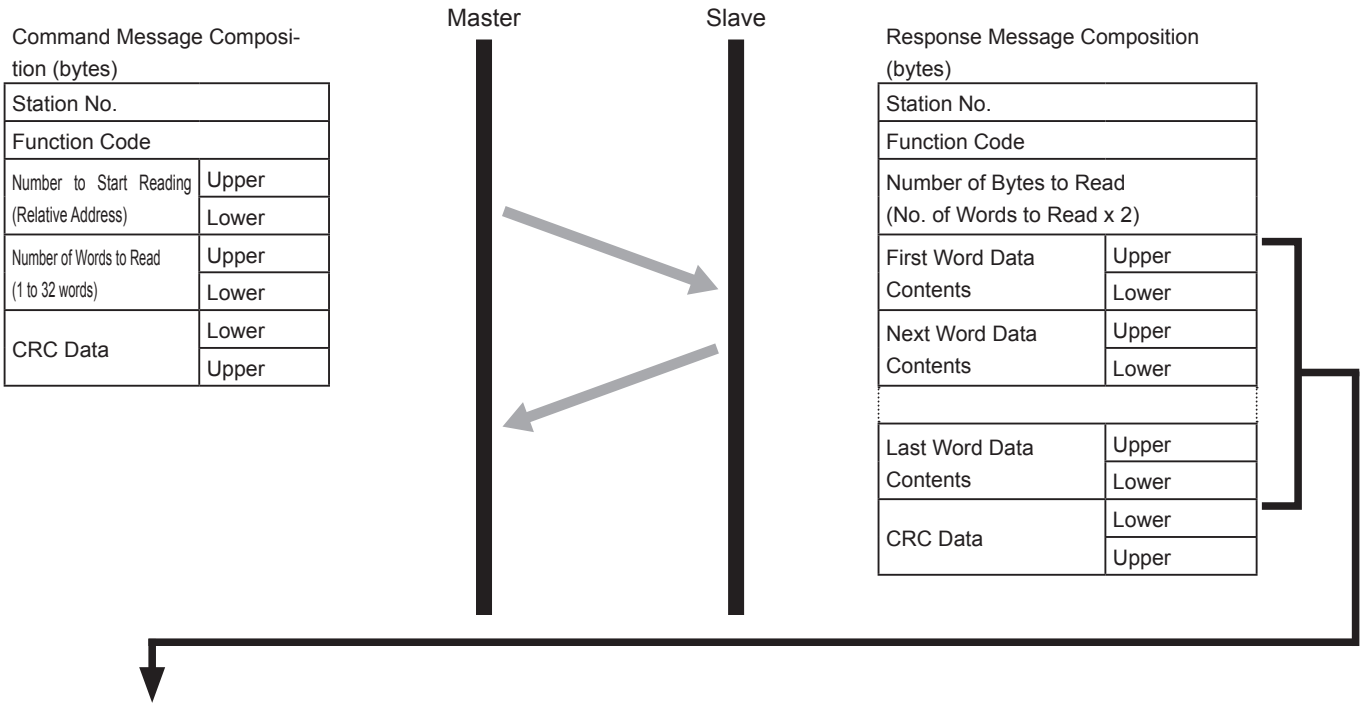
The slave forwards the read word data from the upper number of bytes to the lower number.

Note

- Specifying word data out of the relative address area when word data is read continuously results in no response.
- Do not write data to the numbers not listed on the MODBUS register numbers. (It might cause abnormal operation of this equipment)

Function Code	03H
Max. No. of Words to Read in One Message	32
Relative Address	0000H to 13A7H
Register Number	40001 to 45032

- **Message Composition**



Command Message Composition (bytes)

Station No.	
Function Code	
Number to Start Reading (Relative Address)	Upper
	Lower
Number of Words to Read (1 to 32 words)	Upper
	Lower
CRC Data	Lower
	Upper

Response Message Composition (bytes)

Station No.	
Function Code	
Number of Bytes to Read (No. of Words to Read x 2)	
First Word Data Contents	Upper
	Lower
Next Word Data Contents	Upper
	Lower
Last Word Data Contents	Upper
	Lower
CRC Data	Lower
	Upper

Meaning of Read Word Data

MSB	LSB
First Word Data Contents upper byte	
First Word Data Contents lower byte	
Next Word Data Contents upper byte	
Next Word Data Contents lower byte	
Last Word Data Contents upper byte	
Last Word Data Contents lower byte	

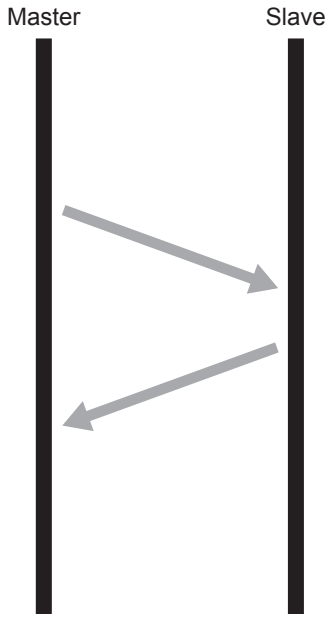
- **Example of Transmitting a Message**

  The message composition is as shown below in case of readout of Analog input lower limit and Analog input upper limit from Ch1 of station number 2.

  - **Relative Address of "Analog input Lower Limit Relative Address" : 04BBH**

Command Message (bytes)

Station No.		02H
Function Code		03H
Number to Start Reading (Relative Address)	Upper	04H
	Lower	BBH
Number of Words to Read	Upper	00H
	Lower	02H
CRC Data	Lower	2DH
	Upper	B5H



Response Message (bytes)

Station No.		02H
Function Code		03H
Number of Bytes to Read		04H
First Word Data Contents	Upper	00H
	Lower	00H
Next Word Data Contents	Upper	0FH
	Lower	A0H
CRC Data	Lower	BBH
	Upper	CCH

Meaning of Read Data

Analog Input Lower Limit 0000H = 0

Analog Input Upper Limit 0FA0H = 4000

If decimal Point Position = 0, then the Analog input upper limit and lower limit are as follows.

Analog Input Lower Limit = 0.0 °C

Analog Input Upper Limit = 400.0 °C

Point

The decimal point cannot be included in transmission data, so data such as [400.0] is transmitted as [4000].

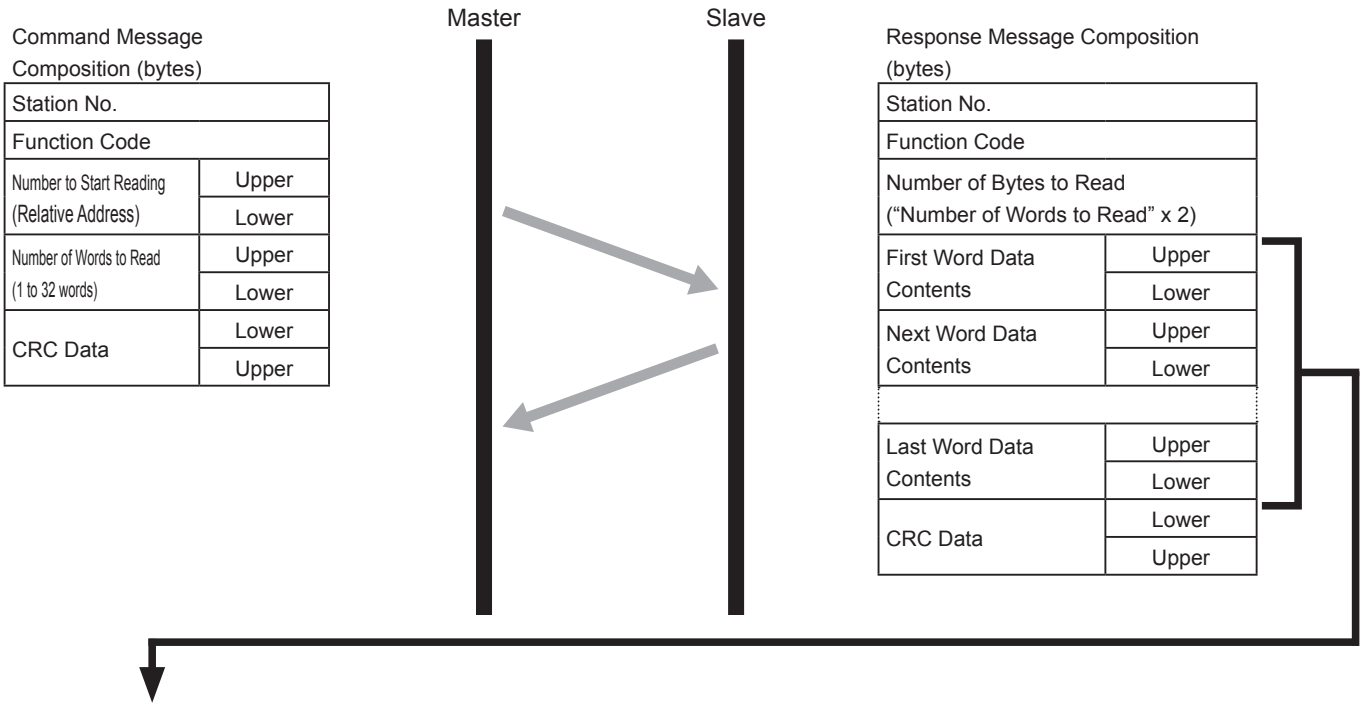
Reading Read-Only Word Data (Function Code: 04H)

The unit reads word data continuously for the specified number of words from the first number to start reading from.

The slave forwards the read word data from the upper number of bytes to the lower number.

Function Code	04H
Max. Number of Words to Read in One Message	32
Relative Address	0000H to 0FDGH
Register Number	30001 to 34061

- **Message Composition**



Command Message Composition (bytes)

Station No.	
Function Code	
Number to Start Reading (Relative Address)	Upper
	Lower
Number of Words to Read (1 to 32 words)	Upper
	Lower
CRC Data	Lower
	Upper

Response Message Composition (bytes)

Station No.	
Function Code	
Number of Bytes to Read (“Number of Words to Read” x 2)	
First Word Data Contents	Upper
	Lower
Next Word Data Contents	Upper
	Lower
Last Word Data Contents	Upper
	Lower
CRC Data	Lower
	Upper

Meaning of Read Word Data

MSB	LSB
First Word Data Contents upper byte	
First Word Data Contents lower byte	
Next Word Data Contents upper byte	
Next Word Data Contents lower byte	
Last Word Data Contents upper byte	
Last Word Data Contents lower byte	

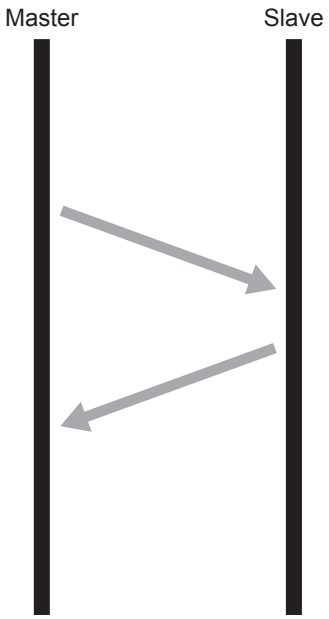
- **Example of Transmitting a Message**

  The message composition is as shown below in case of readout of Analog input value from Ch1 of station number 1.

  - **Relative address of “Analog input value” : 0001H, Number of data:01H**

Command Message (bytes)

Station No.		01H
Function Code		04H
Number to Start Reading (Relative Address)	Upper	00H
	Lower	01H
Number of Words to Read	Upper	00H
	Lower	01H
CRC Data	Lower	0AH
	Upper	60H



Response Message (bytes)

Station No.		01H
Function Code		04H
Number of Bytes to Read		02H
First Word Data Contents	Upper	01H
	Lower	4FH
CRC Data	Lower	7DH
	Upper	00H

Meaning of Read Data

Word Data Contents 014FH=335

In case decimal point position = 1;

Analog Input = 33.5 °C

Writing Data

Writing word Data (1 word, function code: 06H)

This writes the specified data to the specified number for word data. The master sends the data to be written from the upper number of bytes to the lower number.

Function Code	06H
Max. Number of Words to Write in One Message	1
Relative Address	0000H to 13A7H
Register Number	40001 to 45032

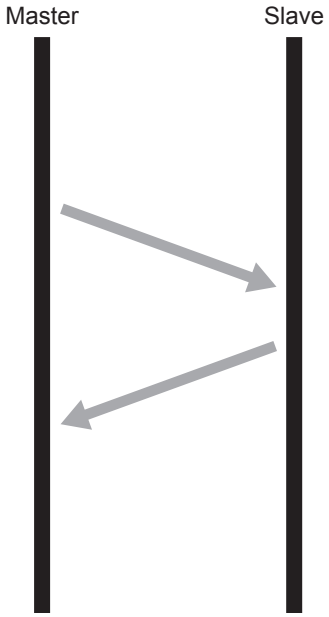
Caution

Do not write data to a address (register number) that is not described in MODBUS address map. (It may cause the malfunction.)

- **Message Composition**

Command Message Composition (bytes)

Station No.	
Function Code	
Specified Write Number (Relative Address)	Upper
	Lower
Word Date to Write	Upper
	Lower
CRC Data	Lower
	Upper



Response Message Composition (bytes)

Station No.	
Function Code	
Specified Write Number (Relative Address)	Upper
	Lower
Word Date to Write	Upper
	Lower
CRC Data	Lower
	Upper

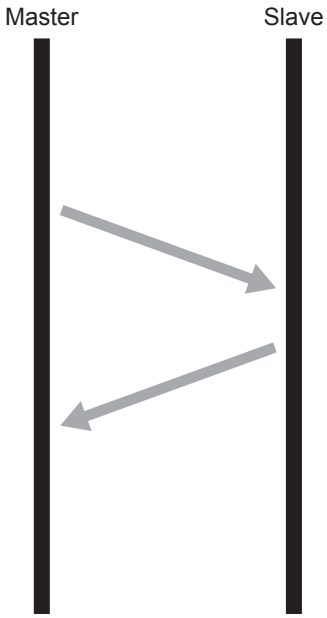
- **Example of Transmitting a Message**

  A case where parameter "internal analog output field" of Ch1 of station number 1 is set as 50.0 is described below as an example.

  - **Relative address of "internal analog output field": 00FAH**

Command Message (bytes)

Station No.		01H
Function Code		06H
Specified Write Number (Relative Address)	Upper	00H
	Lower	FAH
Word Data to Write	Upper	01H
	Lower	F4H
CRC Data	Lower	A9H
	Upper	ECH



Response Message (bytes)

Station No.		01H
Function Code		06H
Specified Write Number (Relative Address)	Upper	00H
	Lower	FAH
Word Data to Write	Upper	01H
	Lower	F4H
CRC Data	Lower	A9H
	Upper	ECH

Writing Continuous Word Data (function code: 10H)

This writes continuous word information for a number of written words from the first number for writing.

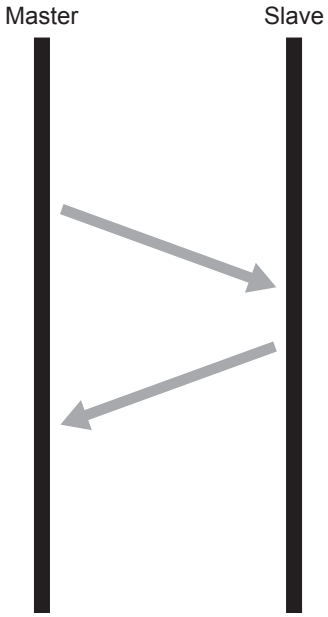
The master sends the data to be written from the upper number of bytes to the lower number.

Function Code	10H
Max. Number of Words to Write in One Message	32
Relative Address	0000H to 13A7H
Register Number	40001 to 45032

- **Message Composition**

Command Message Composition (bytes)

Station No.		
Function Code		
Specified Write Number (Relative Address)	Upper	
	Lower	
Number of words to write	Upper	1 to 32
	Lower	
Number of Bytes to Write		Number of Words to Write × 2
First Word Data to Write	Upper	
	Lower	
Next Word Data to Write	Upper	
	Lower	
Last Word Data to Write	Upper	
	Lower	
CRC Data	Lower	
	Upper	



Response Message Composition (bytes)

Station No.	
Function Code	
Specified Write Number (Relative Address)	Upper
	Lower
Number of words to write	Upper
	Lower
CRC Data	Lower
	Upper

- **Example of Transmitting a Message**

  The message composition is as indicated below in case of write of the following parameters to Ch1 of station number 1.

  Output Type 5 (=0005H)

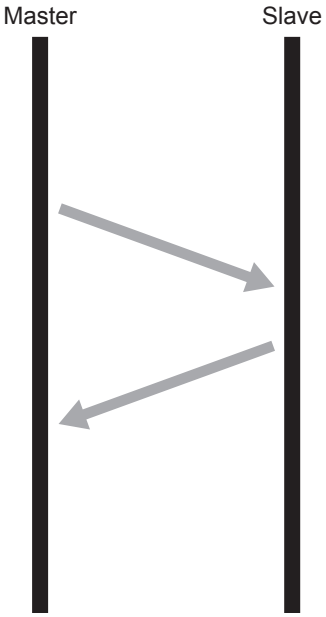
  Output Master St. 2 (=0002H)

  Output Master Ch. 1 (=0001H)

- **Relative address of parameter: 070AH, No. of data: 03H**

Command Message Composition (bytes)

Station No.		01H
Function Code		10H
Specified Write Number (Relative Address)	Upper	07H
	Lower	0AH
Number of words to write	Upper	00H
	Lower	03H
Number of Bytes to Write		06H
First Word Data to Write	Upper	00H
	Lower	05H
Next Word Data to Write	Upper	00H
	Lower	02H
Last Word Data to Write	Upper	00H
	Lower	01H
CRC Data	Lower	70H
	Upper	D4H



Response Message Composition (bytes)

Station No.		01H
Function Code		10H
Specified Write Number (Relative Address)	Upper	07H
	Lower	0AH
Number of words to write	Upper	00H
	Lower	03H
CRC Data	Lower	A1H
	Upper	7EH

Point

The decimal point cannot be included in transmission data, so data such as [100.0] is transmitted as [1000].

Do not write data to a address (register number) that is not described in MODBUS address map. (It may cause the malfunction.)

5.7 Address Map and Data Format

Register numbers of control module readout/write data set values are shown in the table below.

About if the analog I/O module, analog input module or analog output module has parameter or not is shown in the "Parameter (Aio/Ai/Ao)" columns.

Operation Parameters

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
RUN/Standby switch	0: RUN 1:Standby		0 (RUN)	40017 41004	40018 42004	40019 43004	40020 44004	○	○	○
Internal analog output field	-327.6 to 327.6%		0	40251	40252	40253	40254	○	×	○
Digital output latch release command	0: OFF 1: Release latch		0 (OFF)	41031	42031	43031	44031	○	○	×
ALM1 set value 1	-100 to 100%FS	○	2.5%FS	41033	42033	43033	44033			
ALM1 set value 2	-100 to 100%FS	○	2.5%FS	41034	42034	43034	44034			
ALM2 set value 1	-100 to 100%FS	○	2.5%FS	41041	42041	43041	44041			
ALM2 set value 2	-100 to 100%FS	○	2.5%FS	41042	42042	43042	44042			
ALM3 set value 1	-100 to 100%FS	○	2.5%FS	41049	42049	43049	44049			
ALM3 set value 2	-100 to 100%FS	○	2.5%FS	41050	42050	43050	44050			
ALM4 set value 1	-100 to 100%FS	○	2.5%FS	41057	42057	43057	44057			
ALM4 set value 2	-100 to 100%FS	○	2.5%FS	41058	42058	43058	44058			
ALM5 set value 1	-100 to 100%FS	○	2.5%FS	41065	42065	43065	44065			
ALM5 set value 2	-100 to 100%FS	○	2.5%FS	41066	42066	43066	44066			

Setup Parameters

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
Analog input type	0: Not selectable 1: Not selectable 2: Pt100 (0 to 150 °C) 3: Pt100 (-150 to 300 °C) 4: Pt100 (-150 to 850 °C) 5: J (0 to 400 °C) 6: J (0 to 800 °C) 7: K (0 to 400 °C) 8: K (0 to 800 °C) 9: K (0 to 1200 °C) 10: R (0 to 1600 °C) 11: B (0 to 1800 °C) 12: S (0 to 1600 °C) 13: T (-199 to 400 °C) 14: E (-199 to 800 °C) 18: N (0 to 1300 °C) 19: PL-2 (0 to 1300 °C) 21: Voltage (0 to 5V) 22: Voltage (1 to 5V) 23: Voltage (0 to 10V) 24: Voltage (2 to 10V)		7 (TC/Pt) 22 (VI)	40151 41029	40152 42029	40153 43029	40154 44029	○	○	×
Analog input scale lower	-1999 to 9999		0%FS	41212	42212	43212	44212			
Analog input scale upper	-1999 to 9999		100%FS	41213	42213	43213	44213			
Decimal place	0: No decimal point 1: One decimal place 2: Two decimal places		0 (TC/Pt) 1 (VI)	41214	42214	43214	44214			
Temperature unit	0: Degree C 1: Degree F		0 (degree C)	41215	42215	43215	44215			
Analog input shift	-10 to 10%FS	○	0	41216	42216	43216	44216			
Analog input filter	0.0 to 120.0sec		2.0	41220	42220	43220	44220			
Analog input display zero adjustment	-50 to 50%FS	○	0	41221	42221	43221	44221			
Analog input display span adjustment	-50 to 50%FS	○	0	41222	42222	43222	44222			
Cold junction compensation	0: OFF 1: ON		1 (ON)	41223	42223	43223	44223			
Analog output Lower limits	-25.0 to 125.0%		-3.0	41255	42255	43255	44255	○	×	○
Analog output Upper limits	-25.0 to 125.0%		103.0	41256	42256	43256	44256			
Standby Analog output set value	-3.0 to 103.0%		-3.0	41268	42268	43268	44268			
Standby mode setting	0: ALM=OFF 1: ALM=ON		0 (ALM=OFF)	41270	42270	43270	44270	○	○	×
Linkage operation master Station No.	0 to 255		0	41536	42536	43536	44536	○	○	○
Linkage operation master Ch. No.	1 to 4		Each Ch.	41537	42537	43537	44537			

System Parameters

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
Current output range	4: 0 to 20mA 5: 4 to 20mA		5 (4-20mA)	40166 41801	40167 42801	40168 43801	40169 44801	○	×	○
Output type	0: Ai of own station 1: Output 0% 2: Output 0% 3: Output 0% 4: Internal analog output field 5: PV of other stations 6: SV of other stations 7: MV of other stations		3 (Output 0%)	40171 41803	40177 42803	40183 43803	40189 44803			
Output master Station No.	0 to 255 stations		0	40172 41804	40178 42804	40184 43804	40190 44804			
Output master Ch. No.	1 to 4Ch		Each Ch.	40173 41805	40179 42805	40185 43805	40191 44805			
Output scaling base	-100.0 to 100.0%		0.0	40175 41807	40181 42807	40187 43807	40193 44807			
Output scaling span	-100.0 to 1000.0%		100.0	40174 41806	40180 42806	40186 43806	40192 44806			
Output shutdown	0000 to 1111 bit0 : Output 1 shutdown bit1 : Output 2 shutdown bit2 : Output 3 shutdown bit3 : Output 4 shutdown		0000	40201						

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
DI-1 function select	O: No function 1: Run/Standby switch 2: No function 3: No function 4: No function 5: No function 6: No function 7: No function 8: No function 9: No function 10: No function 11: No function 12: No function 13: No function 14: No function 15: No function 16: No function 17: Latch release (all) 18: Latch release (DO1) 19: Latch release (DO2) 20: Latch release (DO3) 21: Latch release (DO4) 22: Latch release (DO5) 23: No function 24: No function 25: No function 26: Start timer (DO1) 27: Start timer (DO2) 28: Start timer (DO3) 29: Start timer (DO4) 30: Start timer (DO5) 31: No function 32: No function 33: No function 34: No function 35: No function 36: No function 37: No function 38: No function 39: No function 40: No function 41: No function 42: No function 43: No function 44: No function 45: No function 46: No function 47: No function 48: No function 49: Output 1 shutdown 50: Output 2 shutdown 51: Output 3 shutdown 52: Output 4 shutdown		0	41013	42013	43013	44013	○	○	○

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
DI-2 function select	0 to 52		0	41014	42014	43014	44014	○	○	○
DI-3 function select	0 to 52		0	41015	42015	43015	44015			
DI-4 function select	0 to 52		0	41016	42016	43016	44016			
DI-5 function select	0 to 52		0	41017	42017	43017	44017			
DI-6 function select	0 to 52		0	41018	42018	43018	44018			
DI-7 function select	0 to 52		0	41019	42019	43019	44019			
DI-8 function select	0 to 52		0	41020	42020	43020	44020			
DI-9 function select	0 to 52		0	41021	42021	43021	44021			
DI-10 function select	0 to 52		0	41022	42022	43022	44022			
DI-11 function select	0 to 52		0	41023	42023	43023	44023			
DI-12 function select	0 to 52		0	41024	42024	43024	44024			
DI-13 function select	0 to 52		0	41025	42025	43025	44025			
DI-14 function select	0 to 52		0	41026	42026	43026	44026			
DI-15 function select	0 to 52		0	41027	42027	43027	44027			
DI-16 function select	0 to 52		0	41028	42028	43028	44028			
DI master Station setting	0 to 255		0	41011	42011	43011	44011			
DO1 output event type setting	0 to 102		0	41032	42032	43032	44032	○	○	×
DO1 option function setting	0 to 15 (bit data : 0000 to 1111) bit 0: Alarm latch function bit 1: Error input alarm function bit 2: Non-excitation output function bit 3: Hold reset function		0000	41036	42036	43036	44036			
DO2 output event type setting	0 to 102		0	41040	42040	43040	44040			
DO2 option function setting	0 to 15 (bit data : 0000 to 1111) bit 0: Alarm latch function bit 1: Error input alarm function bit 2: Non-excitation output function bit 3: Hold reset function		0000	41044	42044	43044	44044			
DO3 output event type setting	0 to 102		0	41048	42048	43048	44048			
DO3 option function setting	0 to 15 (bit data : 0000 to 1111) bit 0: Alarm latch function bit 1: Error input alarm function bit 2: Non-excitation output function bit 3: Hold reset function		0000	41052	42052	43052	44052			
DO4 output event type setting	0 to 102		0	41056	42056	43056	44056			
DO4 option function setting	0 to 15 (bit data : 0000 to 1111) bit 0: Alarm latch function bit 1: Error input alarm function bit 2: Non-excitation output function bit 3: Hold reset function		0000	41060	42060	43060	44060			
DO5 output event type setting	0 to 102		0	41064	42064	43064	44064			
DO5 option function setting	0 to 15 (bit data : 0000 to 1111) bit 0: Alarm latch function bit 1: Error input alarm function bit 2: Non-excitation output function bit 3: Hold reset function		0000	41068	42068	43068	44068			
Mode at startup	0: Auto mode 1: Standby 2: Standby 3: Standby		0 (Auto mode)	41304	42304	43304	44304	○	○	○

Alarm Parameter

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
ALM1 hysteresis	0 to 50%FS	○	0.25%FS	41035	42035	43035	44035	○	○	×
ALM1 delay time	0 to 99min.59sec. /0 to 99hr.59min.		0	41037	42037	43037	44037			
ALM1 delay time units	0: sec. 1: min.		0 (Second)	41038	42038	43038	44038			
ALM2 hysteresis	0 to 50%FS	○	0.25%FS	41043	42043	43043	44043			
ALM2 delay time	0 to 99min.59sec. /0 to 99hr.59min.		0	41045	42045	43045	44045			
ALM2 delay time units	0: sec. 1: min.		0 (Second)	41046	42046	43046	44046			
ALM3 hysteresis	0 to 50%FS	○	0.25%FS	41051	42051	43051	44051			
ALM3 delay time	0 to 99min.59sec. /0 to 99hr.59min.		0	41053	42053	43053	44053			
ALM3 delay time units	0: sec. 1: min.		0 (Second)	41054	42054	43054	44054			
ALM4 hysteresis	0 to 50%FS	○	0.25%FS	41059	42059	43059	44059			
ALM4 delay time	0 to 99min.59sec. /0 to 99hr.59min.		0	41061	42061	43061	44061			
ALM4 delay time units	0: sec. 1: min.		0 (Second)	41062	42062	43062	44062			
ALM5 hysteresis	0 to 50%FS	○	0.25%FS	41067	42067	43067	44067			
ALM5 delay time	0 to 99min.59sec. /0 to 99hr.59min.		0	41069	42069	43069	44069			
ALM5 delay time units	0: sec. 1: min.		0 (Second)	41070	42070	43070	44070			
Object Ch. No. for interchannel ALM1	1 to 4		1	41039	42039	43039	44039			
Object Ch. No. for interchannel ALM2	1 to 4		1	41047	42047	43047	44047			
Object Ch. No. for interchannel ALM3	1 to 4		1	41055	42055	43055	44055			
Object Ch. No. for interchannel ALM4	1 to 4		1	41063	42063	43063	44063			
Object Ch. No. for interchannel ALM5	1 to 4		1	41071	42071	43071	44071			

Communication Parameters

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
RS-485 Parity setting	0: NONE 1: ODD 2: EVEN		0	40111				○	○	○
RS-485 Communication speed	0: 9.6kbps 1: 19.2kbps 2: 38.4kbps 3: Forbidden 4: 115.2kbps		1	40115						
RS-485 Communication permission	0: Read only 1: Read/Write		1 (R/W)	40114						
RS-485 Response interval time	0 to 25 (20ms/1digit)		0	40113						
Enhanced communication module (PUMC) connection permission	0: PUMC not connected (RS-485 Enable) 1: PUMC connected (RS-485 Disable)		0 (RS-485 valid)	40116						
Master/slave setting in connected modules	0: Master 1: Slave		1 (Slave)	40117						
User address 01	30000 to 49999		30002(Ai1)	40301						
User address 02	30000 to 49999		30002(Ai1)	40302						
User address 03	30000 to 49999		30002(Ai1)	40303						
User address 04	30000 to 49999		30002(Ai1)	40304						
User address 05	30000 to 49999		30002(Ai1)	40305						
User address 06	30000 to 49999		30002(Ai1)	40306						
User address 07	30000 to 49999		30002(Ai1)	40307						
User address 08	30000 to 49999		30002(Ai1)	40308						
User address 09	30000 to 49999		30002(Ai1)	40309						
User address 10	30000 to 49999		30002(Ai1)	40310						
User address 11	30000 to 49999		30002(Ai1)	40311						
User address 12	30000 to 49999		30002(Ai1)	40312						
User address 13	30000 to 49999		30002(Ai1)	40313						
User address 14	30000 to 49999		30002(Ai1)	40314						
User address 15	30000 to 49999		30002(Ai1)	40315						
User address 16	30000 to 49999		30002(Ai1)	40316						
User address 17	30000 to 49999		30002(Ai1)	40317						
User address 18	30000 to 49999		30002(Ai1)	40318						
User address 19	30000 to 49999		30002(Ai1)	40319						
User address 20	30000 to 49999		30002(Ai1)	40320						
User address 21	30000 to 49999		30002(Ai1)	40321						
User address 22	30000 to 49999		30002(Ai1)	40322						
User address 23	30000 to 49999		30002(Ai1)	40323						
User address 24	30000 to 49999		30002(Ai1)	40324						
User address 25	30000 to 49999		30002(Ai1)	40325						
User address 26	30000 to 49999		30002(Ai1)	40326						
User address 27	30000 to 49999		30002(Ai1)	40327						
User address 28	30000 to 49999		30002(Ai1)	40328						
User address 29	30000 to 49999		30002(Ai1)	40329						
User address 30	30000 to 49999		30002(Ai1)	40330						
User address 31	30000 to 49999		30002(Ai1)	40331						
User address 32	30000 to 49999		30002(Ai1)	40332						

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
User data 01	Depends on “User address 01”		—	45001				○	○	○
User data 02	Depends on “User address 02”		—	45002						
User data 03	Depends on “User address 03”		—	45003						
User data 04	Depends on “User address 04”		—	45004						
User data 05	Depends on “User address 05”		—	45005						
User data 06	Depends on “User address 06”		—	45006						
User data 07	Depends on “User address 07”		—	45007						
User data 08	Depends on “User address 08”		—	45008						
User data 09	Depends on “User address 09”		—	45009						
User data 10	Depends on “User address 10”		—	45010						
User data 11	Depends on “User address 11”		—	45011						
User data 12	Depends on “User address 12”		—	45012						
User data 13	Depends on “User address 13”		—	45013						
User data 14	Depends on “User address 14”		—	45014						
User data 15	Depends on “User address 15”		—	45015						
User data 16	Depends on “User address 16”		—	45016						
User data 17	Depends on “User address 17”		—	45017						
User data 18	Depends on “User address 18”		—	45018						
User data 19	Depends on “User address 19”		—	45019						
User data 20	Depends on “User address 20”		—	45020						
User data 21	Depends on “User address 21”		—	45021						
User data 22	Depends on “User address 22”		—	45022						
User data 23	Depends on “User address 23”		—	45023						
User data 24	Depends on “User address 24”		—	45024						
User data 25	Depends on “User address 25”		—	45025						
User data 26	Depends on “User address 26”		—	45026						
User data 27	Depends on “User address 27”		—	45027						

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
User data 28	Depends on “User address 28”		—	45028				○	○	○
User data 29	Depends on “User address 29”		—	45029						
User data 30	Depends on “User address 30”		—	45030						
User data 31	Depends on “User address 31”		—	45031						
User data 32	Depends on “User address 32”		—	45032						

Configuration Parameters

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
LED2 Lamp Allocation	0 to 255		1	40222				○	○	○
LED3 Lamp Allocation	0 to 255		12	40223						
LED4 Lamp Allocation	0 to 255		13	40224						
LED5 Lamp Allocation	0 to 255		14	40225						
LED6 Lamp Allocation	0 to 255		15	40226						
Reset main unit	0: Do nothing 1: Reset main unit		0	40101						

Monitor Parameters

Content	Readout/write data setting range	Depends on input range	Factory-set value	Register No. 1 (Ch1)	Register No. 2 (Ch2)	Register No. 3 (Ch3)	Register No. 4 (Ch4)	Parameter		
								Aio	Ai	Ao
System time	0 to 65535		—	30001				○	○	×
Input value (Ai)	–5 to 105%FS		—	30002 31001	30003 32001	30004 33001	30005 34001			
RCJ temp	–3276.7 to 3276.7 °C		—	30110 31016	30111 32016	30112 33016	30113 34016			
Error source display	0000 to FFFF		—	31008	32008	33008	34008			
Alarm 1-5 status	0000 to 001F		—	31007	32007	33007	34007			
Event input status	0000 to FFFF		—	31061	32061	33061	34061			
Remaining time on timer 1	0 to 99min.59sec. /0 to 99hr.59min.		—	31011	32011	33011	34011			
Remaining time on timer 2	0 to 99min.59sec. /0 to 99hr.59min.		—	31012	32012	33012	34012			
Remaining time on timer 3	0 to 99min.59sec. /0 to 99hr.59min.		—	31013	32013	33013	34013			
Remaining time on timer 4	0 to 99min.59sec. /0 to 99hr.59min.		—	31014	32014	33014	34014			
Remaining time on timer 5	0 to 99min.59sec. /0 to 99hr.59min.		—	31015	32015	33015	34015			
Output value (Ao)	–3.0 to 103.0%		—	30120	30121	30122	30123	○	×	○
RS-485 Communication permission	0: Read only 1: Read/Write		—	30062				○	○	○

Order of Register Numbers

Content	Register number	Relative address
Ch1 RUN/Standby switch	40017	0010h
Ch2 RUN/Standby switch	40018	0011h
Ch3 RUN/Standby switch	40019	0012h
Ch4 RUN/Standby switch	40020	0013h
Ch1 Communication SV value	40023	0016h
Ch2 Communication SV value	40024	0017h
Ch3 Communication SV value	40025	0018h
Ch4 Communication SV value	40026	0019h
Reset main unit	40101	0064h
RS-485 Parity setting	40111	006Eh
RS-485 Response interval time	40113	0070h
RS-485 Communication permission	40114	0071h
RS-485 Communication speed	40115	0072h
Enhanced communication module (PUMC) connection	40116	0073h
Master/slave setting in connected modules	40117	0074h
Ch1 Analog input type	40151	0096h
Ch2 Analog input type	40152	0097h
Ch3 Analog input type	40153	0098h
Ch4 Analog input type	40154	0099h
OUT1 Current output range	40166	00A5h
OUT2 Current output range	40167	00A6h
OUT3 Current output range	40168	00A7h
OUT4 Current output range	40169	00A8h
OUT1 Output type	40171	00AAh
OUT1 Output master St. No.	40172	00ABh
OUT1 Output master Ch. No.	40173	00ACh
OUT1 Output scaling span	40174	00ADh
OUT1 Output scaling base	40175	00AEh
OUT2 Output type	40177	00B0h
OUT2 Output master St. No.	40178	00B1h
OUT2 Output master Ch. No.	40179	00B2h
OUT2 Output scaling span	40180	00B3h
OUT2 Output scaling base	40181	00B4h
OUT3 Output type	40183	00B6h
OUT3 Output master St. No.	40184	00B7h
OUT3 Output master Ch. No.	40185	00B8h
OUT3 Output scaling span	40186	00B9h
OUT3 Output scaling base	40187	00BAh
OUT4 Output type	40189	00BCh
OUT4 Output master St. No.	40190	00BDh
OUT4 Output master Ch. No.	40191	00BEh
OUT4 Output scaling span	40192	00BFh
OUT4 Output scaling base	40193	00C0h
Output shutdown	40201	00C8h
LED2 Lamp Allocation	40222	00DDh
LED3 Lamp Allocation	40223	00DEh
LED4 Lamp Allocation	40224	00DFh
LED5 Lamp Allocation	40225	00E0h
LED6 Lamp Allocation	40226	00E1h

Content	Register number	Relative address
Ch1 Internal analog output field	40251	00FAh
Ch2 Internal analog output field	40252	00FBh
Ch3 Internal analog output field	40253	00FCh
Ch4 Internal analog output field	40254	00FDh
User address 01	40301	012Ch
User address 02	40302	012Dh
User address 03	40303	012Eh
User address 04	40304	012Fh
User address 05	40305	0130h
User address 06	40306	0131h
User address 07	40307	0132h
User address 08	40308	0133h
User address 09	40309	0134h
User address 10	40310	0135h
User address 11	40311	0136h
User address 12	40312	0137h
User address 13	40313	0138h
User address 14	40314	0139h
User address 15	40315	013Ah
User address 16	40316	013Bh
User address 17	40317	013Ch
User address 18	40318	013Dh
User address 19	40319	013Eh
User address 20	40320	013Fh
User address 21	40321	0140h
User address 22	40322	0141h
User address 23	40323	0142h
User address 24	40324	0143h
User address 25	40325	0144h
User address 26	40326	0145h
User address 27	40327	0146h
User address 28	40328	0147h
User address 29	40329	0148h
User address 30	40330	0149h
User address 31	40331	014Ah
User address 32	40332	014Bh
Ch1 RUN/Standby switch	41004	03EBh
Ch1 DI master Station No. setting	41011	03F2h
Ch1 DI-1 function select	41013	03F4h
Ch1 DI-2 function select	41014	03F5h
Ch1 DI-3 function select	41015	03F6h
Ch1 DI-4 function select	41016	03F7h
Ch1 DI-5 function select	41017	03F8h
Ch1 DI-6 function select	41018	03F9h
Ch1 DI-7 function select	41019	03FAh
Ch1 DI-8 function select	41020	03FBh
Ch1 DI-9 function select	41021	03FCh
Ch1 DI-10 function select	41022	03FDh
Ch1 DI-11 function select	41023	03FEh
Ch1 DI-12 function select	41024	03FFh
Ch1 DI-13 function select	41025	0400h
Ch1 DI-14 function select	41026	0401h

Content	Register number	Relative address
Ch1 DI-15 function select	41027	0402h
Ch1 DI-16 function select	41028	0403h
OUT1 Analog input type	41029	0404h
Ch1 Digital output latch release command	41031	0406h
Ch1 DO1 output event type setting	41032	0407h
Ch1 ALM1 set value 1	41033	0408h
Ch1 ALM1 set value 2	41034	0409h
Ch1 ALM1 hysteresis	41035	040Ah
Ch1 DO1 option function setting	41036	040Bh
Ch1 ALM1 delay time	41037	040Ch
Ch1 ALM1 delay time units	41038	040Dh
Ch1 Object Ch. No. for interchannel ALM1	41039	040Eh
Ch1 DO2 option event type setting	41040	040Fh
Ch1 ALM2 set value 1	41041	0410h
Ch1 ALM2 set value 2	41042	0411h
Ch1 ALM2 hysteresis	41043	0412h
Ch1 DO2 option function setting	41044	0413h
Ch1 ALM2 delay time	41045	0414h
Ch1 ALM2 delay time units	41046	0415h
Ch1 Object Ch. No. for interchannel ALM2	41047	0416h
Ch1 DO3 option event type setting	41048	0417h
Ch1 ALM3 set value 1	41049	0418h
Ch1 ALM3 set value 2	41050	0419h
Ch1 ALM3 hysteresis	41051	041Ah
Ch1 DO3 option function setting	41052	041Bh
Ch1 ALM3 delay time	41053	041Ch
Ch1 ALM3 delay time units	41054	041Dh
Ch1 Object Ch. No. for interchannel ALM3	41055	041Eh
Ch1 DO4 option event type setting	41056	041Fh
Ch1 ALM4 set value 1	41057	0420h
Ch1 ALM4 set value 2	41058	0421h
Ch1 ALM4 hysteresis	41059	0422h
Ch1 DO4 option function setting	41060	0423h
Ch1 ALM4 delay time	41061	0424h
Ch1 ALM4 delay time units	41062	0425h
Ch1 Object Ch. No. for interchannel ALM4	41063	0426h
Ch1 DO5 option event type setting	41064	0427h
Ch1 ALM5 set value 1	41065	0428h
Ch1 ALM5 set value 2	41066	0429h
Ch1 ALM5 hysteresis	41067	042Ah
Ch1 DO5 option function setting	41068	042Bh
Ch1 ALM5 delay time	41069	042Ch
Ch1 ALM5 delay time units	41070	042Dh
Ch1 Object Ch. No. for interchannel ALM5	41071	042Eh
Ch1 Analog input scale lower	41212	04BBh

Content	Register number	Relative address
Ch1 Analog input scale upper	41213	04BCh
Ch1 Decimal place	41214	04BDh
Ch1 Temperature unit	41215	04BEh
Ch1 Analog input shift	41216	04BFh
Ch1 Analog input filter	41220	04C3h
Ch1 Analog display zero adjustment	41221	04C4h
Ch1 Analog display span adjustment	41222	04C5h
Ch1 Cold junction compensation	41223	04C6h
Ch1 Analog output lower limits	41255	04E6h
Ch1 Analog output upper limits	41256	04E7h
Ch1 Standby Analog output value	41268	04F3h
Ch1 Mode at startup	41304	0517h
Ch1 Linkage operation master Station No.	41536	05FFh
Ch1 Linkage operation master Ch. No.	41537	0600h
Out1 Current output range	41801	0708h
Out1 Output type	41803	070Ah
Out1 Output master Station No.	41804	070Bh
Out1 Output master Ch. No.	41805	070Ch
Out1 Output scaling span	41806	070Dh
Out1 Output scaling base	41807	070Eh
Ch2 RUN/Standby switch	42004	07D3h
Ch2 DI master Station No. setting	42011	07DAh
Ch2 DI-1 function select	42013	07DCh
Ch2 DI-2 function select	42014	07DDh
Ch2 DI-3 function select	42015	07DEh
Ch2 DI-4 function select	42016	07DFh
Ch2 DI-5 function select	42017	07E0h
Ch2 DI-6 function select	42018	07E1h
Ch2 DI-7 function select	42019	07E2h
Ch2 DI-8 function select	42020	07E3h
Ch2 DI-9 function select	42021	07E4h
Ch2 DI-10 function select	42022	07E5h
Ch2 DI-11 function select	42023	07E6h
Ch2 DI-12 function select	42024	07E7h
Ch2 DI-13 function select	42025	07E8h
Ch2 DI-14 function select	42026	07E9h
Ch2 DI-15 function select	42027	07EAh
Ch2 DI-16 function select	42028	07EBh
OUT2 Analog input type	42029	07ECh
Ch2 Digital output latch release command	42031	07EEh
Ch2 DO1output event type setting	42032	07EFh
Ch2 ALM1 set value 1	42033	07F0h
Ch2 ALM1 set value 2	42034	07F1h
Ch2 ALM1 hysteresis	42035	07F2h
Ch2 DO1 option function setting	42036	07F3h
Ch2 ALM1 delay time	42037	07F4h
Ch2 ALM1 delay time units	42038	07F5h

Content	Register number	Relative address
Ch2 Object Ch. No. for interchannel ALM1	42039	07F6h
Ch2 DO2 output event type setting	42040	07F7h
Ch2 ALM2 set value 1	42041	07F8h
Ch2 ALM2 set value 2	42042	07F9h
Ch2 ALM2 hysteresis	42043	07FAh
Ch2 DO2 option function setting	42044	07FBh
Ch2 ALM2 delay time	42045	07FCh
Ch2 ALM2 delay time units	42046	07FDh
Ch2 Object Ch. No. for interchannel ALM2	42047	07FEh
Ch2 DO3 output event type setting	42048	07FFh
Ch2 ALM3 set value 1	42049	0800h
Ch2 ALM3 set value 2	42050	0801h
Ch2 ALM3 hysteresis	42051	0802h
Ch2 DO3 option function setting	42052	0803h
Ch2 ALM3 delay time	42053	0804h
Ch2 ALM3 delay time units	42054	0805h
Ch2 Object Ch. No. for interchannel ALM3	42055	0806h
Ch2 DO4 output event type setting	42056	0807h
Ch2 ALM4 set value 1	42057	0808h
Ch2 ALM4 set value 2	42058	0809h
Ch2 ALM4 hysteresis	42059	080Ah
Ch2 DO4 option function setting	42060	080Bh
Ch2 ALM4 delay time	42061	080Ch
Ch2 ALM4 delay time units	42062	080Dh
Ch2 Object Ch. No. for interchannel ALM4	42063	080Eh
Ch2 DO5 output event type setting	42064	080Fh
Ch2 ALM5 set value 1	42065	0810h
Ch2 ALM5 set value 2	42066	0811h
Ch2 ALM5 hysteresis	42067	0812h
Ch2 DO5 option function setting	42068	0813h
Ch2 ALM5 delay time	42069	0814h
Ch2 ALM5 delay time units	42070	0815h
Ch2 Object Ch. No. for interchannel ALM5	42071	0816h
Ch2 Analog input scale lower	42212	08A3h
Ch2 Analog input scale upper	42213	08A4h
Ch2 Decimal place	42214	08A5h
Ch2 Temperature unit	42215	08A6h
Ch2 Analog input shift	42216	08A7h
Ch2 Analog input filter	42220	08ABh
Ch2 Analog display zero adjustment	42221	08ACh
Ch2 Analog display span adjustment	42222	08ADh
Ch2 Cold junction compensation	42223	08AEh
Ch2 Analog output lower limits	42255	08CEh
Ch2 Analog output upper limits	42256	08CFh
Ch2 Standby Ao value	42268	08DBh

Content	Register number	Relative address
Ch2 Standby mode setting	42270	08DDh
Ch2 Control algorithm	42291	08F2h
Ch2 Mode at startup	42304	08FFh
Ch2 Linkage operation master Station No.	42536	09E7h
Ch2 Linkage operation master Ch. No.	42537	09E8h
Out2 Current output range	42801	0AF0h
Out2 Output type	42803	0AF2h
Out2 Output master station No.	42804	0AF3h
Out2 Output master Ch. No.	42805	0AF4h
Out2 Output scaling span	42806	0AF5h
Out2 Output scaling base	42807	0AF6h
Ch3 RUN/Standby switch	43004	0BBBh
Ch3 DI master Station No. setting	43011	0BC2h
Ch3 DI-1 function select	43013	0BC4h
Ch3 DI-2 function select	43014	0BC5h
Ch3 DI-3 function select	43015	0BC6h
Ch3 DI-4 function select	43016	0BC7h
Ch3 DI-5 function select	43017	0BC8h
Ch3 DI-6 function select	43018	0BC9h
Ch3 DI-7 function select	43019	0BCAh
Ch3 DI-8 function select	43020	0BCBh
Ch3 DI-9 function select	43021	0BCCh
Ch3 DI-10 function select	43022	0BCDh
Ch3 DI-11 function select	43023	0BCEh
Ch3 DI-12 function select	43024	0BCFh
Ch3 DI-13 function select	43025	0BD0h
Ch3 DI-14 function select	43026	0BD1h
Ch3 DI-15 function select	43027	0BD2h
Ch3 DI-16 function select	43028	0BD3h
Out3 Analog input type	43029	0BD4h
Ch3 Digital output latch release command	43031	0BD6h
Ch3 DO1 output event type setting	43032	0BD7h
Ch3 ALM1 set value 1	43033	0BD8h
Ch3 ALM1 set value 2	43034	0BD9h
Ch3 ALM1 hysteresis	43035	0BDAh
Ch3 DO1 option function setting	43036	0BDBh
Ch3 ALM1 delay time	43037	0BDCh
Ch3 ALM1 delay time units	43038	0BDDh
Ch3 Object Ch. No. for interchannel ALM1	43039	0BDEh
Ch3 DO2 output event type setting	43040	0BDFh
Ch3 ALM2 set value 1	43041	0BE0h
Ch3 ALM2 set value 2	43042	0BE1h
Ch3 ALM2 hysteresis	43043	0BE2h
Ch3 DO2 option function setting	43044	0BE3h
Ch3 ALM2 delay time	43045	0BE4h
Ch3 ALM2 delay time units	43046	0BE5h
Ch3 Object Ch. No. for interchannel ALM2	43047	0BE6h

Content	Register number	Relative address
Ch3 DO3 output event type setting	43048	0BE7h
Ch3 ALM3 set value 1	43049	0BE8h
Ch3 ALM3 set value 2	43050	0BE9h
Ch3 ALM3 hysteresis	43051	0BEAh
Ch3 DO3 option function setting	43052	0BEBh
Ch3 ALM3 delay time	43053	0BECh
Ch3 ALM3 delay time units	43054	0BEDh
Ch3 Object Ch. No. for interchannel ALM3	43055	0BEEh
Ch3 DO4 output event type setting	43056	0BEFh
Ch3 ALM4 set value 1	43057	0BF0h
Ch3 ALM4 set value 2	43058	0BF1h
Ch3 ALM4 hysteresis	43059	0BF2h
Ch3 DO4 option function setting	43060	0BF3h
Ch3 ALM4 delay time	43061	0BF4h
Ch3 ALM4 delay time units	43062	0BF5h
Ch3 Object Ch. No. for interchannel ALM4	43063	0BF6h
Ch3 DO5 output event type setting	43064	0BF7h
Ch3 ALM5 set value 1	43065	0BF8h
Ch3 ALM5 set value 2	43066	0BF9h
Ch3 ALM5 hysteresis	43067	0BFAh
Ch3 DO5 option function setting	43068	0BFBh
Ch3 ALM5 delay time	43069	0BFCh
Ch3 ALM5 delay time units	43070	0BFDh
Ch3 Object Ch. No. for interchannel ALM5	43071	0BFEh
Ch3 Analog input scale lower	43212	0C8Bh
Ch3 Analog input scale upper	43213	0C8Ch
Ch3 Decimal place	43214	0C8Dh
Ch3 Temperature unit	43215	0C8Eh
Ch3 Analog input shift	43216	0C8Fh
Ch3 Analog input filter	43220	0C93h
Ch3 Analog display zero adjustment	43221	0C94h
Ch3 Analog display span adjustment	43222	0C95h
Ch3 Cold junction compensation	43223	0C96h
Ch3 Analog output lower limits	43255	0CB6h
Ch3 Analog output upper limits	43256	0CB7h
Ch3 Standby Analog output value	43268	0CC3h
Ch3 Standby mode setting	43270	0CC5h
Ch3 Mode at startup	43304	0CE7h
Ch3 Linkage operation master Station No.	43536	0DCFh
Ch3 Linkage operation master Ch. No.	43537	0DD0h
Out3 Current output range	43801	0ED8h
Out3 Output type	43803	0EDAh
Out3 Output master Station No.	43804	0EDBh
Out3 Output master Ch. No.	43805	0EDCh
Out3 Output scaling span	43806	0EDDh

Content	Register number	Relative address
Out3 Output scaling base	43807	0EDEh
Ch4 RUN/Standby switch	44004	0FA3h
Ch4 DI master Station No. setting	44011	0FAAh
Ch4 DI-1 function select	44013	0FACh
Ch4 DI-2 function select	44014	0FADh
Ch4 DI-3 function select	44015	0FAEh
Ch4 DI-4 function select	44016	0FAFh
Ch4 DI-5 function select	44017	0FB0h
Ch4 DI-6 function select	44018	0FB1h
Ch4 DI-7 function select	44019	0FB2h
Ch4 DI-8 function select	44020	0FB3h
Ch4 DI-9 function select	44021	0FB4h
Ch4 DI-10 function select	44022	0FB5h
Ch4 DI-11 function select	44023	0FB6h
Ch4 DI-12 function select	44024	0FB7h
Ch4 DI-13 function select	44025	0FB8h
Ch4 DI-14 function select	44026	0FB9h
Ch4 DI-15 function select	44027	0FBAh
Ch4 DI-16 function select	44028	0FBBh
Out4 Analog input type	44029	0FBCh
Ch4 Digital output latch release command	44031	0FBEh
Ch4 DO1 output event type setting	44032	0FBFh
Ch4 ALM1 set value 1	44033	0FC0h
Ch4 ALM1 set value 2	44034	0FC1h
Ch4 ALM1 hysteresis	44035	0FC2h
Ch4 DO1 option function setting	44036	0FC3h
Ch4 ALM1 delay time	44037	0FC4h
Ch4 ALM1 delay time units	44038	0FC5h
Ch4 Object Ch. No. for interchannel ALM1	44039	0FC6h
Ch4 DO2 output event type setting	44040	0FC7h
Ch4 ALM2 set value 1	44041	0FC8h
Ch4 ALM2 set value 2	44042	0FC9h
Ch4 ALM2 hysteresis	44043	0FCAh
Ch4 DO2 option function setting	44044	0FCBh
Ch4 ALM2 delay time	44045	0FCCh
Ch4 ALM2 delay time units	44046	0FCDh
Ch4 Object Ch. No. for interchannel ALM2	44047	0FCEh
Ch4 DO3 output event type setting	44048	0FCFh
Ch4 ALM3 set value 1	44049	0FD0h
Ch4 ALM3 set value 2	44050	0FD1h
Ch4 ALM3 hysteresis	44051	0FD2h
Ch4 DO3 option function setting	44052	0FD3h
Ch4 ALM3 delay time	44053	0FD4h
Ch4 ALM3 delay time units	44054	0FD5h
Ch4 Object Ch. No. for interchannel ALM3	44055	0FD6h
Ch4 DO4 output event type setting	44056	0FD7h
Ch4 ALM4 set value 1	44057	0FD8h

Content	Register number	Relative address
Ch4 ALM4 set value 2	44058	0FD9h
Ch4 ALM4 hysteresis	44059	0FDAh
Ch4 DO4 option function setting	44060	0FDBh
Ch4 ALM4 delay time	44061	0FDCh
Ch4 ALM4 delay time units	44062	0FDDh
Ch4 Object Ch. No. for interchannel ALM4	44063	0FDEh
Ch4 DO5 output event type setting	44064	0FDFh
Ch4 ALM5 set value 1	44065	0FE0h
Ch4 ALM5 set value 2	44066	0FE1h
Ch4 ALM5 hysteresis	44067	0FE2h
Ch4 DO5 option function setting	44068	0FE3h
Ch4 ALM5 delay time	44069	0FE4h
Ch4 ALM5 delay time units	44070	0FE5h
Ch4 Object Ch. No. for interchannel ALM5	44071	0FE6h
Ch4 Analog input scale lower	44212	1073h
Ch4 Analog input scale upper	44213	1074h
Ch4 Decimal place	44214	1075h
Ch4 Temperature unit	44215	1076h
Ch4 Analog input shift	44216	1077h
Ch4 Analog input filter	44220	107Bh
Ch4 Analog display zero adjustment	44221	107Ch
Ch4 Analog display span adjustment	44222	107Dh
Ch4 Cold junction compensation	44223	107Eh
Ch4 Analog output lower limits	44255	109Eh
Ch4 Analog output upper limits	44256	109Fh
Ch4 StandbyAnalog output value	44268	10ABh
Ch4 Standby mode setting	44270	10ADh
Ch4 Mode at startup	44304	10CFh
Ch4 Linkage operation master Station No.	44536	11B7h
Ch4 Linkage operation master Ch. No.	44537	11B8h
Out4 Current output range	44801	12C0h
Out4 Output type	44803	12C2h
Out4 Output master Station No.	44804	12C3h
Out4 Output master Ch. No.	44805	12C4h
Out4 Output scaling span	44806	12C5h
Out4 Output scaling base	44807	12C6h
User data 01	45001	1388h
User data 02	45002	1389h
User data 03	45003	138Ah
User data 04	45004	138Bh
User data 05	45005	138Ch
User data 06	45006	138Dh
User data 07	45007	138Eh
User data 08	45008	138Fh
User data 09	45009	1390h
User data 10	45010	1391h
User data 11	45011	1392h
User data 12	45012	1393h

Content	Register number	Relative address
User data 13	45013	1394h
User data 14	45014	1395h
User data 15	45015	1396h
User data 16	45016	1397h
User data 17	45017	1398h
User data 18	45018	1399h
User data 19	45019	139Ah
User data 20	45020	139Bh
User data 21	45021	139Ch
User data 22	45022	139Dh
User data 23	45023	139Eh
User data 24	45024	139Fh
User data 25	45025	13A0h
User data 26	45026	13A1h
User data 27	45027	13A2h
User data 28	45028	13A3h
User data 29	45029	13A4h
User data 30	45030	13A5h
User data 31	45031	13A6h
User data 32	45032	13A7h
System time	30001	0000h
Ch1 Input value (Ai)	30002	0001h
Ch2 Input value (Ai)	30003	0002h
Ch3 Input value (Ai)	30004	0003h
Ch4 Input value (Ai)	30005	0004h
RS-485 Communication permission	30062	003Dh
Ch1 RCJtemp	30110	006Dh
Ch2 RCJtemp	30111	006Eh
Ch3 RCJtemp	30112	006Fh
Ch4 RCJtemp	30113	0070h
Out1 Output value	30120	0077h
Out2 Output value	30121	0078h
Out3 Output value	30122	0079h
Out4 Output value	30123	007Ah
Ch1 Input value (Ai)	31001	03E8h
Ch1 Alarm 1-5 status	31007	03EEh
Ch1 Error source display	31008	03EFh
Ch1 Remaining time on timer 1	31011	03F2h
Ch1 Remaining time on timer 2	31012	03F3h
Ch1 Remaining time on timer 3	31013	03F4h
Ch1 Remaining time on timer 4	31014	03F5h
Ch1 Remaining time on timer 5	31015	03F6h
Ch1 RCJtemp	31016	03F7h
Ch1 Remote mode switch	31037	040Ch
Ch1 Alarm 1-5 status	31060	0423h
Ch1 Event input status	31061	0424h
Ch2 Input value (Ai)	32001	07D0h
Ch2 Alarm 1-5 status	32007	07D6h
Ch2 Error source display	32008	07D7h
Ch2 Remaining time on timer 1	32011	07DAh
Ch2 Remaining time on timer 2	32012	07DBh
Ch2 Remaining time on timer 3	32013	07DCh
Ch2 Remaining time on timer 4	32014	07DDh
Ch2 Remaining time on timer 5	32015	07DEh
Ch2 RCJtemp	32016	07DFh

Content	Register number	Relative address
Ch2 Error source display	32054	0805h
Ch2 Alarm 1-5 status	32060	080Bh
Ch2 Event input status	32061	080Ch
Ch3 Input value (Ai)	33001	0BB8h
Ch3 Alarm 1-5 status	33007	0BBEh
Ch3 Error source display	33008	0BBFh
Ch3 Remaining time on timer 1	33011	0BC2h
Ch3 Remaining time on timer 2	33012	0BC3h
Ch3 Remaining time on timer 3	33013	0BC4h
Ch3 Remaining time on timer 4	33014	0BC5h
Ch3 Remaining time on timer 5	33015	0BC6h
Ch3 RCJtemp	33016	0BC7h
Ch3 Error source display	33054	0BEDh
Ch3 Alarm 1-5 status	33060	0BF3h
Ch3 Event input status	33061	0BF4h
Ch4 Input value (Ai)	34001	0FA0h
Ch4 Alarm 1-5 status	34007	0FA6h
Ch4 Error source display	34008	0FA7h
Ch4 Remaining time on timer 1	34011	0FAAh
Ch4 Remaining time on timer 2	34012	0FABh
Ch4 Remaining time on timer 3	34013	0FACh
Ch4 Remaining time on timer 4	34014	0FADh
Ch4 Remaining time on timer 5	34015	0FAEh
Ch4 RCJtemp	34016	0FAFh
Ch4 Remote mode switch	34037	0FC4h
Ch4 Error source display	34054	0FD5h
Ch4 Alarm 1-5 status	34060	0FDBh
Ch4 Event input status	34061	0FDCh

5.8 Sample Program

A sample program for reading and writing data that runs on Microsoft Visual Basic 6.0 (SP6) is distributed in our home page.

The sample program is meant to be used as a reference for your own program creation, and therefore all its actions are not guaranteed.

Sample program body can be downloaded from our home page indicated below.

Home page address : http://www.fic-net.jp/ PUM_Sample_program.lzh

Before running the program, check the following summary of points for communication conditions.

- Parity, communication speed to be set in this program. Please match these values with the conditions of the PUM.

Warning when using an RS-232C to RS-485 converter

The sent data is sometimes added to the response data from the slave before it is received. In this case, when receiving the data, process the response data only after first getting rid of the number of bytes from the sent data.

Compatible OS
Windows 2000 Professional
Windows XP Professional Edition

Note

- Windows® is a registered trademark of the Microsoft Corporation.
- Visual Basic® is a registered trademark of the Microsoft Corporation.

Fuji Electric Systems Co., Ltd. assumes no responsibility for damages or infringement upon third party rights as a result of using this sample program. Use this program while conforming to the contents of the agreement listed within.

6 Troubleshooting

6.1 Troubleshooting Procedures …… 6-3

6.1 Troubleshooting Procedures

Troubles that May Occur when the Loader Software is Connected

The following table lists troubles that may occur when module setting is made using a loader software and remedies against such troubles.

Also see the instruction manual of the loader software.

Trouble	Causes	Solution
None of the connected modules is capable of communicating with the loader software.	Improper loader software connection	Check that the loader software and the modules are connected properly.
	Cables connected to the loader software are defective.	Replace the cables connected to the loader software.
	Improper station No. setting	Check station No. of module that connected with loader software.
	Incompatible communication conditions	Check that the communication specifications of the loader software and those of the module are compatible.
Some of the connected modules only cannot communicate with the loader software.	Improper loader software connection	Check that the loader software is connected to the master of the internal communication between modules.
	Improper station No. setting	Check that none of the station Nos. is set duplicated.
Parameters cannot be changed.	“RS-485 communication permission setting” is set to “Read only.”	Set “RS-485 communication permission setting” to “Read/Write.”

Troubles during Operation

If trouble should occur during operation, check the type of your module and its connection as well as parameter setting for any abnormalities. The following table lists typical trouble and measures to be taken against them.

At power ON

Trouble	Causes	Solution
The PWR indicator does not come on even if the power is turned on.	Power is not supplied to the main unit.	Check that power supply wiring is installed.
	Power supply voltage does not fall within the permissible range.	Use a power supply conforming to the module specifications.
	Main unit failure	Replace the module.
An alarm is output on turning on the power.	Setting has been made to allow the alarm range to be entered when operation for production is not performed.	Check the values set as alarm operation points. Change the type of alarms to the one provided with the hold function as required.

At start of operation

Trouble	Causes	Solution
The Analog input value exceeds the upper or lower limit.	Improper sensor connection	Check that the sensor is connected to the input terminal, and that the polarity is not reversed.
	Sensor failure (break or degradation)	Replace the sensor.
	Too long compensating lead wire from the sensor causes conductor resistance to affect the reading.	Use a thick compensating lead wire. Keep wiring as short as possible by changing the sensor position.
	Improper input settings	Check input type and input correction.
Improper output (Analog output or re-transmission output)	Output is limited	Set the output limiter set value.
	Standby mode is selected.	Check the control mode currently selected.
	Improper output setting	Check the Output master station No., Output master Ch, and output type.
	Output is shut down.	Check the output shutdown setting.
Event input from Event I/O module cannot be made.	Digital input master station No. has not been set.	Check the Digital input master station No. setting.
Event output from Event I/O module cannot be made.	Digital output master has not been set.	Check Digital output master station No. and Digital output master Ch.
Alarm output is latched.	Alarm latch is enabled by alarm options.	Check alarm options.
	Contact melting caused by a unit failure	Replace the module.

During operation

Trouble	Causes	Solution
Fluctuation of Analog input value	Effect of external noise	Take measures against noise, or provide an input filter as required.
	Inappropriate parameter of PID.	Perform Auto tuning.
Analog input value does not change.	Sensor failure	Check the sensor, and replace it as required.
	Main unit failure	Contact us or your dealer.
Alarm is output during normal operation.	Setting has been made to allow alarms to be detected during normal operation.	Check the alarm setting.
Abnormal LED indicator display	Abnormal internal communication between modules	<About the LED indicator display> If either one of the following state is reached, the “RUN” LED indicator may come on in red, indicating that the internal communication error between modules is occurring. • Station No. is duplicated in the connected modules. • There are two or more “Master” station in the connected modules. • There is no master module designated as DI input master station, output master station, and linkage operation master station.
Standby Analog output value is output.	Operation is made in Standby and not in RUN state.	“RUN /Standby” setting is set to “0:RUN”.
	The upper/lower limit range of the Analog input scale exceeds 10.000, causing the module to remain in standby mode.	Set the upper/lower limit range of the Analog input scale to less than 10,000.

Troubles with RS-485 Communication

The following table lists typical trouble in communication and measures to be taken for the case in which a host equipment is connected via RS-485.

Trouble	Causes	Solution
Communication cannot be made from the host equipment.	Improper RS-485 connection	Check the polarity of the wiring and the existence of terminating resistance.
	Improper station No. setting	Check that none of the station Nos. is duplicated.
	incompatible communication conditions	Check “RS-485 Communication speed” setting, “RS-485 Parity” setting, and “RS-485 Response interval time” setting.
Error messages are returned to the host system.	An improper address is accessed.	Check that proper addresses are accessed.
Parameters cannot be changed by way of host equipment.	Values that do not fall within the limit range are written.	Check that the values to be written fall within the limit range.
	“RS-485 communication permission” is set to “0:Read only.”	Set “RS-485 communication permission” to “1:Read/Write.”

Index

A

Accessories 1-3,1-4,3-14
Analog input absolute alarm 4-28
Alarm 1-5 status 4-53,4-55
Alarm hold 4-27,4-37
Alarm parameter 5-34
ALM delay time 4-29,4-32,4-33,4-56
ALM delay time units 4-29,4-32,4-34
ALM hysteresis 4-32,4-35
ALM set value 4-28,4-30,4-39
Analog input display span adjustment 4-13
Analog input display zero adjustment 4-13
Analog input filter 4-7,4-11
Analog input scale lower 4-8
Analog input scale upper 4-8
Analog input shift 4-7,4-12
Analog input type 4-8,4-10
Analog output lower limits 4-22
Analog output upper limits 4-22

B

Base part 1-5,1-8,3-8,3-9,3-10,3-11,3-15,3-17,5-7
Broadcast query 5-3

C

Caution when installing 3,3-8
CC-Link 2-8,4-42
Coil number 5-14,5-15,5-16
Cold junction compensation 4-7,4-14,4-53,4-54
Command message 5-12,5-14,5-15,5-18,5-19
Communication condition 3-7,5-10
Communication parameter 3-3,3-4,3-5,5-35
Communication specifications 5-5
Condition output 4-29
Configuration parameter 5-37
Connecting controllers 3-4,3-5,3-6,3-11,3-12
Connector 1-3,1-5,1-8,3-12,3-14
Crimp terminal 4,3-17
Current output 3-16,4-15,4-16
Current output range 4-15,4-16

D

Decimal place 4-7,4-8,4-9,4-10
Deviation alarm 4-28,4-30,4-31,4-39
DI function 4-21,4-46,4-56
Digital input function select 4-4, 4-5,4-21,4-38,4-46,4-48,4-50,4-56
Digital input master Station No. setting 4-19, 4-46,4-47,4-48,4-51
Digital output event type ... 4-27,4-28,4-36,4-37,4-39,4-56
Digital output latch release command 4-5,4-38
Digital output option function setting 4-36,4-55
Dimensions 3-8

E

End plates 3-14
Enhanced communication module ... 2-8,3-6,3-13,4-42
Enhanced communication module (PUMC) communication permission setting 2-8,4-42
Error check code 5-14,5-15,5-17
Error input alarm function 4-36
Error source display 4-53,4-55
Event delay 4-33
Event input status 4-54,4-56
Event input/output module 2-5, 2-6,2-8,3-5,3-13,4-21,4-26,4-38,4-46,4-47,4-56
Event output 2-5,4-25

F

Frame detection 5-18
Front terminal block 1-5,1-6,3-9
Function code 5-14,5-15,5-16

H

Hold reset 4-36,4-37
Host communication equipment 3-3

I

Input value (Ai) 4-53,4-54
Input/output monitor 4-53
Insulation 3,3-16,5-5,5-6
Interchannel analog input deviation alarm 4-28,4-39
Intermodule communication 4-42,4-43,4-58
Internal analog output field 4-3,4-19,4-23
Irregular slave response 5-15

L

LED display 4-57
LED indicator lamp 1-6,2-6
Linkage operation 4-49,4-50
Linkage operation master channel No. 4-49,4-50
Linkage operation master station No. 4-19, 4-48,4-49,4-50,4-51
Loader communication port 1-5,1-6,1-7,2-3,2-4,2-6,5-7
Loader connecting cable 1-7,2-4,2-5,2-8,5-3,5-9
Loader interface 5-3,5-6,5-7,5-9,5-11
Lock lever 3-9,3-10
Locking tab 4,1-8,3-11,3-12,3-15

M

Master 1-6, 1-7,2-5,2-6,2-8,3-5,3-6,3-13,4-17,4-18,4-19, 4-41,4-43,4-44,4-46,4-47,4-48,4-49,4-50,4-51, 4-58,5-3,5-8,5-10,5-11,5-12,5-18,5-19,5-25,5-27
Master module communication method 5-18
Master/slave setting 2-6,3-5,3-6,4-43,5-11
Master/slave setting in connected modules 4-43,5-11
Message composition 5-22,5-24,5-28
MODBUS communication protocol 5-12
Mode at startup 4-6
Model code 1-4
Monitor parameter 5-38
Mounting screw 3-15
Mounting screw hole 1-8,3-15

N

No response 5-15,5-17,5-18,5-20
Non-excitation output 4-36,4-37,4-55

O

Operation parameter 5-29
Order of register numbers 5-39
Output master Ch. No. 4-17,4-18
Output master St. No. 4-17,4-18,4-19,4-48,4-51
Output scaling base 4-15,4-20
Output scaling span 4-15,4-20
Output shutdown 4-15,4-21
Output type 4-17,4-19,4-23
Output value (Ao) 4-3,4-53,4-54,4-55
Overrange 4-10,4-55

P

Parameter loader 1-7, 2-3,2-4,2-5,2-6,2-8,3-3,3-4,3-5,3-6
Power terminal 1-5,1-8,3-17
Process value 4-11,4-32,4-37
Programless communication 2-8,3-6
PUM parameter loader software 1-7, 2-3,2-4,2-5,2-6,2-8,3-3,3-4,3-5,3-6
PUM response 5-19

R

Range alarm 4-28
Reading read-only word data 5-16,5-23
Reading word data 5-16,5-20
Recommended power supply 4
Remaining time on timer 4-54,4-56
Reset main unit 4-43,4-61
Resistance bulb 1-3,3-16,4-8,4-9,4-10,4-13
Response message 5-12, 5-13,5-14,5-15,5-16,5-18,5-19
RS-485 communication permission setting 4-42,5-10
RS-485 communication speed 4-41,5-10
RS-485 parity setting 4-41,5-10
RS-485 response interval time setting 4-41,5-10
RS-485 terminal 1-8,3-17
RUN/Standby switch 4-3,4-4,4-51

S

Sample program 5-45

Setup parameter 5-30

Side connecting terminal covers 3-14

Slave 1-6,
1-7,2-6,3-5,3-6,3-13,4-41,4-43,4-44,
5-3,5-8,5-11,5-12,5-14,5-15,5-17,5-20,5-23

Standby Analog output set value 4-23

Standby mode setting 4-23

Station number 1-7,
2-4,2-6,3-4,3-5,3-6,3-13,4-18,4-19,
4-48,4-50,4-51,5-3,5-6,5-10,5-11,5-12,5-14

System configuration 2-3

System parameter 5-31

T

Terminal layout 3-17

Terminal resistance 3-16,5-8

Thermocouple ... 4,1-3,3-16,3-17,4-8,4-9,4-10,4-14,4-54

Timer code..... 4-25,4-29

Transmission control steps..... 5-18

U

Under range 4-10,4-55

Upper/lower limit alarm 4-28

User address R/W field 4-60

User address register number specification ... 5-16,5-23

User address specification communication 4-60

W

Wiring for power supply 3-17

Wiring for RS-485..... 3-17

Wiring to input/output 3-16

Writing continuous word data..... 5-16,5-27

Writing word data 5-16,5-25

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