Module Type Controller

SRZ

Instruction Manual
[For PLC Communication]

RKC INSTRUMENT INC.

IMS01T13-E3

- Modbus is a registered trademark of Schneider Electric.
- Windows is a trademark of Microsoft Corporation.
- The name of each programmable controller (PLC) means the products of each manufacturer.
- Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.

Thank you for purchasing this RKC instrument. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place this manual in a convenient location for easy reference.

SYMBOLS

WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

 : This mark indicates that all precautions should be taken for safe usage.

 : This mark indicates important information on installation, handling and operating procedures.

 : This mark indicates supplemental information on installation, handling and operating procedures.

 : This mark indicates where additional information may be located.

⚠ WARNING

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take adequate measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
  The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- To prevent instrument damage or failure, protect the power line and the input/output lines from high currents with a protection device such as fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- Do not connect modular connectors to telephone line.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

CONTENTS

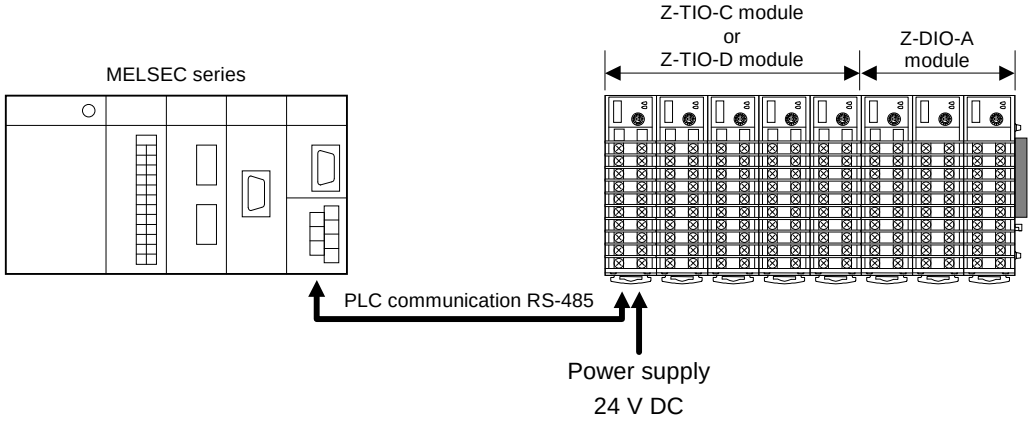
MEMO

1 OUTLINE

1.1 Features

This chapter describes features, package contents, model code, and system configuration, etc.

The Z-TIO-C (4-channel type) module and Z-TIO-D (2-channel type) module can be connected to the MITSUBISHI MELSEC series programmable controller (hereafter called PLC) without using any program. (The communication interface is only RS-485.)



Up to 16 Z-TIO-C/D modules can be joined together.

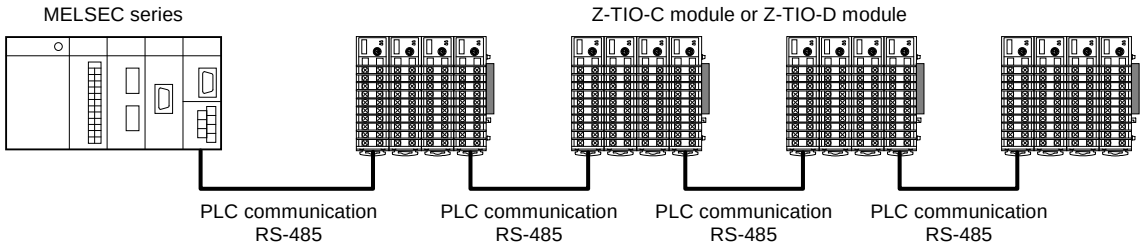
When a Z-TIO-C/D module is used for PLC communication, it cannot be connected to a Z-TIO-A, Z-TIO-B, or Z-COM-A module.

A Z-TIO-C/D module can be joined to a Z-DIO-A module. However, only the Z-TIO-C/D module can be used for communication with a PLC.

■ Distributed installation of modules is possible

A distributed installation of Z-TIO-C/D modules is possible (including singly distributed modules).
Up to 16 Z-TIO-C/D modules can be connected on the same communication line.

Example: When modules distributed in sets of four each are connected



■ Number of temperature controls

Up to 16 Z-TIO-C/D modules can be connected on the same communication line.
When 16 4-channel type Z-TIO-D modules are used, temperature control of up to 64 channels is possible.

■ PLC communication data map editing is possible

Communication data of a PLC communication data map can be edited by loader communication or host communication.
For example, the amount of PLC register space that is used can be reduced by setting unnecessary communication data to “unused.”

1.2 Checking the Product

Before using this product, check each of the following:

- Model code
- Check that there are no scratch or breakage in external appearance (case, front panel, or terminal, etc.)
- Check that all of the items delivered are complete. (See below)

If any of the products are missing, damaged, or if your manual is incomplete, please contact RKC sales office or the agent.

■ Accessories

Name	Q'TY	Remarks
☐ Z-TIO-C module or Z-TIO-D module	1	————
☐ [for PLC Communication] Z-TIO INSTRUCTION MANUAL (IMS01T10-E☐)	1	Enclosed with instrument
☐ [for PLC Communication] Z-TIO PLC Communication Quick Instruction Manual [PART1: Preparation] (IMS01T11-E☐)	1	Enclosed with instrument
☐ [for PLC Communication] Z-TIO PLC Communication Quick Instruction Manual [PART2: Operation] (IMS01T12-E☐)	1	Enclosed with instrument
☐ Joint connector cover KSRZ-517A	2	Enclosed with instrument
☐ Power terminal cover KSRZ-518A	1	Enclosed with instrument

■ Separate volumes

Name	Q'TY	Remarks
☐ SRZ Instruction Manual [for PLC Communication] (IMS01T13-E3)	1	This manual (sold separately) * * This manual can be downloaded from our website: URL: http://www.rkcinst.co.jp/down_load.htm
☐ SRZ Instruction Manual [for Host Communication] (IMS01T04-E☐)	1	Sold separately * * This manual can be downloaded from our website: URL: http://www.rkcinst.co.jp/down_load.htm

■ Accessories (sold separately)

Name	Q'TY	Remarks
☐ End plate DEP-01	2	————
☐ Connector SRZP-01 (front screw type)	2	For the connector type module
☐ Connector SRZP-02 (side screw type)	2	For the connector type module
☐ CT cable W-BW-03-1000	1	For CT input connector (cable length: 1 m)
☐ CT cable W-BW-03-2000	1	For CT input connector (cable length: 2 m)
☐ CT cable W-BW-03-3000	1	For CT input connector (cable length: 3 m)
☐ Current transformer CTL-6-P-N	1	0.0 to 30.0 A
☐ Current transformer CTL-12-S56-10L-N	1	0.0 to 100.0 A
☐ Terminal cover KSRZ-510A	1	For the terminal type module

1.3 Model Code

Check whether the delivered product is as specified by referring to the following model code list. If the product is not identical to the specifications, please contact RKC sales office or the agent.

■ Suffix code

4-channel type: Z-TIO-C□-□□ □ □ □/□ □-□ □□□/Y

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10)

2-channel type: Z-TIO-D□-□□ □/□ N □-□ □□□/Y

(1) (2) (3) (6) (7) (8) (9) (10)

Specifications		Suffix code									
		Hardware coding only							Quick start code1		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Wiring type	Terminal type	T									
	Connector type	C									
Output1 (OUT1)	Relay contact output		M								
	Voltage pulse output		V								
	Voltage output, Current output (See Output Code Table)		□								
	Triac output		T								
	Open collector output		D								
Output2 (OUT2)	Relay contact output			M							
	Voltage pulse output			V							
	Voltage output, Current output (See Output Code Table)			□							
	Triac output			T							
	Open collector output			D							
Output3 (OUT3) [Z-TIO-C type only]	Relay contact output				M						
	Voltage pulse output				V						
	Voltage output, Current output (See Output Code Table)				□						
	Triac output				T						
	Open collector output				D						
Output4 (OUT4) [Z-TIO-C type only]	Relay contact output					M					
	Voltage pulse output					V					
	Voltage output, Current output (See Output Code Table)					□					
	Triac output					T					
	Open collector output					D					
Current transformer (CT) input	None						N				
	CT (4 points) [4-channel type], CT (2 points) [2-channel type]						A				
Quick start code	No quick start code (Configured as factory default)							N			
	Specify quick start code 1							1			
	Specify quick start code 1 and 2							2			
Control Method (all channel common) [Quick start code 1]	No specify quick start code								No code		
	PID action with AT (Reverse action)								F		
	PID action with AT (Direct action)								D		
	Heat/cool PID action with AT [1]								G		
	Heat/cool PID action with AT (for Extruder [air cooling]) [1]								A		
	Heat/cool PID action with AT (for Extruder [water cooling]) [1]								W		
	Position proportioning PID action without FBR [2]								Z		
Measured input and Range (all channel common) [Quick start code 1]	No specify quick start code									No code	
	See range code table.									□□□	
Instrument specification	Version symbol										/Y

[1] Z-TIO-C type: CH2 and CH4 are unused
Z-TIO-D type: CH2 is unused
[2] Z-TIO-C type: CH2 and CH4 are feedback resistance input (for monitor)
Z-TIO-D type: CH2 is feedback resistance input (for monitor)

● Output Code Table

Output type	Code
Voltage output (0 to 1 V DC)	3
Voltage output (0 to 5 V DC)	4
Voltage output (0 to 10 V DC)	5

Output type	Code
Voltage output (1 to 5 V DC)	6
Current output (0 to 20 mA DC)	7
Current output (4 to 20 mA DC)	8

● Range Code Table

[Thermocouple (TC) input, RTD input]

Type	Code	Range (Input span)	Code	Range (Input span)
K	K35	−200.0 to +400.0 °C	KA1	0 to 800 °F
	K40	−200.0 to +800.0 °C	KA2	0 to 1600 °F
	K42	−200.0 to +1372.0 °C	KC7	−328 to +2501 °F
	K09	0.0 to 400.0 °C	KA4	0.0 to 800.0 °F
	K10	0.0 to 800.0 °C		
J	J27	−200.0 to +400.0 °C	JA1	0 to 800 °F
	J32	−200.0 to +800.0 °C	JA2	0 to 1600 °F
	J29	−200.0 to +1200.0 °C	JB9	−328 to +2192 °F
	J08	0.0 to 400.0 °C	JB6	0.0 to 800.0 °F
	J09	0.0 to 800.0 °C		
T	T19	−200.0 to +400.0 °C	TC5	−328 to +752 °F
			TC6	0.0 to 752.0 °F
E	E20	−200.0 to +1000.0 °C	EB2	0.0 to 800.0 °F
			EB1	−328 to +1832 °F
S	S06	−50 to +1768 °C	SA7	−58 to +3214 °F
R	R07	−50 to +1768 °C	RA7	−58 to +3214 °F
B	B03	0 to 1800 °C	BB1	32 to +3272 °F
N	N07	−200 to +1372 °C	NA8	−328 to +2502 °F
PLII	A02	0 to 1390 °C	AA2	0 to 2534 °F
W5Re/W26Re	W03	0 to 2300 °C	WB1	32 to 4208 °F
Pt100	D21	−200.0 to +200.0 °C	DC6	−328.0 to +752.0 °F
	D35	−200.0 to +850.0 °C	DD2	328 to +1562 °F
JPt100	P31	−200.0 to +649.0 °C	PC6	−328.0 to +752.0 °F
			PD2	328 to +1200 °F

[Voltage input, Current input]

Type	Code	Range (Input span)
0 to 10 mV DC	101	Programmable range −19999 to +19999 [The decimal point position is selectable] (Factory set value: 0.0 to 100.0)
0 to 100 mV DC	201	
0 to 1 V DC	301	
0 to 5 V DC	401	
0 to 10 V DC	501	
1 to 5 V DC	601	
0 to 20 mA DC	701	
4 to 20 mA DC	801	

■ Quick start code 2 (Initial setting code)

Quick start code 2 tells the factory to ship with each parameter preset to the values detailed as specified by the customer. Quick start code is not necessarily specified when ordering, unless the preset is requested. These parameters are software selectable items and can be re-programmed in the field via the manual.

□ □ □ □−□ □
(1) (2) (3) (4) (5) (6)

Specifications		Quick start code 2 (Initial setting code)					
		(1)	(2)	(3)	(4)	(5)	(6)
Event function 1 (EV1) [1]	None	N					
	Event function 1 (See Event type code table)	□					
Event function 2 (EV2) [1]	None		N				
	Event function 2 (See Event type code table)		□				
Event function 3 (EV3) [1]	None			N			
	Event function 3 (See Event type code table)			□			
	Temperature rise completion			6			
Event function 4 (EV4) [1]	None				N		
	Event function 4 (See Event type code table)				□		
	Control loop break alarm (LBA)				5		
CT type [2]	None					N	
	CTL-6-P-N					P	
	CTL-12-S56-10L-N					S	
Communication protocol	RKC communication (ANSI X3.28)						1
	Modbus						2
	MITSUBISHI AnA/QnA/Q series special protocol						3
	MITSUBISHI A series, FX2N, FX2NC series special protocol						5

[1] If it is desired to specify the deviation action between channels or the deviation using local SV, the settings must be configured by the customer. (Engineering setting data)
[2] The CT assignment and heater break alarm (HBA) type must be configured by the customer. (Engineering setting data)

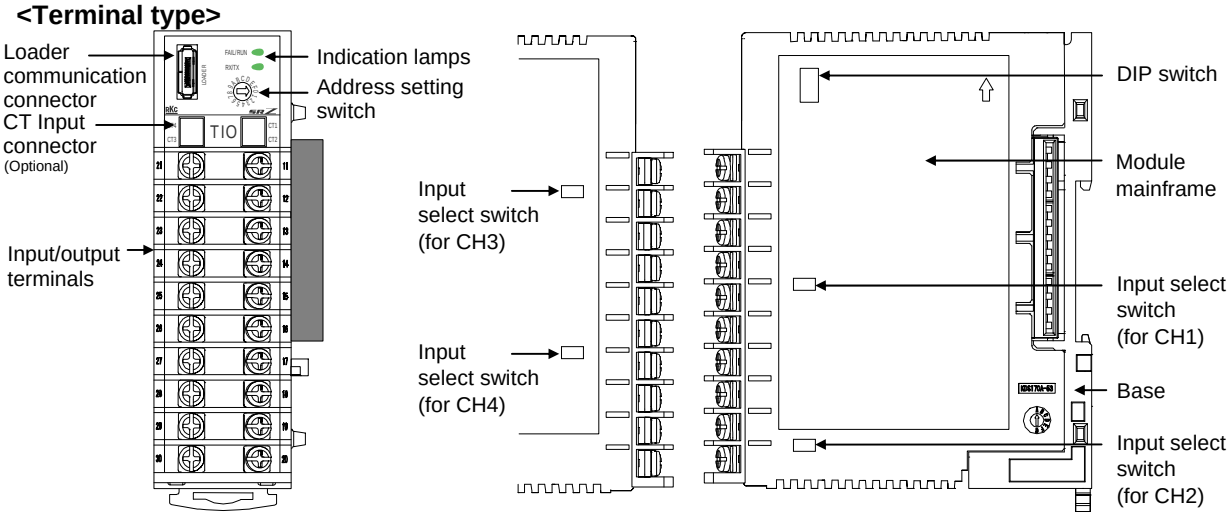
● Event type code table

Code	Type	Code	Type	Code	Type
A	Deviation high	H	Process high	V	SV high
B	Deviation low	J	Process low	W	SV low
C	Deviation high/low	K	Process high with hold action	1	MV high [heat-side]
D	Band	L	Process low with hold action	2	MV low [heat-side]
E	Deviation high with hold action	Q	Deviation high with re-hold action	3	MV high [cool-side]
F	Deviation low with hold action	R	Deviation low with re-hold action	4	MV low [cool-side]
G	Deviation high/low with hold action	T	Deviation high/low with re-hold action		

1.4 Parts Description

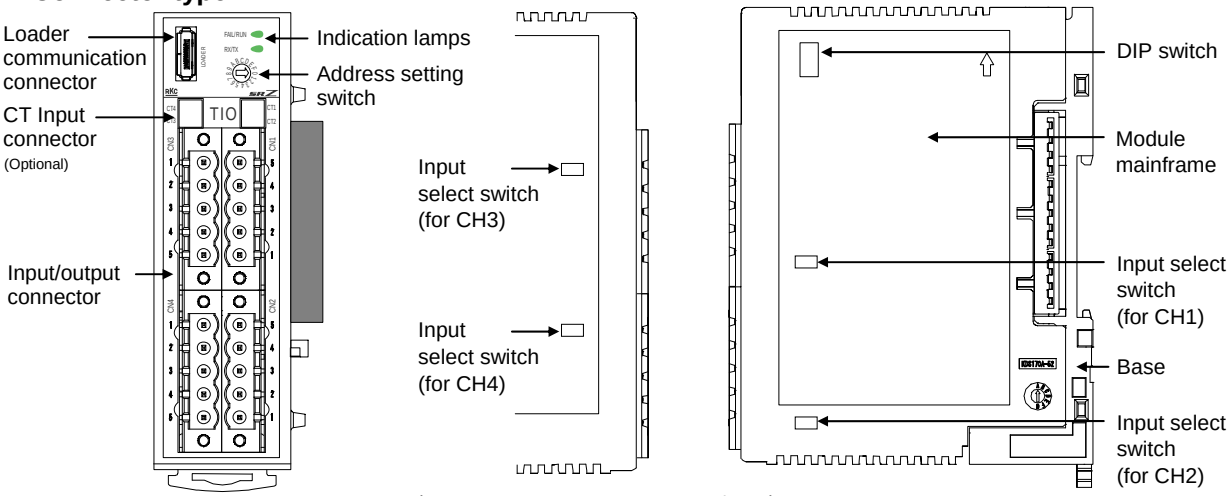
■ Module mainframe

<Terminal type>



(These diagrams represent any module of SRZ.)

<Connector type>



(These diagrams represent any module of SRZ.)

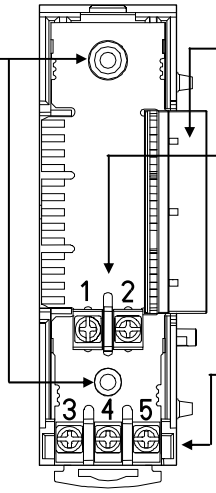
● Indication lamps

FAIL/RUN [Green or Red]	When normal (RUN):	A green lamp is on
	Self-diagnostic error (FAIL):	A green lamp flashes
	Instrument abnormality (FAIL):	A red lamp is on
RX/TX [Green]	During data send and receive:	A green lamp turns on

● Switches

Address setting switch	Sets the Z-TIO-C/D module address. (See **P. 3-3**.)
DIP switch	Sets the communication speed, data bit configuration, and communication protocol. (See **P. 3-5**.)
Input select switch	Selector switch for the measurement input type. For input select switch, see chapter **8. COMMUNICATION DATA DESCRIPTION** of "**Input type**" of **SRZ instruction manual (IMS01T04-E□)**.

■ Base



Mounting holes (M3 screw)

Holes for screws to fix the base to a panel, etc.
Customer must provide the M3 screws.

Joint connector

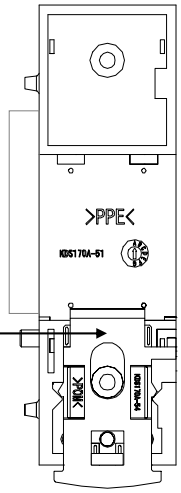
Used to mechanically and electrically connect each module.

Power supply terminals

Supply power to only one of the joined modules, and all of the joined modules will receive power.
(See **5.1 Wiring Cautions**)

Communication terminals (RS-485)

Connect communication wires to only one of the joined modules, and all of the joined modules will communicate.



Mounting bracket

Used to fix the module on DIN rails and also to fix each module joined together.

1.5 Example of System Configuration

An example of a system configuration for PLC communication is shown below.

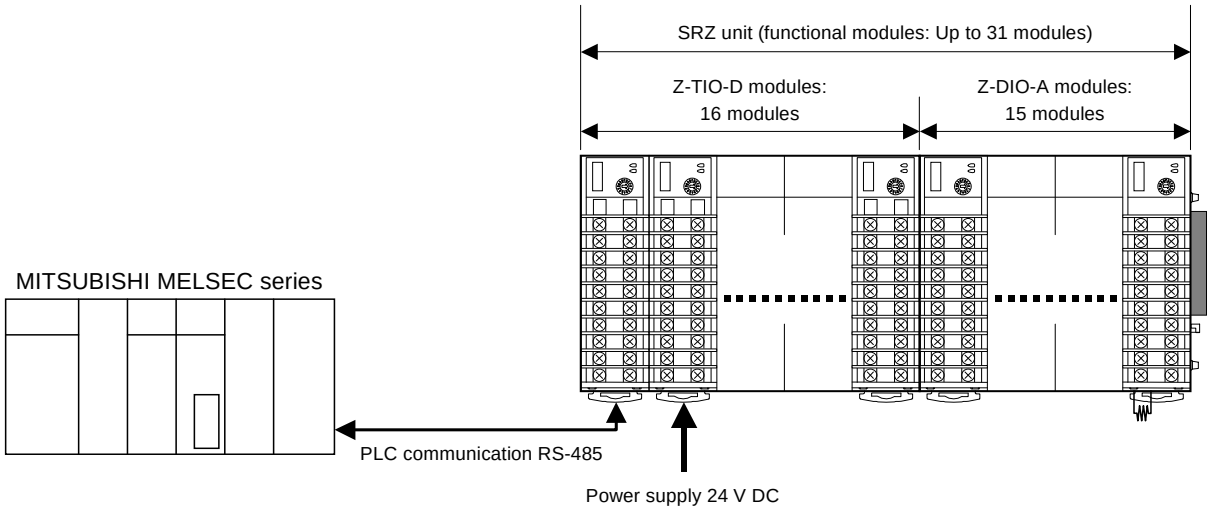
"SRZ unit" refers to a unit consisting of only Z-TIO-C/D modules, or a unit in which Z-TIO-C/D modules are connected to several other function modules (Z-TIO-A/B or Z-DIO-A).
(When PLC communication is performed, Z-TIO-A/B modules cannot be used.)

1.5.1 Using joined Z-TIO-C/D modules

Up to 16 Z-TIO-C/D modules can be joined. This enables a temperature control point number of up to 64 channels. When Z-TIO-C/D modules and Z-TIO-A modules are joined, up to 31 modules can be joined in one unit. (However, the maximum joinable number of functional modules of the same type is 16.)

■ Example of connection

Z-TIO-D module: 16 modules
Z-DIO-A module: 15 modules
MITSUBISHI MELSEC series: 1 unit



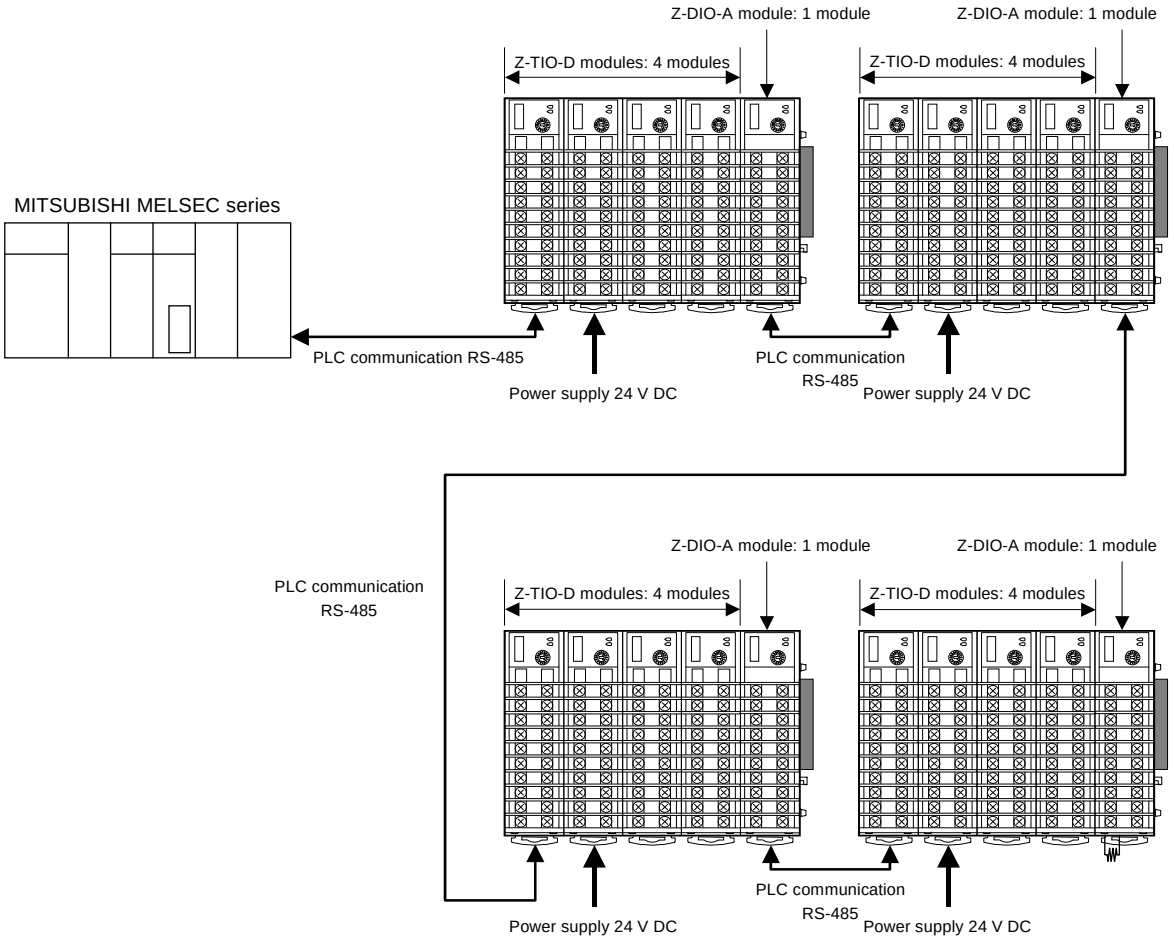
Z-DIO-A modules are not capable of PLC communication.

1.5.2 Using distributed Z-TIO-C/D modules

Up to 16 Z-TIO-C/D modules can be connected on the same communication line. This enables a temperature control point number of up to 64 channels. When Z-TIO-C/D modules and Z-DIO-A modules are connected, up to 31 modules can be connected on one communication line.
(However, the maximum joinable number of functional modules of the same type is 16.)

■ Example of connection

Z-TIO-D module: 16 modules (Connecting modules distributed in sets of four)
Z-DIO-A module: 4 modules
MITSUBISHI MELSEC series: 1 unit



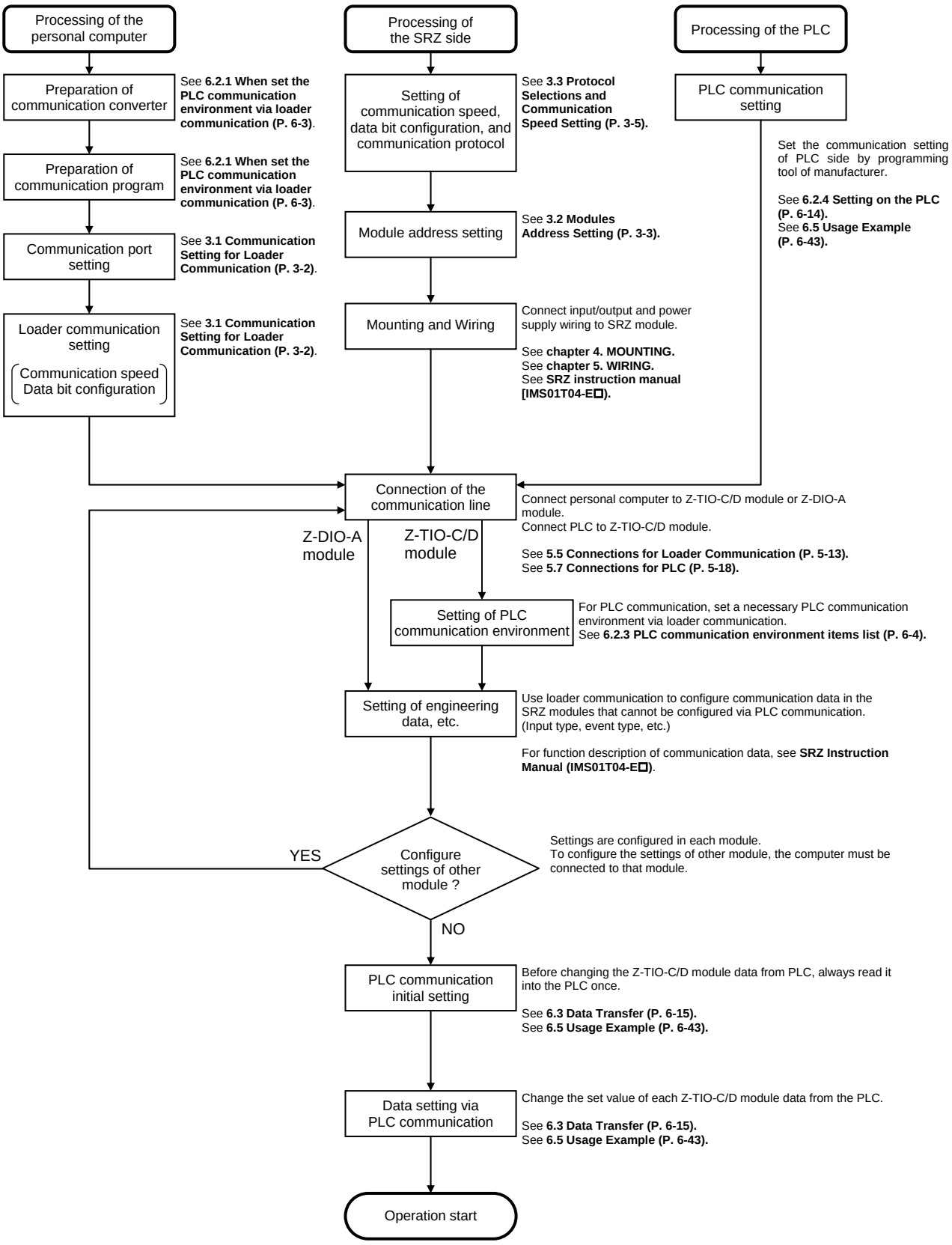
Z-TIO-C/D modules can be singly distributed (up to 16 modules).
When singly distributed modules are connected, the power must be connected to each module.

MEMO

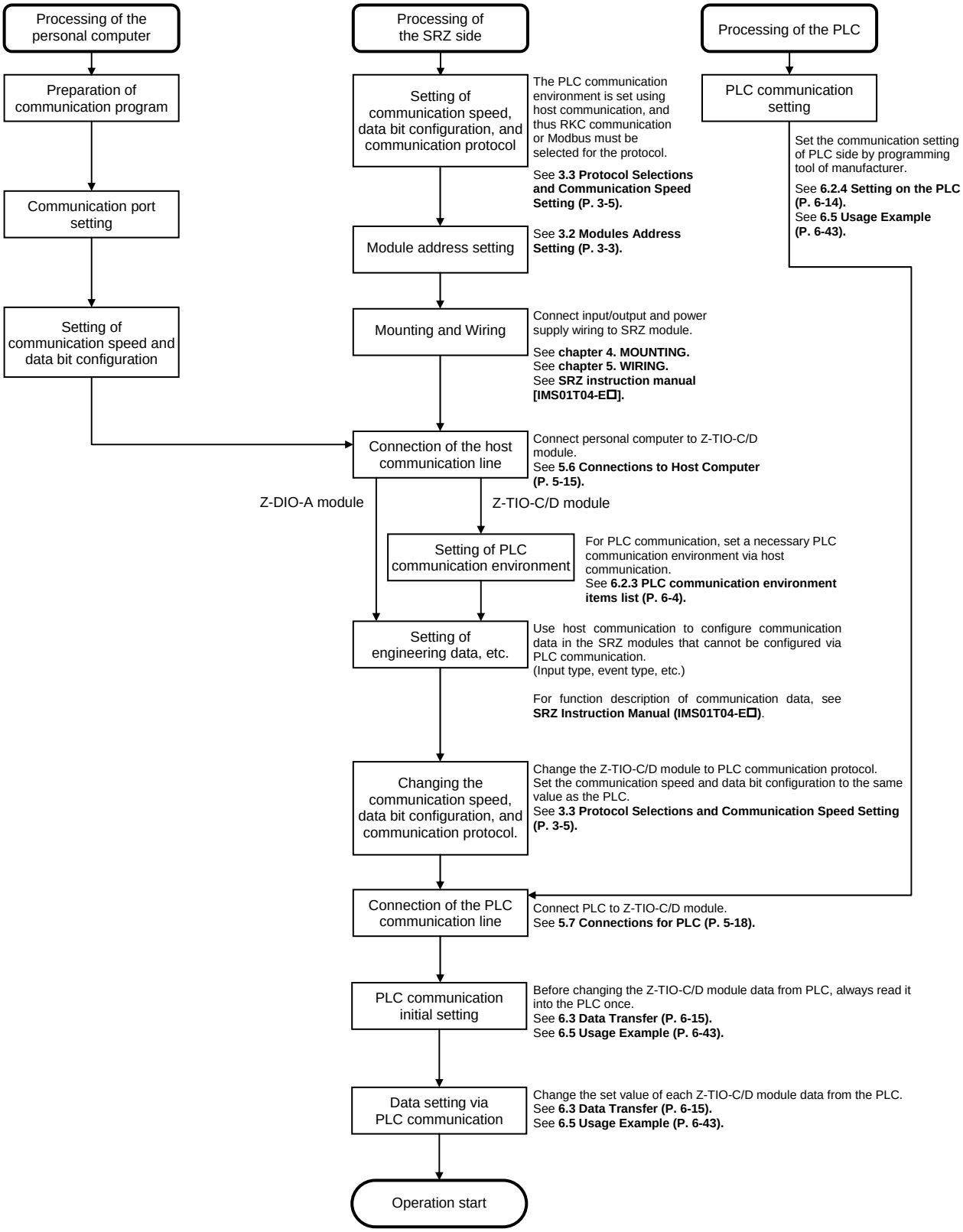
SETTING PROCEDURE TO OPERATION

2

2.1 When Performing Operation Setting via Loader Communication



2.2 When Performing Operation Setting via Host Communication



■ Using Z-TIO-C/D modules with host communication

The procedure for using Z-TIO-C/D modules with host communication is the same as that for Z-TIO-A/B modules. For the procedures for using host communication, see the following manual.

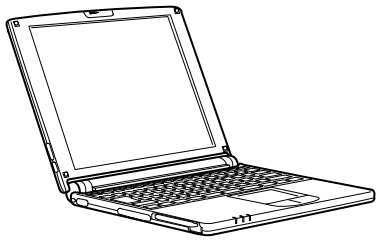
☞ See **SRZ Instruction Manual (IMS01T04-E□)** Download or sold separately

COMMUNICATION SETTING

3

3.1 Communication Setting for Loader Communication

For loader communication, set the communication port of the computer to the following values. There are no loader communication settings on the Z-TIO-C/D module side.



Communication speed *	38400 bps
Start bit *	1
Data bit *	8
Parity bit *	Without parity
Stop bit *	1

* Above setting data is fixed.

The module address of Z-TIO-C/D module is fixed to zero. The setting of address setting switch is ignored.

3.2 Modules Address Setting

Set communication setting before mounting and wiring of the Z-TIO-C/D module.

⚠ WARNING

- To prevent electric shock or instrument failure, always turn off the power before setting the switch.
- To prevent electric shock or instrument failure, never touch any section other than those instructed in this manual.

CAUTION

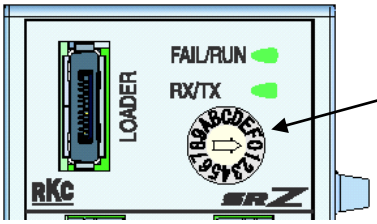
Do not separate the module mainframe from the base with the power turned on. If so, instrument failure may result.

■ Address setting switches

Set an address for the module using a small blade screwdriver.

When using two or more modules, set the desired address to each module.

To avoid problems or malfunction, do not duplicate an address on the same communication line.



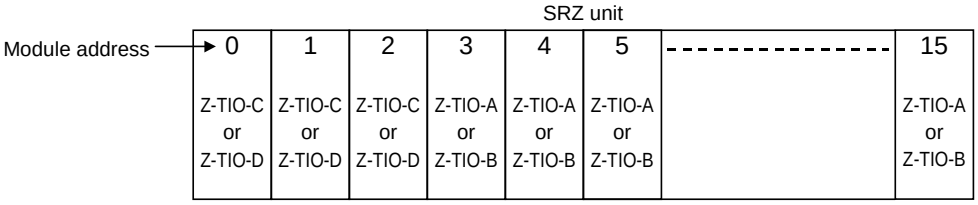
Address setting switch
Setting range: 0 to F [0 to 15: Decimal]
Factory set value: 0

The module address number of Z-TIO-C/D module:

PLC communication	0 to 15 (decimal) • When one module is used, set the module address to 0. • When multiple modules are used, be sure to set one of the modules to module address 0. The module with module address 0 will be the master module.
Loader communication	0 The module address of Z-TIO-C/D module is fixed to zero. The setting of address setting switch is ignored.
RKC communication	0 to 15 (decimal)
MODBUS	1 to 16 (decimal) The value obtained by adding “1” to the set address corresponds to the address used for the actual program.

■ Addresses when Z-TIO-C/D modules and Z-TIO-A/B modules are joined (host communication only)

The maximum number of modules of the same type that can be connected is 16.
Z-TIO-C/D modules and Z-TIO-A/B modules are considered to be the same type, and thus when these are joined, configure the addresses within the range 0 to F (0 to 15 decimal).

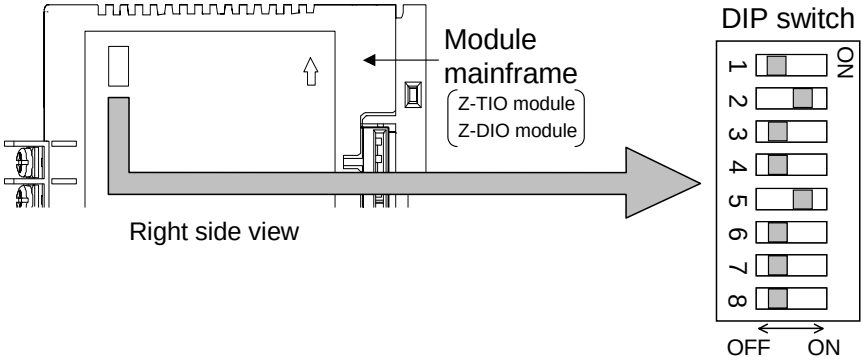


Z-TIO-C/D modules and Z-TIO-A/B modules can be joined only when host communication is used.

3.3 Protocol Selections and Communication Speed Setting

Use the DIP switch on the right side of module to select communication speed, data bit, configuration and protocol. The data changes become valid when the power is turned on again or when changed to RUN/STOP.

When two or more Z-TIO-C/D modules are connected on the same communication line, the DIP switch settings (switch 1 to 8) of all modules must be the same. Otherwise the module may fail or malfunction.



(The above figure is for the terminal type. However, the switch positions are the same for the connector type.)

1	2	Communication speed
OFF	OFF	4800 bps
ON	OFF	9600 bps
OFF	ON	19200 bps
ON	ON	38400 bps

Factory set value: 19200 bps

3	4	5	Data bit configuration	
OFF	OFF	OFF	Data 7-bit, without parity, Stop 1-bit [1]	Setting range of RKC communication and PLC communication
OFF	ON	OFF	Data 7-bit, Even parity, Stop 1-bit [1]	
ON	ON	OFF	Data 7-bit, Odd parity, Stop 1-bit [1]	
OFF	OFF	ON	Data 8-bit, without parity, Stop 1-bit	Setting range of Modbus
OFF	ON	ON	Data 8-bit, Even parity, Stop 1-bit [2]	
ON	ON	ON	Data 8-bit, Odd parity, Stop 1-bit [2]	

Factory set value: Data 8-bit, without parity

[1] When the Modbus communication protocol is selected, this setting becomes invalid.

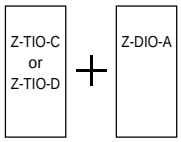
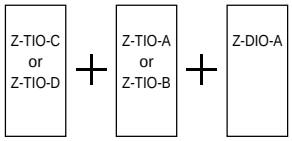
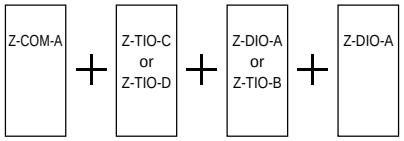
[2] For Modbus communication, this is treated as "Without parity."

6	7	Protocol
OFF	OFF	RKC communication
ON	OFF	Modbus
OFF	ON	MITSUBISHI MELSEC series special protocol (type 4) A compatible, 1C frame, AnA/AnUCPU common command (QR/QW) QnA compatible, 3C frame, command (0401/1401) ZR register only (AnA/QnA/Q series)
ON	ON	MITSUBISHI MELSEC series special protocol (type 4) A compatible, 1C frame, ACPU common command (WR/WW) (A series, FX2N, FX2NC series, FX3U/FX3UC series)

Factory set value: Based on model code (When not specifying: PLC communication [6: OFF 7: ON)]

Switch No. 8 must be always OFF. Do not set to ON.

■ Protocol and communication speed settings when joined with other modules

Combination	PLC communication	Host communication
	• Set the Z-TIO-C/D modules to MITSUBISHI MELSEC series special protocol. • Set the Z-DIO-A modules to RKC communication protocol. (This is because Z-DIO-A modules are not capable of PLC communication.) • Set the same values for the communication protocol, communication speed, and data bit configuration in all modules.	Set the same values for the communication protocol, communication speed, and data bit configuration in all modules.
	This combination is not possible when PLC communication is used.	Set the same values for the communication protocol, communication speed, and data bit configuration in all modules.
	This combination is not possible when PLC communication is used.	Set the communication protocol, communication speed, and data bit configuration of the Z-COM-A module only. The communication protocol, communication speed, and data bit configuration of the Z-TIO-C/D, Z-TIO-A/B, and Z-DIO-A modules do not need to be set.

4 MOUNTING

4.1 Mounting Cautions

This chapter describes installation environment, mounting cautions, dimensions and mounting procedures.

> **⚠ WARNING**
>
> To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

(1) This instrument is intended to be used under the following environmental conditions.
(IEC61010-1) [OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

(2) Use this instrument within the following environment conditions.
- Allowable ambient temperature: −10 to +50 °C
- Allowable ambient humidity: 5 to 95 %RH
  (Absolute humidity: MAX.W.C 29.3 g/m^3 dry air at 101.3 kPa)
- Installation environment conditions: Indoor use
  Altitude up to 2000 m

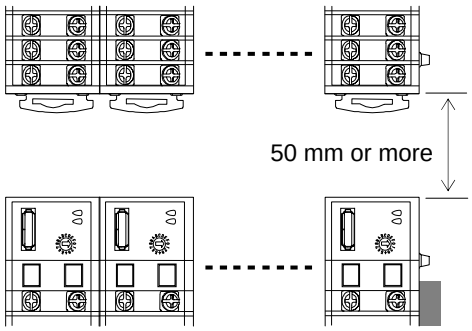
(3) Avoid the following conditions when selecting the mounting location:
- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron particles.
- Excessive induction noise, static electricity, magnetic fields or noise.
- Direct air flow from an air conditioner.
- Exposure to direct sunlight.
- Excessive heat accumulation.

(4) Take the following points into consideration when mounting this instrument in the panel.
- Provide adequate ventilation space so that heat does not build up.
- Do not mount this instrument directly above equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors).
- If the ambient temperature rises above 50 °C, cool this instrument with a forced air fan, cooler, or the like. However, do not allow cooled air to blow this instrument directly.
- In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
  - High voltage equipment: Do not mount within the same panel.
  - Power lines: Separate at least 200 mm
  - Rotating machinery: Separate as far as possible

(5) This instrument is Permanently connected to equipment, please take the following points.
- A switch or circuit-breaker shall be included in the building installation.
- It shall be in close proximity to the equipment and within easy reach of the operator.
- It shall be marked as the disconnecting device for the equipment.

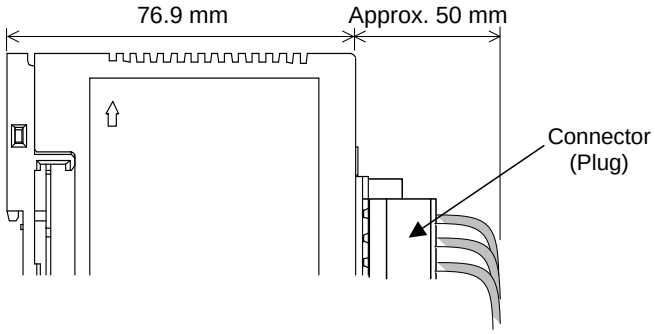
- **Space required between each module vertically**

When the module is mounted on the panel, allow a minimum of 50 mm at the top and bottom of the module to attach the module to the mainframe.



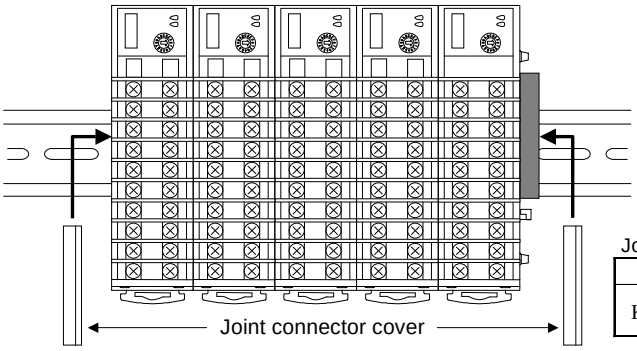
- **Depth for connector mount type module (Connector type)**

Space for connectors and cables must be considered when installing.



- **Mounting the joint connector cover**

It is recommended to use a plastic cover on the connector on both sides of the mounted modules for protection of connectors.

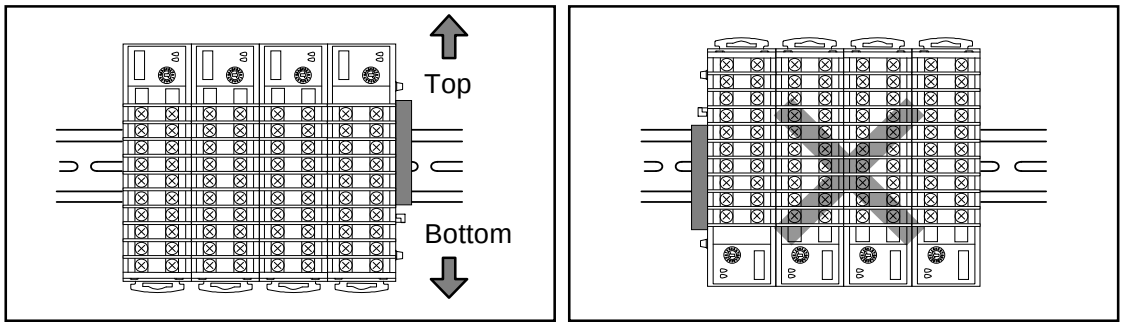


Joint connector cover (Standard equipment)

Parts code	Ordering code	Q'ty
KSRZ-517A	00433384	2

- **Installing direction of SRZ unit**

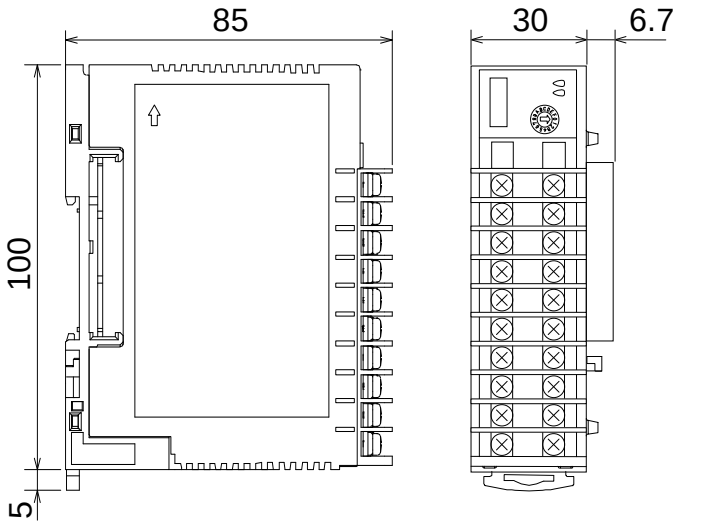
Mount the SRZ unit in the direction specified as shown below.



4.2 Dimensions

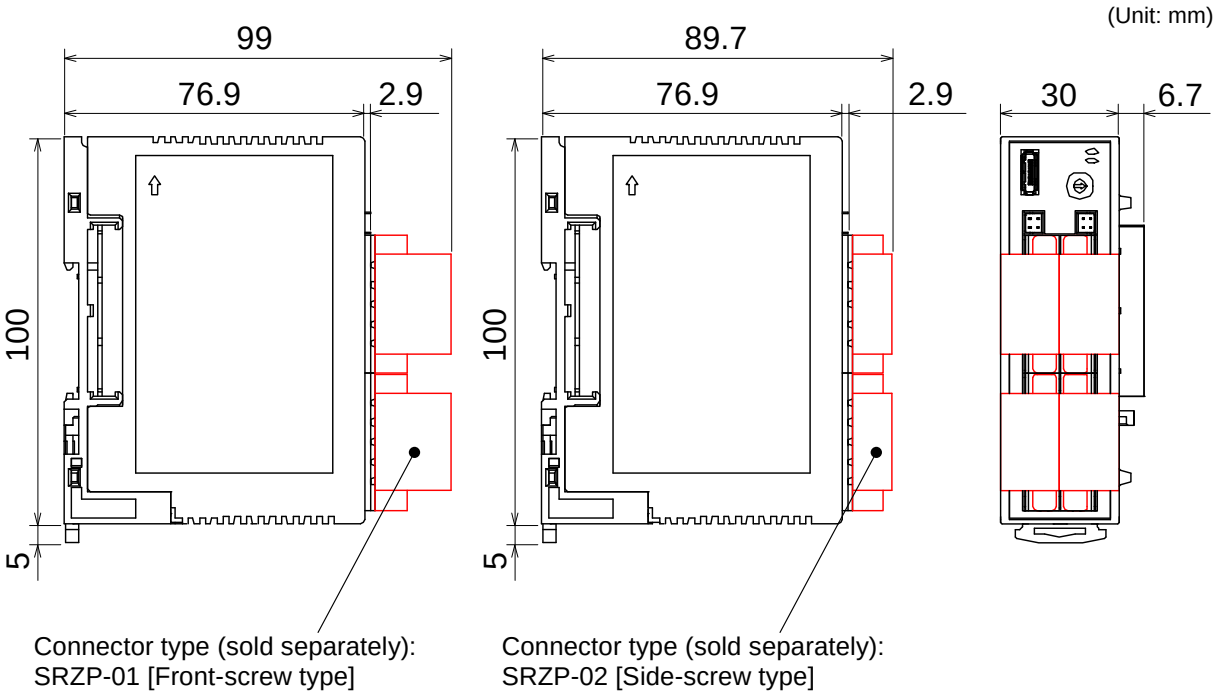
<Terminal type module>

(Unit: mm)



<Connector type module>

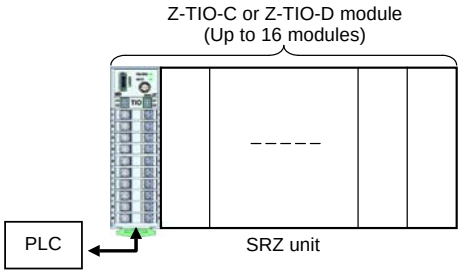
(Unit: mm)



4.3 Important Points When Joining Modules

When joining Z-TIO-C/D modules, note the following:

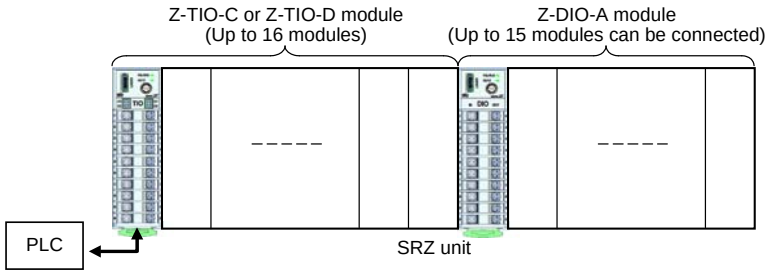
■ The maximum number of joined Z-TIO-C/D modules that can be connected to one PLC unit is 16.



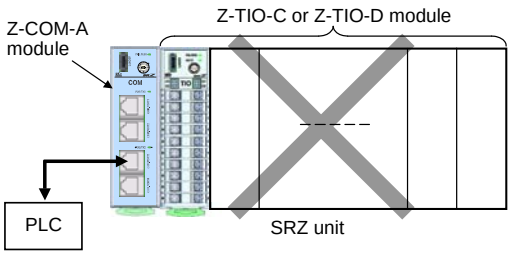
The maximum number of SRZ modules (including Z-TIO-A, Z-TIO-B, and Z-DIO-A modules) on the same communication line is 31.
However, with the exception of Z-TIO-C/D modules that support PCL communication, communication with the PLC is not possible.

■ Z-DIO-A modules can be connected to Z-TIO-C/D modules used for PLC communication.

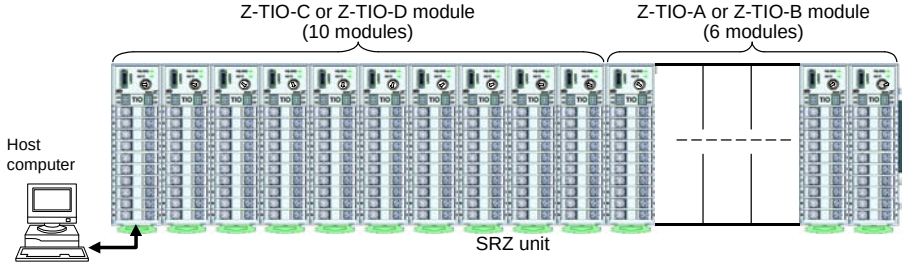
Only the Z-TIO-C/D modules can communicate with the PLC. The Z-DIO-A modules cannot be used for host communication (only loader communication is possible).



■ Z-COM-A modules cannot be connected to Z-TIO-C/D modules that use PLC communication.



■ When Z-TIO-C/D modules are used for host communication (RKC communication or Modbus), they can be combined with Z-TIO-A/B modules.
[However, the total number of joined Z-TIO modules must not exceed the maximum (16).]

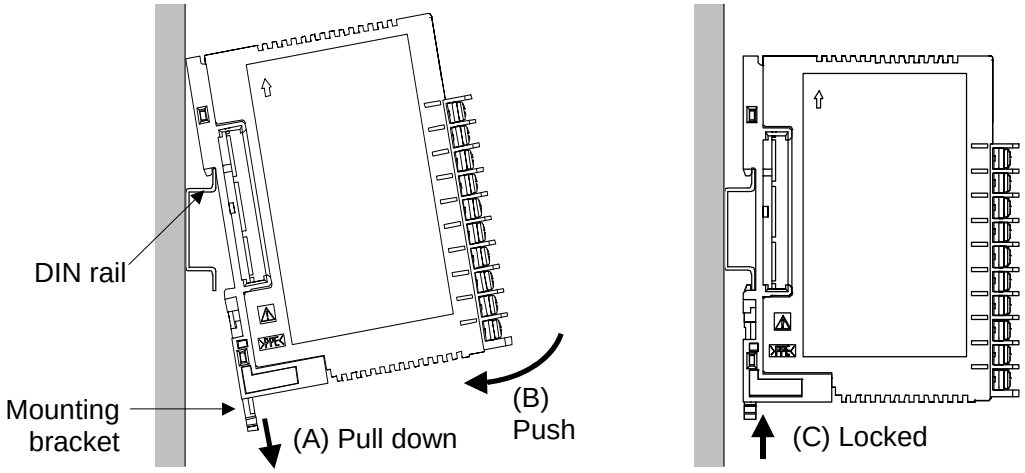


4.4 DIN Rail Mounting and Removing

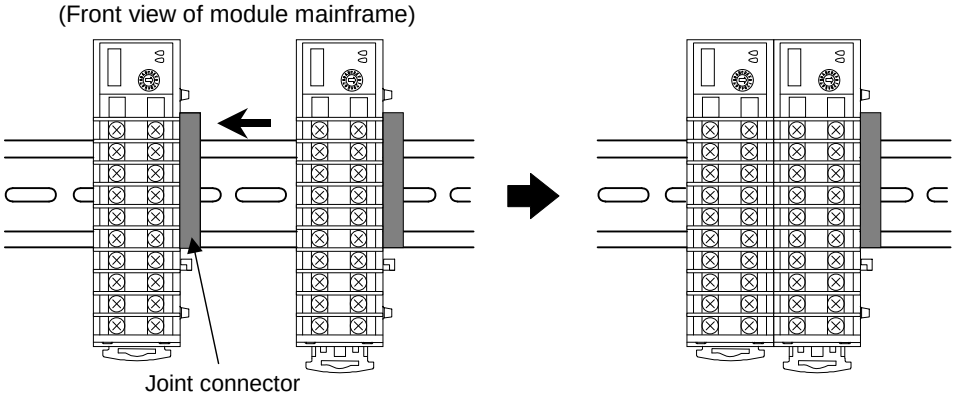
■ Mounting procedures

1. Pull down the mounting bracket at the bottom of the module (A). Attach the hooks on the top of the module to the DIN rail and push the lower section into place on the DIN rail (B).

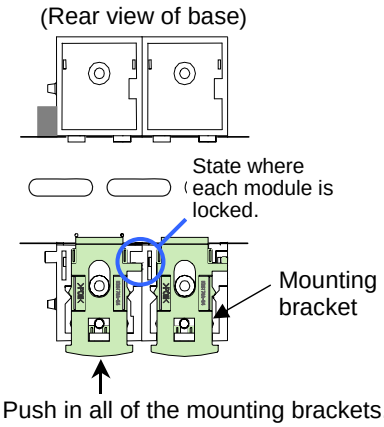
2. Slide the mounting bracket up to secure the module to the DIN rail (C).



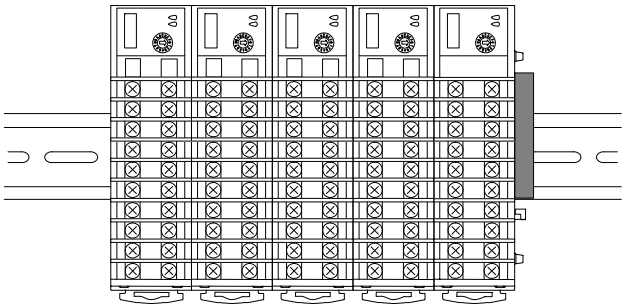
3. Mount the modules on the DIN rail. Slide the modules until the modules are closely joined together and the joint connectors are securely connected.



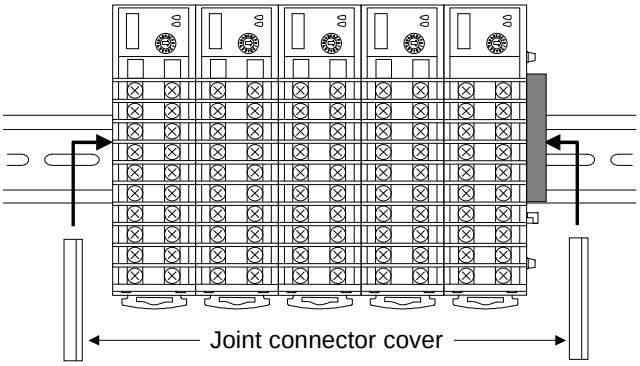
4. Push in the mounting brackets to lock the modules together and fix to the DIN rail.



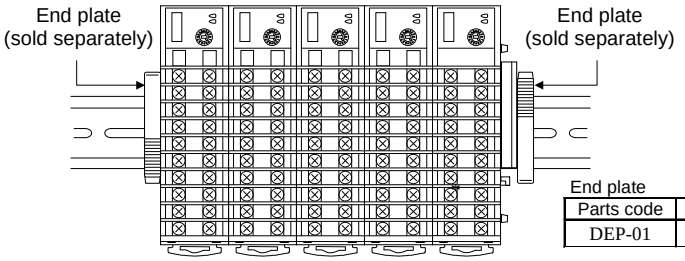
5. Connect the required number of functional modules.



6. Install a plastic cover on the connector on both sides of the mounted modules for protection of connectors.



To firmly fix the modules, use end plates on both sides of the mounted modules.



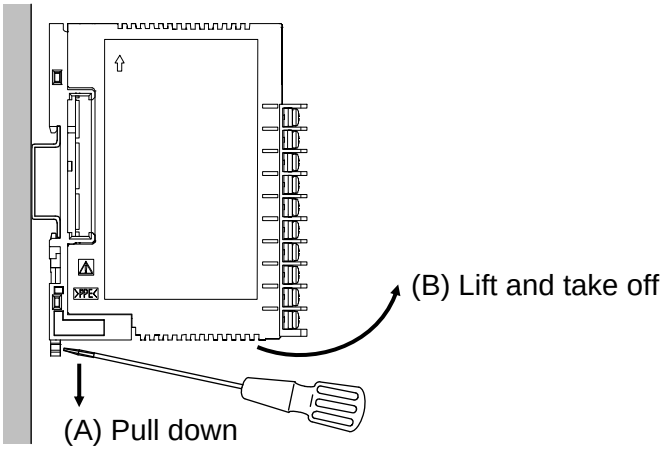
End plate

Parts code	Ordering code	Q'ty
DEP-01	00434944	2

■ Removing procedures

1. Pull down a mounting bracket with a blade screwdriver (A).

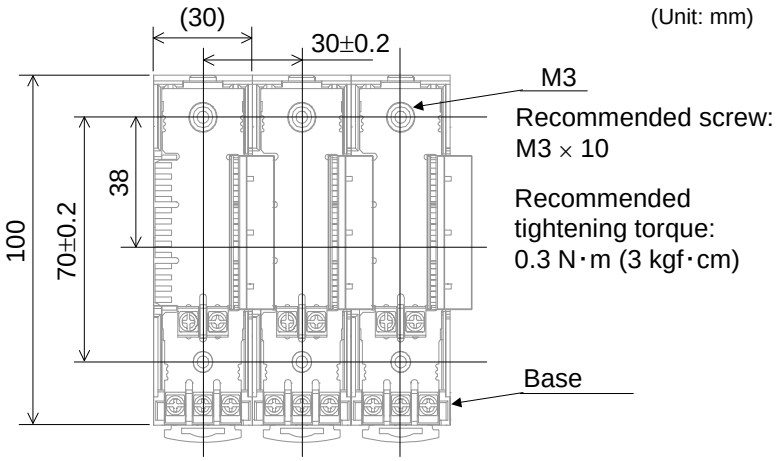
2. Lift the module from bottom, and take it off (B).



4.5 Panel Mounting

■ Mounting procedures

1. Refer to the mounting dimensions below when selecting the location.



Mounting dimensions

2. Remove the base from the module (B) while the lock is pressed (A). (Fig.1)

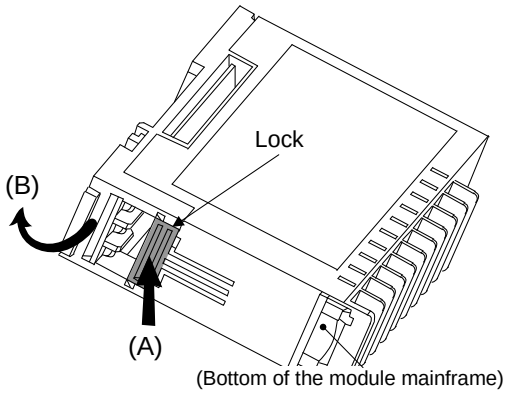


Fig. 1: Removing the base

3. Join bases. Then, lock them by pushing in the mounting brackets.

☞ See the **4.4 DIN Rail Mounting and Removing (P. 4-6).**

4. Fix the base to its mounting position using M3 screws. Customer must provide the screws.

5. Mount the module on the base. (Fig.2)

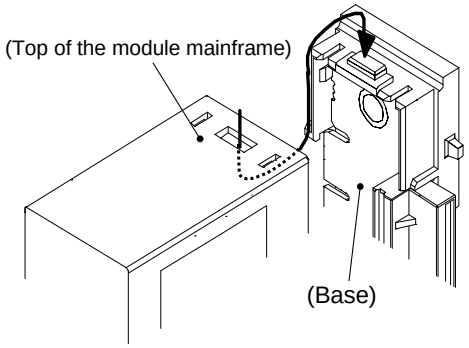


Fig. 2: Mounting the module mainframe

5 WIRING

5.1 Wiring Cautions

This chapter describes wiring cautions, wiring layout and wiring of terminals.

⚠ WARNING

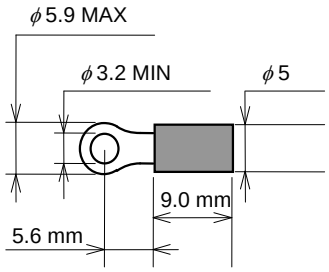
To prevent electric shock or instrument failure, do not turn on the power until all the wiring is completed. Make sure that the wiring has been properly made before applying power to the instrument.

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires (3-wire system).
- To avoid noise induction, keep input/output signal wires away from instrument power line, load lines and power lines of other electric equipment.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
  - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
  - Always install the noise filter on a grounded panel. Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
  - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.
- About eight seconds are required as preparation time for contact output every time the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply, supply power from a SELV circuit.
- A suitable power supply should be considered in the end-use equipment. The power supply must be in compliance with a limited-energy circuits (maximum available current of 8 A).
- Supply the power to only one of the joined modules. When power is supplied to any one of the joined modules, all of the joined modules will receive power.
- Select the power capacity which is appropriate for the total power consumption of all joined modules and the initial current surge when the power is turned on.

Power consumption (at maximum load):	140 mA max. (at 24 V DC)	[Z-TIO-C/D module (4CH type)]
	80 mA max. (at 24 V DC)	[Z-TIO-C/D module (2CH type)]
	Rush current:	10 A or less

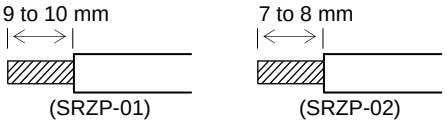
For the terminal type module, use the specified solderless terminals. Only these specified solderless terminals can be used due to the insulation between the terminals.

Screw Size: M3 × 7 (with 5.8 × 5.8 square washer)
Recommended tightening torque:
0.4 N·m (4 kgf·cm)
Applicable wire: Solid/twisted wire of 2 mm^2
Specified solderless terminals:
Manufactured by J.S.T MFG CO., LTD.
Circular terminal with isolation V1.25–MS3
(M3 screw, width 5.5 mm, hole diameter 3.2 mm)



For the connector type module, use the following our connector (plug) [sold separately].

Connector type: SRZP-01 (Front-screw type)
SRZP-02 (Side-screw type)
Screw size: M2.5
Recommended tightening torque:
0.43 to 0.50 N·m (4.3 to 5.0 kgf·cm)
Used cable specifications:
Lead wire type:
Solid (AWG 28 [cross-section: 0.081 mm^2] to 12 [cross-section: 3.309 mm^2]) or
Twisted wire (AWG 30 [cross-section: 0.051 mm^2] to 12 [cross-section: 3.309 mm^2])
Stripping length: 9 to 10 mm (SRZP-01), 7 to 8 mm (SRZP-02)



5.2 Connecting Precautions

⚠ WARNING

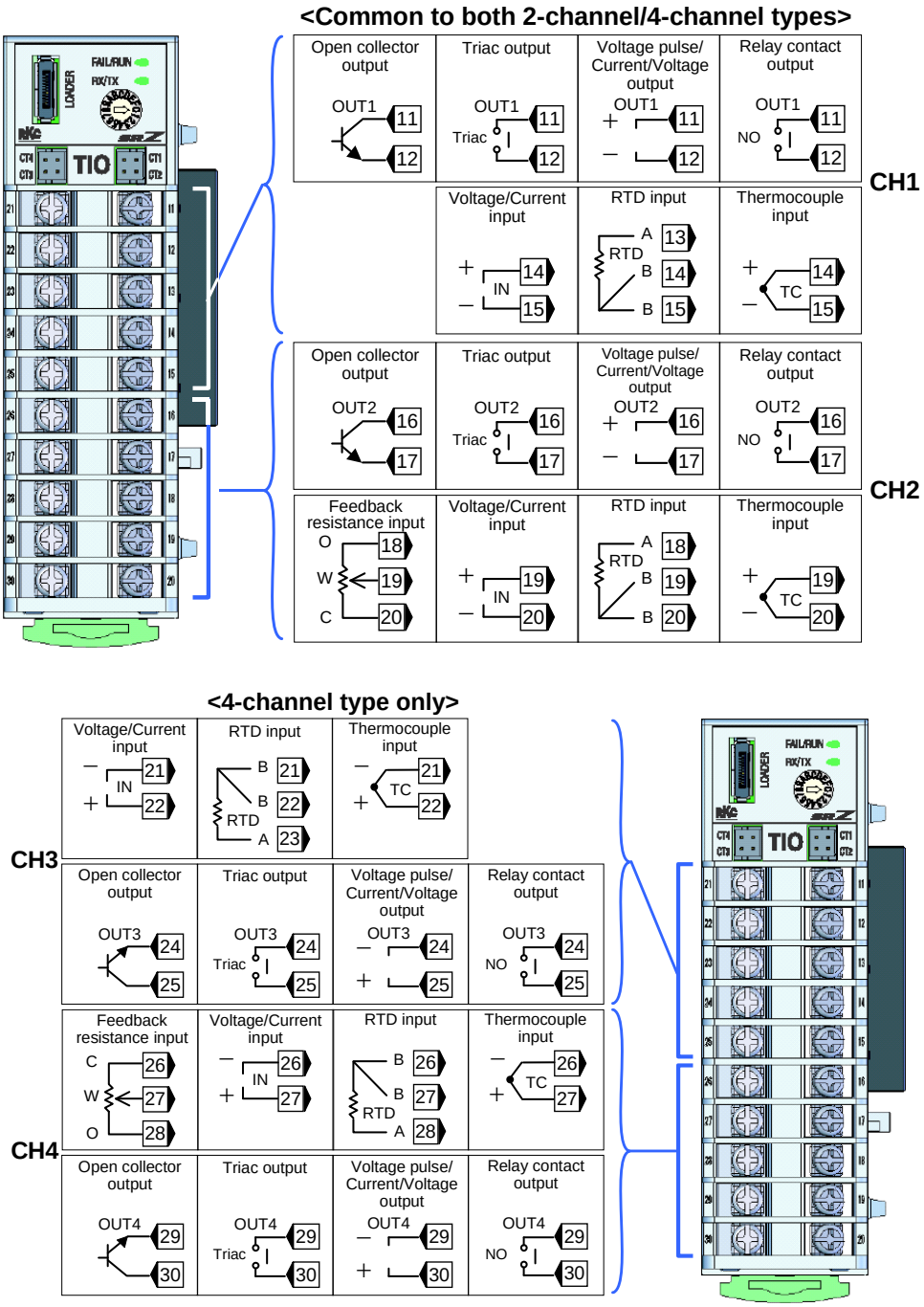
To prevent electric shock or instrument failure, turn off the power before connecting or disconnecting the instrument and peripheral equipment.

- Connect connectors correctly in the right position. If it is forcibly pushed in with pins in the wrong positions, the pins may be bent resulting in instrument failure.
- When connecting or disconnecting the connectors, do not force it too far to right and left or up and down, but move it on the straight. Otherwise, the connector pins may be bent, causing instrument failure.
- When disconnecting a connector, hold it by the connector itself. Disconnecting connectors by yanking on their cables can cause breakdowns.
- To prevent malfunction, never touch the contact section of a connector with bare hands or with hands soiled with oil or the like.
- To prevent damage to cables, do not bend cables over with excessive force.

5.3 Terminal Configuration of Z-TIO-C/D Module

■ Input/output terminals

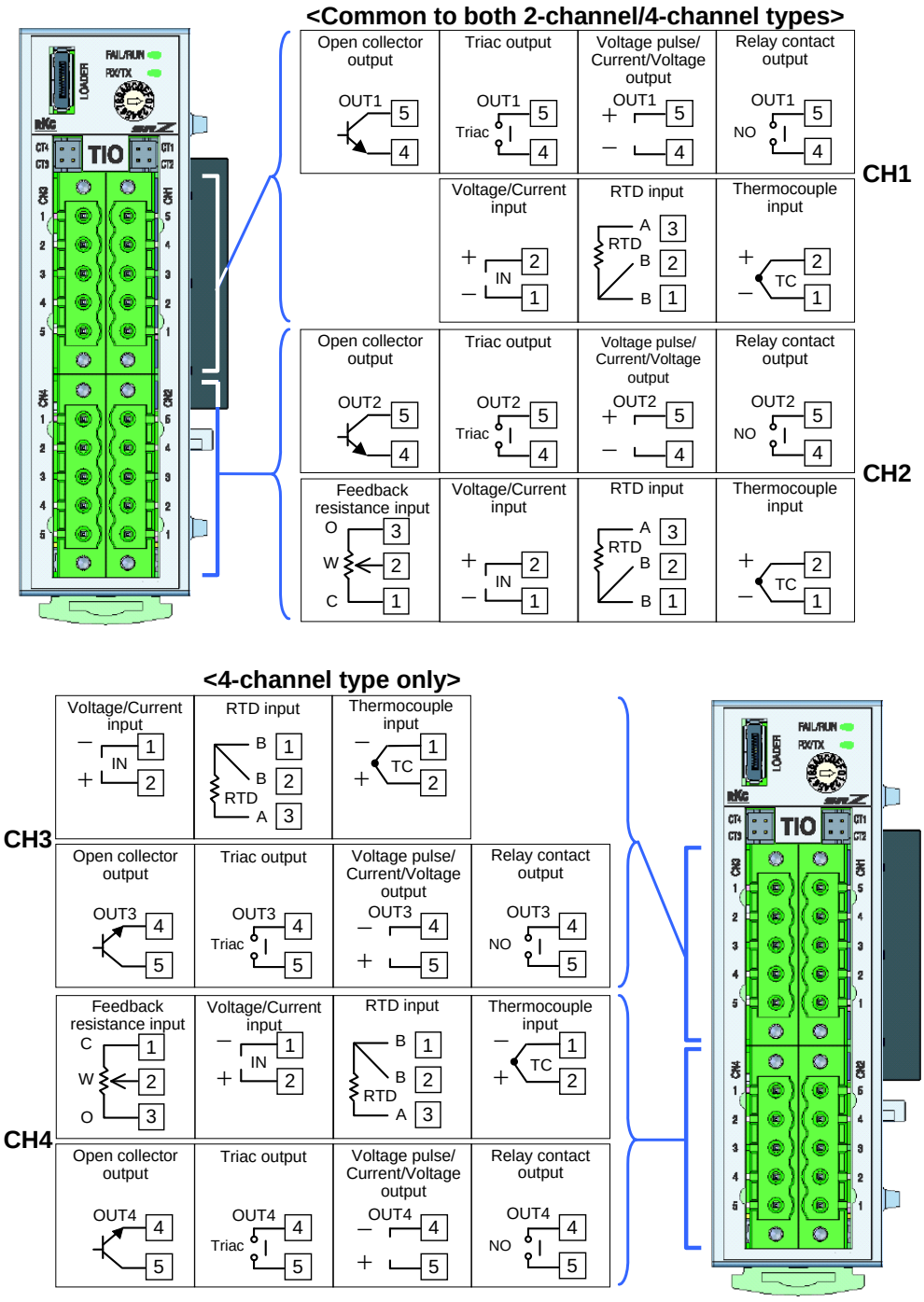
<Terminal type module>



Isolated between each input channel

Voltage pulse output, Current output and Voltage output: Not isolated between output and power supply

<Connecter type module>



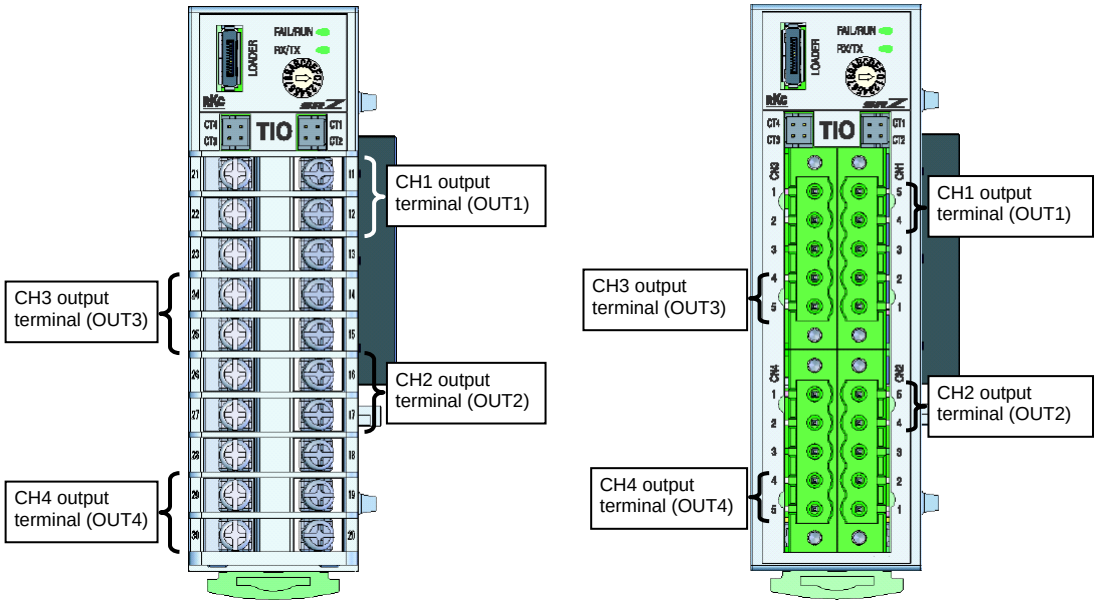
Isolated between each input channel

Voltage pulse output, Current output and Voltage output: Not isolated between output and power supply

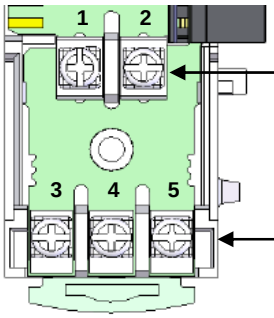
Output configurations by control specifications

	Control type	CH1 output terminal (OUT1)	CH2 output terminal (OUT2)	CH3 output terminal (OUT3)	CH4 output terminal (OUT4)
2-channel type module	PID control	Control output (CH1)	Control output (CH2)	—	—
	Heat/Cool control	Heat-side output (CH1)	Cool-side output (CH1)	—	—
	Position proportioning control	Open-side output (CH1)	Close-side output (CH1)	—	—
4-channel type module	PID control	Control output (CH1)	Control output (CH2)	Control output (CH3)	Control output (CH4)
	Heat/Cool control	Heat-side output (CH1)	Cool-side output (CH1)	Heat-side output (CH3)	Cool-side output (CH3)
	Position proportioning control	Open-side output (CH1)	Close-side output (CH1)	Open-side output (CH3)	Close-side output (CH3)
	PID control ＋ Heat/Cool control	Control output (CH1)	Control output (CH2)	Heat-side output (CH3)	Cool-side output (CH3)
	PID control ＋ Position proportioning control	Control output (CH1)	Control output (CH2)	Open-side output (CH3)	Close-side output (CH3)
	Heat/Cool control ＋ PID control	Heat-side output (CH1)	Cool-side output (CH1)	Control output (CH3)	Control output (CH4)
	Heat/Cool control ＋ Position proportioning control	Heat-side output (CH1)	Cool-side output (CH1)	Open-side output (CH3)	Close-side output (CH3)
	Position proportioning control ＋ PID control	Open-side output (CH1)	Close-side output (CH1)	Control output (CH3)	Control output (CH4)
	Position proportioning control ＋ Heat/Cool control	Open-side output (CH1)	Close-side output (CH1)	Heat-side output (CH3)	Cool-side output (CH3)

"CH" numbers in parentheses indicate the control channel number of the module.



■ Power supply terminals, Communication terminals (Common to both terminal and connector type module)



Power supply terminals

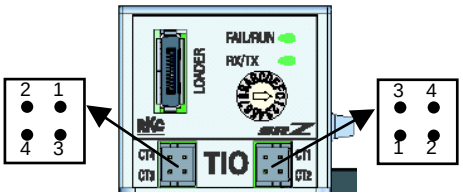
Terminal No.	Description
1	24 V DC (+)
2	24 V DC (–)

Communication terminals (RS-485)

Terminal No.	Description
3	T/R (A)
4	T/R (B)
5	SG

■ CT input connector (Optional)

Pin No.	Description
1	CT4 (CH4)
2	
3	CT3 (CH3)
4	



Pin No.	Description
1	CT2 (CH2)
2	
3	CT1 (CH1)
4	

For the CT input, use the following our CT cable (with socket) and current transformer (CT). [sold separately]

Cable type: W-BW-03-□□□□ (□□□□: Standard cable length [unit: mm])

1000: 1m, 2000: 2 m, 3000: 3 m

[Sleeve color]
White: CT2 (Pin No. 1, 2), CT4 (Pin No. 1, 2)
Blue: CT1 (Pin No. 3, 4), CT3 (Pin No. 3, 4)

Current transformer (CT): CTL-6-P-N (0.0 to 30.0 A) or CTL-12-S56-10L-N (0.0 to 100.0 A)

5.4 Wiring Configuration

⚠ WARNING

To prevent electric shock or instrument failure, turn off the power before connecting or disconnecting the instrument and peripheral equipment.

📖 "SRZ" unit refers to a unit consisting of only Z-TIO-C/D modules, or a unit in which Z-TIO-C/D modules are connected to several other function modules (Z-TIO-A/B, Z-DIO-A).

📖 Function modules (Z-TIO-A/B/C/D, Z-DIO-A) connected inside the same unit can be placed in any position.

☞ For the number of modules that can be joined, see **4.3 Important Points When Joining Modules (P. 4-5).**

☞ For the procedure for connecting modules, see **4.4 DIN Rail Mounting and Removing (P. 4-6).**

☞ For the module address settings, see **3.2 Module Address Settings (P. 3-3).**

5.4.1 Connection configuration for PLC communication

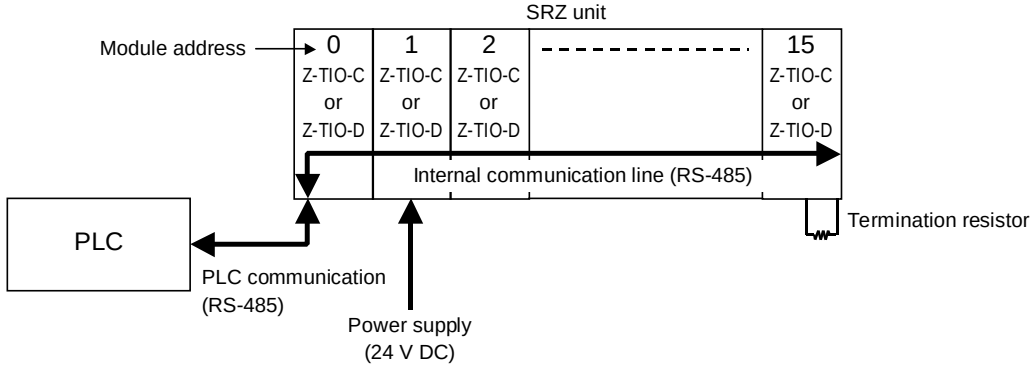
■ SRZ modules that can be connected to Z-TIO-C/D modules when PLC communication is performed

Z-DIO-A module	Connectable
Z-TIO-A or Z-TIO-B module	Cannot be connected when PLC communication is performed
Z-COM-A module	Cannot be connected when PLC communication is performed

■ Connecting joined Z-TIO-C/D modules

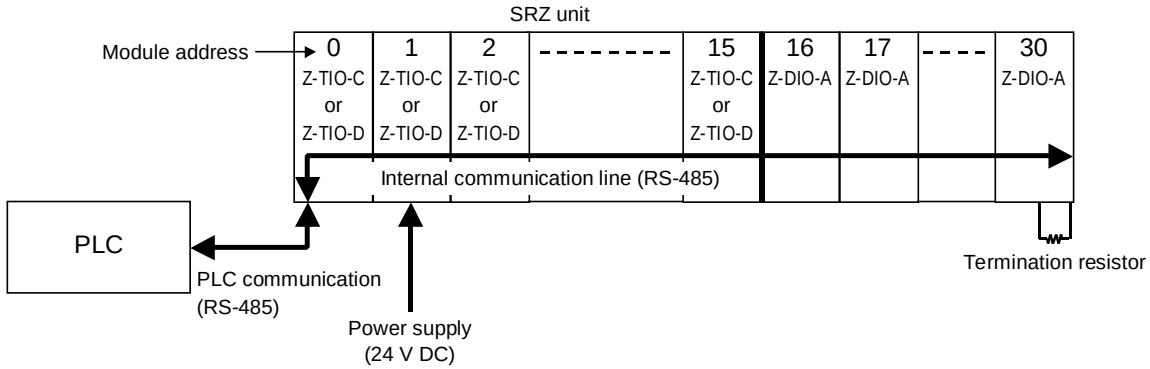
- Configuration example 1

PLC ..... 1 module
Z-TIO-C or Z-TIO-D modules ... 16 modules



- Configuration example 2 (When Z-DIO-A modules are connected)

PLC.....1 module
Z-TIO-C or Z-TIO-D module .....16 modules
Z-DIO-A module .....15 modules



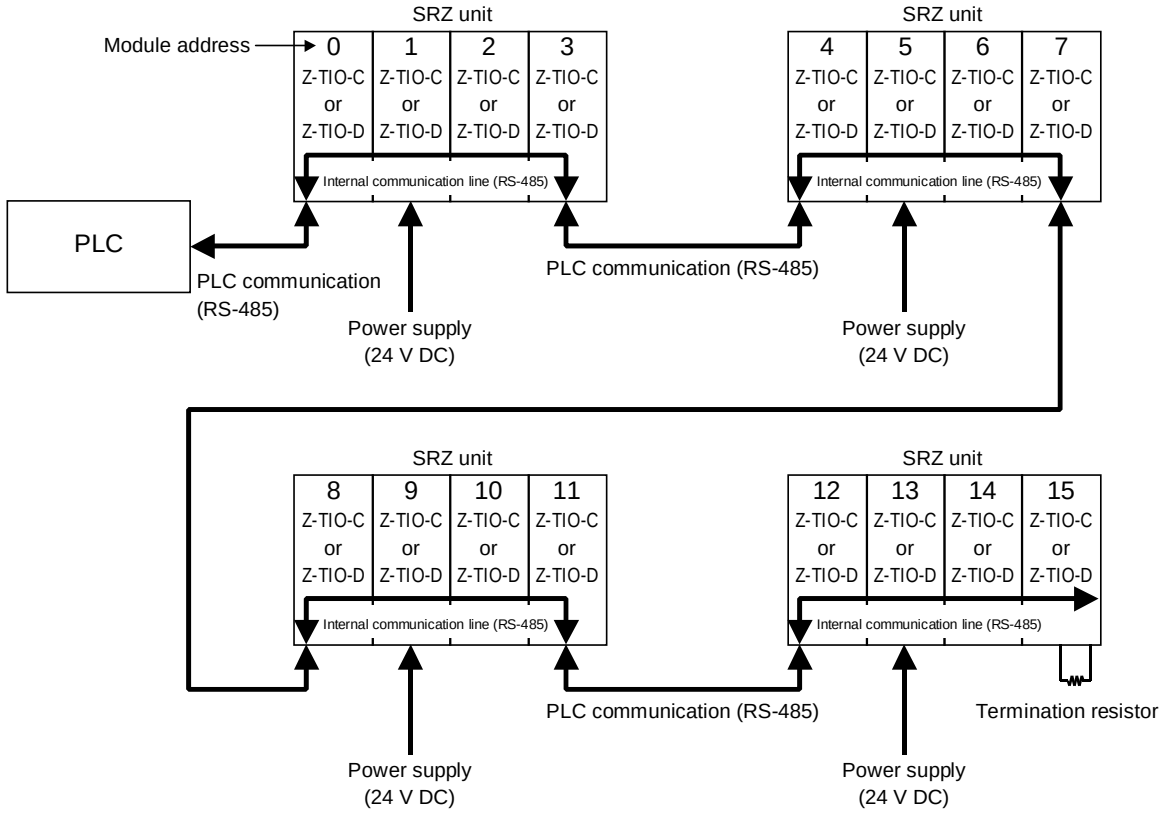
■ Connecting distributed Z-TIO-C/D modules

Distributed Z-TIO-C/D modules can be connected using a communication cable. Up to 16 modules can be singly distributed and connected.

To connect distributed modules, the power supply must be connected to each SRZ unit.

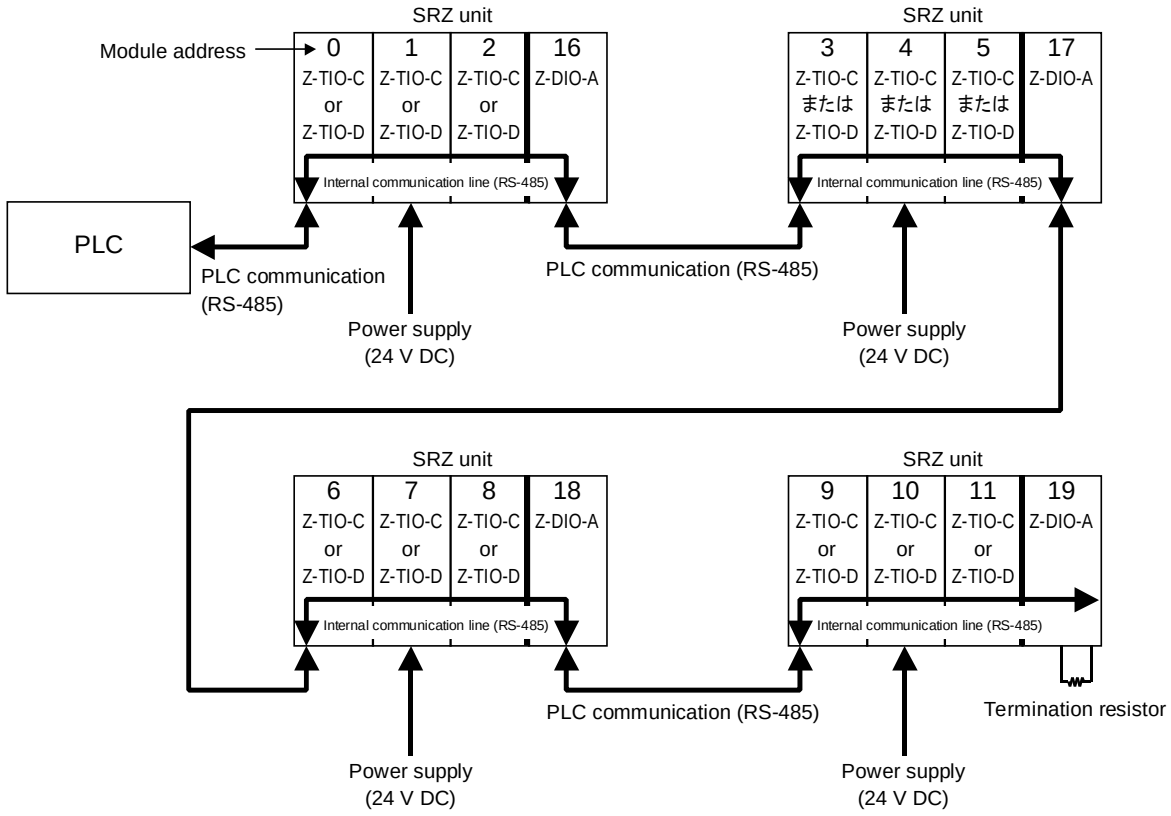
- Configuration example 1 (Connecting modules distributed in sets of four)

PLC .....1 module
Z-TIO-C or Z-TIO-D module.....16 modules

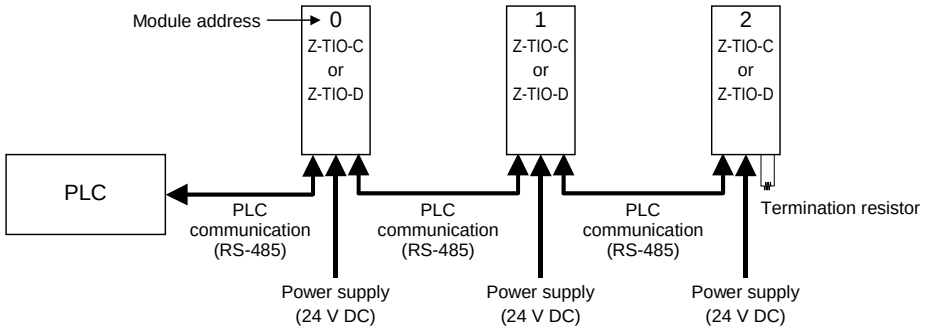


- Configuration example 2
  (When Z-TIO-C/D modules are distributed in sets of three modules each and connected to Z-DIO-A modules.)

PLC ..... 1 module
Z-TIO-C or Z-TIO-D module..... 12 modules
Z-DIO-A module ..... 4 modules



To connect singly distributed Z-TIO-C/D modules, the power supply must be connected to each module.



5.4.2 Connection configuration for host communication

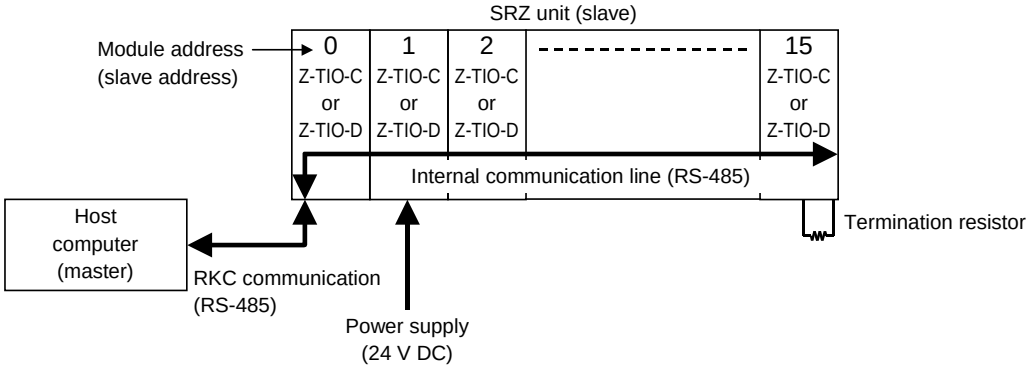
■ SRZ modules that can be connected to Z-TIO-C/D modules when host communication is performed

Z-DIO-A module	Connectable
Z-TIO-A or Z-TIO-B module	Connectable
Z-COM-A module	Connectable

■ When two more Z-TIO-C/D modules are connected

- Configuration example

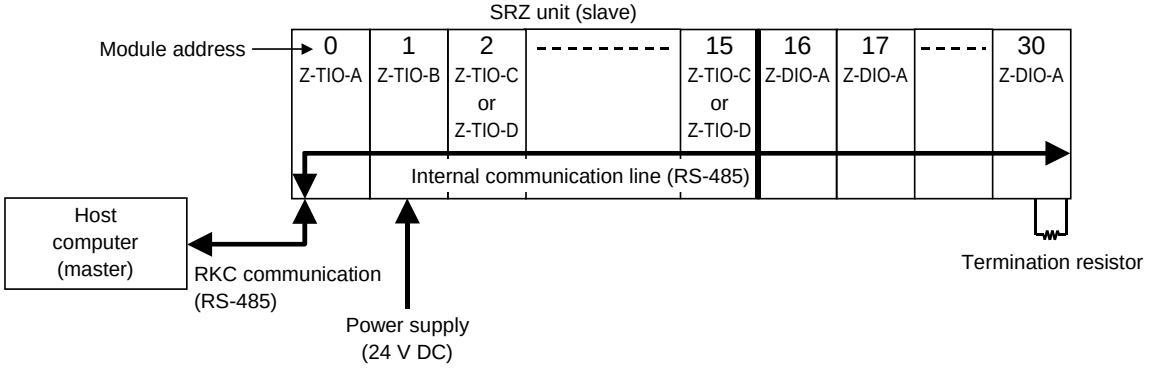
Z-TIO-C or Z-TIO-D module..... 16 module



■ Connecting Z-TIO-C/D modules mixed with other modules

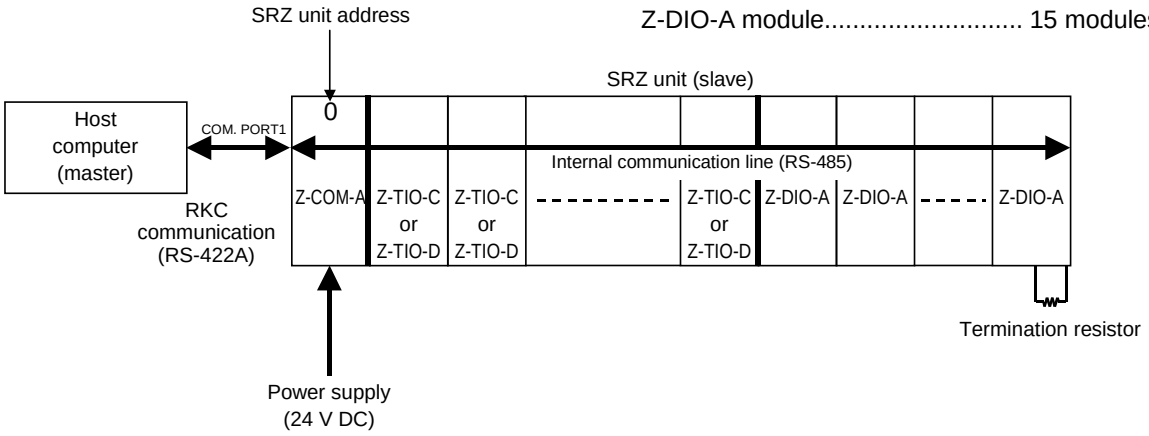
- Configuration example 1

Z-TIO-A module..... 1 module
Z-TIO-B module..... 1 module
Z-TIO-C or Z-TIO-D module..... 14 modules
Z-DIO-A module..... 15 modules



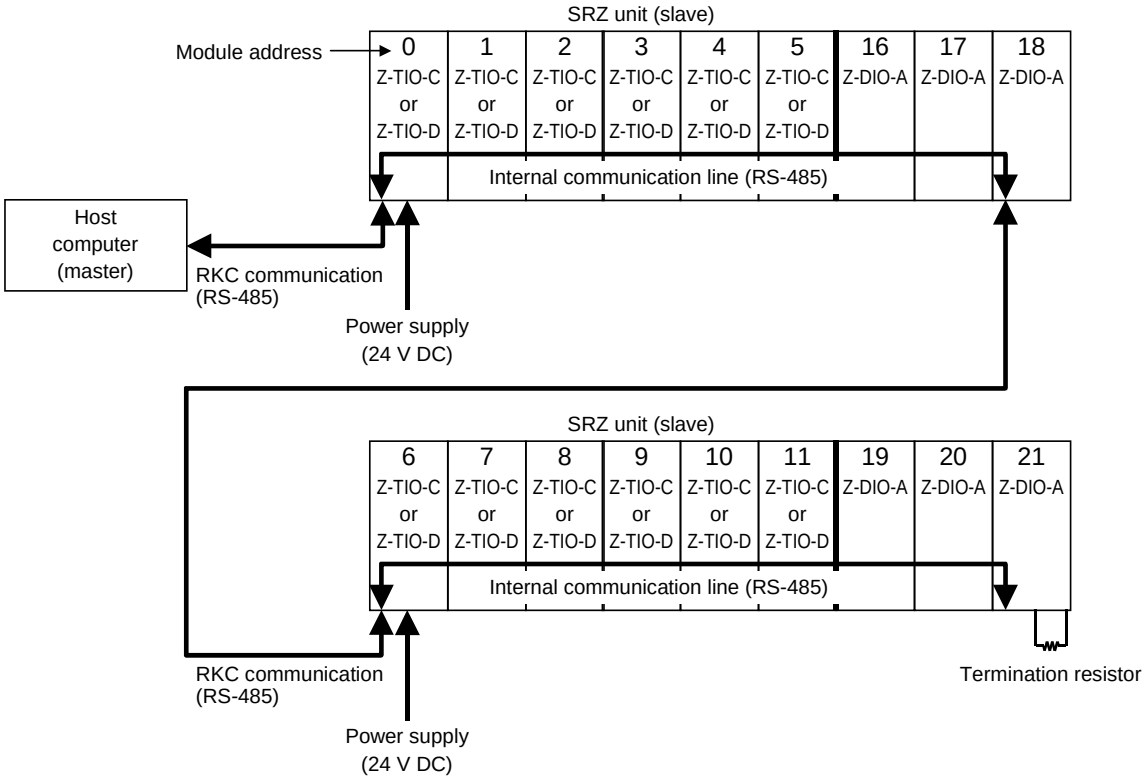
- Configuration example 2

Z-COM-A module..... 1 module
Z-TIO-C or Z-TIO-D module..... 16 modules
Z-DIO-A module..... 15 modules



■ When two more SRZ unit modules are connected

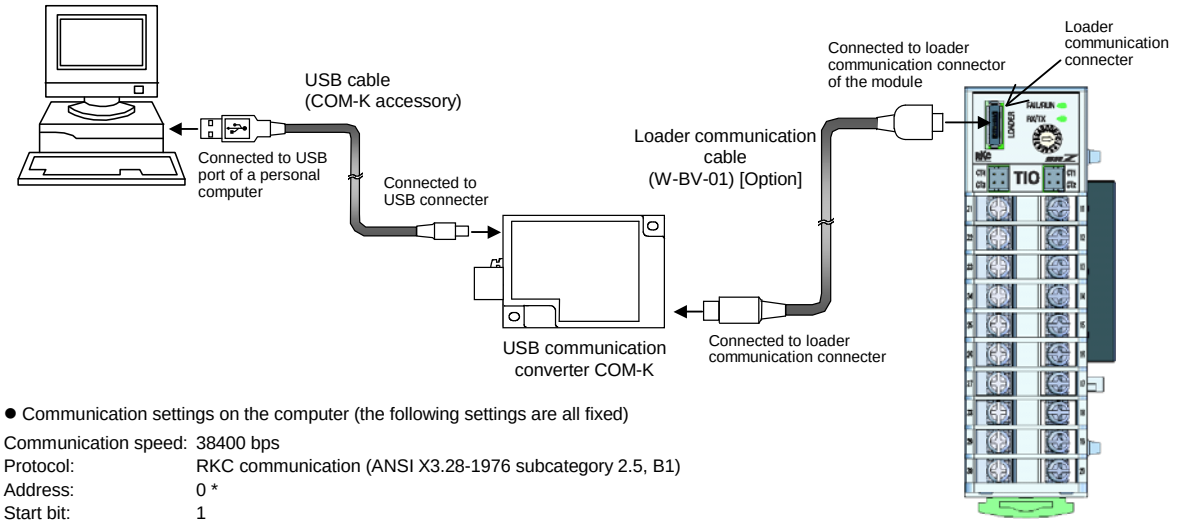
Z-TIO-C or Z-TIO-D module..... 12 modules
Z-DIO-A module..... 6 module



5.5 Connections for Loader Communication

Each function module is equipped standard with a loader communication connector.
The module loader communication connector, our COM-K USB communication converter (sold separately) *, and a personal computer can be connected with the appropriate cables.

* A loader communication cable (option) is required for the connection to the loader communication connector on the module.
  USB communication converter COM-K-1 (with Loader communication cable [cable length: 1 m])



● Communication settings on the computer (the following settings are all fixed)

Communication speed:	38400 bps
Protocol:	RKC communication (ANSI X3.28-1976 subcategory 2.5, B1)
Address:	0 *
Start bit:	1
Data bit:	8
Parity bit:	Without
Stop bit:	1

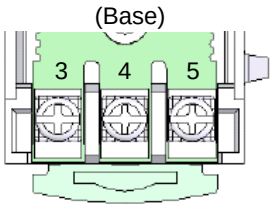
* Not related to the address setting of the address setting switch on the module.

The Loader port is only for parameter setup.

For the COM-K, see the **COM-K Instruction Manual (IMR01Z01-E□).**

5.6 Connection to Host Computer

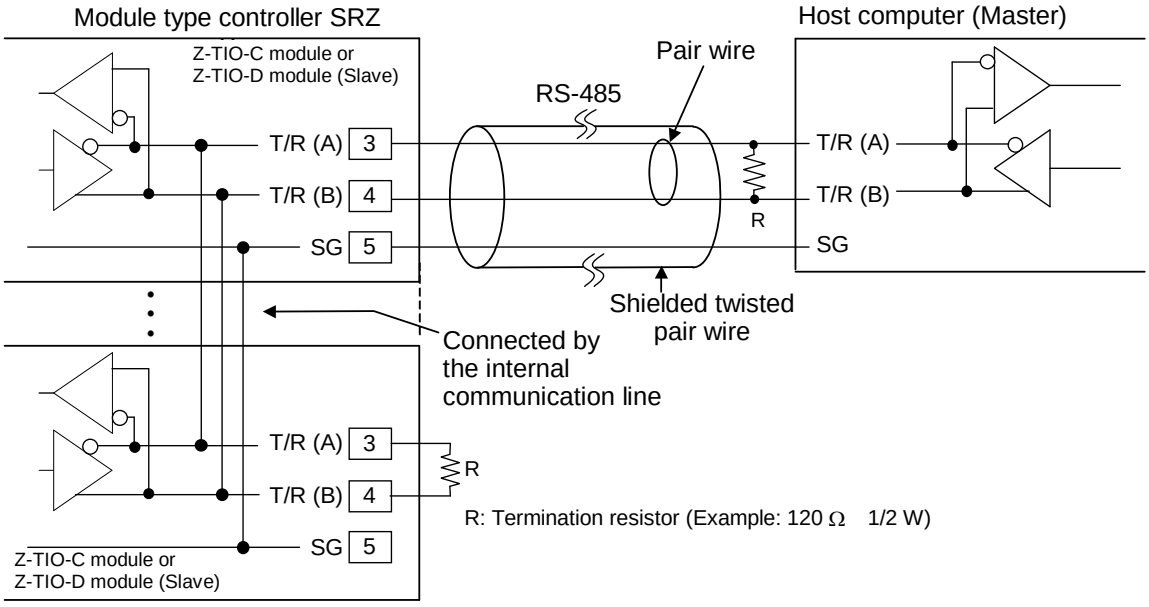
■ Terminal number and signal details



Terminal No.	Signal name	Symbol
3	Send data/Receive data	T/R (B)
4	Send data/Receive data	T/R (A)
5	Signal ground	SG

■ Wiring figure

● Connection to the RS-485 port of the host computer (master)



Up to 16 Z-TIO-C/D modules can be connected.
The maximum number of SRZ modules (including other function modules) on the same communication line is 31.

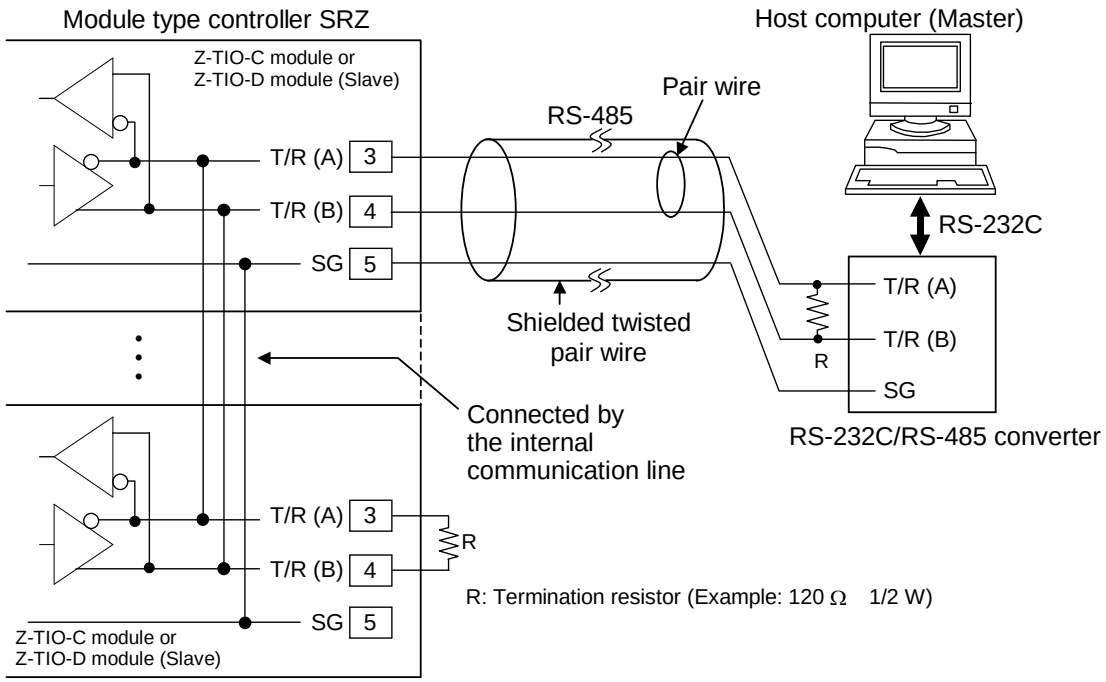
📖 The cable must be provided by the customer.

📖 The above figure shows an example of connecting of Z-TIO-C/D modules. However, this figure is also used even when the Z-TIO-A/B module or Z-DIO-A module is connected instead of the Z-TIO-C/D module.

☞ For installation method of termination resistor of the SRZ side, see **5.8 Installation of Termination Resistor (P. 5-21).**

- **Connection to the RS-232C port of the host computer (master)**

A RS-232C/RS-485 converter is required.



Up to 16 Z-TIO-C/D modules can be connected.
The maximum number of SRZ modules (including other function modules) on the same communication line is 31.

When the host computer (master) uses Windows95/98/Me/NT/2000/XP, use a RS-232C/RS-485 converter with an automatic send/receive transfer function.
Recommended RS-232C/RS-485 converter:
CD485, CD485/Vmanufactured by Data Link, Inc. or equivalent

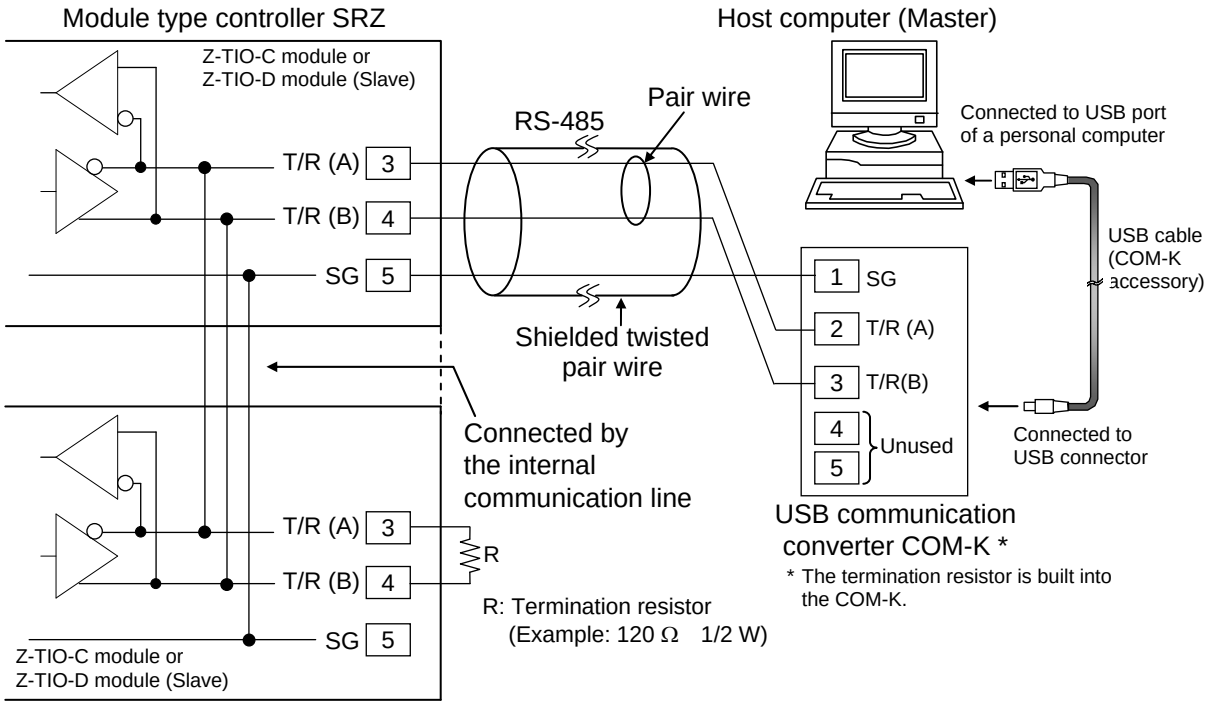
The cable must be provided by the customer.

The above figure shows an example of connecting of Z-TIO-C/D modules. However, this figure is also used even when the Z-TIO-A/B module or Z-DIO-A module is connected instead of the Z-TIO-C/D module.

For installation method of termination resistor of the SRZ side, see **5.8 Installation of Termination Resistor (P. 5-21).**

● Connection to the USB of the host computer (master)

When the host computer (OS: Windows 98SE/2000/XP) is corresponding to the USB connector, our communication converter COM-K (sold separately) can be used.



Up to 16 Z-TIO-C/D modules can be connected.
The maximum number of SRZ modules (including other function modules) on the same communication line is 31.

For the COM-K, see **COM-K Instruction Manual (IMR01Z01-E□)**.

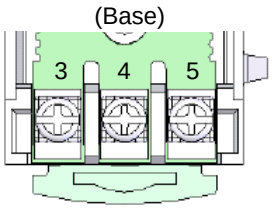
The cable must be provided by the customer.

The above figure shows an example of connecting of Z-TIO-C/D modules. However, this figure is also used even when the Z-TIO-A/B module or Z-DIO-A module is connected instead of the Z-TIO-C/D module.

For installation method of termination resistor of the SRZ side, see **5.8 Installation of Termination Resistor (P. 5-21).**

5.7 Connection to PLC

■ Terminal number and signal details

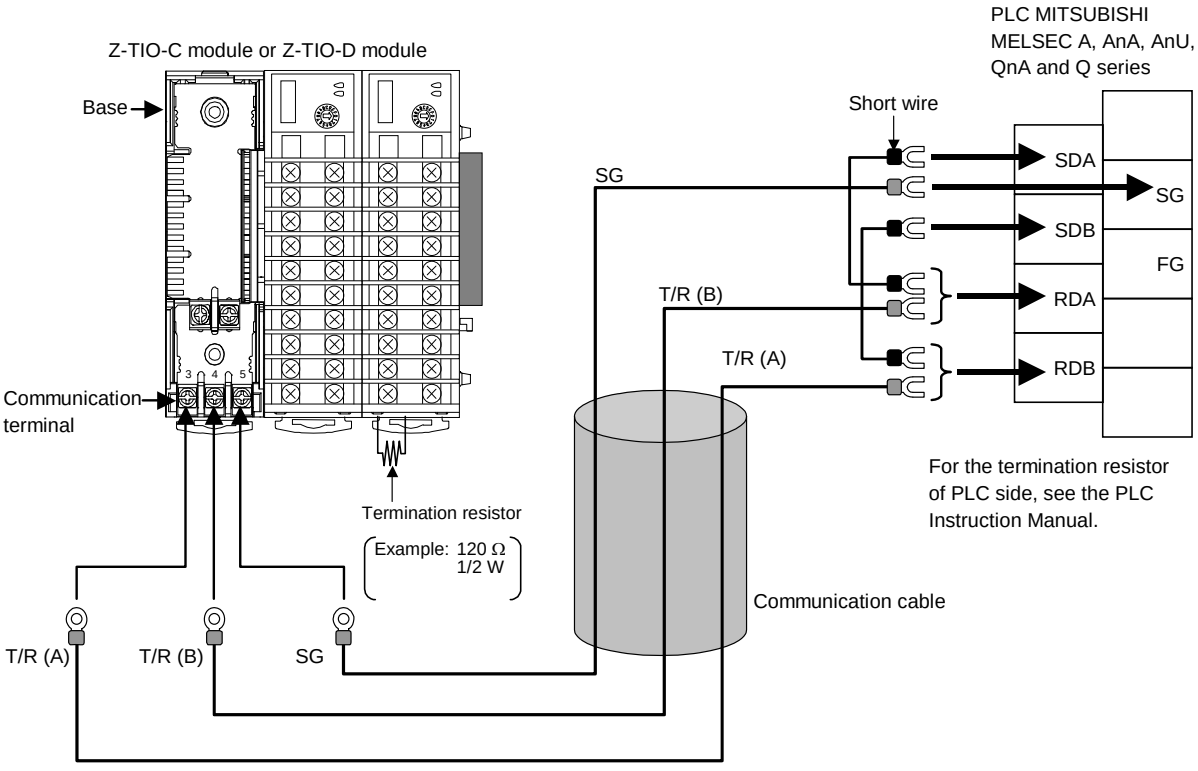


Terminal No.	Signal name	Symbol
3	Send data/Receive data	T/R (B)
4	Send data/Receive data	T/R (A)
5	Signal ground	SG

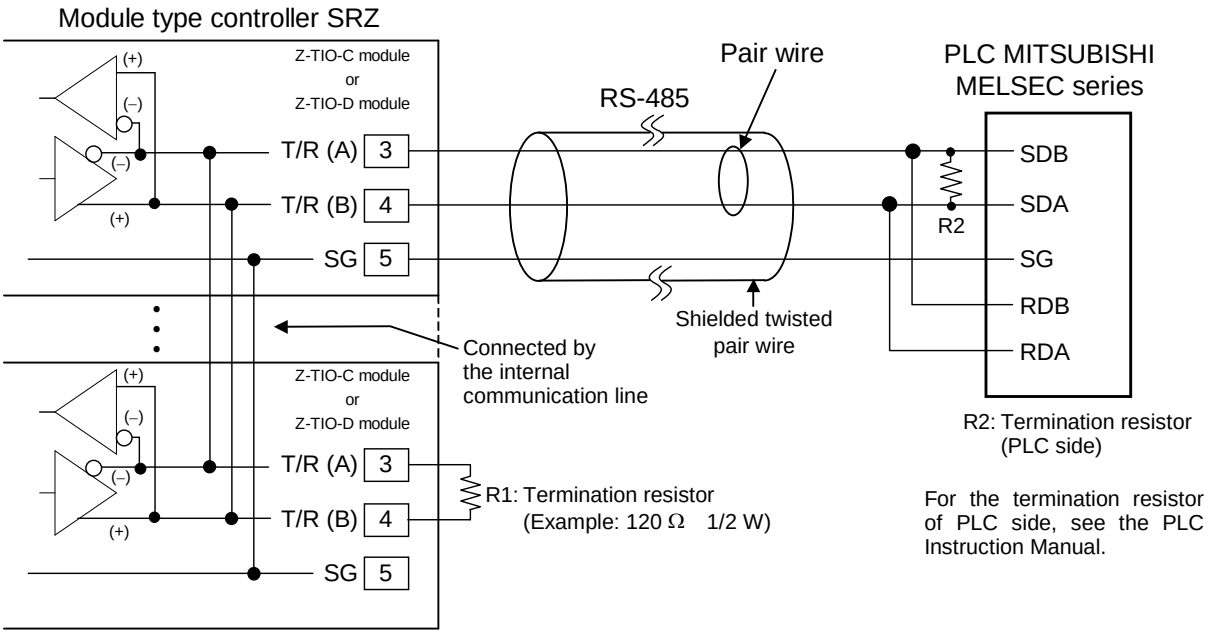
■ Wiring example

Connect a termination resistor between the communication terminals (No.3 and 4) of the module at the end of the communication line from the host computer or PLC.

The cable must be provided by the customer.



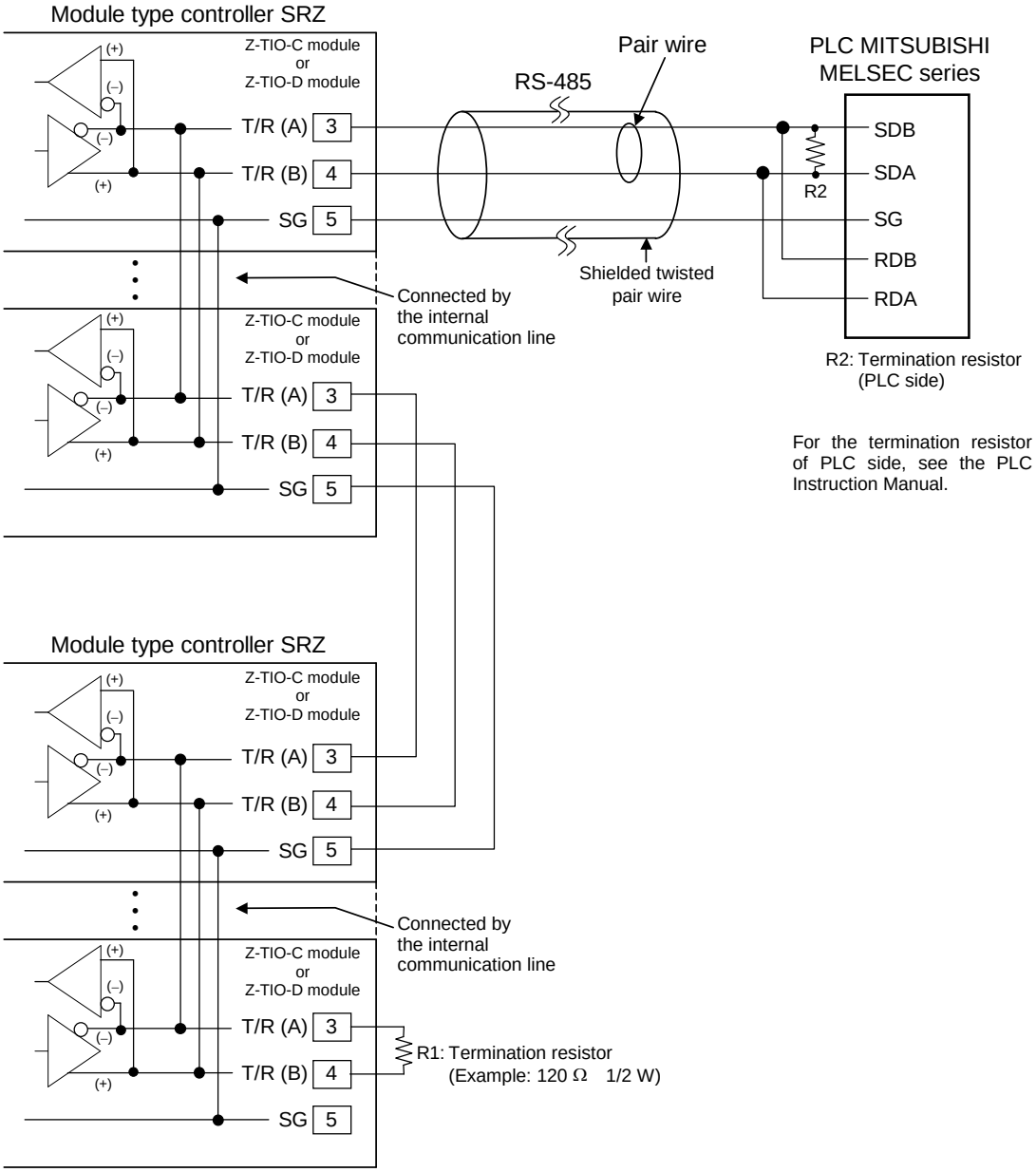
- **Diagram of wiring (Connecting joined Z-TIO-C/D modules)**



Up to 16 Z-TIO-C/D modules can be connected.

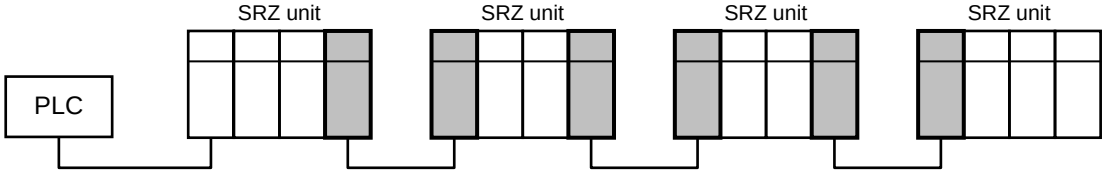
When preparing a cable of connecting the MITSUBISHI MELSEC series to our Z-TIO-C/D module, cross each pair of wires the A and B terminal positions on their terminal boards are not symmetrical.

- **Diagram of wiring (Connecting distributed Z-TIO-C/D modules)**



When preparing a cable of connecting the MITSUBISHI MELSEC series to our Z-TIO-C/D module, cross each pair of wires the A and B terminal positions on their terminal boards are not symmetrical.

When connecting distributed modules, connect the modules on the ends of the SRZ units to each other.



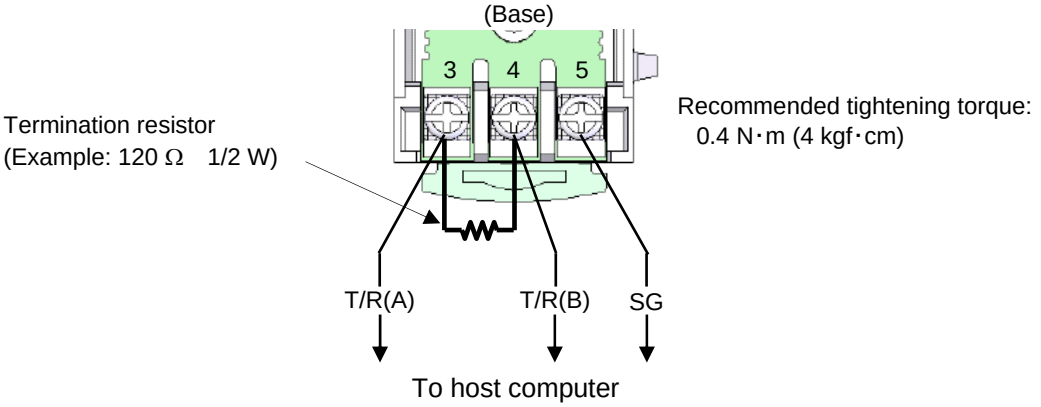
5.8 Installation of Termination Resistor

When connecting termination resistors to each end of the RS-485 communication line, follow the procedure below to connect the resistor to the SRZ end.

For the termination resistor on the host computer side, connect it so as to satisfy the host computer used.

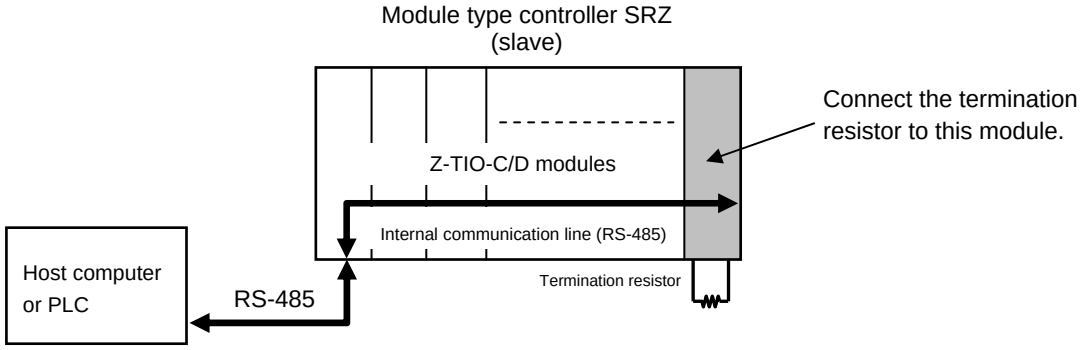
■ Mounting position

Connect a termination resistor between the communication terminals (No.3 and 4) of the module at the end of the communication line from the host computer.

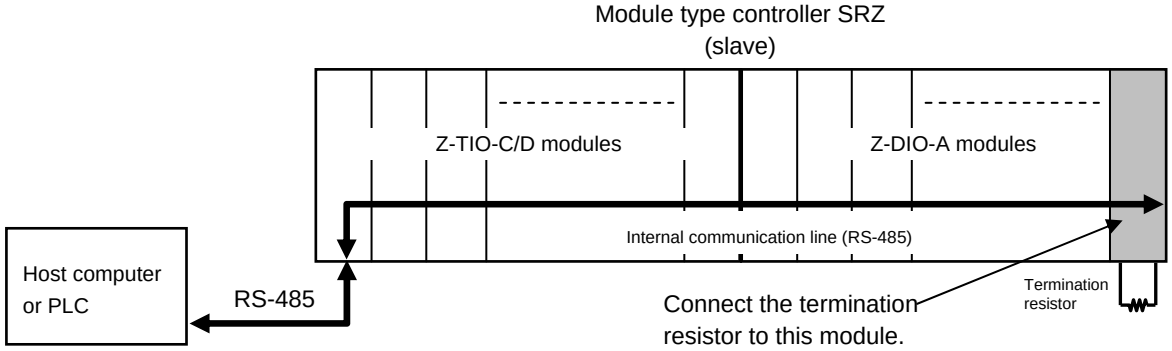


Even if there is only one SRZ module, install a termination resistor.

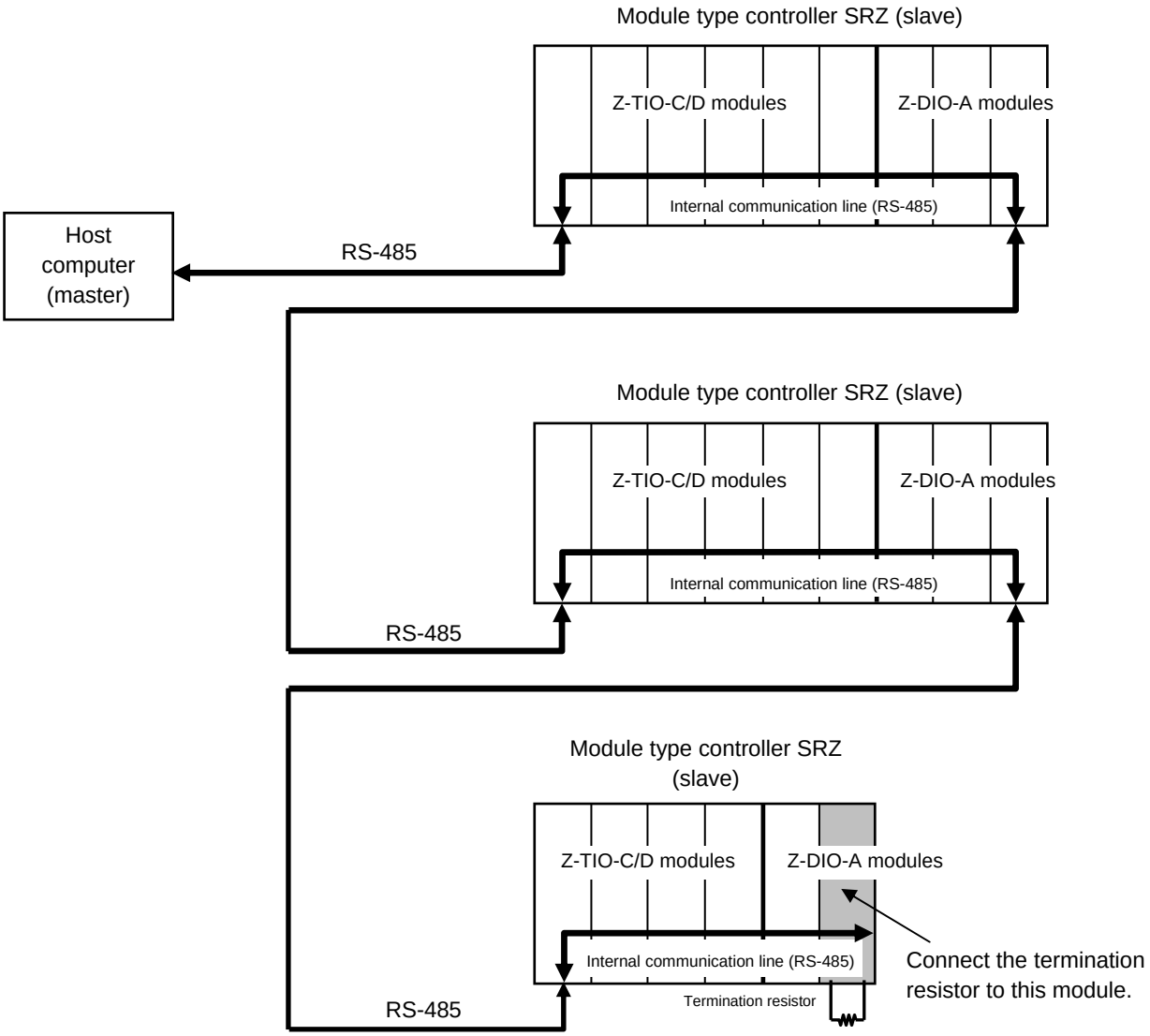
- **When two more Z-TIO-C/D modules are connected**



- **When multiple other function modules (Z-DIO-A) are connected to Z-TIO-C/D modules**



- **When two more SRZ unit modules are connected**



6 PLC COMMUNICATION

6.1 Usable PLC Modules

■ Usable PLC modules (MITSUBISHI MELSEC series)

Name	Type
Computer link module	● AJ71UC24 ● A1SJ71UC24-R4 ● A1SJ71C24-R4 The module which ACPU common command or AnA/AnUCPU common command (type 4) can use.
Serial communication modules	● AJ71QC24N ● A1SJ71QC24N ● QJ71C24 The module which ACPU common command or AnA/AnUCPU common command (type 4) can use.
Special adapter	● FX2NC-485ADP ● FX0N-485ADP ● FX3U-485ADP
Expanded function board	● FX2N-485BD ● FX3U-485-BD

6.2 PLC Communication Environment Setting

To perform PLC communication, PCL communication environment settings must be configured in the Z-TIO-C/D modules. The system data settings are made by the loader communication or host communication.

6.2.1 When set the PLC communication environment via loader communication

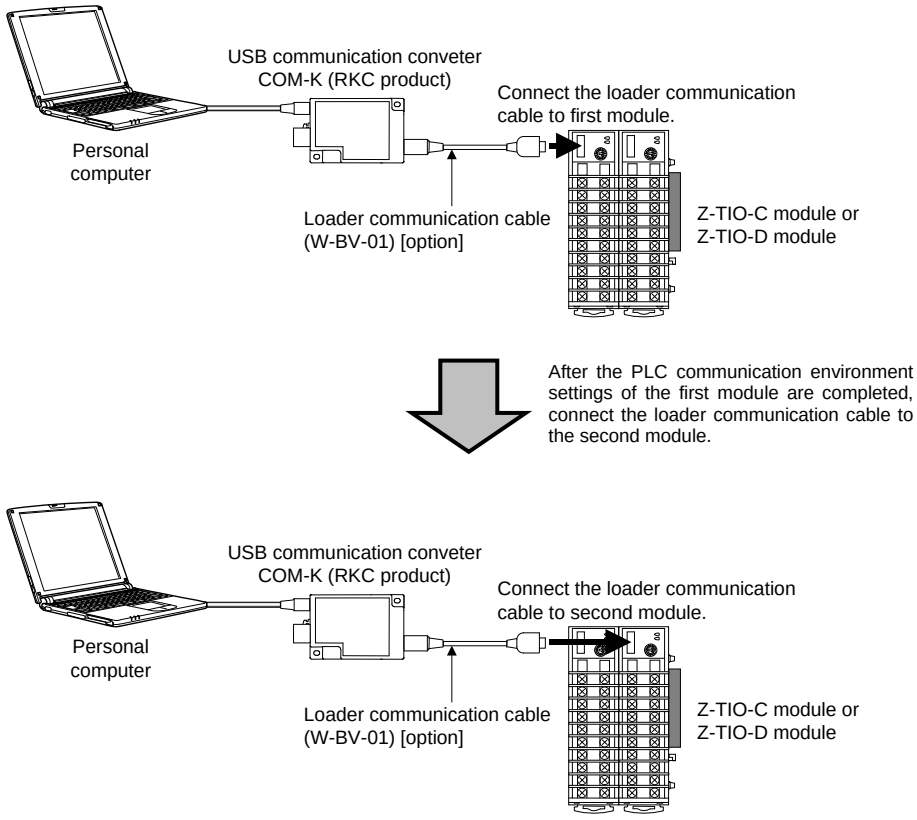
■ Preparation of Communication program

To perform loader communication, our converter and a communication cable are required.

- USB communication converter COM-K (With USB cable)
- Loader communication cable W-BV-01 [option]

■ Settings

The PLC communication environment must be configured in each module. When multiple Z-TIO-C/D modules are used, the settings are configured in each module.



6.2.2 Preparation of Communication program

To perform loader communication or host communication, a communication program is necessary. The customer should refer to the RKC communication protocol or modbus communication protocol and create a communication program.
(However, modbus communication protocol can not be used for loader communication.)

☞ For the communication protocol, see **SRZ Instruction Manual (IMS01T04-E□)**.

6.2.3 PLC communication environment items list

The following items are set to the Z-TIO-C/D module.

(1) Setting items list

The following items become valid by turning off the power of the SRZ unit once, and then turning it on again after the settings are changed.
The items will also become valid by switching control from STOP to RUN.

All of the following items can be read and written (R/W). In addition, no channel designation is required.

"Identifier" and "Digits" are used for RKC communication and "Register address" is used for Modbus.

Name	Iden-tifier	Digits	Register address		Data range	Factory set value
			HEX	DEC		
Station number	**QV**	7	0164	356	0 to 31 Set the PLC station number. Set it to the same number as the PLC.	0
PC number	**QW**	7	0165	357	0 to 255 Set the PLC PC number. Set it to the same number as the PLC. Set all Z-TIO-C/D modules to the same values.	255
Register type (D, R, W, ZR)	**QZ**	7	0166	358	0: D register (data register) 1: R register (file register) 2: W register (link register) 3: ZR register Method of specifying consecutive numbers when 32767 of R register is exceeded. When the ZR register is selected, QnA compatible 3C frame communication is used. Set the register types used in PLC communication. (See **P. 6-11**)	0
Register start number (High-order 4-bit)	**QS**	7	0167	359	0 to 15 Set the start number of the register of system data used in PLC communication. (QnA compatible 3C frame only) Set this if the register address 65535 is exceeded in the ZR register. (For the setting procedure, see **P. 6-11)**	0

Continued on the next page.

Continued from the previous page.

Name	Iden-tifier	Digits	Register address		Data range	Factory set value
			HEX	DEC		
Register start number (Low-order 16-bit)	**QX**	7	0168	360	0 to 9999 A compatible, 1C frame, ACPU common command (WR/WW) If a value higher than 9999 is set, a "PLC register read/write error" will result. (excluding the W register) 0 to 65535 A compatible 1C frame AnA/AnU CPU common command (QR/QW), QnA compatible 3C frame Set the start number of the register of system data used in PLC communication. System data is required to perform PLC communication. The system data occupies ten PLC registers. (For the setting procedure, see **P. 6-11)**	1000
Monitor item register bias	**R3**	7	0169	361	10 to 9999 A compatible, 1C frame, ACPU common command (WR/WW) 10 to 65535 A compatible 1C frame AnA/AnU CPU common command (QR/QW), QnA compatible 3C frame Set the start number of the register of monitor group communication data. A bias is applied to the register start number. The factory set value for the register bias is 10, and thus the register start number of the monitor group is D01010. Equation for calculating: Register start number of monitor group = Register start number + Monitor item register bias	10

Continued on the next page.

Continued from the previous page.

Name	Iden-tifier	Digits	Register address		Data range	Factory set value
			HEX	DEC		
Setting item register bias	**R4**	7	016A	362	0, 10 to 9999 A compatible, 1C frame, ACPU common command (WR/WW) 0, 10 to 65535 A compatible 1C frame AnA/AnU CPU common command (QR/QW), QnA compatible 3C frame Set the start number of the register of setting group communication data. When set to 0 to 9 In the monitor group, the register start number of the setting group is set after the communication data of the last address. When set to 10 or more A bias is applied to the register start number of the system data. If set to 10 or greater, take care that overlapping of the communication data of the monitor group and the register address does not occur. Equation for calculating: Register start number of setting group = Register start number + Setting item register bias	0
Monitor item selection	**R6**	7	016C	364	0 to 65535 Select the communication data of monitor group. The selected communication data only performs PLC communication. Convert binary to decimal and configure the setting. (See **P. 6-8 Table 1**.)	33535
Setting item selection	**R7**	7	016D * ⋮ 0170	365 * ⋮ 368	0 to 65535 Select the communication data of setting group. The selected communication data only performs PLC communication. Convert binary to decimal and configure the setting. (See **P. 6-9 Table 2**.)	ch1: 62427 ch2: 15583 ch3: 512 ch4: 512

* ch1 register address: 016D (Hexadecimal number) 365 (Decimal number)
ch2 register address: 016E (Hexadecimal number) 366 (Decimal number)
ch3 register address: 016F (Hexadecimal number) 367 (Decimal number)
ch4 register address: 0170 (Hexadecimal number) 368 (Decimal number)

Continued on the next page.

Continued from the previous page.

Name	Iden-tifier	Digits	Register address		Data range	Factory set value
			HEX	DEC		
Z-TIO module link recognition time	**QT**	7	0171	369	0 to 255 seconds When connecting two or more Z-TIO-C/D module, set the time required until a module after the second module is recognized. Set this item to the master module (address 0).	5
PLC scanning time	**VT**	7	0172	370	0 to 3000 ms Set the time of waiting for a response from the PLC. Usually, no factory set values are necessary to be changed.	255
PLC communication start time	**R5**	7	0173	371	1 to 255 seconds Time until communication with the PLC starts is set after the power is turned on. The PLC communication start time is the time that writing of the system data starts. Actual communication with the PLC by request command can only take place after the system communication state (D01000) changes to "1."	5
Slave register bias	**R8**	7	0175	373	0 to 65535 When connecting two or more Z-TIO-C/D module, a bias is set for the register addresses of each module so that no address duplication occurs. Set bias enable/disable with the address setting switch. When set the address setting switch to 0: Bias disabled When set the address setting switch to other than 0: Bias enabled Equation for calculating: Slave register start number = Register start number + (Address setting switch) × Slave register bias (See **P. 6-13**.)	150

Continued on the next page.

Continued from the previous page.

Name	Identifier	Digits	Register address		Data range	Factory set value
			HEX	DEC		
Interval time	**ZX**	7	035B	859	0 to 250 ms On some PLC models, the interval time must be set or the PLC will not be able to respond. If communication does not take place correctly on an older MELSEC A Series model, set the interval time to 30 milliseconds or more. Interval time is the engineering setting data. When the Z-TIO module of setting data is stopped, write is possible.	10

Table 1: Monitor item selection (Communication data of monitor group)

Communication data of monitor group is assigned as a bit image in binary numbers. Set decimal-converted values.

Bit image: 0000000000000000 (bit 15 ..... bit 0)

0: Unused
1: used

The selected communication data is justified upward in the PLC register.

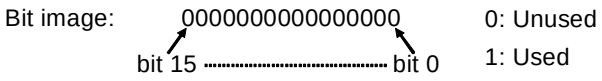
Bit	Communication data (Monitor item)	Number of data	Factory set value	
			Binary	Decimal
0	Measured value (PV)	4	1	33535
1	Comprehensive event state	4	1	
2	Operation mode state monitor	4	1	
3	Error code	4 *	1	
4	Manipulated output value (MV) monitor [heat-side] ♣	4	1	
5	Manipulated output value (MV) monitor [cool-side] ♣	4	1	
6	Current transformer (CT) input value monitor	4	1	
7	Set value (SV) monitor	4	1	
8	Remote setting (RS) input value monitor	4	0	
9	Output state monitor	4 *	1	
10	Memory area soak time monitor	4	0	
11	Integrated operating time monitor	4 *	0	
12	Holding peak value ambient temperature monitor	4	0	
13	Backup memory state monitor	4 *	0	
14	Logic output monitor	4 *	0	
15	Memory area number monitor	4	1	

♣ When heat/cool control or position proportioning control is performed, there will be communication data (indicated by ♣ in the name column) for which the 2nd channel and 4th channel will be invalid. [Read is possible (0 is shown), but the result of Write is disregarded.]

* Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

Table 2: Setting item selection (Communication data of setting group)

Communication data of setting group is assigned as a bit image in binary numbers. Set decimal-converted values.



The selected communication data is justified upward in the PLC register.

Selection item of ch1

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	1	PID/AT transfer	4	1	62427
1	2	Auto/Manual transfer	4	1	
2	3	Remote/Local transfer	4	0	
3	4	RUN/STOP transfer	4 *	1	
4	5	Memory area transfer	4	1	
5	6	Interlock release	4	0	
6	7	Event 1 set value (EV1) ★	4	1	
7	8	Event 2 set value (EV2) ★	4	1	
8	9	Event 3 set value (EV3) ★	4	1	
9	10	Event 4 set value (EV4) ★	4	1	
10	11	Control loop break alarm (LBA) time ★	4	0	
11	12	LBA deadband ★	4	0	
12	13	Set value (SV) ★	4	1	
13	14	Proportional band [heat-side] ★♣	4	1	
14	15	Integral time [heat-side] ★♣	4	1	
15	16	Derivative time [heat-side] ★♣	4	1	

♣ When heat/cool control or position proportioning control is performed, there will be communication data (indicated by ♣ in the name column) for which the 2nd channel and 4th channel will be invalid. [Read is possible (0 is shown), but the result of Write is disregarded.]

* Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

★ Parameters which can be used in multi-memory area function

Selection item of ch2

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	17	Control response parameter ★♣	4	1	15583
1	18	Proportional band [cool-side] ★♣	4	1	
2	19	Integral time [cool-side] ★♣	4	1	
3	20	Derivative time [cool-side] ★♣	4	1	
4	21	Overlap/Deadband ★♣	4	1	
5	22	Manual reset ★	4	0	
6	23	Setting change rate limiter (up) ★	4	1	
7	24	Setting change rate limiter (down) ★	4	1	
8	25	Area soak time ★	4	0	
9	26	Link area number ★	4	0	
10	27	Heater break alarm (HBA) set value	4	1	
11	28	Heater break determination point	4	1	
12	29	Heater melting determination point	4	1	
13	30	PV bias	4	1	
14	31	PV digital filter	4	0	
15	32	PV ratio	4	0	

♣ When heat/cool control or position proportioning control is performed, there will be communication data (indicated by ♣ in the name column) for which the 2nd channel and 4th channel will be invalid. [Read is possible (0 is shown), but the result of Write is disregarded.]

★ Parameters which can be used in multi-memory area function

Selection item of ch3

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	33	PV low input cut-off	4	0	512
1	34	RS bias	4	0	
2	35	RS digital filter	4	0	
3	36	RS ratio	4	0	
4	37	Output distribution selection	4	0	
5	38	Output distribution bias	4	0	
6	39	Output distribution ratio	4	0	
7	40	Proportional cycle time	4	0	
8	41	Minimum ON/OFF time of proportioning cycle	4	0	
9	42	Manual manipulated output value ♣	4	1	
10	43	Area soak time stop function	4	0	
11	44	EDS mode (for disturbance 1)	4	0	
12	45	EDS mode (for disturbance 2)	4	0	
13	46	EDS value 1 (for disturbance 1)	4	0	
14	47	EDS value 1 (for disturbance 2)	4	0	
15	48	EDS value 2 (for disturbance 1)	4	0	

♣ When heat/cool control or position proportioning control is performed, there will be communication data (indicated by ♣ in the name column) for which the 2nd channel and 4th channel will be invalid. [Read is possible (0 is shown), but the result of Write is disregarded.]

Selection item of ch4

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	49	EDS value 2 (for disturbance 2)	4	0	512
1	50	EDS transfer time (for disturbance 1)	4	0	
2	51	EDS transfer time (for disturbance 2)	4	0	
3	52	EDS action time (for disturbance 1)	4	0	
4	53	EDS action time (for disturbance 2)	4	0	
5	54	EDS action wait time (for disturbance 1)	4	0	
6	55	EDS action wait time (for disturbance 2)	4	0	
7	56	EDS value learning times	4	0	
8	57	EDS start signal	4	0	
9	58	Operation mode	4	1	
10	59	Startup tuning (ST)	4	0	
11	60	Automatic temperature rise learning	4	0	
12	61	Communication switch for logic	4 *	0	
13	62	Unused	4	0	
14	63	Unused	4	0	
15	64	Unused	4	0	

* Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

(2) Explanation of PLC communication environment setting function

■ Changing the register type

The register type used for PLC communication can be changed. The factory set value is set to D register (data register).

■ Register start number, Monitor item register bias, Setting item register bias

The area to be used in the PLC register address can be set. Data that can be communicated by PLC communication is arranged in the order “system data,” “monitor group”, “setting group”.

- In “Register start number (High-order 4-bit)” and “Register start number (Low-order 16-bit),” set the start number (start number of system data) of the register used for PLC communication. (factory set value: 1000)

- In “Monitor item register bias,” set the start number of the monitor group. The bias will be applied to the register start number (start number of system data). (factory set value: 10)

  Equation for calculating:
  Register start number of monitor group = Register start number + Monitor item register bias

- In “Setting item register bias,” set the start number of the setting group.
  If set from 0 to 9, the setting group register start number will be set following the register that has the last number in the monitor group. (factory set value: 0)
  If set to 10 or more, a bias will be applied to the start number of the register (start number of system data).
  If set to 10 or greater, take care that overlapping data of the monitor group and the register address does not occur.

  Equation for calculating (When set to 10 or more):
  Register start number of setting group = Register start number + Setting item register bias

Register address example of PLC communication data (factory set value)

Communication data type	Register address	Contents
System data	D01000 ⋮ D01009	Start number [Register start number (Low-order 16-bit)] ⋮ Last number
Communication data of monitor group	D01010 ⋮ D01049	Start number [Monitor item register bias factory set value: 10] ⋮ Last number
Communication data of setting group	D01050 ⋮ D01149	Start number [Setting item register bias factory set value: 0] ⋮ Last number

☞ For register address of PLC communication data, see **6.4 PLC Communication Data Map (P. 6-24)**.

- **Setting method of the register start number**

When any numbers from 0 to 65535 are set the register start number

1. Set the register start number (High-order 4-bit) to 0.

2. In the register start number (low-order 16-bit), set the register address to a value from 0 to 65535.

Example: When set the register start number to “10188”

Register start number (High-order 4-bit) Set the “0.”	Register start number (Low-order16-bit) Set the “10188.”

When any numbers from 65536 to 1042431 are set the register start number (ZR register)

If set within the range from 65536 to 1042431, the register address must be converted. The converted register address is set in two parts in the register start number (high-order 4-bit) and the register start number (low-order 16-bit). Set the value as shown in the example below.

Example 1
When set the register start number to 65536

- Convert **65536** to hexadecimal.
- **10000** (Hexadecimal)
- Separate **10000** into the upper 4 digits and the lower four digits.
  High-order Low-order
  1 **0000** (Hexadecimal)
- Separately convert the upper digits and the lower digits back to decimal.
- High-order Low-order
  1 **0** (Decimal)
- Set the register start number (High-order 4-bit) to “**1**.”
  Set the register start number (Low-order 16-bit) to “**0**.”

Example 2
When set the register start number to 100000

- Convert **100000** to hexadecimal.
- **186A0** (Hexadecimal)
- Separate **186A0** into the upper 4 digits and the lower four digits.
  High-order Low-order
  1 **86A0** (Hexadecimal)
- Separately convert the upper digits and the lower digits back to decimal.
- High-order Low-order
  1 **34464** (Decimal)
- Set the register start number (High-order 4-bit) to “**1**.”
  Set the register start number (Low-order 16-bit) to “**34464**.”

Example 3
When set the register start number to 1040332

- Convert **1040332** to hexadecimal.
- **FDFCC** (Hexadecimal)
- Separate **FDFCC** into the upper 4 digits and the lower four digits.
  High-order Low-order
  F **DFCC** (Hexadecimal)
- Separately convert the upper digits and the lower digits back to decimal.
- High-order Low-order
  15 **57292** (Decimal)
- Set the register start number (High-order 4-bit) to “**15**.”
  Set the register start number (Low-order 16-bit) to “**57292**.”

■ Monitor item selection, Setting item selection

This setting is used to shorten the data update period by eliminating unneeded items from the data communicated to the PLC. Only communication data selected using this setting is written to the PLC.
(The amount of the PLC register that is used can also be reduced.)
Monitor item selection or setting item selection state is assigned as a bit image in binary numbers.

Bit image: 0000000000000000

bit 15 ····· bit 0

■ Z-TIO module link recognition time

In order to recognize the existence of slaves (with addresses 1 to F) when communication with the PLC is performed using two or more connected Z-TIO-C/D modules, the master (with address "0") checks whether or not slaves exist during the time following power-on that is set using "Z-TIO module link recognition time." The master determines that slaves with addresses from which no response is received during the set time do not exist, and thereafter only communicates with addresses that do exist.

Only set this item for a Z-TIO-C module or Z-TIO-D module with an address of "0" (master).

■ Slave register bias

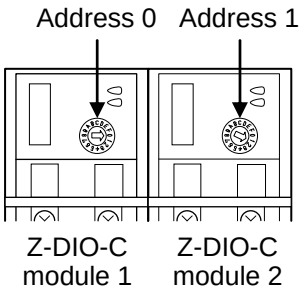
When two or more Z-TIO-C/D modules are connected, a bias can be set to prevent duplication of register addresses. Setting the slave register bias prevents duplication of register addresses of each Z-TIO-C/D module by the address setting switch.

Equation for calculating:
Slave register start number = Register start number + (Address setting switch)´ Slave register bias

Register address example of PLC communication data

- Using two Z-TIO-C modules
- Slave register bias value of Z-TIO-C module 2: 200

When the address of Z-TIO-C module 2 is set to 1, the data is assigned to the register addresses indicated in the table below.



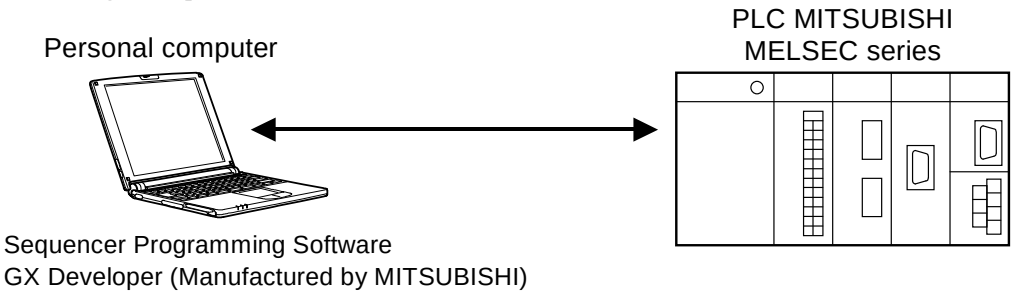
Communication data type	Register address	Details	
System data	D01000 ⋮ D01009	Start number [Register start number (Low-order 16-bit)] ⋮ Last number	Register numbers of Z-TIO-C module 1 with address 0 (master).
Communication data of monitor group	D01010 ⋮ D01049	Start number [Monitor item register bias] ⋮ Last number	
Communication data of setting group	D01050 ⋮ D01149	Start number [Setting item register bias] ⋮ Last number	
System data	D01200 ⋮ D01209	Start number [Register start number (Low-order 16-bit) ⋮ Last number	Register numbers of Z-TIO-C module 2 with address 1 (slave).
Communication data of monitor group	D01210 ⋮ D01249	Start number [Monitor item register bias] ⋮ Last number	
Communication data of setting group	D01250 ⋮ D01349	Start number [Setting item register bias] ⋮ Last number	

6.2.4 Setting on the PLC

Sets the communication items of PLC side. Set the PLC as follows. (Recommend setting example)

☞ The setting item varies depending on the PLC. The details of the setting procedure for the PLC, see the instruction manual for the PLC being used.

Recommend setting example

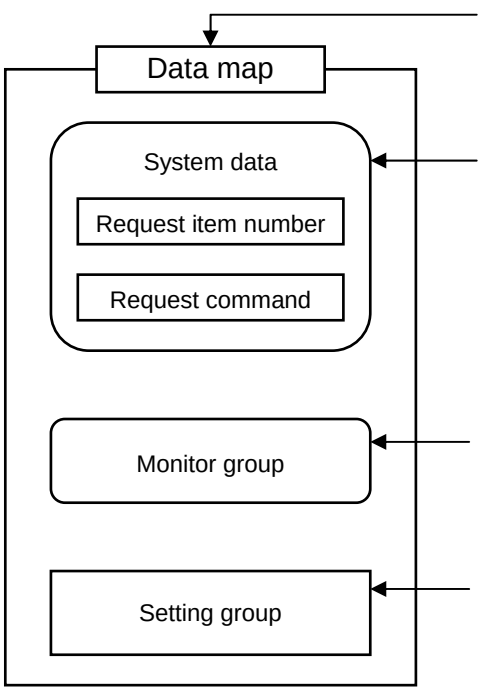


Item	Details
Protocol	Type 4 protocol mode
Station number	00
Computer link/multi-drop selection	Computer link
Communication rate	Set the same as Z-TIO-C module or Z-TIO-D module
Operation setting	Independent
Data bit	8
Parity bit	Without
Stop bit	1
Sum check code	Provided
Writing during RUN	Allowed
Setting modification	Allowed
Termination resistor	Connect the termination resistor attached to the PLC

6.3 Data Transfer

6.3.1 PLC communication data transfer

The data transmitted between the PLC and the Z-TIO-C/D module is compiled in the PLC communication data map (hereafter, called data map). In the PLC communication data map the communication data is classified into system data, monitor group, and setting group.
The communication data is transmitted to every group.



Data map
The data map indicates the addresses, channels and names of data that can be communicated via PLC communication.

System data: D01000 to D01009 (RO, R/W)
Communication data such as the system communication state and Z-TIO normal communication flag are included in this group. This information is used to determine whether or not PLC communication is taking place normally.
This group also includes "request item number" and "request command," which set the transfer command for the communication data of the setting group.

Monitor group: D01010 to D01049 (RO)
Communication data such as the measured value (PV) and comprehensive event state communication flag are included in this group.

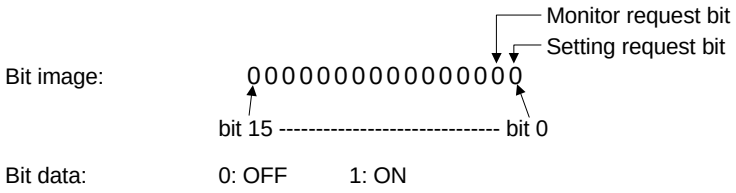
Setting group: D1050 to D01149 (R/W)
Communication data such as the set value (SV), control response parameter and heater break alarm are included in this group.

☞ For the communication data, see **6.4 PLC Communication Data Map (P. 6-24)**.

■ Request item number, Request command

Data transfer between PLC and Z-TIO-C/D module are executed by request item number and request command. For the request command, both "setting request bit" and "monitor request bit" are available.

Request item number	This command sets the communication data of the setting group that is transferred. Set transfer of all communication data of the setting group, or transfer by one data item. [Register address: D01007 (factory set value)] Setting range: 0 or 1 to 64 • When set to 0, all communication data of the setting group is transferred.* • When set to a number from 1 to 64 (item number), only the set communication data item is transferred (transfer by one data item). * * Communication data that has been set to "unused" (binary: 0) in the setting item selection of the PLC communication environment will not be transferred. When set to a number from 1 to 64 (item number), the value will not return to 0 even after setting request or monitor request processing is completed. ☞ For item numbers 1 to 64, see **Table 2: Setting item selection (Communication data of setting group) (P.6-10).**

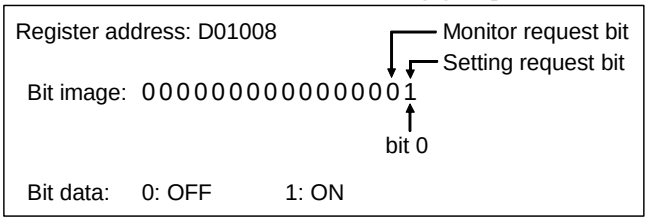
Request command	The setting request bit and monitor request bit of the request command are assigned to each bit datum as a binary number. [Register address: D01008 (Factory set value)] 

● Setting request bit (PLC → Z-TIO-C/D module)

This command requests that the Z-TIO-C/D module read the communication data of the setting group on the PLC side.

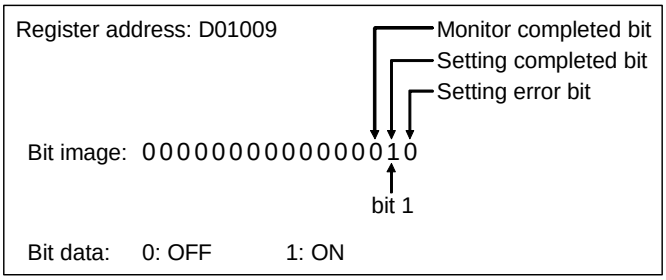
[Processing]

1. When the setting request bit (bit 0) of the request command (D01008) is set to "1,"the Z-TIO-C/D module starts to read the communication data of the setting group from the PLC.



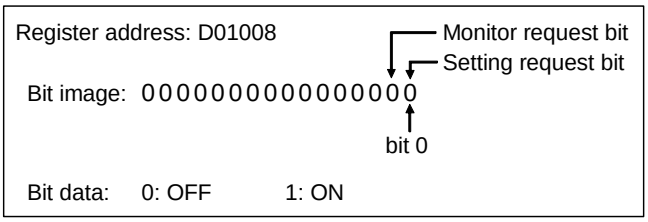
2. The setting group communication data set in "Request item number (D01007)" is transferred from the PCL to the Z-TIO-C/D module.

3. When reading is finished, the Z-TIO-C/D module writes the communication state of the setting group to the setting completed bit (bit 1) of setting group communication state (D01009).



 If there is an error in the setting range of the data, the setting error bit will change to "1." Check and see if there is an error in the values set in the PLC register.

4. The setting request bit (bit 0) will change to "0" to indicate that reading of data from the PLC is finished.

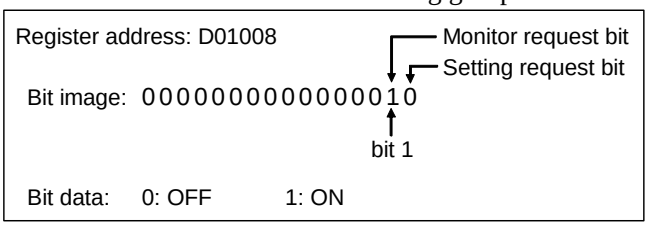


● Monitor request bit (PLC ← Z-TIO-C/D module)

This command requests that the Z-TIO-C/D module write the communication data of the setting group on the PLC side.

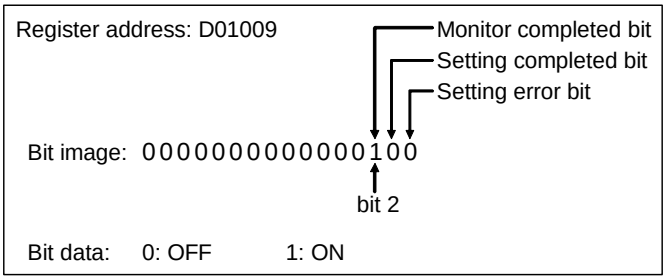
[Processing]

1. When the monitor request bit (bit 1) of the request command (D01008) is set to "1," the Z-TIO-C/D module starts to write the communication data of the setting group to the PLC.

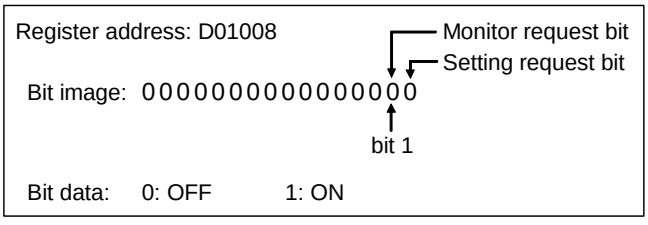


2. The setting group communication data set in "Request item number (D01007)" is transferred from the PCL to the Z-TIO-C/D module.

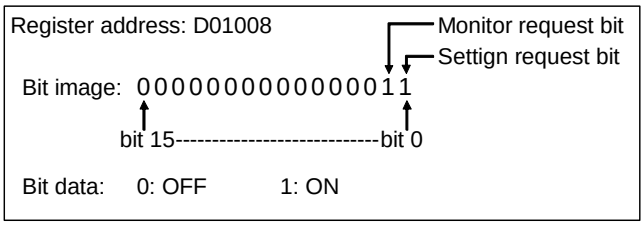
3. When writing is finished, the Z-TIO-C/D module writes the communication state of the setting group to the monitor completed bit (bit 2) of setting group communication state (D01009).



4. The monitor request bit (bit 1) will change to "0" to indicate that reading of data from the PLC is finished.



When setting both the setting request bit and the monitor request bit to "1," set the bits simultaneously. If set separately, the bit set later may be disregarded.



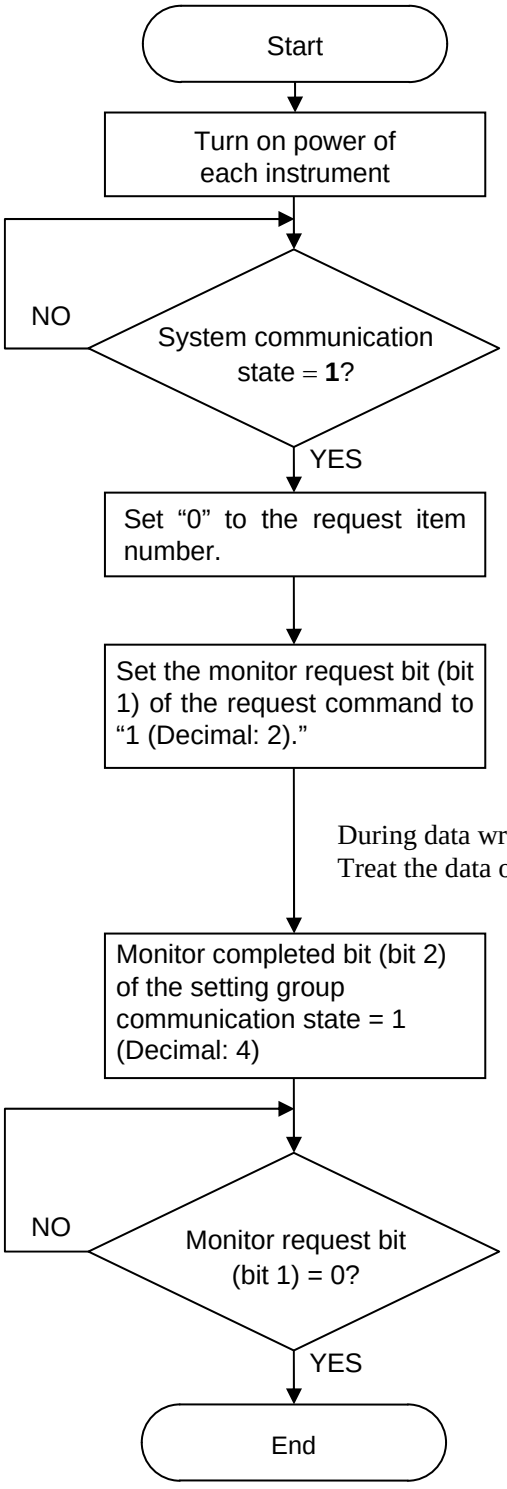
■ Monitor group (PLC ← Z-TIO-C/D module)

The communication data of the monitor group does not have a request command setting.
The Z-TIO-C/D module regularly repeats writing of communication data to the PLC each communication period.
Note that writing of monitor group data is stopped while the communication data of setting group reads or writes by request command.

6.3.2 Data transfer procedures

Change each set value of Z-TIO-C/D module from the PLC after the initial settings are made. If each set value of Z-TIO-C/D module is changed from the PLC without setting the initial values, it is re-written to "0" with each set value of the PLC at that time set to "0."

■ Initial setting



Turn on the power of the Z-TIO-C/D module, and the PLC. When the PLC communication start time (factory setting: 5 seconds) elapses, writing of the system data begins.

After the system data is written, the Z-TIO-C/D module begins writing the communication data of the monitor group to the PLC. When monitor group writing starts, "system communication state" changes to "**1**."
When the system communication condition becomes "**1**," PLC communication can be performed.

Because all communication data of the setting group is written to the PLC, the request item number of the PLC register is set to "**0**."

When the monitor request bit (bit 1) of request command of the PLC register is set to "**1** (Decimal: **2**)," the Z-TIO-C/D module begins writing the setting group to the PLC.

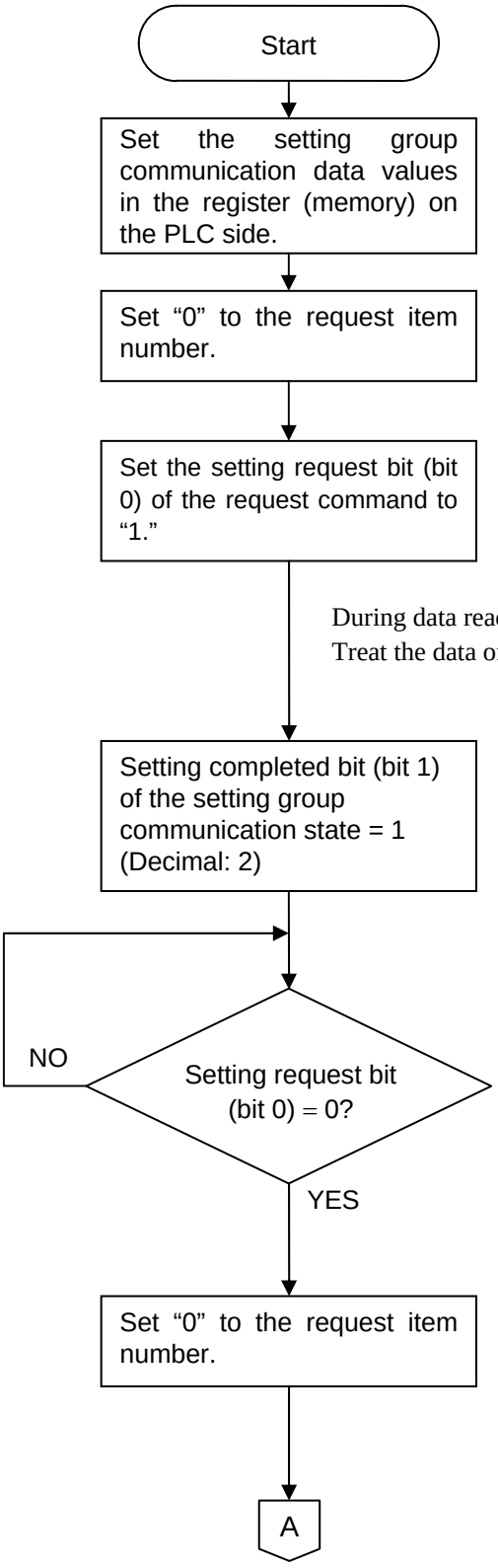
During data write:
Treat the data of all items as inconsistent during the data write.

When writing is finished, the Z-TIO-C/D module writes the communication state of the setting group to the monitor completed bit (bit 2) of the setting group communication state of the PLC.

If the monitor request bit (bit 1) of the request command of the PLC register is "**0**," this indicates that writing of data to the PLC is finished.

When multiple Z-TIO-C/D modules are connected, write the communication data of all Z-TIO-C/D modules to the PLC.

■ When the setting group communication data is transferred from PLC to the Z-TIO-C/D module.



[Data setting]
Set "0" to the request item number of PLC register.

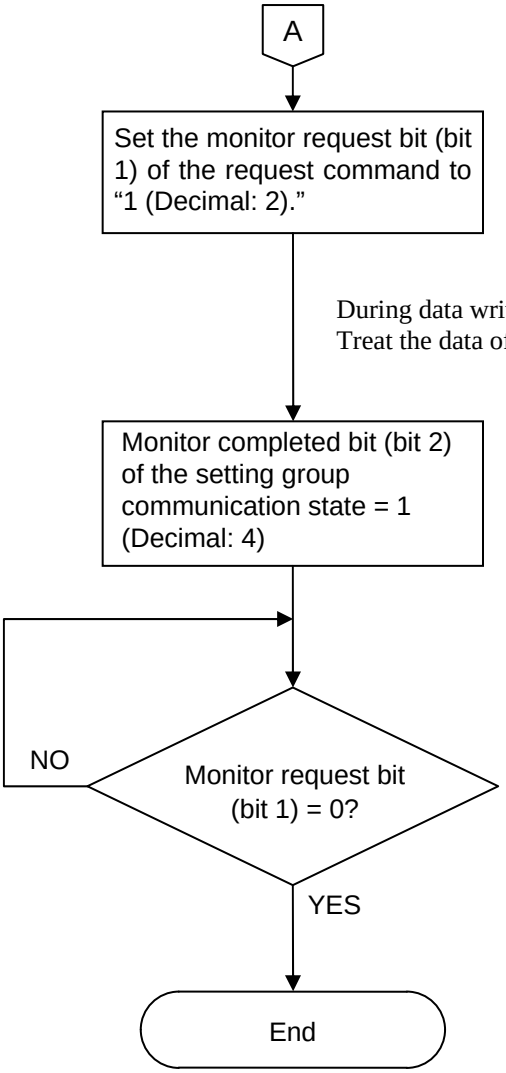
When the setting request bit (bit 0) of request command of the PLC register is set to "**1**," the Z-TIO-C/D module begins reading the data set in the PLC register (memory).

During data read:
Treat the data of all items as inconsistent during the data read.

When reading of the data ends, the Z-TIO-C/D module writes the setting group communication state to the setting completed bit (bit 1) of PLC setting group communication state.

If the setting request bit (bit 0) of the request command of the PLC register is "**0**," this indicates that reading of data from the PLC is finished.

[Confirmation of setting data]
The request item number of the PLC register is set to "**0**" for verification of the data read from the PCL by the Z-TIO-C/D module.



When the monitor request bit (bit 1) of request command of the PLC register is set to "**1** (Decimal: **2**),"the Z-TIO-C/D module begins writing the setting group data to the PLC.

During data write:
Treat the data of all items as inconsistent during the data write.

When writing is finished, the Z-TIO-C/D module writes the communication state of the setting group to the monitor completed bit (bit 2) of the setting group communication state of the PLC.

If the monitor request bit (bit 1) of the request command of the PLC register is "**0**," this indicates that writing of data to the PLC is finished.

6.3.3 Data processing precautions

(1) The data type is treated as binary data with a sign and without a decimal point. For this reason, carefully express and set the data.

[Example] Setting of proportional band
Initial value of internal data: 3.0
Communication data: 30

(2) Any attempt to write to an unused channel is not processed as an error.

(3) Some communication data may become invalid depending on the module selection or the module configuration. If any one of the conditions listed below occurs and data items written are within the setting range.

(4) Automatic update of communication data
Some of the PLC data in the communication data of the setting group will be automatically updated. Under the conditions indicated below, the data will be automatically updated when the data of the Z-TIO-C/D module changes.

- Autotuning (AT) starts autotuning when PID/AT transfer is set to "1: Autotuning (AT)" and the setting request bit is set to "1." After the autotuning function finishes its execution, PID/AT transfer returns to "0: PID control operation" and thus the PID constants and control loop break alarm (LBA) time are updated.
- After startup tuning (ST) ends, if the PID constant or control loop break alarm (LBA) time has been updated, that value will be updated.
- After EDS mode (for disturbance 1) tuning or learning ends, if EDS value 1 (for disturbance 1), EDS value 2 (for disturbance 1), EDS transfer time (for disturbance 1), EDS action time (for disturbance 1), or EDS mode (for disturbance 1) is updated, that value (or values) will be updated.
- After EDS mode (for disturbance 2) tuning or learning ends, if EDS value 1 (for disturbance 2), EDS value 2 (for disturbance 2), EDS transfer time (for disturbance 2), EDS action time (for disturbance 2), or EDS mode (for disturbance 2) is updated, that value (or values) will be updated.
- If the EDS start signal goes from ON to OFF, it is updated to "0: EDS start signal OFF."
- If "Interlock release" goes from 1 to 0, it is updated to "0: Normal state."
- If "Automatic temperature rise learning" goes from 1 to 0, it is updated to "0: Unused."
- If "Startup tuning (ST)" goes from 1 or 2 to 0, it is updated to "0: ST unused."

Autotuning (AT) starts autotuning when PID/AT transfer is set to "1: Autotuning (AT)" and the setting request bit is set to "1." After the autotuning function finishes its execution, PID/AT transfer returns to "0: PID control operation" and thus the PID constants and control loop break alarm (LBA) time are updated.

6.3.4 Processing time of communication data

The processing times for communication data monitor and setting are shown below.

The times shown are the processing times when the interval time is set to 10 milliseconds (factory set value).

■ Communication data processing time of monitor group

Communication speed	Number of communication data items	Monitor processing time	
		When there are 16 Z-TIO-C/D modules	When there is one Z-TIO-C/D module
19200 bps	1	Approx. 6 seconds	Approx. 360 ms
19200 bps	16	Approx. 8 seconds	Approx. 480 ms
38400 bps	1	Approx. 4 seconds	Approx. 280 ms
38400 bps	16	Approx. 5 seconds	Approx. 340 ms

■ Communication data processing time of setting group

Reading PLC communication data (setting request bit)

Communication speed	Number of communication data items	Setting processing time when there is one Z-TIO-C/D module
19200 bps	1	Approx. 200 ms
19200 bps	64	Approx. 970 ms
38400 bps	1	Approx. 170 ms
38400 bps	64	Approx. 630 ms

Writing PLC communication data (monitor request bit)

Communication speed	Number of communication data items	Set value monitor processing time when there is one Z-TIO-C/D module
19200 bps	1	Approx. 230 ms
19200 bps	64	Approx. 850 ms
38400 bps	1	Approx. 150 ms
38400 bps	64	Approx. 570 ms

When several Z-TIO-C/D modules are connected, the processing time can be calculated from the equations below.

Reading PLC communication data (setting request bit)

(Setting processing time when there is one Z-TIO-C/D module + monitor processing time) × number of Z-TIO-C/D modules

Writing PLC communication data (monitor request bit)

(Set value monitor processing time when there is one Z-TIO-C/D module + monitor processing time) × number of Z-TIO-C/D modules

6.4 PLC Communication Data Map

The data map summarizes data addresses, channels and names which enable PLC communication.

6.4.1 Reference to data map

(1) (2) (3) (4) (5) (6)

Name	Register address	Struc-ture	Attri-bute	Data range and Number of data	Factory set value
System communication state	D01000	M	RO	Bit data b0: Data collection condition b1 to b15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0, 1] [1]	—

Number of data

(1) Name: Name of communication data
For setting group communication data, the item number is indicated.

(2) Register address: A register address of communication data in PLC communication
(A register address of MITSUBISHI MELSEC series)
Register addresses in this manual are those assigned when the PLC communication environment is set as follows.

- Register type: 0 (D register)
- Register start number (Low-order 16-bit): 1000
- Monitor item register bias: 10
- Setting item register bias: 0
- Monitor item selection: 33535
- Setting item selection: ch1: 62427
  ch2: 15583
  ch3: 512
  ch4: 512

📖 Assignment of register addresses varies depending on the communication data of the PLC communication environment indicated below.

- Register type
- Register start number (High-order 4-bit)
- Register start number (Low-order 16-bit)
- Monitor item register bias
- Setting item register bias
- Monitor item selection
- Setting item selection
- Slave register bias

☞ For PLC communication environment setting, see **6.2.3 PLC communication environment items list (P. 6-4)**.

(3) Structure: C: Data for each channel [1, 2]
M: Data for each module

[1] On a Z-TIO-D module (2-channel type), there is no communication data for the 3rd and 4th channels.

[2] When heat/cool control or position proportioning control is performed, there will be communication data (indicated by ♣ in the name column) for which the 2nd channel and 4th channel will be invalid.
[Read is possible (0 is shown), but the result of Write is disregarded.]

Continued on the next page.

Continued from the previous page.

(4) Attribute: RO: At the time of monitor request bit "1," Z-TIO-C/D module writes in data to the PLC.
(PLC ← Z-TIO-C/D module)

R/W: At the time of setting request bit "1," Z-TIO-C/D module read out data from the PLC.
At the time of monitor request bit "1," Z-TIO-C/D module writes in data to the PLC.
(PLC ↔ Z-TIO-C/D module)

(5) Data range and Number of data:
Data range: Read or write range of communication data
Number of data: This is the maximum number per communication data that can be handled by one Z-TIO-C/D module.

(6) Factory set value: Factory set value of communication data

When there is one Z-TIO-C/D module, the number of communication data is 150 (factory set value). When the maximum of 16 Z-TIO-C/D modules are connected to the PLC communication port, the number of communication data is 2400.
When there is one Z-TIO-C/D module, the total number of communication data is 330. When the maximum of 16 Z-TIO-C/D modules are connected to the PLC communication port, the total number of communication data is 5280.

The data map classifications of the communication data are shown below. (factory set value)

System data	D01000 [system communication state] to D01009 [setting group communication state]
Monitor group	D01010 [Measured value (PV)] to D01049 [memory area number monitor]
Setting group	D01050 [PID/AT transfer] to D01149 [Operation mode]

The indicated communication data of the PLC communication data map are the communication data of factory set value.
The number of communication data of factory set value is limited by monitor item selection and setting item selection.
For explanations of communication data not described in this manual, see the following manual.

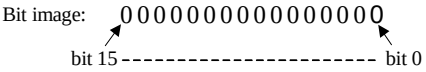
☞ See **chapter 8 COMMUNICATION DATA DESCRIPTION (P. 8-1) of SRZ Instruction Manual (IMS01T04-E□)**.

6.4.2 Data map list

Name	Register address	Struc-ture	Attri-bute	Data range and Number of data	Factory set value
System communication state [1]	D01000	M	RO	Bit data b0: Data collection condition b1 to b15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0, 1] [1]	—
Z-TIO communication flag [2]	D01001	M	RO	0/1 transfer (For communication checking) "0" and "1" are repeated for each communication period. [1]	—
—	D01002	—	RO	Internal processing Do not use the register address [1]	—
—	D01003	—	RO	Internal processing Do not use the register address [1]	—
PLC communication error code [3]	D01004	M	RO	Bit data b0: PLC register read/write error b1: Slave communication timeout b2: Unused b3: Unused b4: Master communication timeout b5 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31] [1]	—

[1] When system communication state becomes "1," PLC communication can be performed.

Data collection condition is assigned as a bit image in binary numbers.



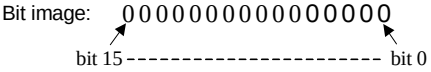
[2] The Z-TIO-C/D module writes alternating zeros and ones (0→1→0) to this area each communication period. By periodically monitoring this area in the PLC program, it can be determined whether or not the Z-TIO-C/D module has stopped communicating.

[3] b0: PLC register read/write error
To be turned on when data read and write cannot be made to/from the PLC register.
Three seconds after the normal communication state is restored, this turns OFF.

b1: Slave communication timeout
To be turned on when communication with slave units is timed out during communication with the PLC with Z-TIO-C/D modules multi-drop connected. If the slave module detects the timeout, data send to the PLC stops to be set to the standby state. Communication re-starts after data send re-opens from the master module. In addition, if the master module detects the timeout, data re-send starts.

b4: Master communication timeout
This turns ON when a timeout occurs during communication between the PLC and the master module.

Each error state is assigned as a bit image in binary numbers.



Continued on the next page.

Continued from the previous page.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Z-TIO module recognition flag [1]	D01005	M	RO	Bit data b0: Z-TIO module 1 b1: Z-TIO module 2 b2: Z-TIO module 3 b3: Z-TIO module 4 b4: Z-TIO module 5 b5: Z-TIO module 6 b6: Z-TIO module 7 b7: Z-TIO module 8 b8: Z-TIO module 9 b9: Z-TIO module 10 b10: Z-TIO module 11 b11: Z-TIO module 12 b12: Z-TIO module 13 b13: Z-TIO module 14 b14: Z-TIO module 15 b15: Z-TIO module 16 Data 0: No unit exists 1: Unit exists [Decimal number: 0 to 65535] [1]	—
—	D01006	—	—	Internal processing Do not use the register address [1]	—
Request item number [2]	D01007	M	R/W	0, 1 to 64 0: Transfer all communication data of the setting group. 1 to 64: Transfer only the communication data of the selected item number.	—

[1] A slave module (other than a master module with unit address 0) can only recognize its own state.

The Z-TIO module recognition flag state is assigned as a bit image in binary numbers.

Bit image: 0000000000000000
bit 15 ---------- bit 0

[2] Request item number

This command sets the communication data of the setting group that is transferred. Set transfer of all communication data of the setting group, or transfer by one data item.
Communication data that has been set to “unused” (binary: 0) in the setting item selection of the PLC communication environment will not be transferred.

Continued on the next page.

Continued from the previous page.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Request command [1]	D01008	M	R/W	Bit data b0: Setting request bit b1: Monitor request bit Data 0: OFF 1: ON [Decimal number: 0 to 3] [1]	0
Setting group communication state [2]	D01009	M	RO	Bit data b0: Setting error bit b1: Setting completed bit b2: Monitor completed bit Data 0: OFF 1: ON [Decimal number: 0 to 7] [1]	—
Measured value (PV) [3]	D01010 to D01013	C	RO	Input scale low to Input scale high [4]	—

[1] Request command

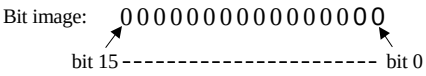
b0: Setting request bit

This command requests that the Z-TIO-C/D module read the communication data of the setting group on the PLC side.

b1: Monitor request bit

This command requests that the Z-TIO-C/D module write the communication data of the setting group on the PLC side.

The setting request bit and monitor request bit is assigned as a bit image in binary numbers.



[2] This is the communication state of setting group.

b0: Setting error bit

Turns ON when the PLC data and Z-TIO-C/D module data do not agree due to a setting range error or other error. Also turns ON when data cannot be set.

When setting error is “1” (ON), it will return to “0” (OFF) the next time data is set normally.

b1: Setting completed bit

When there is a request by setting request bit for a PLC setting data read, this will turn ON when the PLC data read is finished.

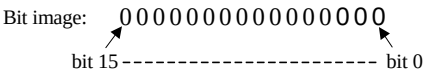
At the next communication period with the setting request bit set to 0, the setting completed bit turns OFF.

b2: Monitor completed bit

When there is a request by monitor request bit for a Z-TIO-C/D module setting data write, this will turn ON when the Z-TIO-C/D module setting data write is finished.

At the next communication period with the monitor request bit set to 0, the monitor completed bit turns OFF.

The setting error bit, setting completed bit, and monitor completed bit is assigned as a bit image in binary numbers.



[3] Measured value (PV) is a temperature input value of Z-TIO-C/D module. There are the TC, RTD, voltage, current, and feedback resistance inputs.

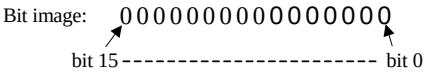
Continued on the next page.

Continued from the previous page.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Comprehensive event state [1]	D01014 to D01017	C	RO	Bit data b0: Event 1 state b1: Event 2 state b2: Event 3 state b3: Event 4 state b4: Heater break alarm state b5: Temperature rise completion b6: Burnout b7 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 127] [4]	—
Operation mode state monitor [2]	D01018 to D01021	C	RO	Bit data b0: 1: Control STOP b1: 1: Control RUN b2: 1: Manual mode (Including Remote mode) b3: 1: Remote mode b4 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15] [4]	—
Error code [3, 4]	D01022 to D01025	M	RO	1: Adjustment data error 2: Data back-up error 4: A/D conversion error 32: Logic output data error [4]	—

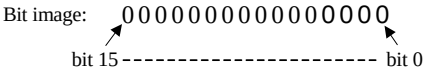
[1] Each event state such as Event 1 to Event 4, heater break alarm, temperature rise completion or burnout is expressed in bit data items.

Each event state is assigned as a bit image in binary numbers.



[2] Indicates an operation mode state of temperature control channel.

The operation mode state is assigned as a bit image in binary numbers.



[3] Each error state of the Z-TIO-C/D module is expressed in bit data items. The error condition is shown by the OR of each module.

[4] Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

Continued on the next page.

Continued from the previous page.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Manipulated output value (MV) monitor [heat-side] [1] ♣	D01026 to D01029	C	RO	PID control or heat/cool PID control: −5.0 to +105.0 % Position proportioning control with feedback resistance (FBR) input: 0.0 to 100.0 % [4]	—
Manipulated output value (MV) monitor [cool-side] [2] ♣	D01030 to D01033	C	RO	−5.0 to +105.0 % [4]	—
Current transformer (CT) input value monitor [3]	D01034 to D01037	C	RO	CTL-6-P-N: 0.0 to 30.0A CTL-12-S56-10L-N: 0.0 to 100.0 A [64]	—
Set value (SV) monitor	D01038 to D01041	C	RO	Setting limiter (low) to Setting limiter (high) This value is a monitor of the set value (SV) that is a desired value for control. [4]	—
Output state monitor [4, 5]	D01042 to D01045	M	RO	Bit data b0: OUT1 b1: OUT2 b2: OUT3 b3: OUT4 b4 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15] [4]	—
Memory area number monitor [6]	D01046 to D01049	C	RO	1 to 8 [4]	—

[1] Heat-side output value for PID control or heat/cool PID control. When feedback resistance (FBR) input is used in position proportioning control, the feedback resistance (FBR) input value is monitored.

When there is feedback resistance (FBR) input and the feedback resistance (FBR) is not connected, overscale will occur and cause a burnout state.

[2] Cool-side output value of heat/cool PID control.

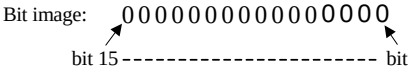
Cool-side output value of heat/cool PID control.

[3] This item is current transformer input value to use by a heater break alarm (HBA) function.

The CT input cannot measure less than 0.4 A.

[4] ON/OFF state of output (OUT1 to OUT4) is expressed as a bit image in decimal number.

The output state is assigned as a bit image in binary numbers.



[5] Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

[6] Shows the memory area number used for control.

Continued on the next page.

Continued from the previous page.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
PID/AT transfer [1] Item number: 1	D01050 to D01053	C	R/W	0: PID control 1: Autotuning (AT) [4]	0

[1] Activation or deactivation of the Autotuning (AT) function is selected.

● Caution for using the autotuning (AT)

- When a temperature change (UP and/or Down) is 1 °C or less per minute during autotuning (AT), autotuning (AT) may be cancelled before calculating PID values. In that case, adjust the PID values manually. It is possible to happen when the set value is around the ambient temperature or is close to the maximum temperature achieved by the load.
- If the output change rate limiter is set, the optimum PID values may not be calculated by autotuning (AT).
- When the cascade control is activated, the AT function cannot be turned on.

● Requirements for autotuning (AT) start

Start the autotuning (AT) when all following conditions are satisfied:
The autotuning (AT) function can start from any state after power on, during arise in temperature or in stable control.

Operation mode state	RUN/STOP transfer	RUN
	PID/AT transfer	PID control
	Auto/Manual transfer	Auto mode
	Remote/Local transfer	Local mode
Parameter setting		Output limiter (high) ≥ 0.1 %, Output limiter (low) ≤ 99.9 %
Input value state		The measured value (PV) is not underscale or overscale.
		Input error determination point (high) ≥ Measured value (PV) ≥ Input error determination point (low)
Operation mode (Identifier: EI)		Control

● Requirements for autotuning (AT) cancellation

If the autotuning (AT) is canceled according to any of the following conditions, the controller immediately changes to PID control. The PID values will be the same as before autotuning (AT) was activated.

When the Operation mode is transferred	When the RUN/STOP mode is changed to the STOP mode.
	When the PID/AT transfer is changed to the PID control.
	When the Auto/Manual mode is changed to the Manual mode.
	When the Remote/Local mode is changed to the Remote mode.
Operation mode (Identifier: EI)	When changed to unused, monitor, or the monitor + event function.
When the parameter is changed	When the temperature set value (SV) is changed.
	When the PV bias, the PV digital filter, or the PV ratio is changed.
	When the AT bias is changed.
	When the control area is changed.
When the input value becomes abnormal	When the measured value (PV) goes to underscale or overscale.
	When the measured value (PV) goes to input error range. (Measured value (PV) ≥ Input error determination point (high) or Input error determination point (low) ≥ Measured value (PV))
When the AT exceeded the execution time	When the AT does not end in two hours after AT started
Power failure	When the power failure of more than 4 ms occurs.
Instrument error	When the instrument is in the FAIL state.

Continued on the next page.

Continued from the previous page.

Parameters for autotuning (AT) are provided to compute the PID values suitable for various controlled systems and control actions. Set them, as required.

Example 1: When you want to find each constant suited for P control, PI control, or PD control by autotuning.

For P control:
Set "0" to Integral time limiter (high) [heat-side] and Derivative time limiter (high) [heat-side].

For PI control:
Set "0" to Derivative time limiter (high) [heat-side].

For PD control:
Set "0" to Integral time limiter (high) [heat-side].

When autotuning (AT) is executed by making the settings above, the control constants suited for P, PI, or PD control are found.

Also corresponds to heat/cool PID control cool-side and position proportioning control.

Example 2: When you want to limit on/off output only at autotuning (AT)
Autotuning (AT) that limits the ON/OFF output values only at autotuning (AT) can be executed by setting the output value with AT turned on and the output value with AT turned off.

Only when the feedback resistance (FBR) input is connected in the position proportioning control, the "Output value with AT turned on" and "Output value with AT turned off" setting becomes valid.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Auto/Manual transfer Item number: 2	D01054 to D01057	C	R/W	0: Auto mode Automatic control is performed. 1: Manual mode The manipulated output value can be manually changed. Use to transfer the Auto mode or Manual mode. [64]	0
RUN/STOP transfer [1] Item number: 4	D01058 to D01061	M	R/W	0: STOP (Control stop) 1: RUN (Control start) Control RUN/STOP is switched to every Z-TIO-C/D module. [1]	0
Memory area transfer Item number: 5	D01062 to D01065	C	R/W	1 to 8 This item selects the memory area (control area) to use for control. [1]	1

[1] Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

Continued on the next page.

Continued from the previous page.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Event 1 set value (EV1) ★ Item number: 7	D01066 to D01069	C	R/W	Deviation action, Deviation action between channels, Temperature rise completion range *: –Input span to +Input span * When temperature rise completion is selected at Event 3 action type. Process action, SV action: Input scale low to Input scale high MV action: –5.0 to +105.0 % Use to set setting value of an event action. [Each 4]	50
Event 2 set value (EV2) ★ Item number: 8	D01070 to D01073	C	R/W		50
Event 3 set value (EV3) ★ Item number: 9	D01074 to D01077	C	R/W		50
Event 4 set value (EV4) ★ Item number: 10	D01078 to D01081	C	R/W		50
Set value (SV) [Local set value (SV)] ★ Item number: 13	D01082 to D01085	C	R/W	Setting limiter (low) to Setting limiter (high) Set value (SV) is desired value of the control. [4]	TC/RTD: 0 °C [°F] V/I: 0.0 %
Proportional band [heat-side] ♣★ Item number: 14	D01086 to D01089	C	R/W	TC/RTD inputs: 0 (0.0) to Input span (Unit: °C [°F]) Voltage (V)/current (I) inputs: 0.0 to 1000.0 % of Input span 0 (0.0): ON/OFF action Use to set the proportional band of the P, PI, PD and PID control. [4]	TC/RTD: 30 V/I: 30.0
Integral time [heat-side] ♣★ Item number: 15	D01090 to D1093	C	R/W	PID control or heat/cool PID control: 0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PD action) Position proportioning control: 1 to 3600 seconds or 0.1 to 1999.9 seconds Integral action is to eliminate offset between set value (SV) and measured value (PV) by proportional action. The degree of Integral action is set by time in seconds. [4]	240
Derivative time [heat-side] [2] ♣★ Item number: 16	D01094 to D01097	C	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action) Derivative action is to prevent rippling and make control stable by monitoring output change. The degree of Derivative action is set by time in seconds. [4]	60

★Parameters which can be used in multi-memory are function

Continued on the next page.

Continued from the previous page.

Name	Register address	Struc-ture	Attri-bute	Data range and Number of data	Factory set value
Control response parameter [1] ♣★ Item number: 17	D01098 to D01101	C	R/W	0: Slow 1: Medium 2: Fast P or PD action: 2 (Fast) fixed [4]	PID control, Position proportioning control: 0 Heat/cool PID control: 2
Proportional band [cool-side] ♣★ Item number: 18	D01102 to D01105	C	R/W	TC/RTD inputs: 1 (0.1) to Input span (Unit: °C [°F]) Voltage (V)/current (I) inputs: 0.1 to 1000.0 % of Input span Use to set the proportional band of the P, PI, PD and PID control. The proportional band [cool-side] is valid only during heat/cool PID control. [4]	TC/RTD: 30 V/I: 30.0
Integral time [cool-side] ♣★ Item number: 19	D01106 to D01109	C	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PD action) Integral action is to eliminate offset between set value (SV) and measured value (PV) by proportional action. The degree of Integral action is set by time in seconds. The integral time [cool-side] is valid only during heat/cool PID control. [4]	240
Derivative time [cool-side] ♣★ Item number: 20	D01110 to D01113	C	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action) Derivative action is to prevent rippling and make control stable by monitoring output change. The degree of Derivative action is set by time in seconds. The derivative time [cool-side] is valid only during heat/cool PID control. [4]	60

★ Parameters which can be used in multi-memory are function

[1] The control response for the set value (SV) change can be selected among Slow, Medium, and Fast.

The control response for the set value (SV) change can be selected among Slow, Medium, and Fast. If a fast response is required, Fast is chosen. Fast may cause overshoot. If overshoot is critical, Slow is chosen.

Fast	Selected when rise time needs to be shortened (operation needs to started fast). However in this case, slight overshooting may not be avoided.
Medium	Middle between “Fast” and “Slow.” Overshooting when set to “Medium” becomes less than that when set to “Fast.”
Slow	Selected when no overshooting is allowed. Used when material may be deteriorated if the temperature becomes higher that the set value.

📖 For P control and PD control, the control response is fixed at 2 (Fast).

Continued on the next page.

Continued from the previous page.

Name	Register address	Struc-ture	Attri-bute	Data range and Number of data	Factory set value
Overlap/Deadband [1] ♣★ Item number: 21	D01114 to D1117	C	R/W	TC/RTD inputs: –Input span to +Input span (Unit: °C [°F]) Voltage (V)/current (I) inputs: –100.0 to +100.0 % of input span [4]	0
Setting change rate limiter (up) ★ Item number: 23	D01118 to D01121	C	R/W	0 (0.0) to Input span/unit time 0 (0.0): Unused Unit time: 60 seconds (factory set value)	0 (0.0)
Setting change rate limiter (down) ★ Item number: 24	D01122 to D01125	C	R/W	This function is to allow the set value (SV) to be automatically changed at specific rates when a new set value (SV). [Each 4]	0 (0.0)
Heater break alarm (HBA) set value [2] Item number: 27	D01126 to D1129	C	R/W	When CT is CTL-6-P-N: 0.0 to 30.0 A (0.0: Not used) When CT is CTL-12-S56-10L-N: 0.0 to 100.0 A (0.0: Not used) [4]	0.0

★ Parameters which can be used in multi-memory are function

[1] This is the overlapped range of proportional bands (on the heat and cool sides) or the deadband range when Heat/Cool PID control is performed.

Overlap (OL):
Range in which the proportional band [heat-side] and the proportional band [cool-side] are overlapped. If a measured value (PV) is within the overlapped range, manipulated output values (heat-side and cool-side) may be simultaneously output.

Deadband (DB):
This is a control dead zone existing between the proportional band [heat-side] and the proportional band [cool-side]. If a measured value (PV) is within the deadband range, neither the manipulated output value (heat-side) nor the manipulated output value (cool-side) is output.

[2] HBA is to set the set values for the heater break alarm (HBA) function.
The HBA function detects a fault in the heating circuit by monitoring the current flowing through the load by a dedicated current transformer (CT).

For type “A” HBA,
- Set the set value to approximately 85 % of the maximum reading of the CT input.
- Set the set value to a slightly smaller value to prevent a false alarm if the power supply may become unstable.
- When more than one heater is connected in parallel, it may be necessary to increase the HBA set value to detect a single heater failure.

For type “B” HBA,
Set the set value to the maximum CT input value. This will be the current when the control is at 100 % control output. The set value is used to calculate the width of a non-alarm range.

Continued on the next page.

Continued from the previous page.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Heater break determination point Item number: 28	D01130 to D01133	C	R/W	0.0 to 100.0 % of HBA set value (0.0: Heater break determination is invalid) Set the heater break determination point for the heater break alarm (HBA) type B. [4]	30.0
Heater melting determination point Item number: 29	D1134 to D01137	C	R/W	0.0 to 100.0 % of HBA set value (0.0: Heater melting determination is invalid) Set the heater melting determination point for the heater break alarm (HBA) type B. [4]	30.0
PV bias Item number: 30	D01138 to D01141	C	R/W	–Input span to +Input span PV bias adds bias to the measured value (PV). The PV bias is used to compensate the individual variations of the sensors or correct the difference between the measured value (PV) of other instruments. [4]	0
Manual manipulated output value ♣ Item number: 42	D01142 to D01145	C	R/W	PID control: Output limiter (low) to Output limiter (high) Heat/cool PID control: –Cool-side output limiter (high) to +Heat-side output limiter (high) Position proportioning control (with FBR input): Output limiter (low) to Output limiter (high) Position proportioning control (without FBR input): 0: Close-side output OFF, Open-side output OFF 1: Close-side output ON, Open-side output OFF 2: Close-side output OFF, Open-side output ON Use to set the output value in the manual control. [4]	0.0

Continued on the next page.

Continued from the previous page.

Name	Register address	Struc-ture	Attri-bute	Data range and Number of data	Factory set value
Operation mode Item number: 58	D01146 to D01149	C	R/W	0: Unused Neither monitor nor control is performed 1: Monitor Only data monitor is performed 2: Monitor + Event function Data monitor and event action (temperature rise completion, including LBA) are performed. 3: Control Control is performed [4]	3

6.4.3 Communication data set to “unused” at the factory

These are communication data items that are set to “unused” when the product is shipped from the factory. The “use” or “unused” setting is configured in monitor item selection or setting item selection.

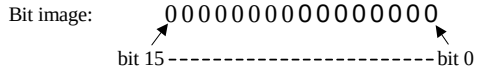
☞ For the setting procedures, see **6.5.9 Example of PLC communication data map editing (P.6-67)**. To configure the settings, reverse the procedure used to reduce communication data.

■ Communication data of monitor group

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Remote setting (RS) input value monitor	—	C	RO	Setting limiter (low) to Setting limiter (high) [4]	—
Memory area soak time monitor	—	C	RO	0 minutes 00 seconds to 199 minutes 59 seconds: 0:00 to 199:59 (min:sec) 0 hours 00 minutes to 99 hours 59 minutes: 0:00 to 99:59 (hrs:min) Data range of Area soak time can be selected on the Soak time unit. [4]	—
Integrated operating time monitor	—	M	RO	0 to 19999 hours [4]	—
Holding peak value ambient temperature monitor	—	C	RO	−10.0 to +100.0 °C (14.0 to 212.0 °F) [4]	—
Backup memory state monitor	—	M	RO	0: The content of the backup memory does not coincide with that of the RAM. 1: The content of the backup memory coincides with that of the RAM. [4]	—
Logic output monitor [1]	—	C	RO	Bit data b0: Logic output 1 b1: Logic output 2 b2: Logic output 3 b3: Logic output 4 b4: Logic output 5 b5: Logic output 6 b6: Logic output 7 b7: Logic output 8 b8 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 255] [4]	—

[1] Indicates a logic output state of Z-TIO module.

The logic output state is assigned as a bit image in binary numbers.



■ Communication data of setting group

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Remote/Local transfer Item number: 3	—	C	R/W	0: Local mode 1: Remote mode When performing remote control by remote setting input and also performing cascade control and ratio setting, transfer to the Remote mode. [4]	0
Interlock release Item number: 6	—	C	R/W	0: Normal state 1: Interlock release execution [4]	0
Control loop break alarm (LBA) time ★ Item number: 11	—	C	R/W	0 to 7200 seconds (0: Unused) If Event 4 is other than "9: Control loop break alarm (LBA)," set to RO (Only reading data is possible). [4]	480
LBA deadband ★ Item number: 12	—	C	R/W	0 (0.0) to Input span If Event 4 is other than "9: Control loop break alarm (LBA)," set to RO (Only reading data is possible). [4]	0 (0.0)
Manual reset ★♣ Item number: 22	—	C	R/W	−100.0 to +100.0 % If the integral function is valid, set to RO (Only reading data is possible). When integral action (heating or cooling side) is zero, manual reset value is added to the control output. [4]	0.0
Area soak time ★ Item number: 25	—	C	R/W	0 minutes 00 seconds to 199 minutes 59 seconds: 0 to 11999 seconds 0 hours 00 minutes to 99 hours 59 minutes: 0 to 5999 minutes Data range of Area soak time can be selected on the Soak time unit.	0
Link area number ★ Item number: 26	—	C	R/W	0 to 8 (0: No link)	0
PV digital filter Item number: 31	—	C	R/W	0.0 to 100.0 seconds (0.0: Unused)	0.0
PV ratio Item number: 32	—	C	R/W	0.500 to 1.500	1.000
PV low input cut-off Item number: 33	—	C	R/W	0.00 to 25.00 % of input span If the Square root extraction corresponds to "0: Unused," set to RO (Only reading data is possible).	0.00

★: Parameters which can be used in multi-memory area function

Continued on the next page.

Continued from the previous page.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
RS bias * Item number: 34	—	C	R/W	–Input span to +Input span [4]	0
RS digital filter * Item number: 35	—	C	R/W	0.0 to 100.0 seconds (0.0: Unused) [4]	0.0
RS ratio * Item number: 36	—	C	R/W	0.001 to 9.999 [4]	1.000
Output distribution selection Item number: 37	—	C	R/W	0: Control output 1: Distribution output [4]	0
Output distribution bias Item number: 38	—	C	R/W	–100.0 to +100.0 % [4]	0.0
Output distribution ratio Item number: 39	—	C	R/W	–9.999 to +9.999 [4]	1.000
Proportional cycle time Item number: 40	—	C	R/W	0.1 to 100.0 seconds This item becomes RO (Only reading data is possible) for the voltage/current output specification. This parameter is valid when "0: control output" has been selected at "Output assignment." [4]	Relay contact output: 20.0 seconds Voltage pulse output, triac output and open collector output: 2.0 seconds
Minimum ON/OFF time of proportioning cycle Item number: 41	—	C	R/W	0 to 1000 ms This item becomes RO (Only reading data is possible) for the voltage/current output specification. [4]	0
Area soak time stop function Item number: 43	—	C	R/W	0: No function 1: Event 1 2: Event 2 3: Event 3 4: Event 4 [4]	0
EDS mode (for disturbance 1) Item number: 44	—	C	R/W	0: No function 1: EDS function mode 2: Learning mode 3: Tuning mode EDS function: External disturbance suppression function [Each 4]	0
EDS mode (for disturbance 2) Item number: 45	—	C	R/W		0
EDS value 1 (for disturbance 1) Item number: 46	—	C	R/W	–100.0 to +100.0 % [4]	0.0
EDS value 1 (for disturbance 2) Item number: 47	—	C	R/W	–100.0 to +100.0 % [4]	0.0
EDS value 2 (for disturbance 1) Item number: 48	—	C	R/W	–100.0 to +100.0 % [4]	0.0
EDS value 2 (for disturbance 2) Item number: 49	—	C	R/W	–100.0 to +100.0 % [4]	0.0

* Data on RS bias, RS ratio and RS digital filter is that in cascade control or ratio setting.

Continued on the next page.

Continued from the previous page.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
EDS transfer time (for disturbance 1) Item number: 50	—	C	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds	0
EDS transfer time (for disturbance 2) Item number: 51	—	C	R/W	[4]	0
EDS action time (for disturbance 1) Item number: 52	—	C	R/W	1 to 3600 seconds	600
EDS action time (for disturbance 2) Item number: 53	—	C	R/W	[Each 4]	600
EDS action wait time (for disturbance 1) Item number: 54	—	C	R/W	0.0 to 600.0 seconds	0.0
EDS action wait time (for disturbance 2) Item number: 55	—	C	R/W	[Each 4]	0.0
EDS value learning times Item number: 56	—	C	R/W	0 to 10 times (0: No learning mode) [4]	1
EDS start signal Item number: 57	—	C	R/W	0: EDS start signal OFF 1: EDS start signal ON (for disturbance 1) 2: EDS start signal ON (for disturbance 2) [4]	0
Startup tuning (ST) Item number: 59	—	C	R/W	0: ST unused 1: Execute once * 2: Execute always * When the startup tuning is finished, the setting will automatically returns to “0: ST unused.” The startup tuning (ST) function is activated according to the ST start condition selected. If control is position proportioning control, set to RO (Only reading data is possible). [4]	0
Automatic temperature rise learning Item number: 60	—	C	R/W	0: Unused 1: Learning * * When the automatic temperature rise learning is finished, the setting will automatically returns to “0: Unused.” [4]	0

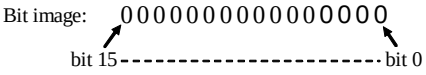
Continued on the next page.

Continued from the previous page.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Communication switch for logic * Item number: 61	—	C	R/W	Bit data b0: Communication switch 1 b1: Communication switch 2 b2: Communication switch 3 b3: Communication switch 4 b4 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15] [4]	0
Unused Item number: 62	—	—	—	Unused [4]	—
Unused Item number: 63	—	—	—	Unused [4]	—
Unused Item number: 64	—	—	—	Unused [4]	—

* ON/OFF signal for updating the logic processing result (logic output), taking the signal of the event information that occurred in the upper system (host computer, etc.) as input.

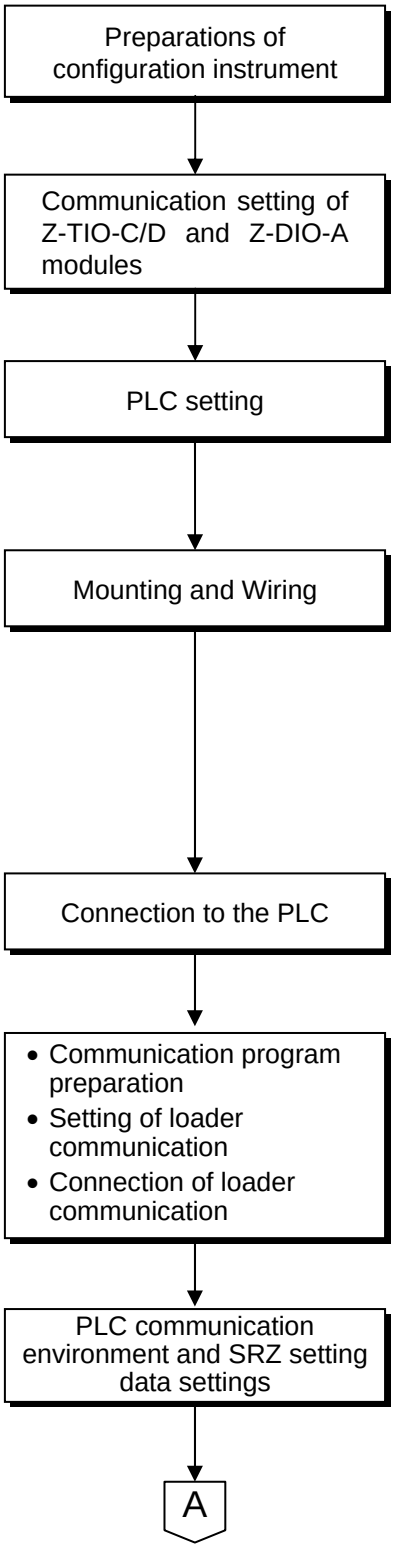
The communication switch for logic is assigned as a bit image in binary numbers.



6.5 Usage Example

In this Chapter, an example of data setting procedure is explained when the Z-TIO-C/D and Z-DIO-A modules are connected to a PLC of MITSUBISHI MELSEC series.

6.5.1 Handling procedures



☞ See **6.5.2 System configuration (P. 6-45)**.

Set the address, communication speed, data bit configuration, and communication protocol of the Z-TIO-C/D and Z-DIO-A modules.

☞ See **6.5.3 Communication setting of Z-TIO-C/D and Z-DIO-A modules (P. 6-46)**.

☞ See **6.5.4 PLC setting (P. 6-49)**.

☞ For information on joining and mounting modules, see **4. MOUNTING (P. 4-1)**.

☞ For Z-TIO-C/D module input/output, power, and termination resistor wiring, see **5. Wiring (P. 5-1)**.

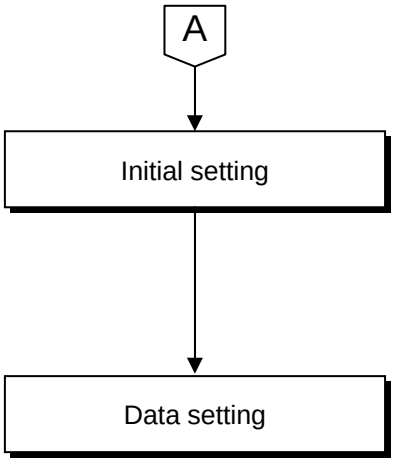
☞ For the wiring of Z-DIO-A module, see **SRZ Instruction Manual (IMS01T04-E□)**.

☞ To mount the PLC and connect the wiring, see the manual for the PLC.

☞ See **6.5.5 Connection to PLC (P. 6-51)**.

☞ See **6.5.6 Configuring the PLC communication environment and SRZ setting data using loader communication (P. 6-52)**.

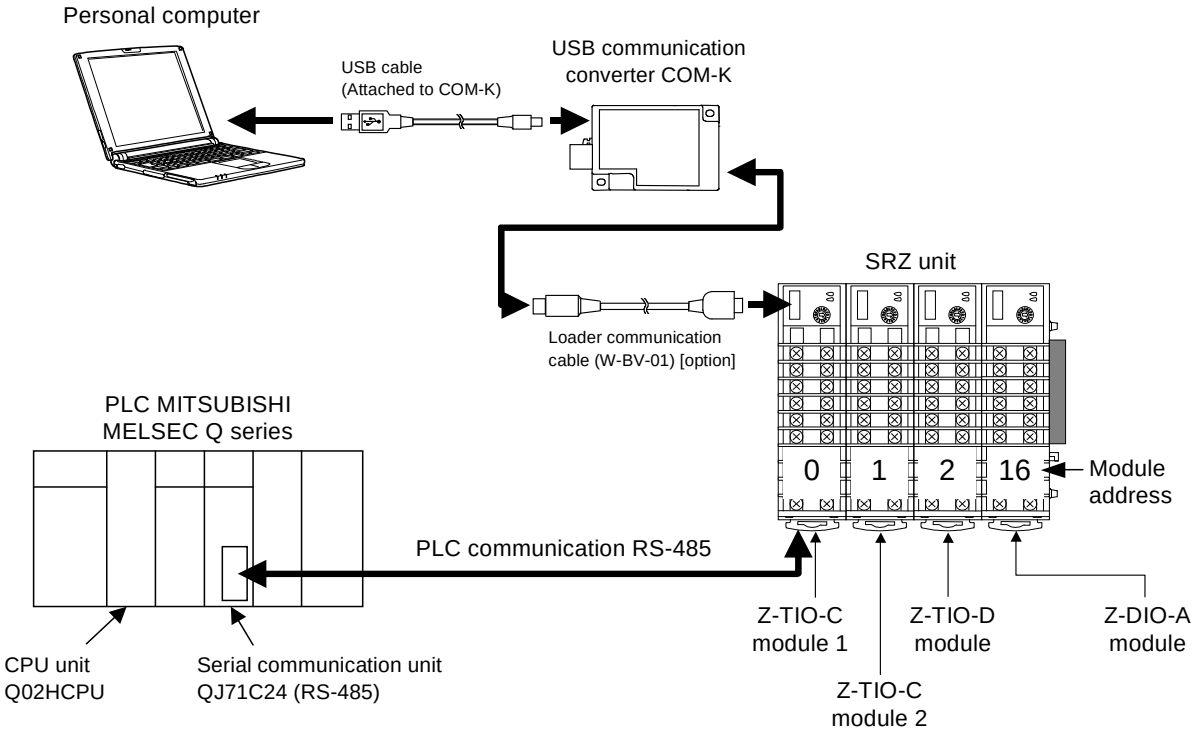
☞ See **6.5.6 Configuring the PLC communication environment and SRZ setting data using loader communication (P. 6-52)**.



☞ See **6.5.7 Initial setting (P. 6-59).**

☞ See **6.5.8 Data setting (P. 6-61).**

6.5.2 System configuration



■ Use instruments

- **PLC MITSUBISHI MELSEC Q series**
  CPU unit Q02HCPU..... 1
  Serial communication unit QJ71C24..... 1
  Power supply, I/O module, etc.

- **SRZ unit**
  Temperature control module Z-TIO-C (4 channel type)..... 2
  Temperature control module Z-TIO-D (2 channel type) 1
  Digital I/O module Z-DIO-A 1

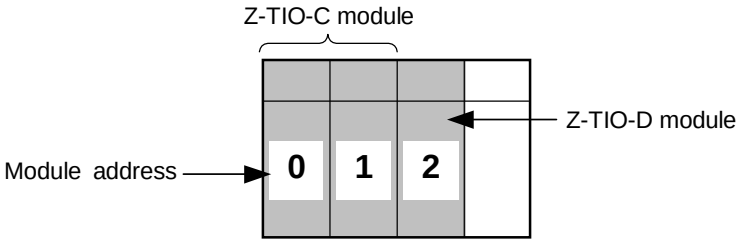
- **Communication converter**
  USB communication converter COM-K (RKC product)..... 1
  Loader communication cable W-BV-01 [option] 1

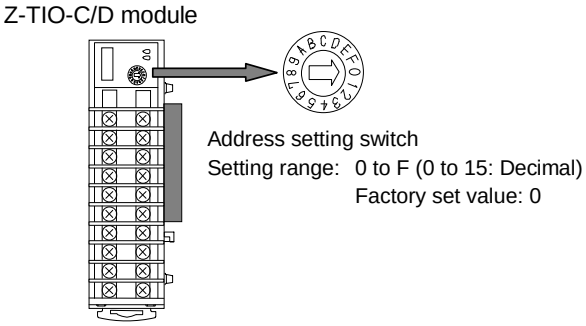
- **Personal computer ..... 1** (Must be running Windows 95, 98, Me, 2000, or XP)

6.5.3 Communication setting of Z-TIO-C/D and Z-DIO-A modules

(1) Z-TIO-C/D module address setting

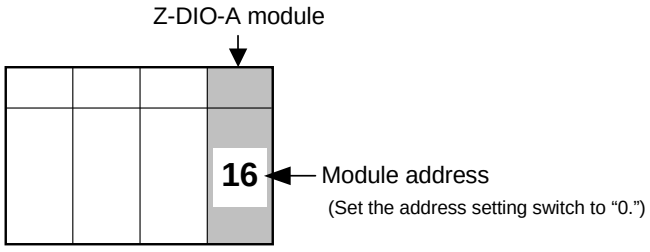
Set the module address by address setting switch of front of Z-TIO-C/D module. For this setting, use a small blade screwdriver. In this application, make the setting as follows.
(Z-TIO-C module address: 0, 1 Z-TIO-D module address: 2)

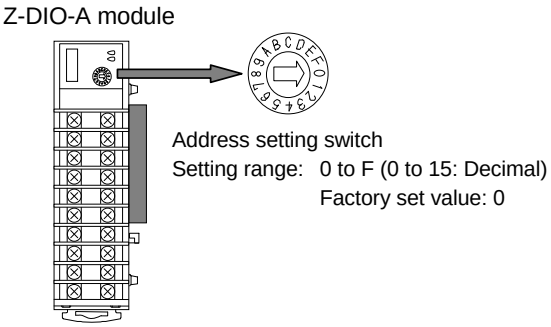




(2) Z-DIO-A module address setting

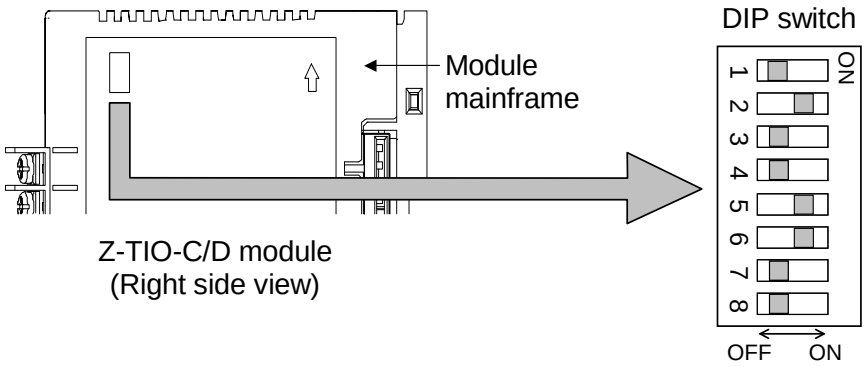
Set the module address by address setting switch of front of Z-DIO-A module. For this setting, use a small blade screwdriver. In this application, make the setting as follows.
(Z-DIO-A module address: 16)





(3) Protocol selections and communication speed setting of Z-TIO-C/D module

Configure the protocol and communication speed settings on the Z-TIO-C/D module using the DIP switches. Set the same values in the Z-TIO-C modules (two) and Z-TIO-D module (one).



(The above figure is for the terminal type. However, the switch positions are the same for the connector type.)

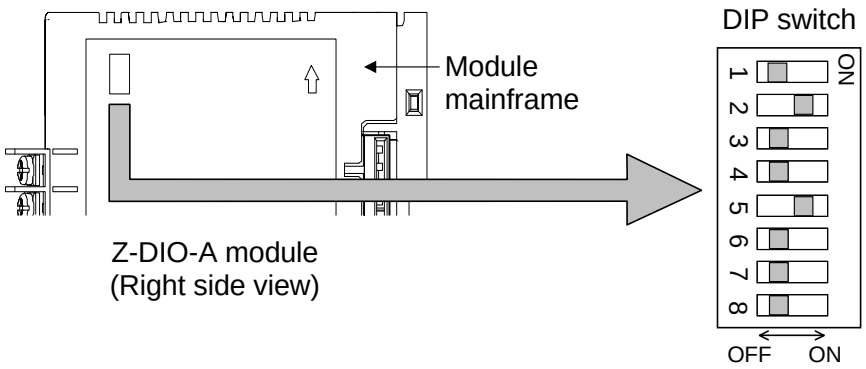
PLC communication setting switch		Setting contents
1	OFF	Communication speed: 19200 bps
2	ON	
3	OFF	Data bit configuration: Data 8-bit, Without parity, Stop 1-bit
4	OFF	
5	ON	
6	OFF	Communication protocol: MITSUBISHI MELSEC series special protocol A compatible 1C frame type 4 AnA/AnUCPU common command (QR/QW)
7	ON	
8	OFF	Switch No. 8 must be always OFF. (Do not set to ON.)

☞ For details of setting, see **3.3 Protocol Selections and Communication Speed Setting (P. 3-5)**.

(4) Protocol selections and communication speed setting of Z-DIO-A module

Configure the protocol and communication speed settings on the Z-DIO-A module using the DIP switches.

The Z-DIO-A module cannot communicate with the PLC, and thus the communication protocol must be set to "RKC communication." However, even if this is set to "RKC communication," host communication will not be possible if PLC communication is used (loader communication is possible).



(The above figure is for the terminal type. However, the switch positions are the same for the connector type.)

PLC communication setting switch		Setting contents
1	OFF	Communication speed:
2	ON	19200 bps
3	OFF	Data bit configuration:
4	OFF	Data 8-bit, Without parity, Stop 1-bit
5	ON	
6	OFF	Communication protocol:
7	OFF	RKC communication
8	OFF	Switch No. 8 must be always OFF. (Do not set to ON.)

For the setting, see **5.2 Protocol Selections and Communication Speed Setting of SRZ Instruction Manual (IMS01T04-E□)**.

6.5.4 PLC setting

Set the Serial communication module of MITSUBISHI MELSEC Q series as follows.

Setting item	Description
Operation setting	Independent
Data bit	8
Parity bit	NO
Even/odd parity	Odd
Stop bit	1
Sum check code	YES

Setting item	Description
Writing during RUN	Allowed
Setting modification	Allowed
Communication rate	19200 bps
Communication protocol	MC protocol, Format 4
Station number	0

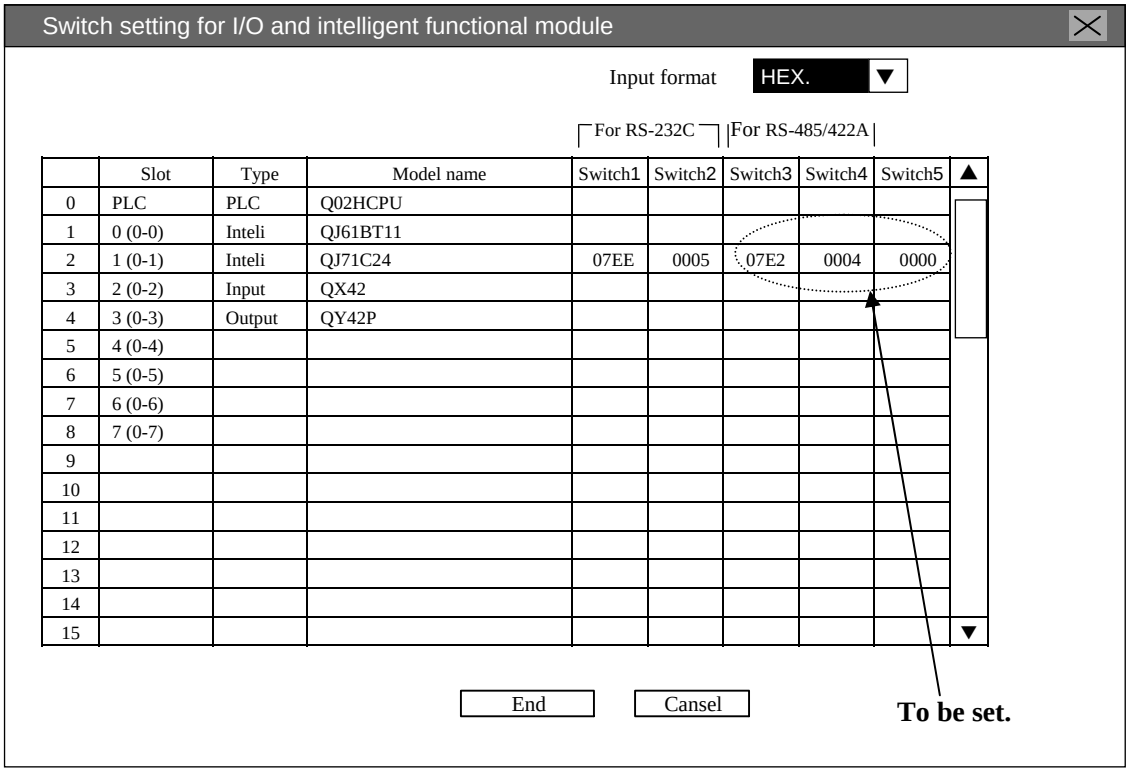
Setting in the serial communication module (QJ71C24) belonging to the MITSUBISHI MELSEC Q series do with the GX Developer of the MITSUBISHI MELSEC PLC programming software (SW□D5C-GPPW-E).
Setting set the following set value with switch setting for I/O and intelligent functional module.

Switch 3: **07E2** * Switch 4: **0004** * Switch 5: **0000** * * Hexadecimal

[Setting procedure]

[GX Developer] → [PLC parameters] → [I/O assignment setting] → **Switch setting**

[Setting screen]



Continued on the next page.

Continued from the previous page.

- **Description Switches 1 to 5**

Switch number	Description	
Switch 1	b15 to b8	b7 to b0
	CH1 Communication rate setting	CH1 Transmission setting
Switch 2	CH1 Communication protocol setting	
Switch 3	b15 to b8	b7 to b0
	CH2 Communication rate setting	CH2 Transmission setting
Switch 4	CH2 Communication protocol setting	
Switch 5	Station number setting	

Set the transmission specifications and communication protocol of each interface using the combinations of setting values for each switch with 16-bit binary data.

- **Setting on switch 3 (CH2 Transmission setting)**

Bit	Description	OFF (0)	ON (1)	Setting	Set value
b0	Operation setting *	Independent	Link	0	2
b1	Data bit	7	8	0	
b2	Parity bit	No	Yes	0	
b3	Even/Odd parity	Odd	Even	0	
b4	Stop bit	1	2	0	E
b5	Sum check code	No	Yes	1	
b6	Write during RUN	Prohibited	Allowed	1	
b7	Setting modifications	Prohibited	Allowed	1	

* Must be set to OFF (0) on CH1

- **Setting on switch 3 (CH2 Communication rate setting)**

Communication rate (Unit: bps)	Bit position b15 to b8	Communication rate (Unit: bps)	Bit position b15 to b8
300	00H	14400	06H
600	01H	19200	07H
1200	02H	28800	08H
2400	03H	38400	09H
4800	04H	57600	0AH
9600	05H	115200	0BH

Set 19200 bps on communication rate. (Set value: 07H)

- **Setting on switch 4 (CH2 Communication protocol setting)**

Set number	Description	
0H	GX Developer connection	
1H	MC protocol	Format 1
2H		Format 2
3H		Format 3
4H		Format 4
5H		Format 5

Set number	Description
6H	Non procedure protocol
7H	Bidirectional protocol
8H	For linked operation setting
9 to DH	Setting prohibited
EH	ROM/RAM/switch test
FH	Individual station loopback test

Set MC protocol Format 4 on communication protocol setting. (Set value: 4H)

- **Setting on switch 5 (Station number setting)**

This setting is common for both CH1 and CH2 sides.
Set the station number to 0.

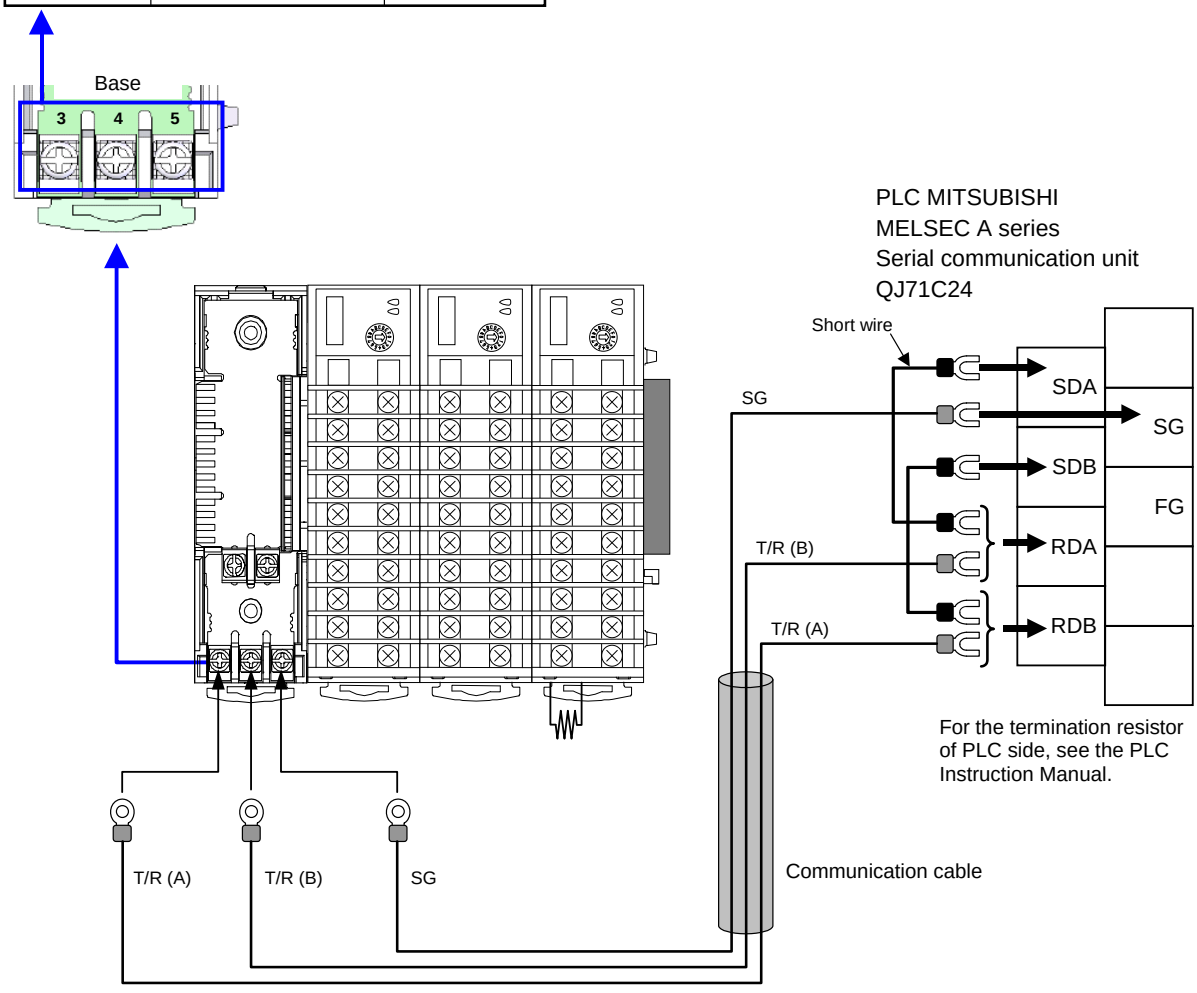
☞ The details of the switch setting for the PLC, see the instruction manual for the PLC being used.

6.5.5 Connection to PLC

Connect a SRZ unit to PLC (serial communication unit QJ71C24).

Communication terminal (RS-485)

Terminal No.	Signal name	Symbol
3	Send data/Receive data	T/R (A)
4	Send data/Receive data	T/R (B)
5	Signal ground	SG



6.5.6 Configuring the PLC communication environment and SRZ setting data using loader communication

The PLC communication environment and SRZ setting data are configured on each module.

(1) Preparation of communication program

To perform loader communication, a communication program is required. The customer should refer to the RKC communication protocol and create a communication program.

☞ For RKC communication protocol, see **SRZ Instruction Manual (IMS01T04-E□)**.

(2) Loader communication setting

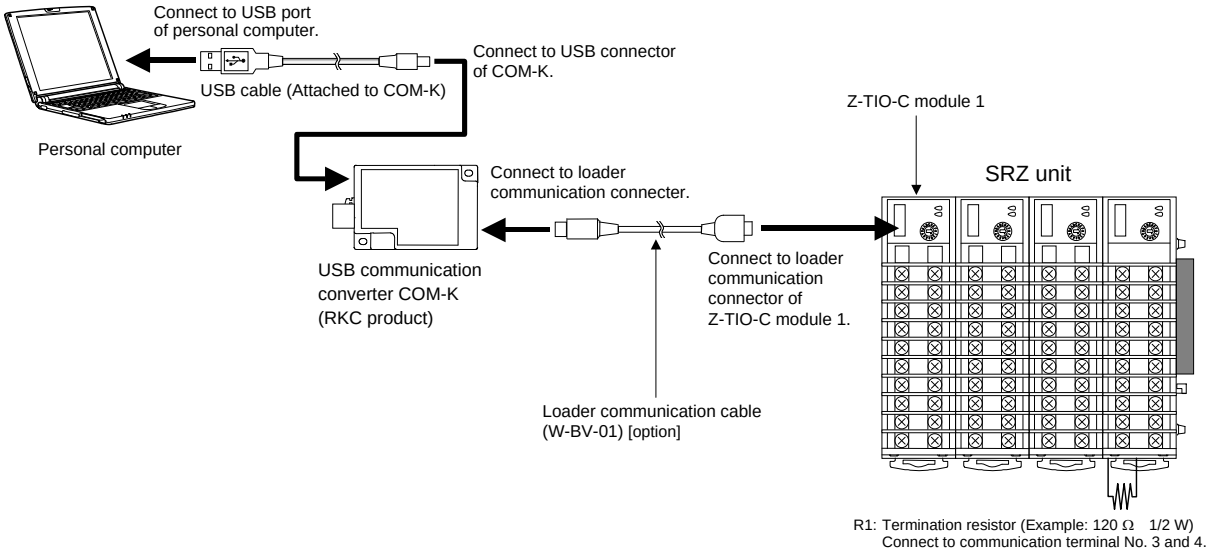
Set the communication port of the computer to the following values. There are no loader communication settings on the Z-TIO-C/D module side.

Communication speed [2]	38400 bps
Address [2]	0
Start bit [2]	1
Data bit [2]	8
Parity bit [2]	Without parity
Stop bit [2]	1

[2] Above setting data is fixed.

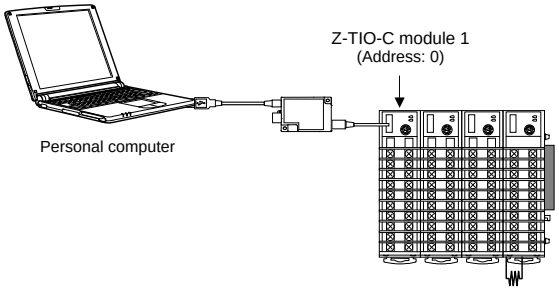
(3) Communication of loader communication

Connect a SRZ unit to converter COM-K and personal computer by connection cable.



(4) Configuring the PLC communication environment and SRZ setting data

Use a personal computer to configure the PLC communication environment and SRZ setting data of Z-TIO-C module 1 (address 0).



1. Turn on the power of the personal computer, and SRZ unit. PLC communication environment can be configured immediately after the power is turned on.
(Keep the PLC power OFF.)

2. Set the PLC communication environmental by personal computer. In this application, use the factory set value.

Setting items	Identifier	Set value (Factory set value)	
Station number	QV	0	
PC number	QW	255	
Register type (D, R, W, ZR)	QZ	0 (D register)	
Register start number (High-order 4 bit)	QS	0	
Register start number (Low-order 16 bit)	QX	1000	These values can be changed to change the starting number of the PCL communication data register.
Monitor item register bias	R3	10	
Setting item register bias	R4	0	
Monitor item selection	R6	33535	
Setting item selection	R7	(A) ch1: 62427 (B) ch2: 15583 (C) ch3: 512 (D) ch4: 512	"Use"/"Unused" can be selected for the communication data.
(10) Z-TIO module link recognition time	QT	5 seconds	
(11) PLC scanning time	VT	255 ms	
(12) PLC communication start time *	R5	5 seconds	
(13) Slave register bias	R8	150	
(14) Interval time	ZX	10	

* The PLC communication start time is the time that writing of the system data starts.
Actual communication with the PLC by request command can only take place after the system communication state (D01000) changes to "1."

☞ For the register start number, monitor item register bias, and setting item register bias, see on page 6-11.

☞ For the setting procedure for "Use"/"Unused," see **6.5.9 Example of PLC communication data map editing (P. 6-63).**

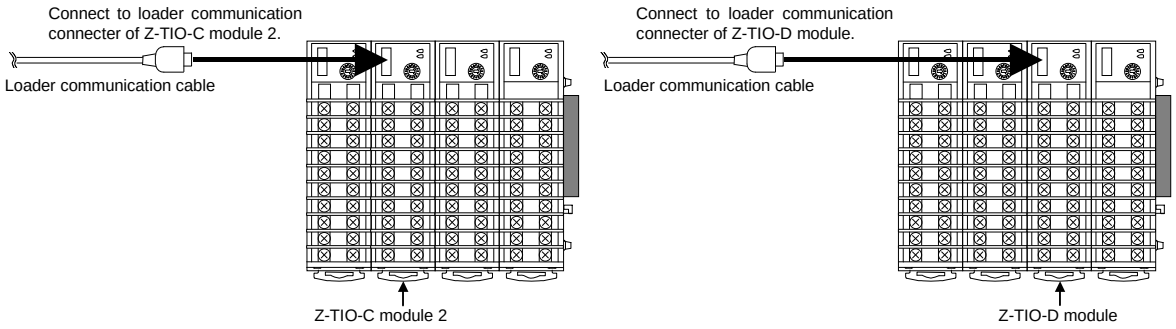
3. After configuring the PLC communication environment, configure the engineering data and operation data of Z-TIO-C module 1.

If the control is the control start (RUN), transfer the control stop (STOP). The engineering data can be configured when the Z-TIO-C/D module is stopped.

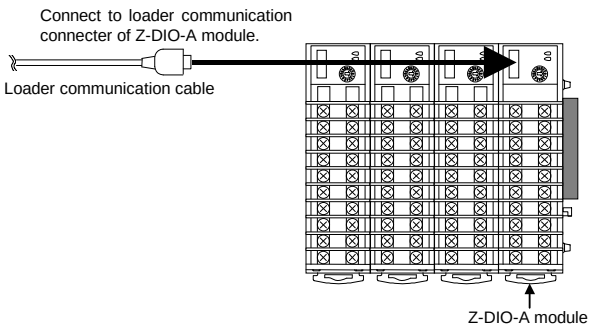
For the engineering data, and function description of communication data, see **SRZ Instruction Manual (IMS01T04-E□)**.

4. After the PLC communication environment, engineering data, and operation data have been configured, turn off the power of Z-TIO-C module 1 and then turn it back on. The new values will take effect when the power is turned on.

5. After configuring the Z-TIO-C module 1 settings, configure the PLC communication environment, engineering data and operation data of Z-TIO-C module 2 and the Z-TIO-D module. Connect the loader communication cable to the module in which data is being configured. Follow the same procedure as for Z-TIO-C module 1 to configure the settings.



6. Set the engineering data, and operation data of the Z-DIO-A module. Connect a loader communication cable to the Z-DIO-A module.



If the control is the control start (RUN), transfer the control stop (STOP). The engineering data can be configured when the Z-TIO-C/D module is stopped.

● PLC communication register address

In the PLC communication environment, by setting the values shown below for the register type, register start number, monitor item register bias, setting item register bias, monitor item selection, setting item selection, and slave register bias, the register address of each data item in PLC communication will be as indicated below.

- Register type: 0 (D register)
- Register start number (Low-order 16-bit): 1000
- Monitor item register bias: 10
- Setting item register bias: 0
- Monitor item selection: 33535
- Setting item selection: ch1: 62427
  ch2: 15583
  ch3: 512
  ch4: 512
- Slave register bias 150

The Z-TIO-C/D module occupies a number of PLC registers equal to the maximum number of data items. For example, the actual number of data of RUN/STOP switching is 1 (data per module), however, four PLC registers are occupied. In the case of heat/cool control or position proportioning control, even though the data of the 2nd channel and 4th channel are invalid (event set value, proportional band, etc.), four registers are occupied.
For invalid data, 0 is sent.

Communication data selected in Monitor item selection and Setting item selection are assigned to PLC registers in sets of four upward justified data.

Register address	Communication data		Data type
D01000	System communication state		Z-TIO-C module 1 System data
D01001	Z-TIO normal communication flag		
D01002	Internal processing		
D01003	Internal processing		
D01004	PLC communication error code		
D01005	Z-TIO module recognition flag		
D01006	Internal processing		
D01007	Request item number		
D01008	Request command		
D01009	Setting group communication state		
D01010 to D01013	Measured value (PV)	CH1 to CH4	Z-TIO-C module 1 Monitor group communication data
D01014 to D01017	Comprehensive event state	CH1 to CH4	
D01018 to D01021	Operation mode state monitor	CH1 to CH4	
D01022 to D01025	Error code	CH1 to CH4	
D01026 to D01029	Manipulated output value (MV) monitor [heat-side]	CH1 to CH4	
D01030 to D01033	Manipulated output value (MV) monitor [cool-side]	CH1 to CH4	
D01034 to D01037	Current transformer (CT) input value monitor	CH1 to CH4	
D01038 to D01041	Set value (SV) monitor	CH1 to CH4	
D01042 to D01045	Output state monitor	CH1 to CH4	
D01046 to D01049	Memory area number monitor	CH1 to CH4	

Continued on the next page.

Continued from the previous page.

Register address	Communication data		Data type
D01050 to D01053	PID/AT transfer	CH1 to CH4	Z-TIO-C module 1 Setting group communication data
D01054 to D01057	Auto/Manual transfer	CH1 to CH4	
D01058 to D01061	RUN/STOP transfer	CH1 to CH4	
D01062 to D01065	Memory area transfer	CH1 to CH4	
D01066 to D01069	Event 1 set value (EV1)	CH1 to CH4	
D01070 to D01073	Event 1 set value (EV2)	CH1 to CH4	
D01074 to D01077	Event 1 set value (EV3)	CH1 to CH4	
D01078 to D01081	Event 1 set value (EV4)	CH1 to CH4	
D01082 to D01085	Set value (SV)	CH1 to CH4	
D01086 to D01089	Proportional band [heat-side]	CH1 to CH4	
D01090 to D01093	Integral time [heat-side]	CH1 to CH4	
D01094 to D01097	Derivative time [heat-side]	CH1 to CH4	
D01098 to D01101	Control response parameter	CH1 to CH4	
D01102 to D01105	Proportional band [cool-side]	CH1 to CH4	
D01106 to D01109	Integral time [cool-side]	CH1 to CH4	
D01110 to D01113	Derivative time [cool-side]	CH1 to CH4	
D01114 to D01117	Overlap/Deadband	CH1 to CH4	
D01118 to D01121	Setting change rate limiter (up)	CH1 to CH4	
D01122 to D01125	Setting change rate limiter (down)	CH1 to CH4	
D01126 to D01129	Heater break alarm (HBA) set value	CH1 to CH4	
D01130 to D01133	Heater break determination point	CH1 to CH4	
D01134 to D01137	Heater melting determination point	CH1 to CH4	
D01138 to D01141	PV bias	CH1 to CH4	
D01142 to D01145	Manual manipulated output value	CH1 to CH4	
D01146 to D01149	Operation mode	CH1 to CH4	
D01150	System communication state		Z-TIO-C module 2 System data
D01151	Z-TIO normal communication flag		
D01152	Internal processing		
D01153	Internal processing		
D01154	PLC communication error code		
D01155	Z-TIO module recognition flag		
D01156	Internal processing		
D01157	Request item number		
D01158	Request command		
D01159	Setting group communication state		
D01160 to D01163	Measured value (PV)	CH1 to CH4	Z-TIO-C module 2 Monitor group communication data
D01164 to D01167	Comprehensive event state	CH1 to CH4	
D01168 to D01171	Operation mode state monitor	CH1 to CH4	
D01172 to D01175	Error code	CH1 to CH4	
D01176 to D01179	Manipulated output value (MV) monitor [heat-side]	CH1 to CH4	

Continued on the next page.

Continued from the previous page.

Register address	Communication data		Data type
D01180 to D01183	Manipulated output value (MV) monitor [cool-side]	CH1 to CH4	Z-TIO-C module 2 Monitor group communication data
D01184 to D01187	Current transformer (CT) input value monitor	CH1 to CH4	
D01188 to D01191	Set value (SV) monitor	CH1 to CH4	
D01192 to D01195	Output state monitor	CH1 to CH4	
D01196 to D01199	Memory area number monitor	CH1 to CH4	
D01200 to D01203	PID/AT transfer	CH1 to CH4	Z-TIO-C module 2 Setting group communication data
D01204 to D01207	Auto/Manual transfer	CH1 to CH4	
D01208 to D01211	RUN/STOP transfer	CH1 to CH4	
D01212 to D01215	Memory area transfer	CH1 to CH4	
D01216 to D01219	Event 1 set value (EV1)	CH1 to CH4	
D01220 to D01223	Event 1 set value (EV2)	CH1 to CH4	
D01224 to D01227	Event 1 set value (EV3)	CH1 to CH4	
D01228 to D01231	Event 1 set value (EV4)	CH1 to CH4	
D01232 to D01235	Set value (SV)	CH1 to CH4	
D01236 to D01239	Proportional band [heat-side]	CH1 to CH4	
D01240 to D01243	Integral time [heat-side]	CH1 to CH4	
D01244 to D01247	Derivative time [heat-side]	CH1 to CH4	
D01248 to D01251	Control response parameter	CH1 to CH4	
D01252 to D01255	Proportional band [cool-side]	CH1 to CH4	
D01256 to D01259	Integral time [cool-side]	CH1 to CH4	
D01260 to D01263	Derivative time [cool-side]	CH1 to CH4	
D01264 to D01267	Overlap/Deadband	CH1 to CH4	
D01268 to D01271	Setting change rate limiter (up)	CH1 to CH4	
D01272 to D01275	Setting change rate limiter (down)	CH1 to CH4	
D01276 to D01279	Heater break alarm (HBA) set value	CH1 to CH4	
D01280 to D01283	Heater break determination point	CH1 to CH4	
D01284 to D01287	Heater melting determination point	CH1 to CH4	
D01288 to D01291	PV bias	CH1 to CH4	
D01292 to D01295	Manual manipulated output value	CH1 to CH4	
D01296 to D01299	Operation mode	CH1 to CH4	
D01300	System communication state		Z-TIO-D module System data
D01301	Z-TIO normal communication flag		
D01302	Internal processing		
D01303	Internal processing		
D01304	PLC communication error code		
D01305	Z-TIO module recognition flag		
D01306	Internal processing		
D01307	Request item number		
D01308	Request command		
D01309	Setting group communication state		

Continued on the next page.

Continued from the previous page.

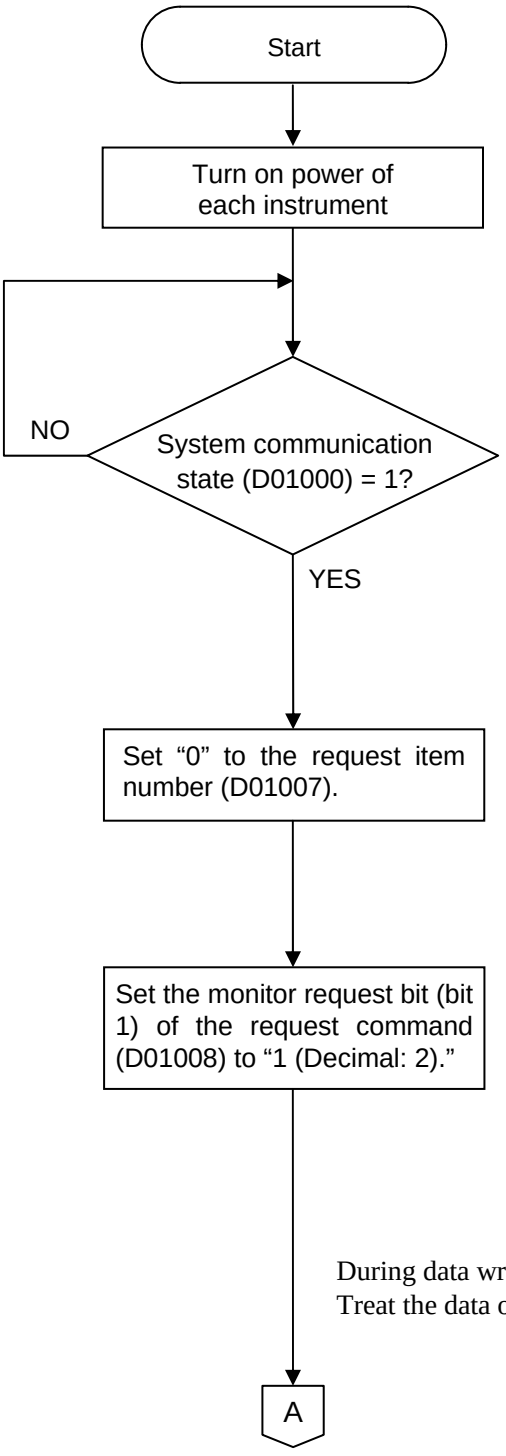
In the case of a Z-TIO-D module (2-channel type), the registers of the 3rd and 4th channels are not used. However, four PLC registers are occupied.

Register address	Communication data		Data type
D01310 to D01313	Measured value (PV)	CH1, CH2	Z-TIO-D module Monitor group Communication data
D01314 to D01317	Comprehensive event state	CH1, CH2	
D01318 to D01321	Operation mode state monitor	CH1, CH2	
D01322 to D01325	Error code	CH1, CH2	
D01326 to D01329	Manipulated output value (MV) monitor [heat-side]	CH1, CH2	
D01330 to D01333	Manipulated output value (MV) monitor [cool-side]	CH1, CH2	
D01334 to D01337	Current transformer (CT) input value monitor	CH1, CH2	
D01338 to D01341	Set value (SV) monitor	CH1, CH2	
D01342 to D01345	Output state monitor	CH1, CH2	
D01346 to D01349	Memory area number monitor	CH1, CH2	
D01350 to D01353	PID/AT transfer	CH1, CH2	Z-TIO-D module Setting group communication data
D01354 to D01357	Auto/Manual transfer	CH1, CH2	
D01358 to D01361	RUN/STOP transfer	CH1, CH2	
D01362 to D01365	Memory area transfer	CH1, CH2	
D01366 to D01369	Event 1 set value (EV1)	CH1, CH2	
D01370 to D01373	Event 1 set value (EV2)	CH1, CH2	
D01374 to D01377	Event 1 set value (EV3)	CH1, CH2	
D01378 to D01381	Event 1 set value (EV4)	CH1, CH2	
D01382 to D01385	Set value (SV)	CH1, CH2	
D01386 to D01389	Proportional band [heat-side]	CH1, CH2	
D01390 to D01393	Integral time [heat-side]	CH1, CH2	
D01394 to D01397	Derivative time [heat-side]	CH1, CH2	
D01398 to D01401	Control response parameter	CH1, CH2	
D01402 to D01405	Proportional band [cool-side]	CH1, CH2	
D01406 to D01409	Integral time [cool-side]	CH1, CH2	
D01410 to D01413	Derivative time [cool-side]	CH1, CH2	
D01414 to D01417	Overlap/Deadband	CH1, CH2	
D01418 to D01421	Setting change rate limiter (up)	CH1, CH2	
D01422 to D01425	Setting change rate limiter (down)	CH1, CH2	
D01426 to D01429	Heater break alarm (HBA) set value	CH1, CH2	
D01430 to D01433	Heater break determination point	CH1, CH2	
D01434 to D01437	Heater melting determination point	CH1, CH2	
D01438 to D01441	PV bias	CH1, CH2	
D01442 to D01445	Manual manipulated output value	CH1, CH2	
D01446 to D01449	Operation mode	CH1, CH2	

6.5.7 Initial setting

Change each set value of Z-TIO-C/D module from the PLC after the initial settings are made. Configure initial settings for all of the Z-TIO-C/D modules.

■ Initial setting of the Z-TIO-C module 1

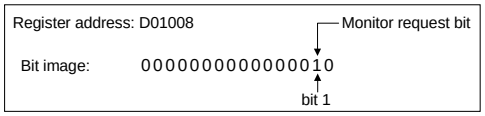


Turn on the power of the Z-TIO-C/D module, and the PLC. When the PLC communication start time (factory setting: 5 seconds) elapses, writing of the system data begins.

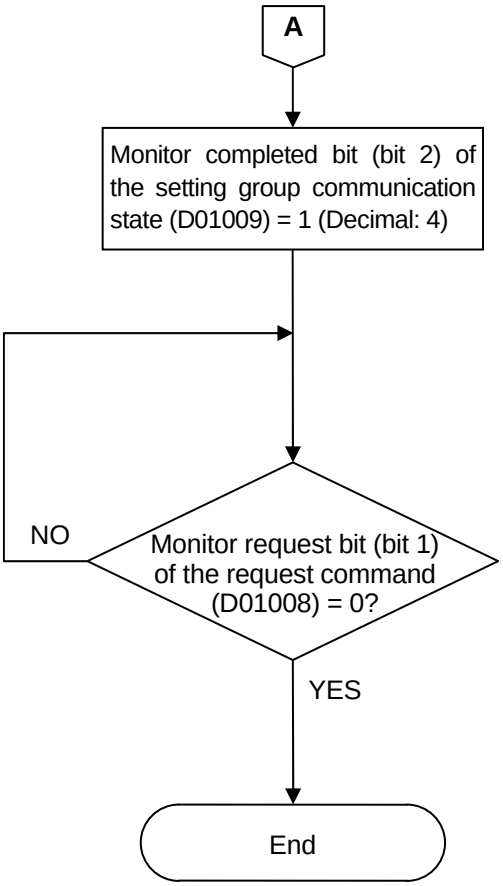
After the system data is written, the Z-TIO-C/D module begins writing the communication data of the monitor group to the PLC. When monitor group writing starts, “system communication state” changes to “**1**.”
When the system communication condition becomes “**1**,” PLC communication can be performed.

Because all communication data of the setting group is written to the PLC, the request item number (**D01007**) of the PLC register is set to “**0**.”

When the monitor request bit (bit 1) of request command (**D01008**) of the PLC register is set to “**1** (Decimal: **2**),” the Z-TIO-C/D module begins writing the setting group to the PLC.

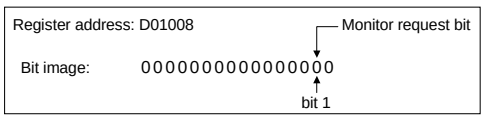


During data write:
Treat the data of all items as inconsistent during the data write.



When writing is finished, the Z-TIO-C/D module writes the communication state of the setting group to the monitor completed bit (bit 2) of the setting group communication state (**D01009**) of the PLC.

If the monitor request bit (bit 1) of the request command (**D01008**) of the PLC register is "**0**," this indicates that writing of data to the PLC is finished.



After configuring the initial settings of Z-TIO-C module 1, configure the initial settings of Z-TIO-C module 2 and the Z-TIO-D module. Perform the procedure on the previous page from the step for the request item number setting.

Communication data	Register number	
	Z-TIO-C module 2	Z-TIO-D module
System communication state	D01150	D01300
Request item number	D01157	D01307
Request command	D01158	D01308
Setting group communication state	D01159	D01309

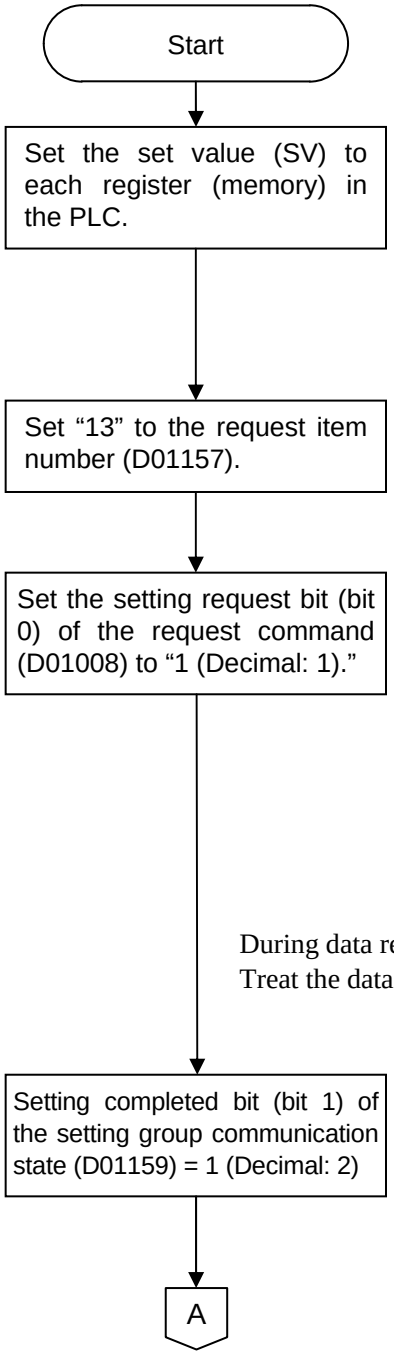
6.5.8 Data setting

It is assumed that initial setting is finished.

If each set value of the Z-TIO-C/D module is changed from the PLC without setting the initial values, it is re-written to 0 with each set value of the PLC at that time set to 0.

■ Setting example

When set the set value (SV) of the Z-TIO-C module 2 as follows:
Set value (SV): CH1 = 100 CH2 = 100 CH3 = 110 CH4 = 110

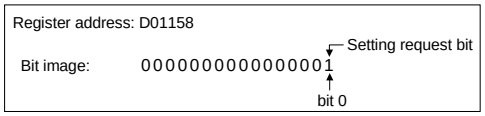


Register address of set value (SV) (See P. 6-57)

Register address	Communication item	Set value
D01232	Set value (SV) CH1	100
D01233	Set value SV) CH2	100
D01234	Set value (SV) CH3	110
D01235	Set value (SV) CH4	110

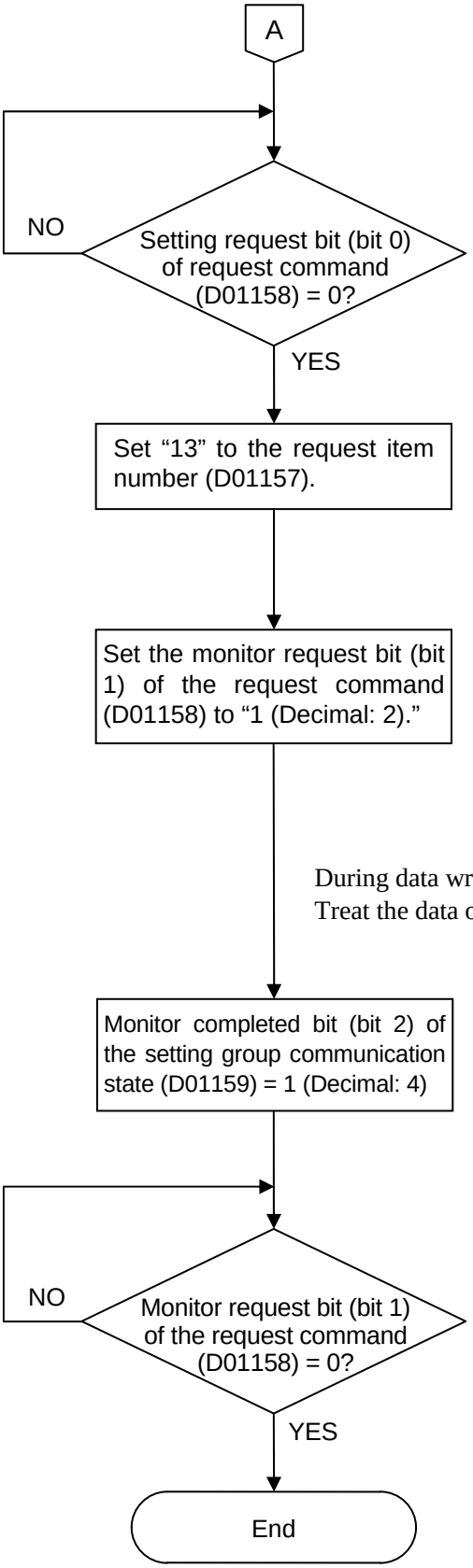
Set "**13**" to the request item number (**D01157**) of PLC register.

When the setting request bit (bit 0) of request command (**D01158**) of the PLC register is set to "**1** (Decimal: **1**)," the Z-TIO-C/D module begins reading the data set in the PLC register (memory).

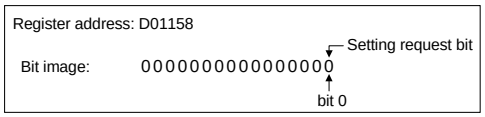


During data read:
Treat the data of all items as inconsistent during the data read.

When reading of the setting group data ends, the Z-TIO-C module 2 writes the setting group communication state to the setting completed bit (bit 1) of PLC setting group communication state (**D01159**).

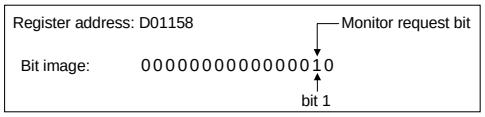


If the setting request bit (bit 0) of the request command (**D01158**) of the PLC register is "**0**," this indicates that reading of data from the PLC is finished.



[Confirmation of setting data]
The request item number (**D01157**) of the PLC register is set to "**13**" for verification of the data read from the PCL by the Z-TIO-C module 2.

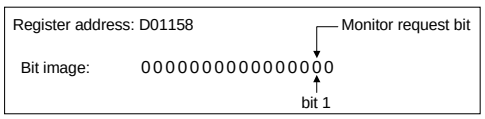
When the monitor request bit (bit 1) of request command (**D01158**) of the PLC register is set to "**1** (Decimal: **2**)," the Z-TIO-C module 2 begins writing the setting group data to the PLC.



During data write:
Treat the data of all items as inconsistent during the data write.

When writing is finished, the Z-TIO-C module 2 writes the communication state of the setting group to the monitor completed bit (bit 2) of the setting group communication state (**D01159**) of the PLC.

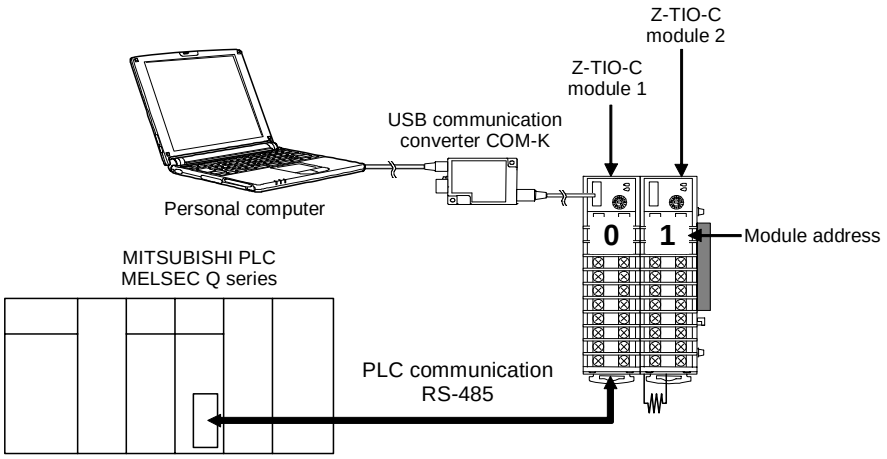
If the monitor request bit (bit 1) of the request command (**D01158**) of the PLC register is "**0**," this indicates that writing of data to the PLC is finished.



6.5.9 Example of PLC communication data map editing

Example: Reducing the number of communication data of Z-TIO-C module 1 and changing the register start number of Z-TIO-C module 2.

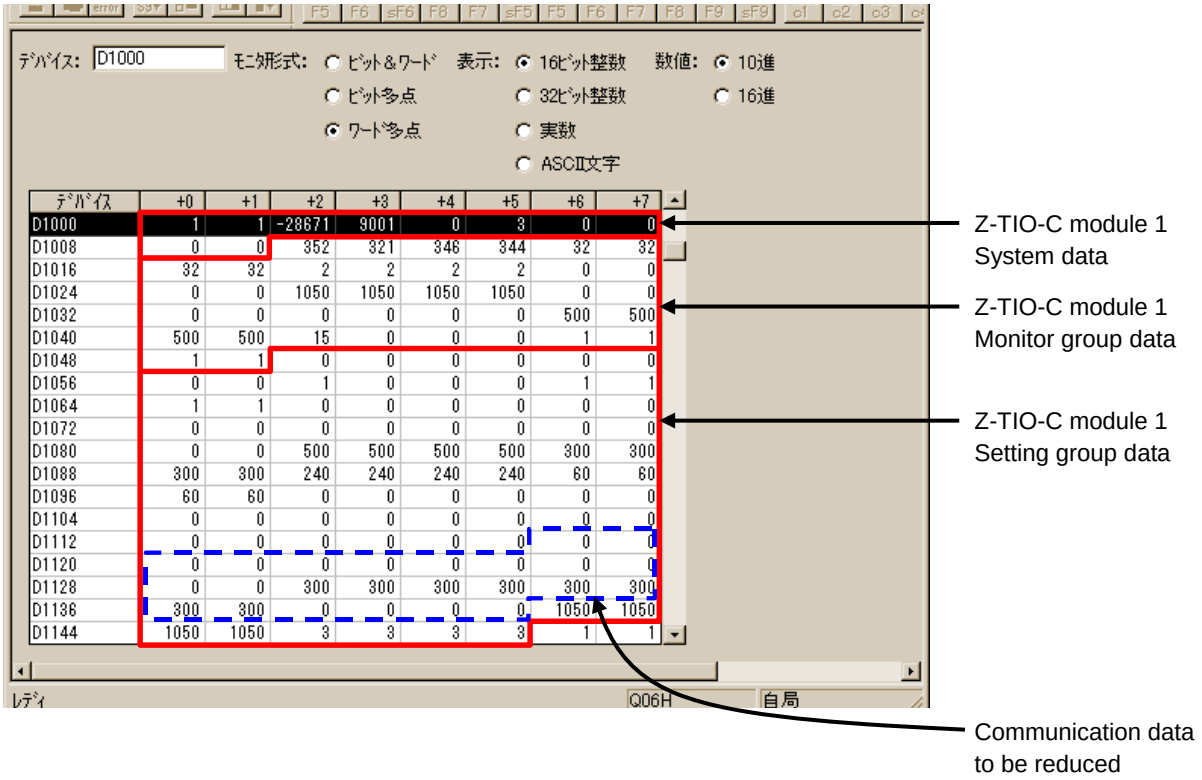
System configuration:



Communication data to be reduced (communication data of Z-TIO-C module 1 setting group):

- Setting change rate limiter (up) (D01118 to D01121)
- Setting change rate limiter (down) (D01122 to D01125)
- Heater break alarm (HBA) set value (D01126 to D01129)
- Heater break determination point (D01130 to D01133)
- Heater melting determination point (D01134 to D01137)
- PV bias (D01138 to D01141)

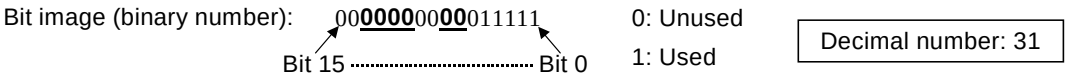
Display example of GX Developer (This screen is a Japanese version of the GX developer.)



■ Reducing the communication data

Communication data from Setting change rate limiter (up) (D01118) to PV bias (D01141) can be set to "use"/"unused" in ch2 of Setting item selection.

1. Set communication data that you wish to reduce to "0: Unused," and change from binary to decimal.



Selection item of ch2

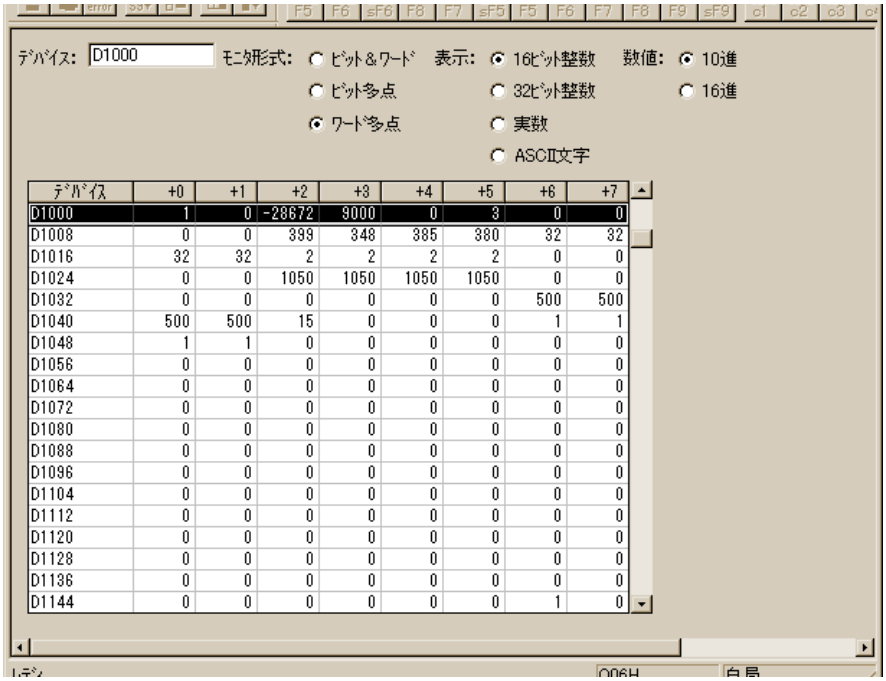
Bit	Item number	Communication data (setting item)	Number of data	Factory set value	
				Binary	Decimal
0	17	Control response parameter	4	1	
1	18	Proportional band [cool-side]	4	1	
2	19	Integral time [cool-side]	4	1	
3	20	Derivative time [cool-side]	4	1	
4	21	Overlap/Deadband	4	1	
5	22	Manual reset	4	0	
6	23	Setting change rate limiter (up)	4	**0**	
7	24	Setting change rate limiter (down)	4	**0**	**31**
8	25	Area soak time	4	0	
9	26	Link area number	4	0	
10	27	Heater break alarm (HBA) set value	4	**0**	
11	28	Heater break determination point	4	**0**	
12	29	Heater melting determination point	4	**0**	
13	30	PV bias	4	**0**	
14	31	PV digital filter	4	0	
15	32	PV ratio	4	0	

☞ For setting item selection, see **6.2.3 PLC communication environment items list (P. 6-4)**.

2. Set the ch2 of the setting item selection to "31 (decimal number)."

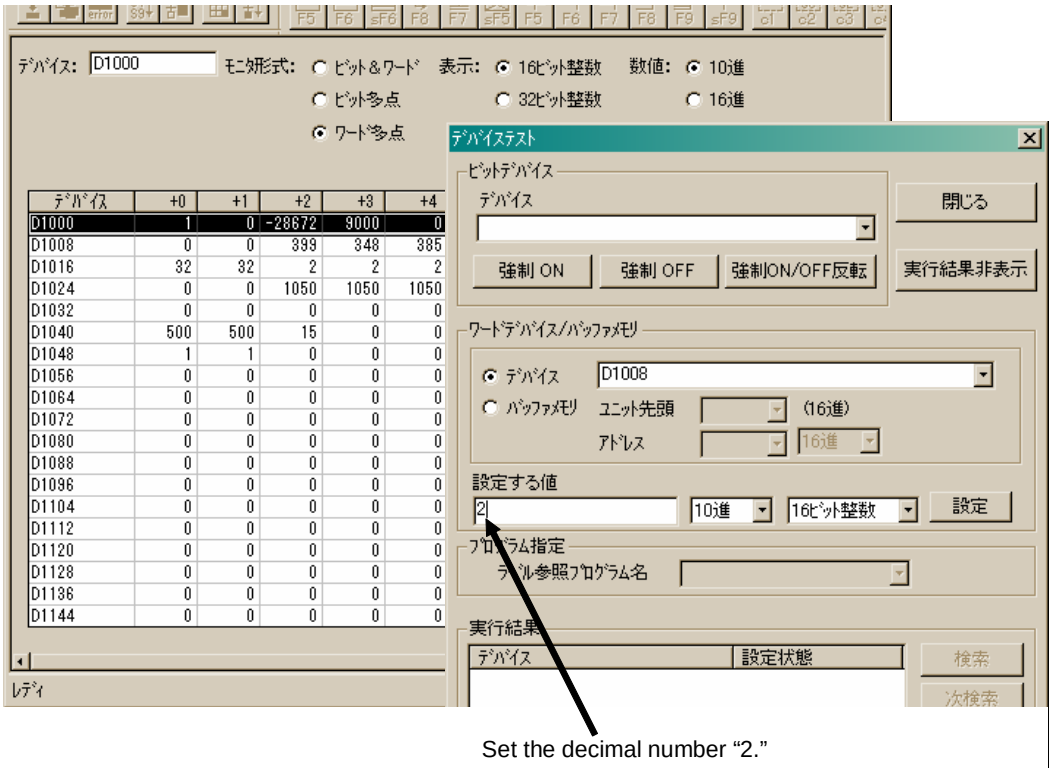
3. Turn off the power of the Z-TIO-C module and then turn it back on. When the power is turned on, the new values will take effect.

4. Check the edited PLC communication data map with “GX Developer.” Turn off the power of the PLC and then restart it to clear the PLC memory.



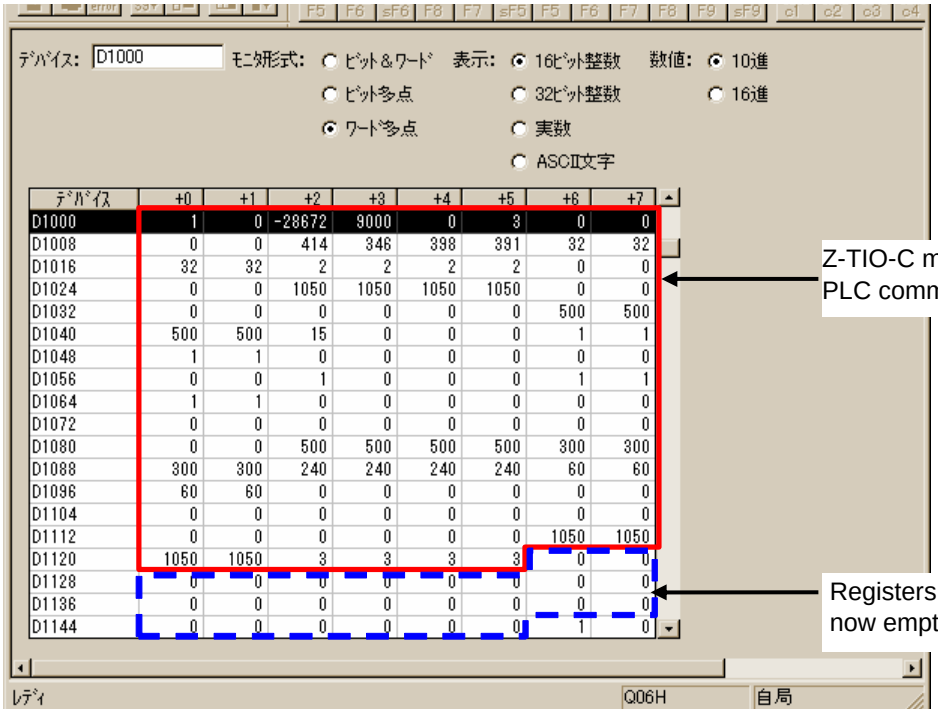
ﾃﾞﾊﾞｲｽ	+0	+1	+2	+3	+4	+5	+6	+7
D1000	1	0	-28672	9000	0	3	0	0
D1008	0	0	399	348	385	380	32	32
D1016	32	32	2	2	2	2	0	0
D1024	0	0	1050	1050	1050	1050	0	0
D1032	0	0	0	0	0	0	500	500
D1040	500	500	15	0	0	0	1	1
D1048	1	1	0	0	0	0	0	0
D1056	0	0	0	0	0	0	0	0
D1064	0	0	0	0	0	0	0	0
D1072	0	0	0	0	0	0	0	0
D1080	0	0	0	0	0	0	0	0
D1088	0	0	0	0	0	0	0	0
D1096	0	0	0	0	0	0	0	0
D1104	0	0	0	0	0	0	0	0
D1112	0	0	0	0	0	0	0	0
D1120	0	0	0	0	0	0	0	0
D1128	0	0	0	0	0	0	0	0
D1136	0	0	0	0	0	0	0	0
D1144	0	0	0	0	0	0	1	0

5. Configure the initial settings. With request item number (D01007) set to “0,” set the monitor request bit (bit 1) of request command (D01008) to “1” (decimal: 2), and write the setting group data of Z-TIO-C module 1 to the PLC.



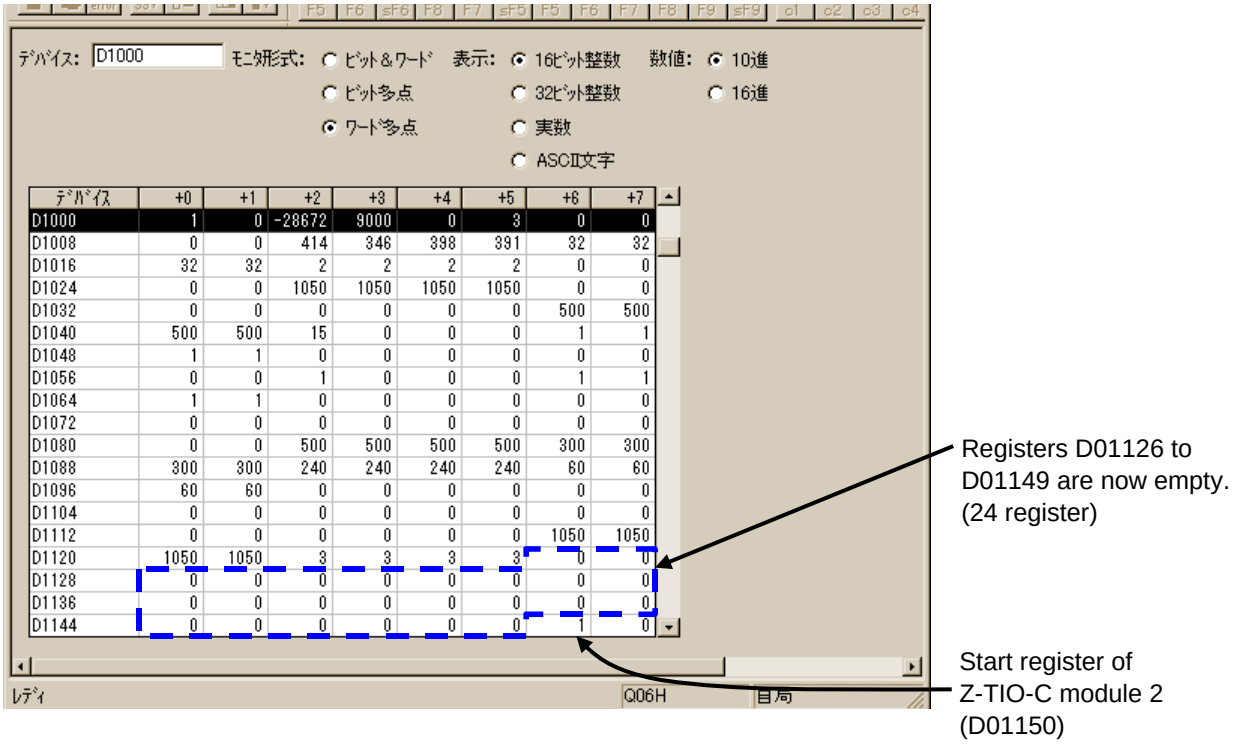
ﾃﾞﾊﾞｲｽ	+0	+1	+2	+3	+4
D1000	1	0	-28672	9000	0
D1008	0	0	399	348	385
D1016	32	32	2	2	2
D1024	0	0	1050	1050	1050
D1032	0	0	0	0	0
D1040	500	500	15	0	0
D1048	1	1	0	0	0
D1056	0	0	0	0	0
D1064	0	0	0	0	0
D1072	0	0	0	0	0
D1080	0	0	0	0	0
D1088	0	0	0	0	0
D1096	0	0	0	0	0
D1104	0	0	0	0	0
D1112	0	0	0	0	0
D1120	0	0	0	0	0
D1128	0	0	0	0	0
D1136	0	0	0	0	0
D1144	0	0	0	0	0

6. The PLC communication data map of Z-TIO-C module 1 has been reduced from D01000 to D01125.

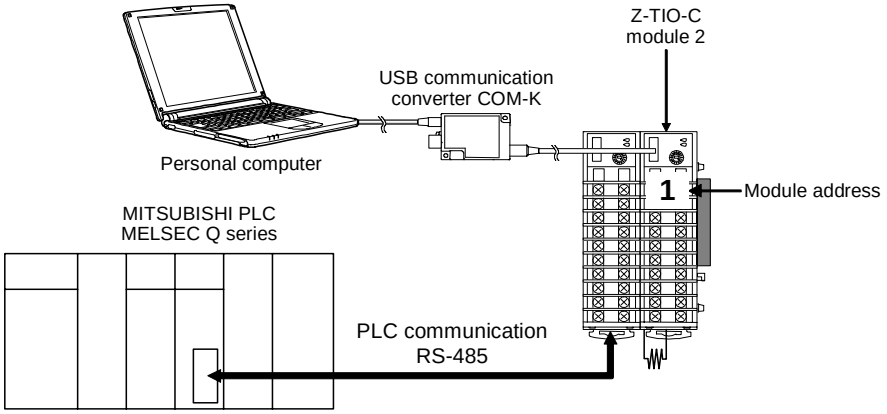


■ Change the register start number of a Z-TIO-C module 2

Registers D01126 to D01149 (24 registers) are now empty, and thus to fill in the empty registers, the register start number of Z-TIO-C module 2 must be changed.



1. Connect a loader communication cable to Z-TIO-C module 2.



2. Set the slave bias of the Z-TIO-C module 2 in the PLC communication environment setting item.

Slave bias value = Register start number – 1000

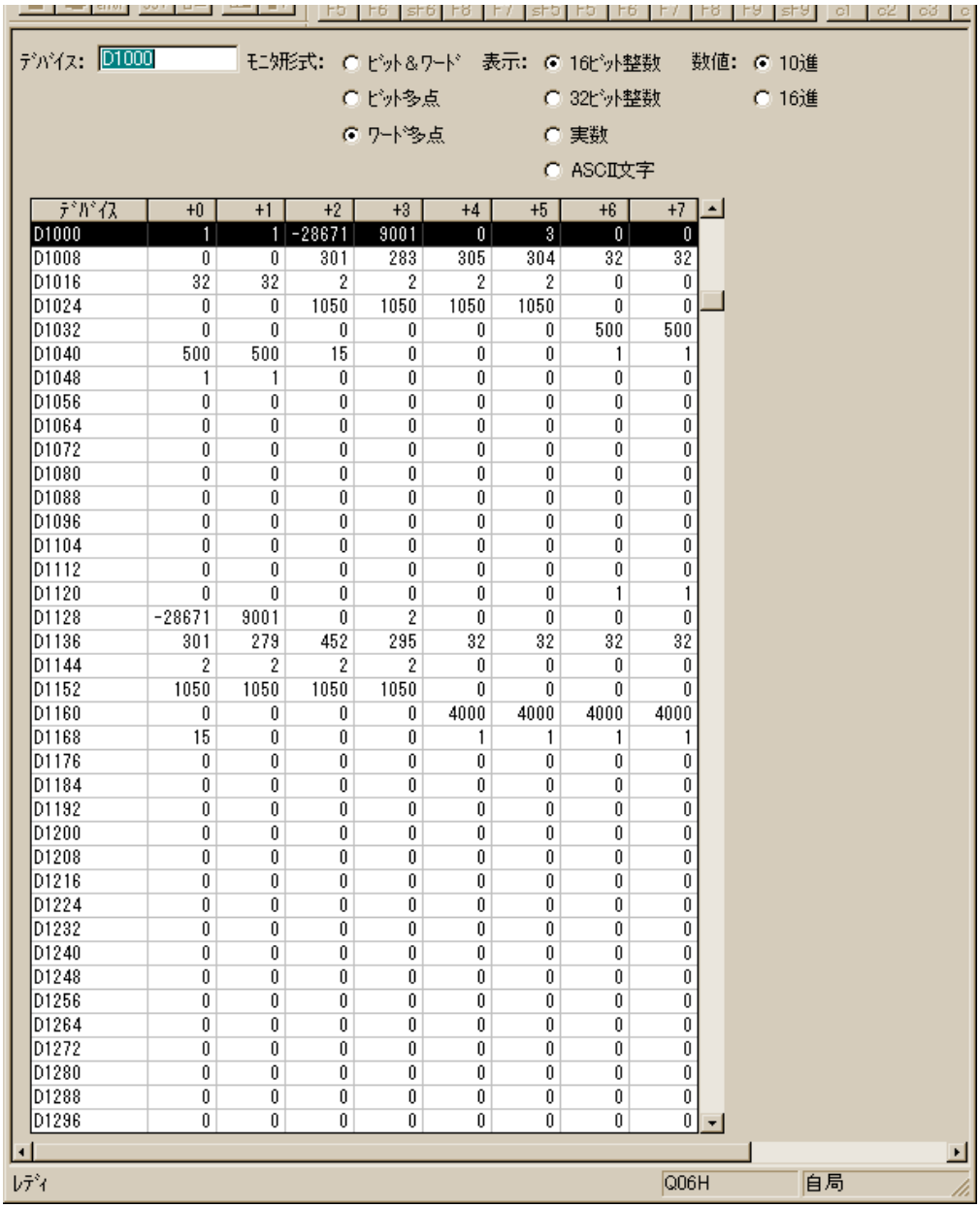
To change the register start number for the communication data of Z-TIO-C module 2 to D01126, set the slave bias value to "126" (D01126 – 1000 = 126).

Slave register bias (PLC communication environment setting item)

Name	Iden-tifier	Digits	Register address		Data range	Factory set value
			HEX	DEC		
Slave register bias	**QQ**	7	0175	373	0 to 65535 When connecting two or more Z-TIO-C/D module, a bias is set for the register addresses of each module so that no address duplication occurs. Set bias enable/disable with the address setting switch. When set the address setting switch to 0: Bias disabled When set the address setting switch to other than 0: Bias enabled Equation for calculating: Slave register start number = Register start number + (Address setting switch) × Slave register bias	150

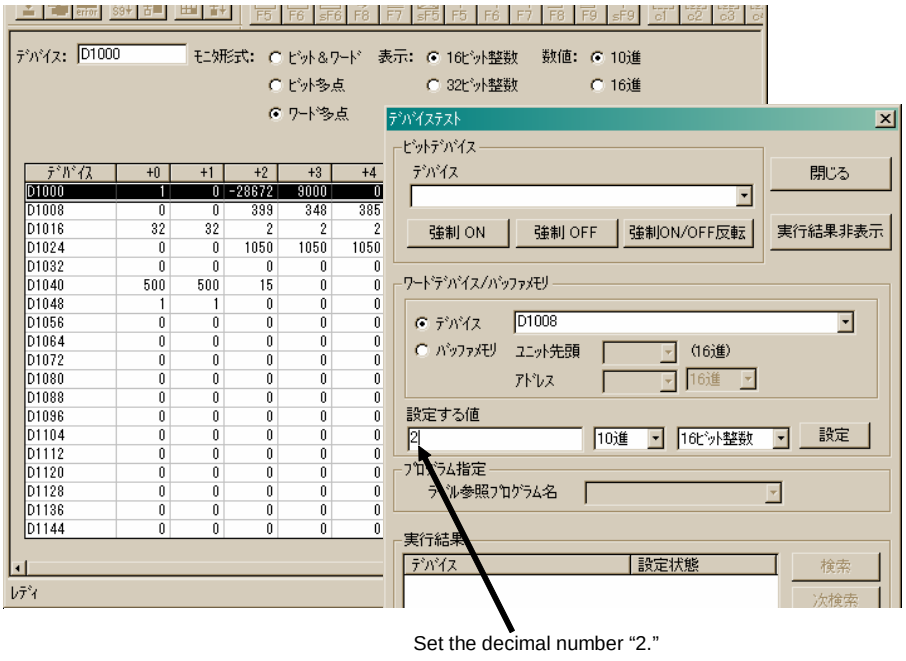
3. Turn off the power of the Z-TIO-C module and then turn it back on. When the power is turned on, the new values will take effect.

4. Check the edited PLC communication data map with “GX Developer.” Turn off the power of the PLC and then restart it to clear the PLC memory.

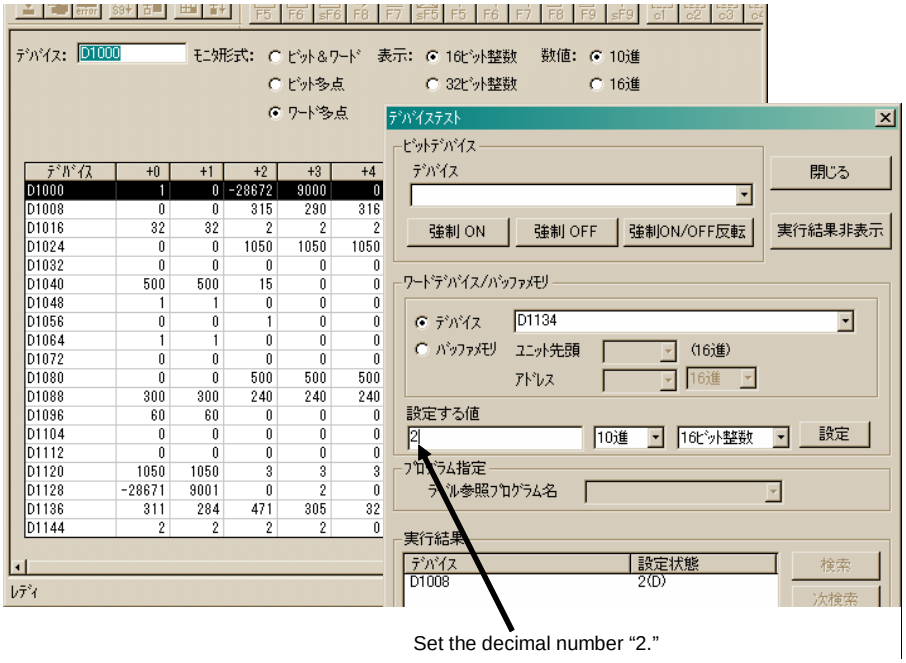


ﾃﾞﾊﾞｲｽ	+0	+1	+2	+3	+4	+5	+6	+7
D1000	1	1	-28671	9001	0	3	0	0
D1008	0	0	301	283	305	304	32	32
D1016	32	32	2	2	2	2	0	0
D1024	0	0	1050	1050	1050	1050	0	0
D1032	0	0	0	0	0	0	500	500
D1040	500	500	15	0	0	0	1	1
D1048	1	1	0	0	0	0	0	0
D1056	0	0	0	0	0	0	0	0
D1064	0	0	0	0	0	0	0	0
D1072	0	0	0	0	0	0	0	0
D1080	0	0	0	0	0	0	0	0
D1088	0	0	0	0	0	0	0	0
D1096	0	0	0	0	0	0	0	0
D1104	0	0	0	0	0	0	0	0
D1112	0	0	0	0	0	0	0	0
D1120	0	0	0	0	0	0	1	1
D1128	-28671	9001	0	2	0	0	0	0
D1136	301	279	452	295	32	32	32	32
D1144	2	2	2	2	0	0	0	0
D1152	1050	1050	1050	1050	0	0	0	0
D1160	0	0	0	0	4000	4000	4000	4000
D1168	15	0	0	0	1	1	1	1
D1176	0	0	0	0	0	0	0	0
D1184	0	0	0	0	0	0	0	0
D1192	0	0	0	0	0	0	0	0
D1200	0	0	0	0	0	0	0	0
D1208	0	0	0	0	0	0	0	0
D1216	0	0	0	0	0	0	0	0
D1224	0	0	0	0	0	0	0	0
D1232	0	0	0	0	0	0	0	0
D1240	0	0	0	0	0	0	0	0
D1248	0	0	0	0	0	0	0	0
D1256	0	0	0	0	0	0	0	0
D1264	0	0	0	0	0	0	0	0
D1272	0	0	0	0	0	0	0	0
D1280	0	0	0	0	0	0	0	0
D1288	0	0	0	0	0	0	0	0
D1296	0	0	0	0	0	0	0	0

5. Configure the initial settings. With request item number (D01007) set to "0", set the monitor request bit (bit 1) of request command (D01008) to "1" (decimal: 2), and write the setting group data of Z-TIO-C module 1 to the PLC.

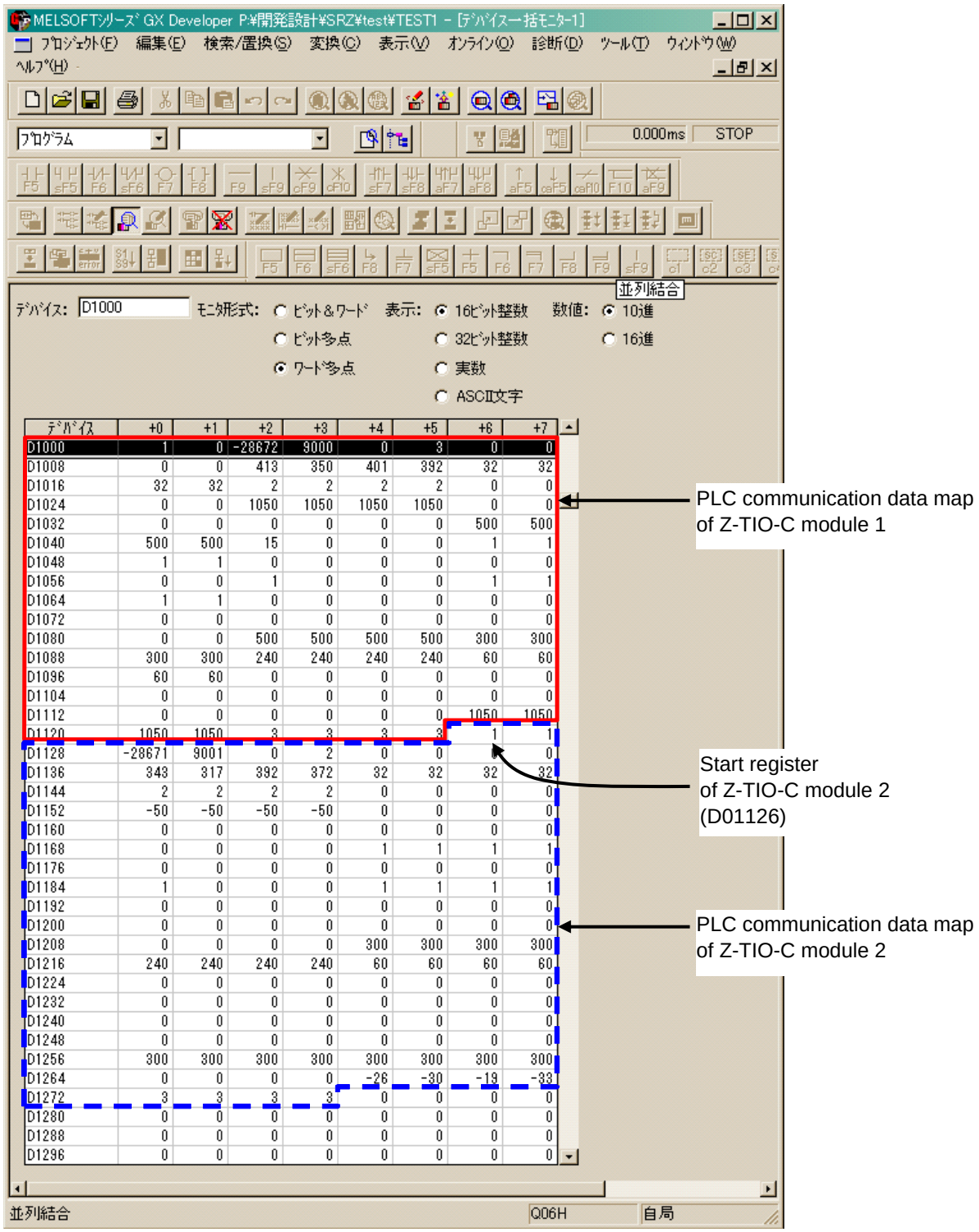


6. Next, write the setting group data of Z-TIO-C module 2 to the PLC. With request item number (D01133) set to "0", set the monitor request bit (bit 1) of request command (D01134) to "1" (decimal number: 2).



The factory set value for the slave bias of Z-TIO-C module 2 is "150," and thus the register number of request item number is "D01157" and the register number of request command is "D01158."
The registers of Z-TIO-C module 1 were reduced by 24, and thus the register of request item number is "D01133" and the register number of request command is "D01134."

7. The first register for the communication data of Z-TIO-C module 2 has been changed from D01150 to D01126.



TROUBLE SHOOTING

7

Solutions for Problems

This section explains probable causes and treatment procedures if any abnormality occurs in the instrument. For any inquiries, please contact RKC sales office or the agent, to confirm the specifications of the product.

If it is necessary to replace a device, always strictly observe the warnings below.

⚠ WARNING

- To prevent electric shock or instrument failure, always turn off the system power before replacing the instrument.
- To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.
- To prevent electric shock or instrument failure, do not turn on the power until all the wiring is completed.
- To prevent electric shock or instrument failure, do not touch the inside of the instrument.
- All wiring must be performed by authorized personnel with electrical experience in this type of work.

CAUTION

All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action. The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.

When replacing the module with a new one, always use the module with the same model code. If the module is replaced, it is necessary to re-set each data item.

■ Z-TIO-C/D module

Problem	Probable cause	Solution
FAIL/RUN lamp does not light up	Power not being supplied	Check external breaker etc.
	Appropriate power supply voltage not being supplied	Check the power supply
	Power supply terminal contact defect	Retighten the terminals
	Power supply section defect	Replace Z-TIO-C (or Z-TIO-D) module
RX/TX lamp does not flash	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	CPU section defect	Replace Z-TIO-C (or Z-TIO-D) module
The FAIL/RUN lamp is lit (red): FAIL status	CPU section or power section defect	Replace Z-TIO-C (or Z-TIO-D) module

■ PLC communication

Problem	Probable cause	Solution
• Even if "1" is set to the sitting request bit or monitor request bit in request command, transfer is not finished. Request command does not return to "0: Monitor" • RX/TX lamp is lit, and it can be seen to communicate normally, but monitor value is not transferred to PLC • No response	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Mismatch of the setting data of communication speed, data bit configuration and protocol with those of the PLC	Confirm the communication settings of Z-TIO-C or Z-TIO-D module DIP switch and set them correctly
	Wrong setting of PLC communication data	Confirm the PLC communication settings and set them correctly
		Setting of termination resistor in accordance with PLC or the insertion is done
	Setting of PLC becomes write inhibit	Setting of PLC is turned into write enable (Write enable in RUN, shift to monitor mode, etc.)
	Accesses outside the range of memory address of PLC (wrong setting of address)	Confirm the PLC communication environment setting and set them correctly
If two or more units are connected, no units after the second unit are recognized	Z-TIO module Link recognition time is short	Lengthen Z-TIO module link recognition time * * Set the Z-TIO module link recognition time only for a master module (address 0).
When the setting request command of request command is set in "1," setting error is become (bit 0 of setting group communication state: ON)	Data rang error	Confirm the setting range of set value and set them correctly

☞ For the "PLC communication environment setting" and "Z-TIO module link recognition time," see **6.2 PLC Communication Environment Setting (P. 6-3).**

■ RKC communication

Problem	Probable cause	Solution
No response	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Mismatch of the setting data of communication speed and data bit configuration with those of the host computer	Confirm the settings and set them correctly
	Wrong address setting	
	Error in the data format	Reexamine the communication program
	Transmission line is not set to the receive state after data send	
EOT return	The specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it
	Error in the data format	Reexamine the communication program
NAK return	Error occurs on the line (parity bit error, framing error, etc.)	Confirm the cause of error, and solve the problem appropriately. (Confirm the transmitting data, and resend data)
	BCC error	
	The data exceeds the setting range	Confirm the setting range and transmit correct data
	The block data length of the transmission exceeds 128 bytes	Divide the block using ETB before sending it
	The specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it

■ Modbus

Problem	Probable cause	Solution
No response	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Mismatch of the setting data of communication speed and data bit configuration with those of the host computer	Confirm the settings and set them correctly
	Wrong address setting	
	There is length of query message exceeds set range	
	A transmission error (overrun error, framing error, parity error or CRC-16 error) is found in the query message	Re-transmit after time-out occurs or verify communication program
	The time interval between adjacent data in the query message is too long, exceeding 24 bit's time	
Error code 1	Function cod error (Specifying nonexistent function code)	Confirm the function code
Error code 2	When the mismatched address is specified	Confirm the address of holding register
Error code 3	• When the specified number of data items in the query message exceeds the maximum number of data items available • When the data written exceeds the setting range	Confirm the setting data
Error code 4	Self-diagnostic error	Turn off the power to the instrument. If the same error occurs when the power is turned back on, please contact RKC sales office or the agent.

8

SPECIFICATIONS

8.1 Communication Specifications

■ PLC communication

Interface: Based on EIA, RS-485 standard

Connection method: 2-wire system, half-duplex multi-drop connection

Synchronous method: Start/stop synchronous type

Communication speed: 4800 bps, 9600 bps, 19200 bps, 38400 bps

Data bit configuration:
Start bit: 1
Data bit: 7 or 8
Parity bit: Without, Odd or Even
Stop bit: 1

Protocol: MITSUBISHI MELSEC series special protocol (type 4)

– A compatible, 1C frame, ACPU common command (WR/WW)
(A series, FX2N/FX2NC series or FX3U/FX3UC series)
WR: Word device read for each word
WW: Word device write for each word

– A compatible, 1C frame, AnA/AnUCPU common command (QR/QW)
QR: Word device read for each word
QW: Word device write for each word
D register, R register, W register

QnA compatible, 3C frame, command (0401/1401)
0401: Word device read for each word
1401: Word device write for each word
ZR register only
(AnA/AnU/QnA series, Q series)

Termination resistor: Externally terminal connected (Example: 120 Ω, 1/2 W)

Interval time: 0 to 250 ms

Maximum connections: Up to 16 Z-TIO-C/D modules

(Number of modules that can be connected to one PLC communication port)

- The maximum number of SRZ modules (including other function modules) on the same communication line is 31. However, modules other than Z-TIO-C/D modules cannot communicate with the PLC.
- When PLC communication is performed, Z-TIO-C or Z-TIO-D modules cannot be used in a connection with Z-COM modules.

■ Host communication (RKC communication/Modbus)

Interface: Based on EIA, RS-485 standard

Connection method: 2-wire system, half-duplex multi-drop connection

Synchronous method: Start/stop synchronous type

Communication speed: 4800 bps, 9600 bps, 19200 bps, 38400 bps
Communication speed can be selected with switch

Data bit configuration:
Start bit: 1
Data bit: RKC communication: 7 or 8
Modbus: 8
Parity bit: RKC communication: Without, 1 (Odd or Even)
Modbus: Without
Stop bit: 1
Data bit configuration can be selected with switch

Protocol:
- RKC communication

Based on ANSI X3.28 subcategory 2.5 B1
Polling/selecting type
Error control: Vertical parity (with parity bit selected)
Horizontal parity (BCC check)
Data types: ASCII 7-bit code

- Modbus

Signal transmission mode:
Remote Terminal Unit (RTU) mode
Function codes: 03H (Read holding registers)
06H (Preset single register)
08H (Diagnostics: loopback test)
10H (Preset multiple registers)
Error check method: CRC-16
Error codes: 1: Function code error
(An unsupported function code was specified)
2: When the mismatched address is specified
3: • When the specified number of data items in the query message exceeds the maximum number of data items available
• When the data written exceeds the setting range
4: Self-diagnostic error response

RKC communication or Modbus protocol can be selected with switch

Termination resistor: Externally terminal connected (Example: 120 Ω 1/2W)

Interval time: 0 to 250 ms

Maximum connections: Up to 16 Z-TIO-C/D modules
The maximum number of SRZ modules (including other function modules) on the same communication line is 31.

Signal logic: RS-485

Signal voltage	Logic
V (A) – V (B) ≥ 2 V	0 (SPACE)
V (A) – V (B) ≤ –2 V	1 (MARK)

Voltage between V (A) and V (B) is the voltage of (A) terminal for the (B) terminal.

■ Loader communication function

Interface:	Connection with a loader communication cable for our USB converter COM-K (sold separately).
Synchronous method:	Start/stop synchronous type
Communication speed:	38400 bps
Data bit configuration:	Address: 0 Start bit: 1 Data bit: 8 Parity bit: Without Stop bit: 1 Module address: 0 (fixted)
Protocol:	Based on ANSI X3.28 subcategory 2.5 B1
Maximum connections:	1 point

8.2 Product Specifications

■ Measuring input

Number of inputs: 4 point or 2 point (Isolated between each input)

Input type:

• Temperature, Current, Voltage (low) and Feedback resistance input group *

Thermocouple (TC)
K, J, T, S, R, E, B, N (JIS-C1602-1995)
PL II (NBS), W5Re/W26Re (ASTM-E988-96)

RTD: Pt100 (JIS-C1604-1997)
JPt100 (JIS-C1604-1981 of Pt100)
3-wire system

Voltage: 0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC

Current: 4 to 20 mA DC, 0 to 20 mA DC

Feedback resistance (FBR) input:
100 Ω to 6 kΩ (standard: 135 Ω)
[FBR inputs can be used to minitor FBR (feedback resistance)]

• Voltage (high) input group *

Voltage: 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC

* Universal input
(Use the input select switch to change input group.)

Input range:

TC input

Input type	Measured range
K	–200.0 to +1372.0 °C (–328 to +2501 °F, 0.0 to 800.0 °F)
J	–200.0 to +1200.0 °C (–328 to +2192 °F, 0.0 to 800.0 °F)
T	–200.0 to +400.0 °C (–328 to +752 °F, 0.0 to 752.0 °F)
S	–50 to +1768 °C (–58 to +3214 °F)
R	–50 to +1768 °C (–58 to +3214 °F)
E	–200.0 to +1000.0 °C (–328 to +1832 °F, 0.0 to 800.0 °F)
B	0 to 1800 °C (32 to 3272 °F)
N	0 to 1300 °C (32 to +2372 °F)
PLII	0 to 1390 °C (32 to 2534 °F)
W5Re/W26Re	0 to 2300 °C (32 to 4208 °F)

RTD input

Input type	Measured range
Pt100	–200.0 to +850.0 °C (–328 to +1562 °F, –328.0 to +752.0 °F)
JPt100	–200.0 to +640.0 °C (–328 to +1184 °F, –328.0 to +752.0 °F)

Voltage/Current input

Input type		Measured range
Voltage (low)	0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC	Programmable range (–19999 to +19999)
Voltage (high)	0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC	
Current	0 to 20 mA DC, 4 to 20 mA DC	

Feedback resistance input

Measuring range	100 Ω to 6 kΩ (standard: 135 Ω)

Sampling cycle: 250 ms

Influence of external resistance: Approx. 0.125 μV/Ω (Converted depending on TC types)

Influence of input lead: Approx. 0.02 %/Ω of PV (RTD input)
10 Ω or less per wire

Input impedance:

TC input:	1 MΩ or more
Voltage (low) input:	1 MΩ or more
Voltage (high) input:	Approx. 1 MΩ
Current input:	Approx. 50 Ω

Sensor current: Approx. 250 μA (RTD input)

Action at input beak:

TC input:	Upscale or downscale
RTD input:	Upscale
Voltage (low) input:	Upscale or downscale
Voltage (high) input:	Downscale (Indicates value near 0 V)
Current input:	Downscale (Indicates value near 0 mA)
Feedback resistance input:	Upscale

Action at input short circuit: Downscale (RTD input, Feedback resistance input)

Action at input error: Setting range of Input error determination point (high/low):
Input scale low − (5 % of input span) to
Input scale high + (5 % of input span)
High/Low individual setting

Manipulated output value at input error: −105.0 to +105.0 %

Input correction:

PV bias:	–Input span to +Input span
PV ratio:	0.500 to 1.500
First order lag digital filter:	0.0 to 100.0 seconds (0.0: OFF)

Square root extraction function (Voltage input, Current input):

Calculation method:	Measured value = √ (Input value × PV ratio + PV bias)
Low level cutoff:	0.00 to 25.00 % of input span

■ Current transformer (CT) input [optional]

Number of inputs: 4 points or 2 points

CT type: CTL-6-P-N or CTL-12-S56-10-N (Sold separately)

Input range:

CTL-6-P-N:	0.0 to 30.0 A
CTL-12-S56-10L-N:	0.0 to 100.0 A

Sampling cycle: 500 ms

■ Output (OUT1 to OUT4)

Number of outputs: 4 points or 2 points

Output contents: Used for control output or logic output

Output type:

• Relay contact output

Contact type:	1a contact
Contact rating (Resistive load):	250 V AC 3 A, 30 V DC 1 A
Electrical life:	300,000 times or more (Rated load)
Mechanical life:	50 million times or more (Switching: 180 times/min)
Proportional cycle time *:	0.1 to 100.0 seconds
Minimum ON/OFF time:	0 to 1000 ms

• Voltage pulse output (Not isolated between output and power supply)

Output voltage:	0/12 V DC (Rating) ON voltage: 11.0 V or more, 13.0 V or less OFF voltage: 0.2 V or less
Allowable load resistance:	600 Ω or more
Proportional cycle time *:	0.1 to 100.0 seconds
Minimum ON/OFF time:	0 to 1000 ms

• Current output (Not isolated between output and power supply)

Output current (Rating):	4 to 20 mA DC, 0 to 20 mA DC
Output range:	1 to 21 mA DC, 0 to 21 mA DC
Allowable load resistance:	600 Ω or less
Output impedance:	1 MΩ or more

• Voltage output (Not isolated between output and power supply)

Output voltage (Rating):	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC
Output range:	–0.05 to +1.05 V DC, –0.25 to +5.25 V DC, 0.8 to 5.2 V DC, –0.5 to +10.5 V DC
Allowable load resistance:	1 kΩ or more
Output impedance:	0.1 Ω or less

• Triac output

Output method:	AC output (Zero-cross method)
Allowable load current:	0.5 A (Ambient temperature 40 °C or less) Ambient temperature 50 °C: 0.3 A
Load voltage:	75 to 250 V AC
Minimum load current:	30 mA
ON voltage:	1.6 V or less (at maximum load current)
Proportional cycle time *:	0.1 to 100.0 seconds
Minimum ON/OFF time:	0 to 1000 ms

• Open collector output

Output method:	Sink type
Allowable load current:	100 mA
Load voltage:	30 V DC or less
Minimum load current:	0.5 mA
ON voltage:	2 V or less (at maximum load current)
Leakage current at OFF:	0.1 mA or less
Proportional cycle time *:	0.1 to 100.0 seconds
Minimum ON/OFF time:	0 to 1000 ms

* When control output is selected.

■ Performance (at the ambient temperature 23 ±2 °C, mounting angle ±3°)

Input accuracy:

Measured input:

Input type	Input range	Accuracy
K, J, T, PLII, E	Less than −100 °C	±2.0 °C
	−100 °C or more, less than +500° C	±1.0 °C
	500 °C or more	±(0.2 % of Reading +1 digit)
S, R, N, W5Re/W26Re	Less than 1000 °C	±2.0 °C
	1000 °C or more	±(0.2 % of Reading +1 digit)
B	Less than 400 °C	±70.0 °C
	400 or more, less than 1000 °C	±2.0 °C
	1000 °C or more	±(0.2 % of Reading +1 digit)
Pt100, JPt100	Less than 200 °C	±0.4 °C
	200 °C or more	±(0.2 % of Reading +1 digit)
Voltage input	±0.2 % of input span	
Current input		
Feedback resistance input	±0.2 % of input span ±1 digit (for adjustment span of open and close)	

Current transformer (CT) input:
±5 % of Reading ±1 digit or ±2 A (whichever is larger)

Noise rejection:
Nomal mode: 60dB or more (50/60Hz)
Common mode: 120dB or more (50/60Hz)

Output accuracy:
Current output: ±3.0 % of span
Voltage output: ±3.0 % of span

Cold-junction temperature compensation error (Close horizontal mounting):
Within ±1.0 °C (Terminal type)
[When the input is −100 °C or less: within ±2.0 °C]
Within ±2.0 °C (Connector type)
[When the input is −100 °C or less: within ±4.0 °C]

Influence of physical orientation (± 90°):
- Input:
  TC input: No more than ±0.6 % of input span or ±3.0 °C, whichever value is larger
  RTD input: ±0.5 °C or less
  Voltage/Current input: Less than ±0.2 % of input span
- Output: Less than 0.3 % of output span

■ Indication lamp

Number of indicates: 2 points

Indication contents:
- Operation state indication (1 point)
  When normal (RUN): A green lamp is on
  Self-diagnostic error (FAIL): A green lamp flashes
  Instrument abnormality (FAIL): A red lamp is on
- Communication state indication (1 point)
  During data send and receive (RX/TX): A green lamp turns on

■ Control

Control method:

a) Brilliant II PID control (Direct action/Reverse action is selectable)
b) Brilliant II Heat/Cool PID control (Water cooling)
c) Brilliant II Heat/Cool PID control (Air cooling)
d) Brilliant II Heat/Cool PID control (Cooling gain linear)
e) Position proportioning PID control without FBR
a) to e) is selectable

Autotuning (AT):

a) Enhanced AT
(Brilliant II PID control or Position proportioning control)
b) Heat/Cool PID control for AT

Startup tuning (ST):

When in Heat/Cool PID control, it is possible to execute the startup tuning (ST) function only in the temperature rise direction.
The PID values on the heat side are automatically calculated.
Becomes invalid when in position proportioning control.

■ Brilliant II PID control

Setting range:

a) Proportional band (P) *
• Temperature input: 0 to Input span (unit: °C [°F])
• Voltage/current input: 0.0 to 1000.0 % of input span
* 0 [0.0]: ON/OFF action
ON/OFF action differential gap: Temperature input: 0.0 to Input span (unit: °C [°F])
Voltage/current input: 0.0 to 10.0 % of input span

b) Integral time (I): 0 to 3600 seconds or 0.0 to 1999.9 seconds
(0 [0.0]: Integral action OFF)
c) Derivative time (D): 0 to 3600 seconds or 0.0 to 1999.9 seconds
(0 [0.0]: Derivative action OFF)
d) Control response parameter:
Slow, Medium and Fast (3-step selection)
P or PD action: Fast (fixed)
e) Output limiter (high): Output limiter (low) to +105.0 %
f) Output limiter (low): −5.0 % to Output limiter (high)
g) Output change rate limiter (up/down):
0.0 to 100.0 %/seconds
(0.0: Output change rate limiter OFF)
Up/Down individual setting
h) Manual reset: −100.0 to +100.0 %
i) Manual output: Output limiter (low) to Output limiter (high)
j) Manipulated output value at (MV) at STOP mode:
−5.0 to +105.0 %
k) Derivative action: 0 (Measured value derivative),
1 (Deviation derivative)
l) Derivative gain: 0.1 to 10.0
m) Integral/derivative time decimal point position:
0 (1 second setting), 1 (0.1 seconds setting)

Balanceless/bumpless:

When the mode is transferred from Manual mode to Auto mode, control starts at manual output value.

■ Brilliant II heat/cool PID control (Only CH1 and CH3 can be set)

Setting range:

a) Proportional band (P) *
- Temperature input: 0 to Input span (unit: °C [°F])
- Voltage/current input: 0.0 to 1000.0 % of input span

* 0 [0.0]: ON/OFF action
ON/OFF action differential gap: Temperature input: 0.0 to Input span (unit: °C [°F])
Voltage/current input: 0.0 to 10.0 % of input span

b) Integral time (I): 0 to 3600 seconds or 0.0 to 1999.9 seconds
(0 [0.0]: Integral action OFF)

c) Derivative time (D): 0 to 3600 seconds or 0.0 to 1999.9 seconds
(0 [0.0]: Derivative action OFF)

d) Proportional band [cool-side]:
- Temperature input: 1 (0.1) to Input span (unit: °C [°F])
- Voltage/current input: 0.1 to 1000.0 % of input span

e) Integral time [cool-side]:
0 to 3600 seconds or 0.0 to 1999.9 seconds
(0 [0.0]: Integral action OFF)

f) Derivative time [cool-side]:
0 to 3600 seconds or 0.0 to 1999.9 seconds
(0 [0.0]: Derivative action OFF)

g) Overlap/Deadband:
- Temperature input: –Input span to +Input span (unit: °C [°F])
- Voltage/current input: –100.0 to +100.0 % of input span

Minus (–) setting results in overlap.
(However, the overlapping range is within the proportional range.)

h) Control response parameter:
Slow, Medium and Fast (3-step selection)
P or PD action: Fast (fixed)

i) Output limiter (high): Output limiter (low) to +105.0 %
Heat-side/Cool-side individual setting

j) Output limiter (low): –5.0 % to Output limiter (high)
High/Low individual setting

k) Output change rate limiter (up/down) (heat-side, cool-side):
0.0 to 100.0 %/seconds
(0.0: Output change rate limiter OFF)
Heat-side/Cool-side individual setting

l) Manual reset: –100.0 to +100.0 %

m)Manual output: –Output limiter (high) [cool-side] to Output limiter (high) [heat-side]

n) Manipulated output value at (MV) at STOP mode:
–5.0 to +105.0 %
Heat-side/Cool-side individual setting

o) Derivative action: 0 (Measured value derivative),
1 (Deviation derivative)

p) Derivative gain: 0.1 to 10.0

q) Integral/derivative time decimal point position:
0 (1 second setting), 1 (0.1 seconds setting)

Balanceless/bumpless: When the mode is transferred from Manual mode to Auto mode, control starts at manual output value.

■ Position proportioning PID control without FBR (Only CH1 and CH3 can be set)

Setting range:

a) Proportional band (P) *
- Temperature input: 0 to Input span (unit: °C [°F])
- Voltage/current input: 0.0 to 1000.0 % of input span

* 0 [0.0]: ON/OFF action
ON/OFF action differential gap: Temperature input: 0.0 to Input span (unit: °C [°F])
Voltage/current input: 0.0 to 10.0 % of input span

b) Integral time (I): 1 to 3600 seconds or 0.1 to 1999.9 seconds
c) Derivative time (D): 0 to 3600 seconds or 0.0 to 1999.9 seconds
d) Control response parameter:
Slow, Medium, Fast (3-step selection)
e) Control motor time: 5 to 1000 seconds
f) Output limiter (high): Output limiter (low) to +105.0 %
g) Output limiter (low): –5.0 % to Output limiter (high)
h) Integrated output limiter:
0.0 to 200.0 % of control motor time
(0.0: OFF)
Invalid when Feedback resistance (FBR) input is used.
i) Open/Close output neutral zone: 0.1 to 10.0 %
j) Open/Close output differential gap: 0.1 to 5.0 %
k) Manipulated output value (MV) at STOP mode:
–5.0 to +105.0 %
Only when there is feedback resistance (FBR) input and it does not input break.
l) Valve action at STOP: ① Open-side output OFF, Close-side output OFF
② Open-side output OFF, Close-side output ON
③ Open-side output ON, Close-side output OFF
①, ②, or ③ is selectable
m) Manual output:
When there is feedback resistance (FBR) input and it does not break:
Output limiter (low) to Output limiter (high)
When there is no feedback resistance (FBR) input or the feedback resistance (FBR) input is disconnected:
0 (Open-side output OFF, Close-side output OFF)
1 (Open-side output OFF, Close-side output ON)
2 (Open-side output ON, Close-side output OFF)
n) Derivative action: 0 (Measured value derivative),
1 (Deviation derivative)
o) Derivative gain: 0.1 to 10.0
p) Integral/derivative time decimal point position:
0 (1 second setting), 1 (0.1 seconds setting)

Balanceless/bumpless: When the mode is transferred from Manual mode to Auto mode, control starts at manual output value.

■ Event function [optional]

Number of events: 4 points/channel

Event action: Deviation high, Deviation low, Deviation high/low, Band,
Process high, Process low, SV high, SV low,
MV high [heat-side]*, MV low [heat-side]*,
MV high [cool-side], MV low [cool-side]
Deviation high (Local SV), Deviation low (Local SV),
Deviation high/low (Local SV), Band (Local SV)
Deviation between channels high, Deviation between channels low,
Deviation between channels high/low,
Deviation between channels band
Temperature rise completion (Event 3 only)
Control loop break alarm (LBA) (Event 4 only)
* Position proportioning control: Feedback resistance (FBR) input value

Setting range:
- Deviation
  Event setting: −Input span to +Input span
  Differential gap: 0 to span
- Process
  Event setting: Same as input range
  Differential gap: 0 to Input span
- SV
  Event setting: Same as input range
  Differential gap: 0 to Input span
- MV
  Event setting: −5.0 to +105.0 %
  Differential gap: 0.0 to 110.0 %
- Deviation between channels
  Event setting: −Input span to +Input span
  Differential gap: 0 to span
  Channel setting: Channel 1 to 4
- Temperature rise completion
  Event setting: −Input span to +Input span
  Differential gap: 0 to span
- Control loop break alarm (LBA)
  (Heat/cool control: LBA is not selectable)
  LBA time: 0 to 7200 seconds (0: LBA function OFF)
  LBA deadband (LBD):
  0 to Input span

Additional function:
Hold action: Hold action is selectable from Hold action OFF, Hold action ON, and Re-hold action ON. Valid only when the event action (Process, Deviation, or MV) is selected.
Delay timer: 0.0 to 18000 seconds
Interlock: 0 (Unused), 1 (Used)
Force ON of Event action:
0 (Invalid), 1 (Valid)

■ Heater break alarm (HBA) [time-proportional control output (optional)]

Number of HBA: 4 points or 2 points

Setting range: 0.0 to 100.0 A (0.0: HBA function OFF)
[HBA function OFF: The current value monitoring is available]
CT assignment: 0 (HBA function OFF)
1 (OUT1) to 4 (OUT4)
HBA does not action when control output ON time is 0.1 second or less.

Additional function: Number of HBA delay times: 0 to 255 times

■ Heater break alarm (HBA) [continuous control output (optional)]

Number of HBA: 4 points or 2 points

Setting range: 0.0 to 100.0 A (0.0: HBA function OFF)
[HBA function OFF: The current value monitoring is available]
Heater break determination point:
0.0 to 100.0 % of HBA set value
(0.0: HBA function OFF)
Heater melting determination point:
0.0 to 100.0 % of HBA set value
(0.0: HBA function OFF)
CT assignment: 0 (HBA function OFF)
1 (OUT1) to 4 (OUT4)

■ Multi-memory area function [optional]

Number of areas: 8 area/channel

Stored parameters: Set value (SV), Event function 1 to 4, LBA time, LBA deadband,
Proportional band, Integral time, Derivative time,
Control response parameter, Proportional band [cool-side],
Integral time [cool-side], Derivative time [cool-side],
Overlap/Deadband, Manual reset,
Setting change rate limiter (up), Setting change rate limiter (down),
Soak time setting, Link area number

Method of area transfer: Communication function (optional)
Inaternal communication
Area soak time

Memory area link function: Link area number: 0 to 8 (0: No link)
Soak time: 00 minutes 00 seconds to 199 minutes 59 seconds or
00 hours 00 minutes to 99 hours 59 minutes
(Selectable)
Accuracy: ±(0.5 % of set value +0.25 seconds)
Area soak time stop function:
0 (No function)
1 (Event 1) to 4 (Event 4)

■ Logic output function

Number of logic output points: 8 points

Input: Event output 1 (CH1 to CH4), Event output 2 (CH1 to CH4),
Event output 3 (CH1 to CH4), Event output 4 (CH1 to CH4),
Heater break alarm1 to 4,
Communication switch for logic 1 to 4,
FAIL signal

Output assignment selection (each output terminal):
0 (Control output), 1 (Logic outputs result)

Operation mode assignment selection:
0 (No assignment)
1 (monitor, control)
2 (monitor, event function, control)
3 (Auto/Manual)
4 (Remote/Local)
5 (Interlock release)

Additional function: Energized/De-energized: 0 (Energized), 1 (De-energized)
Can be selected for each logic output 1 to 4 (OUT1 to OUT4)

■ SV select function

● Remote SV function

Setting range:

SV select function:	0 (Remote SV function)
Master channel module address:	−1, 0 to 99
Master channel selection:	1 to 99
RS digital filter:	0.0 to 100.0 seconds (0: Filter OFF)
RS bias:	−Input span to + Input span
RS ratio:	0.001 to 9.999

● Ratio setting function

Setting range:

SV select function:	2 (Ratio setting function)
Master channel module address:	Common to Remote SV function setting
Master channel selection:	Common to Remote SV function setting
Ratio setting bias:	Common to RS bias setting
Ratio setting ratio:	Common to RS ratio setting
Ratio setting filter:	Common to RS digital filter setting

● Cascade control

Setting range:

SV select function:	1 (Cascade control function) 3 (Cascade control 2 function)
Master channel module address:	Common to Remote SV function setting
Master channel selection:	Common to Remote SV function setting
Cascade bias:	Common to RS bias setting
Cascade ratio:	Common to RS ratio setting
Cascade filter:	Common to RS digital filter setting

■ Output distribution function

Setting range:

Output distribution master channel module address:
−1, 0 to 99
Master channel selection: 1 to 99
Output distribution bias: −100.0 to +100.0 %
Output distribution ratio: −9.999 to +9.999
Output distribution selection: 0 (Control output),
1 (Distribution output)

■ Automatic temperature rise function

Setting range:

Automatic temperature rise group:
0 to 16 (0: Automatic temperature rise function OFF)
Automatic temperature rise learning: 0 (Unused), 1 (Learning)
Automatic temperature rise dead time: 0.1 to 1999.9 seconds
Automatic temperature rise gradient data: 0.1 to Input span/minutes

■ EDS function

Setting range:

Output distribution master channel module address:
−1, 0 to 99
EDS mode (for disturbance 1, for disturbance 2):
0 (No function), 1 (EDS function mode),
2 (Learning mode), 3 (Tuning mode)
EDS value 1 (for disturbance 1, for disturbance 2):
−100.0 to +100.0 %
EDS value 2 (for disturbance 1, for disturbance 2):
−100.0 to +100.0 %
EDS transfer time (for disturbance 1, for disturbance 2):
0 to 3600 seconds or 0.0 to 1999.9 seconds
EDS action time (for disturbance 1, for disturbance 2):
1 to 3600 seconds
EDS value learning times: 0 to 10 times
EDS action wait time (for disturbance 1, for disturbance 2):
0.0 to 600.0 seconds
EDS transfer time decimal point position:
0 (1 second setting), 1 (0.1 seconds setting)
Output average processing time for EDS:
0.1 to 200.0 seconds
Responsive action trigger point for EDS:
0 to Input span
EDS start signal: 0 (Start signal OFF),
1 (Start signal ON [for disturbance 1]),
2 (Start signal ON [for disturbance 2])

■ Peak current suppression function

This function is effective for modules connected each other by connectors on the base.
The peak current suppression function is performed in coupleds modules.

■ Master-slave mode

Setting range:

Address of interacting modules: −1, 0 to 99
Channel selection of interacting modules: 1 to 99
Selection switch of interacting modules:
0 (No interaction)
1 (Interact with other channels)
bit 0: Memory area number
bit 1: Operation mode
bit 2: Auto/Manual
bit 3: Remote/Local
bit 4: EDS start signal
bit 5: Interlock release
bit 6: Suspension of area soak time

■ Self-diagnostic function

Control stop:

Adjustment data error (Err 1)
Data back-up error (Err 2)
A/D conversion error (Err 4)
Logic output data error (Err 32)

Action stop (Error number is not displayed [Operation: Impossible]):

Power supply voltage monitoring
Watchdog timer

Instrument status:

When a self-diagnostic error occurs: All output OFF
Display: A green lamp flashes (Self-diagnostic error (FAIL))
A red lamp is on (Instrument abnormality (FAIL))

■ Power

Power supply voltage:

21.6 to 26.4 V DC [Including power supply voltage variation]
(Rating 100 to 240 V AC)

Power consumption (at maximum load):

140 mA max. (at 24 V DC) [4CH type]
80 mA max. (at 24 V DC) [2CH type]
Rush current: 10 A or less

■ Standard

Safety standards:

UL: UL61010-1
cUL: CAN/CSA-C22.2 No.61010-1

CE marking:

LVD: EN61010-1
OVERVOLTAGE CATEGORYII,
POLLUTION DEGREE 2,
Class II (Reinforced insulation)
EMC: EN61326-1

RCM:

EN55011

■ General specifications

Insulation resistance:

Between measuring terminal and grounding:
20 MΩ or more at 500 V DC
Between power supply terminal and grounding:
20 MΩ or more at 500 V DC
Between power supply and measuring terminals:
20 MΩ or more at 500 V DC
When grounding is not provided: Between panels

Withstand voltage:

Time: 1 min.	①	②	③	④
① Grounding terminal				
② Power terminal	750 V AC			
③ Measured input terminal	750 V AC	750 V AC	400 V AC	
④ Output terminal (Relay contact, Triac)	1500 V AC	2300 V AC	2300 V AC	2300 V AC
⑤ Output terminal (Voltage, Current) Communication terminal	750 V AC		750 V AC	2300 V AC

Power failure: A power failure of 4 ms or less will not affect the control action.

Memory backup: Backed up by non-volatile memory (FRAM)
Number of writing: Approx. 10,000,000,000 times or more
Data storage period: Approx. 10 years

Allowable ambient temperature: –10 to +50 °C

Allowable ambient humidity: 5 to 95 %RH
(Absolute humidity: MAX.W.C 29.3 g/m^3 dry air at 101.3 kPa)

Installation environment conditions:
Indoor use
Altitude up to 2000 m

Transportation and Storage environment conditions:
Vibration:
- Amplitude: < 7.5 mm (2 to 9 Hz)
- Acceleration: < 20 m/s^2 (9 to 150 Hz)
  Each direction of XYZ axes

Shock: Height 800 mm or less

Temperature:
- At storage: –25 to +70 °C
- At transport: –40 to +70 °C

Humidity: 5 to 95 %RH (Non condensing)

Storage period: Within the warranty period

Mounting and Structure:
Mounting method: DIN rail mounting or Panel mounting
Case material: PPE [Flame retardancy: UL94 V-1]
Panel sheet material: Polyester

Weight:
Terminal type module: Approx. 160 g
Connector type module: Approx. 140 g

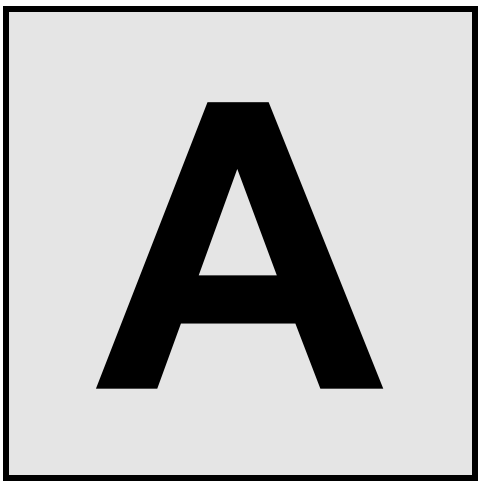
■ Isolation between Inputs and Outputs

▬ : Isolated
— : Not isolated

Power supply		Output 1 (OUT1)
Measured input (CH1)		Output 2 (OUT2)
Measured input (CH2)		
Measured input (CH3)		Output 3 (OUT3)
Measured input (CH4)		
Communication		Output 4 (OUT4)

When outputs (OUT1 to OUT4) are relay outputs or triac outputs, isolation is not made between “the outputs and the power supply” and “the outputs and the communication”.

APPENDIX



A.1 RKC Communication

RKC communication uses the polling/selecting method to establish a data link. The basic procedure is followed ANSI X3.28 subcategory 2.5, B1 basic mode data transmission control procedure (Fast selecting is the selecting method used in SRZ).
For detailed information on RKC communication protocol and the communication data for host communication, see the following manuals:

[Download or sold separately]
Manual name: Module Type Controller SRZ Instruction Manual
Manual number: IMS01T04-E□

The above manuals can be downloaded from our website:
URL: http://www.rkcinst.com/english/manual_load.htm

This section describes the communication data of the PLC communication environment which is added to a Z-TIO-C module.

A.1.1 Reference to communication data list

No. (1)	Name (1)	Identifier (2)	Digits (3)	Attribute (4)	Structure (5)	Data range (6)	Factory set value (7)
1	Station number	**QV**	7	R/W	M	0 to 31	0
2	PC number	**QW**	7	R/W	M	0 to 255	255
3	Register type	**QZ**	7	R/W	M	0: D register 1: R register	0

(1) Name: Communication data name

(2) Identifier: Communication identifier of RKC communication

(3) Digits: The number of communication data digits in RKC communication

(4) Attribute: A method of how communication data items are read or written when viewed from the host computer is described

RO: Read only data

Data direction
Host computer ◄——— Z-TIO-C/D module

R/W: Read and Write data

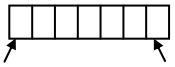
Data direction
Host computer ◄———► Z-TIO-C/D module

(5) Structure: C: Data for each channel [1, 2] M: Data for each module

[1] On a two-channel type module, there is no communication data for the 3rd and 4th channels.

[2] When heat/cool control or position proportioning control is performed, there will be communication data (indicated by ♣ in the name column) for which the 2nd channel and 4th channel will be invalid. [Read is possible (0 is shown), but the result of Write is disregarded.]

(6) Data range: Read or Write range of communication data

ASCII code data (Example: 7 digits) 

Most significant digit ·····Least significant digit

(7) Factory set value: Factory set value of communication data

A.1.2 Communication data list

■ Monitor data

No.	Name	Identifier	Digits	Attribute	Structure	Data range	Factory set value
1	PLC communication error code	**ES**	7	RO	M	Bit data b0: PLC register read/write error b1: Slave communication timeout b2: Unused b3: Unused b4: Master communication time out b5 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31]	
2	Z-TIO module recognition flag	**QN**	7	RO	M	Bit data b0: Z-TIO module 1 b1: Z-TIO module 2 b2: Z-TIO module 3 b3: Z-TIO module 4 b4: Z-TIO module 5 b5: Z-TIO module 6 b6: Z-TIO module 7 b7: Z-TIO module 8 b8: Z-TIO module 9 b9: Z-TIO module 10 b10: Z-TIO module 11 b11: Z-TIO module 12 b12: Z-TIO module 13 b13: Z-TIO module 14 b14: Z-TIO module 15 b15: Z-TIO module 16 Data 0: No module exists 1: Module exists [Decimal number: 0 to 65535]	

■ PLC Communication Environment Setting Data

No.	Name	Identifier	Digits	Attribute	Structure	Data range	Factory set value
1	Station number	**QV**	7	R/W	M	0 to 31	0
2	PC number	**QW**	7	R/W	M	0 to 255	255
3	Register type	**QZ**	7	R/W	M	0: D register 1: R register 2: W register 3: ZR register Method of specifying consecutive numbers when 32767 of R register is exceeded. When the ZR register is selected, QnA compatible 3C frame communication is used.	0
4	Register start number (High-order 4-bit)	**QS**	7	R/W	M	0 to 15 Set this if the register address 65535 is exceeded in the ZR register.	0
5	Register start number (Low-order 16-bit)	**QX**	7	R/W	M	0 to 9999 A compatible, 1C frame, ACPU common command (WR/WW) 0 to 65535 A compatible 1C frame AnA/AnUCPU common command (QR/QW), QnA compatible 3C frame	1000

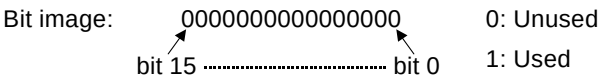
Continued on the next page.

Continued from the previous page.

No.	Name	Iden-tifier	Digits	Attri-bute	Struc-ture	Data range	Factory set value
6	Monitor item register bias	**R3**	7	R/W		10 to 9999 A compatible, 1C frame, ACPU common command (WR/WW) 10 to 65535 A compatible 1C frame AnA/AnUCPU common command (QR/QW), QnA compatible 3C frame Equation for calculating: Register start number of monitor group = Register start number + Monitor item register bias	10
7	Setting item register bias	**R4**	7	R/W		0, 10 to 9999 A compatible, 1C frame, ACPU common command (WR/WW) 0, 10 to 65535 A compatible 1C frame AnA/AnUCPU common command (QR/QW), QnA compatible 3C frame When set to 0 to 9 In the monitor group, the register start number of the setting group is set after the communication data of the last address. When set to 10 or more A bias is applied to the register start number of the system data. If set to 10 or greater, take care that overlapping of the communication data of the monitor group and the register address does not occur. Equation for calculating: Register start number of setting group = Register start number + Setting item register bias	0
8	Monitor item selection	**R6**	7	R/W		0 to 65535 Convert binary to decimal and configure the setting. (See Table 1 (P. A-5).)	33535
9	Setting item selection	**R7**	7	R/W		0 to 65535 Convert binary to decimal and configure the setting. (See Table 2 (P. A-6).)	(A) 62427 (B) 15583 (C) 512 (D) 512
10	Z-TIO module link recognition time	**QT**	7	R/W		0 to 255 seconds Set this item to the master module (address 0).	5
11	PLC scanning time	**VT**	7	R/W		0 to 3000 ms Usually, no factory set values are necessary to be changed.	255
12	PLC communication start time	**R5**	7	R/W		1 to 255 seconds	5
13	Slave register bias	**R8**	7	R/W		0 to 65535 Equation for calculating: Slave register start number = Register start number + (Address setting switch) × Slave register bias	150

Table 1: Monitor item selection (Communication data of monitor group)

Communication data of monitor group is assigned as a bit image in binary numbers. Set decimal-converted values.



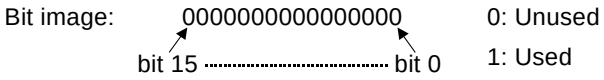
The selected communication data is justified upward in the PLC register.

Bit	Communication data (Monitor item)	Number of data	Factory set value	
			Binary	Decimal
0	Measured value (PV)	4	1	33535
1	Comprehensive event state	4	1	
2	Operation mode state monitor	4	1	
3	Error code	4 *	1	
4	Manipulated output value (MV) monitor [heat-side] ♣	4	1	
5	Manipulated output value (MV) monitor [cool-side] ♣	4	1	
6	Current transformer (CT) input value monitor	4	1	
7	Set value (SV) monitor	4	1	
8	Remote setting (RS) input value monitor	4	0	
9	Output state monitor	4 *	1	
10	Memory area soak time monitor	4	0	
11	Integrated operating time monitor	4 *	0	
12	Holding peak value ambient temperature monitor	4	0	
13	Backup memory state monitor	4 *	0	
14	Logic output monitor	4 *	0	
15	Memory area number monitor	4	1	

* Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

Table 2: Setting item selection (Communication data of Setting group)

Communication data of setting group is assigned as a bit image in binary numbers. Set decimal-converted values in the setting columns of (A) ch1 to (D) ch4.



The selected communication data is justified upward in the PLC register.

Selection items of ch1

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	1	PID/AT transfer	4	1	62427
1	2	Auto/Manual transfer	4	1	
2	3	Remote/Local transfer	4	0	
3	4	RUN/STOP transfer	4 *	1	
4	5	Memory area transfer	4	1	
5	6	Interlock release	4	0	
6	7	Event 1 set value (EV1) ★	4	1	
7	8	Event 2 set value (EV2) ★	4	1	
8	9	Event 3 set value (EV3) ★	4	1	
9	10	Event 4 set value (EV4) ★	4	1	
10	11	Control loop break alarm (LBA) time ★	4	0	
11	12	LBA deadband ★	4	0	
12	13	Set value (SV) ★	4	1	
13	14	Proportional band [heat-side] ★ ♣	4	1	
14	15	Integral time [heat-side] ★ ♣	4	1	
15	16	Derivative time [heat-side] ★ ♣	4	1	

* Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

★ Parameters which can be used in multi-memory area function

Selection items of ch2

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	17	Control response parameter ★ ♣	4	1	15583
1	18	Proportional band [cool-side] ★ ♣	4	1	
2	19	Integral time [cool-side] ★ ♣	4	1	
3	20	Derivative time [cool-side] ★ ♣	4	1	
4	21	Overlap/Deadband ★ ♣	4	1	
5	22	Manual reset ★	4	0	
6	23	Setting change rate limiter (up) ★	4	1	
7	24	Setting change rate limiter (down) ★	4	1	
8	25	Area soak time ★	4	0	
9	26	Link area number ★	4	0	
10	27	Heater break alarm (HBA) set value	4	1	
11	28	Heater break determination point	4	1	
12	29	Heater melting determination point	4	1	
13	30	PV bias	4	1	
14	31	PV digital filter	4	0	
15	32	PV ratio	4	0	

★ Parameters which can be used in multi-memory area function

Selection items of ch3

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	33	PV low input cut-off	4	0	512
1	34	RS bias	4	0	
2	35	RS digital filter	4	0	
3	36	RS ratio	4	0	
4	37	Output distribution selection	4	0	
5	38	Output distribution bias	4	0	
6	39	Output distribution ratio	4	0	
7	40	Proportional cycle time	4	0	
8	41	Minimum ON/OFF time of proportioning cycle	4	0	
9	42	Manual manipulated output value ♣	4	1	
10	43	Area soak time stop function	4	0	
11	44	EDS mode (for disturbance 1)	4	0	
12	45	EDS mode (for disturbance 2)	4	0	
13	46	EDS value 1 (for disturbance 1)	4	0	
14	47	EDS value 1 (for disturbance 2)	4	0	
15	48	EDS value 2 (for disturbance 1)	4	0	

Selection items of ch4

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	49	EDS value 2 (for disturbance 2)	4	0	512
1	50	EDS transfer time (for disturbance 1)	4	0	
2	51	EDS transfer time (for disturbance 2)	4	0	
3	52	EDS action time (for disturbance 1)	4	0	
4	53	EDS action time (for disturbance 2)	4	0	
5	54	EDS action wait time (for disturbance 1)	4	0	
6	55	EDS action wait time (for disturbance 2)	4	0	
7	56	EDS value learning times	4	0	
8	57	EDS start signal	4	0	
9	58	Operation mode	4	1	
10	59	Startup tuning (ST)	4	0	
11	60	Automatic temperature rise learning	4	0	
12	61	Communication switch for logic	4 *	0	
13	62	Unused	4	0	
14	63	Unused	4	0	
15	64	Unused	4	0	

* Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

A.2 Modbus

In Modbus, the master controls communication between master and slave (Z-TIO-C/D). A typical message consists of a request (query message) sent from the master followed by an answer (response message) from the slave. When master begins data transmission, a set of data is sent to the slave in a fixed sequence. When it is received, the slave decodes it, takes the necessary action, and returns data to the master.
For detailed information on Modbus communication protocol and the communication data for host communication, see the following manuals:

This section describes the communication data of the PLC communication environment which is added to a Z-TIO-C module.

[Download or sold separately]
Manual name: Module Type Controller SRZ Instruction Manual
Manual number: IMS01T04-E□

The above manuals can be downloaded from our website:
URL: http://www.rkcinst.com/english/manual_load.htm

A.2.1 Reference to communication data list

No.	Name	Chan-nel	Resister address		Attri-bute	Struc-ture	Data range	Factory set value
			HEX	DEC				
1	Station number	CH1	0164	356	R/W	M	0 to 31	0
2	PC number	CH1	0165	357	R/W	M	0 to 255	255
3	Register type	CH1	0166	358	R/W	M	0: D register 1: R register	0

(1) (2) (3) (4) (5) (6) (7)

(1) Name: Communication data name

(2) Channel: Channel number of Z-TIO-C/D module

(3) Register address:

Register addresses of each channel (HEX: Hexadecimal DEC: Decimal)
With respect to the following communication data of the Z-TIO-C/D module, the register addresses of the indicated channels are non-used areas.

- Two-channel type module: Register addresses of the 3rd and 4th channels
- Heat/cool control and position proportioning control: Register addresses of the 2nd and 4th channels *
- Cool-only communication data of heat/cool control: Register addresses of the 2nd and 4th channels *

* Communication data with a ♣ mark in the name column.

(4) Attribute: A method of how communication data items are read or written when viewed from the host computer is described

RO: Read only data

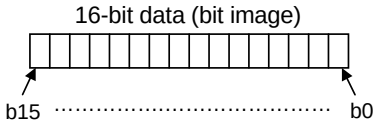
Data direction
Host computer ← Z-TIO-C/D module

R/W: Read and Write data

Data direction
Host computer ↔ Z-TIO-C/D module

(5) Structure: C: Data for each channel M: Data for each module

(6) Data range: Read or write range of communication data



(7) Factory set value: Factory set value of communication data

A.2.2 Communication data list

■ Monitor data

No.	Name	Channel	Resister address HEX	Resister address DEC	Attribute	Structure	Data range	Factory set value
1	PLC communication error code	CH1	0045	69	RO	M	Bit data b0: PLC register read/write error b1: Slave communication timeout b2: Unused b3: Unused b4: Master communication time out b5 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31]	—
2	Z-TIO module recognition flag	CH1	0046	70	RO	M	Bit data b0: Z-TIO module 1 b1: Z-TIO module 2 b2: Z-TIO module 3 b3: Z-TIO module 4 b4: Z-TIO module 5 b5: Z-TIO module 6 b6: Z-TIO module 7 b7: Z-TIO module 8 b8: Z-TIO module 9 b9: Z-TIO module 10 b10: Z-TIO module 11 b11: Z-TIO module 12 b12: Z-TIO module 13 b13: Z-TIO module 14 b14: Z-TIO module 15 b15: Z-TIO module 16 Data 0: No module exists 1: Module exists [Decimal number: 0 to 65535]	—

■ PLC Communication Environment Setting Data

No.	Name	Channel	Resister address HEX	Resister address DEC	Attribute	Structure	Data range	Factory set value
1	Station number	CH1	0164	356	R/W	M	0 to 31	0
2	PC number	CH1	0165	357	R/W	M	0 to 255	255
3	Register type	CH1	0166	358	R/W	M	0: D register 1: R register 2: W register 3: ZR register Method of specifying consecutive numbers when 32767 of R register is exceeded.When the ZR register is selected, QnA compatible 3C frame communication is used.	0

Continued on the next page.

Continued from the previous page.

No.	Name	Chan-nel	Resister address		Attri-bute	Struc-ture	Data range	Factory set value
			HEX	DEC				
4	Register start number (High-order 4-bit)	CH1	0167	359	R/W	M	0 to 15 Set this if the register address 65535 is exceeded in the ZR register.	0
5	Register start number (Low-order 16-bit)	CH1	0168	360	R/W	M	0 to 9999 A compatible, 1C frame, ACPU common command (WR/WW) 0 to 65535 A compatible 1C frame AnA/AnUCPU common command (QR/QW), QnA compatible 3C frame	1000
6	Monitor item register bias	CH1	0169	361	R/W	M	10 to 9999 A compatible, 1C frame, ACPU common command (WR/WW) 10 to 65535 A compatible 1C frame AnA/AnUCPU common command (QR/QW), QnA compatible 3C frame Equation for calculating: Register start number of monitor group = Register start number + Monitor item register bias	10
7	Setting item register bias	CH1	016A	362	R/W		0, 10 to 9999 A compatible, 1C frame, ACPU common command (WR/WW) 0, 10 to 65535 A compatible 1C frame AnA/AnUCPU common command (QR/QW), QnA compatible 3C frame When set to 0 to 9 In the monitor group, the register start number of the setting group is set after the communication data of the last address. When set to 10 or more A bias is applied to the register start number of the system data. If set to 10 or greater, take care that overlapping of the communication data of the monitor group and the register address does not occur. Equation for calculating: Register start number of setting group = Register start number + Setting item register bias	0
8	Monitor item selection	CH1	016C	364	R/W		0 to 65535 Convert binary to decimal and configure the setting. (See Table 1 (P. A-11).)	33535
9	Setting item selection	CH1 CH2 CH3 CH4	016D 016E 016F 0170	365 366 367 368	R/W		0 to 65535 Convert binary to decimal and configure the setting. (See Table 2 (P. A-12).)	(A) 62427 (B) 15583 (C) 512 (D) 512
10	Z-TIO module link recognition time	CH1	0171	369	R/W		0 to 255 seconds Set this item to the master module (address 0).	5
11	PLC scanning time	CH1	0172	370	R/W		0 to 3000 ms Usually, no factory set values are necessary to be changed.	255

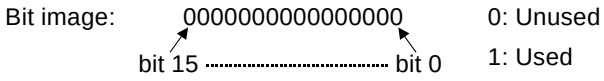
Continued on the next page.

Continued from the previous page.

No.	Name	Chan-nel	Resister address		Attri-bute	Struc-ture	Data range	Factory set value
			HEX	DEC				
12	PLC communication start time	CH1	0173	371	R/W		1 to 255 seconds	5
13	Slave register bias	CH1	0175	373	R/W		0 to 65535 Equation for calculating: Slave register start number = Register start number + (Address setting switch) × Slave register bias	150

Table 1: Monitor item selection (Communication data of monitor group)

Communication data of monitor group is assigned as a bit image in binary numbers. Set decimal-converted values.



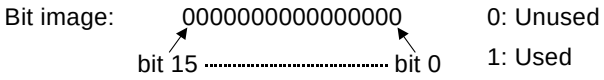
The selected communication data is justified upward in the PLC register.

Bit	Communication data (Monitor item)	Number of data	Factory set value	
			Binary	Decimal
0	Measured value (PV)	4	1	33535
1	Comprehensive event state	4	1	
2	Operation mode state monitor	4	1	
3	Error code	4 *	1	
4	Manipulated output value (MV) monitor [heat-side] ♣	4	1	
5	Manipulated output value (MV) monitor [cool-side] ♣	4	1	
6	Current transformer (CT) input value monitor	4	1	
7	Set value (SV) monitor	4	1	
8	Remote setting (RS) input value monitor	4	0	
9	Output state monitor	4 *	1	
10	Memory area soak time monitor	4	0	
11	Integrated operating time monitor	4 *	0	
12	Holding peak value ambient temperature monitor	4	0	
13	Backup memory state monitor	4 *	0	
14	Logic output monitor	4 *	0	
15	Memory area number monitor	4	1	

* Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

Table 2: Setting item selection (Communication data of Setting group)

Communication data of setting group is assigned as a bit image in binary numbers. Set decimal-converted values in the setting columns of (A) ch1 to (D) ch4.



The selected communication data is justified upward in the PLC register.

Selection items of ch1

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	1	PID/AT transfer	4	1	62427
1	2	Auto/Manual transfer	4	1	
2	3	Remote/Local transfer	4	0	
3	4	RUN/STOP transfer	4 *	1	
4	5	Memory area transfer	4	1	
5	6	Interlock release	4	0	
6	7	Event 1 set value (EV1) ★	4	1	
7	8	Event 2 set value (EV2) ★	4	1	
8	9	Event 3 set value (EV3) ★	4	1	
9	10	Event 4 set value (EV4) ★	4	1	
10	11	Control loop break alarm (LBA) time ★	4	0	
11	12	LBA deadband ★	4	0	
12	13	Set value (SV) ★	4	1	
13	14	Proportional band [heat-side] ★ ♣	4	1	
14	15	Integral time [heat-side] ★ ♣	4	1	
15	16	Derivative time [heat-side] ★ ♣	4	1	

* Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

★ Parameters which can be used in multi-memory area function

Selection items of ch2

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	17	Control response parameter ★ ♣	4	1	15583
1	18	Proportional band [cool-side] ★ ♣	4	1	
2	19	Integral time [cool-side] ★ ♣	4	1	
3	20	Derivative time [cool-side] ★ ♣	4	1	
4	21	Overlap/Deadband ★ ♣	4	1	
5	22	Manual reset ★	4	0	
6	23	Setting change rate limiter (up) ★	4	1	
7	24	Setting change rate limiter (down) ★	4	1	
8	25	Area soak time ★	4	0	
9	26	Link area number ★	4	0	
10	27	Heater break alarm (HBA) set value	4	1	
11	28	Heater break determination point	4	1	
12	29	Heater melting determination point	4	1	
13	30	PV bias	4	1	
14	31	PV digital filter	4	0	
15	32	PV ratio	4	0	

★ Parameters which can be used in multi-memory area function

Selection items of ch3

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	33	PV low input cut-off	4	0	512
1	34	RS bias	4	0	
2	35	RS digital filter	4	0	
3	36	RS ratio	4	0	
4	37	Output distribution selection	4	0	
5	38	Output distribution bias	4	0	
6	39	Output distribution ratio	4	0	
7	40	Proportional cycle time	4	0	
8	41	Minimum ON/OFF time of proportioning cycle	4	0	
9	42	Manual manipulated output value ♣	4	1	
10	43	Area soak time stop function	4	0	
11	44	EDS mode (for disturbance 1)	4	0	
12	45	EDS mode (for disturbance 2)	4	0	
13	46	EDS value 1 (for disturbance 1)	4	0	
14	47	EDS value 1 (for disturbance 2)	4	0	
15	48	EDS value 2 (for disturbance 1)	4	0	

Selection items of ch4

Bit	Item number	Number of data (Setting item)	Number of data	Factory set value	
				Binary	Decimal
0	49	EDS value 2 (for disturbance 2)	4	0	512
1	50	EDS transfer time (for disturbance 1)	4	0	
2	51	EDS transfer time (for disturbance 2)	4	0	
3	52	EDS action time (for disturbance 1)	4	0	
4	53	EDS action time (for disturbance 2)	4	0	
5	54	EDS action wait time (for disturbance 1)	4	0	
6	55	EDS action wait time (for disturbance 2)	4	0	
7	56	EDS value learning times	4	0	
8	57	EDS start signal	4	0	
9	58	Operation mode	4	1	
10	59	Startup tuning (ST)	4	0	
11	60	Automatic temperature rise learning	4	0	
12	61	Communication switch for logic	4 *	0	
13	62	Unused	4	0	
14	63	Unused	4	0	
15	64	Unused	4	0	

* Occupies four PLC registers, however, the actual number of data items is 1 (data units are modules), and thus only the data of CH1 is effective.

MEMO

The first edition: NOV. 2006 [IMQ00]
The third edition: DEC. 2015 [IMQ00]

RKC INSTRUMENT INC.

HEADQUARTERS: 16-6, KUGAHARA 5-CHOME, OHTA-KU TOKYO 146-8515 JAPAN
PHONE: 03-3751-9799 (+81 3 3751 9799)
FAX: 03-3751-8585 (+81 3 3751 8585)
E-mail: info@rkcinst.co.jp
Website: http://www.rkcinst.com/

IMS01T13-E3 **DEC. 2015**