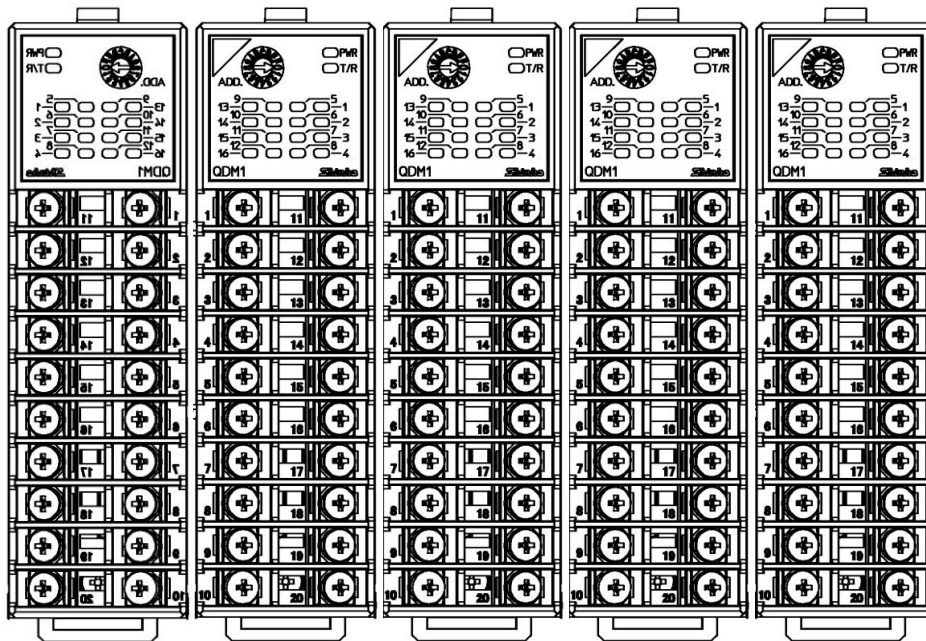


Digital I/O Module

QDM1 Series

INSTRUCTION MANUAL



Shinko

Preface

Thank you for purchasing our digital I/O module [QDM1 series].

This manual contains instructions for the mounting, functions, operations and notes when operating the digital I/O module [QDM1 series].

To prevent accidents arising from the misuse of this instrument, please ensure the operator receives this manual

Notes

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause a fire.
- Be sure to follow the warnings, cautions and notices. If they are not observed, serious injury or malfunction may occur.
- The contents of this instruction manual are subject to change without notice.
- Care has been taken to ensure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
- This instrument is designed to be installed on a DIN rail in an indoor control panel. If it is not, measures must be taken to ensure that the operator does not touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos Co., Ltd. is not liable for any damage or secondary damage(s) incurred as a result of using this product, including any indirect damage.

SAFETY PRECAUTIONS (Be sure to read these precautions before using our products.)

The safety precautions are classified into categories: "Warning" and "Caution".

Depending on circumstances, procedures indicated by ⚠ Caution may result in serious consequences, so be sure to follow the directions for usage.



Warning

Procedures which may lead to dangerous conditions and cause death or serious injury, if not carried out properly.



Caution

Procedures which may lead to dangerous conditions and cause superficial to medium injury or physical damage or may degrade or damage the product, if not carried out properly.



Warning

- To prevent an electrical shock or fire, only Shinko or qualified service personnel may handle the inner assembly.
- To prevent an electrical shock, fire, or damage to instrument, parts replacement may only be undertaken by Shinko or qualified service personnel.



Safety Precautions

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after purpose-of-use consultation with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protective equipment against excessive temperature rise, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Proper periodic maintenance is also required.
- This instrument must be used under the conditions and environment described in this manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.



Caution with Respect to Export Trade Control Ordinance

To avoid this instrument from being used as a component in, or as being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment, etc.), please investigate the end users and the final use of this instrument.

In the case of resale, ensure that this instrument is not illegally exported.

Precautions for Use

1. Installation Precautions



Caution

This instrument is intended to be used under the following environmental conditions (IEC61010-1):

- Overvoltage Category II, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of -10 to 50°C (14°F to 122°F) that does not change rapidly, and no icing
- An ambient non-condensing humidity of 35 to 85%RH
- No large capacity electromagnetic switches or cables through which large current is flowing
- No water, oil or chemicals or the vapors of these substances can come into direct contact with the unit.
- When installing this unit within a control panel, please note that ambient temperature of this unit – not the ambient temperature of the control panel – must not exceed 50°C (122°F).

Otherwise the life of electronic components (especially electrolytic capacitor) may be shortened.

- * Avoid setting this instrument directly on or near flammable material even though the case of this instrument is made of flame-resistant resin.

2. Wiring Precautions



Caution

- Do not leave bits of wire in the instrument, because they could cause a fire and malfunction.
- When wiring, use a crimping pliers and a solderless terminal with an insulation sleeve in which an M3 screw fits.
- The terminal block of this instrument has a structure that is wired from the left side.
Be sure to insert the lead wire into the terminal of the instrument from the left side and tighten the terminal screw.
- Tighten the terminal screw using the specified torque. If excessive force is applied to the screw when tightening, the screw or case may be damaged.
- Do not pull or bend the lead wire with the terminal as the base point during or after wiring work.
It may cause malfunction.
- This instrument does not have a built-in power switch, circuit breaker and fuse. It is necessary to install a power switch, circuit breaker and fuse near the instrument.
(Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- When wiring the power supply (24 VDC), do not confuse the polarities.

3. Operation and Maintenance Precautions



Caution

- Do not touch live terminals. This may cause electrical shock or problems in operation.
- Turn the power supply to the instrument OFF when retightening the terminal or cleaning. Working on or touching the terminal with the power switched ON may result in severe injury or death due to electrical shock.
- Use a soft, dry cloth when cleaning the instrument.
(Alcohol based substances may tarnish or deface the unit.)
- As the panel part is vulnerable, be careful not to put pressure on, scratch or strike it with a hard object.

- The following abbreviations are used in the text, figures, and tables of this manual.

Symbol	Term
PV	Process variable (PV)

- About description of reference page

In the case of "Refer to 2-2.", it is described as (P.2-2).

- How to read this manual

- When connecting to host computer

Refer to "1 Overview" to "12 Operation".

Refer to "15 Action Explanation" to "18 Troubleshooting" as necessary.

- When connecting to PLC

Refer to "1 Overview" to "3 Name and Functions" and "13 Communication with PLC Using SIF Function".

Refer to "15 Action Explanation" to "18 Troubleshooting" as necessary.

- When connecting to CUnet

Refer to "1 Overview" to "3 Name and Functions" and "14 CUnet Communication".

Refer to "15 Action Explanation" to "18 Troubleshooting" as necessary.

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1 Overview

1.1 Overview of QDM1 Series

This instrument is a digital I/O module with 16 inputs / 16 outputs or 8 inputs / 8 outputs.

A multi-point measurement system can be configured via a host computer or PLC.

A maximum of 16 instruments can be connected to the BUS, and a maximum of 256 I/O points can be performed.

One block connected to BUS is called "1 unit".

1.2 Description of Module

This instrument is available in terminal block type and connector type.

The following options are available.

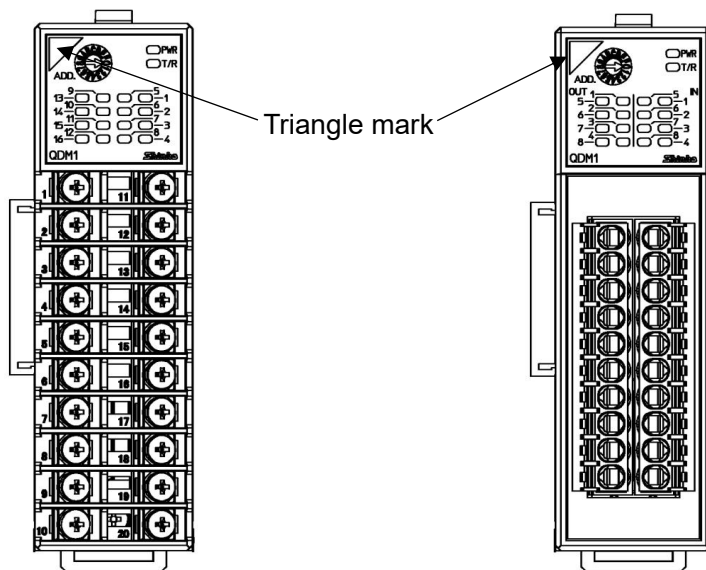
- Power supply / communication option
 - With power supply / host communication function
 - With power supply / CUnet communication function

Depending on whether have the option, the panel design differs.

There is a triangle mark on the upper left of the panel, when the power supply / communication option is not available.

QDM1-□□0□

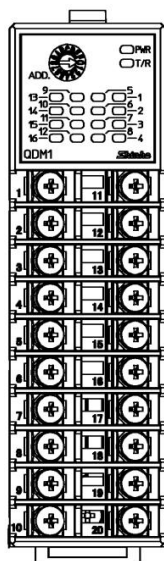
No options



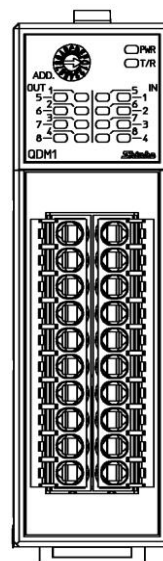
(Fig. 1.2-1)

QDM1-□□P□, QDM1-□□C□

With power supply /
host communication function



With power supply /
CUnet communication function



(Fig. 1.2-2)

1.3 System Configuration

1.3.1 Connecting to Host Computer

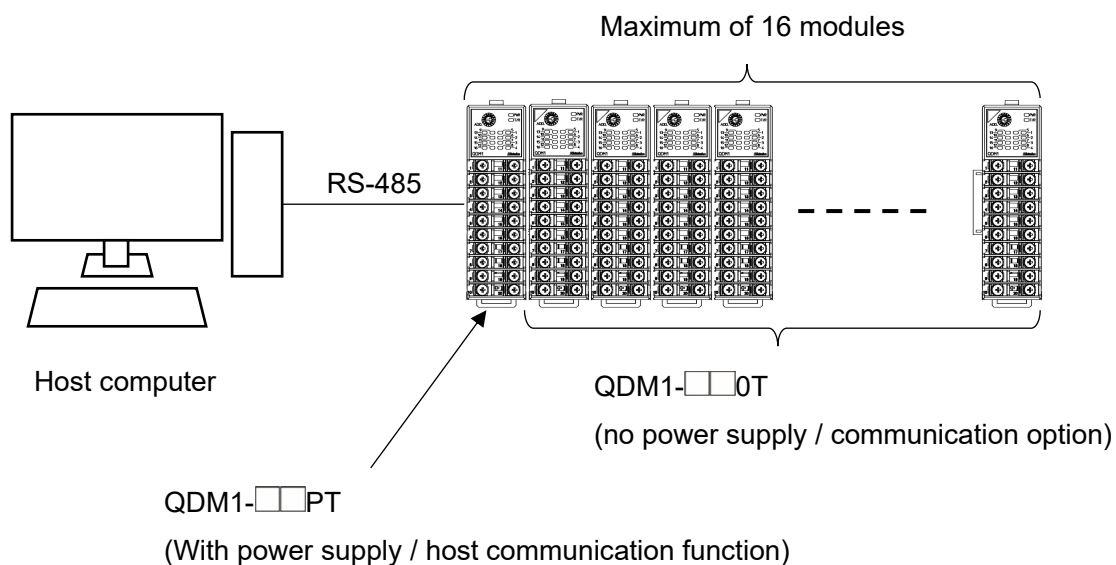
When connecting to the host computer, one QDM1-□□P□(with power supply / host communication function) is required for host communication.

The second and subsequent power lines to the QDM1 are BUS-connected by the connector.

For the second and subsequent control modules, use the QDM1-□□0□(no power supply / communication option).

Maximum of 16 control modules can be connected.

Configuration example of host computer and QDM1-□□PT, QDM1□□0T

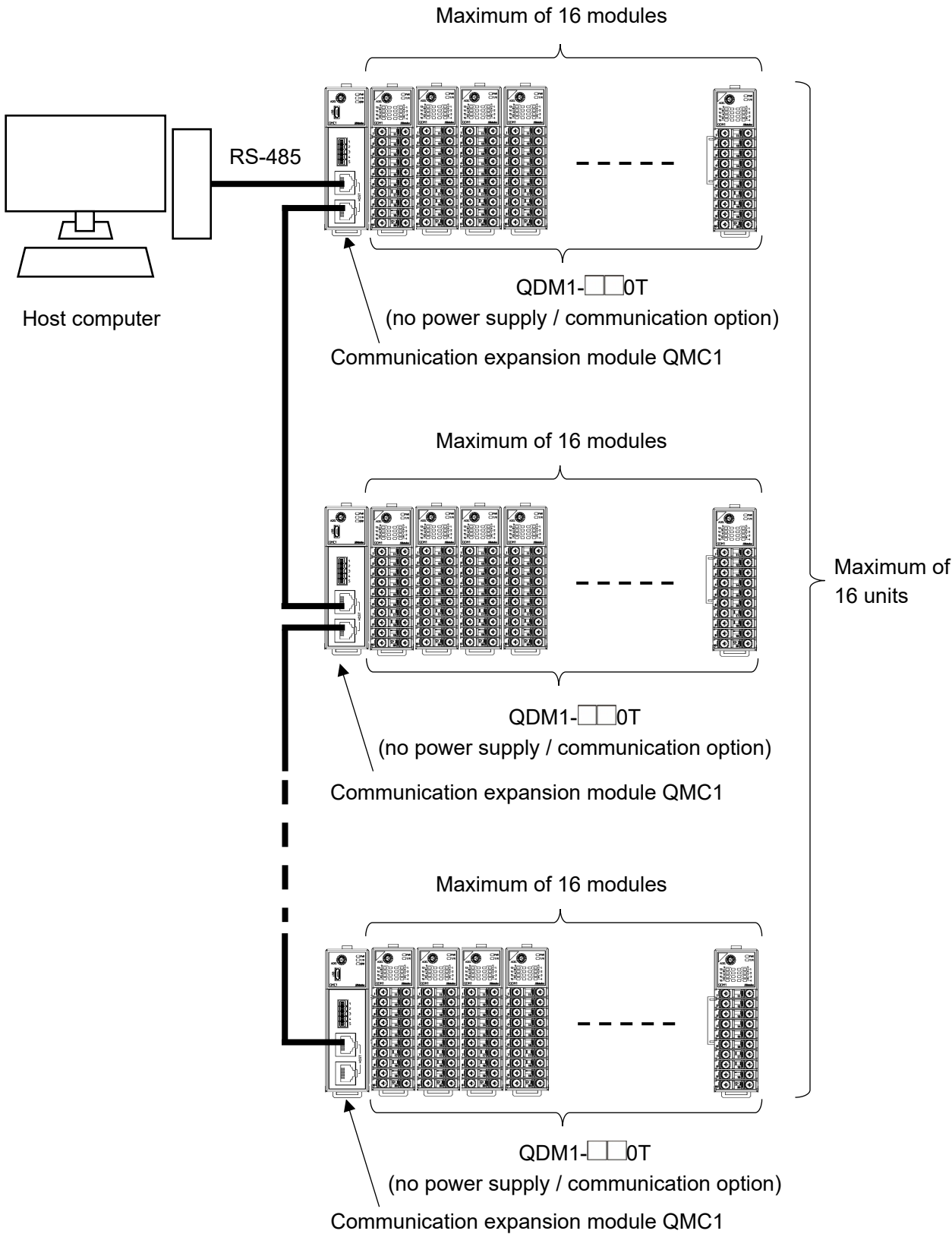


- * Communication with QMC1 via the internal bus connection is standardized to standard speed communication (communication specification setting dip switch No.6: OFF)
- * When mixed with QTC1 (or QAM1), communication with QMC1 via the internal bus connection is standardized to standard speed communication (communication specification setting dip switch No.6: OFF)

(Fig. 1.3.1-1)

A maximum of 16 units can be connected by connecting the communication expansion module QMC1s.
 Refer to communication expansion module QMC1 instruction manual for detail.

Configuration example of host computer and QMC1, QDM1-□□0T



* Communication with QMC1 via the internal bus connection is standardized to either standard speed communication or high speed communication (communication specification setting dip

switch

No.6)

(Fig. 1.3.1-2)

1.3.2 Connecting to PLC

- (1) When connecting to MELSEC Q, QnA series by Mitsubishi Electric Corporation

When connecting to the MELSEC Q, QnA series by Mitsubishi Electric Corporation, one QDM1-□□P□ (with power supply / host communication function) is required for host communication.

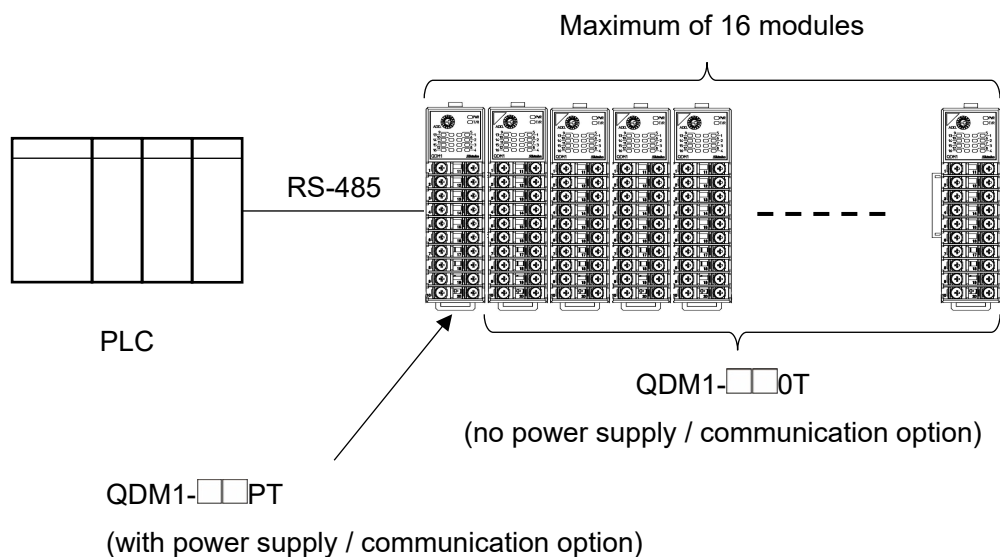
Use the SIF function (Smart InterFace, programless communication function) (P.13-1).

The second and subsequent power lines to the QDM1 are BUS-connected by the connector.

For the second and subsequent control modules, use the QDM1-□□0□ (no power supply / communication option).

Maximum of 16 control modules can be connected.

Configuration example of PLC and QDM1-□□PT, QDM1□□0T



* Communication with QMC1 via the internal bus connection is standardized to standard speed communication (communication specification setting dip switch No.6: OFF)

* When mixed with QTC1 (or QAM1), communication with QMC1 via the internal bus connection is

standardized to standard speed communication (communication specification setting dip switch No.6: OFF)

(Fig. 1.3.2-1)

- (2) When connecting to PLC by Mitsubishi Electric Corporation, PLC by OMRON Corporation and PLC by KEYENCE CORPORATION

When connecting to the PLC by Mitsubishi Electric Corporation, PLC by OMRON Corporation (*) and PLC by KEYENCE CORPORATION, one communication expansion module QMC1 is required for host communication per unit.

The power and communication lines to the QDM1 are BUS-connected with the connector.

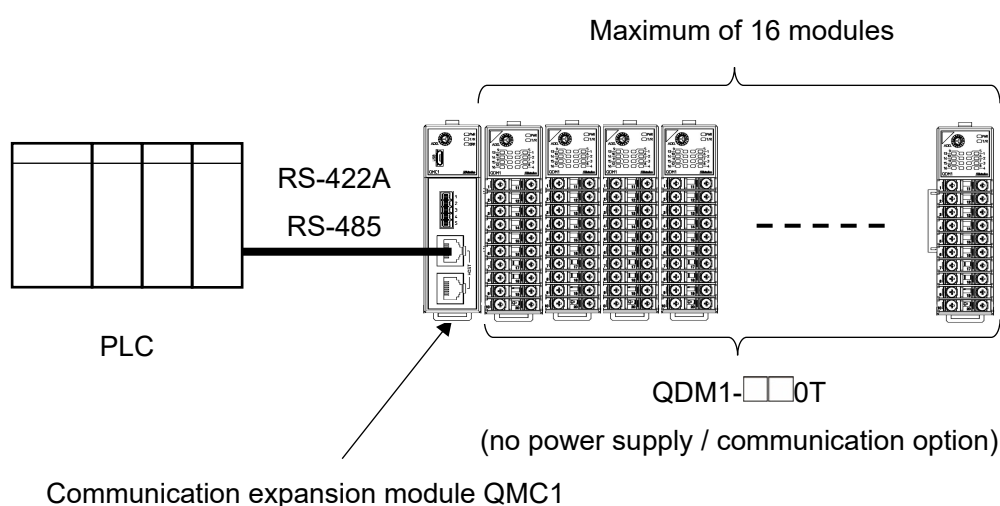
Use the QDM1-□□0□ (no power supply / communication option).

Maximum of 16 control modules can be connected.

- (*): When connecting to an OMRON PLC with the SIF function of communication expansion module QMC1, the RS-485 communication type cannot be used.

Only RS-422A communication type can be connected.

Configuration example of PLC and QMC1, QDM1-□□0T



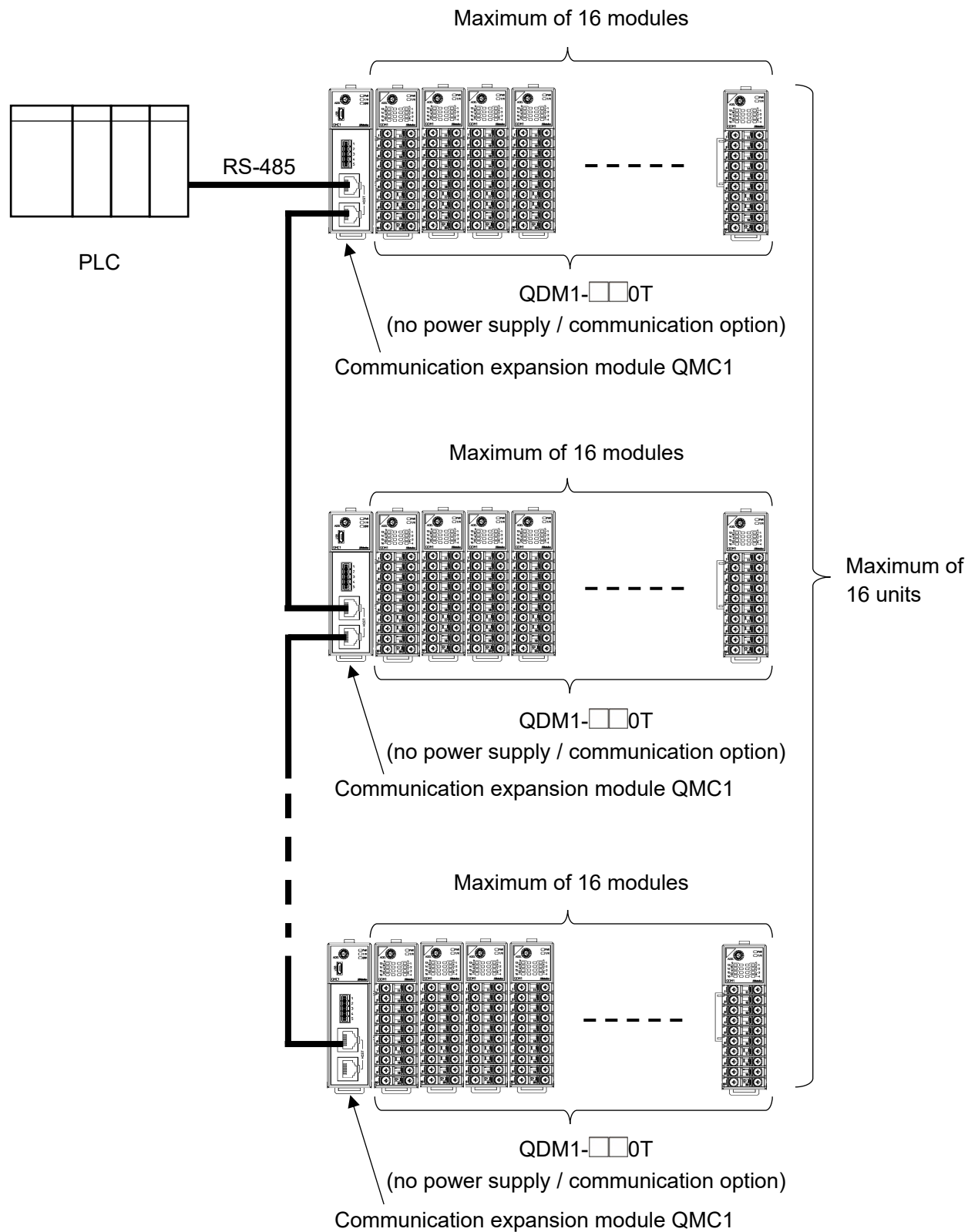
- * Communication with QMC1 via the internal bus connection is standardized to either standard speed communication or high speed communication (communication specification setting dip switch No.6)

(Fig. 1.3.2-2)

A maximum of 16 units can be connected by connecting the communication expansion module QMC1s.

Refer to communication expansion module QMC1 instruction manual for detail.

Configuration example of PLC and QMC1, QDM1-□□0T



* Communication with QMC1 via the internal bus connection is standardized to either standard speed communication or high speed communication (communication specification setting dip switch No.6)

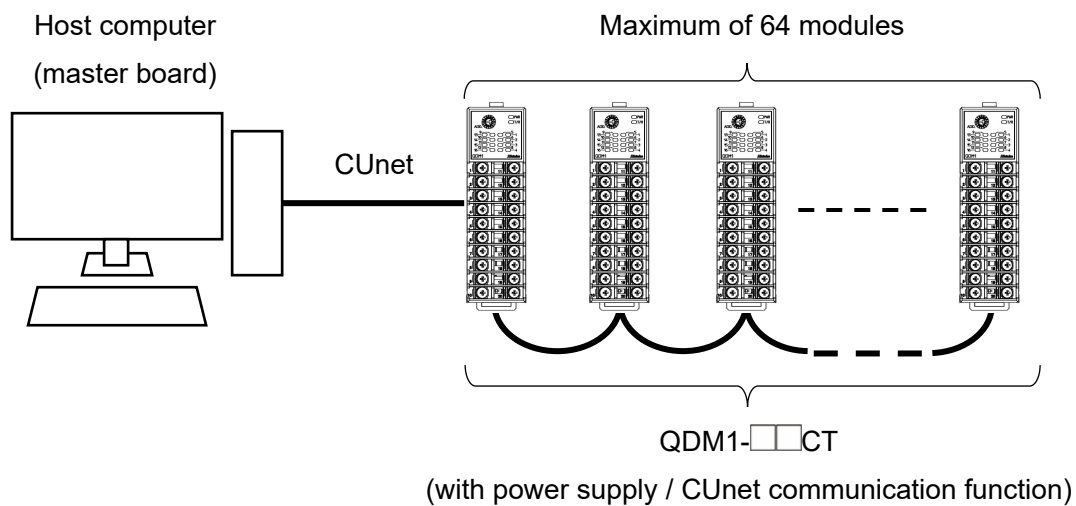
(Fig. 1.3.2-3)

1.3.3 Connecting to CUnet

When connecting to CUnet, the QDM1-□□C□ (with power supply / CUnet communication function) is required for CUnet communication.

Maximum of 64 control modules can be connected.

Configuration example of host computer (master board) and QDM1-□□CT

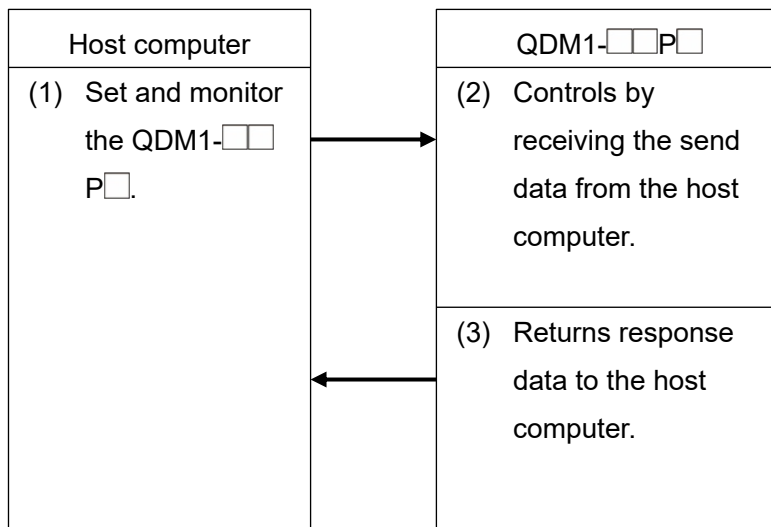


(Fig. 1.3.3-1)

1.4 Parameter Passing

1.4.1 Using the QDM1-□□P□ (with power supply / host communication function)

When the QDM1-□□P□ (with power supply / host communication function) is used, the parameter passing is as shown below.

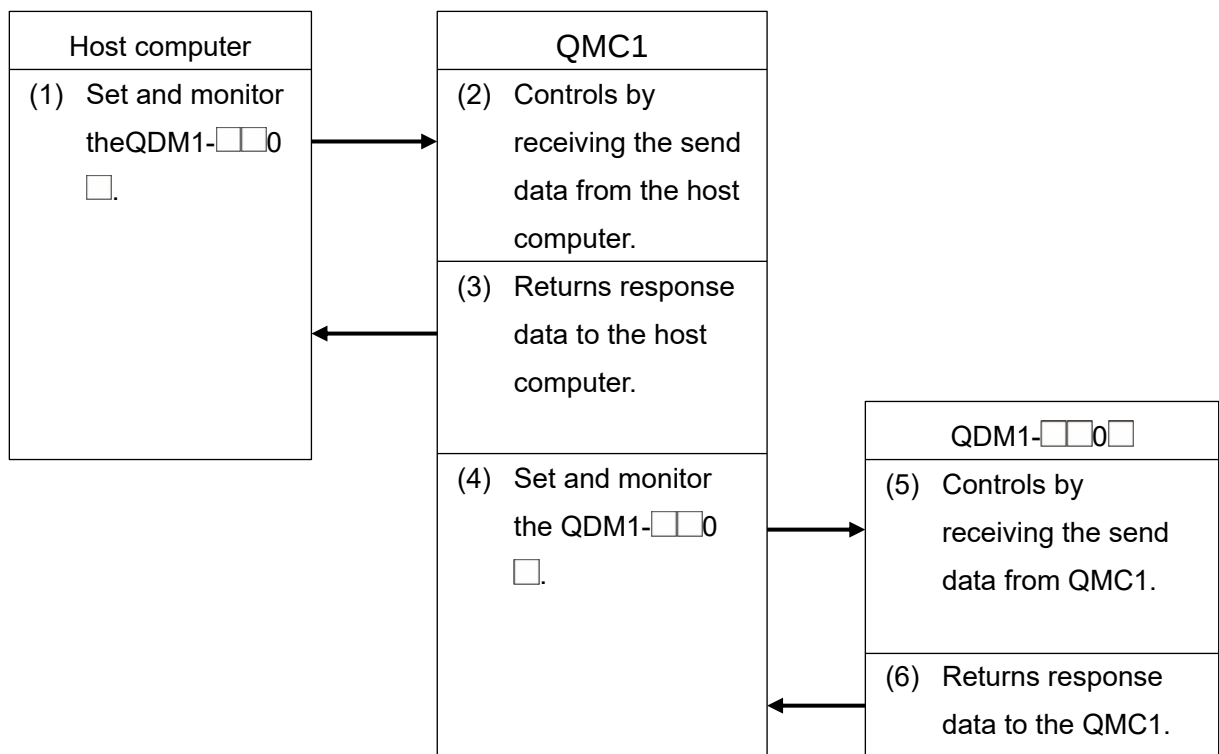


(Fig. 1.4.1-1)

1.4.2 Using the Communication Expansion Module QMC1

When the communication expansion module QMC1 is used, the parameter passing is as shown below.

Refer to the communication expansion module QMC1 instruction manual for detail.



(Fig. 1.4.2-1)

2 Model

2.1 Model

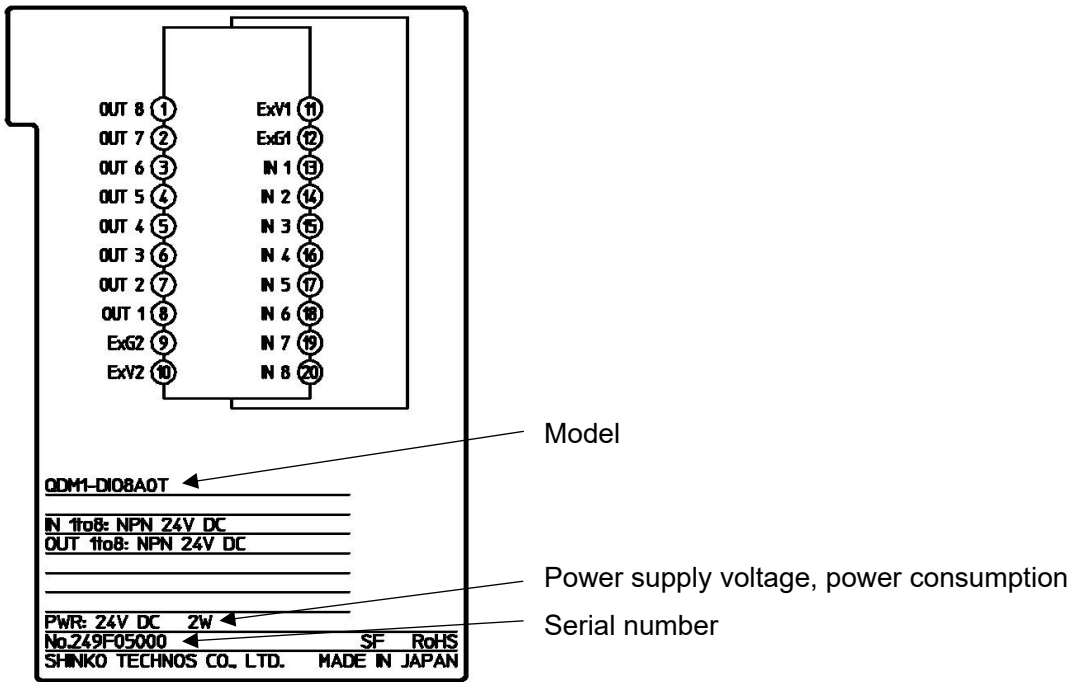
QDM1-	☐	☐	☐	☐	
Points	DI16				Input: 16 points
	DO16				Output: 16 points
	DIO8				Input: 8 points / Output: 8 points
Plus / Minus common		A			Minus common (NPN)
		B			Plus common (PNP)
Power supply / communication option		0			No option
		P			With power supply / host communication function
		C			With power supply / CUnet communication function
Wiring type			T		Terminal block type
			C		Connector type

2.2 How to Read the Model Label

The model label is attached to the right side of this instrument.

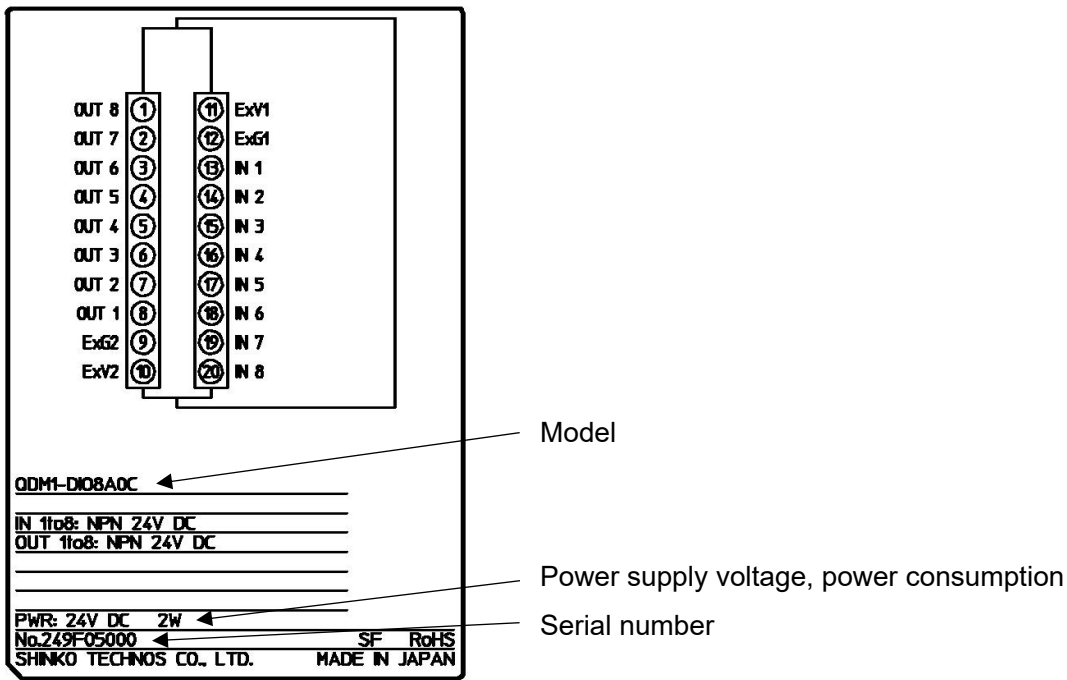
No power supply / communication option

Terminal block type



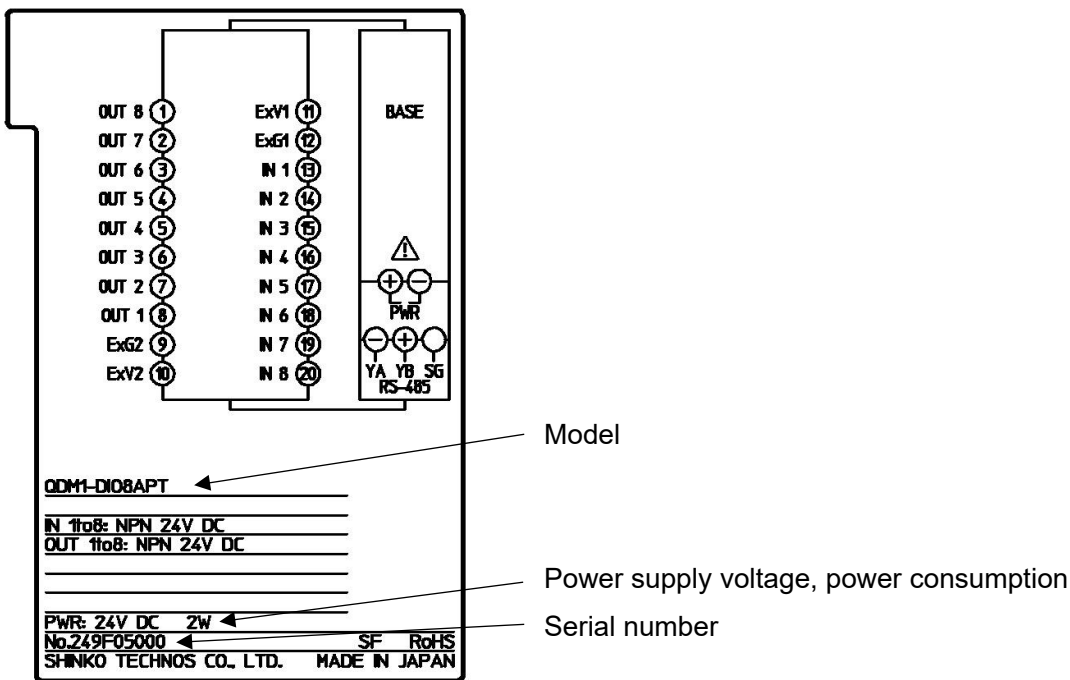
(Fig. 2.2-1)

Connector type



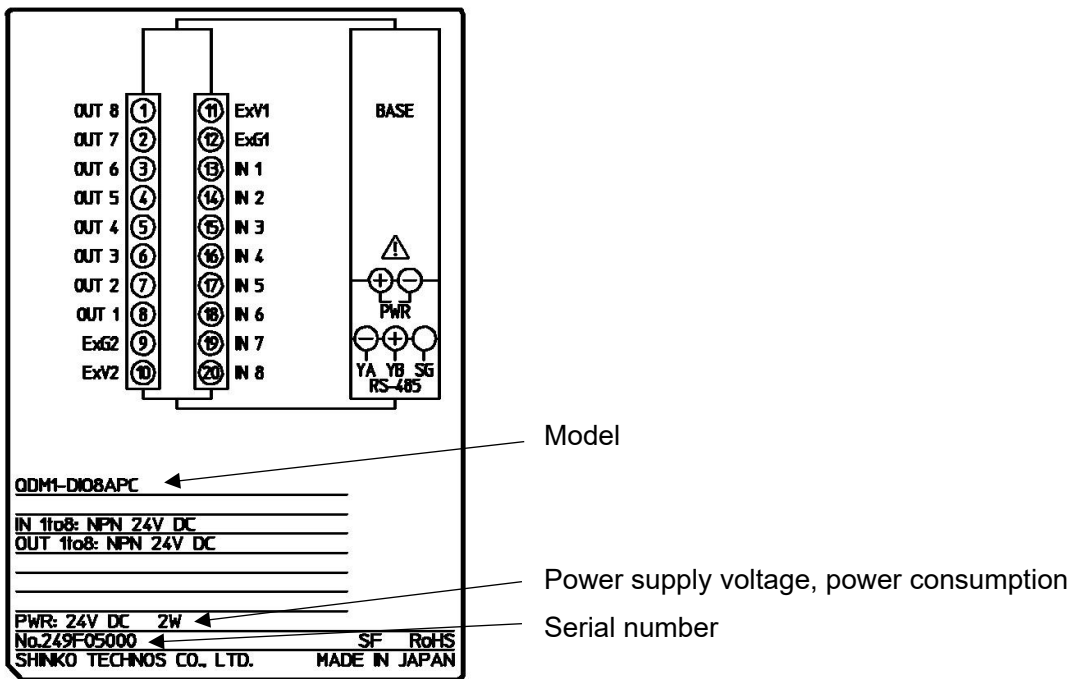
(Fig. 2.2-2)

With power supply / host communication function
Terminal block type



(Fig. 2.2-3)

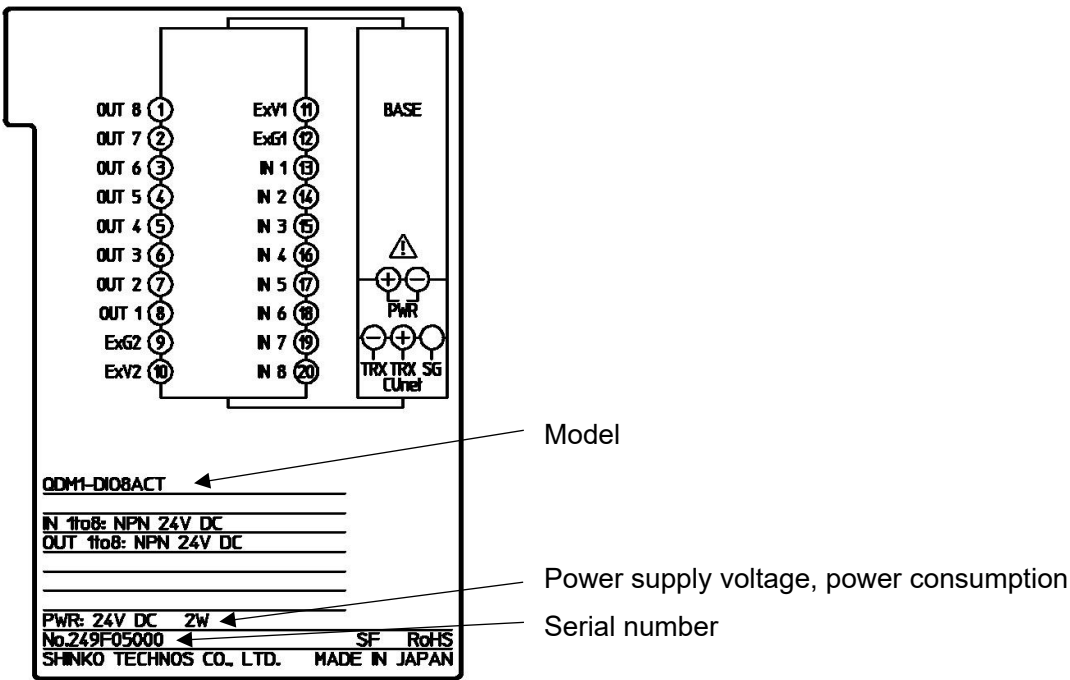
Connector type



(Fig. 2.2-4)

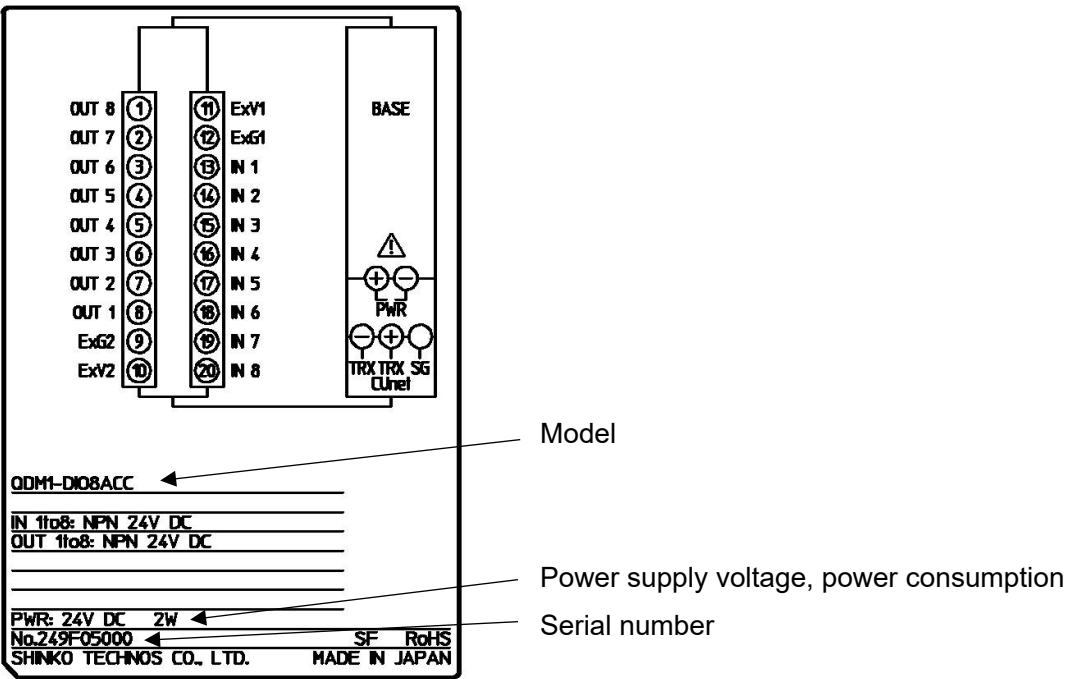
With power supply / CUnet communication function

Terminal block type



(Fig. 2.2-5)

Connector type

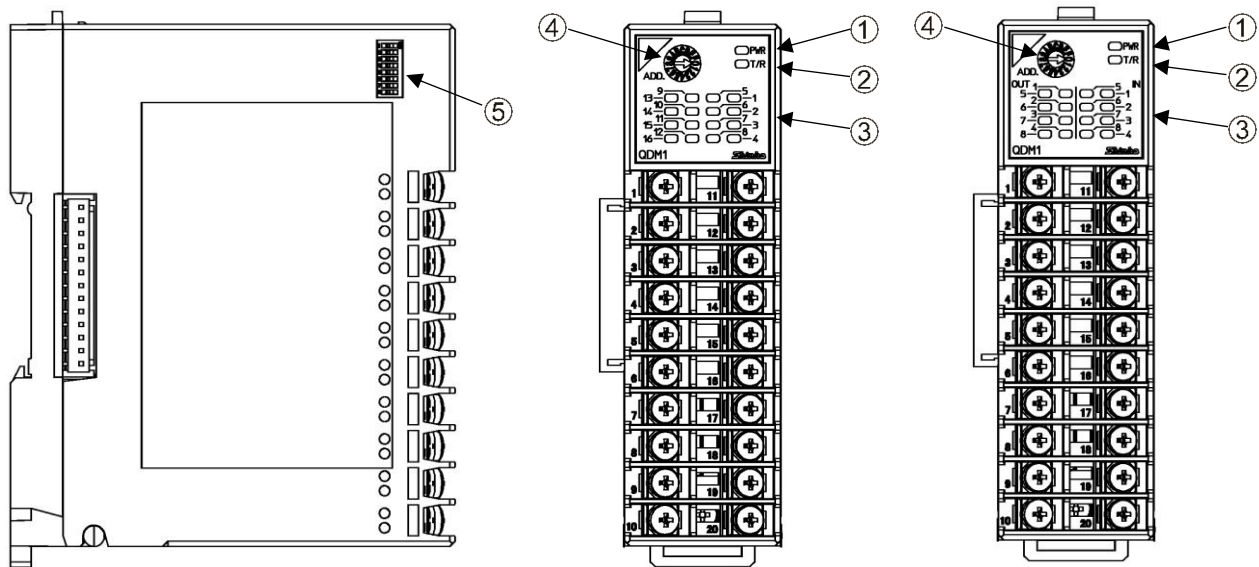


(Fig. 2.2-6)

3 Name and Functions

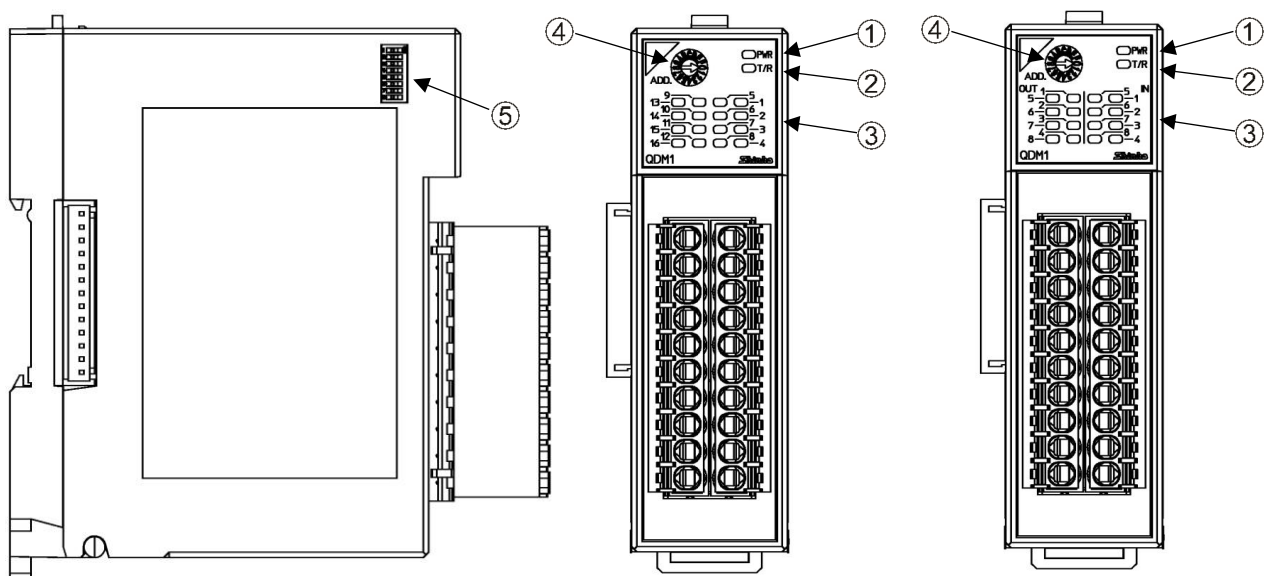
3.1 Digital I/O Module QDM1-

Terminal block type



(Fig. 3.1-1)

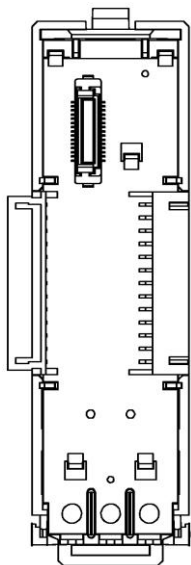
Connector type



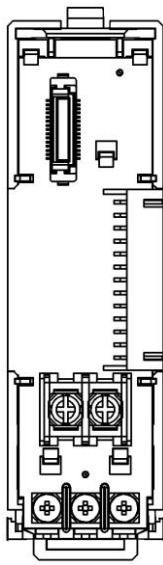
(Fig. 3.1-2)

Base part

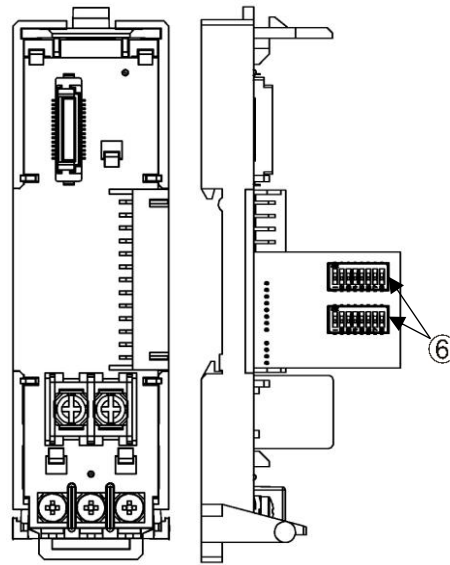
No power supply /
communication option



With power supply /
host communication option



With power supply /
CUNet communication option



(Fig. 3.1-3)

Action indicator

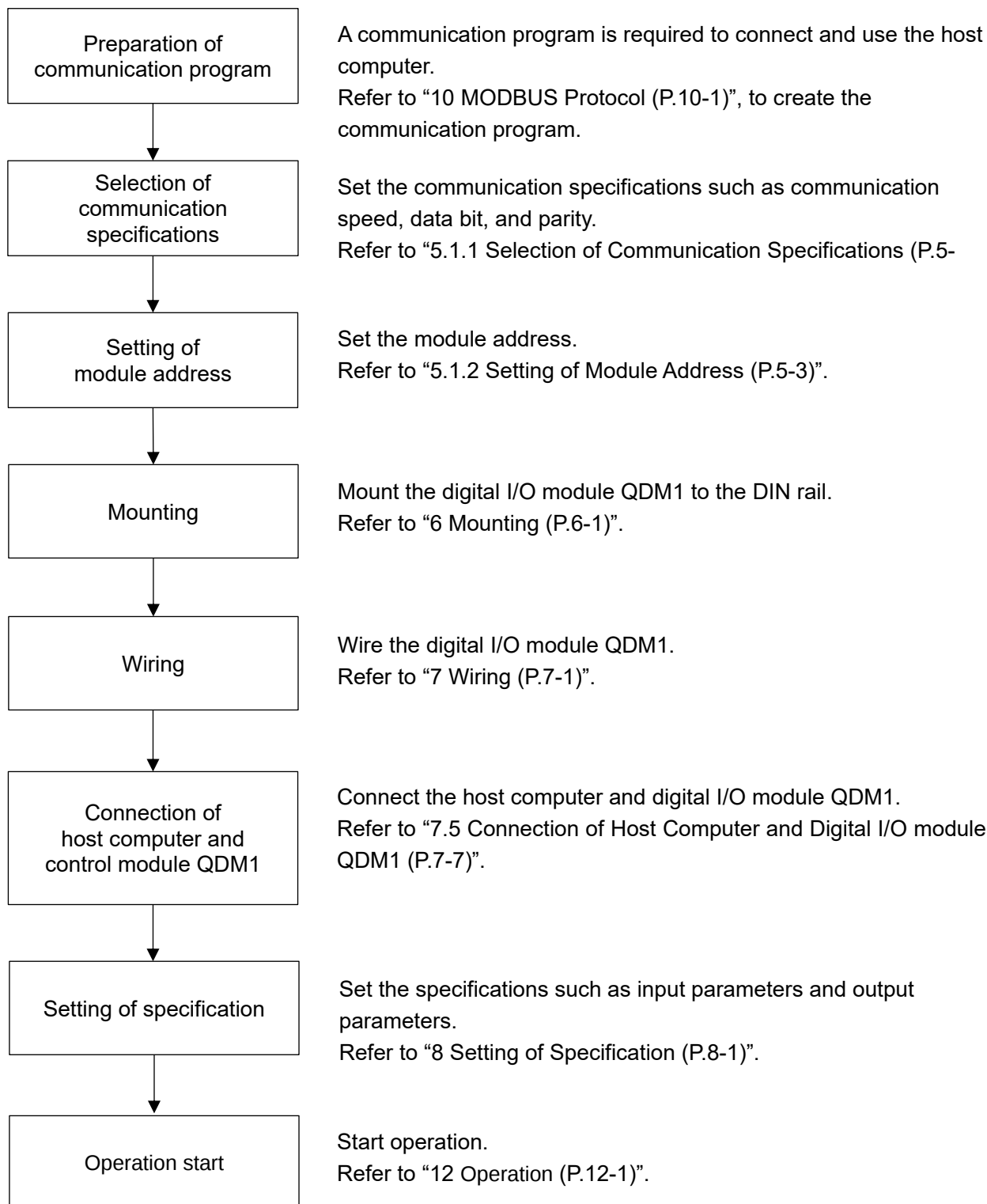
No.	Symbol (color)	Name and Function
①	PWR (Green)	Power indicator • Lights off (always): No power supply to the instrument • Lights up (always): Power supply to the instrument • Flashing for 500 ms (3 seconds): Warming up the instrument • Flashing for 500 ms (always): Internal failure of the instrument [When non-volatile IC memory error or ADC (internal circuit) error]
②	T/R (Yellow)	Communication indicator • Lights off (always): Communication error (no response) or USB communication • Flashing (slow): Communication error (reception error) • Flashing (fast): Communication is normal
③	INx/OUTx (Green)	I/O indicator • Lights off (always): Digital I/O OFF (1 point/1 CH) • Lights up (always): Digital I/O ON (1 point/1 CH)

Switch and connector

No.	Symbol	Name and Function
④	ADD.	Module address setting rotary switch Rotary switch for module address selection. The module address is the value of the selected rotary switch plus one.
⑤		Communication specification setting dip switch DIP switch for setting communication specifications. Set the communication specifications such as communication speed, data bit, parity, stop bit and communication protocol.
⑥		CUnet communication specification setting dip switch DIP switches for setting CUnet communication specifications. Set the station address, communication speed, master address, and number of occupied (OWN) items.

4 Procedure Before Starting Operation

The procedure up to the start of operation when connecting to a host computer is shown below.



(Fig. 4-1)

5 Communication Parameter Setting

5.1 Communication Parameter Setting

5.1.1 Selection of Communication Specifications

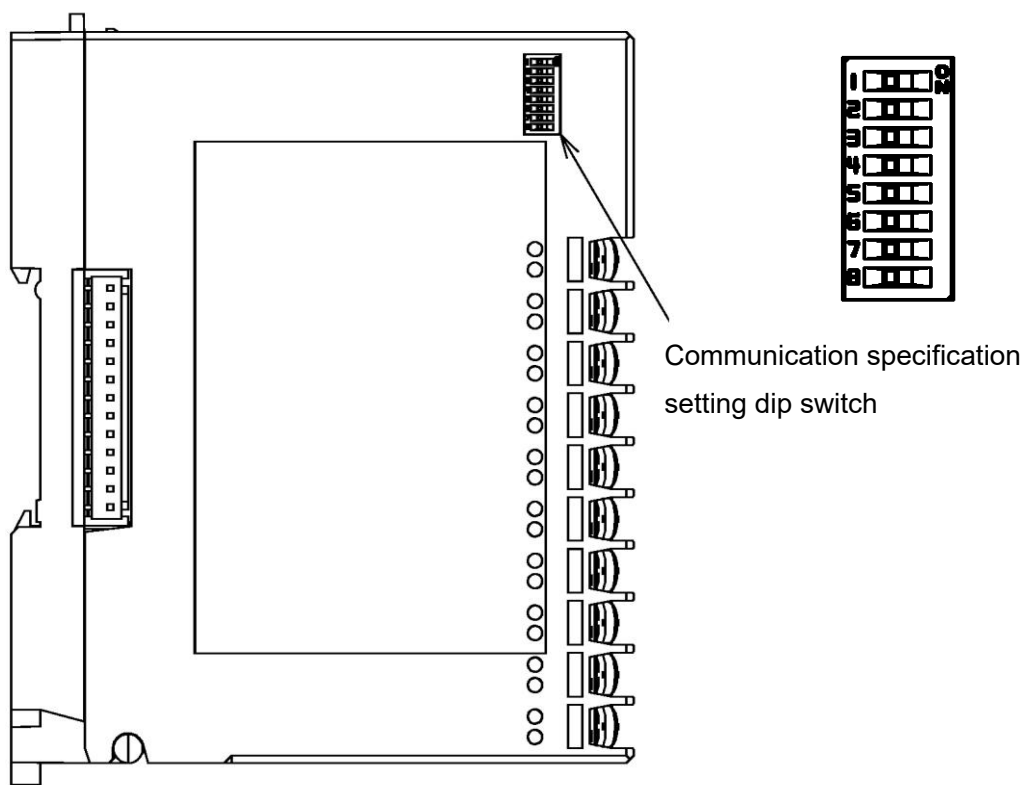


Caution

When connecting to the communication expansion module QMC1, the communication specification selection is not required.

Use it in the factory default (all OFF).

Use the communication specification setting dip switch on the left side of the instrument to set communication specifications.



(Fig. 5.1.1-1)

Set the communication speed, data bit, parity, stop bit, internal bus connection communication type, MODBUS specification/SIF specification, and output at communication break.

The factory defaults are as follows.

- Communication speed
 - With power supply / host communication option: 57600 bps
 - With power supply / CUnet communication option: 38400 bps
- Data bit: 8 bits
- Parity: Even
- Stop bit: 1 bit
- Internal bus connection communication type: Standard speed communication with QMC1 when connected to internal bus
- MODBUS specification/SIF specification: MODBUS specification
- Output at communication break: Hold

(1) Setting of communication speed

Communication specification setting dip switch		Communication speed
1	2	
OFF	OFF	57600 bps
ON	OFF	38400 bps
OFF	ON	19200 bps
ON	ON	9600 bps

(2) Setting of data bit, parity and stop bit

Communication specification setting dip switch			Data bit, parity and stop bit
3	4	5	
OFF	OFF	OFF	8 bits, Even, 1 bit
ON	OFF	OFF	8 bits, Even, 2 bits
OFF	ON	OFF	8 bits, Odd, 1 bit
ON	ON	OFF	8 bits, Odd, 2 bits
OFF	OFF	ON	8 bits, None, 1 bit
ON	OFF	ON	8 bits, None, 2 bits

(3) Selection of internal bus connection communication type

Communication specification setting dip switch		Internal bus connection communication type
6	OFF	Standard speed communication with QMC1 when connected to internal bus
	ON	High speed communication with QMC1 when connected to internal bus

When ON, the digital I/O data update cycle with QMC1 corresponding to this function is within 10 ms per 1 module.

Refer to “1.3 System Configuration (P.1-3 to 1-7)”.

(4) Selection of MODBUS specification/SIF specification

Communication specification setting dip switch		MODBUS specification/SIF specification
7	OFF	MODBUS specification
	ON	SIF specification (master module)

This selection is invalid when the power supply/CUnet communication function is available.

When using the module as a slave module for the SIF function, select the MODBUS specification.

(5) Selection of output at communication break

Communication specification setting dip switch		Output at communication break
8	OFF	Output hold at communication break
	ON	Output OFF at communication break

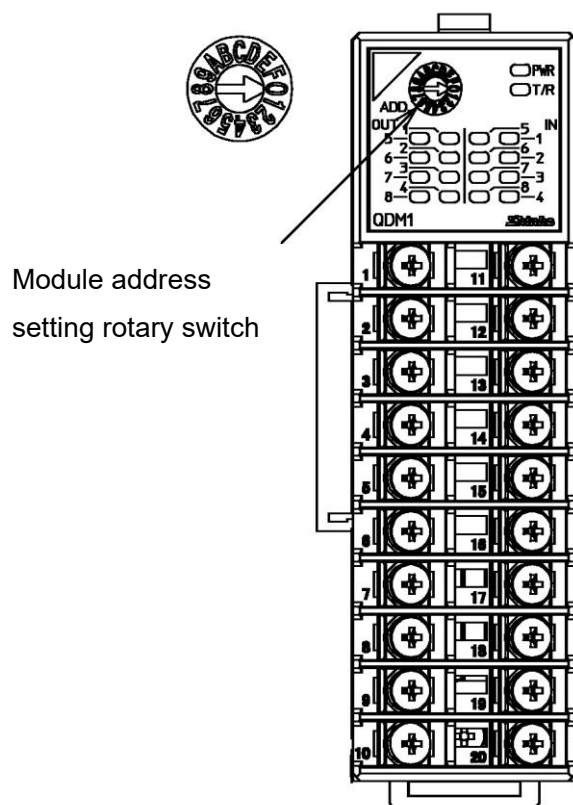
The communication break is condition in which a valid command cannot be received for more than one minute.

5.1.2 Setting of Module Address

Caution

When using the SIF function, module addresses should be set to consecutive numbers starting from 1.
When using the MODBUS specification, any number between 0 to F (1 to 16) can be set.

The module addresses are set with the rotary switch.



(Fig. 5.1.2-1)

Use a small flat-blade screwdriver to set the module addresses.

The value obtained by adding 1 to the value of the set rotary switch becomes the module addresses.

Module address: 0 to F (1 to 16)

Rotary switch	0	1		9	A	B		F
Module address	1	2		10	11	12		16

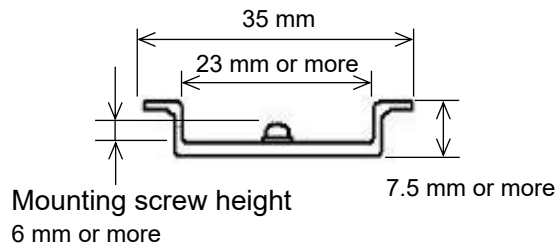
6 Mounting



Caution

- When mounting or removing this instrument, be sure to turn off the power supply to this instrument.
- Mount the DIN rail horizontally.
- This instrument fits the following DIN rails.

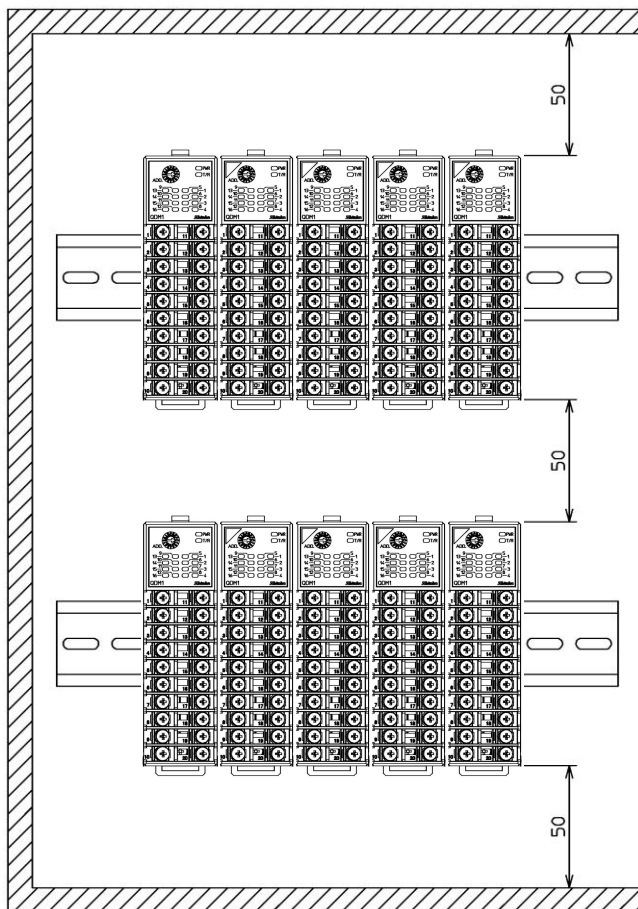
Top hat rail TH35 JIS C 2812-1988



Width: 35 mm
Height: 7.5 mm or more
Groove width: 23 mm or more
DIN rail mounting screw height:
6 mm or more
(For DIN rail height 7.5 mm)

(Fig. 6-1)

- If this instrument is mounted in a position susceptible to vibration or shock, mount commercially available end plate at both ends of the instrument.
 - When installing, make sure that the orientation (upper and lower) of this instrument is correct.
 - When mounting or removing this instrument on the DIN rail, it must be tilted slightly
- Secure a space of 50 mm or more in the vertical direction of the instrument, considering the wiring space of the power supply/communication line and heat dissipation.



(Fig. 6-2)

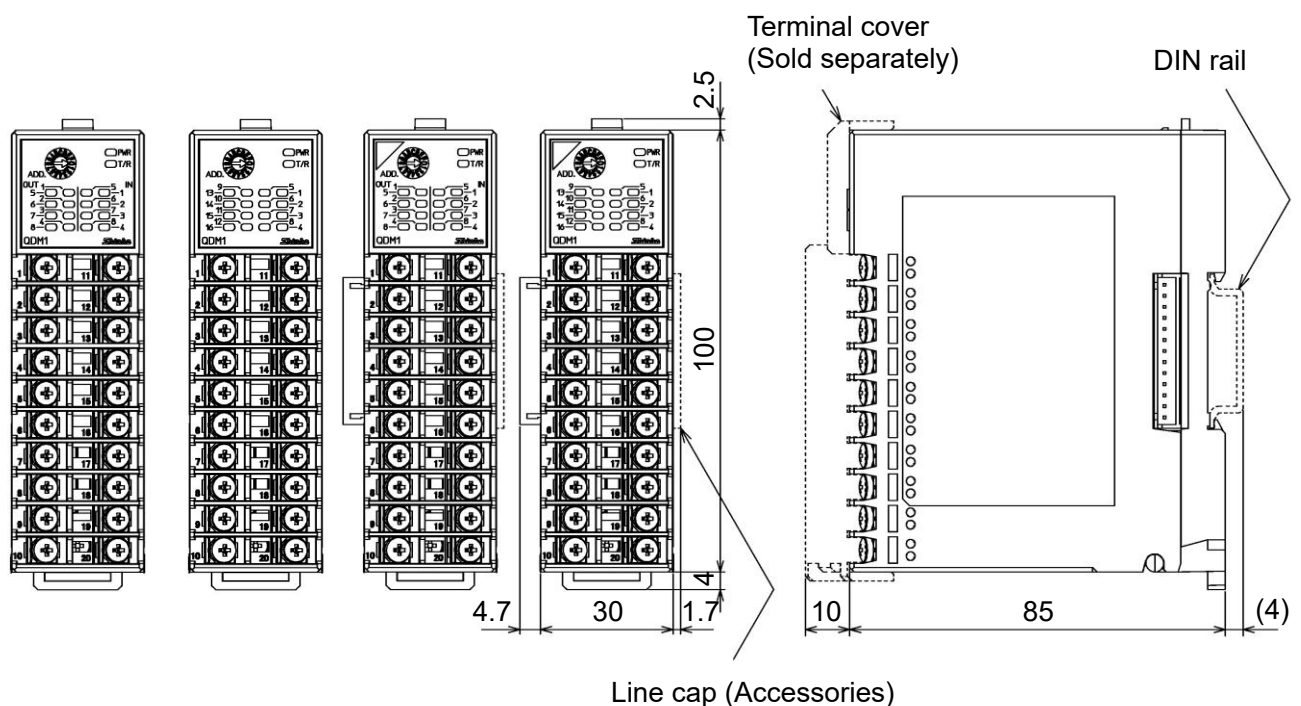
6.1 Selection of Location

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
 - No flammable, explosive gases
 - No mechanical vibrations or shocks
 - No exposure to direct sunlight, an ambient temperature of -10 to 50°C (14°F to 122°F) that does not change rapidly, and no icing
 - An ambient non-condensing humidity of 35 to 85%RH
 - No large capacity electromagnetic switches or cables through which large current is flowing
 - No water, oil or chemicals or the vapors of these substances can come into direct contact with the unit.
 - When installing this unit within a control panel, please note that ambient temperature of this unit – not the ambient temperature of the control panel – must not exceed 50°C (122°F). Otherwise the life of electronic components (especially electrolytic capacitor) may be shortened.
- * Avoid setting this instrument directly on or near flammable material even though the case of this instrument is made of flame-resistant resin.

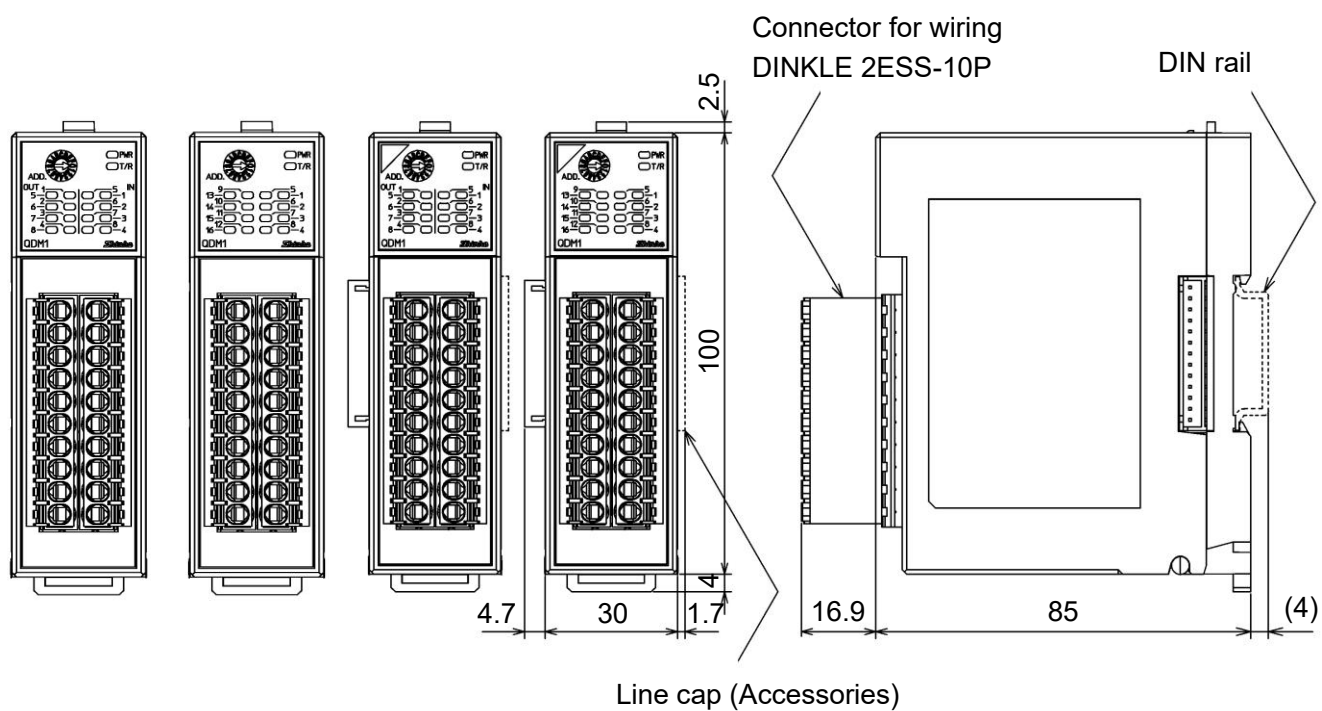
6.2 External Dimensions (Scale: mm)

Terminal block type



(Fig. 6.2-1)

Connector type



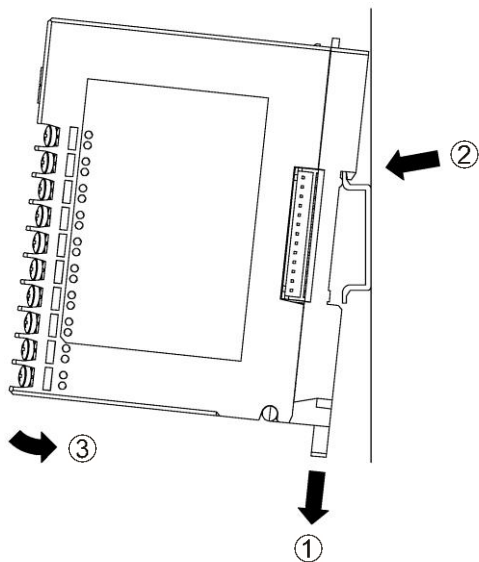
(Fig. 6.2-2)

6.3 Mounting

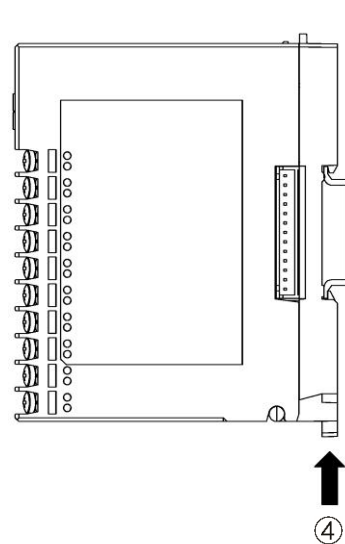
Mounting to the DIN rail

- ① Lower the lock lever of this instrument. (The lock lever of this instrument has a spring structure, but if lower it in the direction of the arrow until it stops, it will be locked in that position.)
- ② Hook the part ② of this instrument onto the top of the DIN rail.
- ③ Insert the lower part of this instrument with the part ② as a fulcrum.
- ④ Raise the lock lever of this instrument.

Make sure it is fixed to the DIN rail.



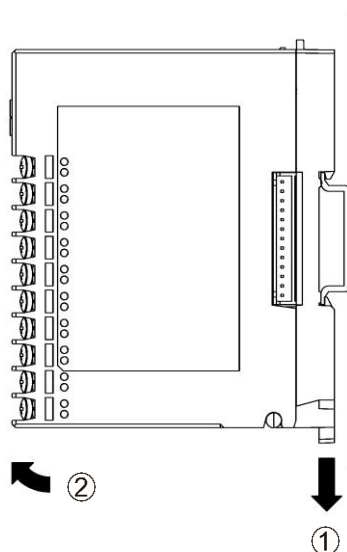
(Fig. 6.3-1)



(Fig. 6.3-2)

Removal from the DIN rail

- ① Insert a flat blade screwdriver into the lock lever of this instrument and lower the lock lever until it stops.
- ② Remove this instrument from the DIN rail by lifting it from below.



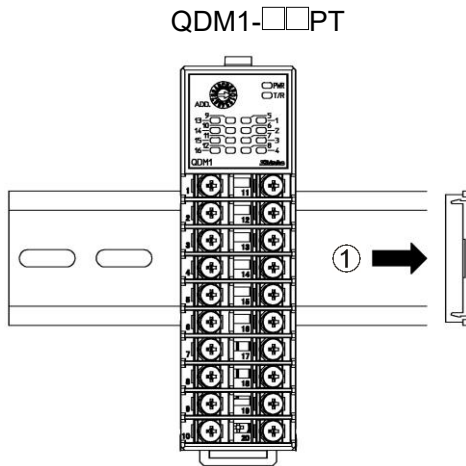
(Fig. 6.3-3)

Mounting multiple modules to the DIN rail

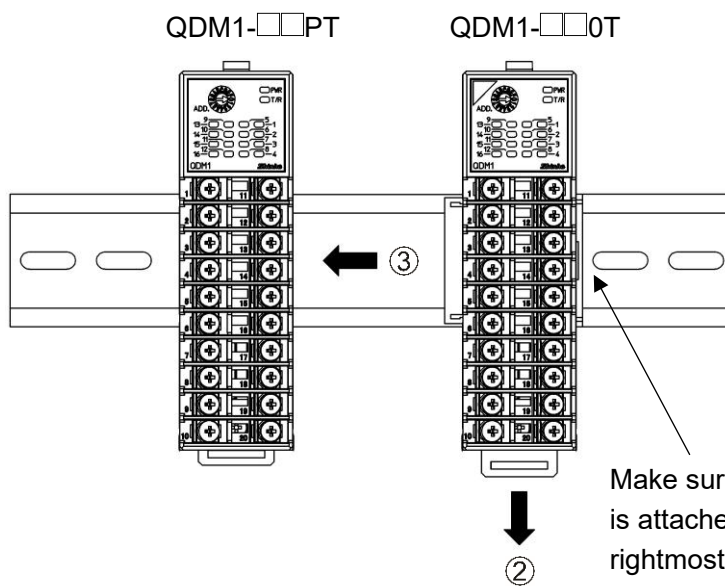
This section describes an example of mounting multiple modules on the DIN rail.

- ① Remove the line cap on the right side of the QDM1-□□PT.
- ② Lower the lock lever of the QDM1-□□0T, and mounting the QDM1-□□0T to the DIN rail.
- ③ Slide the QDM1-□□0T to the left and connect the connectors to each other.
- ④ Raise the lock lever of the QDM1-□□0T.

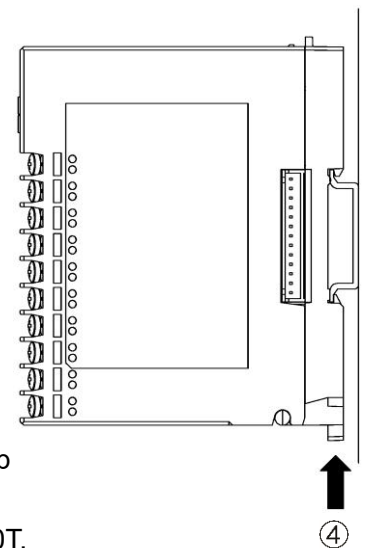
Make sure it is fixed to the DIN rail.



(Fig. 6.3-4)



(Fig. 6.3-5)

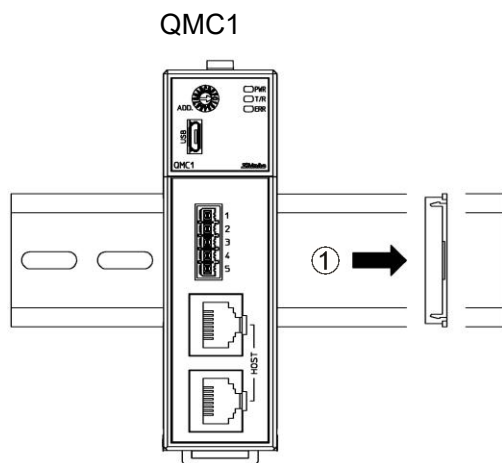


(Fig. 6.3-6)

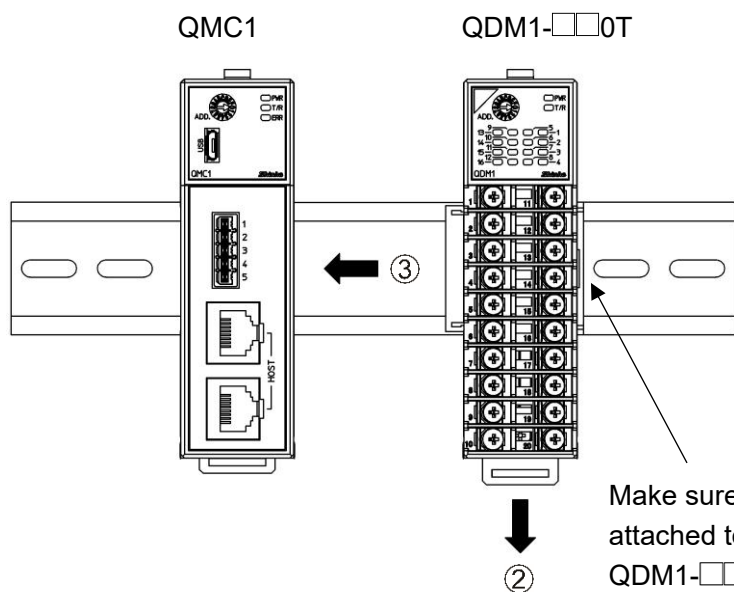
This section describes an example of mounting communication expansion module QMC1 and QDM1-□□0T on the DIN rail.

- ① Remove the line cap on the right side of the QMC1.
- ② Lower the lock lever of the QDM1-□□0T, and mounting the QDM1-□□0T to the DIN rail.
- ③ Slide the QDM1-□□0T to the left and connect the connectors to each other.
- ④ Raise the lock lever of the QDM1-□□0T.

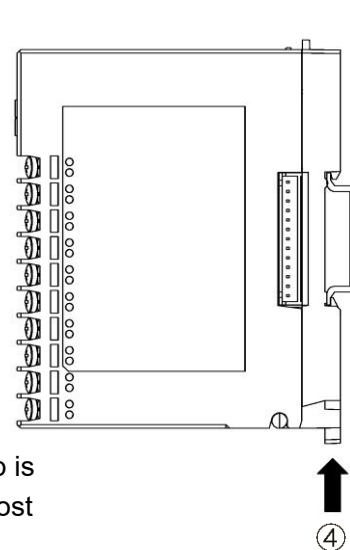
Make sure it is fixed to the DIN rail.



(Fig. 6.3-7)



(Fig. 6.3-8)

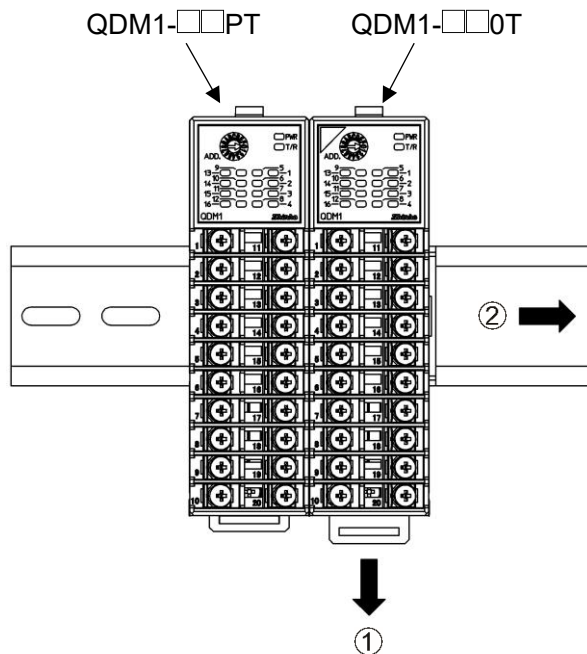


(Fig. 6.3-9)

Removal multiple modules from the DIN rail

This section describes an example of removing multiple QDM1-□□0T on the DIN rail.

- ① Insert a flat blade screwdriver into the lock lever of the QDM1-□□0T and lower the lock lever until it stops.
- ② Slide QDM1-□□0T to the right side and disconnect it from the connector, then remove it from the DIN rail.



(Fig. 6.3-10)

7 Wiring



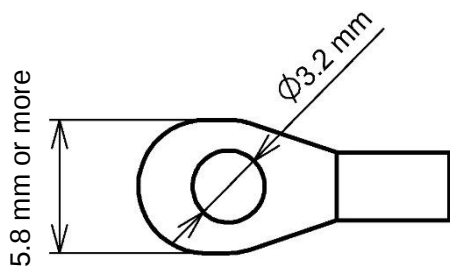
Warning

Turn off the power supply to this instrument before wiring.
If you work while the power is supplied, you may get an electric shock, which could result in an accident resulting in death or serious injury.

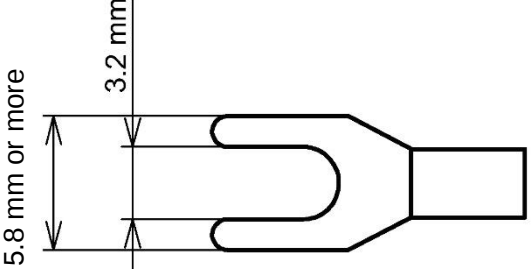
7.1 Recommended Terminal

Use a solderless terminal with an insulation sleeve in which an M3 screw fits as shown below. Use the Ring-type for the power supply and communication section.

Solderless Terminal	Manufacturer	Model	Tightening torque
Y-type	NICHIFU TERMINAL INDUSTRIES CO., LTD.	TMEX1.25Y-3	Input/output section: 0.63 N•m Power supply section: 0.5 N•m Serial communication section: 0.3 N•m
	J.S.TMFG.CO.,LTD.	VD1.25-B3A	
Ring-type	NICHIFU TERMINAL INDUSTRIES CO., LTD.	TMEX1.25-3	
	J.S.TMFG.CO.,LTD.	V1.25-3	



(Fig. 7.1-1)



(Fig. 7.1-2)

7.2 Using Terminal Cover Precaution

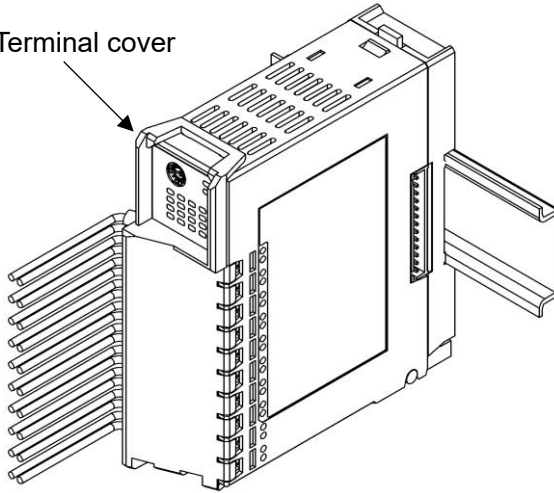
Attach the terminal cover TC-QTC (sold separately) (*) so that the shorter one is on the right side of the case.

For the wiring of terminal numbers 11 to 20, pass through the left side of the terminal cover.

(*): QDM1 has the same case shape as QTC1, so the terminal cover of QTC1 is used.

QDM1-□□PT

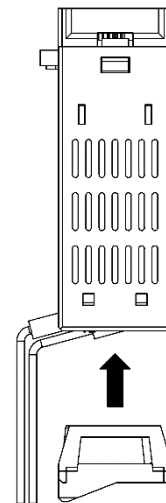
Terminal cover



(Fig. 7.2-1)

Top of QDM1-□□PT

Case



Attach the terminal cover so that the shorter one is on the right side of the case.

(Fig. 7.2-2)

7.3 Terminal Arrangement

7.3.1 Input and Output Terminal Arrangement



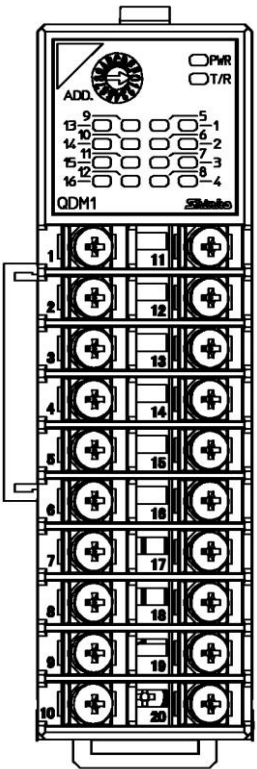
Caution

- Please note that terminal numbers 1 to 10 and 11 to 20 have different terminal arrangements.

Terminal block type

QDM1-D□16□0T

1	IN16/OUT16
2	IN15/OUT15
3	IN14/OUT14
4	IN13/OUT13
5	IN12/OUT12
6	IN11/OUT11
7	IN10/OUT10
8	IN9/OUT9
9	ExG2
10	ExV2

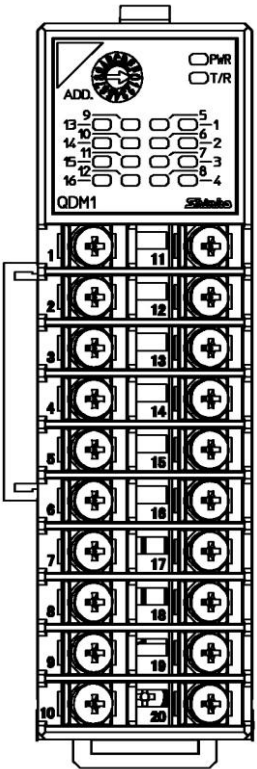


11	ExV1
12	ExG1
13	IN1/OUT1
14	IN2/OUT2
15	IN3/OUT3
16	IN4/OUT4
17	IN5/OUT5
18	IN6/OUT6
19	IN7/OUT7
20	IN8/OUT8

(Fig. 7.3.1-1)

QDM1-DIO8□0T

1	OUT8
2	OUT7
3	OUT6
4	OUT5
5	OUT4
6	OUT3
7	OUT2
8	OUT1
9	ExG2
10	ExV2



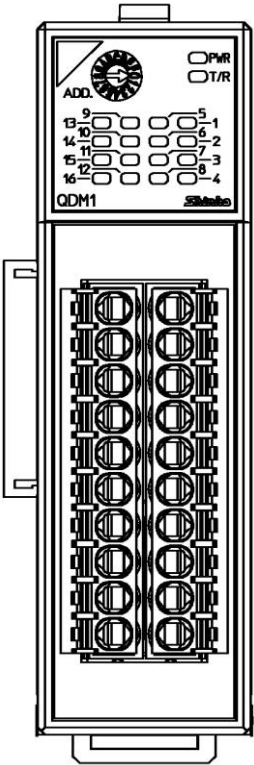
11	ExV1
12	ExG1
13	IN1
14	IN2
15	IN3
16	IN4
17	IN5
18	IN6
19	IN7
20	IN8

(Fig. 7.3.1-2)

Connector type

QDM1-D□16□0C

1	IN16/OUT16
2	IN15/OUT15
3	IN14/OUT14
4	IN13/OUT13
5	IN12/OUT12
6	IN11/OUT11
7	IN10/OUT10
8	IN9/OUT9
9	ExG2
10	ExV2

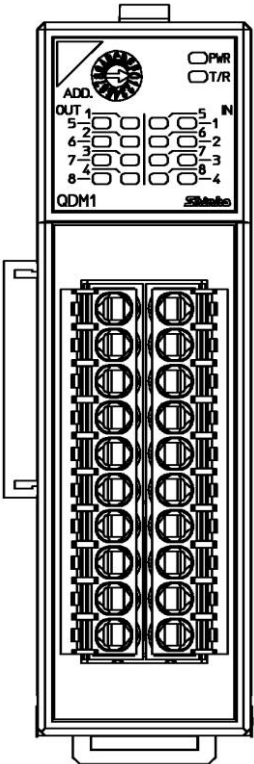


11	ExV1
12	ExG1
13	IN1/OUT1
14	IN2/OUT2
15	IN3/OUT3
16	IN4/OUT4
17	IN5/OUT5
18	IN6/OUT6
19	IN7/OUT7
20	IN8/OUT8

(Fig. 7.3.1-3)

QDM1-DIO8□0C

1	OUT8
2	OUT7
3	OUT6
4	OUT5
5	OUT4
6	OUT3
7	OUT2
8	OUT1
9	ExG2
10	ExV2



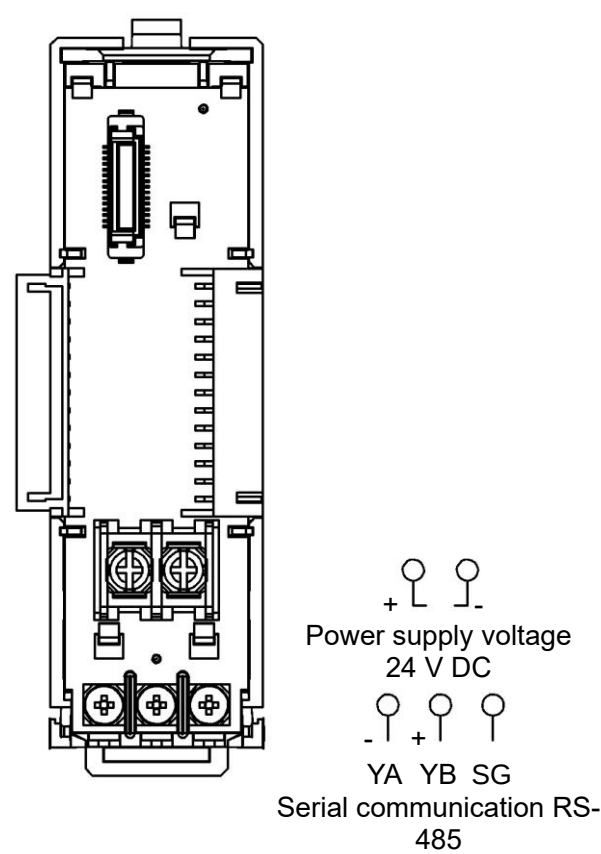
11	ExV1
12	ExG1
13	IN1
14	IN2
15	IN3
16	IN4
17	IN5
18	IN6
19	IN7
20	IN8

(Fig. 7.3.1-4)

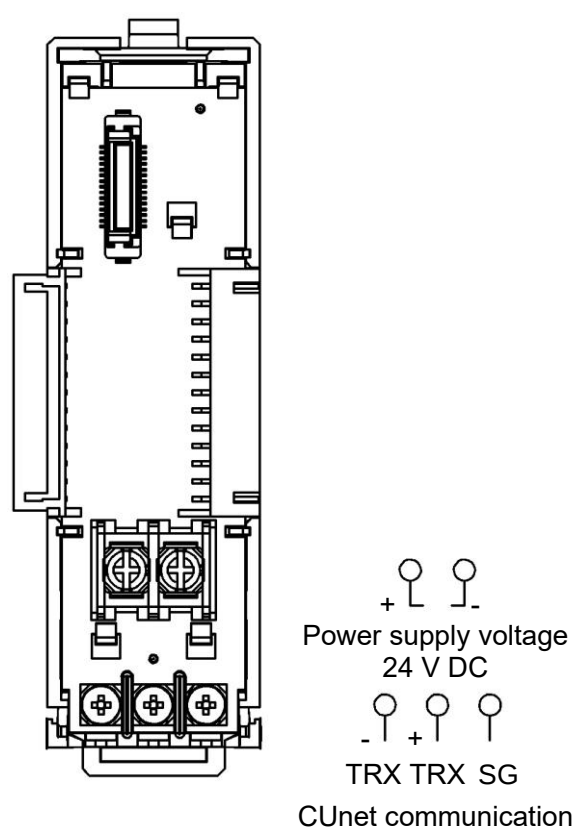
7.3.2 Power Supply and Communication Terminal Arrangement

Serial communication RS-485

CUnet communication



(Fig. 7.3.2-1)



(Fig. 7.3.2-2)

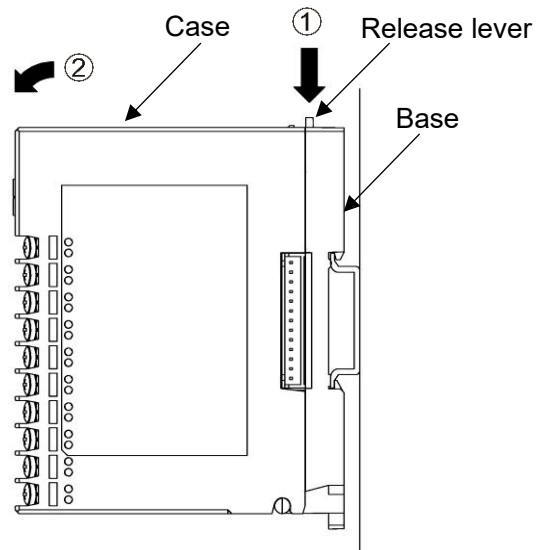
7.4 Wiring

7.4.1 Wiring for Power Supply and Communication

The terminal block for power supply and communication is located on the base of QDM1-□□P□. Wiring by the following procedure.

(1) Case removal

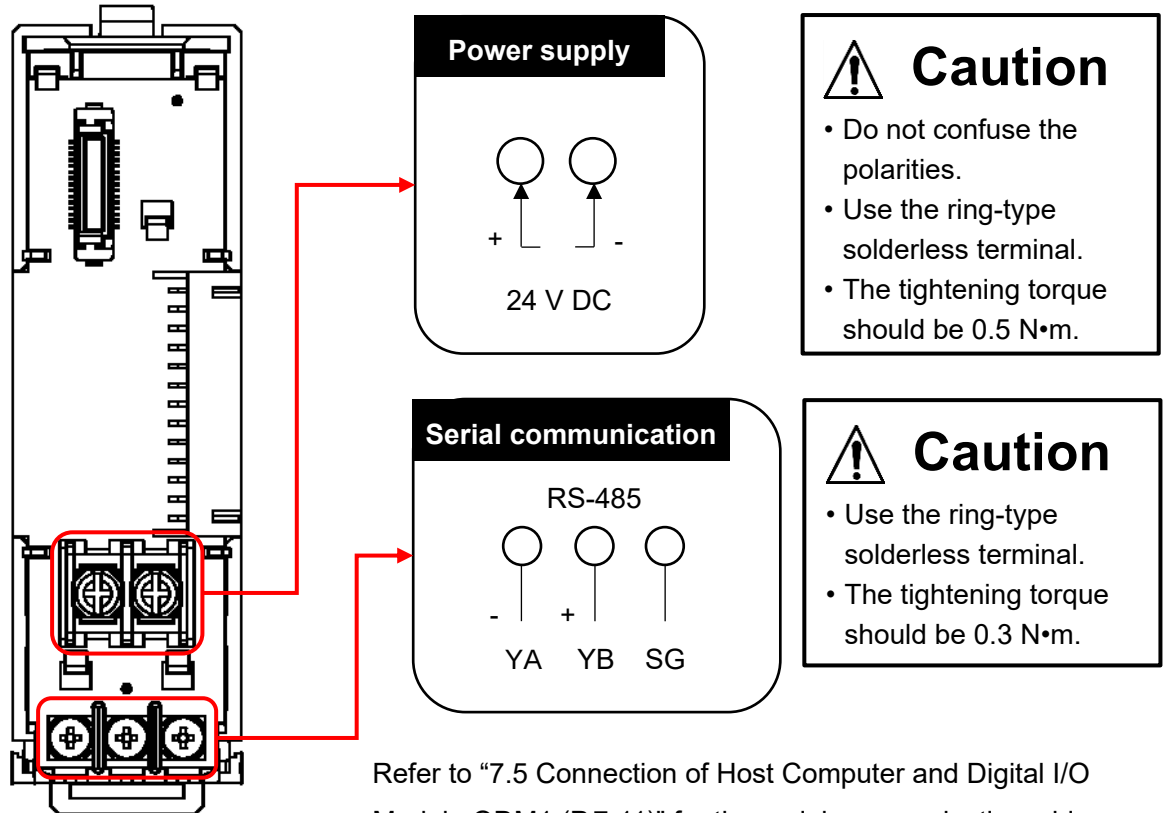
- ① Push the release lever on the top of QDM1-□□P□ to unlock it.
- ② Remove the case.



(Fig. 7.4.1-1)

(2) Wiring

Serial communication RS-485

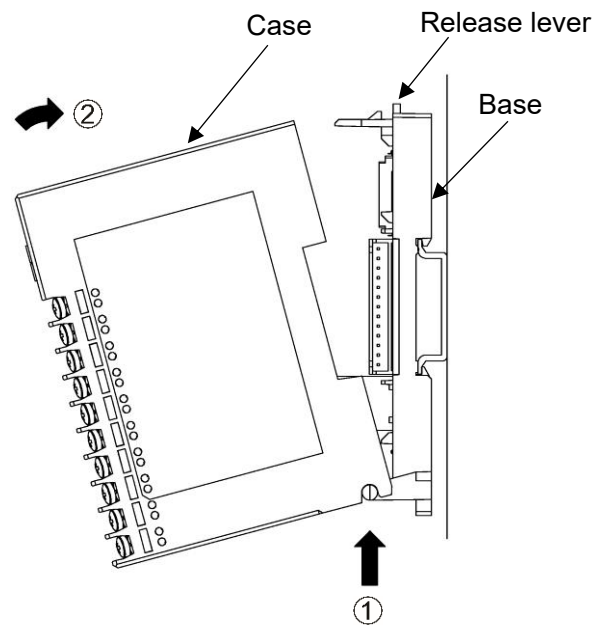


Refer to "7.5 Connection of Host Computer and Digital I/O Module QDM1 (P.7-11)" for the serial communication wiring.

(Fig. 7.4.1-2)

(3) Case mounting

- ① Hook the case on the lower part ① of QDM1-□□P□.
- ② Mount the case so that the lower part ① of QDM1-□□P□ is the fulcrum and covers the release lever. There is a clicking sound.



(Fig. 7.4.1-3)

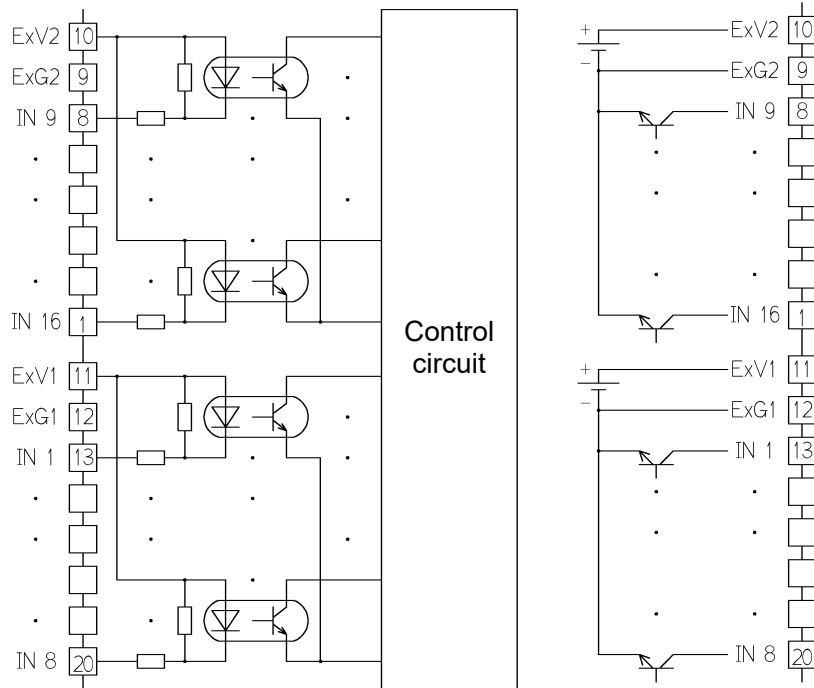


Caution

- Please note that terminal numbers 1 to 10 and 11 to 20 have different terminal arrangements.
- The tightening torque should be 0.63 N•m.

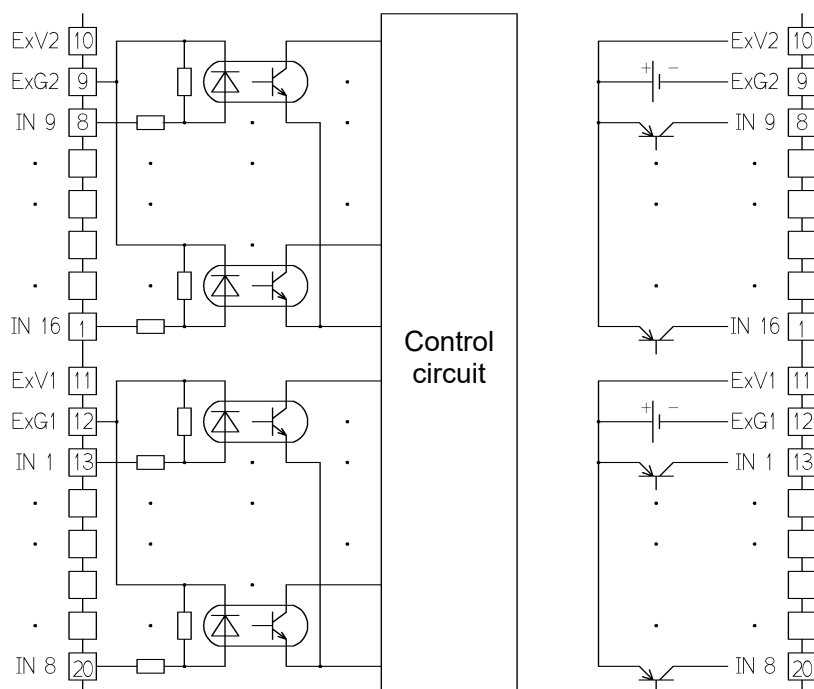
(1) Example of circuit configuration and wiring of digital input module

QDM1-DI16A□□



(Fig. 7.4.2-1)

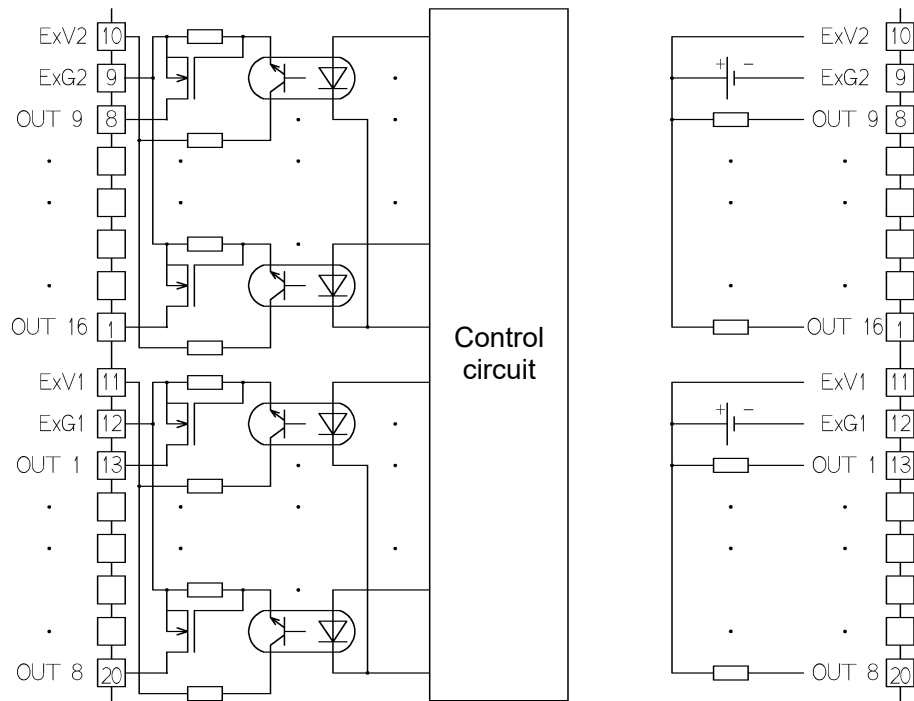
QDM1-DI16B□□



(Fig. 7.4.2-2)

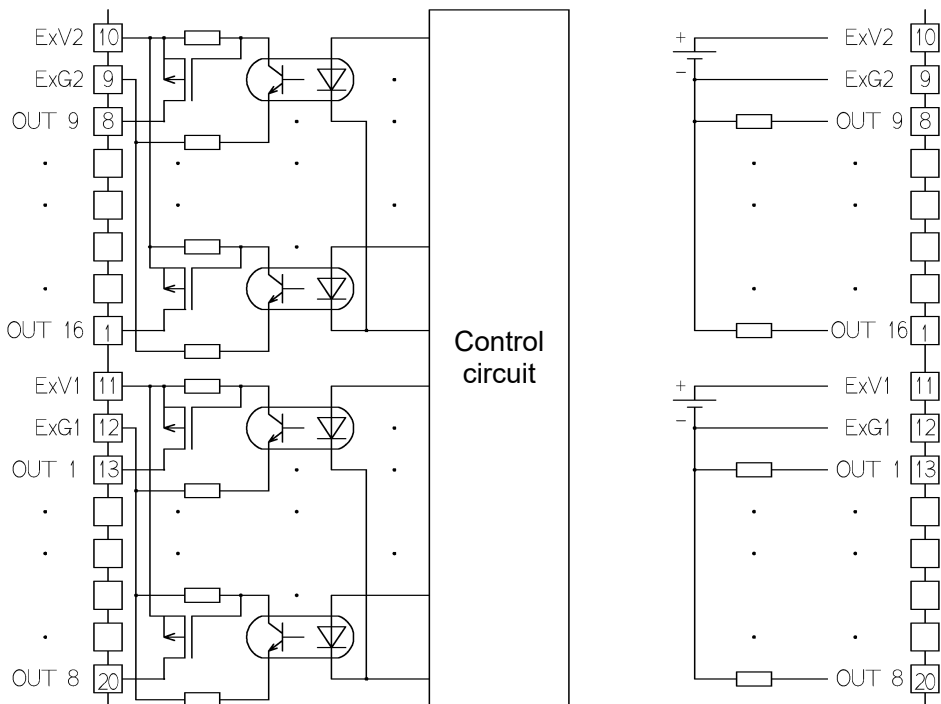
(2) Example of circuit configuration and wiring of digital output module

QDM1-DO16A□□



(Fig. 7.4.2-3)

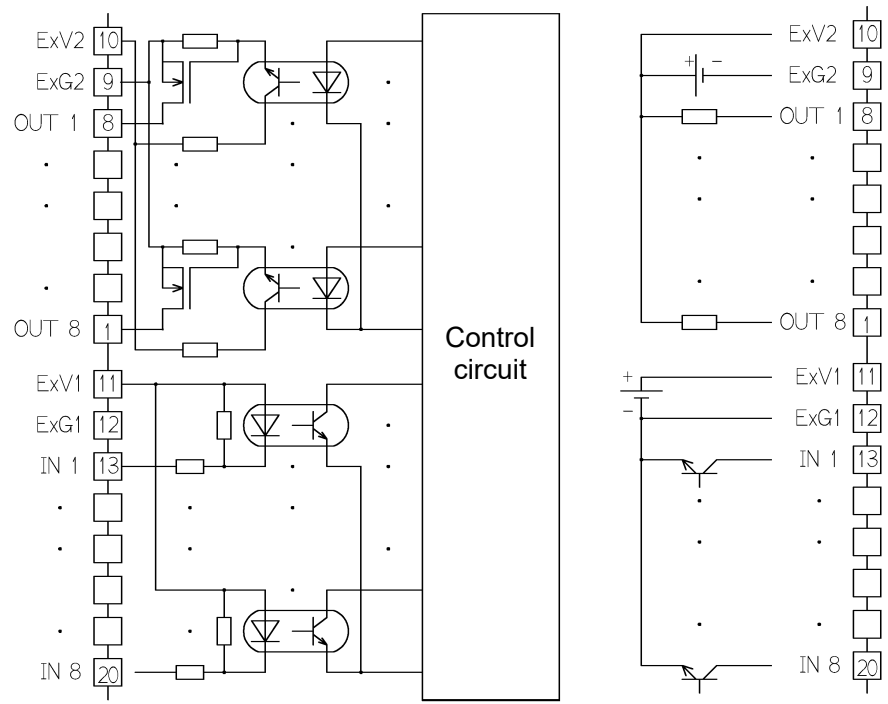
QDM1-DO16B□□



(Fig. 7.4.2-4)

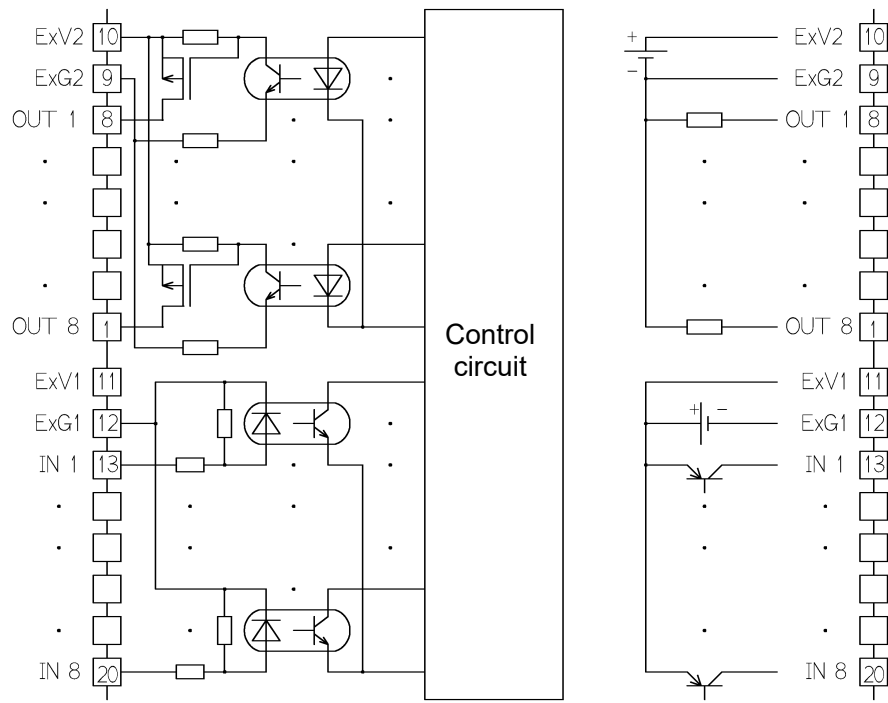
(3) Example of circuit configuration and wiring of digital I/O module

QDM1-DIO8A□□



(Fig. 7.4.2-5)

QDM1-DIO8B□□



(Fig. 7.4.2-6)

7.5 Connection of Host Computer and QDM1

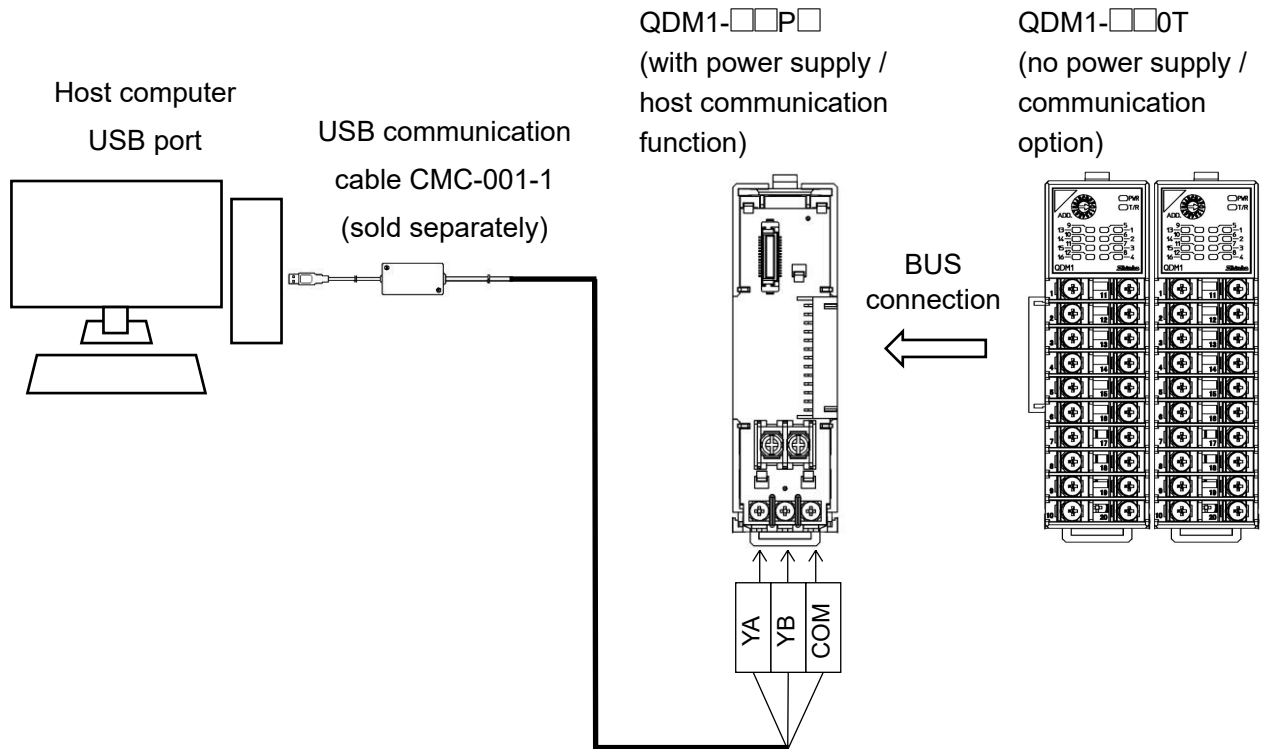
7.5.1 Wiring Example for Using USB Communication Cable CMC-001-1 (Sold separately)

When connecting using USB communication cable CMC-001-1 (sold separately), one QDM1-□□P□ (with power supply / host communication function) is required for host communication.

The power supply and communication lines to the second and subsequent QDM1 are connected to the BUS using connectors.

For the second and later modules, use the QDM1-□□0□ (no power supply / communication option).

A maximum of 16 modules can be connected.



(Fig. 7.5.1-1)

7.5.2 Wiring Example for Using Communication Converter IF-400 (Sold separately)

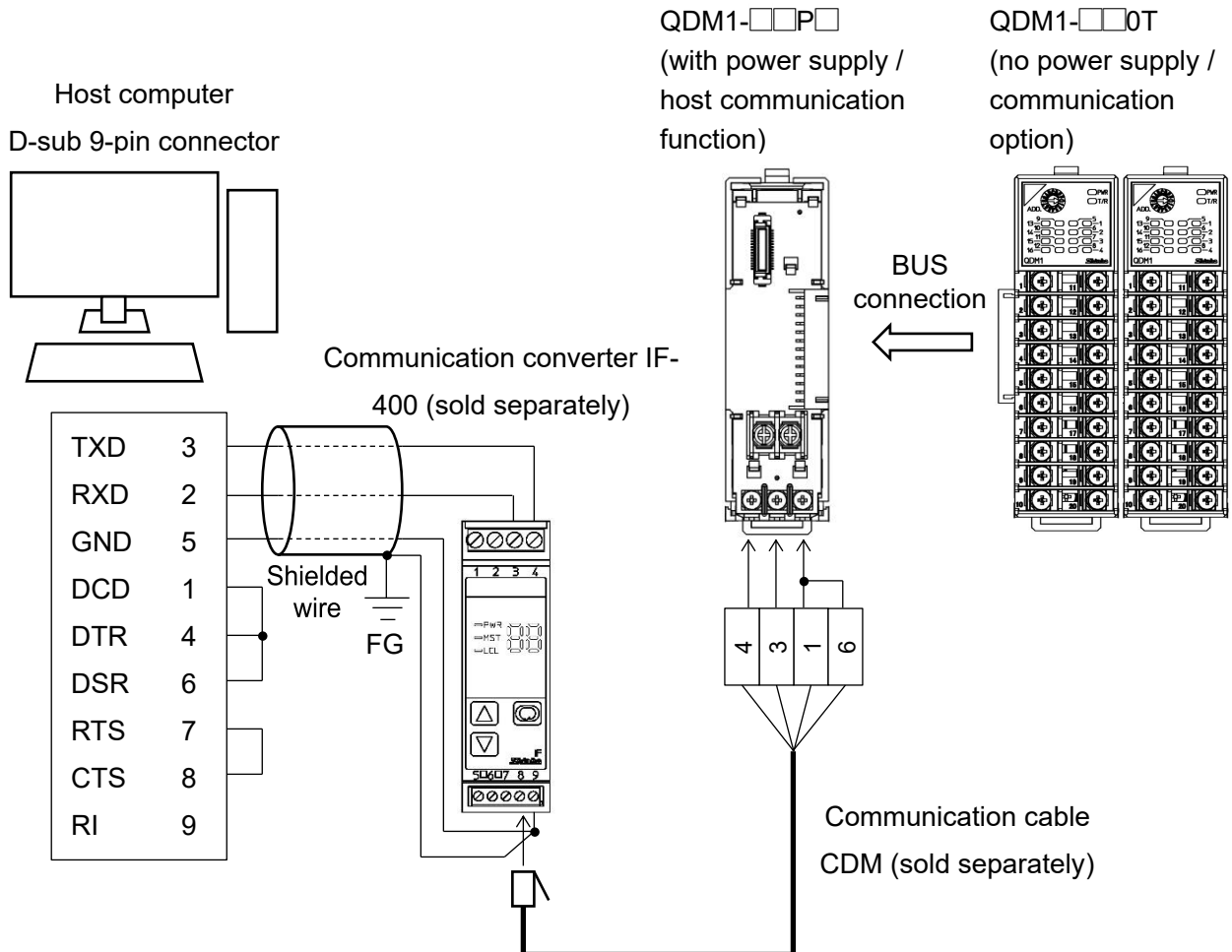
When connecting using the communication converter IF-400 (sold separately), one QDM1-□□P□ (with power supply / host communication function) is required for host communication.

The power supply and communication lines to the second and subsequent QDM1 are connected to the BUS using connectors.

For the second and later modules, use the QDM1-□□0□ (no power supply / communication option).

A maximum of 16 modules can be connected.

The communication converter IF-400 (sold separately) does not support communication speeds of 38400 bps and 57600 bps.



(Fig. 7.5.2-1)

Shielded wire

Connect only one side of the shielded wire to FG so that no current flows in the shield part. If both sides of the shield are connected to FG, a closed circuit will be created between the shielded wire and the ground, and a current will flow through the shielded wire, making it more susceptible to noise. Be sure to ground FG.

Recommended cable: OTSC-VB 2PX0.5SQ by Onamba Co., Ltd. or equivalent (use twisted pair shielded wire).

Termination resistor (terminator)

The communication converter IF-400 (sold separately) has a built-in termination resistor. The termination resistor is also called a terminator. It is a resistor attached to the end of wiring when peripheral devices are connected to the host computer in a chain, and prevents signal reflection and signal disturbance at the end.

Since this instrument has a built-in pull-up resistor and pull-down resistor, no termination resistor is required on the communication line.

8 Setting of Specification

Set the specifications.

This section describes how to set specifications using console software (SWC-QDM101M).

8.1 Preparation

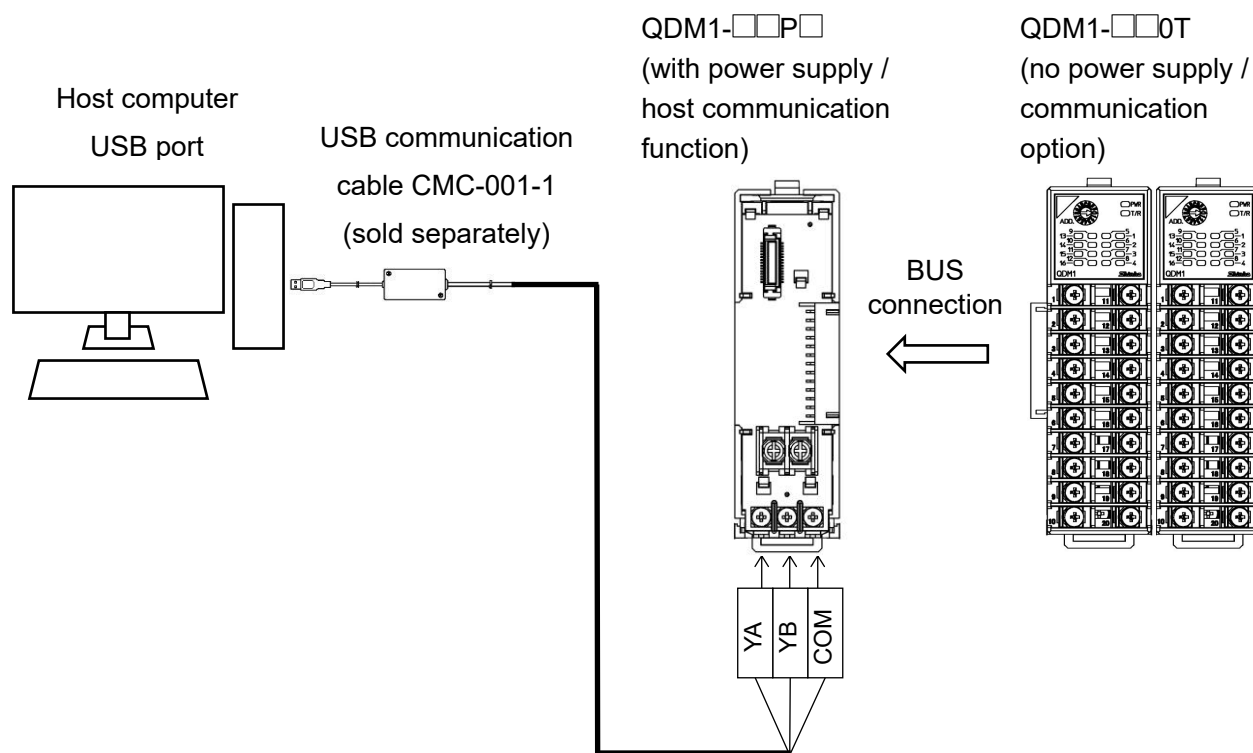
8.1.1 Preparation of USB Communication Cable and Console Software

Please prepare the USB communication cable and the console software.

- USB communication cable
USB-micro USB Type-B (commercial item)
- Console software (SWC-QDM101M)
Please download from our website and install.

Click <https://shinko-technos.co.jp/e/> → Support/Download → Software

8.1.2 Connecting to Host Computer



(Fig. 8.1.2-1)

(3) Checking the COM port number

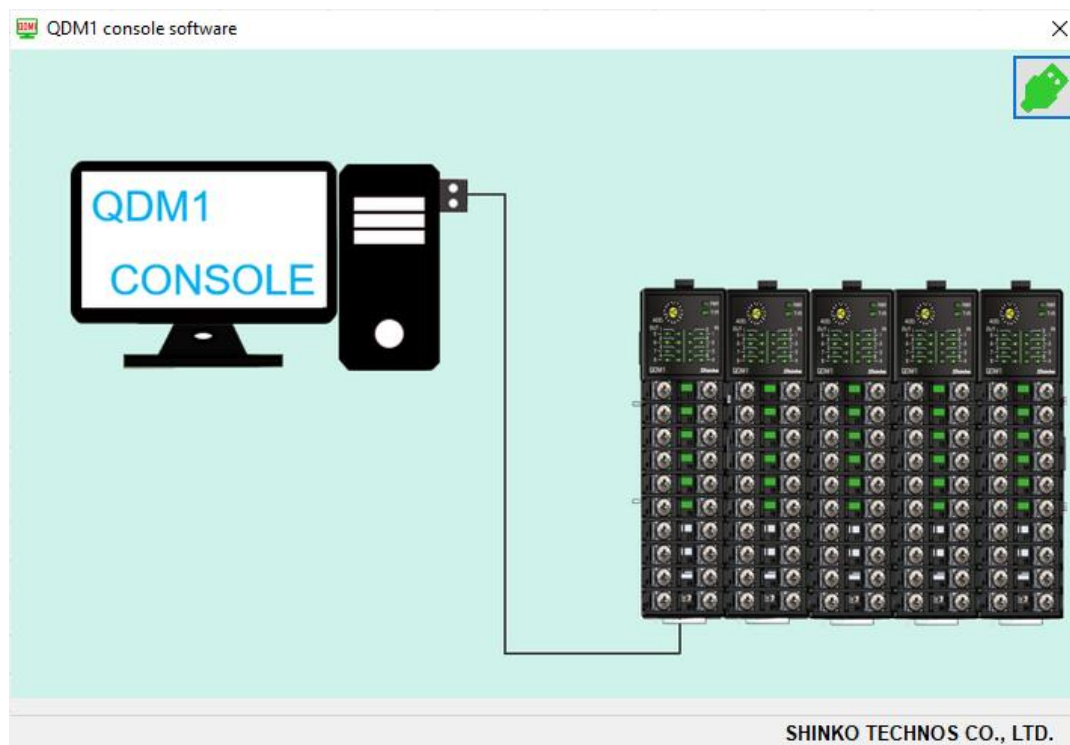
Follow the procedure below to check the COM port number.

- ① Right-click "Start" → Click "Device manager" from menu.
- ② When "USB Serial Port (COM3)" is displayed in "Port (COM and LPT)", the COM port is assigned to No. 3.

Check the COM port number, and then close "Device Manager".

(4) Starting the console software (SWC-QDM101M)

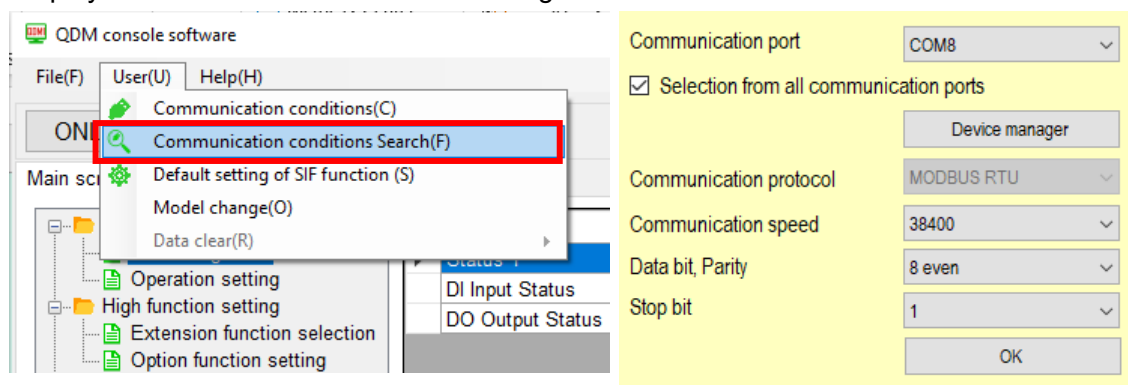
- ① Start the console software (SWC-QDM101M).



(Fig. 8.1.2-2)

- ② Click [User (U)] on the menu bar → [Communication condition (C)].

Display the communication condition setting screen.



(Fig. 8.1.2-3)

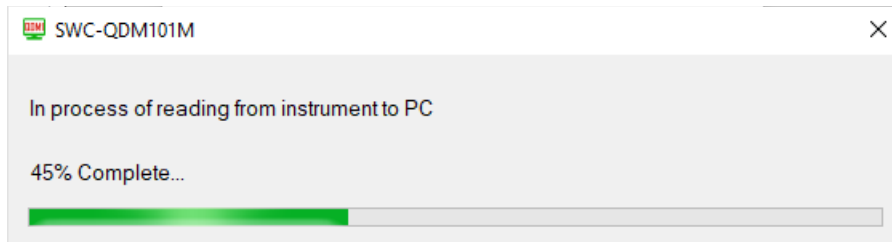
- ③ Set the communication condition as shown below.

Setup Items	Setting Value
Communication port	Select the COM port number confirmed in ② of (3).
Communication protocol	MODBUS RTU

- ④ Click [OK].

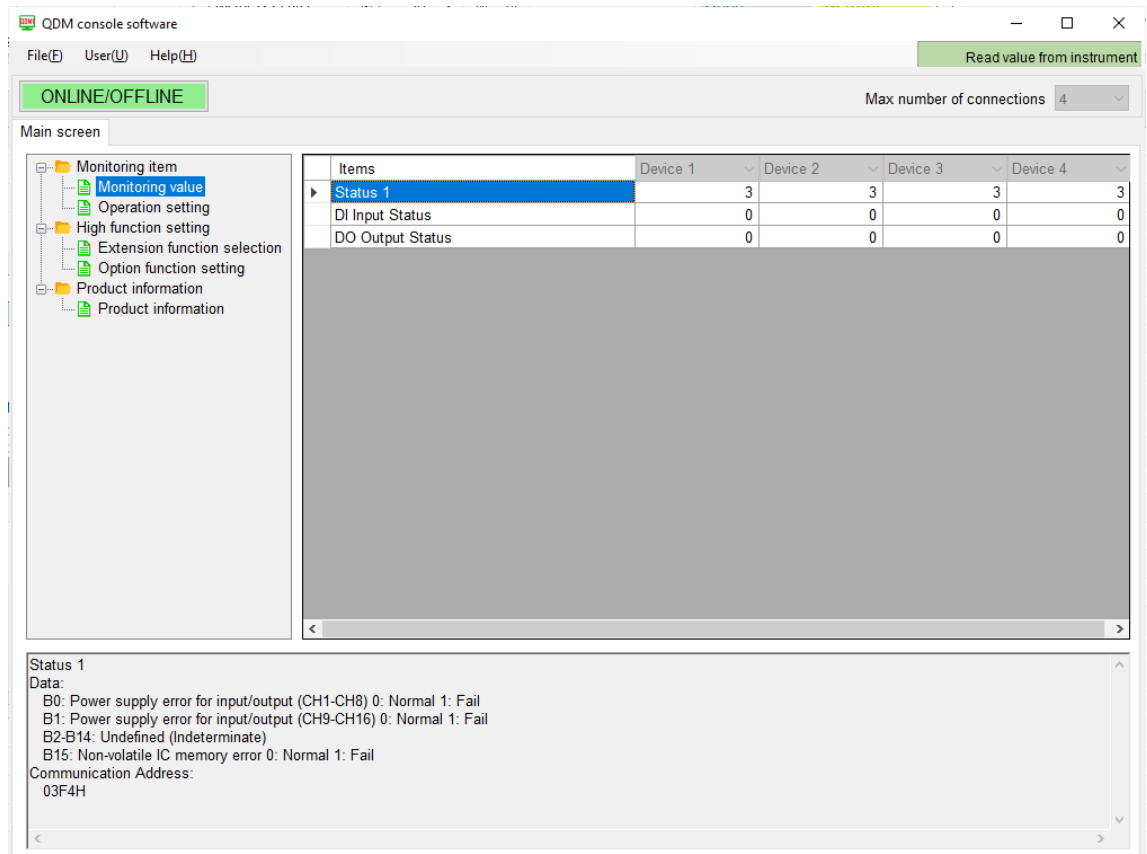
- ⑤ Click [File (F)] on the menu bar → [Instrument to PC (U)].

Read all the setting values of the connected QDM1.



(Fig. 8.1.2-4)

- ⑥ Display the monitor value screen.



(Fig. 8.1.2-5)

The specifications are ready.

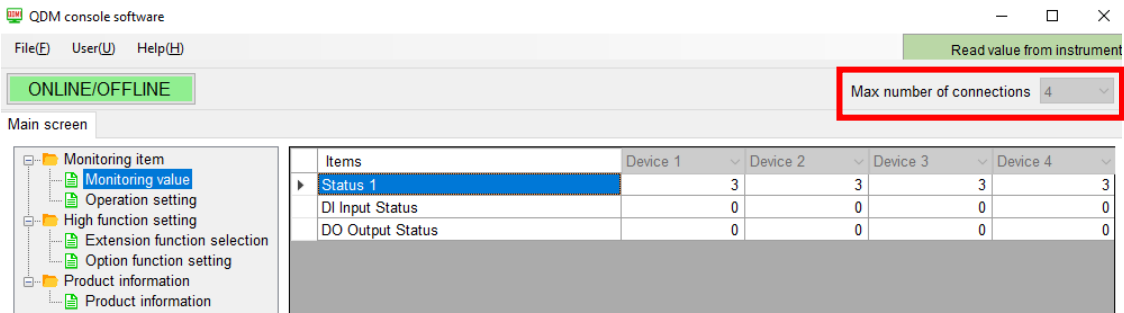
Please refer to "8.2 Specification Setting (P.8-5)" to set the specifications.

Setting the specifications for the second and subsequent modules

To set the specifications of the second and subsequent QDM1, follow the procedure below.

- ① Set the number of modules to be connected.

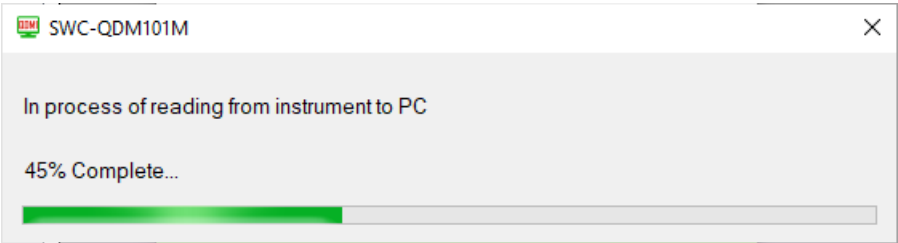
The following is an example of a case with 4 modules.



(Fig. 8.1.2-6)

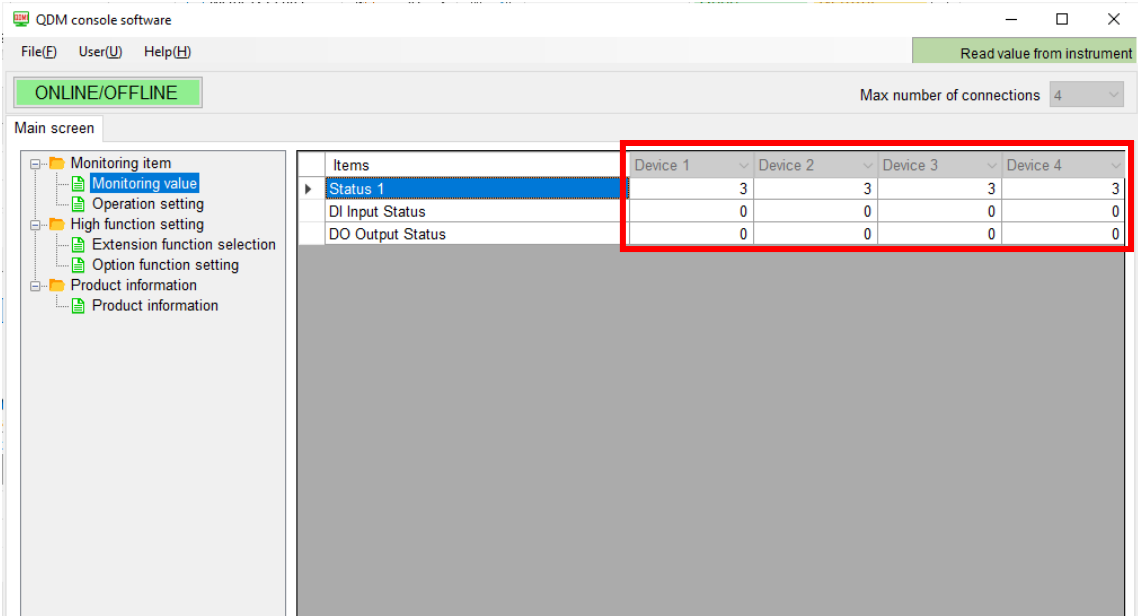
- ② Click [File (F)] on the menu bar → [Instrument to PC (U)].

Read all the setting values of the connected QDM1.



(Fig. 8.1.2-7)

- ③ Displays the monitor value screen for the number of modules connected.



(Fig. 8.1.2-8)

Please refer to "8.2 Specification Setting (P.8-5)" to set the specifications.

8.2 Specification Setting

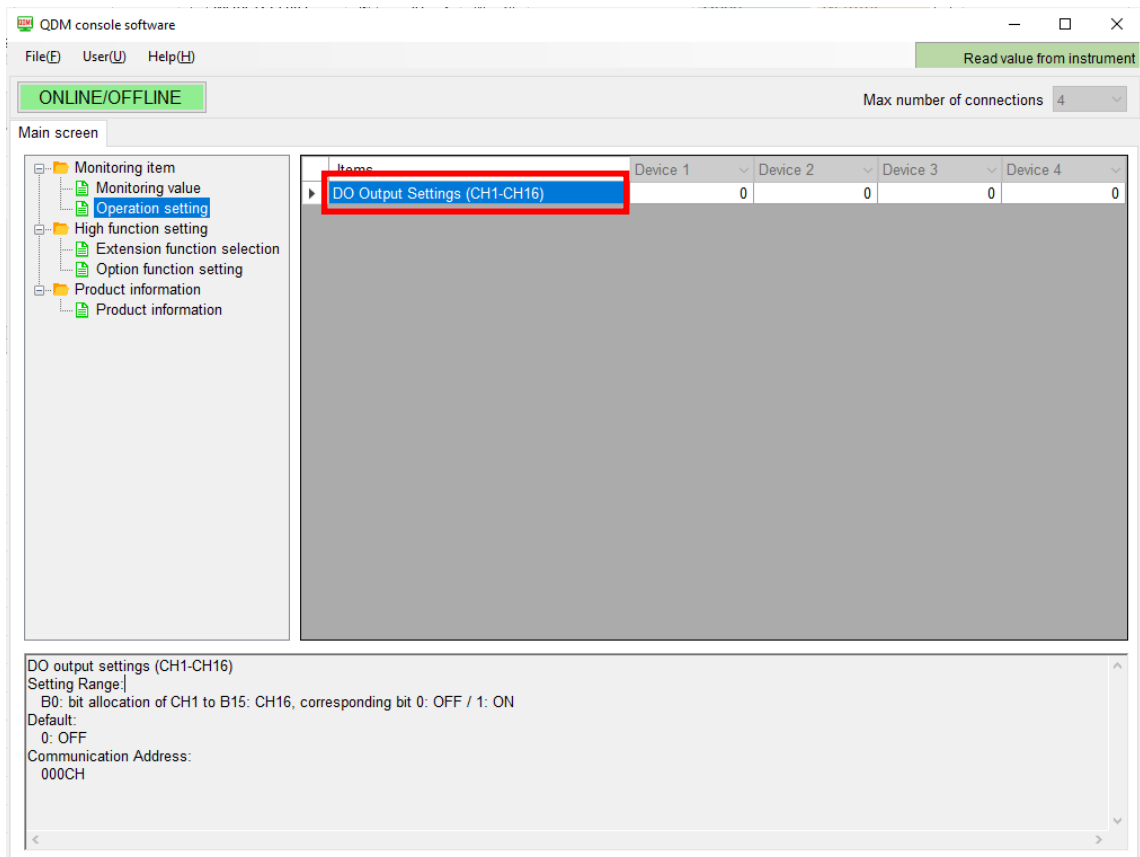
Basic operation of specification setting

Before setting the specifications, how to select the selection item and how to set the setting item are explained.

Select the selection item

The following is an explanation of how to select a selection item, using the DO output settings (CH1 to CH16) of module number 1 as an example.

Click the selection item name to be selected.

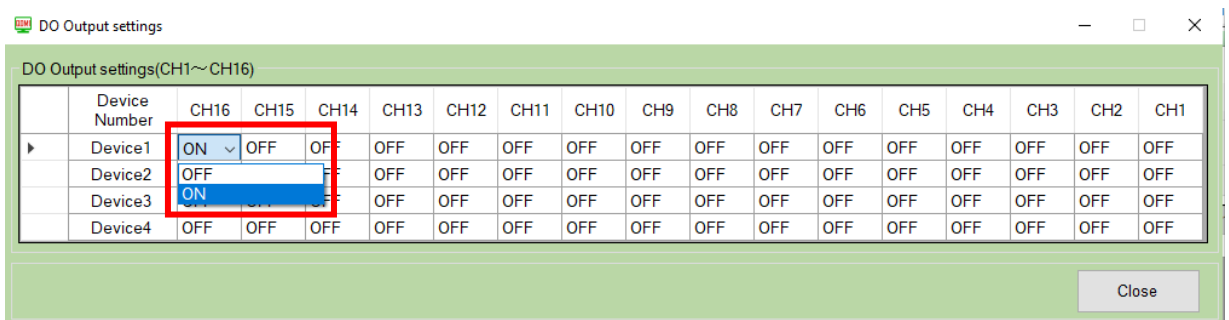


(Fig. 8.2-1)

Display the selection item list.

Click "0: OFF" or "1: ON".

Transfers the selected contents to the QDM1.

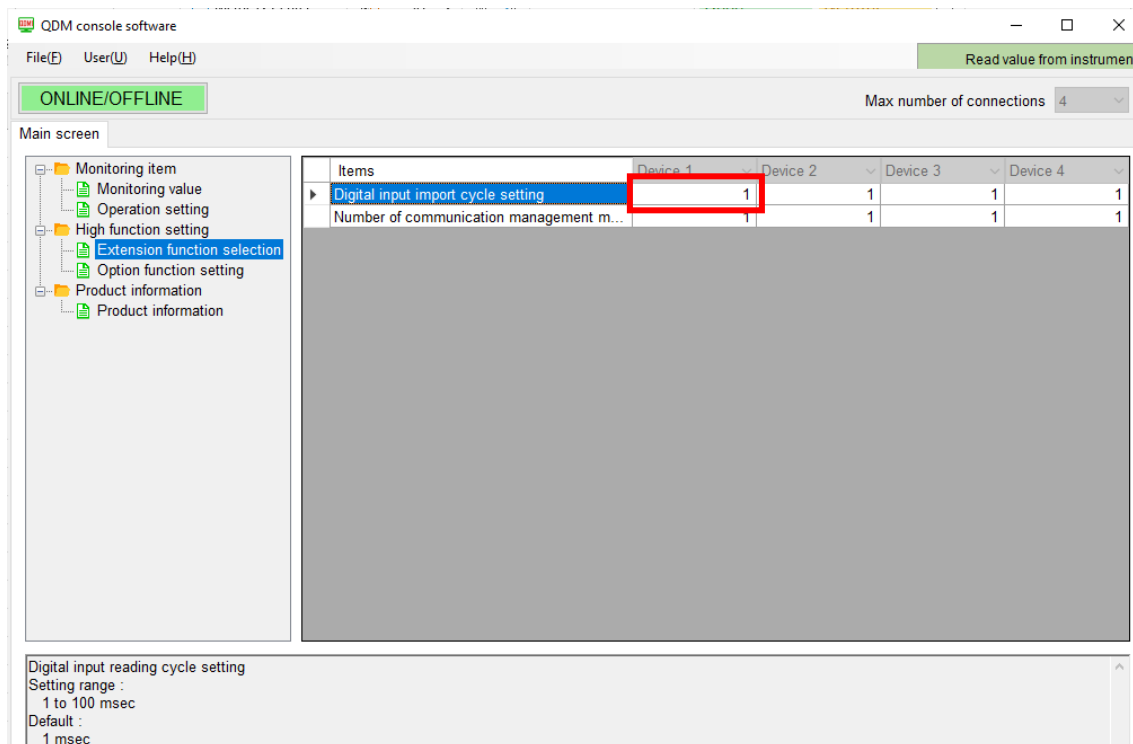


(Fig. 8.2-2)

Set the setting item

The following is an explanation of how to set the setting item, using the digital input sampling cycle setting for module number 1 as an example.

Click the setting value of the module number to be set.



(Fig. 8.2-3)

Display the numeric keypad screen.

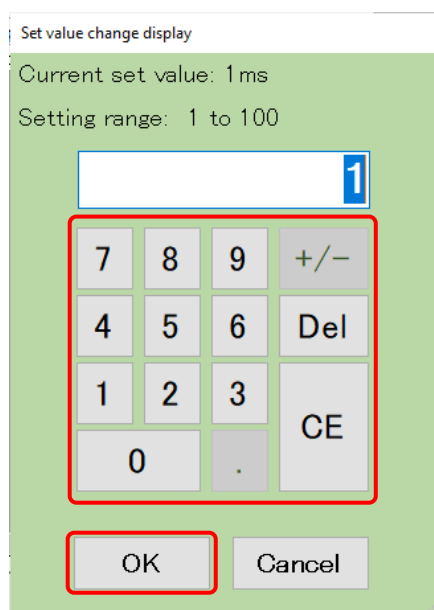
The current setting value and setting range are displayed on the numeric keypad screen.

Set within the setting range.

Input the setting value, and click [OK]. (*)

Transfer the setting value to the analog I/O module QDM1.

(*): The setting value can also be entered from the keyboard of the host computer.



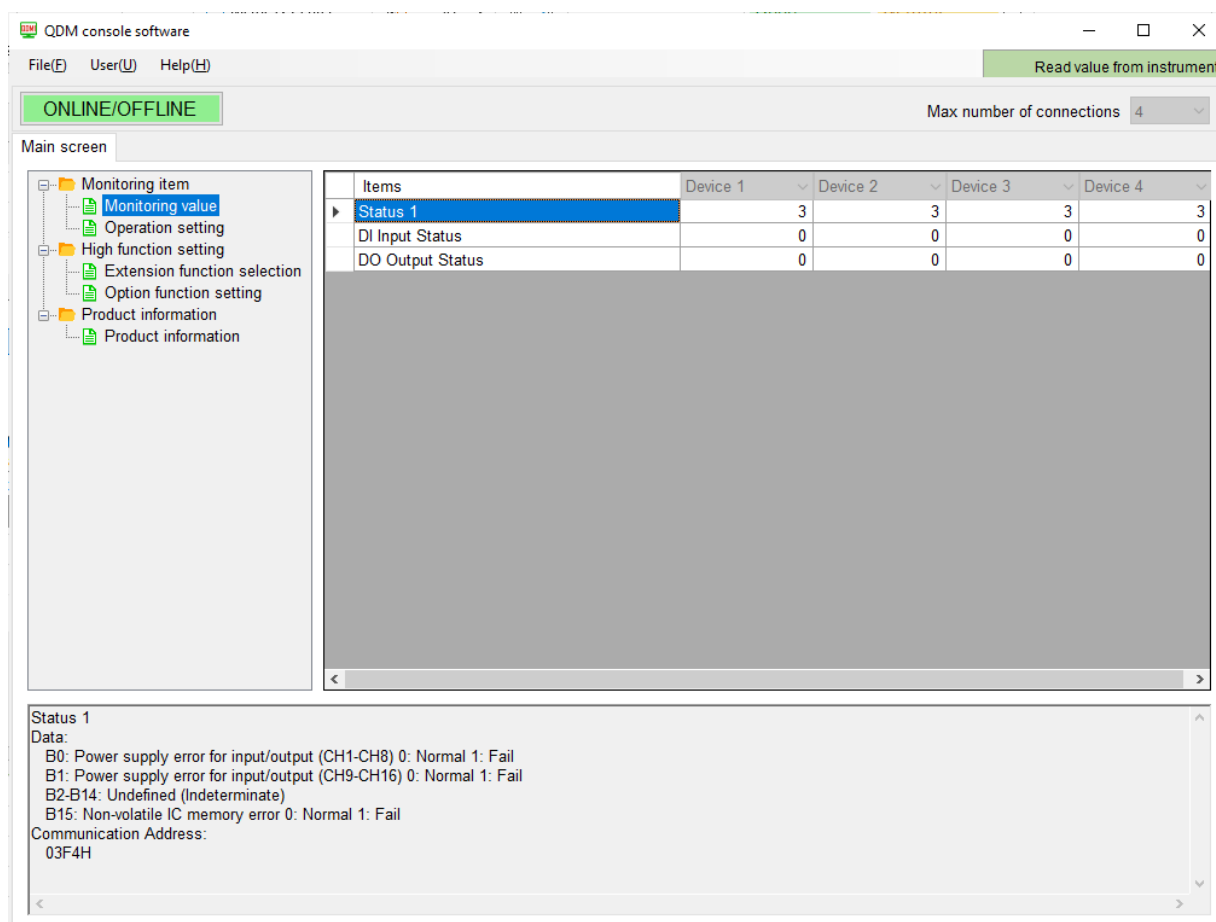
(Fig. 8.2-4)

8.2.1 Monitoring Value Parameter Setting

Set monitoring value parameters such as state 1, DI input state, DO output state, etc.

Click [Monitoring item] of [Main screen] tab → [Monitoring value].

Display the monitoring value screen.



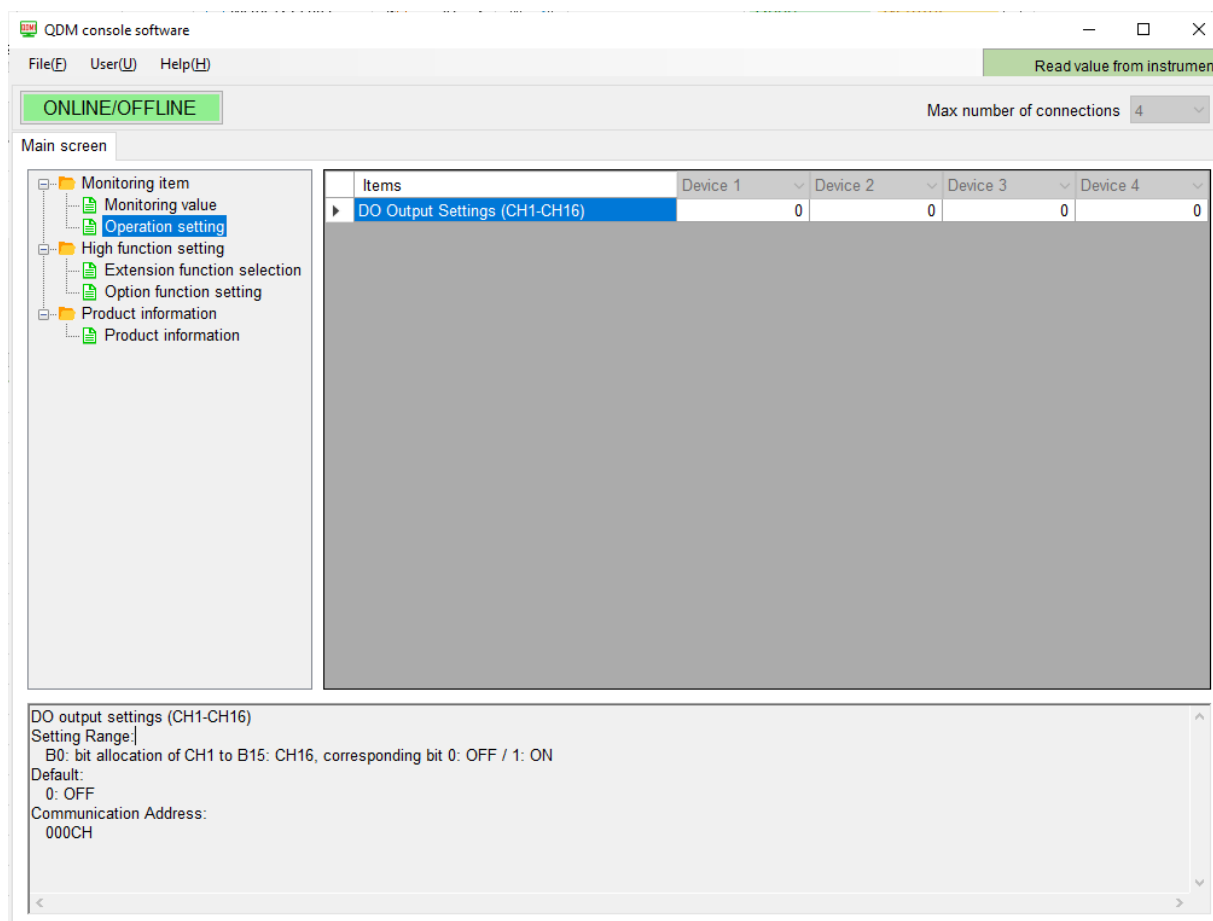
(Fig. 8.2.1-1)

8.2.2 Operation Parameter Setting

Set DO output.

Click [Monitoring item] of [Main screen] tab → [Operation setting].

Display the operation setting screen.



(Fig. 8.2.2-1)

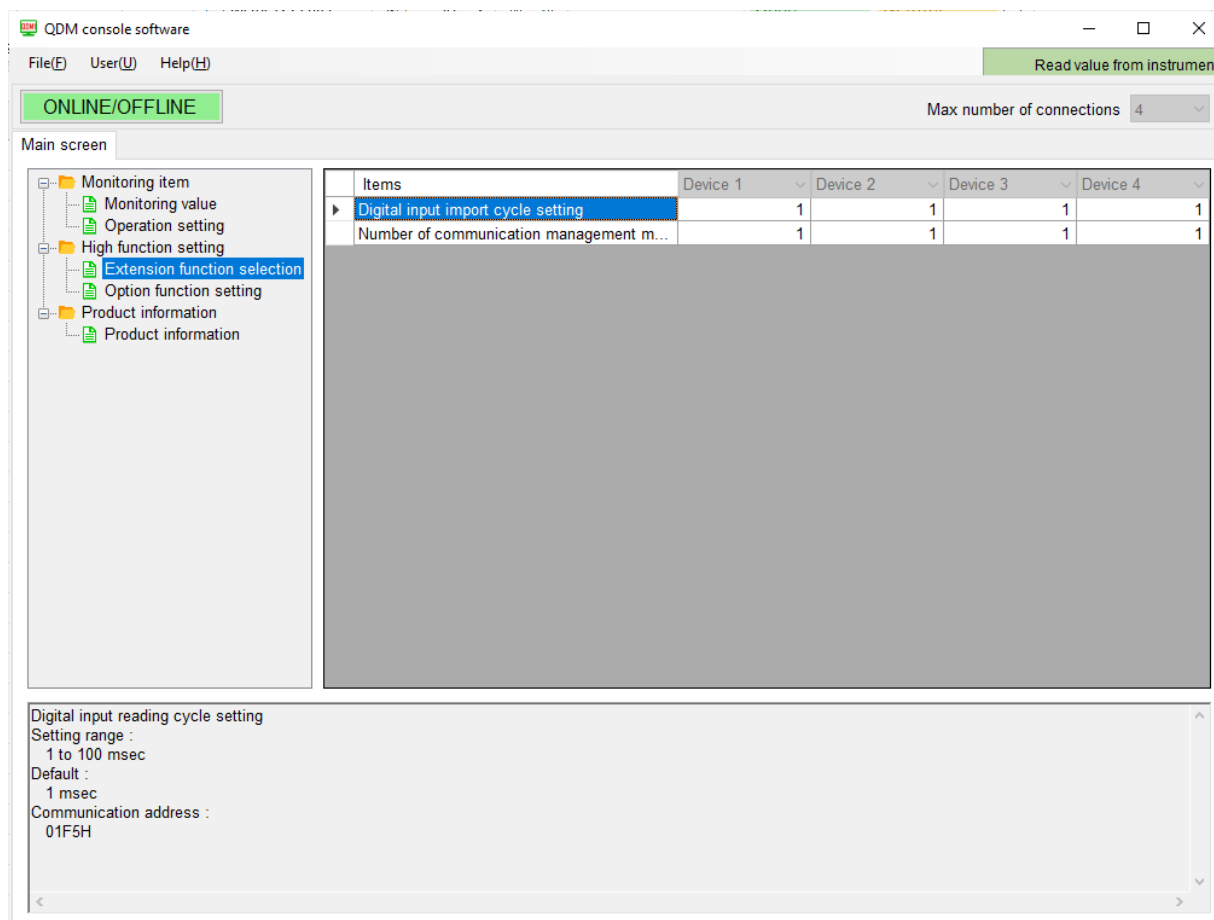
Setting item	Address [HEX]	Description, setting range and selection item	Factory default
DO output setting	000C	Set the DO output. Bit allocation for B0: CH1 to B15: CH16. Selection item 0: OFF 1: ON	0: OFF

8.2.3 Extension Function Parameter Setting

Set the digital input sampling cycle and the number of communication management modules.

Click [High function setting] of [Main screen] tab → [Extension function setting].

Display the extension function setting screen.



(Fig. 8.2.3-1)

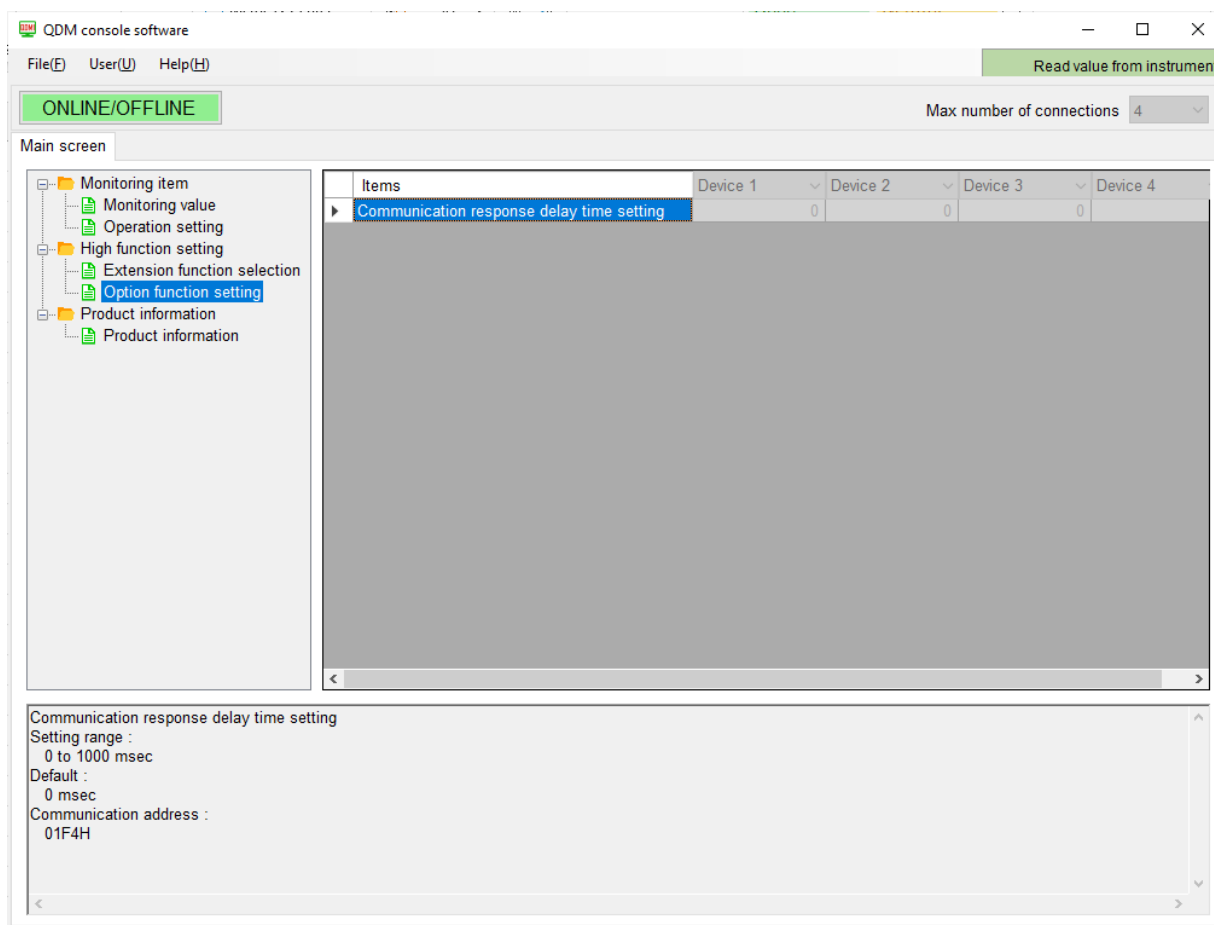
Setting item	Address [HEX]	Description, setting range and selection item	Factory default
Digital input sampling cycle setting	01F5	Set the digital input sampling cycle. Setting range: 1 to 100 ms	1 ms
Communication management module number setting	020A	Set the number of communication management modules. Setting range: 1 to 16	1

8.2.4 Option Function Parameter Setting

Set the communication response delay time setting.

Click [High function setting] of [Main screen] tab → [Option function setting].

Display the Option function setting screen.

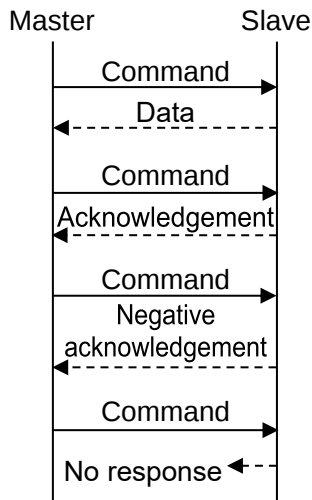


(Fig. 8.2.4-1)

Setting item	Address [HEX]	Description, setting range and selection item	Factory default
Communication response delay time setting	01F4	Set the delay time for returning a response after receiving a command from the host. When connecting to the communication expansion module QMC1, set the communication response delay time to 0 ms (initial value). Setting range: 0 to 1000 ms	0 ms

9 Communication Procedure

Communication starts with command transmission from the host computer (hereafter Master), and ends with the response of this instrument (hereafter Slave).



(Fig. 9-1)

- Response with data

When the master sends the Read command, the slave responds with the corresponding set value or current status.

- Acknowledgement

When the master sends the Write command, the slave responds by sending the acknowledgement after the processing is terminated.

- Negative acknowledgement

When the master sends a non-existent command or value out of the setting range, the slave returns a negative acknowledgement.

- No response

The slave will not respond to the master in the following cases:

- Broadcast address is set.
- Communication error (framing error, parity error)
- CRC-16 discrepancy

Communication timing of the RS-485

Master Side (Take note while programming)

When the master starts transmission through the RS-485 communication line, the master is arranged so as to provide an idle status (mark status) transmission period of 1 or more characters before sending the command to ensure synchronization on the receiving side.

Set the program so that the master can disconnect the transmitter from the communication line within a 1 character transmission period after sending the command in preparation for reception of the response from the slave.

To avoid collision of transmissions between the master and the slave, send the next command after carefully checking that the master has received the response.

If a response to the command is not returned due to communication errors, set the Retry Processing to send the command again. (It is recommended to execute Retry twice or more.)

Slave Side

When the slave starts transmission through the RS-485 communication line, the slave is arranged so as to provide an idle status (mark status) transmission period of 1 ms or more (*) before sending the response to ensure synchronization on the receiving side.

The slave is arranged so as to disconnect the transmitter from the communication line within a 1 character transmission period after sending the response.

(*): Can be set in "Communication response delay time setting (P.8-13)" within a range of 0 to 1000 ms.

10 MODBUS Protocol

10.1 Transmission Mode

It becomes the RTU mode, and 8-bit binary data in command is transmitted as it is.

Data format	Start bit:	1 bit
	Data bit:	8 bits
	Parity:	Even (Odd, No parity) (Selectable)
	Stop bit:	1 bit (2 bits) (Selectable)
Error detection:	CRC-16 (Cyclic Redundancy Check)	

10.2 Data Communication Interval

1.5 character transmission times or less

(Communication speed 9600 bps, 19200 bps: 1.5 character transmission times,

Communication speed 38400 bps, 57600 bps: 750 μ s)

To transmit continuously, an interval between characters which consist of one message, must be within 1.5 character transmission times.

If the time is longer than the above, it is assumed that transmission from the master side has finished, and a communication error occurs and no response is returned.

10.3 Message Configuration

Message is configured to start after idle time is processed for more than 3.5 character transmissions, and end after idle time is processed for more than 3.5 character transmissions.

(Communication speed 9600 bps, 19200 bps: 3.5 character transmission times,

Communication speed 38400 bps, 57600 bps: 1.75 ms)

The data part has a maximum of 252 bytes.

3.5 idle characters	Slave address	Function code	Data	Error check CRC- 16	3.5 idle characters
------------------------	------------------	------------------	------	------------------------	------------------------

(1) Slave Address

Slave address is an individual instrument number on the slave side, and is set within the range 1 to 16 (01H to 10H). The master identifies slaves by the slave address of the requested message.

The slave informs the master which slave is responding to the master by placing its own address in the response message.

Slave address 0 (00H, Broadcast address) can identify all the slaves connected. However, slaves do not respond.

(2) Function Code

The function code is the command code for the slave to undertake one of the following actions.

Function Code	Contents
03(03H)	Reads a single or multiple piece(s) of data from slave(s) (Amount of data: Max. 100).
06(06H)	Writes a single piece of data to slave(s).
16(10H)	Writes multiple pieces of data to slave(s) (Amount of data: Max. 20).

Data at one address is expressed in 16 bits. (Up to 16 points are placed in one data)

Function Code	Data item	Contents
01(01H)	Read Coil Status	Read the ON/OFF status of the slave's DO
	1 to 16	Corresponding bit 0: OFF/1: ON
02(02H)	Read Input Status	Read the ON/OFF status of the slave's DI
	1 to 16	Corresponding bit 0: OFF/1: ON
05(05H)	Force Single Coil	Write the ON/OFF status to the slave's DO
	1 to 16	ON: 0xFF00, OFF: 0x0000
15(0FH)	Force Multiple Coil	Write the ON/OFF status to the slave's multiple DO
	1 to 16	Corresponding bit 0: OFF/1: ON

Data at one address is expressed in 1 bit. (0: OFF, 1: ON)

The data for communication is in units of 1 byte for 8 points, and the data for less specified points is set to 0.

The function code is used to discern whether the response is normal (acknowledgement) or if any error (negative acknowledgement) has occurred when the slave returns the response message to the master.

When acknowledgement is returned, the slave simply returns the original function code.

When negative acknowledgement is returned, the MSB of the original function code is set as 1 for the response.

For example, if the master sends request message setting 13H to the function code by mistake, slave returns 93H by setting the MSB to 1, because the former is an illegal function.

For negative acknowledgement, the exception codes below are set to the data of the response message, and returned to the master in order to inform it of what kind of error has occurred.

Exception Code	Contents
1(01H)	Illegal function (Non-existent function)
2(02H)	Illegal data address (Non-existent data address)
3(03H)	Illegal data value (Value out of the setting range)
17(11H)	Status unable to be written.

(3) Data

Data differs depending on the function code.

A request message from the master is composed of a data item, amount of data and setting data.

A response message from the slave is composed of the byte count , data and exception codes in negative acknowledgements, corresponding to the request message.

The effective range of data is -32768 to 32767 (8000H to 7FFFH).

Refer to "11.1 Communication Command List (P.11-1)".

(4) Error Check

After calculating CRC-16 (Cyclic Redundancy Check) from the slave address to the end of the data, the calculated 16-bit data is appended to the end of message in sequence from low order to high order.

[How to calculate CRC-16]

In the CRC-16 system, the information is divided by the polynomial series. The remainder is added to the end of the information and transmitted. The generation of a polynomial series is as follows.

(Generation of polynomial series: $X^{16} + X^{15} + X^2 + 1$)

- ① Initialize the CRC-16 data (assumed as X) (FFFFH).
- ② Calculate exclusive OR (XOR) with the 1st data and X. This is assumed as X.
- ③ Shift X one bit to the right. This is assumed as X.
- ④ When a carry is generated as a result of the shift, XOR is calculated by X of ③ and the fixed value (A001H). This is assumed as X. If a carry is not generated, go to step ⑤.
- ⑤ Repeat steps ③ and ④ until shifting 8 times.
- ⑥ XOR is calculated with the next data and X. This is assumed as X.
- ⑦ Repeat steps ③ to ⑤.
- ⑧ Repeat steps ③ to ⑤ up to the final data.
- ⑨ Set X as CRC-16 to the end of message in sequence from low order to high order.

10.4 Message Example

Numerals written below the command represent the number of characters.

(1) Write [Slave address 1, DO output (000CH)]

- A request message from the master [When DO outputs CH1 to CH16 All ON (FFFFH)]

Idle 3.5 characters	Slave address (01H)	Function code (06H)	Data item (000CH)	Data (FFFFH)	Error check CRC-16 (4879H)	Idle 3.5 characters
	1	1	2	2	2	

- Response message from the slave in normal status

Idle 3.5 characters	Slave address (01H)	Function code (06H)	Data item (000CH)	Data (FFFFH)	Error check CRC-16 (4879H)	Idle 3.5 characters
	1	1	2	2	2	

- Response message from the slave in exception (error) status (When a value out of the setting range is set)

The function code MSB is set to 1 for the response message in exception (error) status, and 86H is returned.

The exception code 03H (Value out of the setting range) is returned (error).

Idle 3.5 characters	Slave address (01H)	Function code (86H)	Exception code (03H)	Error check CRC-16 (0261H)	Idle 3.5 characters
	1	1	1	2	

(2) Read [Slave address 1, DO output (000CH)]

- A request message from the master

Idle 3.5 characters	Slave address (01H)	Function code (03H)	Data item (000CH)	Amount of data (0001H)	Error check CRC-16 (4409H)	Idle 3.5 characters
	1	1	2	2	2	

- Response message from the slave in normal status

[When DO outputs CH1 to CH16 All ON (FFFFH)]

Idle 3.5 characters	Slave address (01H)	Function code (03H)	Response byte count (02H)	Data (FFFFH)	Error check CRC-16 (B9F4H)	Idle 3.5 characters
	1	1	1	2	2	

- Response message from the slave in exception (error) status (When the data item is incorrect)

The function code MSB is set to 1 for the response message in exception (error) status, and 83H is returned.

The exception code 02H (Non-existent data address) is returned (error).

Idle 3.5 characters	Slave address (01H)	Function code (86H)	Exception code (03H)	Error check CRC-16 (0261H)	Idle 3.5 characters
	1	1	1	2	

11 Communication Command List

11.1 Communication Command List

This section explains each item of communication command.

- Data Item
This is a setting item for the QDM1.
- Address [HEX (Hexadecimal), DEC (Decimal)]
This is an each channel address of the QDM1.
- Attribute
R/W: Read and write (Host ↔ QDM1)
RO: Read only (Host ← QDM1)
- Data
This is an explanation of the setting range and setting conditions for each data.

Data Item	Address		Attribute	Data
	HEX	DEC		
System	0000 0001 0002 0003	0 1 2 3		This is a system item for internal processing. Please do not use.
Reservation (*1)	0004 to 000B			
DO output setting (CH1 to CH16) (*2)	000C	12	R/W	Bit allocation for B0: CH1 to B15: CH16. Corresponding bit bit 0: OFF/1: ON
Reservation (*1)	000D to 01F3			
Communication response delay time setting (*3)	01F4	500	R/W	0 to 1000 ms
Digital input sampling cycle setting	01F5	501	R/W	1 to 100 ms
Reservation (*1)	01F6 to 0209			
Communication management module number setting	020A	522	R/W	1 to 16
Reservation (*1)	020B to 020D			

- (*1): A single or multiple data are read, the reserved item returns the initial value (0) in acknowledgment.
When writing single or multiple, Acknowledgement is returned and the data is discarded.
- (*2): It is not stored in the Non-volatile IC memory.
When the power is turned on, the start value is (0).
- (*3): When connecting to communication expansion module QMC1, set the communication response delay time to 0 ms (default value).

Data Item	Address		Attribute	Data
	HEX	DEC		
Reservation (*)	03E8 to 03F3			
Status flag 1 reading	03F4	1012	RO	B0: Power supply error for input/output (CH1 to CH8) 0: Normal 1: Error B1: Power supply error for input/output (CH9 to CH16) 0: Normal 1: Error B2 to B14: Not used (indefinite) B15: Non-volatile IC memory error 0: Normal 1: Error
Reservation (*)	03F5 to 03FF			
DI input status (CH1 to CH16)	0400	1024	RO	Bit allocation for B0: CH1 to B15: CH16. Corresponding bit bit 0: OFF/1: ON
Reservation (*)	0401 to 0403			
DO output status (CH1 to CH16)	0404	1028	RO	Bit allocation for B0: CH1 to B15: CH16. Corresponding bit bit 0: OFF/1: ON
Reservation (*)	0405 to 04A3			
Total energizing time (High)	04A4	1188	RO	Count value of the total energized time 1 hour per count in the high and low total
Total energizing time (Low)	04A5	1189	RO	
Reservation (*)	04A6 to 04B7			
Product code	04B8	1208	RO	Product code
Presence of communication option	04B9	1209	RO	0000H: No option 0001H: With power supply/host communication function With power supply/CUnet communication function
Wiring type	04BA	1210	RO	0000H: Terminal type 0001H: Connector type
Reservation (*)	04BB			
	04BC			
Software version	04BD	1213		Software version
Manufacturing date	04BE	1214		Manufacturing date (e.g. 2409: September 2024)
Hardware version	04BF	1215		Hardware version
Reservation (*)	04C0 to 052C			

(*): A single or multiple data are read, the reserved item returns the initial value (0) in acknowledgment.
 When writing single or multiple, Acknowledgement is returned and the data is discarded.

11.2 Data

11.2.1 Notes About Write/Read Command

- The data (set value, decimal) is converted to a hexadecimal number.
Negative numbers are represented in 2's complement.
- Do not use undefined Data items. If they are used, negative acknowledgement will be returned or a random value will be written or read, resulting in malfunction.
- MODBUS protocol uses Holding Register addresses. The Holding Register addresses are created as follows.

A data item is converted to decimal number, and the offset of 40001 is added. The result is the Holding Register address.

Using CH1 Output volume setting (0014H) as an example: Data item in the sending message is 0014H, however, MODBUS protocol Holding Register address is 40021 (20+40001).

(Example) In the case of DO output setting (000CH), the data item on the message to be sent is 000CH, but the MODBUS protocol holding register address is 40013 (12+40001).

11.2.2 Write Command

- The lifetime of the non-volatile IC memory is about 1 million times.
Do not change the set value frequently by communication, as the set value storage retention time may be shortened if the number of times is exceeded. (If the set value is the same as the value before setting, it is not written to the non-volatile IC memory.)
- Communication parameters such as module address and communication speed of this instrument cannot be written by software communication. Set it with the rotary switch for module address selection and the dip switch for selecting communication specifications.
- When Write is executed using the Broadcast address [(00H) MODBUS protocol] command, the command is sent to all the connected slaves. However, a response is not returned.

11.3 Negative Acknowledgement

11.3.1 Error Code 2 (02H)

The slave will return Error code 2 (02H) in the following case.

- When non-existent data item is read or written.

11.3.2 Error Code 3 (03H)

The slave will return Error code 3 (03H) in the following case.

- When a value out of the setting range is written.

11.3.3 Error Code 17 (11H)

The slave will return Error code 17 (11H) in the following case.

- In the case of a condition that cannot be written.

11.4 Notes on Programming Monitoring Software

11.4.1 How to Speed up the Scan Time

When monitoring multiple this instrument, set the program so that the requisite minimum pieces of data such as Status flag 1 (03F4H), DI input status (0400H), DO output status (0404H) can be read.

For other data, set the program so that they can be read only when their set value has changed.

This will speed up the scan time.

12 Operation

This section describes the operation when operating by communicating with the host computer.

Refer to “11.1 Communication Command List (P.11-1)” for the DO output settings required for operation.

12.1 Start measurement

(1) Before turning the power ON

Check the following contents before turning the power ON to this instrument.

- Preparation of communication program

A communication program is required to connect and use the host computer.

Refer to “10 MODBUS Protocol (P.10-1)” to create the communication program.

- Select communication specifications

Select the communication specifications such as communication speed, data bit, and parity.

Refer to “5.1.1 Selection of Communication Specifications (P.5-1)”.

- Setting module address

Set the module address.

Refer to “5.1.2 Setting of Module Address (P.5-3)”.

- Mounting

Mount the QDM1 to the DIN rail.

Refer to “6 Mounting (P.6-1)”.

- Wiring

Wire the QDM1.

Refer to “7 Wiring (P.7-1)”.

- Connection of host computer and QDM1

Connect the host computer and QDM1.

Refer to “7.5 Connection of Host Computer and QDM1 (P.7-11)”.

(2) After turning the power ON

Check the following contents after turning the power ON to this instrument.

- Specification setting

Set specifications such as input parameters and output parameters.

Refer to “8 Setting of Specification (P.8-1)”.

(3) Turn OFF → ON the QDM1 power

Turn OFF → ON the power of QDM1. The set value becomes effective.

(4) Operation

Start measurement.

Refer to “11.1 Communication Commands List (P.11-1)” to perform communication.

Write [Slave address 1, DO output (000CH)]

- A request message from the master [When DO outputs CH1 to CH16 All ON (FFFFH)]

Idle 3.5 characters	Slave address (01H)	Function code (06H)	Data item (000CH)	Data (FFFFH)	Error check CRC-16 (4879H)	Idle 3.5 characters
	1	1	2	2	2	

- Response message from the slave in normal status

Idle 3.5 characters	Slave address (01H)	Function code (06H)	Data item (000CH)	Data (FFFFH)	Error check CRC-16 (4879H)	Idle 3.5 characters
	1	1	2	2	2	

Read [Slave address 1, DO output (000CH)]

- A request message from the master

Idle 3.5 characters	Slave address (01H)	Function code (03H)	Data item (000CH)	Amount of data (0001H)	Error check CRC-16 (4409H)	Idle 3.5 characters
	1	1	2	2	2	

- Response message from the slave in normal status

[When DO outputs CH1 to CH16 All ON (FFFFH)]

Idle 3.5 characters	Slave address (01H)	Function code (03H)	Response byte count (02H)	Data (FFFFH)	Error check CRC-16 (B9F4H)	Idle 3.5 characters
	1	1	1	2	2	

13 Communication with PLC Using SIF Function

The SIF function (Smart InterFace, programless communication function) is a function that serially connects the PLC Q series (manufactured by Mitsubishi Electric Corp.) and this instrument, and reads and writes various data to and from PLC registers using the communication protocol of the PLC.

The following communication protocols and commands are supported.

Communication protocol	Format 4
Communication command	A compatible 1C frame AnA/AnU common command (QR/QW)

When connecting to Mitsubishi Electric Corporation MELSEC Q and QnA series, one QDM1-□□P□ (with power supply / host communication function) is required for host communication.

Uses the SIF function (Smart InterFace, programless communication function) (P.13-1).

The power supply and communication lines to the second and subsequent QDM1 are connected to the BUS using connectors.

For the second and later modules, use the QDM1-□□0□ (no power supply / communication option).

A maximum of 16 modules can be connected.

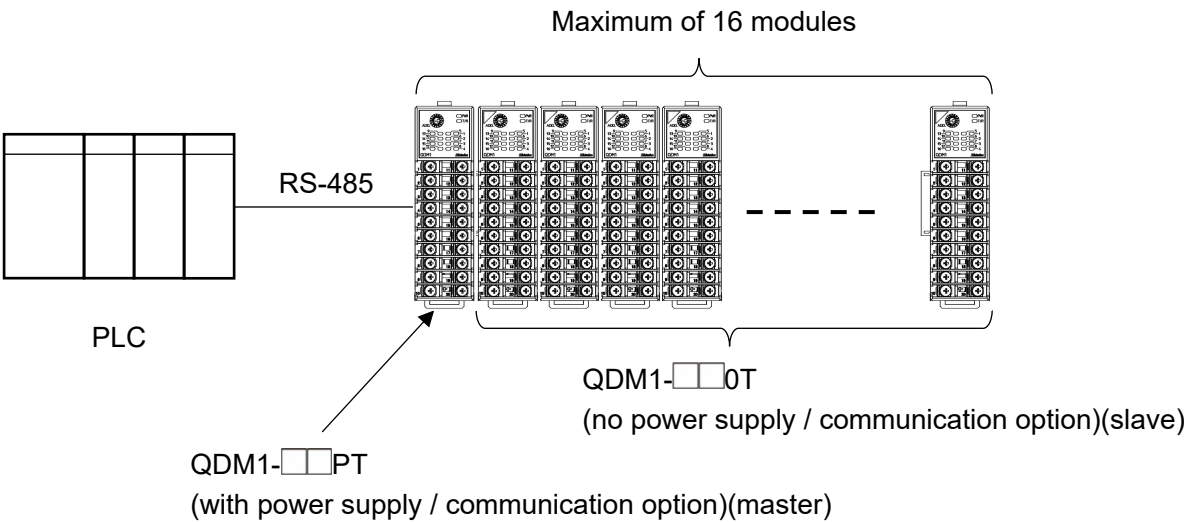
Using the console software (SWC-QDM101M), select the PLC register start number, PLC register address, the monitoring items and setting items to be linked, and set the specifications.

The QDM1-□□P□ (with power supply / host communication function) becomes the master and the selected monitor item is periodically written to the PLC register using the QW command, and the PLC register value is constantly updated.

In addition, the selected setting items are read from the PLC register in response to a setting request using the QR command.

When the read data is changed, the set value of QDM1-□□P□ (with power supply / host communication function) and QDM1-□□0□ (no power supply / communication option) is updated.

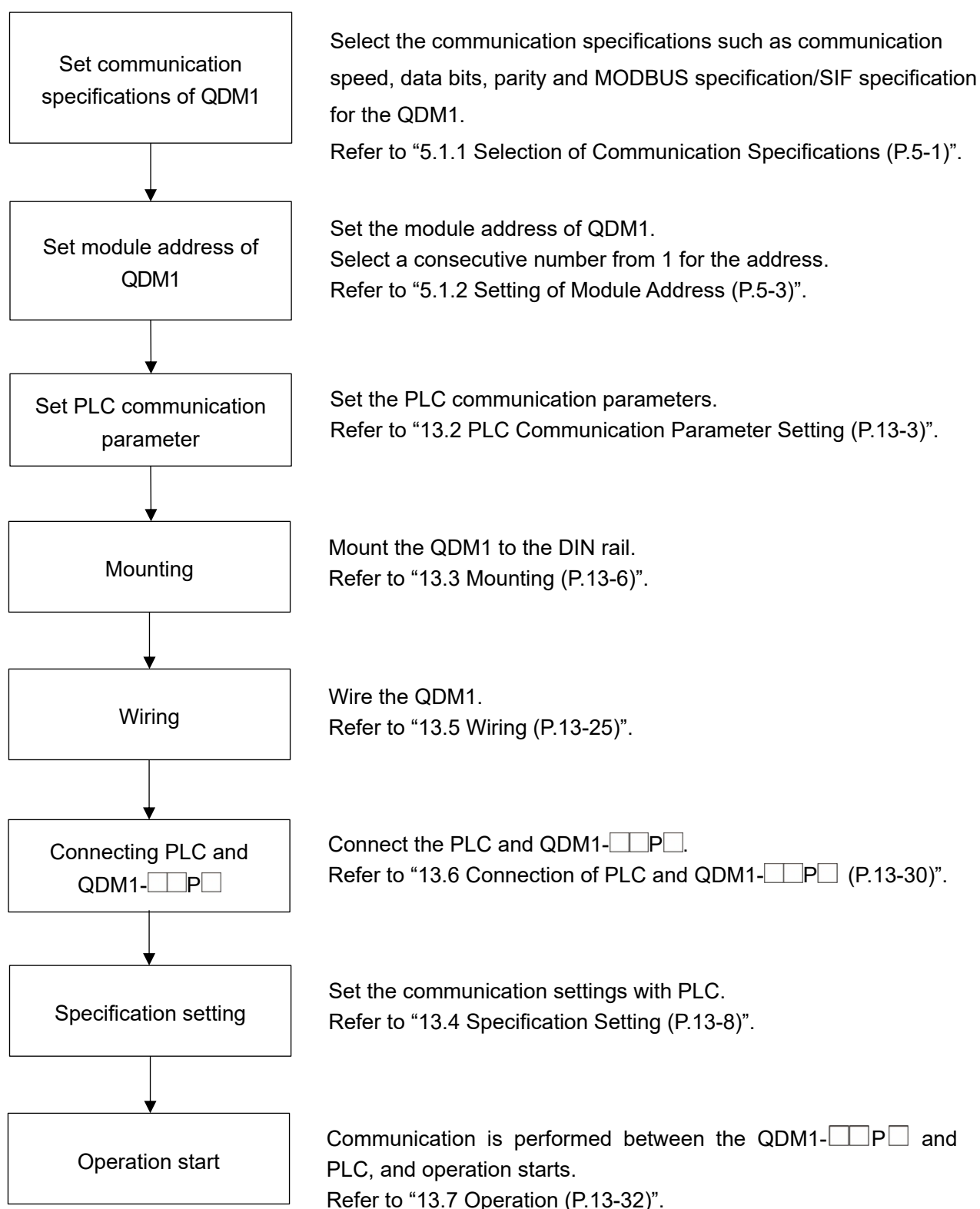
Configuration example of PLC and QDM1-□□PT, QDM1-□□0T



(Fig. 13-1)

13.1 Flow of Before Operation

The flow of operation when the QDM1 is connected to the PLC is shown below.



(Fig. 13.1-1)

13.2 PLC Communication Parameter Setting

Set the PLC communication parameters.

The setting method using GX Works3 is explained.

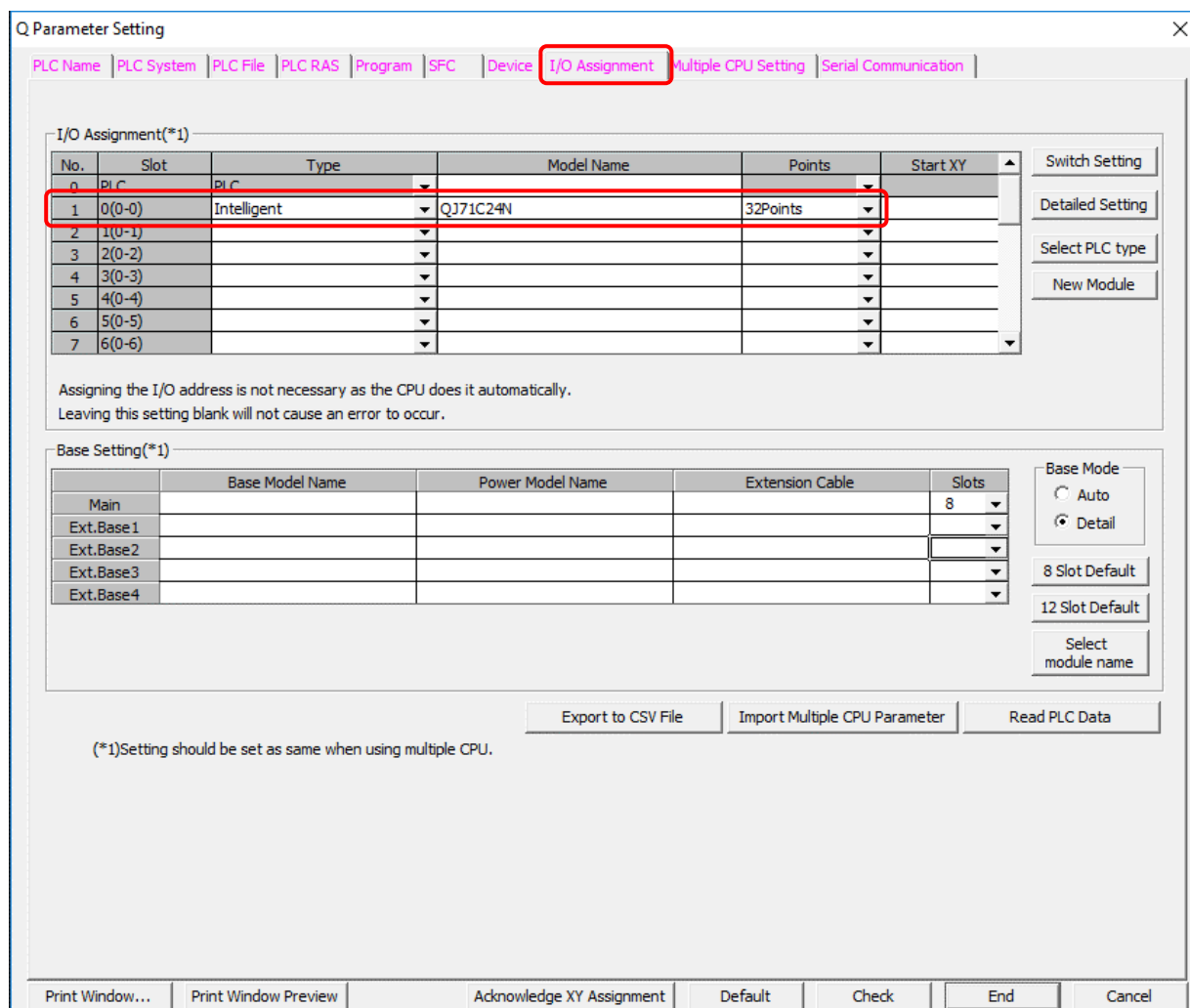
Connect the GX Works3 installed PC, set the communication speed, transmission specifications, communication protocol, etc., and then set the communication parameters using the PC write function. Refer to “Serial Communication Module User's Manual (Basic)” for detail.

(1) I/O assignment setting

Double-click [PLC parameter] on Project data list -> Parameter.

Display the Parameter Setting screen.

Click “I/O Assignment” tab, and set “Type”, “Model Name” and “Points”.



Q Parameter Setting

PLC Name | PLC System | PLC File | PLC RAS | Program | SFC | Device | **I/O Assignment** | Multiple CPU Setting | Serial Communication

I/O Assignment(*1)

No.	Slot	Type	Model Name	Points	Start XY
0	PLC	PLC			
1	0(0-0)	Intelligent	QJ71C24N	32Points	
2	1(0-1)				
3	2(0-2)				
4	3(0-3)				
5	4(0-4)				
6	5(0-5)				
7	6(0-6)				

Assigning the I/O address is not necessary as the CPU does it automatically.
Leaving this setting blank will not cause an error to occur.

Base Setting(*1)

	Base Model Name	Power Model Name	Extension Cable	Slots
Main				8
Ext.Base 1				
Ext.Base 2				
Ext.Base 3				
Ext.Base 4				

Base Mode
☐ Auto
☒ Detail
 8 Slot Default
 12 Slot Default
 Select module name

Export to CSV File | Import Multiple CPU Parameter | Read PLC Data

(*1)Setting should be set as same when using multiple CPU.

Print Window... | Print Window Preview | Acknowledge XY Assignment | Default | Check | End | Cancel

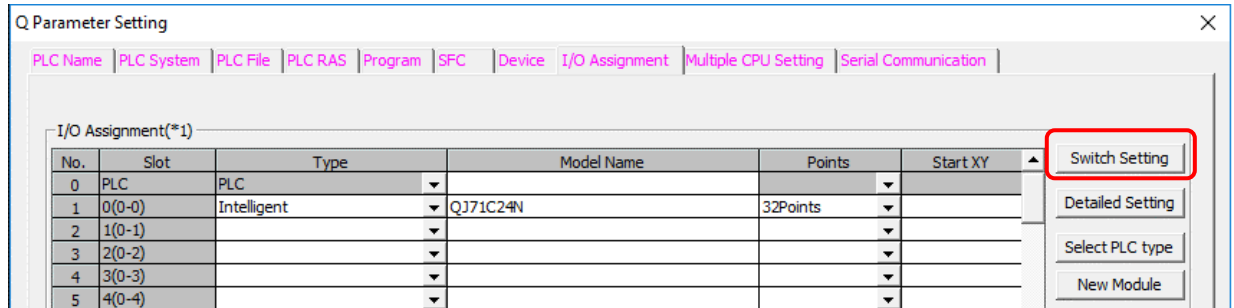
(Fig. 13.2-1)

[Setting Example]

Setting item	Setting contents
Type	Intelligent
Model Name	Model name of mounted unit (Example: QJ71C24N)
Point	32 points

(2) Switch setting

Click [Switch Setting] button to the right of the I/O Assignment setting.

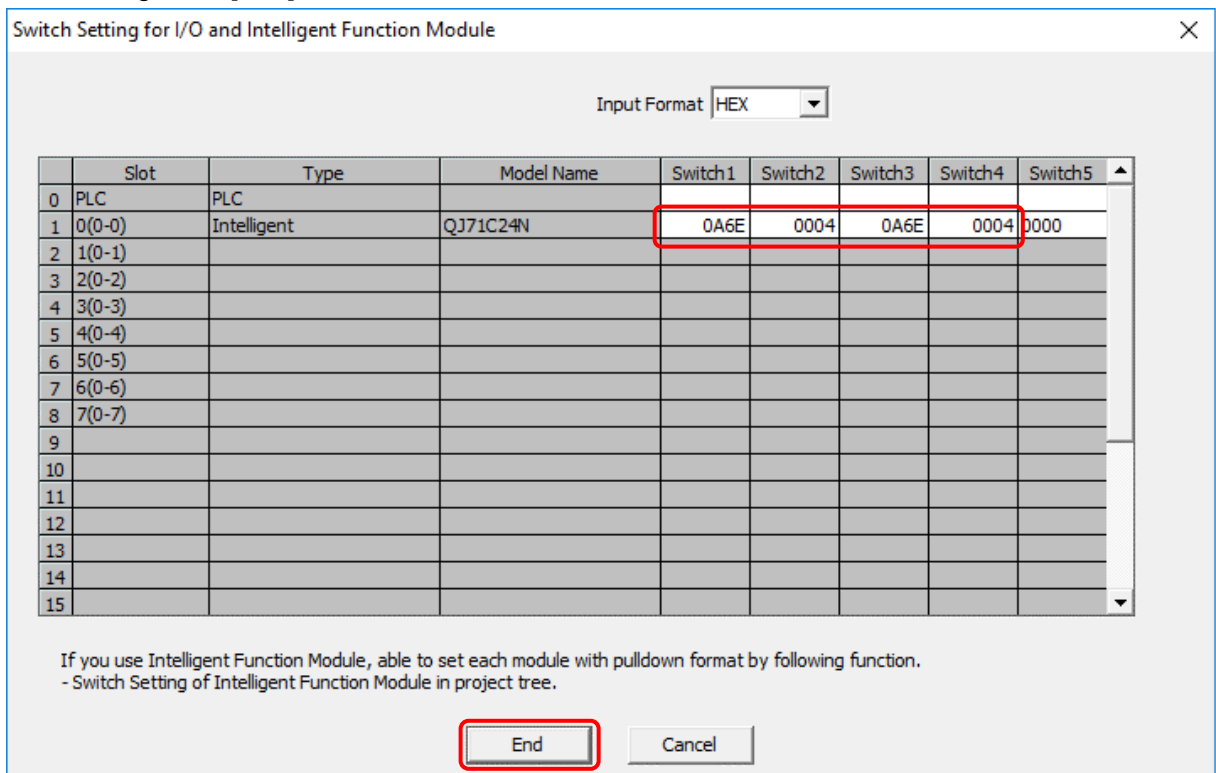


(Fig. 13.2-2)

Displays the Switch Setting for I/O and Intelligent Function Module screen.

Set the data bit, parity bit, stop bit, communication speed and communication protocol settings.

After setting, click [End] button.



(Fig. 13.2-3)

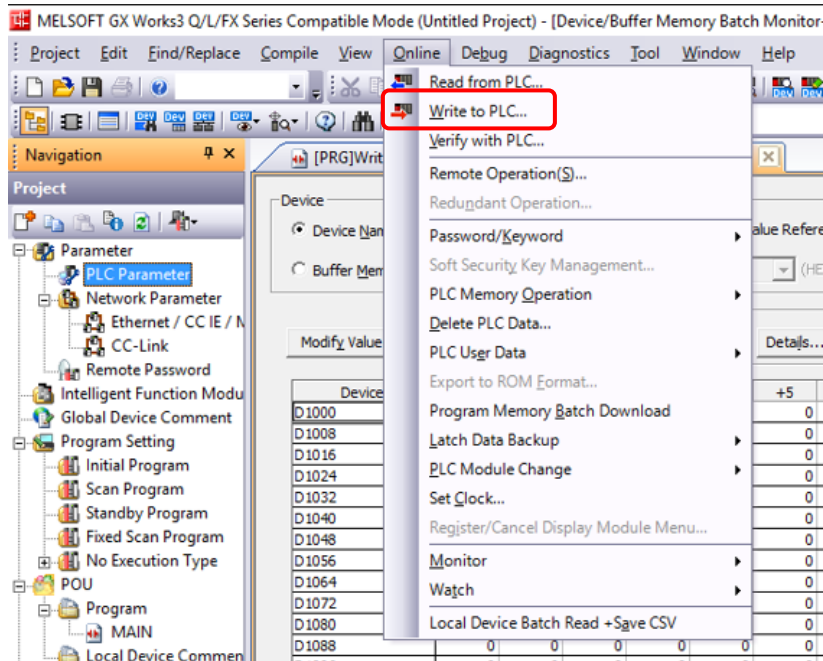
[Setting Example]

Setting item	Setting contents
Action setting	Independent
Data bit	8 bits
Parity bit	Even
Stop bit	1 bit
Sum check code	Yes
Write during RUN	Enable
Setting change	Disable
Communication speed setting	Set the same communication speed as the QDM1-□□P□ (Setting example: 57600 bps)
Communication protocol setting	Format 4

(3) PLC writing

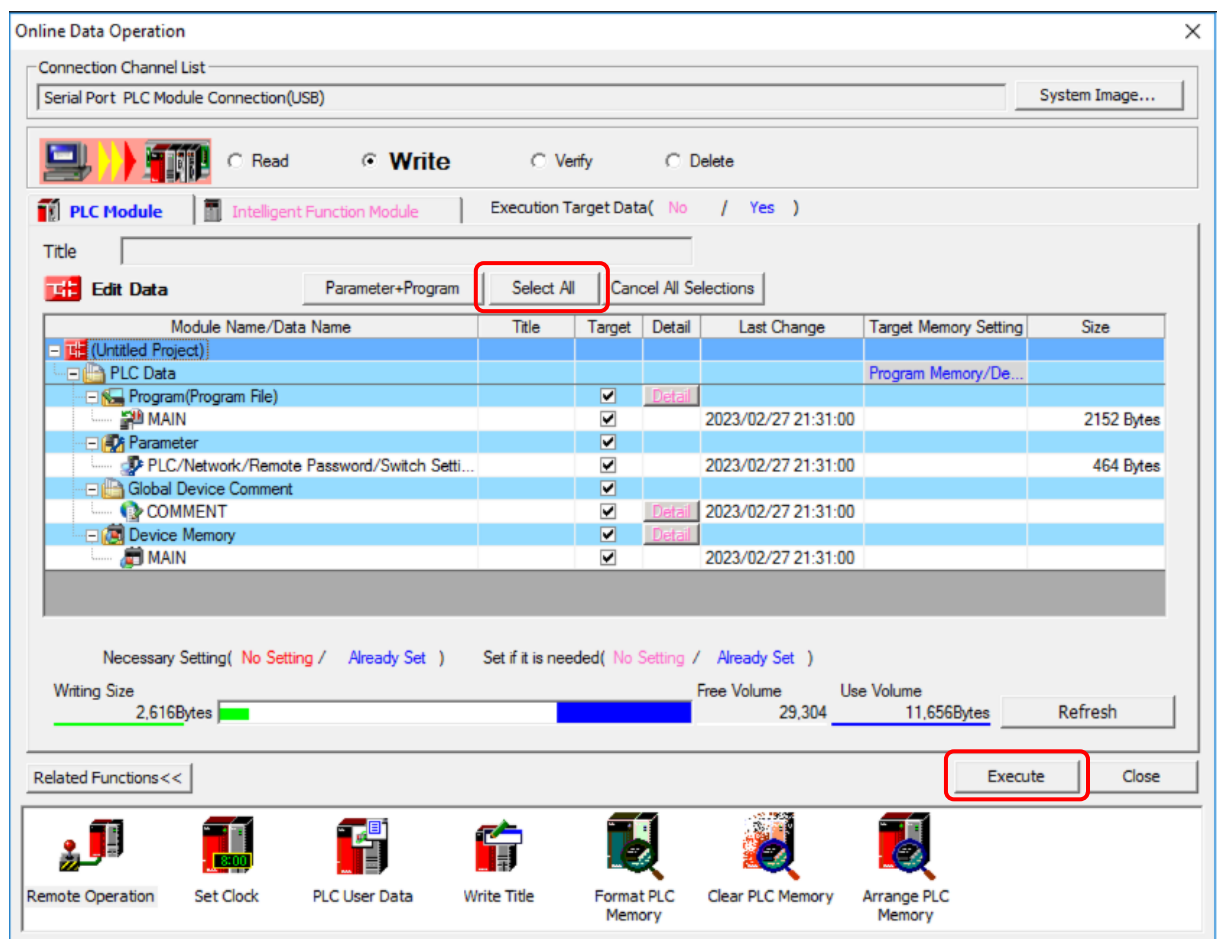
Click [Write to PLC...] on Menu bar -> Online.

Display the PC writing screen.



(Fig. 13.2-4)

Click [Select all] button -> [Execute] button.



(Fig. 13.2-5)

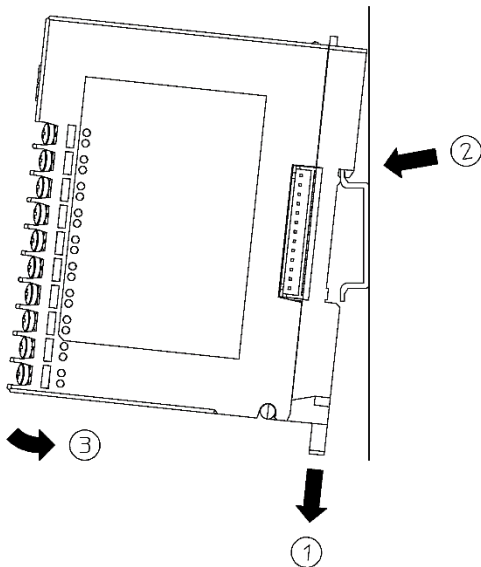
This completes the PLC communication parameter settings.

13.3 Mounting

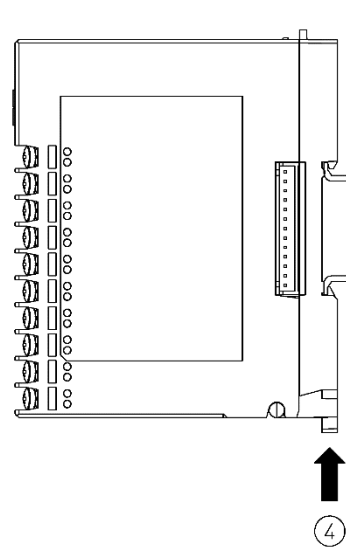
Mounting to the DIN rail

- ① Lower the lock lever of this instrument. (The lock lever of this instrument has a spring structure, but if lower it in the direction of the arrow until it stops, it will be locked in that position.)
- ② Hook the part ② of this instrument onto the top of the DIN rail.
- ③ Insert the lower part of this instrument with the part ② as a fulcrum.
- ④ Raise the lock lever of this instrument.

Make sure it is fixed to the DIN rail.



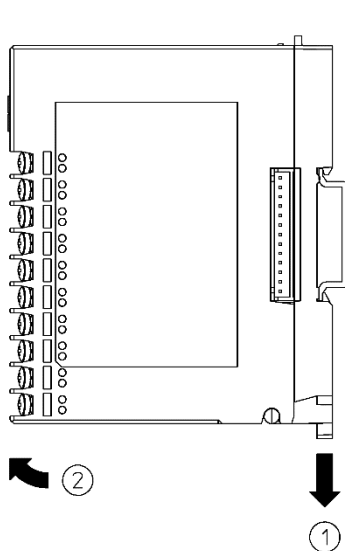
(Fig. 13.3-1)



(Fig. 13.3-2)

Removal from the DIN rail

- ① Insert a flat blade screwdriver into the lock lever of this instrument and lower the lock lever until it stops.
- ② Remove this instrument from the DIN rail by lifting it from below.



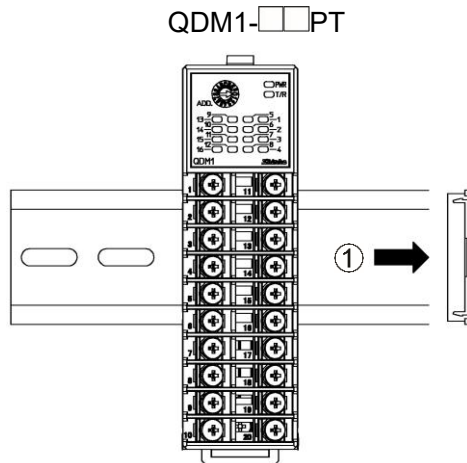
(Fig. 13.3-3)

Mounting multiple modules to the DIN rail

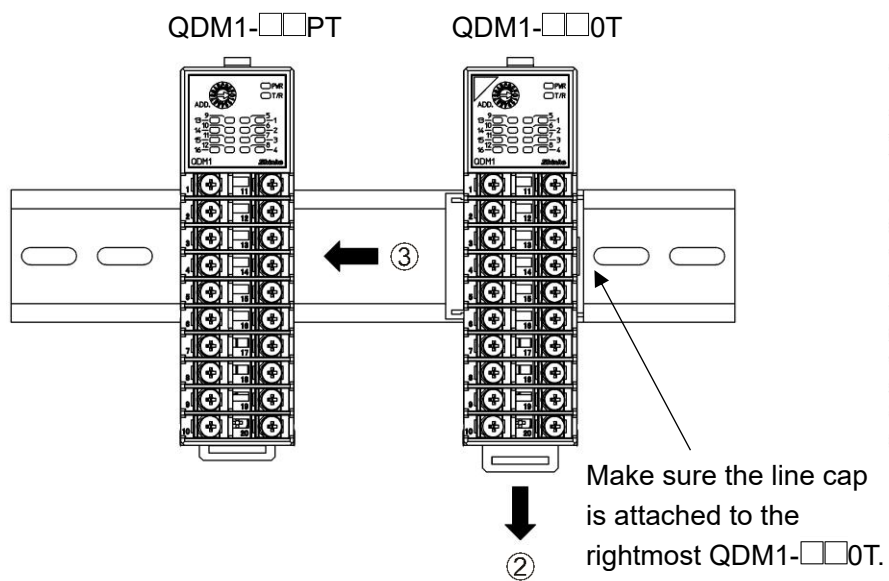
This section describes an example of mounting multiple modules on the DIN rail.

- ① Remove the line cap on the right side of the QDM1-□□PT.
- ② Lower the lock lever of the QDM1-□□0T, and mounting the QDM1-□□0T to the DIN rail.
- ③ Slide the QDM1-□□0T to the left and connect the connectors to each other.
- ④ Raise the lock lever of the QDM1-□□0T.

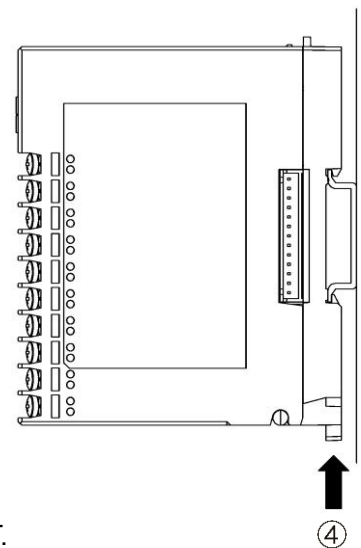
Make sure it is fixed to the DIN rail.



(Fig. 13.3-4)



(Fig. 13.3-5)



(Fig. 13.3-6)

13.4 Specification Setting

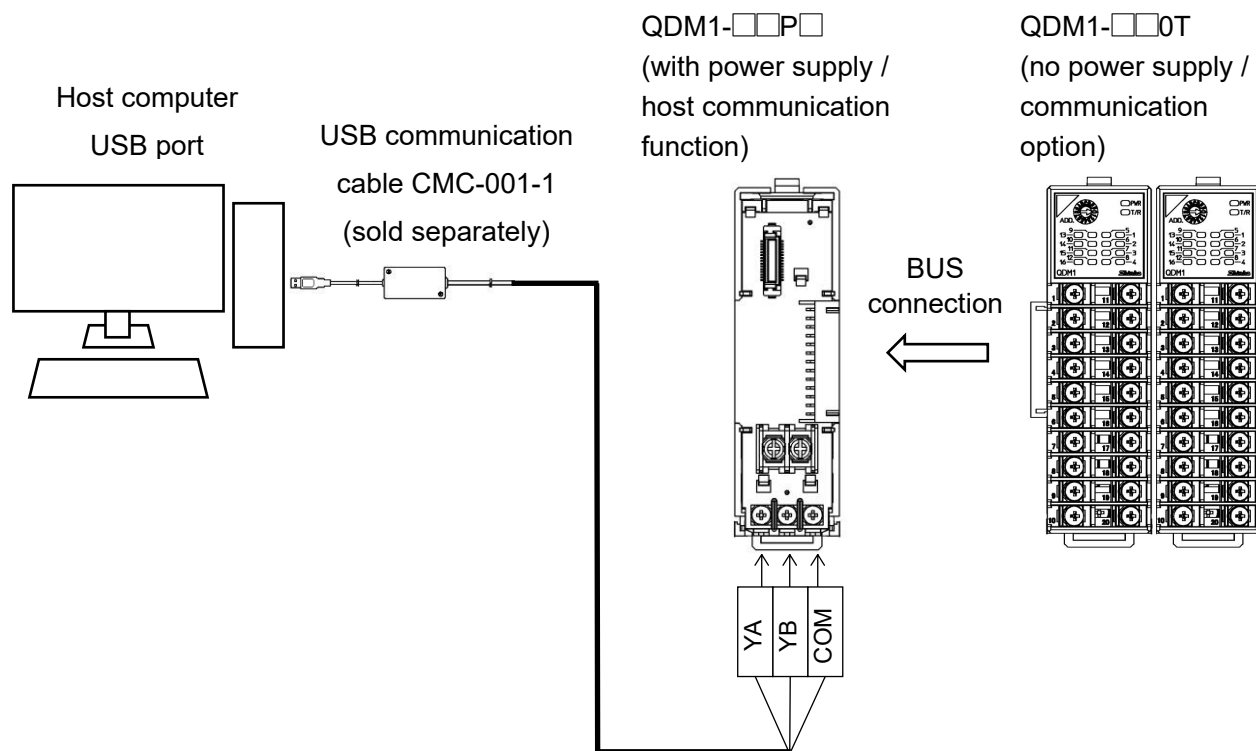
Set the specifications of the QDM1-□□P□ and QDM1-□□0□ to communicate with the PLC.
This section describes how to set specifications using console software (SWC-QDM101M).

13.4.1 Preparation of USB Communication Cable and Console Software

Please prepare the USB communication cable and the console software.

- USB communication cable
USB-micro USB Type-B (commercial item)
- Console software (SWC-QDM101M)
Please download from our website and install.
Click <https://shinko-technos.co.jp/e/> → Support/Download → Software

13.4.2 Connecting to Host Computer



(Fig. 13.4.2-1)

(3) Checking the COM port number

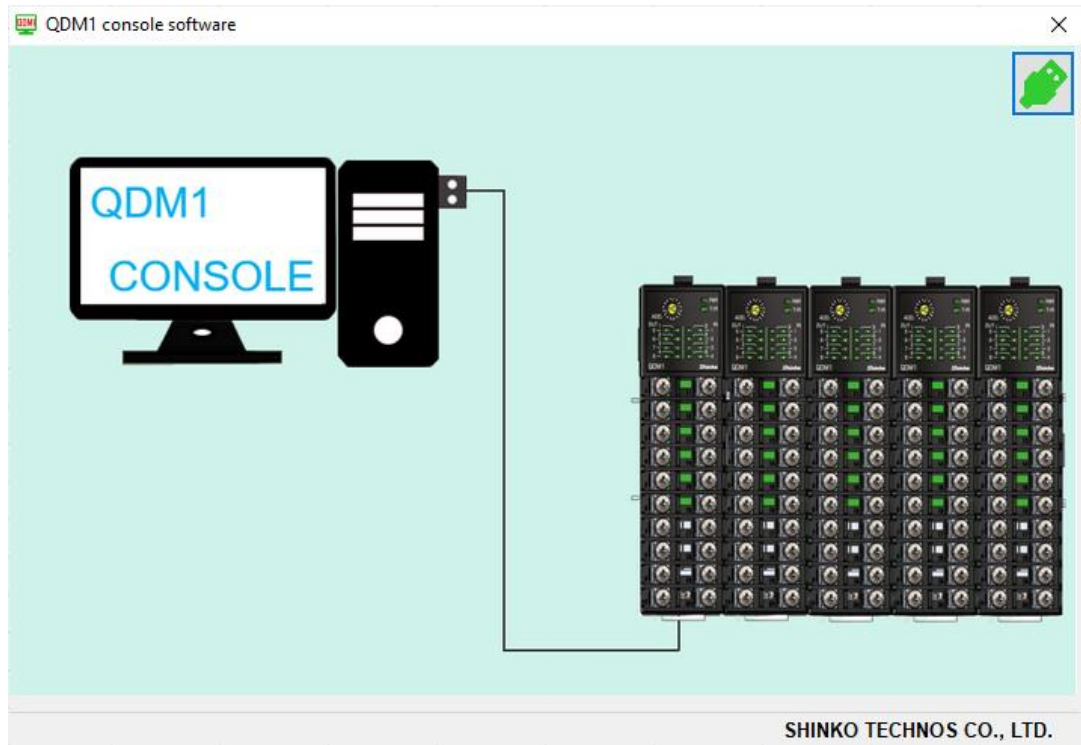
Follow the procedure below to check the COM port number.

- ① Right-click "Start" → Click "Device manager" from menu.
- ② When "USB Serial Port (COM3)" is displayed in "Port (COM and LPT)", the COM port is assigned to No. 3.

Check the COM port number, and then close "Device Manager".

(4) Starting the console software (SWC-QDM101M)

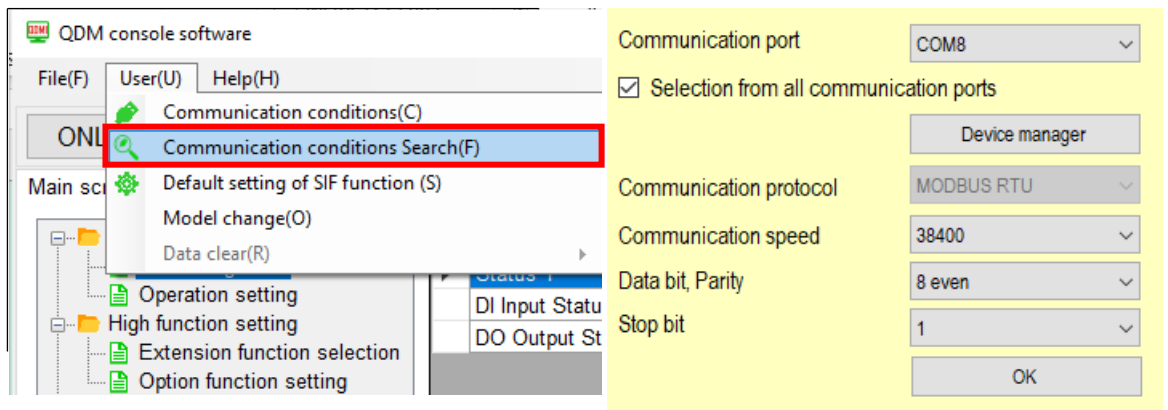
- ① Start the console software (SWC-QDM101M).



(Fig. 13.4.2-2)

- ② Click [User (U)] on the menu bar → [Communication condition (C)].

Display the communication condition setting screen.



(Fig. 13.4.2-3)

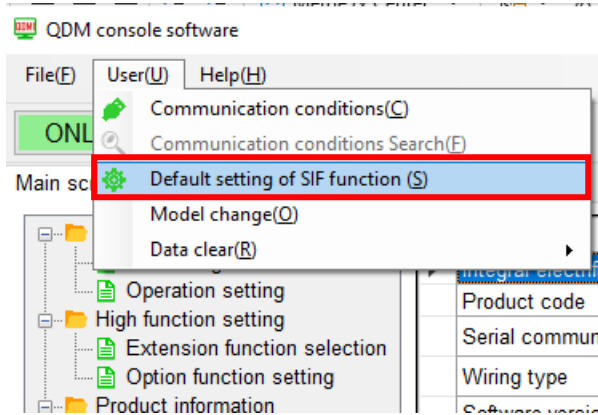
- ③ Set the communication condition as shown below.

Setup Items	Setting Value
Communication port	Select the COM port number confirmed in ② of (3).
Communication protocol	MODBUS RTU

- ④ Click [OK]

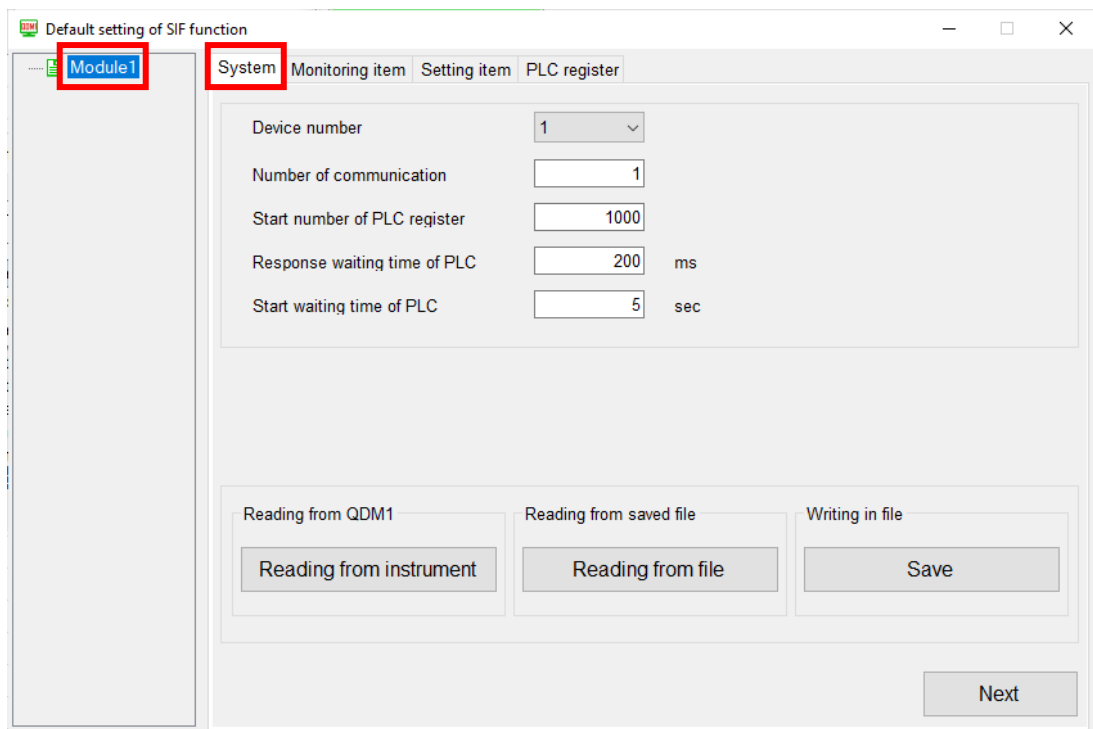
- ⑤ Click “Default setting of SIF function(S)” from “User(U)” of menu ber.

Display “Default setting of SIF function” screen.



(Fig. 13.4.2-4)

- ⑥ Select “Module 1” and click “System” tab.



(Fig. 13.4.2-5)

The specifications are ready.

13.4.3 Specification Setting

Specification setting of QDM1-□□P□

Set the specifications of the QDM1-□□P□ with reference to the SIF function initial setting items.

SIF function initial setting items

MODBUS address		Name	Settings • Selection range	Initial value	Remarks (*)
HEX	DEC				
020A	522	Communication management module number setting	1 to 16 modules	1	1
0384	900	PLC register start number	0 to 65535	1000	0
0385	901	PLC response wait time	100 to 3000 ms	200	1
0386	902	PLC communication start wait time	1 to 255 seconds	5	1
0387	903	Reservation (Not used)		0	0
0388	904	Reservation (Not used)		0	0
0389	905	Monitor item 1	Refer to Monitor item 1 (P.13-12)	200	0
038A	906	Monitor item 2	Refer to Monitor item 2 (P.13-13)	0	0
038B	907	Monitor item 3	Refer to Monitor item 3 (P.13-13)	0	0
038C	908	Reservation (Not used)		0	0
038D	909	Reservation (Not used)		0	0
038E	910	Setting item 1	Refer to Setting item 1 (P.13-14)	4	0
038F	911	Setting item 2	Refer to Setting item 2 (P.13-14)	0	0
0390	912	Setting item 3	Refer to Setting item 3 (P.13-15)	0	0
0391	913	Setting item 4	Refer to Setting item 4 (P.13-15)	0	0
0392	914	Setting item 5	Refer to Setting item 5 (P.13-16)	0	0
0393	915	Setting item 6	Refer to Setting item 6 (P.13-16)	0	0
0394	916	Setting item 7	Refer to Setting item 7 (P.13-17)	0	0

(*) 0: The value set in each module is a valid item.

1: The value set in the QDM1-□□P□ is a valid item.

(1) Communication management module number setting

Set the number of modules managed by the master module.

Set the number of modules including the master module.

(2) PLC register start number

Set the start number of the register used in PLC communication. It is fixed to the D register.

Please set in the range of 0 to 65535.

For A compatible 1C frame AnA/AnU, set within the range of 0 to 8191.

A maximum of 90 registers are used per QDM1. [System area: 10 registers, Monitor item: 40 registers (10 × 4ch), Setting item: 40 registers (10 × 4ch)]

When using multiple control modules, be careful not to duplicate them.

(3) PLC response wait time

Set the retransmission interval time when there is no response from the PLC.

Please set in the range of 100 to 3000 ms.

(4) PLC communication start wait time

Set the time from when the QDM1-□□P□ power is turned on until communication is started to the PLC.

Please set in the range of 1 to 255 seconds.

(5) Monitor item 1 to 3

Click [Monitor item] tab or [Next] button.

Displays the Monitor item screen.

Select any of Monitor item 1 to 3. The maximum number of valid item selections is 10.

The excess is invalid.

Monitor item 1 (Initial value: 200)

Bit	No.	Selection	Description
0	01	0	Not used
1	02	0	Not used
2	03	0	Not used
3	04	1	Status flag 1
4	05	0	Not used
5	06	0	Not used
6	07	1	DI input status (CH1 to CH16)
7	08	1	DO output status (CH1 to CH16)
8	09	0	Not used
9	10	0	Not used
10	11	0	Not used
11	12	0	Not used
12	13	0	Not used
13	14	0	Not used
14	15	0	Not used
15	16	0	Not used

Monitor item 2 (Initial value: 0)

Bit	No.	Selection	Description
0	17	0	Not used
1	18	0	Not used
2	19	0	Not used
3	20	0	Not used
4	21	0	Not used
5	22	0	Not used
6	23	0	Not used
7	24	0	Not used
8	25	0	Not used
9	26	0	Not used
10	27	0	Not used
11	28	0	Not used
12	29	0	Not used
13	30	0	Not used
14	31	0	Not used
15	32	0	Not used

Monitor item 3 (Initial value: 0)

Bit	No.	Selection	Description
0	33	0	Not used
1	34	0	Not used
2	35	0	Not used
3	36	0	Not used
4	37	0	Not used
5	38	0	Not used
6	39	0	Total energizing time (High, Low)
7	40	0	Not used
8	41	0	Not used
9	42	0	Not used
10	43	0	Not used
11	44	0	Not used
12	45	0	Not used
13	46	0	Not used
14	47	0	Not used
15	48	0	Not used

(6) Setting item 1 to 7

Click [Setting item] tab or [Next] button.

Displays the Setting item screen.

Select any of Setting item 1 to 7. The maximum number of valid item selections is 10.

The excess is invalid.

Setting item 1 (Initial value: 4)

Bit	Setting request item number	Selection	Description
0	1	0	Not used
1	2	0	Not used
2	3	1	DO output (CH1 to CH16)
3	4	0	Not used
4	5	0	Not used
5	6	0	Not used
6	7	0	Not used
7	8	0	Not used
8	9	0	Not used
9	10	0	Not used
10	11	0	Not used
11	12	0	Not used
12	13	0	Not used
13	14	0	Not used
14	15	0	Not used
15	16	0	Not used

Setting item 2 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	17	0	Not used
1	18	0	Not used
2	19	0	Not used
3	20	0	Not used
4	21	0	Not used
5	22	0	Not used
6	23	0	Not used
7	24	0	Not used
8	25	0	Not used
9	26	0	Not used
10	27	0	Not used
11	28	0	Not used
12	29	0	Not used
13	30	0	Not used
14	31	0	Not used
15	32	0	Not used

Setting item 3 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	33	0	Not used
1	34	0	Not used
2	35	0	Not used
3	36	0	Not used
4	37	0	Not used
5	38	0	Not used
6	39	0	Not used
7	40	0	Not used
8	41	0	Not used
9	42	0	Not used
10	43	0	Not used
11	44	0	Not used
12	45	0	Not used
13	46	0	Not used
14	47	0	Not used
15	48	0	Not used

Setting item 4 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	49	0	Not used
1	50	0	Not used
2	51	0	Not used
3	52	0	Not used
4	53	0	Not used
5	54	0	Not used
6	55	0	Not used
7	56	0	Not used
8	57	0	Not used
9	58	0	Not used
10	59	0	Not used
11	60	0	Not used
12	61	0	Not used
13	62	0	Not used
14	63	0	Not used
15	64	0	Not used

Setting item 5 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	65	0	Not used
1	66	0	Not used
2	67	0	Not used
3	68	0	Not used
4	69	0	Not used
5	70	0	Not used
6	71	0	Not used
7	72	0	Not used
8	73	0	Not used
9	74	0	Not used
10	75	0	Not used
11	76	0	Not used
12	77	0	Not used
13	78	0	Not used
14	79	0	Not used
15	80	0	Not used

Setting item 6 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	81	0	Not used
1	82	0	Not used
2	83	0	Not used
3	84	0	Not used
4	85	0	Not used
5	86	0	Not used
6	87	0	Not used
7	88	0	Not used
8	89	0	Not used
9	90	0	Not used
10	91	0	Not used
11	92	0	Not used
12	93	0	Not used
13	94	0	Not used
14	95	0	Not used
15	96	0	Not used

Setting item 7 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	97	0	Communication response delay time setting
1	98	0	Digital input sampling cycle setting
2	99	0	Not used
3	100	0	Not used
4	101	0	Not used
5	102	0	Not used
6	103	0	Not used
7	104	0	Not used
8	105	0	Not used
9	106	0	Not used
10	107	0	Communication management module number setting (SIF function)
11	108	0	Not used
12	109	0	Not used
13	110	0	Not used
14	111	0	Not used
15	112	0	Not used

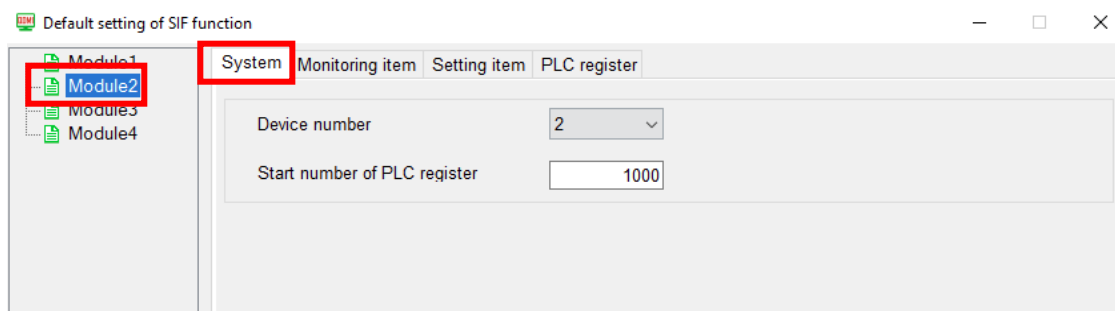
(7) Module power OFF → ON

Turn the module power off and then on. The set value becomes effective.

This completes the specification setting of QDM1-□□P□.

If multiple control modules are connected, connect the USB communication cable to the next control module.

Select the connected module number (Example: Module 2) and click the [System] tab.



(Fig. 13.4.3-1)

Specification setting of QDM1-□□0□

Set the specifications of QDM1-□□0□ referring to the SIF function initial setting items.

SIF function initial setting items

MODBUS address		Name	Settings • Selection range	Initial value	Remarks (*)
HEX	DEC				
020A	522	Communication management module number setting	1 to 16 modules	1	1
0384	900	PLC register start number	0 to 65535	1100	0
0385	901	PLC response wait time	100 to 3000 ms	200	1
0386	902	PLC communication start wait time	1 to 255 seconds	5	1
0387	903	Reservation (Not used)		0	0
0388	904	Reservation (Not used)		0	0
0389	905	Monitor item 1	Refer to Monitor item 1 (P.13-19)	200	0
038A	906	Monitor item 2	Refer to Monitor item 2 (P.13-20)	0	0
038B	907	Monitor item 3	Refer to Monitor item 3 (P.13-20)	0	0
038C	908	Reservation (Not used)		0	0
038D	909	Reservation (Not used)		0	0
038E	910	Setting item 1	Refer to Setting item 1 (P.13-21)	4	0
038F	911	Setting item 2	Refer to Setting item 2 (P.13-21)	0	0
0390	912	Setting item 3	Refer to Setting item 3 (P.13-22)	0	0
0391	913	Setting item 4	Refer to Setting item 4 (P.13-22)	0	0
0392	914	Setting item 5	Refer to Setting item 5 (P.13-23)	0	0
0393	915	Setting item 6	Refer to Setting item 6 (P.13-23)	0	0
0394	916	Setting item 7	Refer to Setting item 7 (P.13-24)	0	0

(*) 0: The value set in each module is a valid item.

1: The value set in the QDM1-□□P□ is a valid item.

(1) Communication management module number setting

Set the number of modules managed by the master module.

Set the number of modules including the master module.

(2) PLC register start number

Set the start number of the register used in PLC communication. It is fixed to the D register.

Please set in the range of 0 to 65535.

For A compatible 1C frame AnA/AnU, set within the range of 0 to 8191.

A maximum of 90 registers are used per QDM1. [System area: 10 registers, Monitor item: 40 registers (10 × 4ch), Setting item: 40 registers (10 × 4ch)]

When using multiple control modules, be careful not to duplicate them.

(3) PLC response wait time

Set the retransmission interval time when there is no response from the PLC.

Please set in the range of 100 to 3000 ms.

(4) PLC communication start wait time

Set the time from when the QDM1-□□P□ power is turned on until communication is started to the PLC.

Please set in the range of 1 to 255 seconds.

(5) Monitor item 1 to 3

Click [Monitor item] tab or [Next] button.

Displays the Monitor item screen.

Select any of Monitor item 1 to 3. The maximum number of valid item selections is 10.

The excess is invalid for all channels in the control module.

Monitor item 1 (Initial value: 200)

Bit	No.	Selection	Description
0	01	0	Not used
1	02	0	Not used
2	03	0	Not used
3	04	1	Status flag 1
4	05	0	Not used
5	06	0	Not used
6	07	1	DI input status (CH1 to CH16)
7	08	1	DO output status (CH1 to CH16)
8	09	0	Not used
9	10	0	Not used
10	11	0	Not used
11	12	0	Not used
12	13	0	Not used
13	14	0	Not used
14	15	0	Not used
15	16	0	Not used

Monitor item 2 (Initial value: 0)

Bit	No.	Selection	Description
0	17	0	Not used
1	18	0	Not used
2	19	0	Not used
3	20	0	Not used
4	21	0	Not used
5	22	0	Not used
6	23	0	Not used
7	24	0	Not used
8	25	0	Not used
9	26	0	Not used
10	27	0	Not used
11	28	0	Not used
12	29	0	Not used
13	30	0	Not used
14	31	0	Not used
15	32	0	Not used

Monitor item 3 (Initial value: 0)

Bit	No.	Selection	Description
0	33	0	Not used
1	34	0	Not used
2	35	0	Not used
3	36	0	Not used
4	37	0	Not used
5	38	0	Not used
6	39	0	Total energizing time (High, Low)
7	40	0	Not used
8	41	0	Not used
9	42	0	Not used
10	43	0	Not used
11	44	0	Not used
12	45	0	Not used
13	46	0	Not used
14	47	0	Not used
15	48	0	Not used

(6) Setting item 1 to 7

Click [Setting item] tab or [Next] button.

Displays the Setting item screen.

Select any of Setting item 1 to 7. The maximum number of valid item selections is 10.

The excess is invalid for all channels in the control module.

Setting item 1 (Initial value: 4)

Bit	Setting request item number	Selection	Description
0	1	0	Not used
1	2	0	Not used
2	3	1	DO output (CH1 to CH16)
3	4	0	Not used
4	5	0	Not used
5	6	0	Not used
6	7	0	Not used
7	8	0	Not used
8	9	0	Not used
9	10	0	Not used
10	11	0	Not used
11	12	0	Not used
12	13	0	Not used
13	14	0	Not used
14	15	0	Not used
15	16	0	Not used

Setting item 2 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	17	0	Not used
1	18	0	Not used
2	19	0	Not used
3	20	0	Not used
4	21	0	Not used
5	22	0	Not used
6	23	0	Not used
7	24	0	Not used
8	25	0	Not used
9	26	0	Not used
10	27	0	Not used
11	28	0	Not used
12	29	0	Not used
13	30	0	Not used
14	31	0	Not used
15	32	0	Not used

Setting item 3 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	33	0	Not used
1	34	0	Not used
2	35	0	Not used
3	36	0	Not used
4	37	0	Not used
5	38	0	Not used
6	39	0	Not used
7	40	0	Not used
8	41	0	Not used
9	42	0	Not used
10	43	0	Not used
11	44	0	Not used
12	45	0	Not used
13	46	0	Not used
14	47	0	Not used
15	48	0	Not used

Setting item 4 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	49	0	Not used
1	50	0	Not used
2	51	0	Not used
3	52	0	Not used
4	53	0	Not used
5	54	0	Not used
6	55	0	Not used
7	56	0	Not used
8	57	0	Not used
9	58	0	Not used
10	59	0	Not used
11	60	0	Not used
12	61	0	Not used
13	62	0	Not used
14	63	0	Not used
15	64	0	Not used

Setting item 5 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	65	0	Not used
1	66	0	Not used
2	67	0	Not used
3	68	0	Not used
4	69	0	Not used
5	70	0	Not used
6	71	0	Not used
7	72	0	Not used
8	73	0	Not used
9	74	0	Not used
10	75	0	Not used
11	76	0	Not used
12	77	0	Not used
13	78	0	Not used
14	79	0	Not used
15	80	0	Not used

Setting item 6 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	81	0	Not used
1	82	0	Not used
2	83	0	Not used
3	84	0	Not used
4	85	0	Not used
5	86	0	Not used
6	87	0	Not used
7	88	0	Not used
8	89	0	Not used
9	90	0	Not used
10	91	0	Not used
11	92	0	Not used
12	93	0	Not used
13	94	0	Not used
14	95	0	Not used
15	96	0	Not used

Setting item 7 (Initial value: 0)

Bit	Setting request item number	Selection	Description
0	97	0	Communication response delay time setting
1	98	0	Digital input sampling cycle setting
2	99	0	Not used
3	100	0	Not used
4	101	0	Not used
5	102	0	Not used
6	103	0	Not used
7	104	0	Not used
8	105	0	Not used
9	106	0	Not used
10	107	0	Communication management module number setting (SIF function)
11	108	0	Not used
12	109	0	Not used
13	110	0	Not used
14	111	0	Not used
15	112	0	Not used

(7) Module power OFF → ON

Turn the module power off and then on. The set value becomes effective.

This completes the specification setting for the QDM1-□□0□.

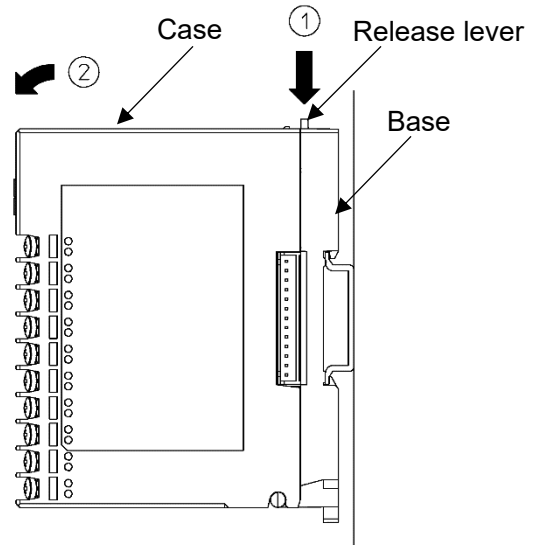
13.5 Wiring

13.5.1 Wiring for Power Supply and Communication

The terminal block for power supply and communication is located on the base of the QDM1-□□P□. Wiring by the following procedure.

(1) Case removal

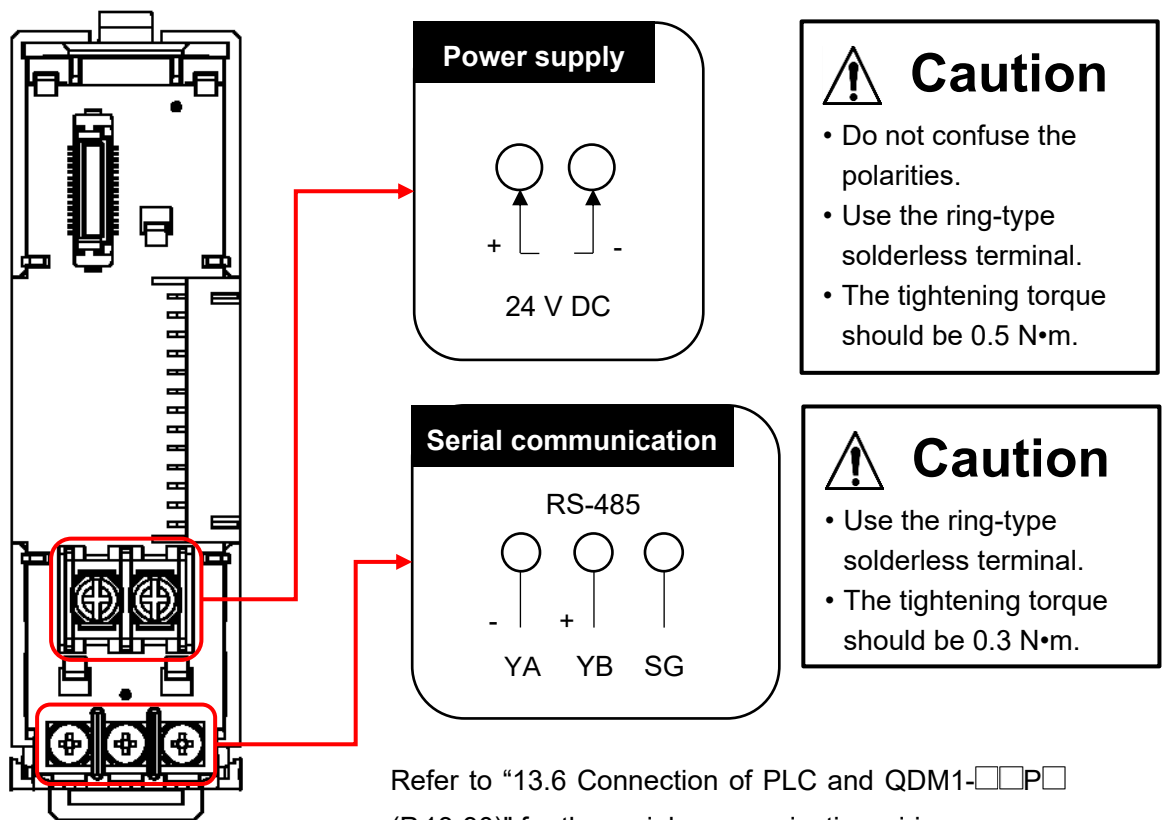
- ① Push the release lever on the top of QDM1-□□P□ to unlock it.
- ② Remove the case.



(Fig. 13.5.1-1)

(2) Wiring

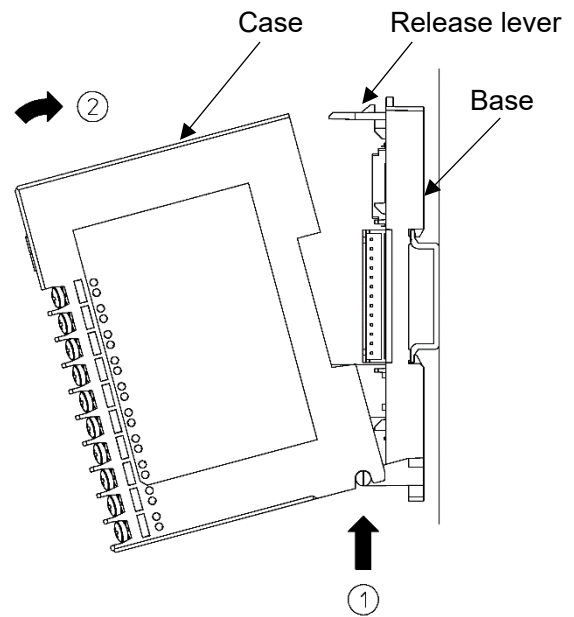
Serial communication RS-485



(Fig. 13.5.1-2)

(3) Case mounting

- ① Hook the case on the lower part ① of QDM1-□□P□.
- ② Mount the case so that the lower part ① of QDM1-□□P□ is the fulcrum and covers the release lever.
There is a clicking sound.



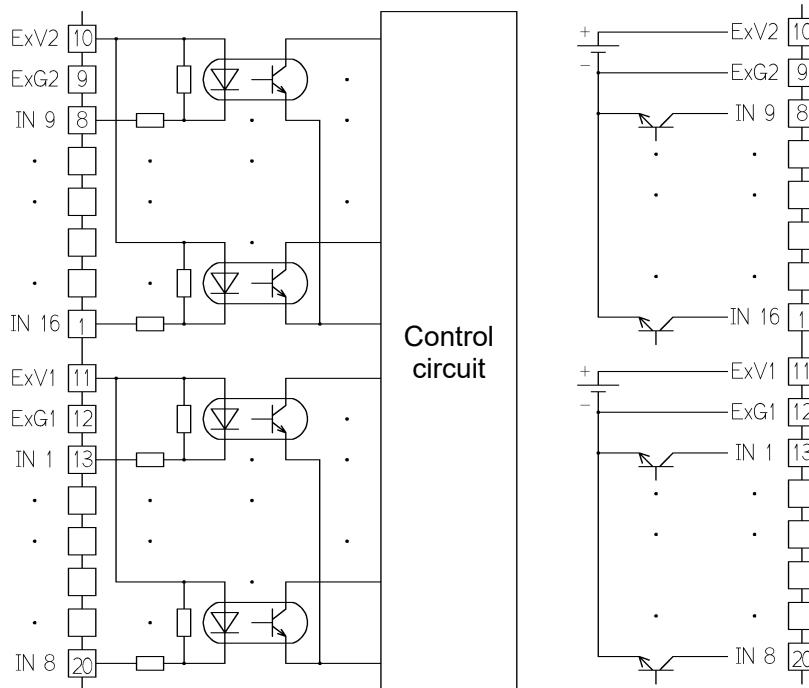
(Fig. 13.5.1-3)

⚠ Caution

- Please note that terminal numbers 1 to 10 and 11 to 20 have different terminal arrangements.
- The tightening torque should be 0.63 N•m.

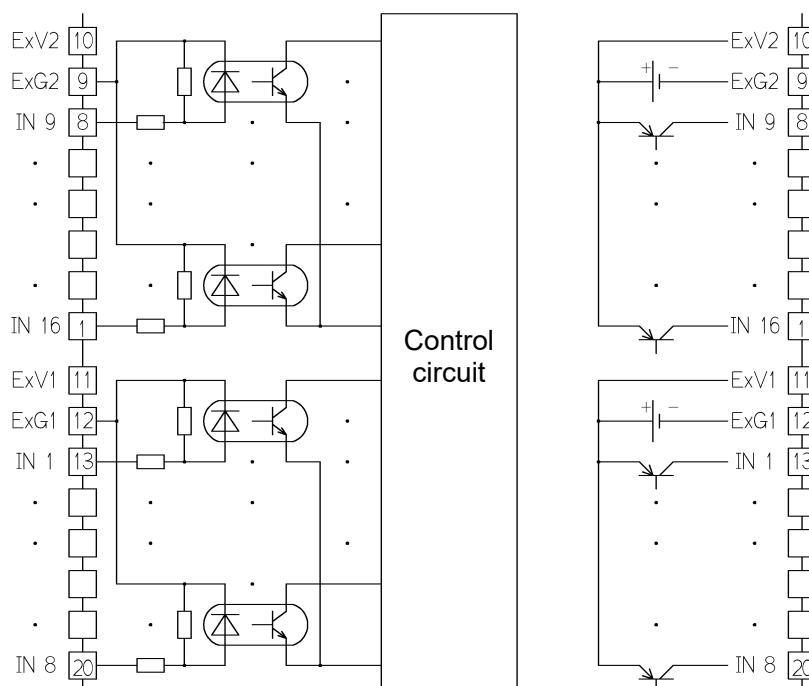
(1) Example of circuit configuration and wiring of digital input module

QDM1-DI16A□□



(Fig. 13.5.2-1)

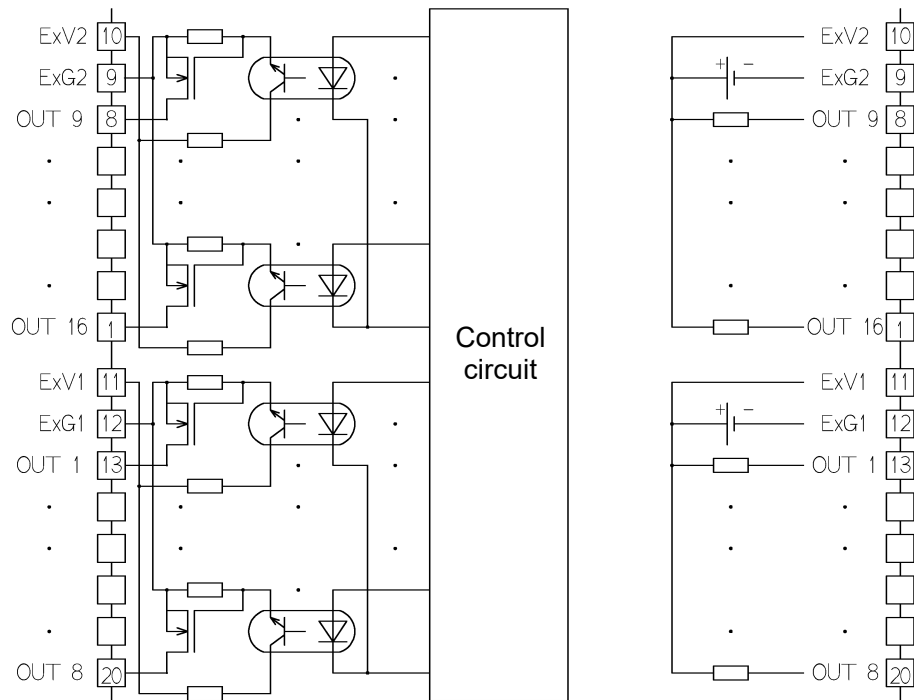
QDM1-DI16B□□



(Fig. 13.5.2-2)

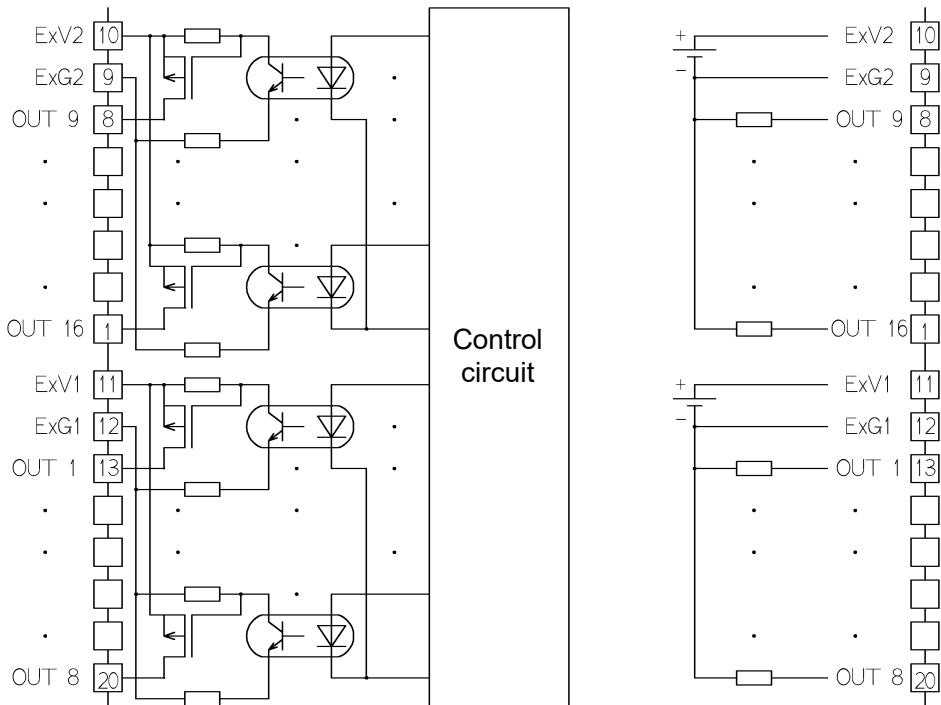
(2) Example of circuit configuration and wiring of digital output module

QDM1-DO16A□□



(Fig. 13.5.2-3)

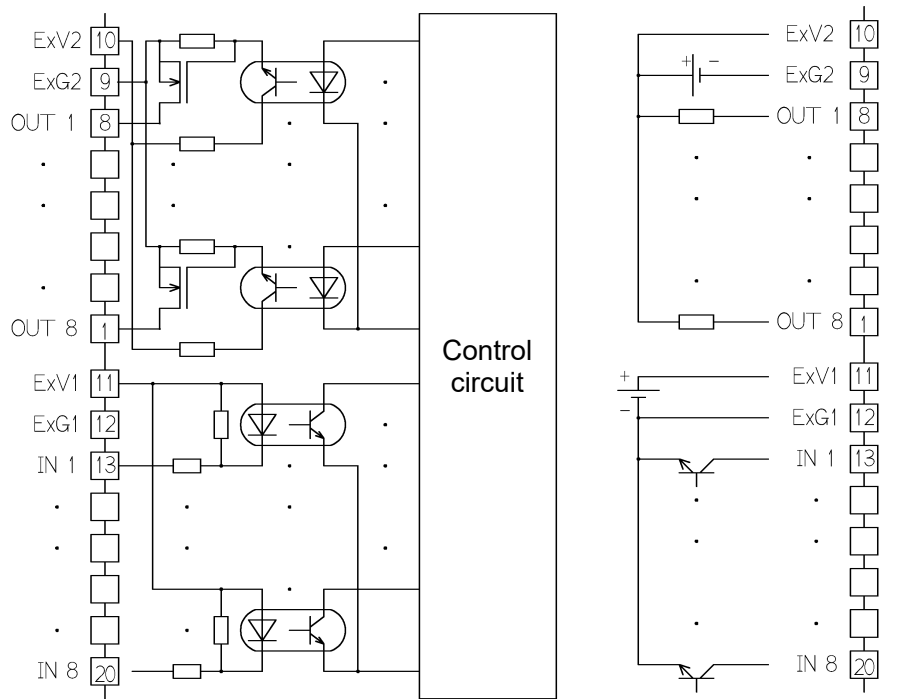
QDM1-DO16B□□



(Fig. 13.5.2-4)

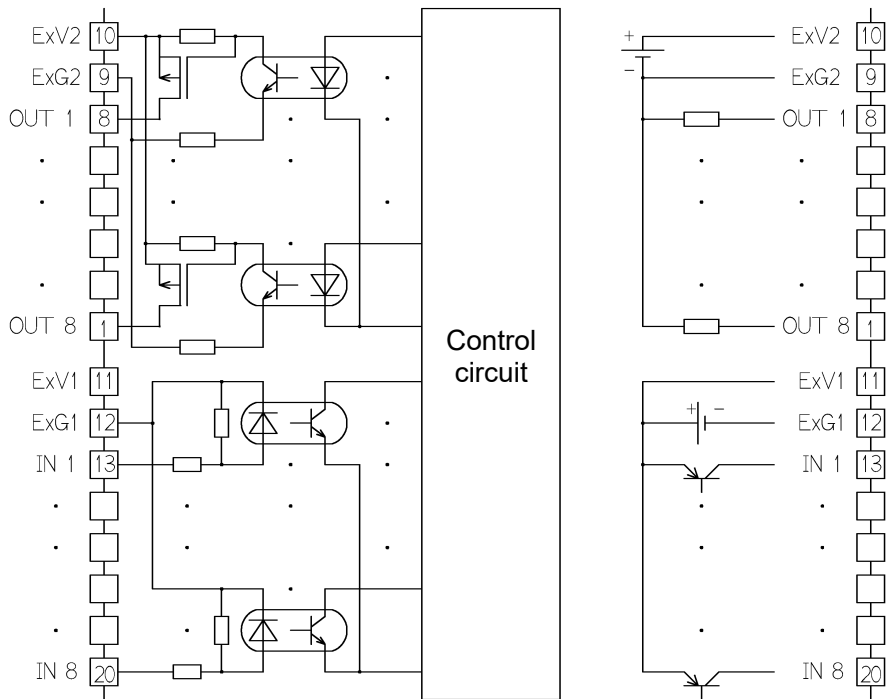
(3) Example of circuit configuration and wiring of digital I/O module

QDM1-DIO8A□□



(Fig. 13.5.2-5)

QDM1-DIO8B□□



(Fig. 13.5.2-6)

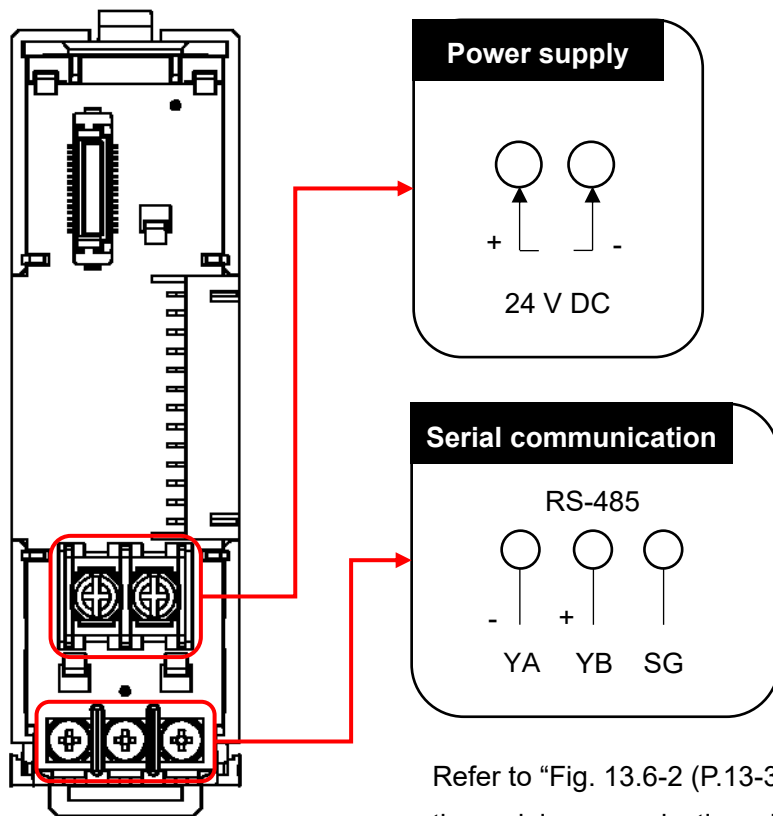
13.6 Connection of PLC and QDM1-□□P□



Warning

Turn off the power supply to this instrument before wiring.

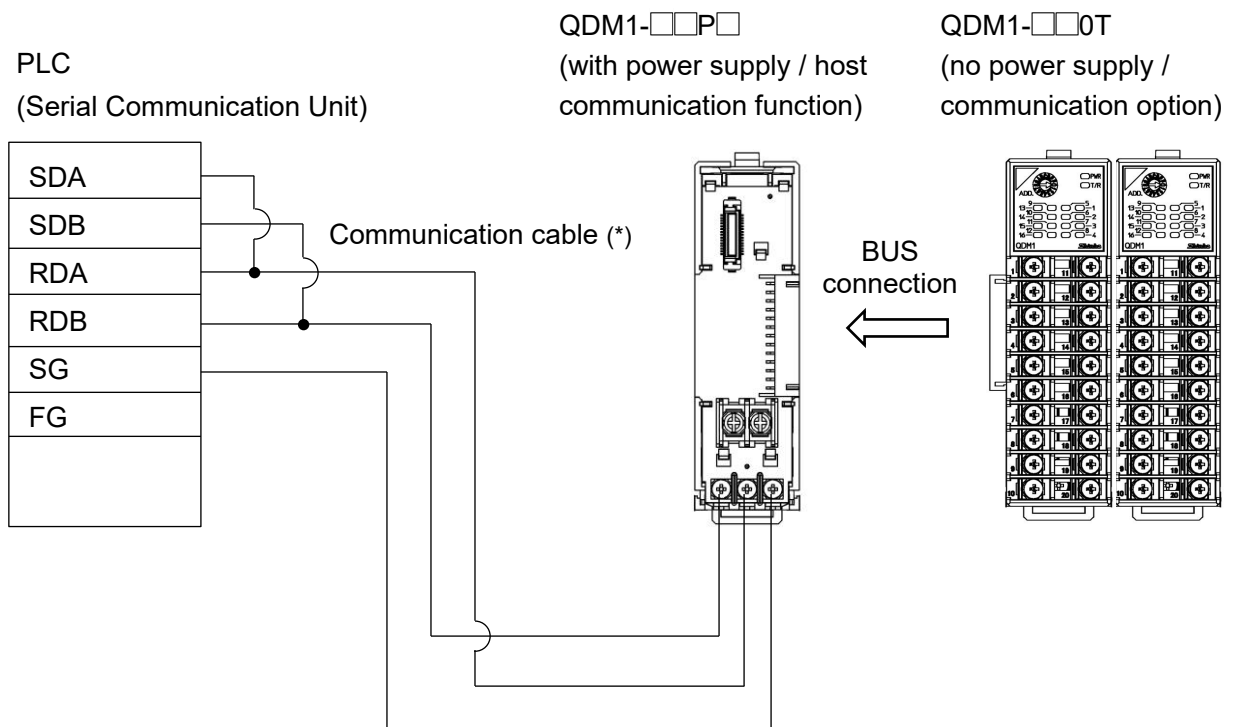
If you work while the power is supplied, you may get an electric shock, which could result in an accident resulting in death or serious injury.



Refer to “Fig. 13.6-2 (P.13-31)” for the serial communication wiring.

(Fig. 13.6-1)

Example of connection between PLC and QDM1-□□P□, QDM1-□□0T



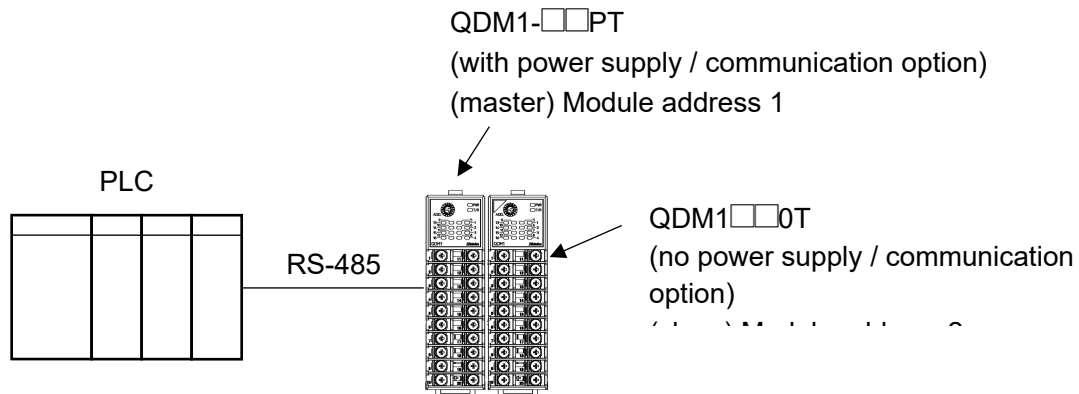
(*): For communication cables, please contact the store where you purchased the product or our sales office.

(Fig. 13.6-2)

13.7 Operation

The following explains how to connect two modules to the PLC.

Connection example of PLC and QDM1-□□PT, QDM1-□□OT

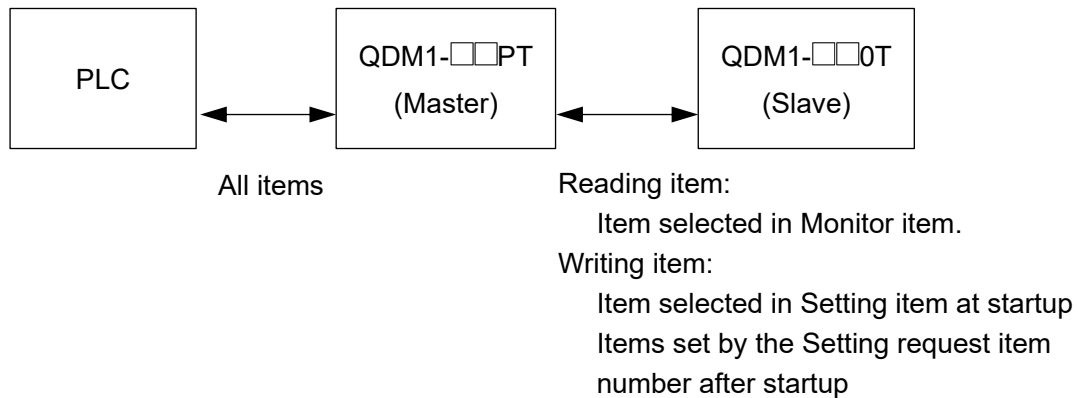


(Fig. 13.7-1)

13.7.1 Communication Procedure

- (1) The QDM1-□□PT becomes the master and collects the valid monitor items and setting items of the QDM1-□□OT (slave).
- (2) After the PLC communication start waiting time has elapsed, the QDM1-□□PT periodically writes the item selected in the monitor items to the PLC register.

Also, the item selected from the setting items is read from the PLC register in response to a setting request.



(Fig. 13.7.1-1)

13.7.2 PLC Communication Data Map

Shown below is the PLC communication data map when the initial setting example for PLC communication is set.

Example of initial setting for PLC communication

MODBUS address		Name	QDM1-□□PT	QDM1-□□OT
HEX	DEC		(Master) setting	(Slave) setting
0384	900	Register start number	1000	1100
0385	901	PLC response wait time	200	200
0386	902	PLC communication start wait time	5	5
0387	903	Reservation (Not used)	0	0
0388	904	Reservation (Not used)	0	0
0389	905	Monitor item 1	200	200
038A	906	Monitor item 2	0	0
038B	907	Monitor item 3	0	0
038C	908	Reservation (Not used)	0	0
038D	909	Reservation (Not used)	0	0
038E	910	Setting item 1	4	4
038F	911	Setting item 2	0	0
0390	912	Setting item 3	0	0
0391	913	Setting item 4	0	0
0392	914	Setting item 5	0	0
0393	915	Setting item 6	0	0
0394	916	Setting item 7	0	0

PLC data register placement

	QDM1-□□PT (Master)	QDM1-□□OT (Slave)
Information between QDM1-□□PT and PLC (System data)	1000 to 1009	1100 to 1109
Monitor Item	1010 to 1012	1110 to 1112
Setting item	1013	1113

Details of information (system data) between QDM1-□□PT and PLC

QDM1-□□PT (Master)

Data	PLC data register	Attribute	Description
Communication status	1000	RO	0: QDM1-□□PT collecting data 1: QDM1-□□PT completes data collection (Startup: Initial setting value of each slave)
QDM1-□□PT - PLC Normal communication monitor	1001	RO	Increment counter Repeat 0 to 65535 → 0 to 65535
QDM1-□□PT Error code	1002	RO	B0: PLC register R/W error 0: Normal 1: Error B1: QDM1-□□PT communication error 0: Normal 1: Error B2: QDM1-□□PT Negative acknowledgement when setting0: 0: Normal 1: Error (It will be cleared when B0 of 1006 is cleared.)
Setting request monitor	1003	RO	B0: Setting (Reflect and set to B0 of 1006.) B1: Monitoring (Reflect and set until B1 of 1006 is cleared.)
Reservation	1004	RO	
Setting request item number	1005	R/W	0: All items selected in setting items 1 to 7 1 to 112: Items selected in setting items 1 to 7 (1 data) Only the data (1 data) of the selected item will be read or written. However, because communication with the PLC is a batch process, all the selected items are read or written.
Setting request command (*)	1006	R/W	B0: Setting request (PLC → QDM1-□□PT) QDM1-□□PT requests to read the setting item data from the PLC register. B1: Monitor request (QDM1-□□PT → PLC) QDM1-□□PT requests to write the setting item data to the PLC register. After the setting request or monitor request is completed, QDM1-□□PT clears each bit.
Reservation	1007	R/W	
Reservation	1008	R/W	
Reservation	1009	R/W	

(*): If the setting request and the monitor request are set at the same time, processing is performed in the following procedure: ① setting request (QDM1-□□PT reads PLC register data), ② monitor request (writing data to PLC register).

If the setting request is set during the monitor request, the monitor request is discarded and the monitoring request is made again after the setting request.

QDM1-□□0T (Slave)

Data	PLC data register	Attribute	Description
Communication status	1100	RO	0: QDM1-□□PT collecting data of QDM1-□□0T 1: QDM1-□□PT completes data collection of QDM1-□□0T (Startup: Initial setting value of each slave)
QDM1-□□PT - PLC Normal communication monitor	1101	RO	Increment counter Repeat 0 to 65535 → 0 to 65535
QDM1 Error code	1102	RO	B0: PLC register R/W error 0: Normal 1: Error B1: Communication error between QDM1-□□PT and QDM1-□□0T 0: Normal 1: Error B2: Negative acknowledgement when setting QDM1-□□PT to QDM1-□□0T (It will be cleared when B0 of 1106 is cleared.) 0: Normal 1: Error
Setting request monitor	1103	RO	B0: Setting (Reflect and set to B0 of 1106.) B1: Monitoring (Reflect and set until B1 of 1106 is cleared.)
Reservation	1104	RO	
Setting request item number	1105	R/W	0: All items selected in setting items 1 to 7 1 to 112: Items selected in setting items 1 to 7 (1 data) Only the data (1 data) of the selected item will be read or written. However, because communication with the PLC is a batch process, all the selected items are read or written.
Setting request command (*)	1106	R/W	B0: Setting request (PLC → QDM1-□□PT) QDM1-□□PT requests to read the setting item data from the PLC register. B1: Monitor request (QDM1-□□PT → PLC) QDM1-□□PT requests to write the setting item data to the PLC register. After the setting request or monitor request is completed, QDM1-□□PT clears each bit.
Reservation	1107	R/W	
Reservation	1108	R/W	
Reservation	1109	R/W	

(*): If the setting request and the monitor request are set at the same time, processing is performed in the following procedure: ① setting request (QTC1-4P reads PLC register data), ② monitor request (writing data to PLC register).

If the setting request is set during the monitor request, the monitor request is discarded and the monitoring request is made again after the setting request.

Details of monitor item and setting item between QDM1-□□PT - PLC and PLC

QDM1-□□PT (Master)

Data	PLC data register	Attribute	Description
Status flag 1	1010	RO	B0: Input/output power supply error (CH1 to CH8) 0: Normal 1: Error B1: Input/output power supply error (CH9 to CH16) 0: Normal 1: Error B2 to B14: Not used (indefinite) B15: Non-volatile IC memory error 0: Normal 1: Error
DI input status (CH1 to CH16)	1011	RO	Bit allocation for B0: CH1 to B15: CH16. Corresponding bit bit 0: OFF/1: ON
DO output state (CH1 to CH16)	1012	RO	Bit allocation for B0: CH1 to B15: CH16. Corresponding bit bit 0: OFF/1: ON
DO output (CH1 to CH16)	1013	R/W	Bit allocation for B0: CH1 to B15: CH16. Corresponding bit bit 0: OFF/1: ON

QDM1-□□0T (Slave)

Data	PLC data register	Attribute	Description
Status flag 1	1110	RO	B0: Input/output power supply error (CH1 to CH8) 0: Normal 1: Error B1: Input/output power supply error (CH9 to CH16) 0: Normal 1: Error B2 to B14: Not used (indefinite) B15: Non-volatile IC memory error 0: Normal 1: Error
DI input status (CH1 to CH16)	1111	RO	Bit allocation for B0: CH1 to B15: CH16. Corresponding bit bit 0: OFF/1: ON
DO output state (CH1 to CH16)	1112	RO	Bit allocation for B0: CH1 to B15: CH16. Corresponding bit bit 0: OFF/1: ON
DO output (CH1 to CH16)	1113	R/W	Bit allocation for B0: CH1 to B15: CH16. Corresponding bit bit 0: OFF/1: ON

13.7.3 Data Exchange between QDM1-□□PT and PLC

Data transfer between the QDM1-□□PT and PLC is performed by the setting request item number and setting request command.

(1) Setting request item number

Set whether to transfer the data of all items selected in setting item 1 to 7 selection or only the data (1 data) of the selected item.

0: Transfers the data of all items selected in setting item 1 to 7 selection.

1 to 112: Transfers only the data (1 data) of the item selected in setting item 1 to 7 selection.

(2) Setting request command

The setting request command includes setting request and monitor request.

B0: Setting request (PLC → QDM1-□□PT)

The QDM1-□□PT is a command to request to read the data of the setting item of the PLC register.

B1: Monitor request (QDM1-□□PT → PLC)

The QDM1-□□PT is a command to request to write the data of the setting item of the PLC register.

If setting request and monitor request are set at the same time, processing is performed in the order of setting request (QDM1-□□PT reads the data of the setting item in the PLC register) and then monitor request (writing the data of the setting item in the PLC register).

If a setting request is set during monitor request, the monitor request is discarded and the monitor request is made again after the setting request.



Caution

When setting data, first write all the setting item data to the PLC register.

Note that if you change the setting items of the QDM1-□□0T without writing all the setting item data, it may be overwritten with an undefined value and malfunction may occur.

Data setting procedure

When setting the DO output (CH1 to CH16) of the QDM1-□□0T

- (1) Set 0 to the setting request item number

To write all the setting item data to the PLC register, set 0 to 1105 (setting request item number).

- (2) Set B1 (monitor request) of the setting request command

Set 1 (decimal number: 2) to B1 (monitor request) of 1106 (setting request command).

The QDM1-□□PT starts writing the setting item data to the PLC register.

- (3) Check B1 (monitor request) of the setting request command

When the writing of the setting item data to the PLC register is completed, B1 (monitor request) of 1106 (setting request command) is cleared.

- (4) Set data

Set ON/OFF to 1113 [DO output (CH1 to CH16)] in the PLC register.

- (5) Set 5 to the setting request item number

To read the DO output (CH1 to CH16) setting data of the PLC register, set 3 to 1105 (setting request item number).

- (6) Set B0 (setting request) of the setting request command

Set 1 (decimal number: 1) to B0 (monitor request) of 1106 (setting request command).

The QDM1-□□PT starts reading the setting item data of the PLC register.

- (7) Check B0 (monitor request) of the setting request command

When the reading of the setting item data to the PLC register is completed, B0 (monitor request) of 1106 (setting request command) is cleared.

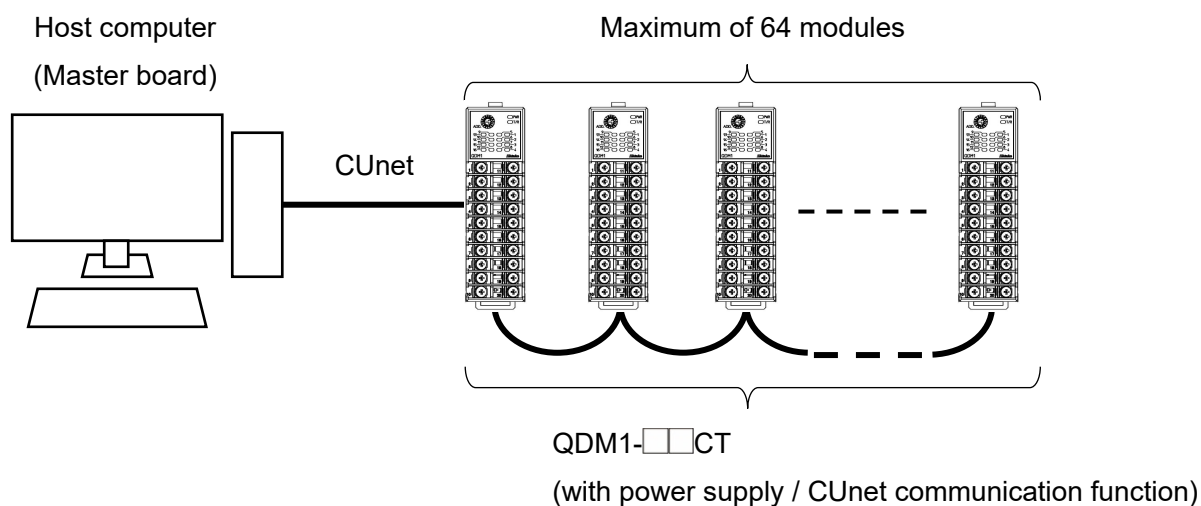
14 CUnet Communication

CUnet communication writes the reading value from the module to the global memory (GM) specified by the station address (SA).

It reads the setting values from the master address (DOSA) and sets them to the module.

The setting value can also be changed by using the mail function of CUnet.

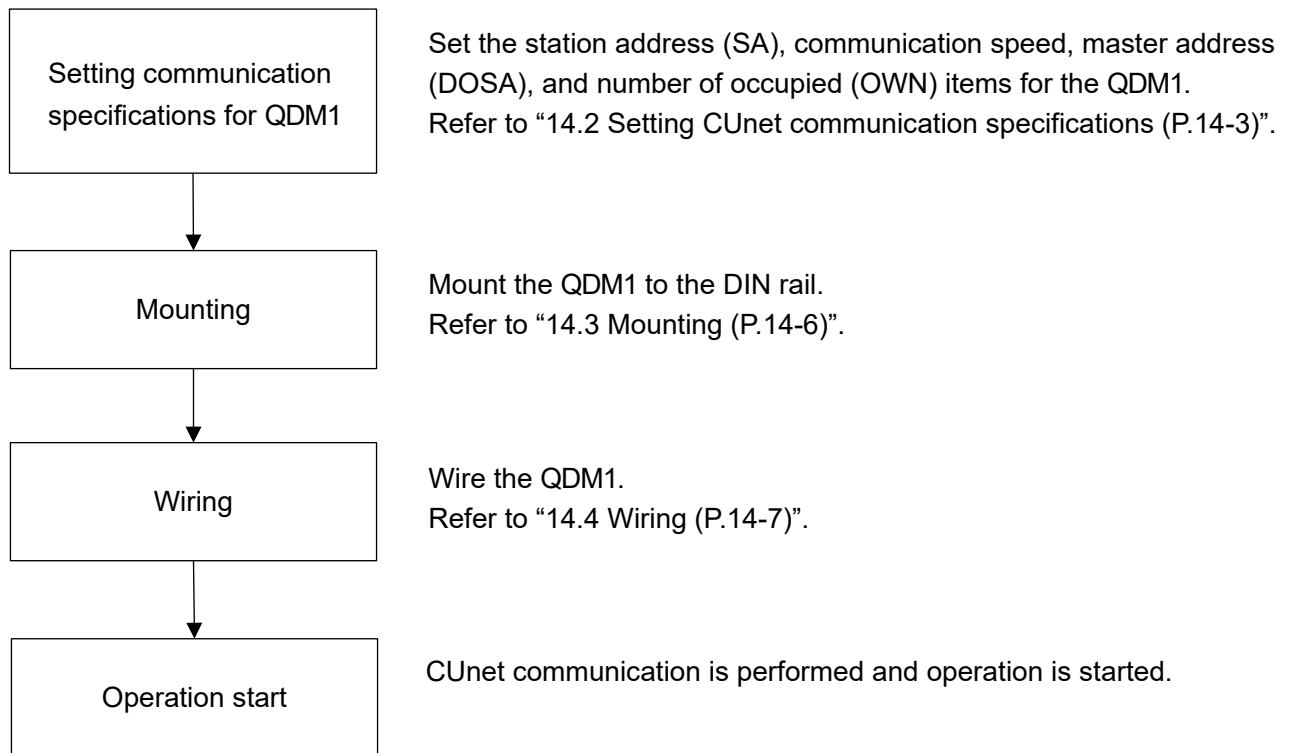
Configuration example of host computer (master board) and QDM1-□□CT



(Fig. 14-1)

14.1 Flow of Before Operation

The flow of operation when using CUnet communication is shown below.



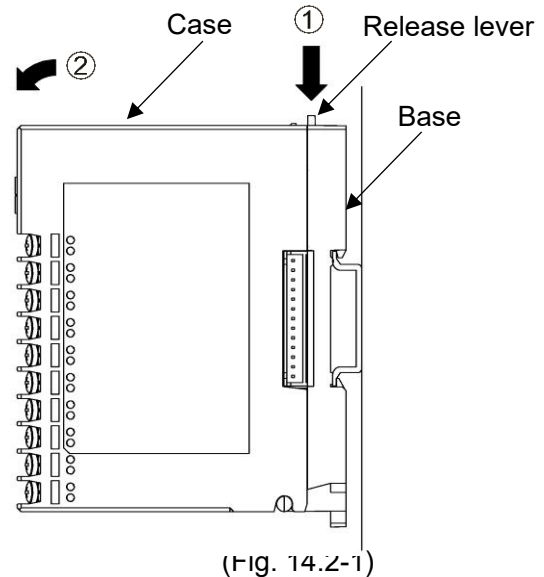
(Fig. 14.1-1)

14.2 Setting CUnet communication specifications

The CUnet communication specifications are set by the dip switches (SW10, SW11) on the base part.

(1) Case removal

- ① Push the release lever on the top of this instrument to unlock it.
- ② Remove the case.



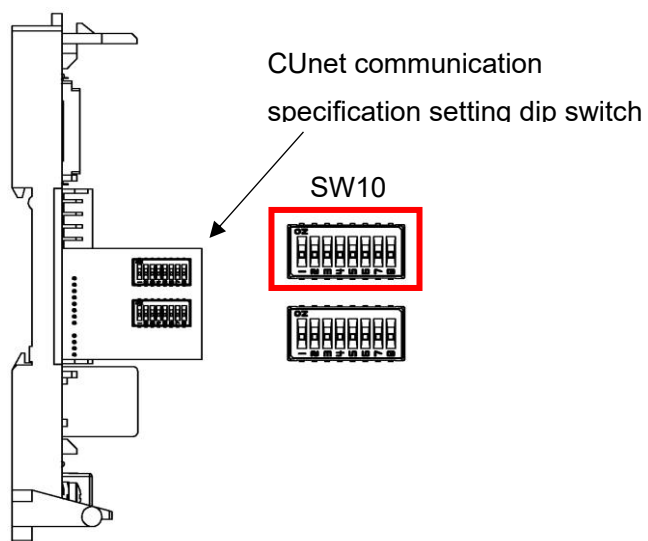
(2) Station address (SA), communication speed setting (SW10)



Caution

Please set the station address (SA) so that there are no duplicate addresses.

The station address (SA) and communication speed are set by DIP switch (SW10).



(Fig. 14.2-2)

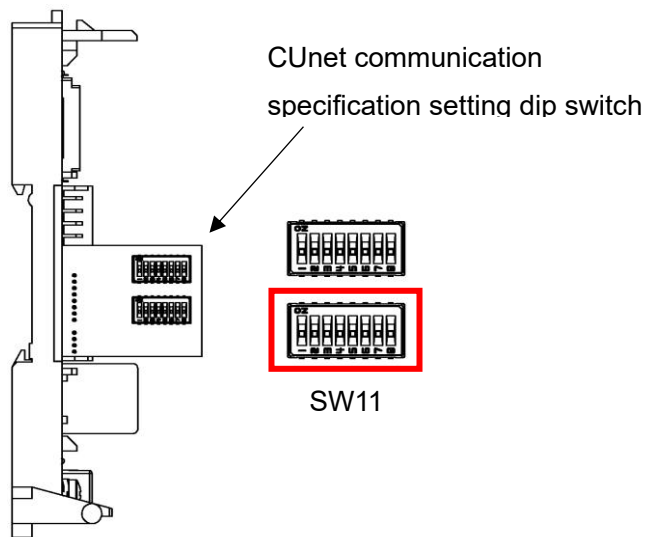
Set the station address (SA) and communication speed.

The setting range of the station address (SA) is 00 to 63.

No.	Setting item	Status	Factory default
1	Station address setting	Bit0 ON: Enable, OFF: Disable	Disable
2		Bit1 ON: Enable, OFF: Disable	Disable
3		Bit2 ON: Enable, OFF: Disable	Disable
4		Bit3 ON: Enable, OFF: Disable	Disable
5		Bit4 ON: Enable, OFF: Disable	Disable
6		Bit5 ON: Enable, OFF: Disable	Disable
7	Communication speed setting	7: OFF 8: OFF 12 Mbps	12 Mbps
		7: ON 8: OFF 6 Mbps	
		7: OFF 8: ON 3 Mbps	
8		7: ON 8: ON Disable (12 Mbps)	

(3) Master address (DOSA) and number of occupied (OWN) items selection (SW11)

The master address (DOSA) and the number of occupied (OWN) items are set by DIP switch (SW11).



(Fig. 14.2-3)

Set the master address (DOSA) and the number of occupied (OWN) items.

Set which master global memory (GM) area data is output to the analog output terminal.

The setting range of the master address (DOSA) is 00 to 63.

No.	Setting item	Status	Factory default
1	Master address setting	Bit0 ON: Enable, OFF: Disable	Disable
2		Bit1 ON: Enable, OFF: Disable	Disable
3		Bit2 ON: Enable, OFF: Disable	Disable
4		Bit3 ON: Enable, OFF: Disable	Disable
5		Bit4 ON: Enable, OFF: Disable	Disable
6		Bit5 ON: Enable, OFF: Disable	Disable
7	Number of occupied (OWN) items selection(*)	7: OFF 8: OFF 1 item	1 item
		7: ON 8: OFF 2 items	
		7: OFF 8: ON 3 items	
8		7: ON 8: ON 4 items	

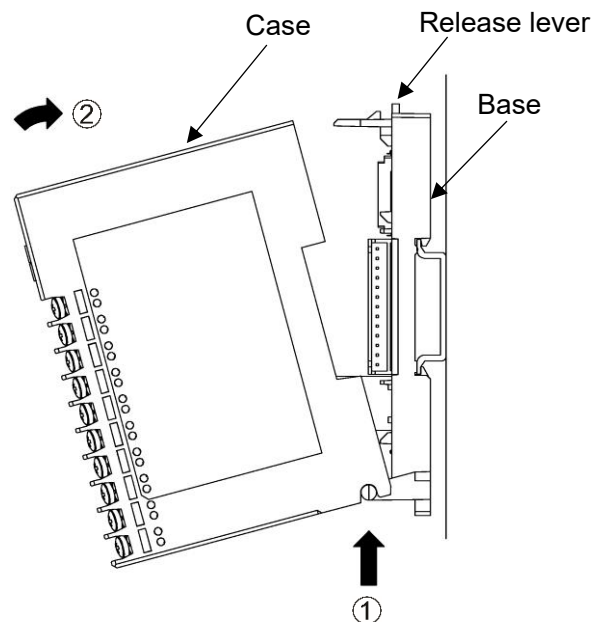
(*): The following items are allocated to global memory for each module.

Number of occupied (OWN) items	QDM1	
	DI item	DO item
1	PV: 03E8-03EB	Output: 0014-0017
2	Status 1: 03F4-03F7	
3	MV: 03EC-03EF	
4		

Shaded area is invalid because there is no allocation (no area is allocated in global memory)

(4) Case mounting

- ① Hook the case on the lower part ① of this instrument.
- ② Mount the case so that the lower part ① of this instrument is the fulcrum and covers the release lever. There is a clicking sound.



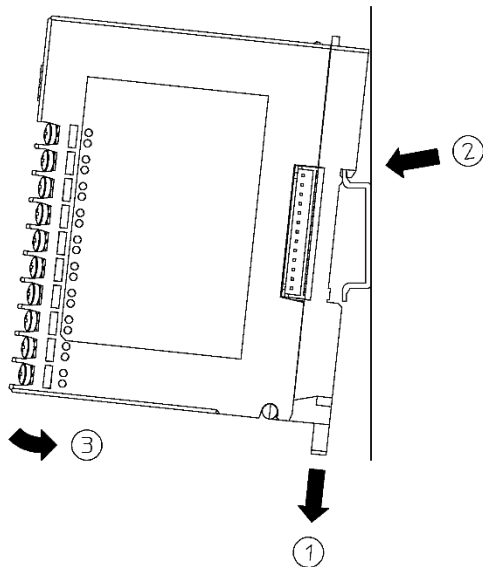
(Fig. 14.2-4)

14.3 Mounting

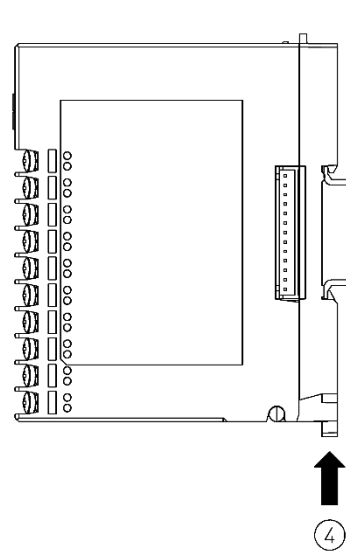
Mounting to the DIN rail

- ① Lower the lock lever of this instrument. (The lock lever of this instrument has a spring structure, but if lower it in the direction of the arrow until it stops, it will be locked in that position.)
- ② Hook the part ② of this instrument onto the top of the DIN rail.
- ③ Insert the lower part of this instrument with the part ② as a fulcrum.
- ④ Raise the lock lever of this instrument.

Make sure it is fixed to the DIN rail.



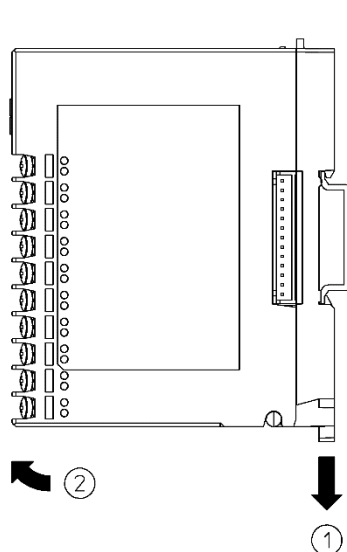
(Fig. 14.3-1)



(Fig. 14.3-2)

Removal from the DIN rail

- ① Insert a flat blade screwdriver into the lock lever of this instrument and lower the lock lever until it stops.
- ② Remove this instrument from the DIN rail by lifting it from below.



(Fig. 14.3-3)

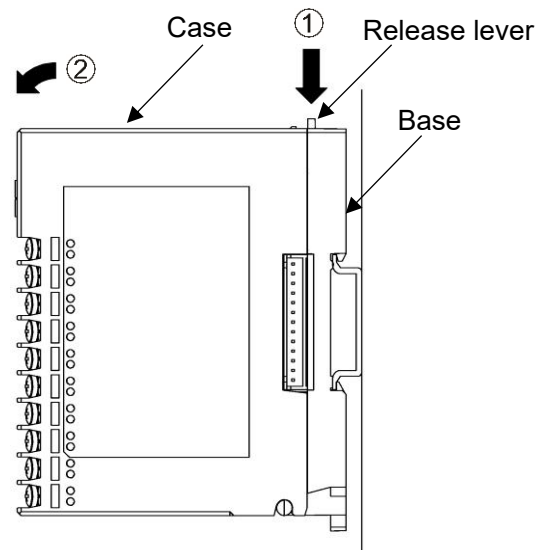
14.4 Wiring

14.4.1 Wiring for Power Supply and Communication

The terminal block for power supply and communication is located on the base of this instrument. Wiring by the following procedure.

(1) Case removal

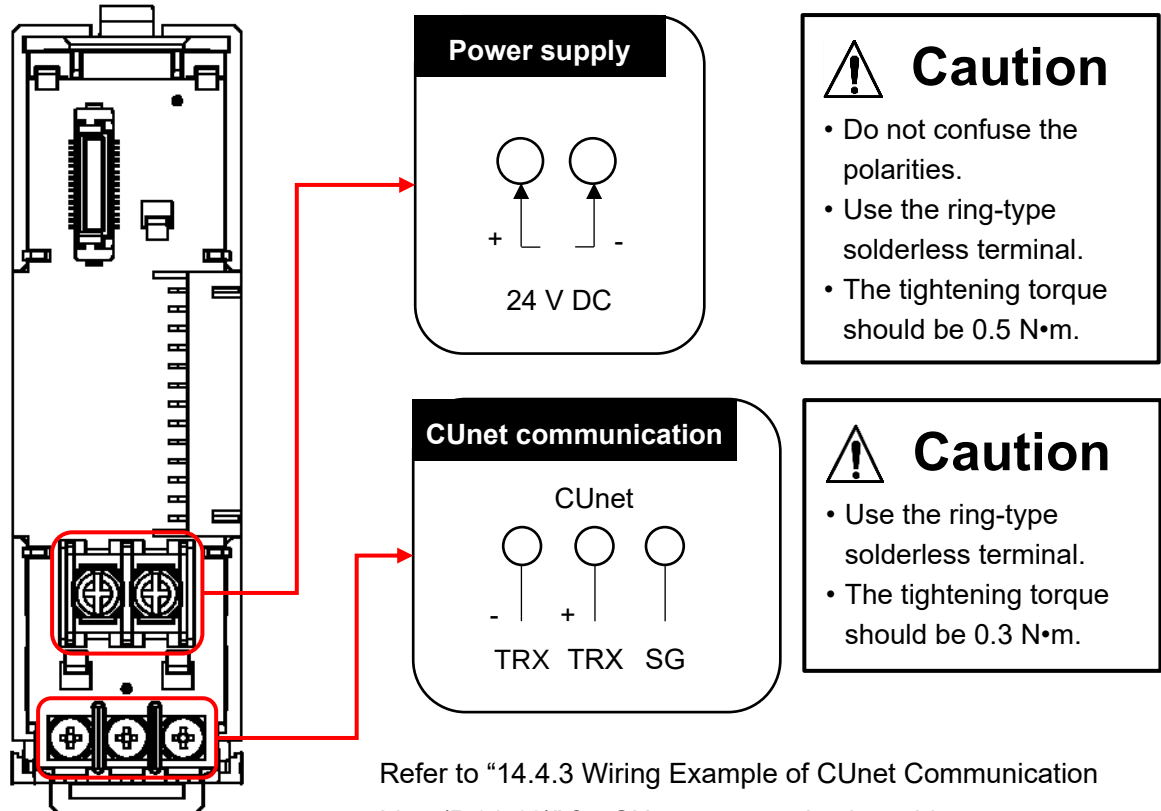
- ① Push the release lever on the top of this instrument to unlock it.
- ② Remove the case.



(Fig. 14.4.1-1)

(2) Wiring

CUnet communication

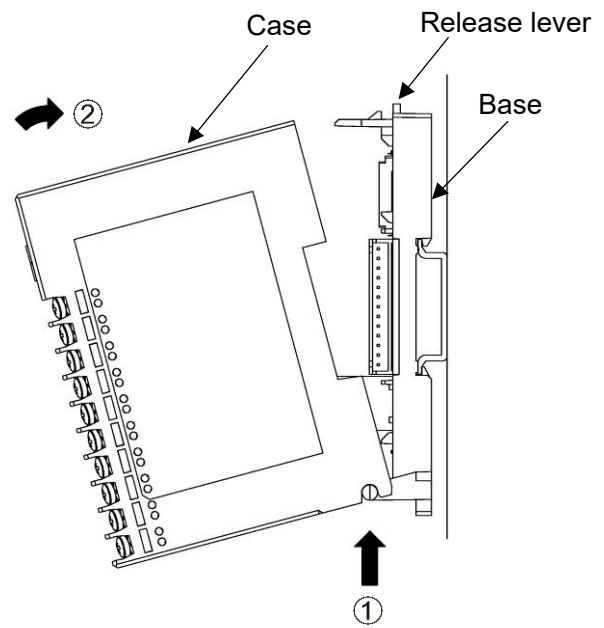


Refer to “14.4.3 Wiring Example of CUnet Communication Line (P.14-12)” for CUnet communication wiring.

(Fig. 14.4.1-2)

(3) Case mounting

- ① Hook the case on the lower part ① of this instrument.
- ② Mount the case so that the lower part ① of this instrument is the fulcrum and covers the release lever. There is a clicking sound.



(Fig. 14.4.1-3)

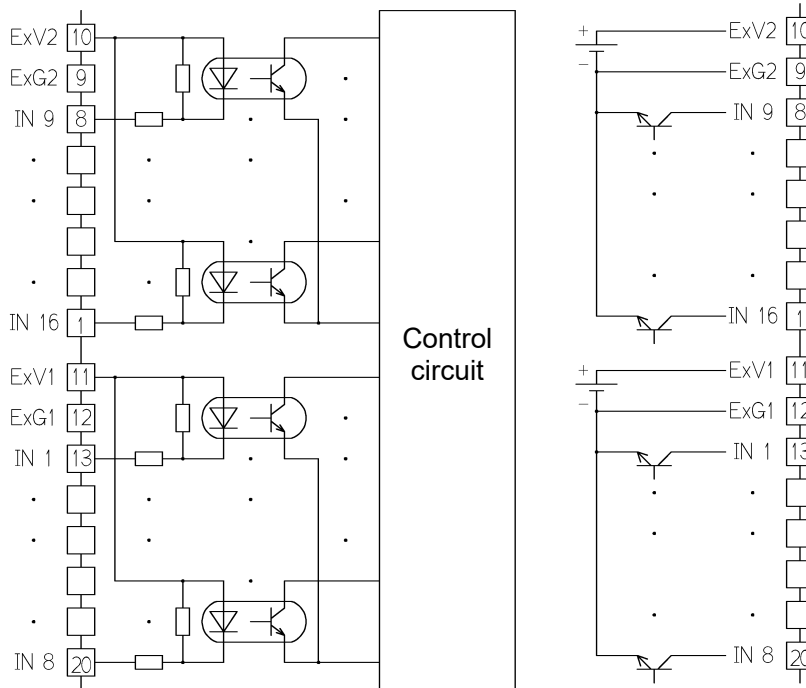


Caution

- Please note that terminal numbers 1 to 10 and 11 to 20 have different terminal arrangements.
- The tightening torque should be 0.63 N•m.

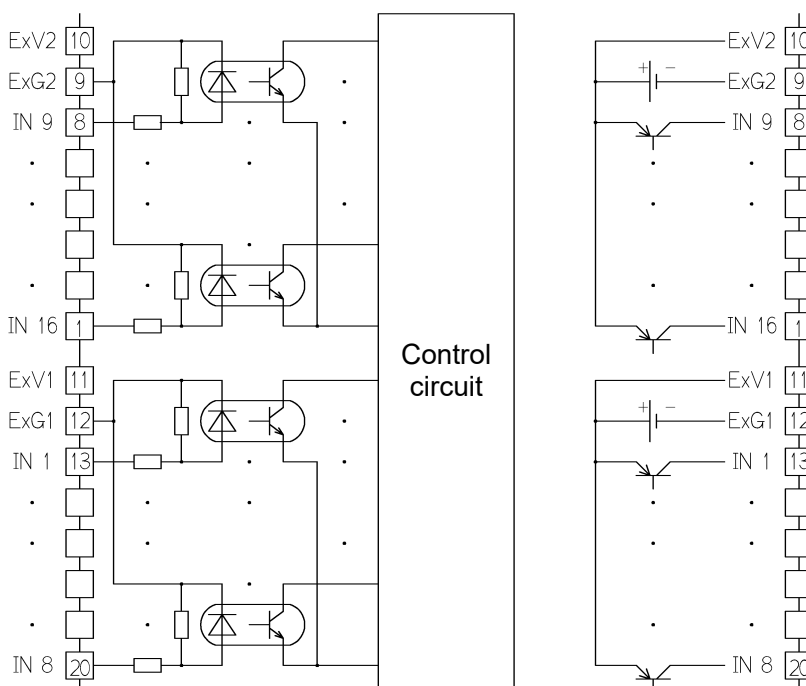
(1) Example of circuit configuration and wiring of digital input module

QDM1-DI16A□□



(Fig. 14.4.2-1)

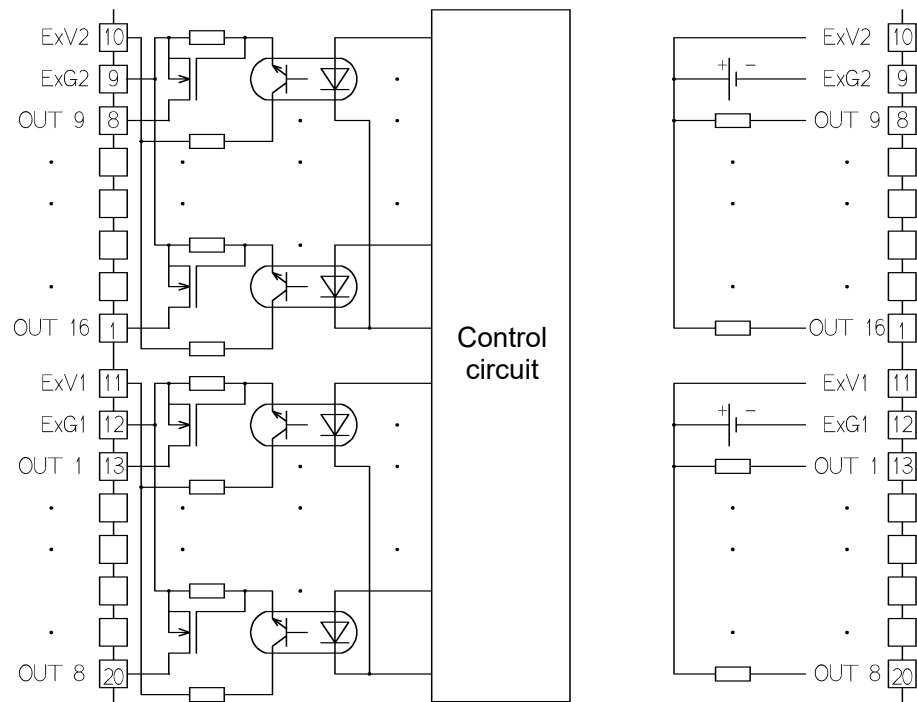
QDM1-DI16B□□



(Fig. 14.4.2-2)

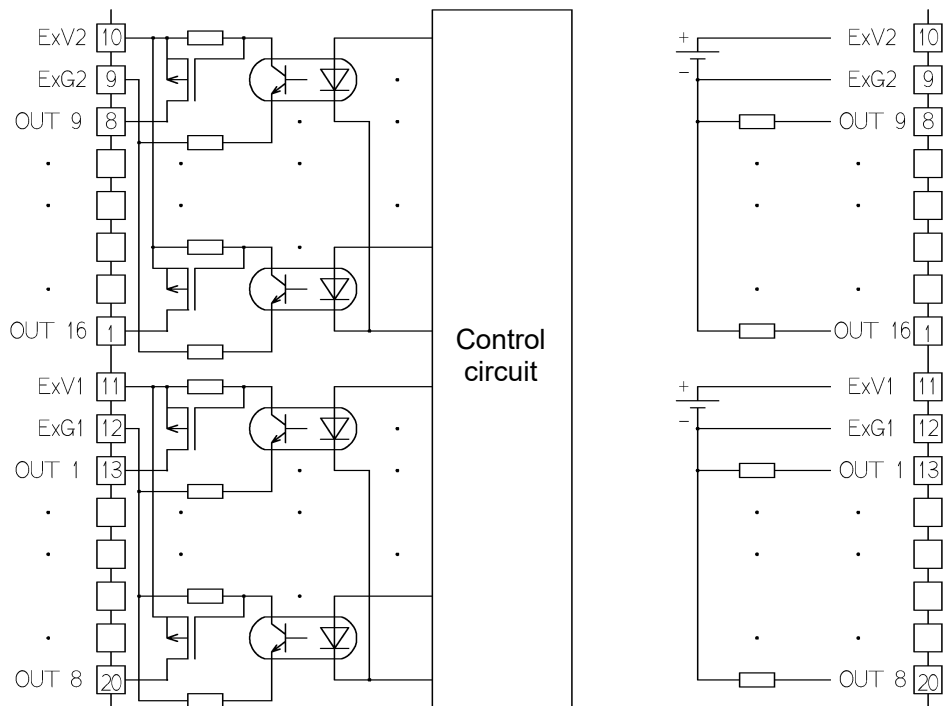
(2) Example of circuit configuration and wiring of digital output module

QDM1-DO16A□□



(Fig. 14.4.2-3)

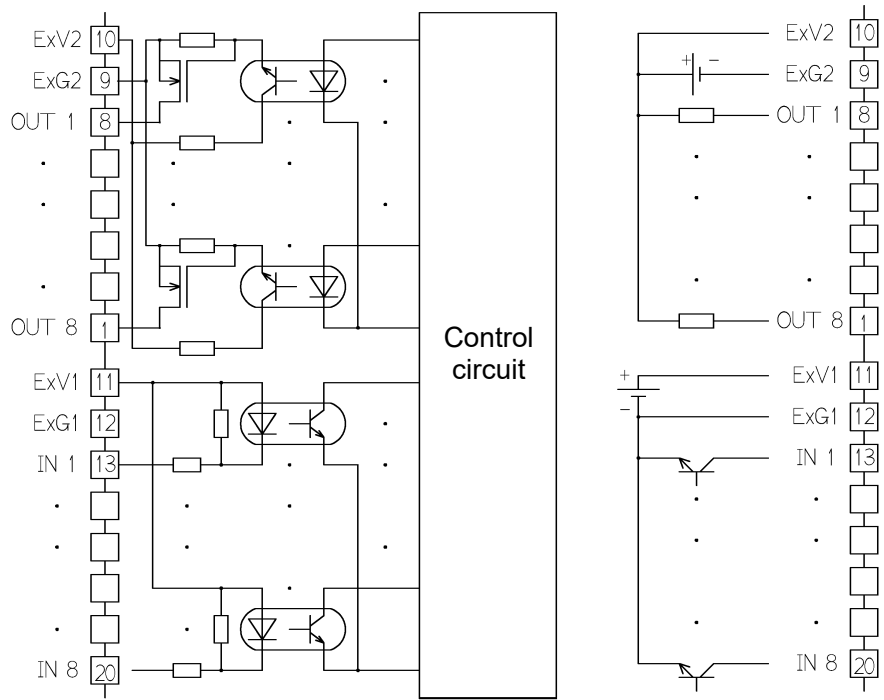
QDM1-DO16B□□



(Fig. 14.4.2-4)

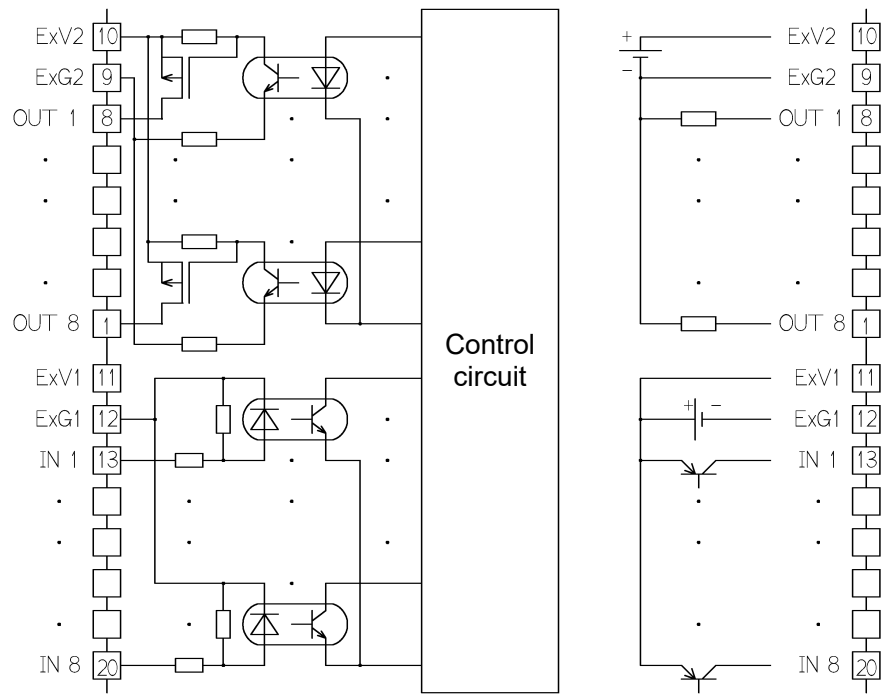
(3) Example of circuit configuration and wiring of digital I/O module

QDM1-DIO8A□□



(Fig. 14.4.2-5)

QDM1-DIO8B□□



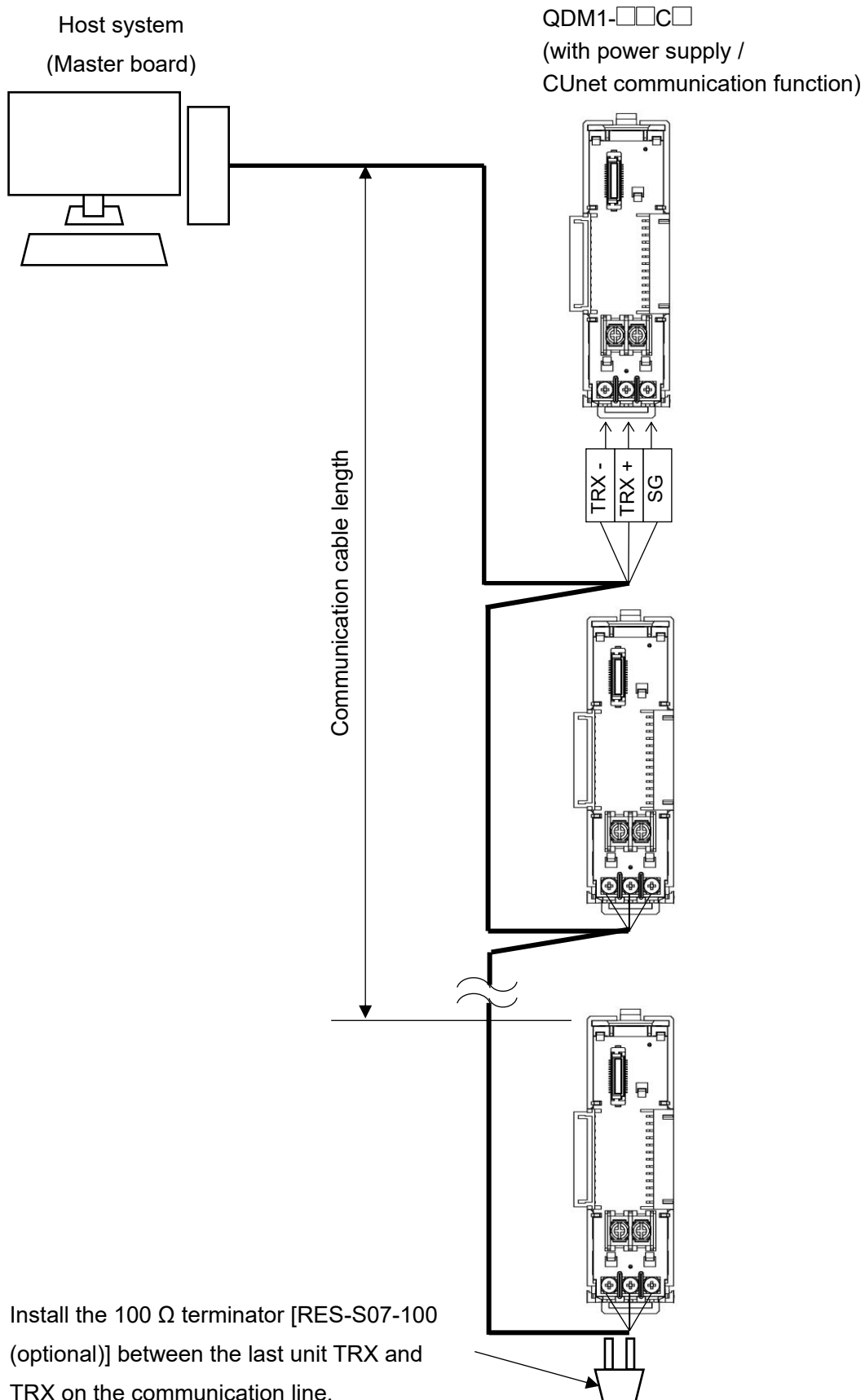
(Fig. 14.4.2-6)

14.4.3 Wiring Example of CUnet Communication Line

Connect the LAN cable between the upper system (master) and this instrument.

Recommended cable: LAN cable (straight cable) / Category 5 or higher shielded cable

Install a 100 Ω terminator [RES-S07-100 (optional)] on the last unit in the communication line.



(Fig. 14.4.3-1)

The communication cable length is the total length of the communication cable from the upper system (master) to the last unit, and varies depending on the communication speed.

The communication cable length can be extended by inserting a dedicated HUB for CUnet.

Communication speed	Communication cable length		
	No HUB	HUB 1-deck	HUB 2-deck
12 Mbps	100 m	200 m	300 m
6 Mbps	200 m	400 m	600 m
3 Mbps	300 m	600 m	900 m

14.5 Global Memory (GM)

The memory space where memory data is shared is called global memory (GM).

The size of global memory (GM) is 512 bytes and is divided into 64 areas in 8-byte units corresponding to station addresses (SA).

The addresses in global memory (GM) correspond to station addresses (SA).

Station addresses (SA)	Global memory (GM)
00(0x00)	000H to 007H
01(0x01)	008H to 00FH
02(0x02)	010H to 017H
63(0x3F)	1F8H to 1FFH

The basic unit of the amount of data that can be written to global memory (GM) by one station is 8 bytes.

- Station 00 (0x00) writes data in the 000H to 007H area of the global memory (GM).
- Station 63 (0x3F) writes data in the 1F8H to 1FFH area of the global memory (GM).

All stations can read all areas of the global memory (GM).

- All units can read the 000H to 007H area of the global memory (GM) to obtain the data written by the 00 (0x00) station.
- All units can read the 1F8H to 1FFH area of the global memory (GM) to obtain the data written by the 63 (0x3F) station.

14.6 Software

CUnet master board and software are required for CUnet communication.

Using the software, the CUnet communication status and the input/output status of the unit can be controlled on the PC screen.

	Manufacturer	Model name
CUnet master board	StepTechnica Co., Ltd.	CU-43USB
Software	StepTechnica Co., Ltd.	ASSIST-CU

14.7 Global Memory (GM) Map

SA: Station Address

GM: Global Memory

DOSA: Data Output Station Address

(1) Number of occupied (OWN) items: 1 item

SA	GM+0	GM+2	GM+4	GM+6
16bit signed	DI (No.1)			

DOSA	GM+0	GM+2	GM+4	GM+6
16bit signed	DO (No.1)			

(2) Number of occupied (OWN) items: 2 items

SA	GM+0	GM+2	GM+4	GM+6
16bit signed	DI (No.1)	State 1		

DOSA	GM+0	GM+2	GM+4	GM+6
16bit signed	DO (No.1)			

DOSA is 1 item.

(3) Number of occupied (OWN) items: 3 items

Same as 2 items.

(4) Number of occupied (OWN) items: 4 items

Same as 2 items.

When setting by CUnet communication, please set within the range of the module.

The data out of the setting range will be invalid.

For items not covered by global memory (GM), set them in the console software of each module or via e-mail communication.

14.8 Attached Function

Automatic recognition function of connection modules

At power-on, the configuration of connected modules is checked and the data of modules whose connection is recognized is expanded in global memory (GM).

15 Action Explanation

15.1 Attached Function

15.1.1 Watchdog Timer

The watchdog timer monitors program runaway and halt, and resets the MCU and initializes the instrument when an error is detected.

15.1.2 Unapplied Digital Output Power Supply

When the digital output power supply is not applied or dropped, the output of the channel using that power supply is turned off.

The output is reapplied 1 second after the power is restored.

15.1.3 Warm-up Display

After power-on, the power indicator light blinks in 500 ms cycles for approx. 3 seconds.

15.1.4 Integral electrification time measurement function

The control output ON/OFF count can be integrated and measured.

ON/OFF is set as one time and totaling is performed.

This allows you to grasp the approximate contact life as the number of switching times of the switch used externally. However, since the saving cycle is 1 hour, the number of times within 1 hour may not be saved due to a power failure.

Contact switching total number of times: 1 hour per count

15.1.5 Power Failure Countermeasure

The non-volatile IC memory backs up the setting data.

- Input sampling cycle setting value
- Communication response delay time set value
- Cumulative energizing time
- Power supply and communication options
- Wiring type (terminal block type, connector type)

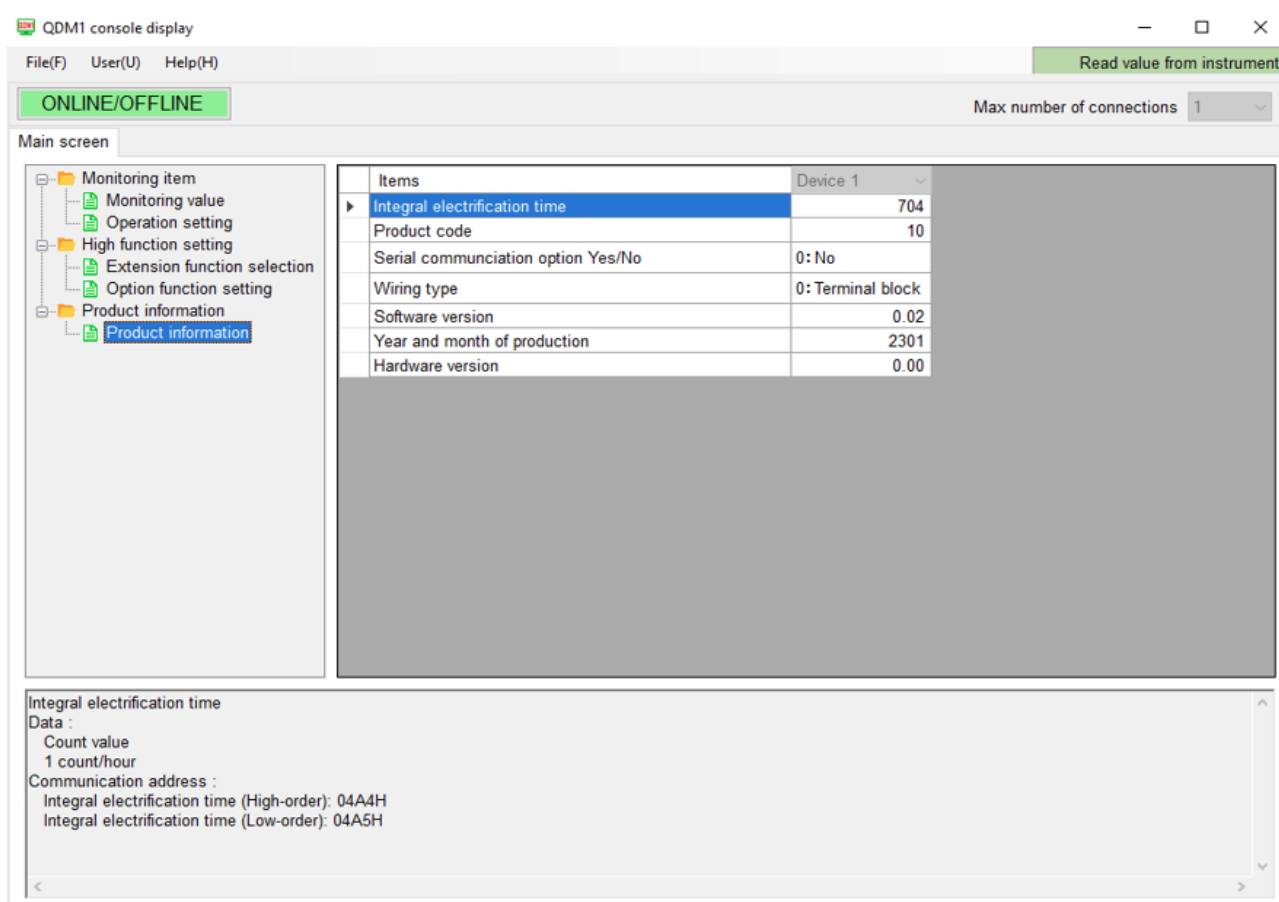
16 Maintenance

You can use the console software (SWC-QDM101M) to check the error history, and so on.

Integral electrification time · Product information

Click [Product information] of [Main screen] tab → [Product information].

Display the Product information screen.



(Fig. 16-1)

Integral electrification time

It can be used to check the product life of the control module itself.

Product information

It can check the product information from the output form, input form, and product code.

Item	Product information example
Product code	Product code
Communication option	0: No communication option
Wiring type	0: Terminal block type
Software version	Ver. 1.00
Year and month of production	096BH: 2411 (November 2024)
Hardware version	Ver. 1.00

17 Specifications

17.1 Standard Specifications

Input

Input		
	Common	Plus/minus common (NPN/PNP compatible)
	Input points	8 points/16 points
	Input status indicator	Green (LED) lights up when ON
	Allowable supply voltage for input	24 V DC 10%, ripple content less than 5 %p-p
	ON voltage/ON current	15 V DC or more/3.5 mA or more
	OFF voltage/OFF current	5 V DC or less / 1 mA or less
	Input current	5.5 mA or less (at 24 V DC)
	Input resistance	Approx. 4.7 kΩ
	ON delay time	0.2 ms or less
	OFF delay time	0.5 ms or less
	Take-in cycle setting	1 ms, 5 ms by communication Setting range 1 to 100 ms

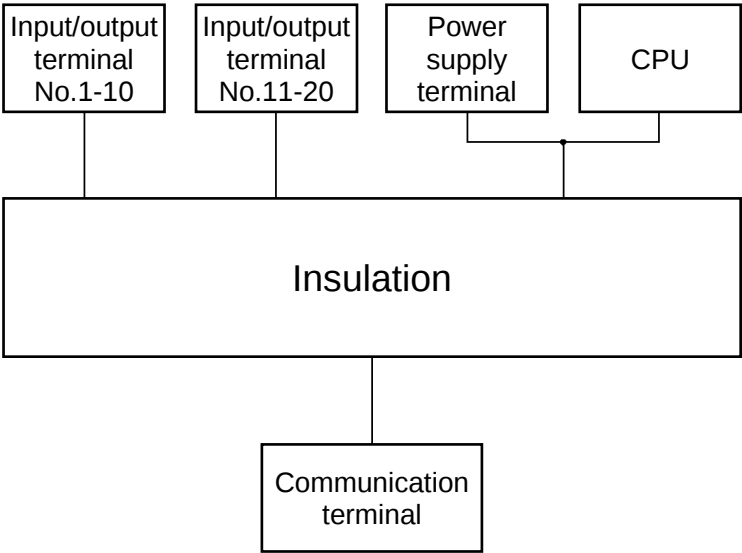
Output

Output		
	Common	Minus/plus common (for NPN specification / for PNP specification)
	Output points	8 points/16 points
	Output status indicator	Green (LED) lights up when ON
	Allowable supply voltage for output	24 V DC 10%, ripple content less than 5 %p-p
	Rated output current	0.1 A/point, 1.6 A/common
	Residual voltage	1.2 V or less
	Leakage current	0.1 mA or less
	ON delay time	0.2 ms or less
	OFF delay time	0.5 ms or less
	Overcurrent protection function	Limit current value when overcurrent is detected
	Output setting at communication error	Output status (hold or OFF) can be set until normal data is received in the event of communication error (lasting 1 minute or longer) (factory default: hold)

Power supply

Power supply voltage	24 V DC Allowable voltage fluctuation: 20 to 28 V DC
Power consumption	Approx. 2 W or less
Inrush current	Max. 10 A

Circuit insulation configuration

Circuit insulation configuration	 (Fig. 17.1-1)	
Insulation resistance	10 MΩ or more at 500 V DC	
Dielectric strength	Between Power terminal – Ground (GND): 1.5 kV AC for 1 minute Between Digital I/O terminal – Ground (GND): 1.5 kV AC for 1 minute Between Digital I/O terminal – Power terminal: 1.5 kV AC for 1 minute Between Communication terminal – Power terminal: 1.5 kV AC for 1 minute Between Digital I/O terminal – Communication terminal: 1.5 kV AC for 1 minute	

Recommended Environment

Ambient temperature	-10 to 50°C (no condensation or freezing)
Ambient humidity	35 to 85%RH (no condensation)
Environmental specification	RoHS directive compliant

General Structure

Weight	Approx. 160 g	
External dimensions	Terminal block type	30 × 100 × 85 mm (W × H × D excluding protrusion) 95 mm depth when the terminal cover is attached
	Connector Type	30 × 100 × 98.4 mm (W × H × D excluding protrusion)
Mounting type	DIN rail mounting type	
Case	Flame-resistant resin, Color: Black	
Panel	Polycarbonate sheet	
Applicable standard	EN	EN61010-1 (Pollution degree 2)
	EC Directive	EMI: EN61326 Radiated interference field strength: EN55011 Group1 ClassA
		EMS: EN61326

Setting Structure

Communication specification setting	Set the communication speed, data bit, parity, stop bit, internal bus connection communication type, MODBUS specification/SIF specification, and output at communication error by DIP switches.
Module address setting	Set the module address 0 to F (1 to 16) with the rotary switch. The value obtained by adding 1 to the value of the setting rotary switch becomes the module address.
CUnet communication specification setting	The station address, communication speed, master address, and number of occupied (OWN) items are set by the DIP switches (SW10, SW11) on the board mounted in the base section.

Attached Function

Watchdog timer	The watchdog timer monitors program runaway and halt, and resets the MCU and initializes the instrument when an error is detected.
Unapplied digital output power supply	When the digital output power supply is not applied or dropped, the output of the channel using the power supply is turned off. The output is reapplied 1 second after the power is restored.
Warm up indication	The power indicator flashes every 500 ms for about 3 seconds after the power is turned on.
Total energizing time measurement function	It can check the time that the power is on. The accumulated time is saved every 1 hour. It can grasp the approximate usage time from the accumulated time. However, since the save cycle is 1 hour, the time within 1 hour may not be saved due to a power failure. Total energizing time: 1 hour/count
Power Failure Countermeasure	The non-volatile IC memory backs up the setting data. • Input sampling cycle setting value • Communication response delay time set value • Cumulative energizing time • Power supply and communication options • Wiring type (terminal block type, connector type)

Other Item

Accessories	Mounting and wiring instruction manual: 1 Wiring connector (2ESS-10P): 1 (connector type) Line cap: 1 Power supply terminal cover: 1 (Included when adding "With power supply / host communication function" and "With power supply / CUnet communication function")
Sold separately	Front terminal cover: TC-QTC (*) Termination resistor: RES-S07-100 100 Ω

(*): QDM1 has the same case shape as QTC1, so the terminal cover of QTC1 is used.

17.2 Optional Specifications

Power supply / RS-485 communication function	Perform the following operations from the external computer. (1) Reading and setting the DO output setting value of each CH (2) Reading DI input status, DO output status, and operation status of each CH (3) Reading and setting the digital input sampling cycle	
	Communication line	EIA RS-485
	Communication method	Half-duplex communication
	Synchronization method	Start-stop synchronization
	Communication protocol	MODBUS RTU
	Communication speed	9600 bps, 19200 bps, 38400 bps or 57600 bps can be selected by DIP switch (Factory default: 57600 bps)
	Data bit/Parity/Stop bit	Select the following with the DIP switch Data bit: 8 Parity: Even, Odd, No parity Stop bit: 1 or 2 (Factory default: 8 bits, Even, 1 bit)
	Response delay time	Set the delay time to return the response from the module after receiving the command from the host. 0 to 1000 ms (Factory default: 0 ms)
	Take-in cycle	1 to 100 ms (Factory default: 1 ms)
High-speed communication with QMC1 via internal bus connection	When DIP switch No. 6 for setting communication specifications is set to ON, the digital I/O data update cycle with QMC1 corresponding to this function is within 10 ms per module.	

Power supply / CUnet communication function		
	Connection type	Multi-drop
	Communication method	2-wire half-duplex
	Synchronization method	Bit-synchronous
	Error detection	CRC-16
	Number of occupied slave addresses	1
	Maximum number of connected nodes	64 nodes
	Communication speed, Communication distance	Communication speed
		Maximum network length
		12 Mbps
		100 m
	6 Mbps	200 m
		300 m
	Isolation method	Pulse transformer isolation
	Impedance	100 Ω
	Termination resistance	Last connection, set by CUnet slave This instrument is not equipped.

18 Troubleshooting

If any malfunctions occur, refer to the following items after checking that power is being supplied to the master module and slave module.

18.1 Host Communication

Problem	Possible Cause	Solution
Cannot communicate.	Is the communication cable disconnected?	Check the communication cable.
	Is the communication cable wiring correct?	Refer to “7 Wiring (P.7-1)” or “13.5 Wiring (P.13-25)”, and check the communication cable.
	Is there any disconnection or contact failure of the communication cable?	Check the communication cable.
	Is communication speed of the master and slave same?	Refer to “5.1.1 Setting of Communication Specifications (P.5-1)”, and check the communication speed of the master and slave.
	Are data bits, parity, and stop bits of the master and slave same?	Refer to “5.1.1 Setting of Communication Specifications (P.5-1)”, and check the data bit, parity, and stop bit of the master and slave.
	Is the module address of the command and slave same?	Refer to “5.1.2 Setting of Module Address (P.5-3)”, and check the module address of the command and slave.
	Are there any slaves that have the same module address?	Refer to “5.1.2 Setting of Module Address (P.5-3)”, and check the module address.
	Is the program considering the transmission timing?	Refer to “9. Communication Procedure (P.9-1)”, and check the program.
Communication is possible, but a negative acknowledgement is returned.	Are sending a command code that does not exist?	Refer to “11.1 Communication Command List (P.11-1)”, and check the command code.
	Is the data of the write command exceeding the setting range?	Refer to “11.1 Communication Command List (P.11-1)”, and check the setting range of write command.
	Is it not possible to write?	Check the state of a slave.

18.2 CUnet Communication

Problem	Possible Cause	Solution
Cannot communicate.	Is the communication line wiring correct?	Refer to "14.4.3 Wiring Example of CUnet Communication Line (P.14-12)", and check the wiring of the communication line.
	Is the termination resistance attached to the last module in the communication line?	Refer to "14.4.3 Wiring Example of CUnet Communication Line (P.14-12)", and attach the termination resistance to the last module in the communication line.
	Is the LAN cable a straight cable?	If the LAN cable is a crossover cable, communication is not possible. Use a straight cable.
	Is the station address correct?	Refer to "14.2 Setting CUnet communication specifications (P.14-3)", and check the settings.
	Are there duplicate station addresses?	Refer to "14.2 Setting CUnet communication specifications (P.14-3)" and set the station address to avoid duplication.
	Is the communication speed between the host system (master) and the module the same?	Refer to "14.2 Setting CUnet communication specifications (P.14-3)" and check the communication speed.

18.3 Status Flag 1 Error

Problem	Possible Cause	Solution
"1: Error" is set in B0: Input/output power supply error (CH1 to CH8).	Power supply error for input/output (CH1 to CH8).	Check the power supply for input/output for any errors.
"1: Error" is set in B1: Input/output power supply error (CH9 to CH16).	Power supply error for input/output (CH9 to CH16).	Check the power supply for input/output for any errors.
"1: Error" is set in B15: Non-volatile IC memory error.	The nonvolatile IC memory is defective.	Contact our agency or us.

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