Ethernet
Communication Converter

COM-ML-1

[For SRZ]

Instruction Manual

RKC® RKC INSTRUMENT INC.

IMR02E17-E2

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 explanation purpose.
- 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.

- Ethernet is a registered trademark of Xerox Corp.
- Modbus is a registered trademark of Schneider Electric.
- 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.

Safety Precautions

■ Pictorial Symbols (safety symbols)

Various pictorial symbols are used in this manual to ensure safe use of the product, to protect you and other people from harm, and to prevent damage to property. The symbols are described below.
Be sure you thoroughly understand the meaning of the symbols before reading this manual.

⚠ 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.

⚠ WARNING

- To prevent injury to persons, damage to the instrument and the equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to the instrument and the equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to the instrument and the 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 may occur and warranty is void under these conditions.

⚠ CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy plant.)
- In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- 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 to operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- All wiring must be in accordance with local codes and regulations.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as a fuse, circuit breaker, etc.
- A malfunction in this product may occasionally make control operations impossible or prevent alarm outputs, resulting in a possible hazard. Take appropriate measures in the end use to prevent hazards in the event of malfunction.
- 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 dissipation.
- 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 may occur. Use a soft, dry cloth to remove stains from the instrument.
- Do not connect modular connectors to telephone line.

For Proper Disposal

When disposing of each part used for this instrument, always follows the procedure for disposing of industrial wastes stipulated by the respective local community.

Symbols

■ Pictorial Symbols (safety symbols)

NOTE : 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.

■ Abbreviation symbols

These abbreviations are used in this manual:

Abbreviation symbols	Name	Abbreviation symbols	Name
PV	Measured value	TC (input)	Thermocouple (input)
SV	Set value	RTD (input)	Resistance temperature detector (input)
MV	Manipulated output value	V (input)	Voltage (input)
AT	Autotuning	I (input)	Current (input)
ST	Startup tuning	HBA	Heater break alarm
OUT	Output	CT	Current transformer
DI	Digital input	LBA	Control loop break alarm
DO	Digital output	LBD	LBA deadband

About This Manual

There are five manuals pertaining to this product. Please be sure to read all manuals specific to your application requirements.

The following manuals can be downloaded from the official RKC website:
https://www.rkcinst.co.jp/english/download-center/

Manual	Manual Number	Remarks
COM-ML-1 [For SRZ] Installation Manual	IMR02E13-E☐	This manual is enclosed with instrument. This manual explains the mounting and wiring.
COM-ML-1 [For SRZ] Quick Operation Manual	IMR02E14-E☐	This manual is enclosed with instrument. This manual explains the parts description, communication setting, and message format.
COM-ML-1 [For SRZ] Host Communication Data List	IMR02E15-E☐	This manual is enclosed with instrument. This list is a compilation of the host communication data items.
COM-ML-1 [For SRZ] PLC Communication Data List	IMR02E16-E☐	This manual is enclosed with instrument. This list is a compilation of the PLC communication data items.
COM-ML-1 [For SRZ] Instruction Manual	**IMR02E17-E2**	This manual you are reading now. This manual describes mounting, wiring, communication setting, protocol, communication data, troubleshooting and product specification.

Read this manual carefully before operating the instrument. Please place the manual in a convenient location for easy reference.

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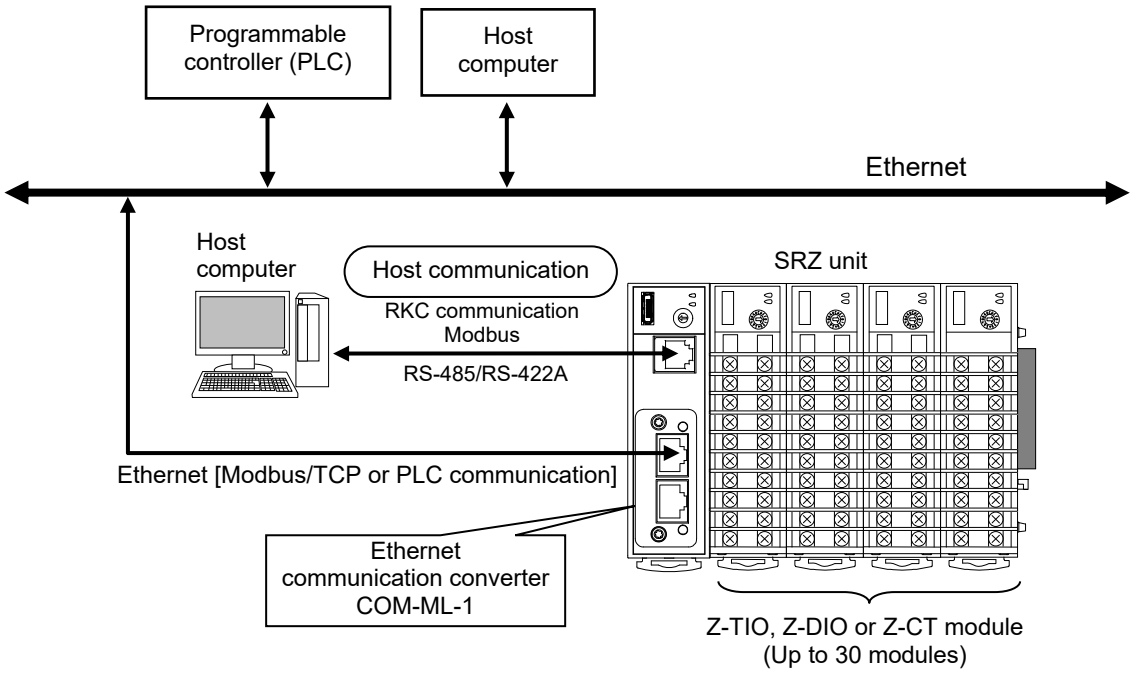
MEMO

1. OUTLINE

Ethernet communication converter COM-ML-1 [For SRZ] (hereafter called COM-ML) is communication converter to connect the RKC module type controller SRZ to the Ethernet [Modbus/TCP or PLC communication (MAPMAN)].
This chapter describes features, package contents, model code, system configuration, etc.

- Ethernet [Modbus/TCP]
  Modbus/TCP is an open field network provided with the Modbus protocol on the TCP/IP protocol of Ethernet. The data request side is called "client" (such as computer) and the data response (supply) side is called "server" (COM-ML).
- Ethernet [PLC communication (MAPMAN)]
  Programmable controller communication (hereinafter called "PLC communication") is conducted between the PLC and the COM-ML through Ethernet.
- Host communication
  Data send/receive is possible between the converter and the host computer through RKC communication (ANSI X3.28-1976 subcategories 2.5 and B1) or Modbus.
- Changing Ethernet communication
  Modbus/TCP or PLC communication (MAPMAN) can be specified at the time of ordering or modified through host communication or loader communication.
- Function modules
  Multi-zone temperature control system can be easily achieved by connecting functional modules (Z-TIO, Z-DIO and Z-CT modules) of SRZ to COM-ML. The combination of COM-ML and functional module of SRZ is called an SRZ unit.
  Up to 30 function modules can be connected to one COM-ML.
  (Connectable module: Z-TIO, Z-DIO and Z-CT)



1.1 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. (Refer to below)

Name	Q'TY	Remarks
☐ COM-ML-1 [For SRZ] Installation Manual (IMR02E13-E☐)	1	Enclosed with instrument
☐ COM-ML-1 [For SRZ] Quick Instruction Manual (IMR02E14-E☐)	1	Enclosed with instrument
☐ COM-ML-1 [For SRZ] Host communication Data List (IMR02E15-E☐)	1	Enclosed with instrument
☐ COM-ML-1 [For SRZ] PLC communication Data List (IMR02E16-E☐)	1	Enclosed with instrument
☐ Joint connector cover KSRZ-517A	2	Enclosed with instrument
☐ Power terminal cover KSRZ-518A	1	Enclosed with instrument
☐ COM-ML-1 [For SRZ] Instruction Manual (IMR02E17-E2)	1	This manual (sold separately) This manual can be downloaded from the official RKC website: https://www.rkcinst.co.jp/english/download-center/

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

■ Accessories (sold separately)

Name	Q'TY	Remarks
☐ End plate DEP-01	2	Secures the SRZ on the DIN rail
☐ Communication converter COM-K2-1	1	For loader communication (Option: with loader communication cable)
☐ Connection cable (W-BF-01-☐, ☐: cable length) [Standard cable length: 3000 mm]	1	For host communication Terminal treatment: Modular connector and Spade lug terminal
☐ Connection cable (W-BF-02-☐, ☐: cable length) [Standard cable length: 3000 mm]	1	For host communication Terminal treatment: Modular connectors (at both ends)
☐ Connection cable (W-BF-28-☐, ☐: cable length) [Standard cable length: 3000 mm]	1	For host communication Terminal treatment: Modular connector and D-sub 9-pin connector

1.2 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.

COM- ML - 1 □* 02 /□ □ □ □
(1) (2) (3) (4) (5) (6) (7)

(1) Network communication

1: Modbus/TCP

(2) Host communication

4: RS-422A
5: RS-485

(3) Corresponding to the RKC controller

02: SRZ

(4) Factory setting (Specify a communication protocol)

No code: No need to factory preset a communication protocol. *
1: A communication protocol needs to be factory preset.

(5) Host communication protocol

No code: No need to specify when the factory setting is not required.
1: RKC communication (ANSI X3.28-1976 subcategories 2.5 and B1)
2: Modbus

(6) Network communication protocol

No code: No need to specify when the factory setting is not required.
1: Modbus/TCP
5: MAPMAN (MITSUBISHI PLC: QnA-compatible 3E fame/SLMP ASCII)
6: MAPMAN (MITSUBISHI PLC: QnA-compatible 3E fame/SLMP binary)

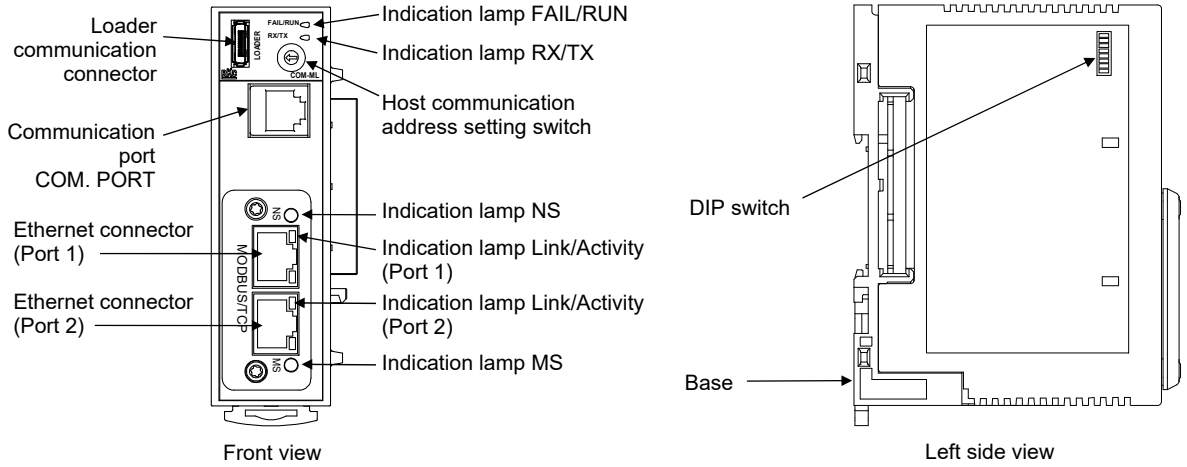
(7) The number of the correspondence channels (Only MAPMAN [PLC communication])

No code: No need to specify when the factory setting is not required.
A: 16 channels
B: 32 channels
C: 48 channels
D: 64 channels

* Factory setting when "No need to factory preset a communication protocol" is specified.
Host communication protocol: RKC communication
Network communication protocol: Modbus/TCP
The number of the correspondence channels: 64 channels

1.3 Parts Description

■ COM-ML mainframe



● Indication lamps

FAIL/ RUN [Green or Red]	• When normal: A green lamp is on (RUN) • During setting of default IP address setting: A green lamp flashes (RUN) • Self-diagnostic error (Recoverable fault): A green lamp flashes (FAIL) • Self-diagnostic error (Major fault): A red lamp is on (FAIL)
RX/TX [Green]	During host communication data send and receive: A green lamp turns on
NS (Network status) [Green or Red]	• No power or no IP address: Turns off • IP address Active or Idle state: A green lamp is on (The green lamp flashes during the PLC communication) • Waiting for connection: A green lamp t flashes • Duplicate IP address, or FATAL error: A red lamp turns on • Process Active Timeout: A red lamp flashes
Link/Activity (Port 1/Port 2) [Green and Yellow]	• No link, no activity: Turns off • Link established, 100 Mbps: A green lamp is on • Activity, 100 Mbps: A green lamp flickering • Link established, 10 Mbps: A yellow lamp is on • Activity, 10 Mbps: A yellow lamp flickering
MS (Module status) [Green or Red]	• No power: Turns off • Normal operation: A green lamp is on • Major fault: A red lamp is on • Recoverable fault: A red lamp flashes

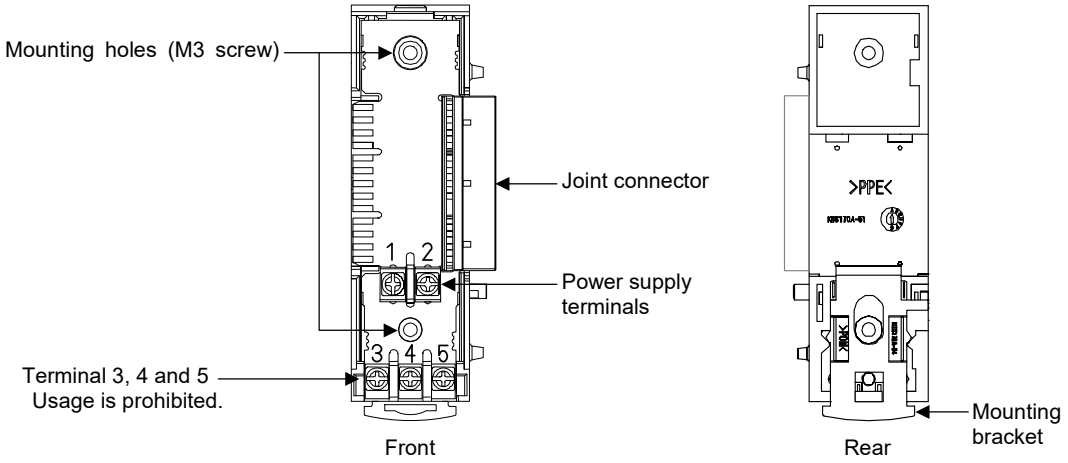
● Communication port (modular connector) and communication connector

COM. PORT	Use to connecting the Operation panel or Host computer. [RS-485 or RS-422A]
Loader communication connector	Use to connecting the communication converter and personal computer when loader communication is performed.
Ethernet connector (Port 1/Port 2)	Use to connecting the Ethernet.

● Switch

Host communication address setting switch	Sets unit address for host communication.
DIP switch	• Sets the communication speed and communication protocol corresponding to host communication. • Sets DIP switch setting validity/invalidity. • Sets the default IP address settings.

■ 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 function module.
Power supply terminals	These are terminals to supply power to the COM-ML and joined function modules.
Terminal 3, 4 and 5	These terminals cannot be used for the COM-ML. (Usage is prohibited.) **NOTE** **When the COM-ML is connected to a function module, do not use terminals 3, 4 and 5 of the function module.**
Mounting bracket	Used to fix the COM-ML on DIN rails and also to fix each module joined together.

Terminal number	Signal name
1	24 V DC (+)
2	24 V DC (–)

2. HANDLING PROCEDURES

Conduct necessary setting before operation according to the procedure described below.

Host communication settings

The address, communication speed, communication protocol, data bit configuration, and DIP switch setting validity/invalidity of host communication are set only when host communication is used in the COM-ML.

☞ Refer to **5. HOST COMMUNICATION SETTINGS (P. 21)**.

Mounting

Install the COM-ML.

☞
- Refer to **3. MOUNTING (P. 7)**.
- For controller (SRZ), refer to **Z-TIO Instruction Manual (IMS01T01-E□), Z-DIO Instruction Manual (IMS01T03-E□)** and **Z-CT Instruction Manual (IMS01T16-E□)**.

Wiring

Connect power wiring to the COM-ML, make wiring to the controller (SRZ), and connect the COM-ML and the PLC to Ethernet. Connect the wiring for host communication or loader communication in the COM-ML.

☞
- Refer to **4. WIRING (P. 12)**
- For controller (SRZ), refer to **Z-TIO Instruction Manual (IMS01T01-E□), Z-DIO Instruction Manual (IMS01T03-E□)** and **Z-CT Instruction Manual (IMS01T16-E□)**.

Controller (SRZ) settings

Set the communication setting of controller (SRZ).

☞
- Refer to **6. COMMUNICATIOM SETTING OF FUNCTION MODULE (P. 23)**.
- For controller (SRZ), refer to **Z-TIO Instruction Manual (IMS01T01-E□), Z-DIO Instruction Manual (IMS01T03-E□)** and **Z-CT Instruction Manual (IMS01T16-E□)**.

IP address settings

Set the IP address of COM-ML.

☞ Refer to **7. IP ADDRESS SETTINGS (P. 27)**.

PLC communication environment settings

For PLC communication, set a necessary system data (setting item).

☞ Refer to **10. PLC COMMUNICATION (MAPMAN) (P. 86)**.

Other communication data settings

Set the data for the COM-ML and controller (SRZ).

☞
- Refer to **7.4 Other Communication Data Settings (P. 32)**.
- Refer to **9. COMMUNICATION DATA LIST (P. 46)**.

Ethernet communication

Execute Modbus/TCP communication or PLC communication (MAPMAN).

☞
- Refer to **8. MODBUS/TCP PROTOCOL (P. 33)**.
- Refer to **10. PLC COMMUNICATION (MAPMAN) (P. 86)**.

3. MOUNTING

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.

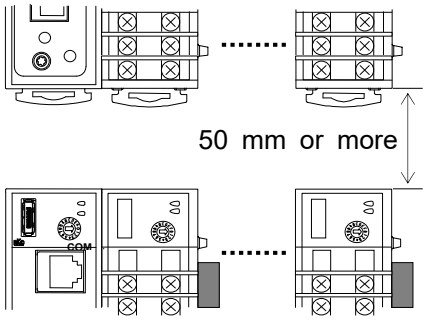
3.1 Mounting Cautions

(1) Use this instrument within the following environment conditions:
- Allowable ambient temperature: −10 to +50 °C (14 to 122 °F)
- 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

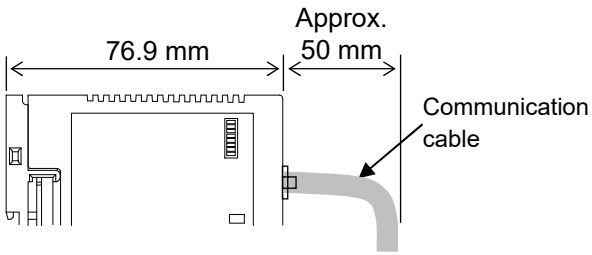
(2) Avoid the following conditions when selecting the mounting location:
- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron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

(3) Mount this instrument in the panel considering the following conditions:
- Provide adequate ventilation space so that heat does not build up.
- Do not mount this instrument directly above the equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors.)
- If the ambient temperature rises above 50 °C (122 °F), cool this instrument with a forced air fan, cooler, or the like. Cooled air should not blow directly on this instrument.
- 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
- For correct functioning mount this instrument in a horizontal position.

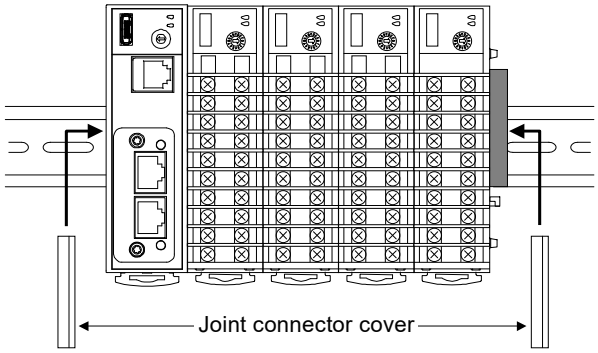
- Space required between each module vertically
  When the module is mounted on the panel, allow a minimum of 50 mm at the top and bottom of the module to attach the module to the mainframe.



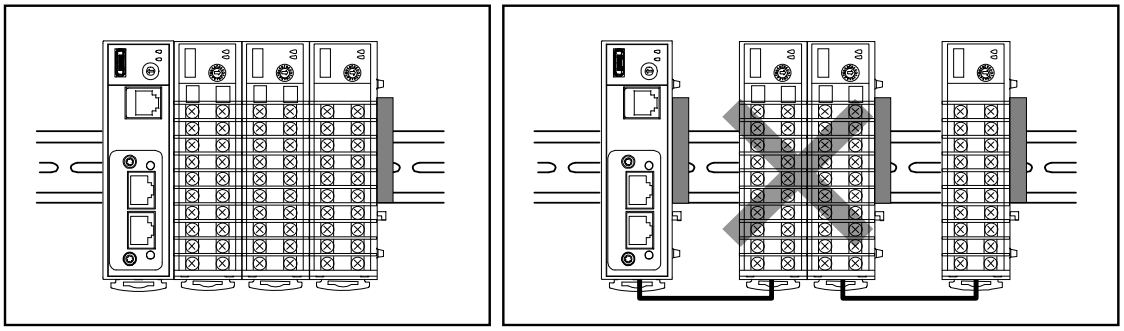
- Depth for modular cables mount type module
  Space for modular cables must be considered when installing.



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



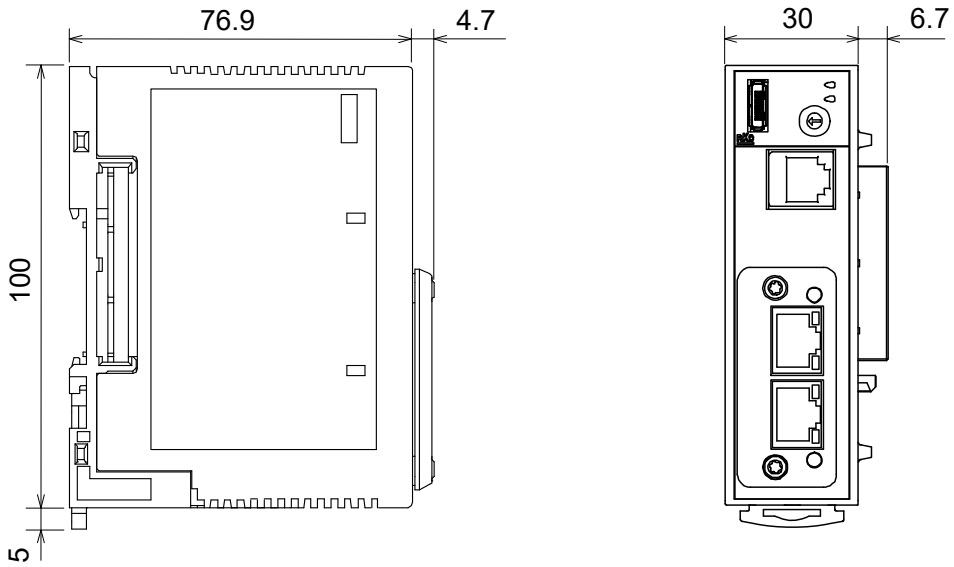
- Be sure the COM-ML and SRZ function modules (Z-TIO, Z-DIO and Z-CT modules) are joined when using them.



(4) In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This 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.

3.2 Dimensions

(Unit: mm)

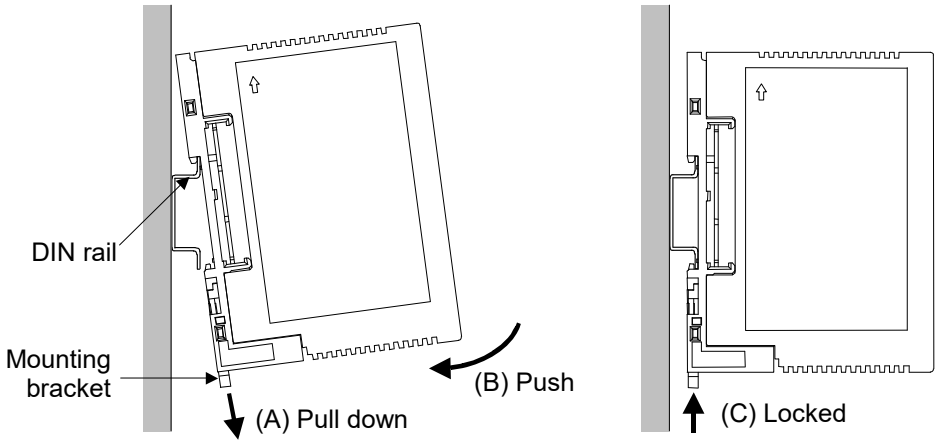


3.3 DIN Rail Mounting

■ Mounting procedures

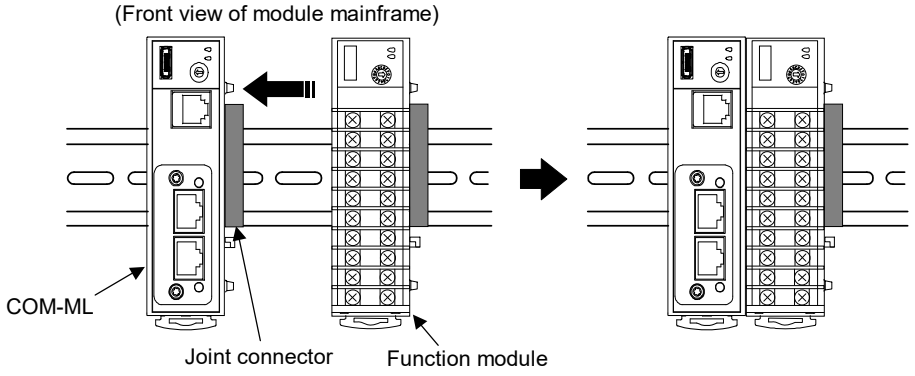
1. Pull down the mounting bracket at the bottom of the module (A). Attach the hooks on the top of the module to the DIN rail and push the lower section into place on the DIN rail (B).

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

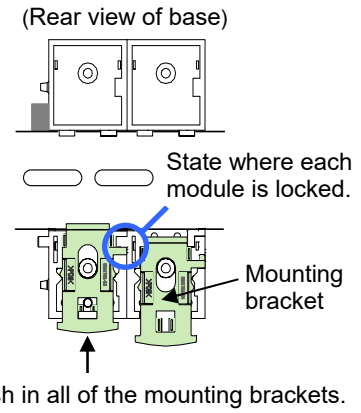


■ Module joining procedures

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



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



After module joining, install a plastic cover on the connector on both sides of the mounted modules for protection of connectors. (Refer to **P. 8**)

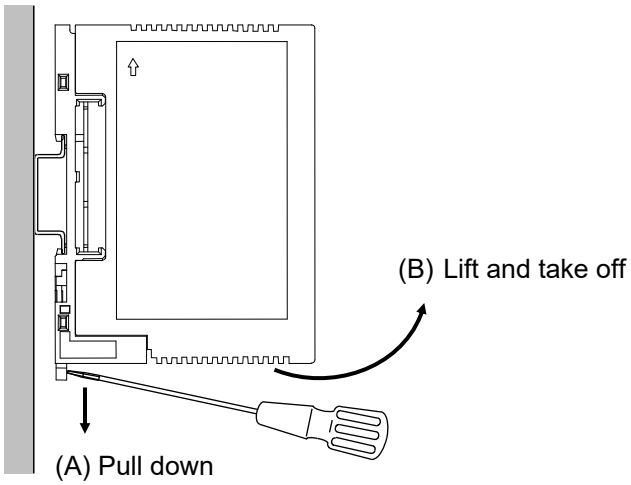
To firmly fix the modules, use end plates (DEP-01) sold separately on both sides of the mounted modules.

■ Removing procedures

1. Turn the power OFF.

2. Remove the wiring.

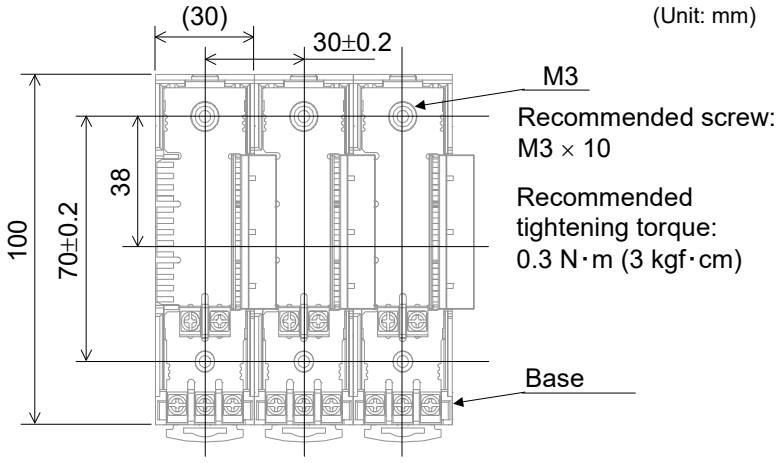
3. Pull down a mounting bracket with a slotted screwdriver (A). Lift the module from bottom, and take it off (B).



3.4 Panel Mounting

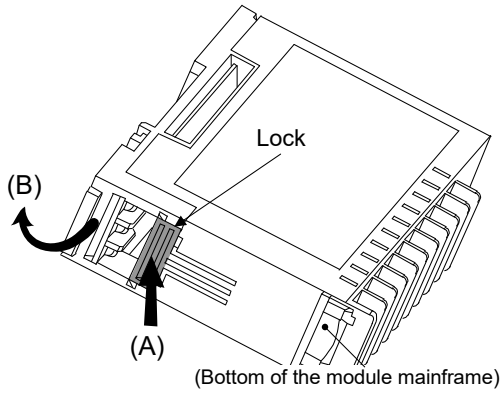
■ Mounting procedures

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



Mounting dimensions

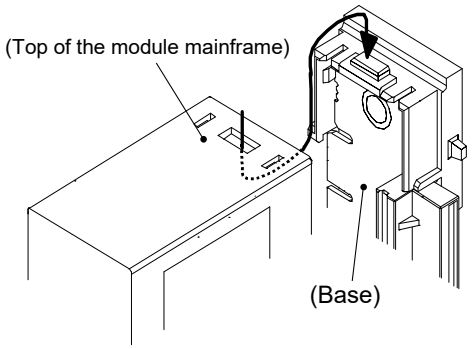
2. Remove the base from the module (B) while the lock is pressed (A).



3. Join bases. Then, lock them by pushing in the mounting brackets. (Refer to **P. 10**)

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

5. Mount the module on the base.



4. WIRING

This chapter describes wiring cautions, terminal configuration and connections.

4.1 Wiring Cautions

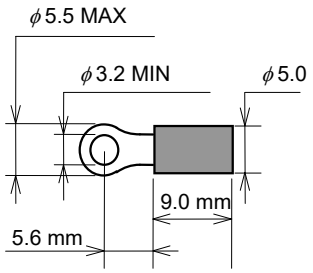
⚠ WARNING

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

- To avoid noise induction, keep communication signal wire 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.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply input, supply power from a "SELV" circuit defined as IEC 60950-1.
- A suitable power supply should be considered in 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 or COM-ML. When power is supplied to any one of the joined modules or COM-ML, all of the joined modules and COM-ML will receive power.
- Select the power capacity which is appropriate for the total power consumption of all joined modules (include COM-ML) and the initial current surge when the power is turned on.

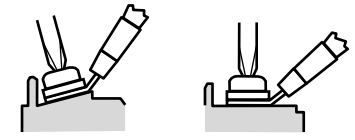
  Power consumption (at maximum load): 120 mA max. (at 24 V DC)
  Rush current: 12 A or less
- When connecting the wiring to the power supply terminals on the base, use the specified solderless terminals. Only these specified solderless terminals can be used due to the insulation between the terminals.

  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 0.25 to 1.65 mm^2
  Specified solderless terminal:
  Manufactured by J.S.T MFG CO., LTD.
  Circular terminal with isolation V1.25–MS3



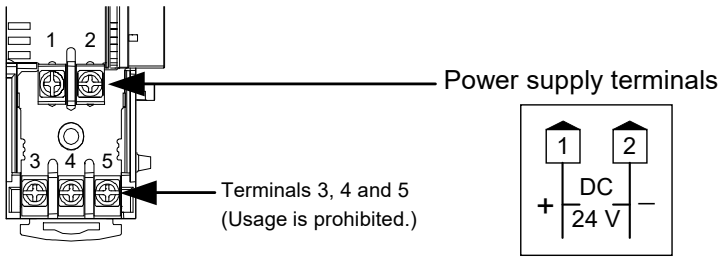
- Make sure that the any wiring such as solderless terminal is not in contact with the adjoining terminals.

When tightening a screw of the instrument, make sure to fit the screwdriver properly into the screw head mounted tilted or flat as shown in the right figure. Tightening the screw with excessive torque may damage the screw thread.
(Only function modules)



4.2 Terminal Configuration

The terminal layout of COM-ML (base) is as follows.



NOTE

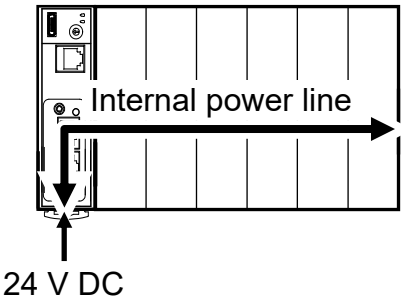
When using the COM-ML connected to function modules, terminals 3, 4 and 5 are not used. Do not connect anything to terminals 3, 4 and 5.
In addition, do not use terminals 3, 4 and 5 of function modules.

■ Wiring method

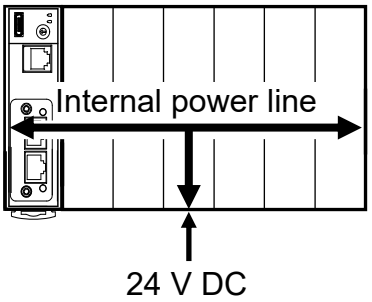
When using the COM-ML connected to function modules, the power supply wiring is connected to any one of the modules. Power is supplied from the module with the power wiring to the other modules.

[Wiring example]

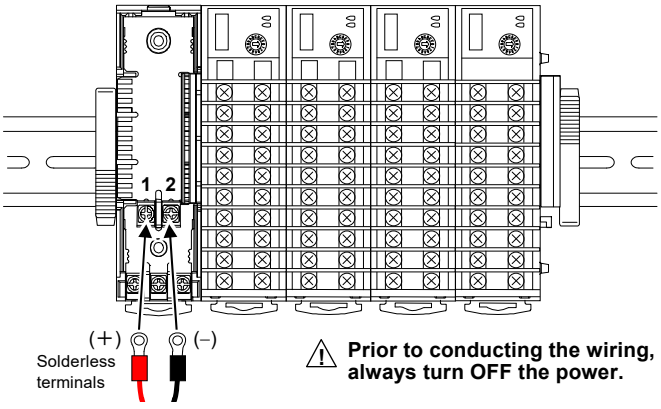
When power is supplied to a COM-ML



When power is supplied to a function module



1. Remove the module mainframe to which the power wiring will be connected.
2. Attach the solderless terminals to the power terminals with a Phillips head screwdriver. When attaching the terminals, make sure that the polarity (+ and –) is correct.

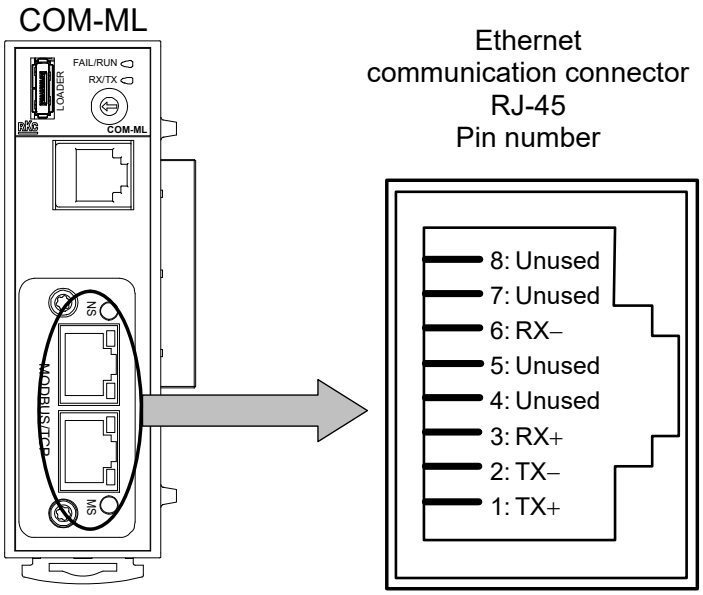


3. Return the module mainframe to the base. This completes the wiring work.

4.3 Connection to Ethernet

Connect COM-ML to Ethernet.

■ Pin layout of connector



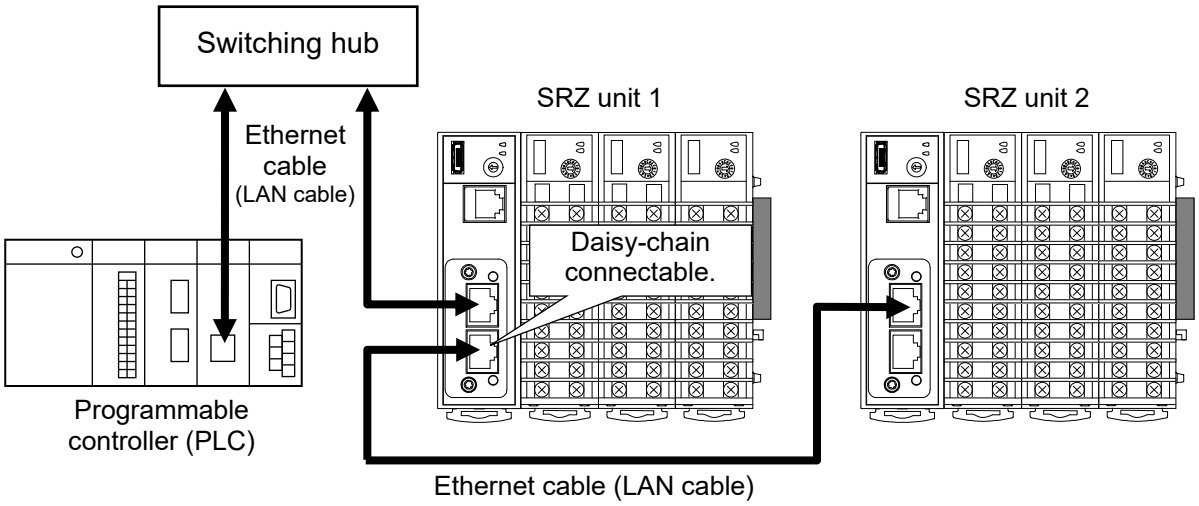
■ Connector pin number and signal details

Pin No.	Signal name	Symbol
1	Send data +	TX+
2	Send data –	TX–
3	Receive data +	RX+
4	Unused	—
5	Unused	—
6	Receive data –	RX–
7	Unused	—
8	Unused	—

The cable must be provided by the customer.
Used cable: The cable is based on the 10BASE-T or the 100BASE-TX standard of Ethernet.
Used connector: RJ-45 type

■ Wiring example

The Ethernet cable (LAN cable) which is marketed can be connected. The Ethernet cable (LAN cable) must be provided by the customer.



Ethernet straight through cable and Ethernet crossover cable may be used.

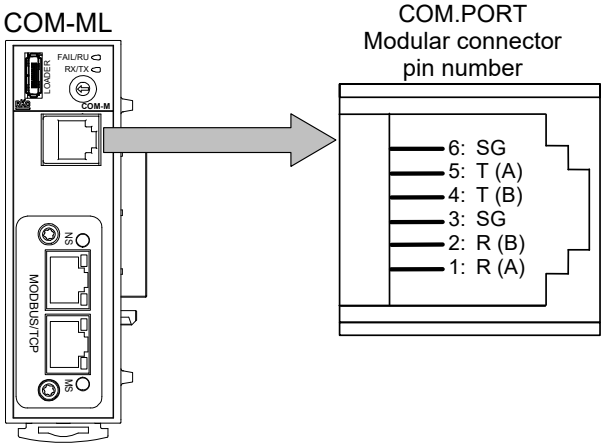
Identification of the SRZ unit connected to Ethernet is done by the IP address of the COM-ML connected to each unit. To use two or more SRZ units, set a unique IP address to each unit.

4.4 Connection to Host Computer

This section explains the connections for using the host computer and the operation panel to set COM-ML data and controller (SRZ) data.

4.4.1 When connected with RS-422A

■ Pin layout of connector

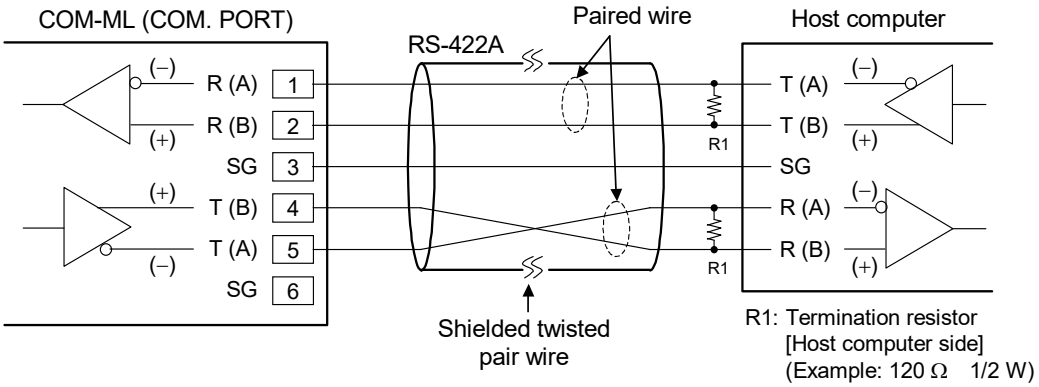


■ Connector pin number and signal details

Pin No.	Signal name	Symbol
1	Receive data	R (A)
2	Receive data	R (B)
3	Signal ground	SG
4	Send data	T (B)
5	Send data	T (A)
6	Signal ground	SG

The 6-pin type modular connector should be used for the connection to the COM-ML.
Recommended model: TM4P-66P
(Manufactured by HIROSE ELECTRIC CO., LTD.)

■ Wiring



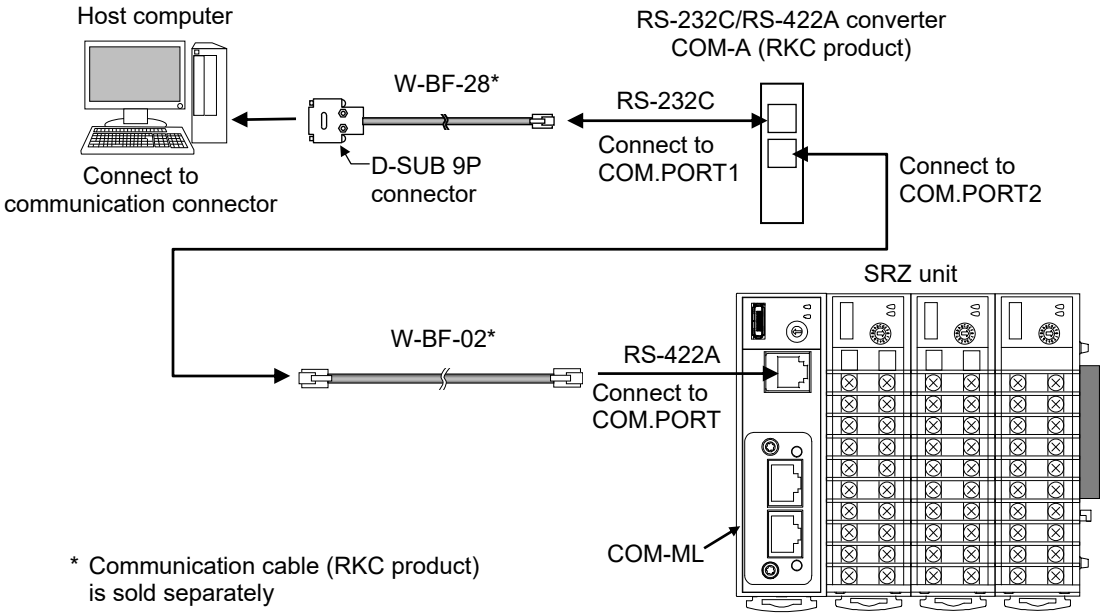
NOTE

If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors to the COM-ML and the other party unit.

Up to 16 SRZ units can be connected to a host computer communication port.

■ When the interface of host computer is RS-232C

Connect the RS-232C/RS-422A converter between the host computer and the COM-ML.



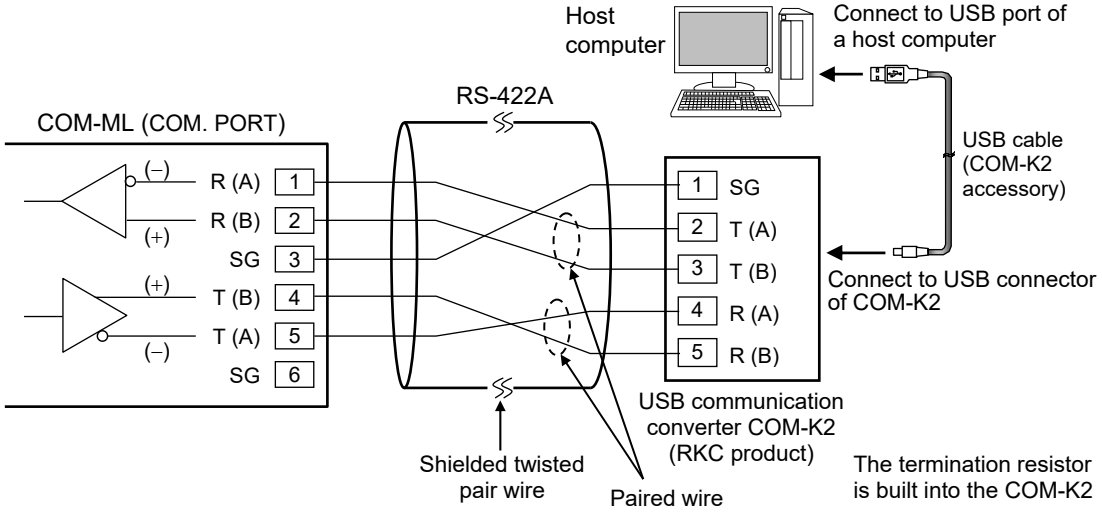
W-BF-02* and W-BF-28* communication cable (RKC product) can be used as communication cable. If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.

* Shields of the cable are connected to SG (No. 6 pin) of the COM-ML connector.

☞ Recommended RS-232C/RS-422A converter: COM-A (RKC product)
For the COM-A, refer to the **COM-A/COM-B Instruction Manual (IMSRM33-E□)**.

■ When the host computer has a USB connector

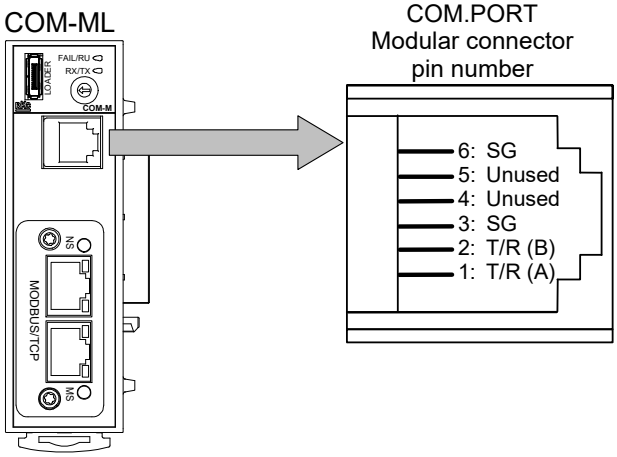
Connect the USB communication converter between the host computer and the COM-ML.



☞ For the COM-K2, refer to the **COM-K2 Instruction Manual (IMR01Z02-E□)**.

4.4.2 When connected with RS-485

■ Pin layout of connector

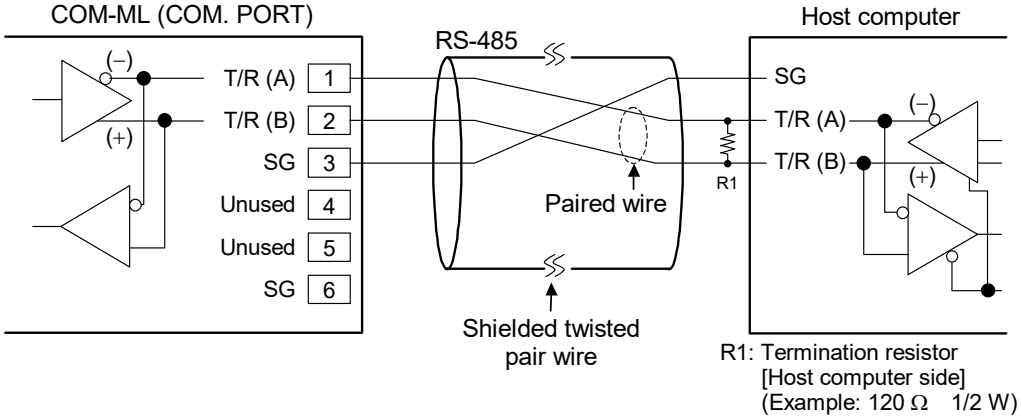


■ Connector pin number and signal details

Pin No.	Signal name	Symbol
1	Send/Receive data	T/R (A)
2	Send/Receive data	T/R (B)
3	Signal ground	SG
4	Unused	—
5	Unused	—
6	Signal ground	SG

The 6-pin type modular connector should be used for the connection to the COM-ML.
Recommended model: TM4P-66P
(Manufactured by HIROSE ELECTRIC CO., LTD.)

■ Wiring



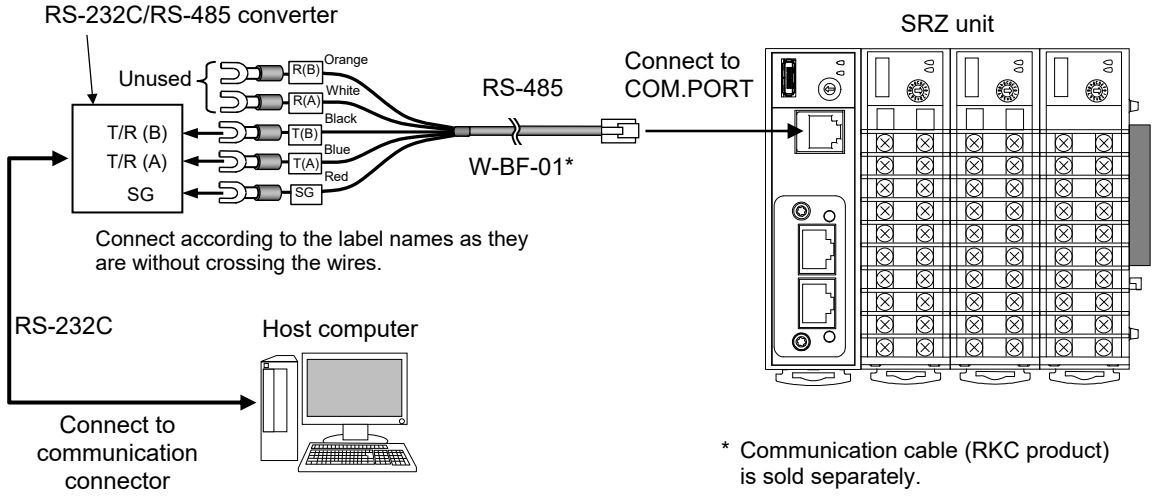
NOTE

If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors to the COM-ML and the other party unit.

Up to 16 SRZ units can be connected to a host computer communication port.

■ When the interface of host computer is RS-232C

Connect the RS-232C/RS-485 converter between the host computer and the COM-ML.



NOTE

Be sure to insulate the wires that are not used by covering them with insulating tape.

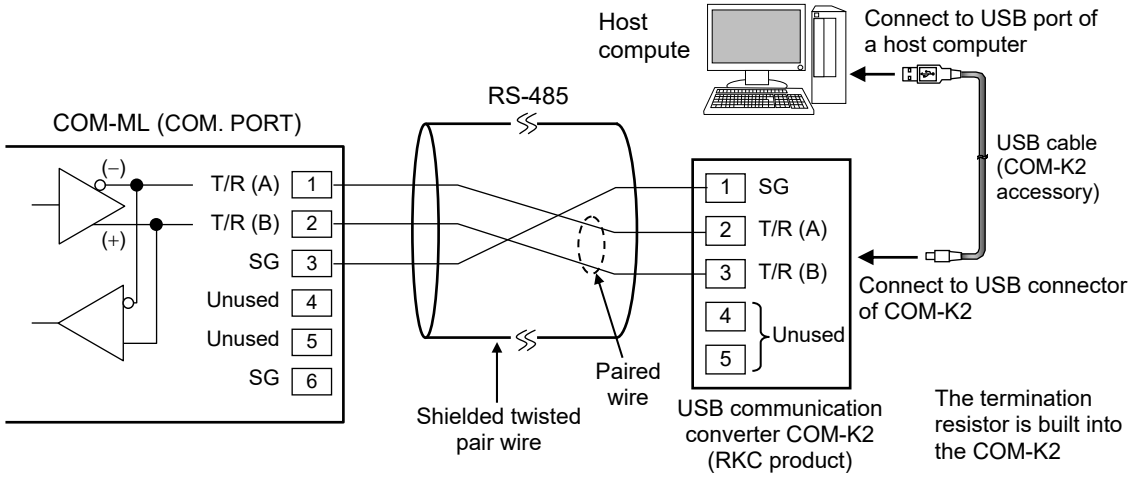
Recommended RS-232C/RS-485 converter:
CD485, CD485/V Data Link product, Inc. or equivalent.

W-BF-01* communication cable (RKC product) can be used as communication cable. If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.

* Shields of the cable are connected to SG (No. 6 pin) of the COM-ML connector.

■ When the host computer has a USB connector

Connect the USB communication converter between the host computer and the COM-ML.

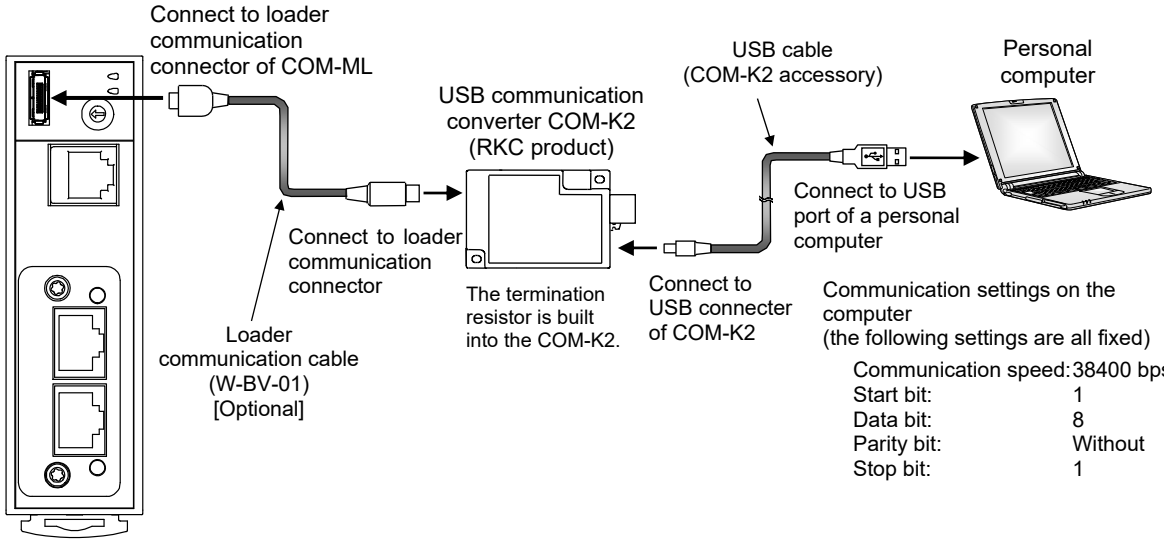


For the COM-K2, refer to the **COM-K2 Instruction Manual (IMR01Z02-E□)**.

4.4.3 Connections for loader communication

Connect a USB communication converter COM-K2 (sold separately)* between the personal computer and the COM-ML.
Loader communication makes it possible to check and set data of the COM-ML and the controller (SRZ). To set and verify the data, our communication tool PROTEM 2 can be used.

* A loader communication cable (optional) is required for the connection to the loader communication connector on the COM-ML.
  USB communication converter COM-K2-1 (with Loader communication cable [cable length: 1.5 m])



The PROTEM 2 can be downloaded from the official RKC website.

During the loader communication, the COM-ML requires an external power source. The COM-ML will not function on the USB power from a personal computer alone.

The module address for loader communication is fixed at "0."

Loader communication corresponds to RKC communication (based on ANSI X3.28-1976 subcategories 2.5 and B1).

For the COM-K2, refer to the **COM-K2 Instruction Manual (IMR01Z02-E□)**.

5. HOST COMMUNICATION SETTING

⚠ WARNING

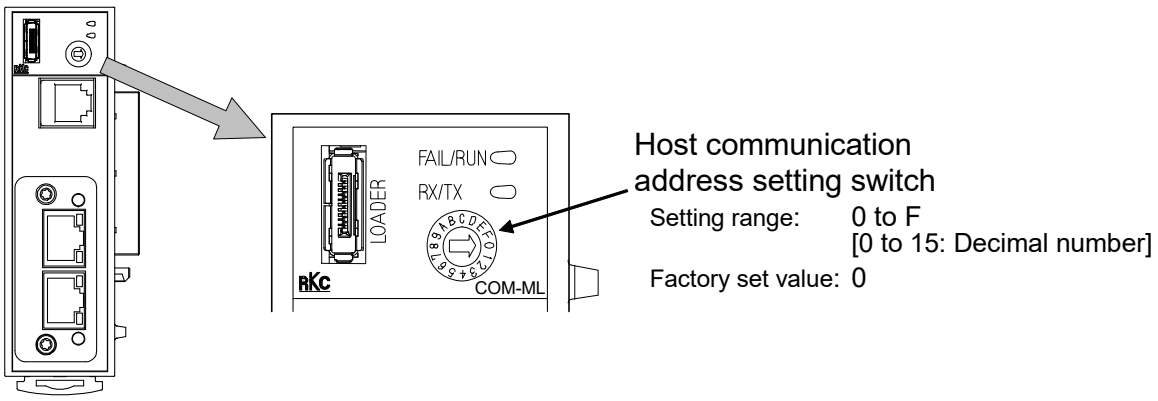
- To prevent electric shock or instrument failure, always turn off the power before setting the switch.
- To prevent electric shock or instrument failure, never touch any section other than those instructed in this manual.

5.1 Address Setting

Set host communication address of COM-ML (SRZ unit).
Set an address for the COM-ML (SRZ unit) using a small blade screwdriver.

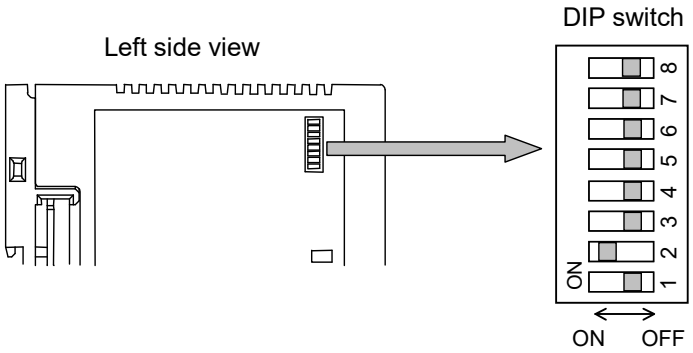
NOTE

Set the address such that it is different to the other addresses on the same line. Otherwise, problems or malfunction may result.



5.2 DIP Switch Setting

Use the DIP switch to set the speed and protocol of host communication, default IP address setting, and DIP switch enable/disable.



1	2	Host communication speed
OFF	OFF	4800 bps
ON	OFF	9600 bps
OFF	ON	19200 bps [Factory se value]
ON	ON	38400 bps

3	Communication protocol/Data bit configuration
OFF	RKC communication (Data 8-bit, without parity, Stop 1-bit) [Factory se value]
ON	Modbus (Data 8-bit, without parity, Stop 1-bit)

4	5	
OFF	OFF	Fixed

6	7	Default IP address setting
OFF	OFF	Do not execute the default IP address setting [Factory se value]
ON	OFF	**Do not set this one**
OFF	ON	**Do not set this one**
ON	ON	Execute the default IP address setting *

* Refer to **7.3 Default IP Address Setting (P. 31)**.

8	DIP switch enable/disable
OFF	Enable (enable the DIP switch settings) [Factory se value]
ON	Disable (enable the host communication or loader communication settings) *

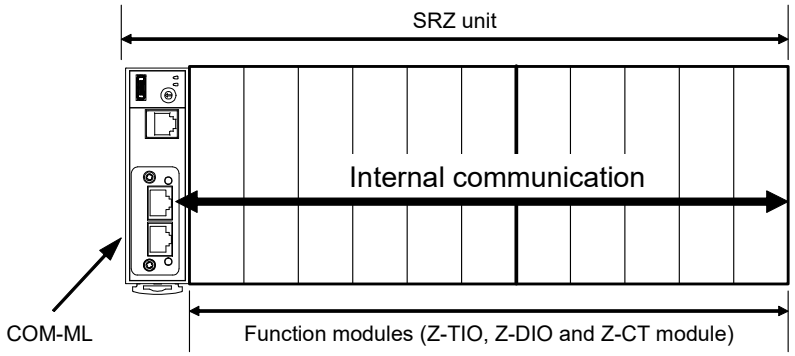
* The only host communication or loader communication settings that are enabled are the host communication speed and protocol and the data bit configuration.

When the communication protocol is set with the DIP switch, the data bit configuration is automatically set to “data 8-bit, without parity, stop 1-bit.” To change to another data bit configuration, set the configuration in host communication or loader communication.

If you wish to set the data bit configuration, host communication speed, and communication protocol in host communication or loader communication, first set DIP switch No. 8 to ON.

6. COMMUNICATION SETTING OF FUNCTION MODULE

Make the module address setting to make the function module (Z-TIO, Z-DIO and Z-CT modules) communication settings. The SRZ unit performs internal communication between the COM-ML and the function module, so the communication protocol, communication speed, and data bit configuration do not need to be set.



Setting the Z-TIO module address determines the temperature control channel number used for communication.

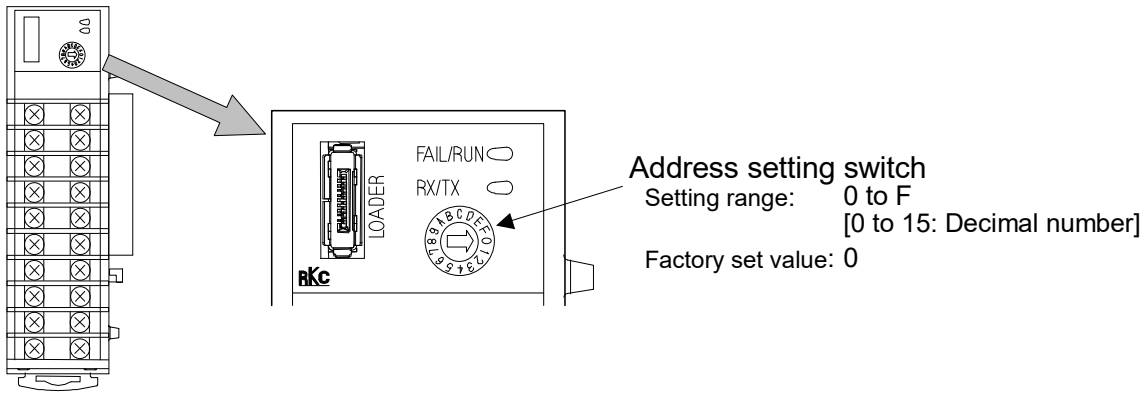
☞ For relation of the module address and channel number, refer to the below:
- **6.2 Temperature Control Channel of SRZ Unit (P. 24)**
- **6.3 Digital Input/Output Channel of Z-DIO Module (P. 25)**.
- **6.4 Current Transformer (CT) Input Channel of Z-CT Module (P. 26)**

6.1 Address Setting of the Function Modules

Set the address of the function modules. When using two or more function modules, set the desired module address to each module. For this setting, use a small blade screwdriver.

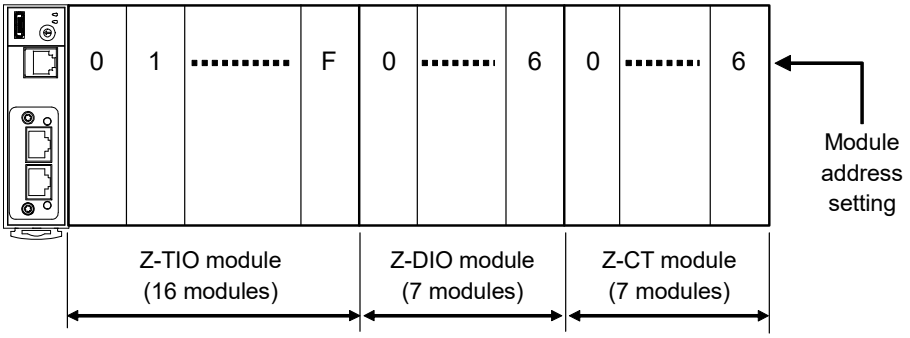
📖 **NOTE**

To avoid problems or malfunction, do not duplicate an address in a function module of the same type on the same communication line.



📖 The maximum number of function modules (Z-TIO, Z-DIO and Z-CT modules) described in the following can be joined per COM-ML.
- When joining function modules of the same type: Up to 16 modules
- When joining function modules of two or more different types: Up to 30 modules
  (However, the maximum joinable number of function modules of the same type is 16.)

Address setting example of function module (16 Z-TIO module, 7 Z-DIO module and 7 Z-CT module):



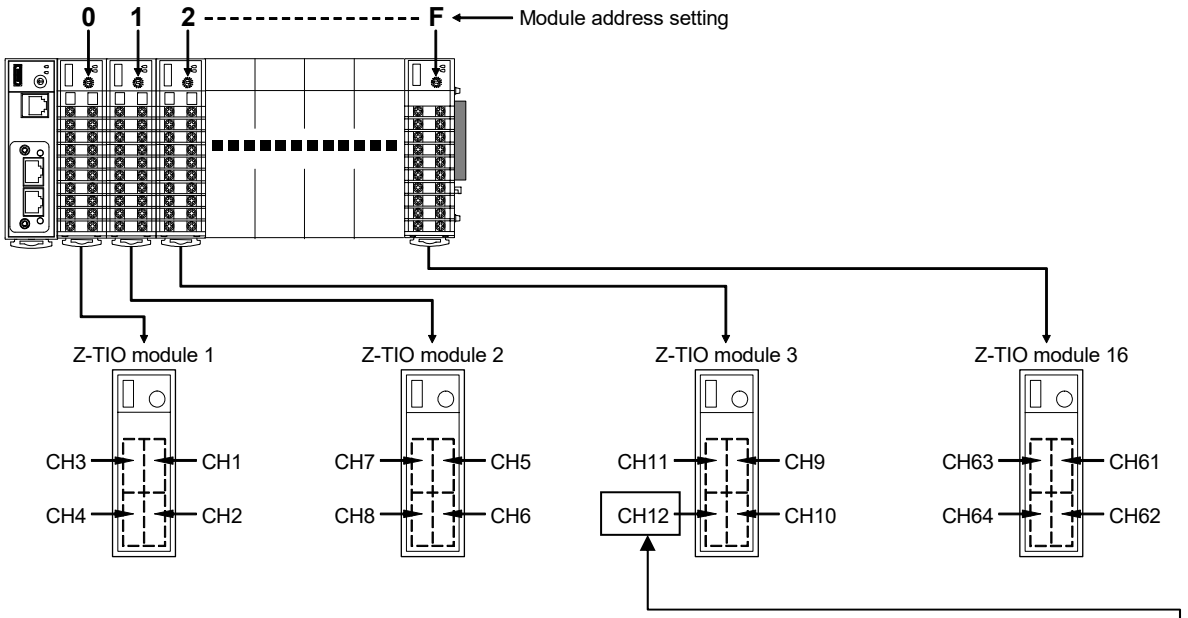
6.2 Temperature Control Channel of the SRZ Unit

Setting the Z-TIO module address determines the temperature control channel number used for communication. To each Z-TIO module address, the relevant temperature control channel is assigned. Each temperature control channel number can be calculated from the following equation.

Temperature control channel number of communication =
[Module address setting [a]] × [Maximum channel number of the function module [b]]
+ [Channel number in a module]

[a] When the setting is A to F, it is a decimal number.
[b] For the Z-TIO module, it is calculated by "4."

Example: When 16 Z-TIO modules (4-channel type) are joined



- Z-TIO module 3: The temperature control channel number used for communication of channel 4
  $2 \times 4 + 4 = 12$

6.3 Digital Input/Output Channel of Z-DIO Module

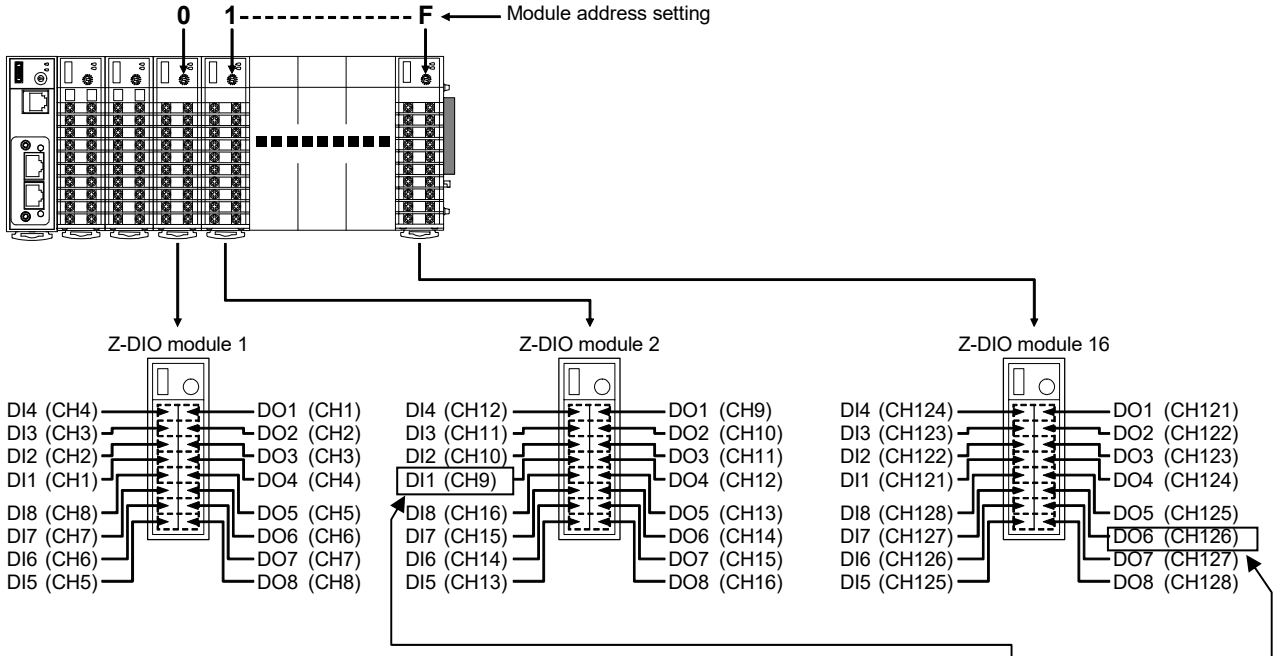
Setting the Z-DIO module address determines the digital input/output channel number of SRZ unit. To each Z-DIO module address, the relevant digital input/output channel is assigned. Each digital input/output channel can be calculated from the following equation.

Digital input/output channel number =
[Module address setting [a]] × [Maximum channel number of the function module [b]]
+ [Input (or output) channel number in a module]

[a] When the setting is A to F, it is a decimal number.

[b] For the Z-DIO module, it is calculated by "8."

Example: When 16 Z-DIO modules are joined



- Digital input channel number of digital input (DI) channel 1 of Z-DIO module 2
  $1 \times 8 + 1 = 9$
- Digital output channel number of digital output (DO) channel 6 of Z-DIO module 16
  $15 \times 8 + 6 = 126$

6.4 Current Transformer (CT) Input Channel of Z-CT Module

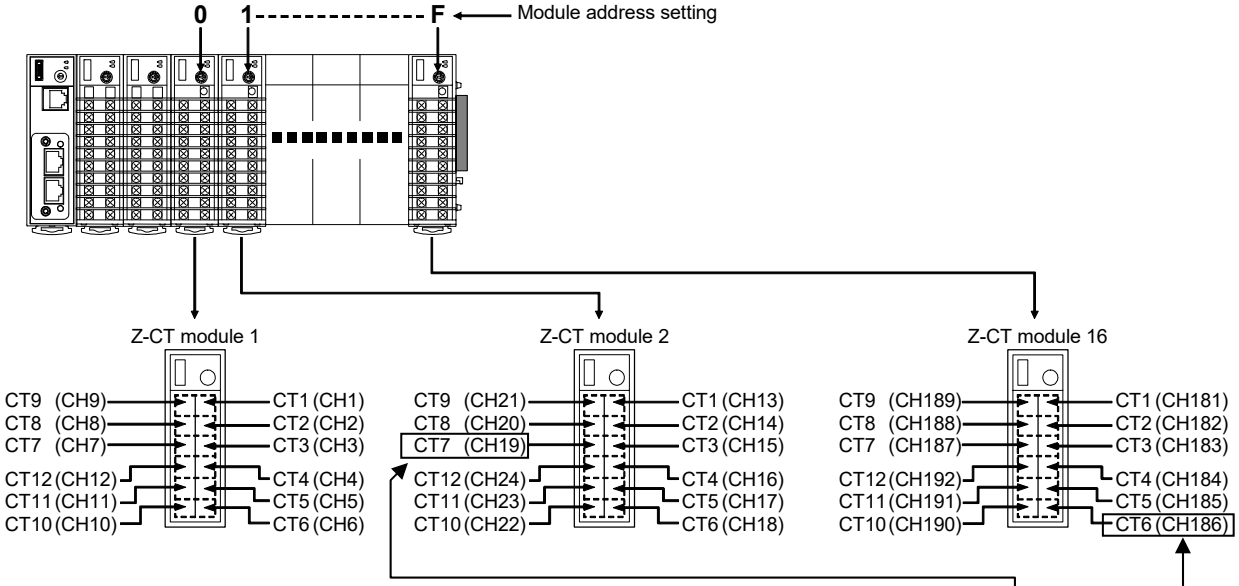
Setting the Z-CT module address determines the current transformer (CT) input channel number of SRZ unit. To each Z-CT module address, the relevant current transformer (CT) input channel is assigned. Each current transformer (CT) input channel can be calculated from the following equation.

Current transformer (CT) input channel number =
[Module address setting [a]] × [Maximum channel number of the function module [b]]
+ [Channel number in a module]

[a] When the setting is A to F, it is a decimal number.

[b] For the Z-CT module, it is calculated by "12."

Example: When 16 Z-CT modules are joined



- Channel number of current transformer (CT) input channel 7 of Z-CT module 2
  $1 \times 12 + 7 = 19$
- Channel number of current transformer (CT) input channel 6 of Z-CT module 16
  $15 \times 12 + 6 = 186$

7. IP ADDRESS SETTINGS

To use the COM-ML on Ethernet [Modbus/TCP or PLC communication (MAPMAN)], IP address setting is necessary.
The IP address can be set in host communication or loader communication.

📖 Identification of the SRZ unit connected to Ethernet is done by the IP address of the COM-ML connected to each unit. To use two or more SRZ units, set a unique IP address to each unit.

7.1 Host Communication Settings

■ Fixed IP address setting

When setting via host communication, refer to the following RKC communication identifiers and Modbus register addresses to set the IP address.
For the set IP address, the power must be turned off and then on, in order for the settings to take effect.

Name	RKC identifier	Modbus register address		Data range	Factory set value
		HEX	DEC		
First-byte of IP address	QB	801B	32795	0 to 255	192
Second-byte of IP address	QC	801C	32796	0 to 255	168
Third-byte of IP address	QD	801D	32797	0 to 255	1
Fourth-byte of IP address	QE	801E	32798	0 to 255	1

(Factory set value for COM-ML IP address: 192.168.1.1)

📖 **NOTE**

For the IP address, check with the administrator of the network (LAN) to which the COM-ML is connected.

📖 The DIP switches can be used to return the IP address to the factory set value setting.
For operating procedure, refer to **7.3 Default IP Address Setting (P. 31)**.

📖 Our **Communication tool "PROTEM 2"** can be used for the communication setup.
This tool can be downloaded from the official RKC website.

☞ For information on connecting the COM-ML to a host computer, refer to **4.4 Connection to Host Computer (P. 16)**.

7.2 Loader Communication Settings

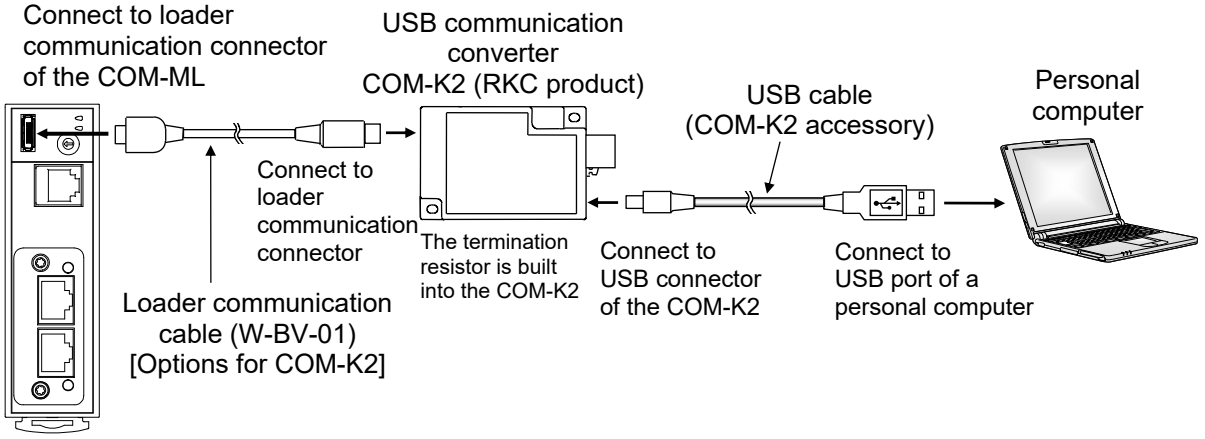
■ Preparation

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

- USB communication converter COM-K2 (With USB cable)
  To use the Loader communication, USB driver for COM-K2 must be installed on the personal computer. The USB driver for COM-K2 can be downloaded from the official RKC website.
- Loader communication cable W-BV-01 [Options for COM-K2]
- Communication tool PROTEM 2
  This tool can be downloaded from the official RKC website.

■ Connection method

Connect the COM-ML, the COM-K2, and the personal computer with a USB cable and a loader communication cable.



During the loader communication, the COM-ML requires an external power source. The COM-ML will not function on the USB power from a personal computer alone.

■ Setting of loader communication

The device address, the communication speed and the data bit configuration are fixed as follows for the loader communication.

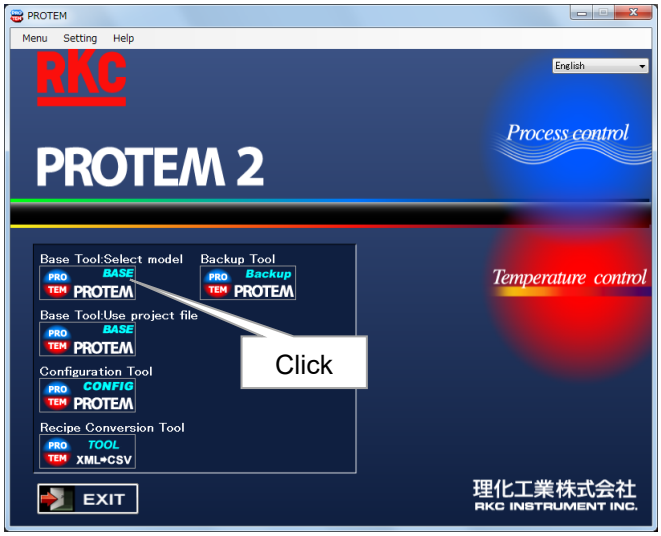
- Device address: 0
- Communication speed: 38400 bps
- Data bit configuration: Data 8-bit, Without parity, Stop 1-bit

■ Setting of PROTEM 2

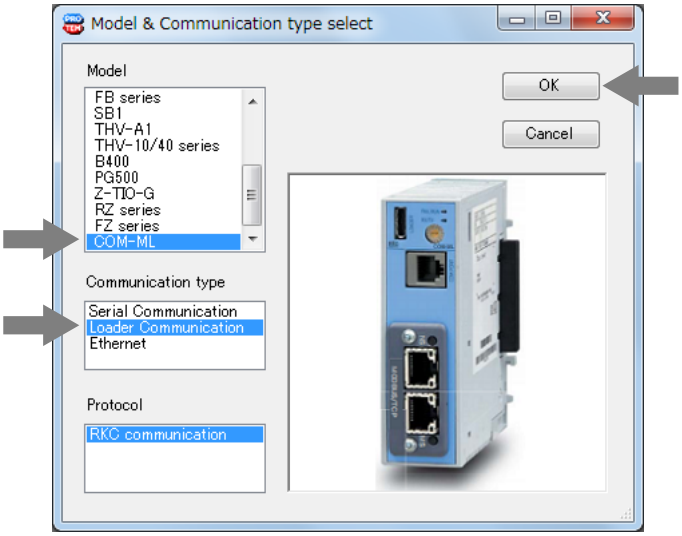
1. Turn on the power of the COM-ML (SRZ unit).

2. Start PPROTEM 2
If you use the PROTEM 2 for the first time, you have to create a new project and set a communication port.

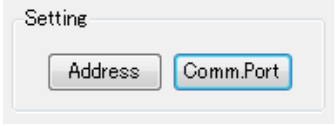
3. Click “Base Tool: Select model”



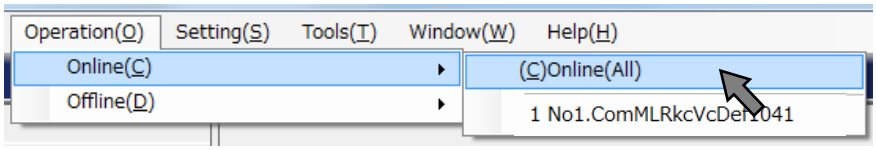
4. Select the “COM-ML” and “Loader Communication,” and click “OK”



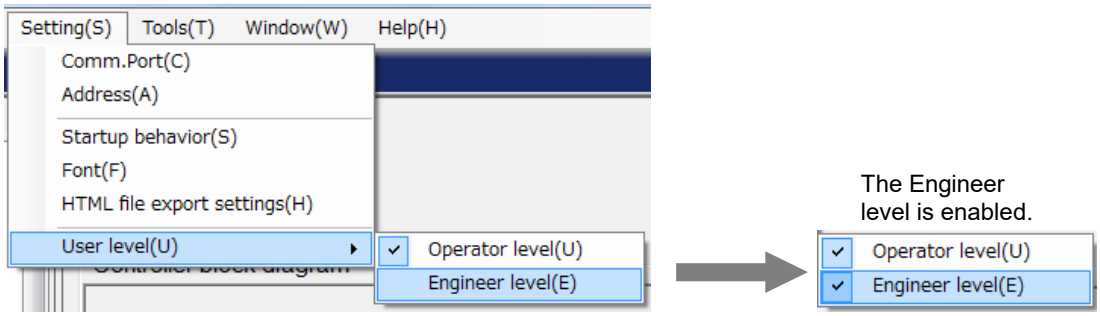
5. Set “Address” setting “0” and “Comm. Port” setting “38400 bps, Data 8-bit, Without parity, Stop 1-bit.” (The COM port number depends on the connected personal computer.)



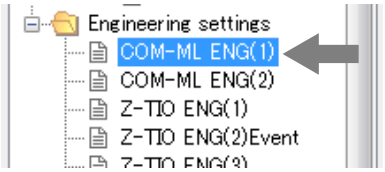
6. Click the menu bar in order of "Operation," "Online," and "Online(All)."



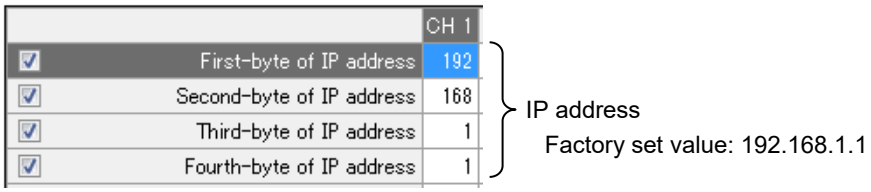
7. Click the menu bar in order of "Setting" and "User level" to activate the "Engineer level."



8. Select "COM-ML ENG(1)" under the "Engineering settings."



9. Set IP address.



10. The set IP address is enabled by turning OFF the power and then turning it ON again.

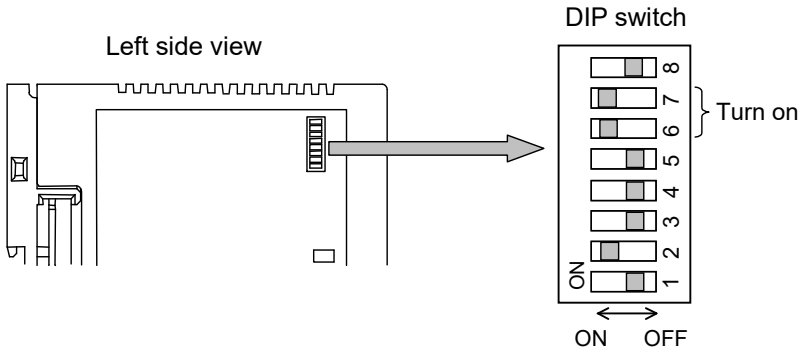
7.3 Default IP Address Setting

The IP address can be set to the factory set value using the DIP switches.

■ Operation procedure

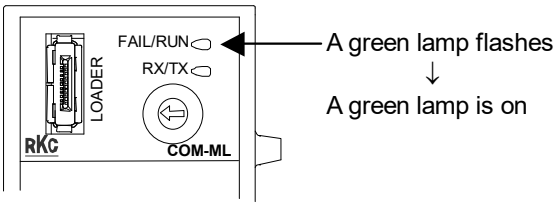
1. Turn off the power of COM-ML.

2. Turn on No. 6 and No. 7 of DIP switch.



3. Turn on the power of COM-ML.

4. The FAIL/RUN lamp will flash green for about 5 seconds and then light solidly.
At this point, the IP address changes to the factory set value "192.168.1.1."



5. Turn off the power of the COM-ML once again and return DIP switches No. 6 and No. 7 to OFF.

If DIP switches No. 6 and No. 7 are left ON, the set IP address will revert to the factory set value every time the power is turned on.

6. Turn the power of the COM-ML back on. This completes the procedure.

7.4 Other Communication Data Settings

Set communication data (PID constants and event set values of the Z-TIO module, DO manual output of the Z-DIO module, etc.) using host communication or loader communication.

Host communication or loader communication is used to configure the IP address setting, and thus it is possible to continue configuring other communication data settings after the IP address setting.

For each of the communication setting items, refer to **9. COMMUNICATION DATA LIST (P. 46)**.

■ Host communication settings by loader communication

Communication protocol, communication speed and data bit configuration can be set by loader communication.

NOTE

Set switch No.8 to "ON" when performing communication by the communication settings set via Host communication or Loader communication. When set to "ON," the DIP switch settings are disabled.

Set the items in the same way as "**7.2 Loader Communication Settings**" (**P. 29**; same procedures up to Step 7 of "**Setting of PROTEM 2**").

R/W: Read/Write

Name	RKC identifier	Modbus register address		Digits	Attribute	Data range	Factory set value
		HEX	DEC				
Host communication Protocol	VP	8004	32772	1	R/W	0: RKC communication 1: Modbus	0
Host communication Communication speed	VU	8005	32773	1	R/W	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps	2
Host communication Data bit configuration	VW	8006	32774	7	R/W	Modbus: 0 to 2 RKC communication: 0 to 5 Refer to Data bit configuration table	0
Host communication Interval time	VX	8007	32775	7	R/W	0 to 250 ms	10

Data bit configuration table

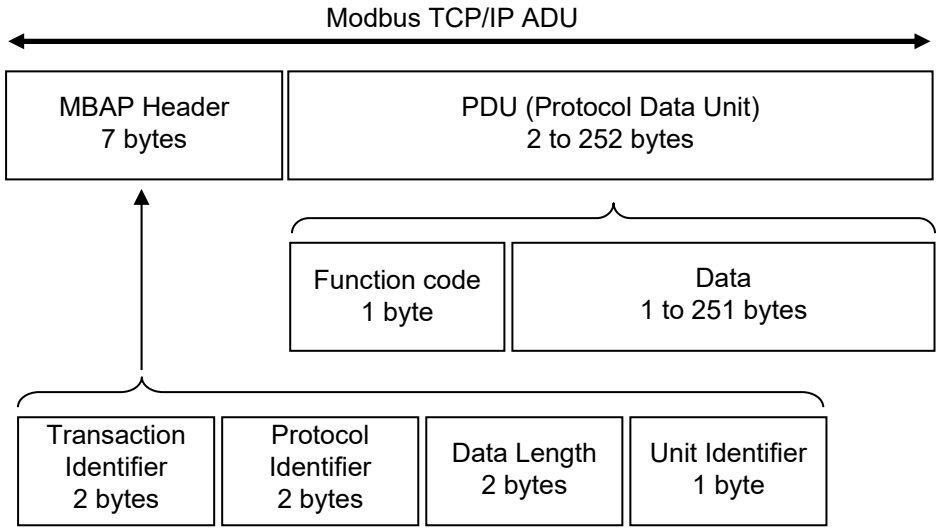
Set value	Data bit	Parity bit	Stop bit	Modbus	RKC communication
0	8	Without	1	Can be set	Can be set
1	8	Even	1		
2	8	Odd	1		
3	7	Without	1	Cannot be Set	
4	7	Even	1		
5	7	Odd	1		

8. MODBUS/TCP PROTOCOL

Modbus/TCP is an open field network provided with the Modbus protocol on the TCP/IP protocol of Ethernet.
The data request side is called “client” (such as computer) and the data response (supply) side is called “server” (COM-ML).

8.1 Message Configuration

Modbus ADU (Application Data Unit) on TCP/IP is in the following configuration.



■ MBAP Header

MBAP (Modbus Application Protocol) header contains the following fields: Transaction Identifier, Protocol Identifier, Data Length and Unit Identifier.

Fields	Length	Request (Client)	Response (Server)
Transaction Identifier	2 bytes	Unused However, data corresponding to two bytes is sent According to need, request and the response are used in order to take consistency	Returns data from the client as is
Protocol Identifier	2 bytes	“0” fixed (Modbus protocol = 0)	Returns data from the client as is
Data Length	2 bytes	The total number of bytes of Unit Identifier and PDU (256 bytes max.)	The total number of bytes of Unit Identifier and PDU (256 bytes max.)
Unit Identifier	1 byte	Unused However, data corresponding to one byte is sent According to need, request and the response are used in order to take consistency	Returns data from the client as is

■ PDU

PDU (Protocol Data Unit) consists of two blocks: function codes and data.

Fields	Length	Request (Client)	Response (Server)
Function code	1 byte	03H: Read holding registers 06H: Write single register 10H: Write multiple registers	Normal response Returns data from the client as is Error response 80H + Function code
Data	1 to 251 bytes	Data meeting the function code	Normal response Data meeting the function code Error response Exception code 01H: Illegal function code 02H: Illegal register address 03H: Illegal data value

8.2 Function Code

- **Function code contents**

Function code	Function	Contents
03H	Read holding registers	Measured value, Control output value, Current transformer input value, Event status, etc.
06H	Write single register	Set value, PID constants, Event set value, etc.
10H	Write multiple registers	Set value, PID constants, Event set value, etc.

- **Message (PDU) length of each function [Unit: byte]**

Function code	Function	Request message		Response message	
		Min	Max	Min	Max
03H	Read holding registers	5	5	4	252
06H	Write single register	5	5	5	5
10H	Write multiple registers	8	252	5	5

8.3 Server (COM-ML) Responses

■ Normal response

- In the response message of the read holding registers, the server (COM-ML) returns the “Function code,” “Number of data items” and the “Read out data” as the response message.
- In the response message of the write single register, the server (COM-ML) returns the same message as the request message.
- In the response message of the write multiple registers, the server (COM-ML) returns the “Function code,” the “Register address number” and the “Number of register” as the response message.

■ Defective message response

- If the request message from the client is defective, except for transmission error, the server (COM-ML) returns the exception response message without any action.
- If the self-diagnostic function of the server (COM-ML) detects an error, the server will return an exception response message to all request messages.

Function code
Exception code

Exception response message

- The function code of each exception response message is obtained by adding “80H” to the function code of the request message.

Exception code	Contents	Causes
01H	Illegal function code	An unsupported function code was specified
02H	Illegal register address	When the mismatched register address is specified.
03H	Illegal data value	• The number of specified data points was out of the following range during data read or write. Function code 03H: 1 to 125 Function code 10H: 1 to 123 • When the data written exceeds the setting range

Exception code priority order
Order of a no response in PDU data length error > 01H > 03H > 02H

■ No response

The server (COM-ML) ignores the request message and does not respond when:

- The IP address does not coincide.
- The server (COM-ML) is not connected to the network.
- The PDU (Protocol Data Unit) data length is abnormal.
  When the PDU data length specified by the request message does not coincide with the number of bytes received as one TCP packet.

8.4 Message Format

8.4.1 Read holding registers [03H]

The request message specifies the starting register address number and quantity of register addresses to be read.
The contents of the registers are entered in the response message as data, divided into two parts: the high-order eight bits and low-order eight bits, arranged in the order of the register numbers.

Example: The contents of the four registers from 01FCH to 01FFH are the read out.

Request message [Client]

Transaction Identifier	High	00H	MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	06H	
Unit Identifier		00H	
Function code		03H	
Register address	High	01H	First register address
	Low	FCH	
Quantity (Number of words)	High	00H	The setting must be between 1 (0001H) and 125 (007DH).
	Low	04H	

Normal response message [Server]

Transaction Identifier	High	00H	MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	0BH	
Unit Identifier		00H	
Function code		03H	
Number of data (byte)		08H	→ Number of registers × 2
First register contents	High	01H	
	Low	24H	
Next register contents	High	01H	
	Low	1BH	
Next register contents	High	01H	
	Low	2BH	
Next register contents	High	01H	
	Low	22H	

Exception response message [Sever]

Transaction Identifier	High	00H	MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	03H	
Unit Identifier		00H	
80H + Function code		83H	
Exception code		03H	→ When the data exceeds the setting range

8.4.2 Write single register [06H]

The request message specifies data to be written into the designated register.
Write data items are arranged in the request message in order starting from the smallest register address number. In addition, each register address is assigned in the order of high-order eight bits and low-order eight bits, respectively.

Example: When 100 (64H) is written to the register 0ADCH

Request message [Client]

Transaction Identifier	High	00H	MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	06H	
Unit Identifier		00H	
Function code		06H	
Register address	High	0AH	
	Low	DCH	
Write data	High	00H	Any data within the range
	Low	64H	

Normal response message [Server]

Transaction Identifier	High	00H	Contents will be the same as request message data
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	06H	
Unit Identifier		00H	
Function code		06H	
Register address	High	0AH	
	Low	DCH	
Write data	High	00H	
	Low	64H	

Exception response message [Sever]

Transaction Identifier	High	00H	MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	03H	
Unit Identifier		00H	
80H + Function code		86H	
Exception code		03H	→ When the data exceeds the setting range

8.4.3 Write multiple registers [10H]

Each data is written to registers in specified quantities starting from the specified register address.
Write data items are arranged in the request message in order starting from the smallest register address number. In addition, each register address is assigned in the order of high-order eight bits and low-order eight bits, respectively.

Example: When 100 (64H) and 120 (78H) are written to the register 0ADCH and 0ADDH (two in total)

Request message [Client]

Transaction Identifier	High	00H	MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	0BH	
Unit Identifier		00H	
Function code		10H	
Register address	High	0AH	First register address
	Low	DCH	
Quantity (Number of words)	High	00H	The setting must be between 1 (0001H) and 123 (007BH).
	Low	02H	
Number of data (byte)		04H	→ Number of registers × 2
Data to first register	High	00H	
	Low	64H	
Data to next register	High	00H	
	Low	78H	

Normal response message [Server]

Transaction Identifier	High	00H	MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	06H	
Unit Identifier		00H	
Function code		10H	
Register address	High	0AH	First register address
	Low	DCH	
Quantity (Number of words)	High	00H	
	Low	02H	

Exception response message [Sever]

Transaction Identifier	High	00H	MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	03H	
Unit Identifier		00H	
80H + Function code		90H	
Exception code		03H	→ When the data exceeds the setting range

8.5 Data Processing Precautions

- The numeric range of data used in Modbus protocol is 0000H to FFFFH. Only the set value within the setting range is effective.

  FFFFH represents −1.

- The Modbus protocol does not recognize data with decimal points during communication.

  Example1: When Heater break alarm (HBA) set value is 20.0 A, 20.0 is processed as 200, 200 = 00C8H

Heater break alarm (HBA) set value	High	00H
	Low	C8H

  Example2: When Set value (SV) is −20.0 °C, −20.0 is processed as −200, −200 = 0000H − 00C8H = FF38H

Set value (SV)	High	FFH
	Low	38H

- In this communication, the data that memory area includes handles different address with for Control area and for setting area.
- If data (register) exceeding the accessible address range is accessed, an exception response message is returned.
- Read data of unused item is a default value.
- Any attempt to write to an unused item is not processed as an error. Data cannot be written into an unused item.
- If an error (data range error or address error) is detected in the data writing process, an exception response message is returned. Writing is aborted at and after the addresses where an error occurred. After having completed the setting, check to see if the data was properly written.
- An attribute of the item for functions which are not in the controller is RO (read only). If read action to this item is performed, the read data will be “0.” If write action to this item is performed, no error message is indicated and no data is written.

For details, refer to **9. COMMUNICATION DATA LIST (P. 46)**.

8.6 How to Use Memory Area Data

Memory area function can store up to 8 individual sets of SVs and parameters. One of the areas is used for control, and the currently selected area is Control area.
Memory area data can be used to check and change settings that belong to memory areas other than the Control area. Reading and writing of memory area data is performed by channel.

■ Read and write of memory area data

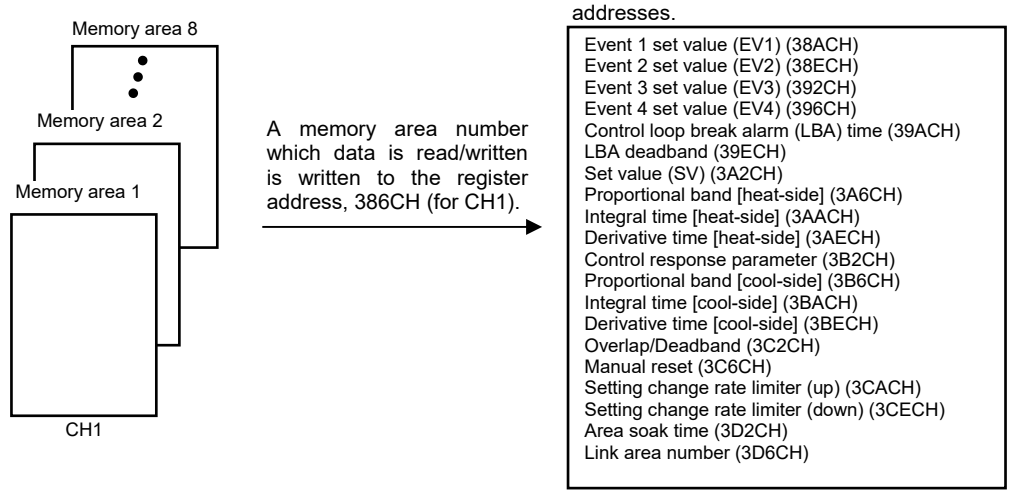
If any Memory area number to perform data read and write is specified by the Setting memory area number (386CH to 38ABH), data corresponding to the specified Memory area number is called up to the register addresses from 38ACH to 3DABH. By using these register addresses from 38ACH to 3DABH, it becomes possible to read and write data in any memory area.

	Register address			
	CH1	CH2	·····	CH64
Setting memory area number	386CH	386DH	·····	38ABH
Event 1 set value (EV1)	38ACH	38ADH	·····	38EBH
Event 2 set value (EV2)	38ECH	38EDH	·····	392BH
Event 3 set value (EV3)	392CH	392DH	·····	396BH
Event 4 set value (EV4)	396CH	396DH	·····	39ABH
Control loop break alarm (LBA) time	39ACH	39ADH	·····	39EBH
LBA deadband	39ECH	39EDH	·····	3A2BH
Set value (SV)	3A2CH	3A2DH	·····	3A6BH
Proportional band [heat-side]	3A6CH	3A6DH	·····	3AABH
Integral time [heat-side]	3AACH	3AADH	·····	3AEBH
Derivative time [heat-side]	3AECH	3AEDH	·····	3B2BH
Control response parameter	3B2CH	3B2DH	·····	3B6BH
Proportional band [cool-side]	3B6CH	3B6DH	·····	3BABH
Integral time [cool-side]	3BACH	3BADH	·····	3BEBH
Derivative time [cool-side]	3BECH	3BEDH	·····	3C2BH
Overlap/Deadband	3C2CH	3C2DH	·····	3C6BH
Manual reset	3C6CH	3C6DH	·····	3CABH
Setting change rate limiter (up)	3CACH	3CADH	·····	3CEBH
Setting change rate limiter (down)	3CECH	3CEDH	·····	3D2BH
Area soak time	3D2CH	3D2DH	·····	3D6BH
Link area number	3D6CH	3D6DH	·····	3DABH

← Register address to specify memory area

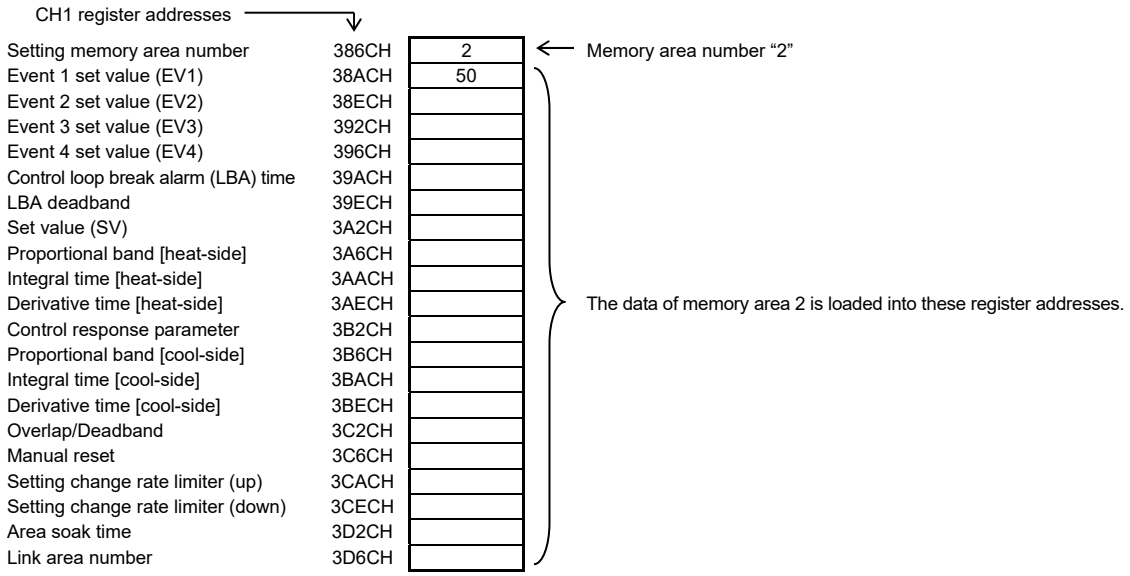
Register address of memory area data

☞ For the Memory area data list, refer to **9.4 Memory Area Data of Z-TIO Module (P. 76)**.



[Example 1] When data on the Event 1 set value in Memory area 2 of CH1 is read

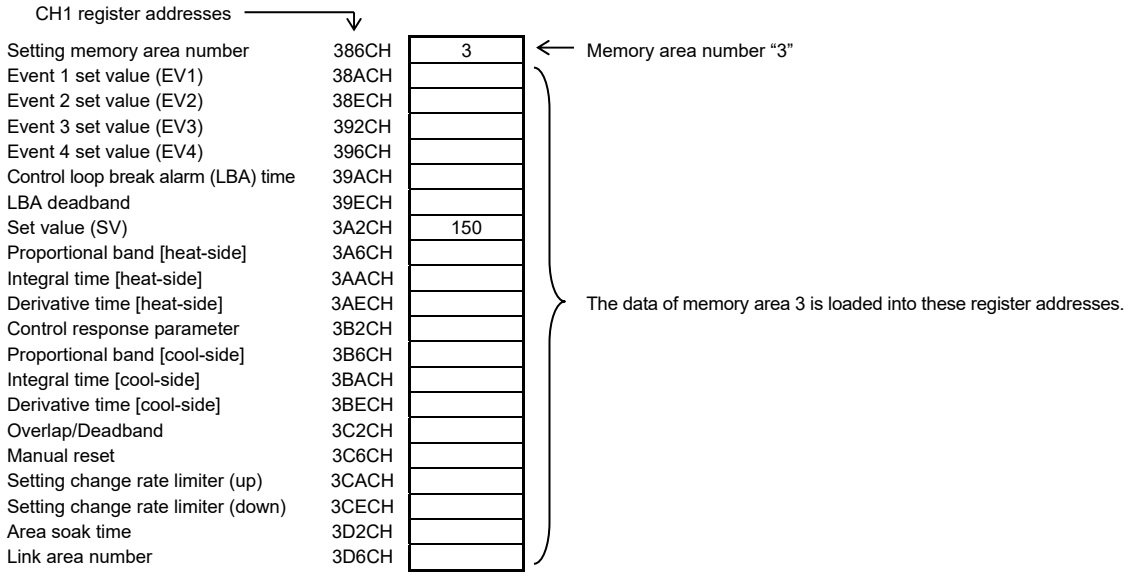
1. The Memory area number, "2" is written to the CH1 Setting memory area number (386CH). Data in Memory area 2 is called up to the CH1 register addresses.



2. Data "50" on Event 1 set value (38ACH) is read.

[Example 2] When the Set value (SV) in Memory area 3 of CH1 is changed to 200

1. The Memory area number, "3" is written to the CH1 Setting memory area number (386CH). Data in Memory area 3 is called up to the CH1 register addresses.



2. "200" is written to the Set value (SV) (3A2CH).

■ Control area transfer

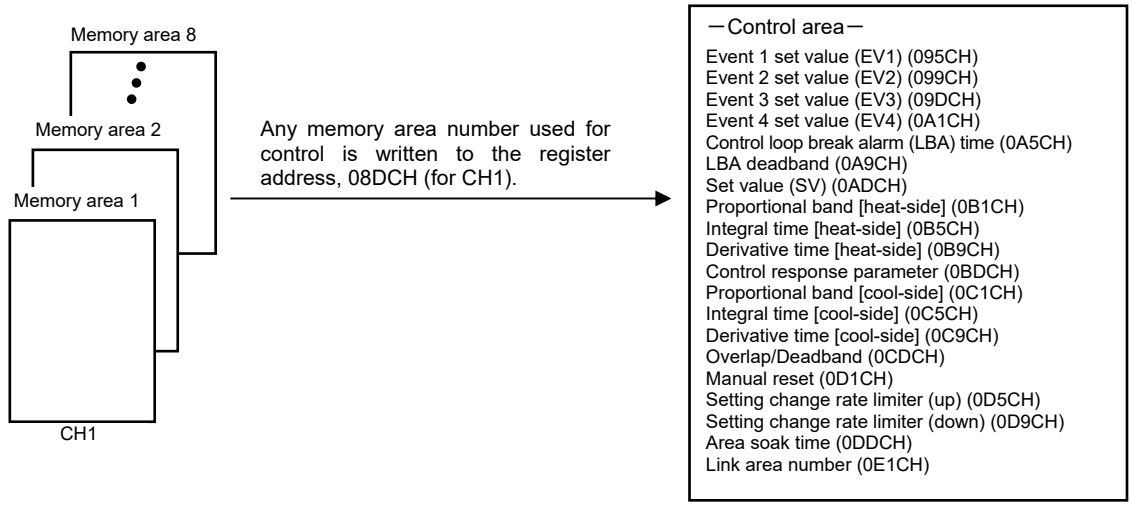
Any memory area used for control is specified by the Memory area transfer (08DCH to 091BH). The area (095CH to 0E5BH) now used for control is called Control area.

The Memory area number (Control area) can be changed at either RUN or STOP.

	Register address			
	CH1	CH2	·····	CH64
Memory area transfer	08DCH	08DDH	·····	091BH
Event 1 set value (EV1)	095CH	095DH	·····	099BH
Event 2 set value (EV2)	099CH	099DH	·····	09DBH
Event 3 set value (EV3)	09DCH	09DDH	·····	0A1BH
Event 4 set value (EV4)	0A1CH	0A1DH	·····	0A5BH
Control loop break alarm (LBA) time	0A5CH	0A5DH	·····	049BH
LBA deadband	0A9CH	0A9DH	·····	0ADBH
Set value (SV)	0ADCH	0ADDH	·····	0B1BH
Proportional band [heat-side]	0B1CH	0B1DH	·····	0B5BH
Integral time [heat-side]	0B5CH	0B5DH	·····	0B9BH
Derivative time [heat-side]	0B9CH	0B9DH	·····	0BDBH
Control response parameter	0BDCH	0BDDH	·····	0C1BH
Proportional band [cool-side]	0C1CH	0C1DH	·····	0C5BH
Integral time [cool-side]	0C5CH	0C5DH	·····	0C9BH
Derivative time [cool-side]	0C9CH	0C9DH	·····	0CDBH
Overlap/Deadband	0CDCH	0CDDH	·····	0CDCH
Manual reset	0D1CH	0D1DH	·····	0D5BH
Setting change rate limiter (up)	0D5CH	0D5DH	·····	0D9BH
Setting change rate limiter (down)	0D9CH	0D9DH	·····	0DDBH
Area soak time	0DDCH	0DDDH	·····	0E1BH
Link area number	0E1CH	0E1CH	·····	0E5BH

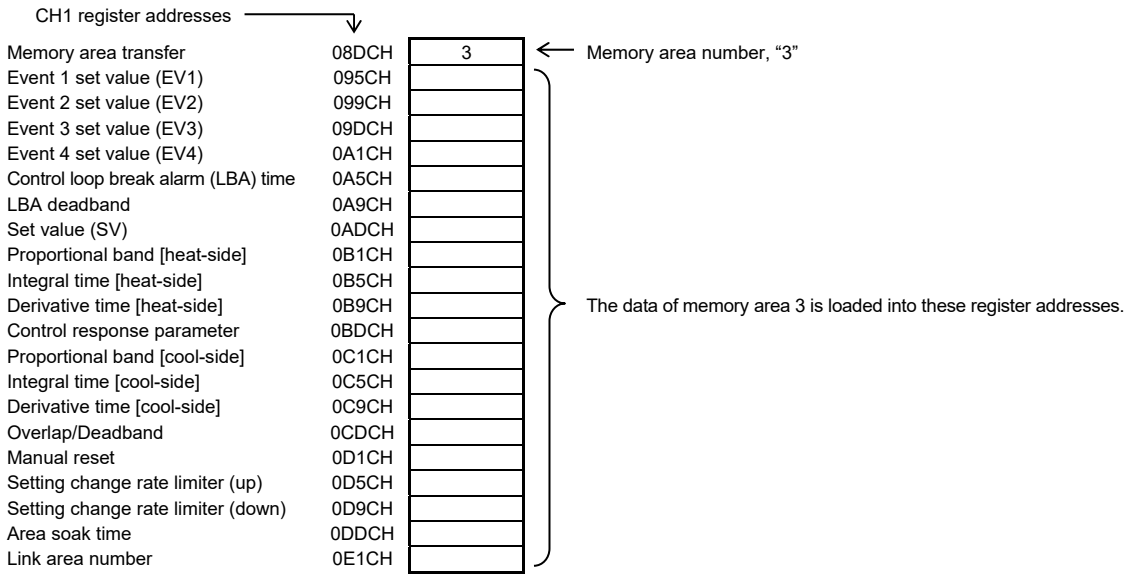
← Register address to specify Control area

Register address of memory area data



[Example] When performing control by calling up data in Memory area 3 of CH1

1. The Memory area number, “3” is written to the Memory area transfer (08DCH).
Data in Memory area 3 is called up to the CH1 register addresses.



2. Control of CH1 is performed by using data in the register addresses.

If the Memory area transfer (08DCH to 091BH) and the setting Memory area number (386CH to 38ABH) are set to the same Memory area number, the respective data can be synchronized.

- Values in the Control areas (095CH to 0E5BH) and the Setting memory area number (38ACH to 3DABH) are set to the same Memory area number, the respective data can be synchronized.
- If data in the Control area is changed, data in the memory area is also changed.
- If data in the memory area is changed, data in the Control area is also changed.

9. COMMUNICATION DATA LIST

9.1 Reference to Communication Data List

(1) No.	(1) Name	(2) Identifier	(3) Channel	(4) Register address HEX	(4) Register address DEC	(5) Digits	(6) Attribute	(7) Structure	(8) Data range	(9) Factory set value
1	Measured value (PV)	M1	CH1 : CH64	01FC : 023B	508 : 571	7	RO	C	Input scale low to Input scale high	—

(1) Name: Communication data name

(2) Identifier: Communication identifier of RKC communication

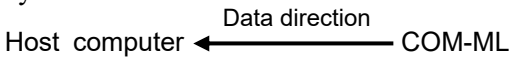
(3) Channel: Channel number of data of one unit

(4) Register address: Register address of Modbus data item specification
HEX: Hexadecimal
DEC: Decimal

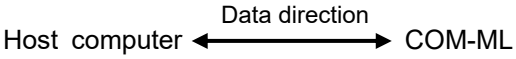
(5) Digits: The number of communication data digits in RKC communication

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

RO: Read only data



R/W: Read and Write data



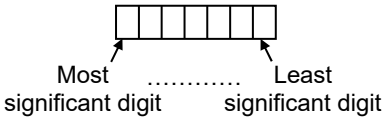
(7) Structure: U: Data for each SRZ unit
M: Data for each module
C: Data for each channel [1, 2]

[1] On a Z-TIO module (2-channel type), the communication data of the CH3 and CH4 becomes invalid.

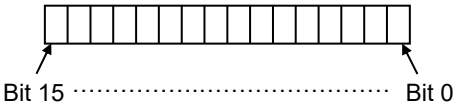
[2] Parameters only used for Heat/Cool control or position proportioning control, therefore data (indicated by ♣ in the name column) for CH2 and CH4 of Z-TIO modules are unused. [Read is possible (0 is shown), but the result of Write is disregarded.]

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

- ASCII code data (Example: 7 digits)



- 16-bit data (bit image)



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

⚠ WARNING

The Engineering setting data should be set according to the application before setting any parameter related to operation. Once the communication data in the Engineering mode are set correctly, no further changes need to be made to parameters for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Engineering mode.

NOTE

Some of the communication data of the COM-ML will not be enabled until the power is turned on again, or control is switched from STOP to RUN.

Communication data No. 22, 24, 46 to 49, 55 to 58, and 60 to 63

NOTE

Communication data includes both "Normal setting data" and "Engineering setting data." During RUN (control), the attribute of Engineering setting data is RO. To configure Engineering setting data, the RUN/STOP switch must be set to STOP (control stopped).

Z-TIO module: Normal setting data No. 1 to 85
Engineering setting data No. 86 to 208

Z-DIO module: Normal setting data No. 1 to 13
Engineering setting data No. 14 to 27

Z-CT module: Normal setting data No. 1 to 16
Engineering setting data No. 17 to 28 *

* No. 17 to 28: When the set lock (Identifier: LK, Resister address: 5E0CH to 5E1BH) is set to "0: Unlock," writing data is possible.

9.2 Communication Data of COM-ML

The communication data below is for PLC communication.

- No. 13 to 16, No. 18 and No. 45: System data (monitoring item) for PLC communication
- No. 32 to 35 and No. 40: System data (setting item) for PLC communication

No.	Name	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	Data range	Factory set value
1	Instrument number (COM-ML)	RX	CH1	—	—	8	RO	M	Serial number (character)	—
2	Instrument number (Function module)	RZ	CH1 ⋮ CH100	—	—	8	RO	M	Serial number (character)	—
3	Model code (COM-ML)	ID	CH1	—	—	32	RO	M	Model code (character)	—
4	Model code (Function module)	IE	CH1 ⋮ CH100	—	—	32	RO	M	Model code (character)	—
5	ROM version (COM-ML)	VR	CH1	—	—	8	RO	M	ROM version	—
6	ROM version (Function module)	VQ	CH1 ⋮ CH100	—	—	8	RO	M	ROM version	—
7	Integrated operating time monitor (COM-ML)	UT	CH1	—	—	7	RO	M	0 to 19999 hours	—
8	Integrated operating time monitor (Function module)	UV	CH1 ⋮ CH100	—	—	7	RO	M	0 to 19999 hours	—
9	Error code (COM-ML)	ER	CH1	0000	0	7	RO	U	• RKC communication 2: Data back-up error 64: Stack overflow 512: Network module error • Modbus Bit data Bit 0: Unused Bit 1: Data back-up error Bit 2 to Bit 5: Unused Bit 6: Stack overflow Bit 7 to Bit 9: Unused Bit 10: Network module error Bit 11 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 1090] The error condition is shown by the *OR* of each module. When multiple errors occur, the error No. is the sum value.	—

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No.	Name	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	Data range	Factory set value
10	Error code (Function module)	EZ	CH1 ⋮ CH100	0001 ⋮ 0064	1 ⋮ 100	7	RO	M	• RKC communication 1: Adjustment data error 2: Data back-up error 4: A/D conversion error 32: Logic output data error * • Modbus Bit 0: Adjustment data error Bit 1: Data back-up error Bit 2: A/D conversion error Bit 3 to Bit 4: Unused Bit 5: Logic output data error * Bit 6 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 39] When multiple errors occur, the error No. is the sum value. * Only the Z-TIO and Z-DIO module	—
11	Backup memory state monitor (COM-ML)	EM	CH1	0065	101	1	RO	M	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.	—
12	Backup memory state monitor (Function module)	CZ	CH1 ⋮ CH100	0066 ⋮ 00C9	102 ⋮ 201	1	RO	M		—
13	System communication state	QM	CH1	00CA	202	1	RO	U	Bit data Bit 0: Data collection condition Bit 1 to Bit 15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0 to 1]	—
14	Normal communication state	QL	CH1	00CB	203	1	RO	U	0/1 transfer or Count up at 0 to 30000 (For communication checking) "0" and "1" are repeated for each communication period. Or 1 is added in the range of 0 to 30000 for each communication cycle. (The count is reset to zero when 30000 is reached). Use the identifier QT (Normal communication state selection) to select.	—
15	PLC communication error code	ES	CH1	00CC	204	7	RO	U	Bit data Bit 0: Network operation not possible Bit 1: PLC register read/write error Bit 2: PLC communication timeout Bit 3: Unused Bit 4: Internal communication error Bit 5 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31]	—
16	PLC communication unit recognition flag	QN	CH1	00CD	205	7	RO	U	Bit data Bit 0: SRZ unit Bit 1 to Bit 15: Unused Data 0: No unit exists 1: Unit exists [Decimal number: 0 to 1]	—

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No.	Name	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	Data range	Factory set value
17	Unused	—	—	00CD ⋮ 0131	205 ⋮ 305	—	—	—	—	—
18	Monitor for the number of connected modules	QK	CH1	0132	306	7	RO	U	0 to 31	—
19	RUN/STOP transfer [1] (Each unit)	SR	CH1	0133	307	1	R/W	U	0: STOP (Control stop) 1: RUN (Control start)	0
20	RUN/STOP transfer [2] (Each module)	SW	CH1 ⋮ CH100	0134 ⋮ 0197	308 ⋮ 407	1	R/W	M	0: STOP (Control stop) 1: RUN (Control start)	0
21	Control RUN/STOP holding setting [2] (Each module)	X1	CH1 ⋮ CH100	0198 ⋮ 01FB	408 ⋮ 507	1	R/W	M	0: Not holding (STOP start) 1: Holding (RUN/STOP hold)	1
22	Ethernet selection [3]	VK	CH1	8000	32768	1	R/W	U	0: Modbus/TCP 3: PLC communication (MAPMAN) MITSUBISHI MELSEC series (QnA-compatible 3E frame [SLMP])	0
23	ASCII/Binary selection	VL	CH1	8001	32769	1	R/W	U	0: ASCII 1: Binary	1
24	TCP port number [3]	VM	CH1	8002	32770	7	R/W	U	0 to 65535	Modbus/TCP: 502 PLC communication (MITSUBISHI PLC): 4096
25	Unused	—	—	8003	322771	—	—	—	—	—
26	Host communication protocol	VP	CH1	8004	32772	1	R/W	U	0: RKC communication 1: Modbus	0
27	Host communication communication speed	VU	CH1	8005	32773	1	R/W	U	0: 4800 bps 1: 9600 bps 2: 19200 bps 3: 38400 bps	2
28	Host communication data bit configuration	VW	CH1	8006	32774	7	R/W	U	0 to 5 Refer to **Table 1: Data bit configuration**	0
29	Host communication interval time	VX	CH1	8007	32775	7	R/W	U	0 to 250 ms	10
30	Unused	—	—	8008	32776	—	—	—	—	—
31	Unused	—	—	8009	32777	—	—	—	—	—

[1] When RUN/STOP transfer (Each unit) becomes STOP, the set lock (Identifier: LK, Resister address: 5E0CH to 5E1BH) of the Z-CT module becomes "0: Unlock."

[2] This item does not support a Z-CT module.

[3] Data that are activated by rebooting

Table 1: Data bit configuration

Set value	Data bit	Parity bit	Stop bit	Settable communication
0	8	Without	1	Modbus RKC communication
1	8	Even	1	
2	8	Odd	1	
3	7	Without	1	RKC communication
4	7	Even	1	
5	7	Odd	1	

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
32	System data register type	QZ	CH1	800A	32778	7	R/W	U	MITSUBISHI MELSEC series 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.) 4 to 29: Unused	0
33	System data register start number (High-order 4-bit)	QS	CH1	800B	32779	7	R/W	U	0 to 15	0
34	System data register start number (Low-order 16-bit)	QX	CH1	800C	32780	7	R/W	U	0 to 65535	1000
35	System data address bias	QQ	CH1	800D	32781	7	R/W	U	0 to 65535	0
36	Normal communication state selection [1]	QT	CH1	800E	32782	7	R/W	U	0: "0" and "1" are repeated for each communication period. 1: 1 is added in the range of 0 to 30000 for each communication cycle. (The count is reset to zero when 30000 is reached).	0
37	Unused	—	—	800F	32783	—	—	—	—	—
38	Unused	—	—	8010	32784	—	—	—	—	—
39	Method for setting the number of connected modules	RY	CH1	8011	32785	7	R/W	U	0: No action 1: Automatically set the maximum number of connected function modules only when power is turned on. 2: Execute automatic setting of the maximum number of connected function modules. (After automatic setting of the number of connected function modules, the value automatically reverts to 0.)	1
40	Slave mapping method	RK	CH1	8012	32786	7	R/W	U	0: Bias from the address setting switch [Resister address + (Set value of address setting switch) × System data address bias] 1: Bias disabled	1
41	Number of connected modules [2] (Z-TIO module)	QY	CH1	8013	32787	7	R/W	U	0 to 16 This is the maximum address of the Z-TIO module that is connected to the COM-ML.	—
42	Number of connected modules [2] (Z-DIO module)	QU	CH1	8014	32788	7	R/W	U	0 to 16 This is the maximum address of the Z-DIO module that is connected to the COM-ML.	—
43	Number of connected modules [2] (Z-CT module)	QO	CH1	8015	32789	7	R/W	U	0 to 16 This is the maximum address of the Z-CT module that is connected to the COM-ML.	—

[1] Data that are activated by rebooting

[2] When 1 or 2 is set for the communication identifier RY (method of setting the number of connected modules), the maximum number of connected modules is set automatically. When 0 is set, the maximum number of connected modules is set manually.
Maximum number of connected modules: Maximum address of function modules (address setting switch set value + 1)
COM–ML uses this set value to calculate the number of channels of communication data (RKC communication only).

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
44	Unused	—	—	8016 ⋮ 8019	32790 ⋮ 32793	—	—	—	—	—
45	Number of valid groups	QA	CH1	801A	32794	7	RO	U	0 to 30	—
46	First-byte of IP address [1, 2]	QB	CH1	801B	32795	7	R/W	U	0 to 255	192
47	Second-byte of IP address [1, 2]	QC	CH1	801C	32796	7	R/W	U	0 to 255	168
48	Third-byte of IP address [1, 2]	QD	CH1	801D	32797	7	R/W	U	0 to 255	1
49	Fourth-byte of IP address [1, 2]	QE	CH1	801E	32798	7	R/W	U	0 to 255	1
50	Unused	—	—	801F ⋮ 80B5	32799 ⋮ 32949	—	—	—	—	—
51	MAPMAN transmission delay timer (×0.01 sec)	Y6	CH1	80B6	32950	1	R/W	U	0 to 100 (0.00 seconds to 1.00 second)	0
52	Control RUN/STOP holding setting (Each unit)	X2	CH1	80B7	32951	1	R/W	U	0: Not holding (STOP start) 1: Holding (RUN/STOP hold)	1
53	Unused	—	—	80B8	32952	—	—	—	—	—
54	Unused	—	—	80B9	32953	—	—	—	—	—
55	First-byte of remote IP address [1]	Q6	CH1	80BA	32954	7	R/W	U	0 to 255	192
56	Second-byte of remote IP address [1]	Q7	CH1	80BB	32955	7	R/W	U	0 to 255	168
57	Third-byte of remote IP address [1]	Q8	CH1	80BC	32956	7	R/W	U	0 to 255	1
58	Fourth-byte of remote IP address [1]	Q9	CH1	80BD	32957	7	R/W	U	0 to 255	2
59	Unused	—	—	80BE ⋮ 813E	32958 ⋮ 33086	—	—	—	—	—
60	First-byte of gateway address [1]	W1	CH1	813F	33087	7	R/W	U	0 to 255	0
61	Second-byte of gateway address [1]	W2	CH1	8140	33088	7	R/W	U	0 to 255	0
62	Third-byte of gateway address [1]	W3	CH1	8141	33089	7	R/W	U	0 to 255	0
63	Fourth-byte of gateway address [1]	W4	CH1	8142	33090	7	R/W	U	0 to 255	0
64	Subnet mask CIDR	W5	CH1	8143	33091	7	R/W	U	0 to 32	24
65	Unused	—	—	8144 ⋮ 814A	33092 ⋮ 33098	—	—	—	—	—

[1] Data that are activated by rebooting

[2] When the IP address is 0.0.0.0, the IP address is obtained through DHCP.

9.3 Communication Data of Z-TIO Module

☞ For details of Z-TIO module communication data, refer to **SRZ Instruction Manual (IMS01T04-E□)**.

No.	Name	Iden-tifier	Chan-nel	Register address		Digits	Attri-bute	Struc-ture	Data range	Factory set value
				HEX	DEC					
1	Measured value (PV)	M1	CH1 ⋮ CH64	01FC ⋮ 023B	508 ⋮ 571	7	RO	C	Input scale low to Input scale high	—
2	Comprehensive event state	AJ	CH1 ⋮ CH64	023C ⋮ 027B	572 ⋮ 635	7	RO	C	• RKC communication Least significant digit: Event 1 2nd digit: Event 2 3rd digit: Event 3 4th digit: Event 4 5th digit: Heater break alarm (HBA) 6th digit: Temperature rise completion 7th digit: Burnout Data 0: OFF 1: ON • Modbus Bit data Bit 0: Event 1 Bit 1: Event 2 Bit 2: Event 3 Bit 3: Event 4 Bit 4: Heater break alarm (HBA) Bit 5: Temperature rise completion Bit 6: Burnout Bit 7 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 127]	—
3	Operation mode state monitor	L0	CH1 ⋮ CH64	027C ⋮ 02BB	636 ⋮ 699	7	RO	C	• RKC communication Least significant digit: Control STOP 2nd digit: Control RUN 3rd digit: Manual mode 4th digit: Remote mode 5th digit to Most significant digit: Unused Data 0: OFF 1: ON • Modbus Bit data Bit 0: Control STOP Bit 1: Control RUN Bit 2: Manual mode Bit 3: Remote mode Bit 4 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15]	—
4	Unused	—	—	02BC ⋮ 02CB	700 ⋮ 715	—	—	—	—	—
5	Manipulated output value (MV) monitor [heat-side] ♣	O1	CH1 ⋮ CH64	02CC ⋮ 030B	716 ⋮ 779	7	RO	C	PID control or Heat/Cool PID control: −5.0 to +105.0 % Position proportioning PID control with feedback resistance (FBR) input: 0.0 to 100.0 %	—
6	Manipulated output value (MV) monitor [cool-side] ♣	O2	CH1 ⋮ CH64	030C ⋮ 034B	780 ⋮ 843	7	RO	C	−5.0 to +105.0 %	—

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
7	Current transformer (CT) input value monitor	M3	CH1 ⋮ CH64	034C ⋮ 038B	844 ⋮ 907	7	RO	C	CTL-6-P-N: 0.0 to 30.0 A CTL-12-S56-10L-N: 0.0 to 100.0 A	—
8	Set value (SV) monitor	MS	CH1 ⋮ CH64	038C ⋮ 03CB	908 ⋮ 971	7	RO	C	Setting limiter low to Setting limiter high	—
9	Remote setting (RS) input value monitor	S2	CH1 ⋮ CH64	03CC ⋮ 040B	972 ⋮ 1035	7	RO	C	Setting limiter low to Setting limiter high	—
10	Burnout state monitor	B1	CH1 ⋮ CH64	040C ⋮ 044B	1036 ⋮ 1099	1	RO	C	0: OFF 1: ON	—
11	Event 1 state monitor	AA	CH1 ⋮ CH64	044C ⋮ 048B	1100 ⋮ 1163	1	RO	C	0: OFF 1: ON If the Event 3 type is temperature rise completion, check the temperature rise completion state in the comprehensive event state (Identifier: AJ, Register address: 023CH to 027BH). (The Event 3 state monitor does not turn ON.)	—
12	Event 2 state monitor	AB	CH1 ⋮ CH64	048C ⋮ 04CB	1164 ⋮ 1227	1	RO	C		—
13	Event 3 state monitor	AC	CH1 ⋮ CH64	04CC ⋮ 050B	1228 ⋮ 1291	1	RO	C		—
14	Event 4 state monitor	AD	CH1 ⋮ CH64	050C ⋮ 054B	1292 ⋮ 1355	1	RO	C		—
15	Heater break alarm (HBA) state monitor	AE	CH1 ⋮ CH64	054C ⋮ 058B	1356 ⋮ 1419	1	RO	C	0: OFF 1: ON	—
16	Output state monitor	Q1	CH1 ⋮ CH16	058C ⋮ 059B	1420 ⋮ 1435	7	RO	M	• RKC communication Least significant digit: OUT1 2nd digit: OUT2 3rd digit: OUT3 4th digit: OUT4 5th digit to Most significant digit: Unused Data 0: OFF 1: ON • Modbus Bit data Bit 0: OUT1 Bit 1: OUT2 Bit 2: OUT3 Bit 3: OUT4 Bit 4 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15] Valid only for time-proportional control output.	—
17	Memory area soak time monitor	TR	CH1 ⋮ CH64	059C ⋮ 05DB	1436 ⋮ 1499	7	RO	C	0 minutes 00 seconds to 199 minutes 59 seconds: RKC communication: 0:00 to 199:59 (min:sec) Modbus: 0 to 11999 seconds 0 hours 00 minutes to 99 hours 59 minutes: RKC communication: 0:00 to 99:59 (hrs:min) Modbus: 0 to 5999 minutes Data range of Area soak time can be selected on the Soak time unit.	—

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
18	Unused	—	—	05DC ⋮ 05EB	1500 ⋮ 1515	—	—	—	—	—
19	Holding peak value ambient temperature monitor	Hp	CH1 ⋮ CH64	05EC ⋮ 062B	1516 ⋮ 1579	7	RO	C	−10.0 to +100.0 °C (14.0 to 212.0 °F)	—
20	Unused	—	—	062C ⋮ 063B	1580 ⋮ 1595	—	—	—	—	—
21	Logic output monitor 1	ED	CH1 ⋮ CH16	063C ⋮ 064B	1596 ⋮ 1611	7	RO	M	• RKC communication Least significant digit: Logic output 1 2nd digit: Logic output 2 3rd digit: Logic output 3 4th digit: Logic output 4 5th digit to Most significant digit: Unused Data 0: OFF 1: ON • Modbus Bit data Bit 0: Logic output 1 Bit 1: Logic output 2 Bit 2: Logic output 3 Bit 3: Logic output 4 Bit 4: Logic output 5 Bit 5: Logic output 6 Bit 6: Logic output 7 Bit 7: Logic output 8 Bit 8 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 255]	—
22	Logic output monitor 2	EE	CH1 ⋮ CH16	—	—	7	RO	M	Least significant digit: Logic output 5 2nd digit: Logic output 6 3rd digit: Logic output 7 4th digit: Logic output 8 5th digit to Most significant digit: Unused Data 0: OFF 1: ON	
23	Unused	—	—	064C ⋮ 080B	1612 ⋮ 2059	—	—	—	—	—
24	PID/AT transfer	G1	CH1 ⋮ CH64	080C ⋮ 084B	2060 ⋮ 2123	1	R/W	C	0: PID control 1: Autotuning (AT) * * Automatically reverts to 0 after autotuning ends.	0
25	Auto/Manual transfer	J1	CH1 ⋮ CH64	084C ⋮ 088B	2124 ⋮ 2187	1	R/W	C	0: Auto mode 1: Manual mode	0
26	Remote/Local transfer	C1	CH1 ⋮ CH64	088C ⋮ 08CB	2188 ⋮ 2251	1	R/W	C	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.	0
27	Unused	—	—	08CC ⋮ 08DB	2252 ⋮ 2267	—	—	—	—	—
28	Memory area transfer	ZA	CH1 ⋮ CH64	08DC ⋮ 091B	2268 ⋮ 2331	7	R/W	C	1 to 8	1

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
29	Interlock release	AR	CH1 ⋮ CH64	091C ⋮ 095B	2332 ⋮ 2395	1	R/W	C	0: Normal state 1: Interlock release execution	0
30	Event 1 set value (EV1) ★	A1	CH1 ⋮ CH64	095C ⋮ 099B	2396 ⋮ 2459	7	R/W	C	Deviation action, Deviation action between channels, Temperature rise completion range: −Input span to +Input span Process action, SV action: Input scale low to Input scale high MV action: −5.0 to +105.0 % If the Event type corresponds to "0: None," set to RO (Only reading data is possible). If Event 3 corresponds to "9: Temperature rise completion," the Event 3 set value becomes the range for determining temperature rise completion. If Event 4 corresponds to "9: Control loop break alarm (LBA)," the Event 4 set value becomes RO (Only reading data is possible).	50 (50.0)
31	Event 2 set value (EV2) ★	A2	CH1 ⋮ CH64	099C ⋮ 09DB	2460 ⋮ 2523	7	R/W	C		50 (50.0)
32	Event 3 set value (EV3) ★	A3	CH1 ⋮ CH64	09DC ⋮ 0A1B	2524 ⋮ 2587	7	R/W	C		50 (50.0)
33	Event 4 set value (EV4) ★	A4	CH1 ⋮ CH64	0A1C ⋮ 0A5B	2588 ⋮ 2651	7	R/W	C		50 (50.0)
34	Control loop break alarm (LBA) time ★	A5	CH1 ⋮ CH64	0A5C ⋮ 0A9B	2652 ⋮ 2715	7	R/W	C	0 to 7200 seconds (0: Unused)	480
35	LBA deadband ★	N1	CH1 ⋮ CH64	0A9C ⋮ 0ADB	2716 ⋮ 2779	7	R/W	C	0 (0.0) to Input span Varies with the setting of the decimal point position.	0 (0.0)
36	Set value (SV) ★	S1	CH1 ⋮ CH64	0ADC ⋮ 0B1B	2780 ⋮ 2843	7	R/W	C	Setting limiter low to Setting limiter high	TC/RTD: 0 (0.0) V/I: 0.0
37	Proportional band [heat-side] ★ ♣	P1	CH1 ⋮ CH64	0B1C ⋮ 0B5B	2844 ⋮ 2907	7	R/W	C	TC/RTD inputs: 0 (0.0) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position selection. Voltage (V)/current (I) inputs: 0.0 to 1000.0 % of input span 0 (0.0): ON/OFF action (ON/OFF action for both heat and cool actions in case of a Heat/Cool control type.)	TC/RTD: 30 (30.0) V/I: 30.0
38	Integral time [heat-side] ★ ♣	I1	CH1 ⋮ CH64	0B5C ⋮ 0B9B	2908 ⋮ 2971	7	R/W	C	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 PID control: 1 to 3600 seconds or 0.1 to 1999.9 seconds Varies with the setting of the Integral/ Derivative time decimal point position.	240
39	Derivative time [heat-side] ★ ♣	D1	CH1 ⋮ CH64	0B9C ⋮ 0BDB	2972 ⋮ 3035	7	R/W	C	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action) Varies with the setting of the Integral/ Derivative time decimal point position.	60

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

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
40	Control response parameter ★ ♣	CA	CH1 ⋮ CH64	0BDC ⋮ 0C1B	3036 ⋮ 3099	1	R/W	C	0: Slow 1: Medium 2: Fast When the P or PD action is selected, this setting becomes invalid.	PID control, Position proportioning PID control: 0 Heat/Cool PID control: 2
41	Proportional band [cool-side] ★ ♣	P2	CH1 ⋮ CH64	0C1C ⋮ 0C5B	3100 ⋮ 3163	7	R/W	C	TC/RTD inputs: 1 (0.1) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position selection. Voltage (V)/current (I) inputs: 0.1 to 1000.0 % of input span If control is other than Heat/Cool PID control, set to RO (Only reading data is possible).	TC/RTD: 30 (30.0) V/I: 30.0
42	Integral time [cool-side] ★ ♣	I2	CH1 ⋮ CH64	0C5C ⋮ 0C9B	3164 ⋮ 3227	7	R/W	C	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PD action) Varies with the setting of the Integral/ Derivative time decimal point position selection. If control is other than Heat/Cool PID control, set to RO (Only reading data is possible).	240
43	Derivative time [cool-side] ★ ♣	D2	CH1 ⋮ CH64	0C9C ⋮ 0CDB	3228 ⋮ 3291	7	R/W	C	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action) Varies with the setting of the Integral/ Derivative time decimal point position selection. If control is other than Heat/Cool PID control, set to RO (Only reading data is possible).	60
44	Overlap/Deadband ★ ♣	V1	CH1 ⋮ CH64	0CDC ⋮ 0D1B	3292 ⋮ 3355	7	R/W	C	TC/RTD inputs: –Input span to +Input span (Unit:°C [°F]) Voltage (V)/current (I) inputs: –100.0 to +100.0 % of input span Minus (–) setting results in overlap. However, the overlapping range is within the proportional range. If control is other than Heat/Cool PID control, set to RO (Only reading data is possible).	0 (0.0)
45	Manual reset ★	MR	CH1 ⋮ CH64	0D1C ⋮ 0D5B	3356 ⋮ 3419	7	R/W	C	–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.	0.0
46	Setting change rate limiter (up) ★	HH	CH1 ⋮ CH64	0D5C ⋮ 0D9B	3420 ⋮ 3483	7	R/W	C	0 (0.0) to Input span/unit time * 0 (0.0): Unused	0 (0.0)
47	Setting change rate limiter (down) ★	HL	CH1 ⋮ CH64	0D9C ⋮ 0DDB	3484 ⋮ 3547	7	R/W	C	* Unit time: 60 seconds (factory set value)	0 (0.0)

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

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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No.	Name	Iden-tifier	Chan-nel	Register address		Digits	Attri-bute	Struc-ture	Data range	Factory set value
				HEX	DEC					
48	Area soak time ★	TM	CH1 ⋮ CH64	0DDC ⋮ 0E1B	3548 ⋮ 3611	7	R/W	C	0 minutes 00 seconds to 199 minutes 59 seconds: RKC communication: 0:00 to 199:59 (min:sec) Modbus: 0 to 11999 seconds 0 hours 00 minutes to 99 hours 59 minutes: RKC communication: 0:00 to 99:59 (hrs:min) Modbus: 0 to 5999 minutes Data range of Area soak time can be selected on the Soak time unit.	RKC communication: 0:00 Modbus: 0
49	Link area number ★	LP	CH1 ⋮ CH64	0E1C ⋮ 0E5B	3612 ⋮ 3675	7	R/W	C	0 to 8 (0: No link)	0
50	Heater break alarm (HBA) set value	A7	CH1 ⋮ CH64	0E5C ⋮ 0E9B	3676 ⋮ 3739	7	R/W	C	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) If there is no current transformer (CT) or CT is assigned to "0: None," set to RO (Only reading data is possible).	0.0
51	Heater break determination point	NE	CH1 ⋮ CH64	0E9C ⋮ 0EDB	3740 ⋮ 3803	7	R/W	C	0.0 to 100.0 % of HBA set value (0.0: Heater break determination is invalid) If there is no current transformer (CT) or CT is assigned to "0: None," set to RO (Only reading data is possible). If Heater break alarm (HBA) corresponds to "0: Type A," set to RO (Only reading data is possible).	30.0
52	Heater melting determination point	NF	CH1 ⋮ CH64	0EDC ⋮ 0F1B	3804 ⋮ 3867	7	R/W	C	0.0 to 100.0 % of HBA set value (0.0: Heater melting determination is invalid) If there is no current transformer (CT) or CT is assigned to "0: None," set to RO (Only reading data is possible). If Heater break alarm (HBA) corresponds to "0: Type A," set to RO (Only reading data is possible).	30.0
53	PV bias	PB	CH1 ⋮ CH64	0F1C ⋮ 0F5B	3868 ⋮ 3931	7	R/W	C	–Input span to +Input span Varies with the setting of the decimal point position.	0 (0.0)
54	PV digital filter	F1	CH1 ⋮ CH64	0F5C ⋮ 0F9B	3932 ⋮ 3995	7	R/W	C	0.0 to 100.0 seconds (0.0: Unused)	0.0
55	PV ratio	PR	CH1 ⋮ CH64	0F9C ⋮ 0FDB	3996 ⋮ 4059	7	R/W	C	0.500 to 1.500	1.000
56	PV low input cut-off	DP	CH1 ⋮ CH64	0FDC ⋮ 101B	4060 ⋮ 4123	7	R/W	C	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
57	RS bias *	RB	CH1 ⋮ CH64	101C ⋮ 105B	4124 ⋮ 4187	7	R/W	C	–Input span to +Input span Varies with the setting of the decimal point position.	0 (0.0)
58	RS digital filter *	F2	CH1 ⋮ CH64	105C ⋮ 109B	4188 ⋮ 4251	7	R/W	C	0.0 to 100.0 seconds (0.0: Unused)	0.0

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

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

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
59	RS ratio *	RR	CH1 ⋮ CH64	109C ⋮ 10DB	4252 ⋮ 4315	7	R/W	C	0.001 to 9.999	1.000
60	Output distribution selection	DV	CH1 ⋮ CH64	10DC ⋮ 111B	4316 ⋮ 4379	1	R/W	C	0: Control output 1: Distribution output	0
61	Output distribution bias	DW	CH1 ⋮ CH64	111C ⋮ 115B	4380 ⋮ 4443	7	R/W	C	–100.0 to +100.0 %	0.0
62	Output distribution ratio	DQ	CH1 ⋮ CH64	115C ⋮ 119B	4444 ⋮ 4507	7	R/W	C	–9.999 to +9.999	1.000
63	Proportional cycle time	T0	CH1 ⋮ CH64	119C ⋮ 11DB	4508 ⋮ 4571	7	R/W	C	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 No.95 “Output assignment.”	Relay contact output: 20.0 Voltage pulse output, triac output and open collector output: 2.0
64	Minimum ON/OFF time of proportioning cycle	VI	CH1 ⋮ CH64	11DC ⋮ 121B	4572 ⋮ 4635	7	R/W	C	0 to 1000 ms This item becomes RO (Only reading data is possible) for the Voltage/Current output specification.	0
65	Manual manipulated output value ♣	ON	CH1 ⋮ CH64	121C ⋮ 125B	4636 ⋮ 4699	7	R/W	C	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 PID control: 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: 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	0.0
66	Area soak time stop function	RV	CH1 ⋮ CH64	125C ⋮ 129B	4700 ⋮ 4763	1	R/W	C	0: No function 1: Event 1 2: Event 2 3: Event 3 4: Event 4	0
67	EDS mode (for disturbance 1)	NG	CH1 ⋮ CH64	129C ⋮ 12DB	4764 ⋮ 4827	1	R/W	C	0: No function 1: EDS function mode 2: Learning mode 3: Tuning mode EDS function: External disturbance suppression function	0
68	EDS mode (for disturbance 2)	NX	CH1 ⋮ CH64	12DC ⋮ 131B	4828 ⋮ 4891	1	R/W	C		0

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

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
69	EDS value 1 (for disturbance 1)	NI	CH1 ⋮ CH64	131C ⋮ 135B	4892 ⋮ 4955	7	R/W	C	−100.0 to +100.0 %	0.0
70	EDS value 1 (for disturbance 2)	NJ	CH1 ⋮ CH64	135C ⋮ 139B	4956 ⋮ 5019	7	R/W	C		0.0
71	EDS value 2 (for disturbance 1)	NK	CH1 ⋮ CH64	139C ⋮ 13DB	5020 ⋮ 5083	7	R/W	C	−100.0 to +100.0 %	0.0
72	EDS value 2 (for disturbance 2)	NM	CH1 ⋮ CH64	13DC ⋮ 141B	5084 ⋮ 5147	7	R/W	C		0.0
73	EDS transfer time (for disturbance 1)	NN	CH1 ⋮ CH64	141C ⋮ 145B	5148 ⋮ 5211	7	R/W	C	0 to 3600 seconds or 0.0 to 1999.9 seconds	0
74	EDS transfer time (for disturbance 2)	NO	CH1 ⋮ CH64	145C ⋮ 149B	5212 ⋮ 5275	7	R/W	C		0
75	EDS action time (for disturbance 1)	NQ	CH1 ⋮ CH64	149C ⋮ 14DB	5276 ⋮ 5339	7	R/W	C	1 to 3600 seconds	600
76	EDS action time (for disturbance 2)	NL	CH1 ⋮ CH64	14DC ⋮ 151B	5340 ⋮ 5403	7	R/W	C		600
77	EDS action wait time (for disturbance 1)	NR	CH1 ⋮ CH64	151C ⋮ 155B	5404 ⋮ 5467	7	R/W	C	0.0 to 600.0 seconds	0.0
78	EDS action wait time (for disturbance 2)	NY	CH1 ⋮ CH64	155C ⋮ 159B	5468 ⋮ 5531	7	R/W	C		0.0
79	EDS value learning times	NT	CH1 ⋮ CH64	159C ⋮ 15DB	5532 ⋮ 5595	7	R/W	C	0 to 10 times (0: No learning mode)	1
80	EDS start signal	NU	CH1 ⋮ CH64	15DC ⋮ 161B	5596 ⋮ 5659	1	R/W	C	0: EDS start signal OFF 1: EDS start signal ON (for disturbance 1) 2: EDS start signal ON (for disturbance 2)	0
81	Operation mode	EI	CH1 ⋮ CH64	161C ⋮ 165B	5660 ⋮ 5723	1	R/W	C	0: Unused 1: Monitor 2: Monitor + Event function 3: Control	3
82	Startup tuning (ST)	ST	CH1 ⋮ CH64	165C ⋮ 169B	5724 ⋮ 5787	1	R/W	C	0: ST unused 1: Execute once * 2: Execute always * When the Startup tuning (ST) 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 PID control, set to RO (Only reading data is possible).	0
83	Automatic temperature rise learning	Y8	CH1 ⋮ CH64	169C ⋮ 16DB	5788 ⋮ 5851	1	R/W	C	0: Unused 1: Learning * * When the automatic temperature rise learning is finished, the setting will automatically returns to "0: Unused."	0

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
84	Communication switch for logic	EF	CH1 ⋮ CH16	16DC ⋮ 16EB	5852 ⋮ 5867	7	R/W	M	• RKC communication Least significant digit: Communication switch 1 2nd digit: Communication switch 2 3rd digit: Communication switch 3 4th digit: Communication switch 4 5th digit to Most significant digit: Unused Data 0: OFF 1: ON • Modbus Bit data Bit 0: Communication switch 1 Bit 1: Communication switch 2 Bit 2: Communication switch 3 Bit 3: Communication switch 4 Bit 4 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15]	0
85	Unused	—	—	16EC ⋮ 196B	5868 ⋮ 6507	—	—	—	—	—
Set data No. 86 or later are for engineering setting [Writable in the STOP mode]										
86	Input type	XI	CH1 ⋮ CH64	196C ⋮ 19AB	6508 ⋮ 6571	7	R/W	C	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PLII 12: RTD input Pt100 13: RTD input JPt100 14: Current input 0 to 20 mA DC 15: Current input 4 to 20 mA DC 16: Voltage (high) input 0 to 10 V DC 17: Voltage (high) input 0 to 5 V DC 18: Voltage (high) input 1 to 5 V DC 19: Voltage (low) input 0 to 1 V DC 20: Voltage (low) input 0 to 100 mV DC 21: Voltage (low) input 0 to 10 mV DC 22: Feedback resistance input 100 to 150 Ω 23: Feedback resistance input 151 Ω to 6 kΩ If changed to Voltage (high) input from TC/RTD/Current/Voltage (low)/ Feedback resistance input, select the hardware by the input selector switch at the side of the module. Refer to **SRZ Instruction Manual (IMS01T04-E□)**.	Based on model code When not specifying: 0
87	Display unit	PU	CH1 ⋮ CH64	19AC ⋮ 19EB	6572 ⋮ 6635	7	R/W	C	0: °C 1: °F Use to select the temperature unit for thermocouple (TC) and RTD inputs.	Based on model code When not specifying: 0

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
88	Decimal point position	XU	CH1 ⋮ CH64	19EC ⋮ 1A2B	6636 ⋮ 6699	7	R/W	C	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC input: • K, J, T, E: Only 0 or 1 can be set. • R, S, B, N, PLII, W5Re/W26Re: Only 0 can be set. RTD input: Only 0 or 1 can be set. Voltage (V)/Current (I) inputs: From 0 to 4 can be set.	Based on model code When not specifying: TC/RTD: 1 V/I: 1
89	Input scale high	XV	CH1 ⋮ CH64	1A2C ⋮ 1A6B	6700 ⋮ 6763	7	R/W	C	TC/RTD inputs: Input scale low to Maximum value of the selected input range Voltage (V)/Current (I) inputs: −19999 to +19999 (However, a span is 20000 or less.) Varies with the setting of the decimal point position.	TC/RTD: Maximum value of the selected input range V/I: 100.0
90	Input scale low	XW	CH1 ⋮ CH64	1A6C ⋮ 1AAB	6764 ⋮ 6827	7	R/W	C	TC/RTD inputs: Minimum value of the selected input range to Input scale high Voltage (V)/Current (I) inputs: −19999 to +19999 (However, a span is 20000 or less.) Varies with the setting of the decimal point position.	TC/RTD: Minimum value of the selected input range V/I: 0.0
91	Input error determination point (high)	AV	CH1 ⋮ CH64	1AAC ⋮ 1AEB	6828 ⋮ 6891	7	R/W	C	Input error determination point (low limit) to (Input range high + 5 % of Input span) Varies with the setting of the decimal point position.	Input range high + (5 % of Input span)
92	Input error determination point (low)	AW	CH1 ⋮ CH64	1AEC ⋮ 1B2B	6892 ⋮ 6955	7	R/W	C	(Input range low − 5 % of Input span) to Input error determination point (high limit) Varies with the setting of the decimal point position.	Input range low − (5 % of Input span)
93	Burnout direction	BS	CH1 ⋮ CH64	1B2C ⋮ 1B6B	6956 ⋮ 7019	1	R/W	C	0: Upscale 1: Downscale Valid only when the TC input and voltage (low) input are selected.	0
94	Square root extraction	XH	CH1 ⋮ CH64	1B6C ⋮ 1BAB	7020 ⋮ 7083	1	R/W	C	0: Unused 1: Used	0
95	Output assignment (Logic output selection function)	E0	CH1 ⋮ CH64	1BAC ⋮ 1BEB	7084 ⋮ 7147	1	R/W	C	0: Control output 1: Logic output result 2: FAIL output	0
96	Energized/ De-energized (Logic output selection function)	NA	CH1 ⋮ CH64	1BEC ⋮ 1C2B	7148 ⋮ 7211	1	R/W	C	0: Energized 1: De-energized	0

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
97	Event 1 type	XA	CH1 ⋮ CH64	1C2C ⋮ 1C6B	7212 ⋮ 7275	7	R/W	C	0: None 1: Deviation high (Using SV monitor value) [1] 2: Deviation low (Using SV monitor value) [1] 3: Deviation high/low (Using SV monitor value) [1] 4: Band (Using SV monitor value) [1] 5: Process high [1] 6: Process low [1] 7: SV high 8: SV low 9: Unused 10: MV high [heat-side] [1, 2] 11: MV low [heat-side] [1, 2] 12: MV high [cool-side] [1] 13: MV low [cool-side] [1] 14: Deviation high (Using local SV value) [1] 15: Deviation low (Using local SV value) [1] 16: Deviation high/low (Using local SV value) [1] 17: Band (Using local SV value) [1] 18: Deviation between channels high [1] 19: Deviation between channels low [1] 20: Deviation between channels high/low [1] 21: Deviation between channels band [1] [1] Event hold action is available. [2] If there is feedback resistance (FBR) input in Position proportioning PID control, set to the feedback resistance (FBR) input value.	Based on model code When not specifying: 0
98	Event 1 channel setting	FA	CH1 ⋮ CH64	1C6C ⋮ 1CAB	7276 ⋮ 7339	1	R/W	C	1: Channel 1 3: Channel 3 2: Channel 2 4: Channel 4 This function is valid when “deviation between channels” is selected.	1
99	Event 1 hold action	WA	CH1 ⋮ CH64	1CAC ⋮ 1CEB	7340 ⋮ 7403	1	R/W	C	0: OFF 1: Hold action ON (when power turned on; when transferred from STOP to RUN) 2: Re-hold action ON (when power turned on; when transferred from STOP to RUN; SV changed) This function is valid when input value, deviation or manipulated value action has been selected. In case of a deviation action, this function is not available while in remote mode and while setting changing rate limiter is working.	Based on model code When not specifying: 0
100	Event 1 interlock	LF	CH1 ⋮ CH64	1CEC ⋮ 1D2B	7404 ⋮ 7467	1	R/W	C	0: Unused 1: Used	0
101	Event 1 differential gap	HA	CH1 ⋮ CH64	1D2C ⋮ 1D6B	7468 ⋮ 7531	7	R/W	C	① Deviation, process, set value, or Deviation action between channels: 0 (0.0) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position. ② MV: 0.0 to 110.0 %	①: 1 ②: 1.0
102	Event 1 delay timer	TD	CH1 ⋮ CH64	1D6C ⋮ 1DAB	7532 ⋮ 7595	7	R/W	C	0 to 18000 seconds	0

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
103	Force ON of Event 1 action	OA	CH1 ⋮ CH64	1DAC ⋮ 1DEB	7596 ⋮ 7659	7	R/W	C	• RKC communication Least significant digit: Event output turned on at input error occurrence 2nd digit: Event output turned on in manual mode 3rd digit: Event output turned on during the Autotuning (AT) function is being executed 4th digit: Event output turned on during the setting change rate limiter is being operated 5th digit to Most significant digit: Unused Data 0: Invalid 1: Valid • Modbus Bit data Bit 0: Event output turned on at input error occurrence Bit 1: Event output turned on in manual mode Bit 2: Event output turned on during the Autotuning (AT) function is being executed Bit 3: Event output turned on during the setting change rate limiter is being operated Bit 4 to Bit 15: Unused Data 0: Invalid 1: Valid [Decimal number: 0 to 15]	0
104	Event 2 type	XB	CH1 ⋮ CH64	1DEC ⋮ 1E2B	7660 ⋮ 7723	7	R/W	C	0: None 1: Deviation high (Using SV monitor value) [1] 2: Deviation low (Using SV monitor value) [1] 3: Deviation high/low (Using SV monitor value) [1] 4: Band (Using SV monitor value) [1] 5: Process high [1] 6: Process low [1] 7: SV high 8: SV low 9: Unused 10: MV high [heat-side] [1, 2] 11: MV low [heat-side] [1, 2] 12: MV high [cool-side] [1] 13: MV low [cool-side] [1] 14: Deviation high (Using local SV value) [1] 15: Deviation low (Using local SV value) [1] 16: Deviation high/low (Using local SV value) [1] 17: Band (Using local SV value) [1] 18: Deviation between channels high [1] 19: Deviation between channels low [1] 20: Deviation between channels high/low [1] 21: Deviation between channels band [1] [1] Event hold action is available. [2] If there is feedback resistance (FBR) input in Position proportioning PID control, set to the feedback resistance (FBR) input value.	Based on model code When not specifying: 0

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No.	Name	Iden-tifier	Chan-nel	Register address		Digits	Attri-bute	Struc-ture	Data range	Factory set value
				HEX	DEC					
105	Event 2 channel setting	FB	CH1 ⋮ CH64	1E2C ⋮ 1E6B	7724 ⋮ 7787	1	R/W	C	1: Channel 1 2: Channel 2 3: Channel 3 4: Channel 4 This function is valid when "deviation between channels" is selected.	1
106	Event 2 hold action	WB	CH1 ⋮ CH64	1E6C ⋮ 1EAB	7788 ⋮ 7851	1	R/W	C	0: OFF 1: Hold action ON (when power turned on; when transferred from STOP to RUN) 2: Re-hold action ON (when power turned on; when transferred from STOP to RUN; SV changed) This function is valid when input value, deviation or manipulated value action has been selected. In case of a deviation action, this function is not available while in remote mode and while setting changing rate limiter is working.	Based on model code When not specifying: 0
107	Event 2 interlock	LG	CH1 ⋮ CH64	1EAC ⋮ 1EEB	7852 ⋮ 7915	1	R/W	C	0: Unused 1: Used	0
108	Event 2 differential gap	HB	CH1 ⋮ CH64	1EEC ⋮ 1F2B	7916 ⋮ 7979	7	R/W	C	① Deviation, process, set value, or Deviation action between channels: 0 (0.0) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position. ② MV: 0.0 to 110.0 %	①: 1 ②: 1.0
109	Event 2 delay timer	TG	CH1 ⋮ CH64	1F2C ⋮ 1F6B	7980 ⋮ 8043	7	R/W	C	0 to 18000 seconds	0
110	Force ON of Event 2 action	OB	CH1 ⋮ CH64	1F6C ⋮ 1FAB	8044 ⋮ 8107	7	R/W	C	• RKC communication Least significant digit: Event output turned on at input error occurrence 2nd digit: Event output turned on in manual mode 3rd digit: Event output turned on during the Autotuning (AT) function is being executed 4th digit: Event output turned on during the setting change rate limiter is being operated 5th digit to Most significant digit: Unused Data 0: Invalid 1: Valid • Modbus Bit data Bit 0: Event output turned on at input error occurrence Bit 1: Event output turned on in manual mode Bit 2: Event output turned on during the Autotuning (AT) function is being executed Bit 3: Event output turned on during the setting change rate limiter is being operated Bit 4 to Bit 15: Unused Data 0: Invalid 1: Valid [Decimal number: 0 to 15]	0

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
111	Event 3 type	XC	CH1 ⋮ CH64	1FAC ⋮ 1FEB	8108 ⋮ 8171	7	R/W	C	0: None 1: Deviation high (Using SV monitor value) [1] 2: Deviation low (Using SV monitor value) [1] 3: Deviation high/low (Using SV monitor value) [1] 4: Band (Using SV monitor value) [1] 5: Process high [1] 6: Process low [1] 7: SV high 8: SV low 9: Unused 10: MV high [heat-side] [1, 2] 11: MV low [heat-side] [1, 2] 12: MV high [cool-side] [1] 13: MV low [cool-side] [1] 14: Deviation high (Using local SV value) [1] 15: Deviation low (Using local SV value) [1] 16: Deviation high/low (Using local SV value) [1] 17: Band (Using local SV value) [1] 18: Deviation between channels high [1] 19: Deviation between channels low [1] 20: Deviation between channels high/low [1] 21: Deviation between channels band [1] [1] Event hold action is available. [2] If there is feedback resistance (FBR) input in Position proportioning PID control, set to the feedback resistance (FBR) input value.	Based on model code When not specifying: 0
112	Event 3 channel setting	FC	CH1 ⋮ CH64	1FEC ⋮ 202B	8172 ⋮ 8235	1	R/W	C	1: Channel 1 2: Channel 2 3: Channel 3 4: Channel 4 This function is valid when “deviation between channels” is selected.	1
113	Event 3 hold action	WC	CH1 ⋮ CH64	202C ⋮ 206B	8236 ⋮ 8299	1	R/W	C	0: OFF 1: Hold action ON (when power turned on; when transferred from STOP to RUN) 2: Re-hold action ON (when power turned on; when transferred from STOP to RUN; SV changed) This function is valid when input value, deviation or manipulated value action has been selected. In case of a deviation action, this function is not available while in remote mode and while setting changing rate limiter is working.	Based on model code When not specifying: 0
114	Event 3 interlock	LH	CH1 ⋮ CH64	206C ⋮ 20AB	8300 ⋮ 8363	1	R/W	C	0: Unused 1: Used	0
115	Event 3 differential gap	HC	CH1 ⋮ CH64	20AC ⋮ 20EB	8364 ⋮ 8427	7	R/W	C	① Deviation, process, set value, or Deviation action between channels: 0 (0.0) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position. ② MV: 0.0 to 110.0 %	①: 1 ②: 1.0
116	Event 3 delay timer	TE	CH1 ⋮ CH64	20EC ⋮ 212B	8428 ⋮ 8491	7	R/W	C	0 to 18000 seconds If Event 3 corresponds to “9: Temperature rise completion,” the Event 3 delay timer becomes the temperature rise completion soak time.	0

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
117	Force ON of Event 3 action	OC	CH1 ⋮ CH64	212C ⋮ 216B	8492 ⋮ 8555	7	R/W	C	• RKC communication Least significant digit: Event output turned on at input error occurrence 2nd digit: Event output turned on in manual mode 3rd digit: Event output turned on during the Autotuning (AT) function is being executed 4th digit: Event output turned on during the setting change rate limiter is being operated 5th digit to Most significant digit: Unused Data 0: Invalid 1: Valid • Modbus Bit data Bit 0: Event output turned on at input error occurrence Bit 1: Event output turned on in manual mode Bit 2: Event output turned on during the Autotuning (AT) function is being executed Bit 3: Event output turned on during the setting change rate limiter is being operated Bit 4 to Bit 15: Unused Data 0: Invalid 1: Valid [Decimal number: 0 to 15]	0
118	Event 4 type	XD	CH1 ⋮ CH64	216C ⋮ 21AB	8556 ⋮ 8619	7	R/W	C	0: None 1: Deviation high (Using SV monitor value) [1] 2: Deviation low (Using SV monitor value) [1] 3: Deviation high/low (Using SV monitor value) [1] 4: Band (Using SV monitor value) [1] 5: Process high [1] 6: Process low [1] 7: SV high 8: SV low 9: Control loop break alarm (LBA) 10: MV high [heat-side] [1, 2] 11: MV low [heat-side] [1, 2] 12: MV high [cool-side] [1] 13: MV low [cool-side] [1] 14: Deviation high (Using local SV value) [1] 15: Deviation low (Using local SV value) [1] 16: Deviation high/low (Using local SV value) [1] 17: Band (Using local SV value) [1] 18: Deviation between channels high [1] 19: Deviation between channels low [1] 20: Deviation between channels high/low [1] 21: Deviation between channels band [1] [1] Event hold action is available. [2] If there is feedback resistance (FBR) input in Position proportioning PID control, set to the feedback resistance (FBR) input value.	Based on model code When not specifying: 0

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
119	Event 4 channel setting	FD	CH1 ⋮ CH64	21AC ⋮ 21EB	8620 ⋮ 8683	1	R/W	C	1: Channel 1 2: Channel 2 3: Channel 3 4: Channel 4 This function is valid when "deviation between channels" is selected.	1
120	Event 4 hold action	WD	CH1 ⋮ CH64	21EC ⋮ 222B	8684 ⋮ 8747	1	R/W	C	0: OFF 1: Hold action ON (when power turned on; when transferred from STOP to RUN) 2: Re-hold action ON (when power turned on; when transferred from STOP to RUN; SV changed) This function is valid when input value, deviation or manipulated value action has been selected. In case of a deviation action, this function is not available while in remote mode and while setting changing rate limiter is working.	Based on model code When not specifying: 0
121	Event 4 interlock	LI	CH1 ⋮ CH64	222C ⋮ 226B	8748 ⋮ 8811	1	R/W	C	0: Unused 1: Used	0
122	Event 4 differential gap	HD	CH1 ⋮ CH64	226C ⋮ 22AB	8812 ⋮ 8875	7	R/W	C	① Deviation, process, set value, or Deviation action between channels: 0 (0.0) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position. ② MV: 0.0 to 110.0 % Becomes invalid when the Event 4 type corresponds to "9: Control loop break alarm (LBA)."	①: 1 ②: 1.0
123	Event 4 delay timer	TF	CH1 ⋮ CH64	22AC ⋮ 22EB	8876 ⋮ 8939	7	R/W	C	0 to 18000 seconds	0
124	Force ON of Event 4 action	OD	CH1 ⋮ CH64	22EC ⋮ 232B	8940 ⋮ 9003	7	R/W	C	• RKC communication Least significant digit: Event output turned on at input error occurrence 2nd digit: Event output turned on in manual mode 3rd digit: Event output turned on during the Autotuning (AT) function is being executed 4th digit: Event output turned on during the setting change rate limiter is being operated 5th digit to Most significant digit: Unused Data 0: Invalid 1: Valid • Modbus Bit data Bit 0: Event output turned on at input error occurrence Bit 1: Event output turned on in manual mode Bit 2: Event output turned on during the Autotuning (AT) function is being executed Bit 3: Event output turned on during the setting change rate limiter is being operated Bit 4 to Bit 15: Unused Data 0: Invalid 1: Valid [Decimal number: 0 to 15]	0

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
125	CT ratio	XS	CH1 ⋮ CH64	232C ⋮ 236B	9004 ⋮ 9067	7	R/W	C	0 to 9999	CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000
126	CT assignment	ZF	CH1 ⋮ CH64	236C ⋮ 23AB	9068 ⋮ 9131	1	R/W	C	0: None 1: OUT1 2: OUT2 3: OUT3 4: OUT4	CH1: 1, CH2: 2 CH3: 3, CH4: 4 (for each Z-TIO module)
127	Heater break alarm (HBA) type	ND	CH1 ⋮ CH64	23AC ⋮ 23EB	9132 ⋮ 9195	1	R/W	C	0: Heater break alarm (HBA) type A (Time-proportional control output) 1: Heater break alarm (HBA) type B (Continuous control output and time-proportional control output)	Set value is based on the Output type specified at ordering.
128	Number of heater break alarm (HBA) delay times	DH	CH1 ⋮ CH64	23EC ⋮ 242B	9196 ⋮ 9259	7	R/W	C	0 to 255 times	5
129	Hot/Cold start	XN	CH1 ⋮ CH64	242C ⋮ 246B	9260 ⋮ 9323	1	R/W	C	0: Hot start 1 1: Hot start 2 2: Cold start	0
130	Start determination point	SX	CH1 ⋮ CH64	246C ⋮ 24AB	9324 ⋮ 9387	7	R/W	C	0 (0.0) to Input span (The unit is the same as input value.) 0 (0.0): Action depending on the Hot/Cold start selection Varies with the setting of the decimal point position.	Based on specification
131	SV tracking	XL	CH1 ⋮ CH64	24AC ⋮ 24EB	9388 ⋮ 9451	1	R/W	C	0: Unused 1: Used	1
132	MV transfer function [Action taken when changed to Manual mode from Auto mode]	OT	CH1 ⋮ CH64	24EC ⋮ 252B	9452 ⋮ 9515	1	R/W	C	0: MV in Auto mode is used. [Balanceless-bumpless function] 1: MV in previous Manual mode is used.	0
133	Control action	XE	CH1 ⋮ CH64	252C ⋮ 256B	9516 ⋮ 9579	1	R/W	C	0: Brilliant II PID control (Direct action) 1: Brilliant II PID control (Reverse action) 2: Brilliant II Heat/Cool PID control [Water cooling type] 3: Brilliant II Heat/Cool PID control [Air cooling type] 4: Brilliant II Heat/Cool PID control [Cooling gain linear type] 5: Brilliant II position proportioning PID control Odd channel: From 0 to 5 can be set. Even channel: Only 0 or 1 can be set. * * In Heat/Cool PID control and Position proportioning PID control, control action is not performed. Only PV monitor and event action is performed.	Based on model code When not specifying: 1
134	Integral/Derivative time decimal point position ♣	PK	CH1 ⋮ CH64	256C ⋮ 25AB	9580 ⋮ 9643	1	R/W	C	0: 1 second setting (No decimal place) 1: 0.1 seconds setting (One decimal place)	0
135	Derivative action ♣	KA	CH1 ⋮ CH64	25AC ⋮ 25EB	9644 ⋮ 9707	1	R/W	C	0: Measured value derivative 1: Deviation derivative	0

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
136	Undershoot suppression factor ♣	KB	CH1 ⋮ CH64	25EC ⋮ 262B	9708 ⋮ 9771	7	R/W	C	0.000 to 1.000	Water cooling: 0.100 Air cooling: 0.250 Cooling gain linear type: 1.000
137	Derivative gain ♣	DG	CH1 ⋮ CH64	262C ⋮ 266B	9772 ⋮ 9835	7	R/W	C	0.1 to 10.0	6.0
138	ON/OFF action differential gap (upper)	IV	CH1 ⋮ CH64	266C ⋮ 26AB	9836 ⋮ 9899	7	R/W	C	TC/RTD inputs: 0 (0.0) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of input span	TC/RTD: 1 V/I: 0.1
139	ON/OFF action differential gap (lower)	IW	CH1 ⋮ CH64	26AC ⋮ 26EB	9900 ⋮ 9963	7	R/W	C		TC/RTD: 1 V/I: 0.1
140	Action (high) at input error	WH	CH1 ⋮ CH64	26EC ⋮ 272B	9964 ⋮ 10027	1	R/W	C	0: Normal control 1: Manipulated output value at Input error	0
141	Action (low) at input error	WL	CH1 ⋮ CH64	272C ⋮ 276B	10028 ⋮ 10091	1	R/W	C		0
142	Manipulated output value at input error	OE	CH1 ⋮ CH64	276C ⋮ 27AB	10092 ⋮ 10155	7	R/W	C	−105.0 to +105.0 % Actual output values become those restricted by the output limiter. Position proportioning PID control: If there is no feedback resistance (FBR) input or the feedback resistance (FBR) input is disconnected, an action taken when abnormal is in accordance with the value action setting during STOP.	0.0
143	Manipulated output value at STOP mode [heat-side] ♣	OF	CH1 ⋮ CH64	27AC ⋮ 27EB	10156 ⋮ 10219	7	R/W	C	−5.0 to +105.0 % Position proportioning PID control: Only when there is feedback resistance (FBR) input and it does not break, the manipulated output value [heat-side] at STOP is output.	−5.0
144	Manipulated output value at STOP mode [cool-side] ♣	OG	CH1 ⋮ CH64	27EC ⋮ 282B	10220 ⋮ 10283	7	R/W	C		−5.0
145	Output change rate limiter (up) [heat-side] ♣	PH	CH1 ⋮ CH64	282C ⋮ 286B	10284 ⋮ 10347	7	R/W	C	0.0 to 100.0 %/seconds (0.0: OFF) Becomes invalid when in Position proportioning PID control.	0.0
146	Output change rate limiter (down) [heat-side] ♣	PL	CH1 ⋮ CH64	286C ⋮ 28AB	10348 ⋮ 10411	7	R/W	C		0.0
147	Output limiter (high) [heat-side] ♣	OH	CH1 ⋮ CH64	28AC ⋮ 28EB	10412 ⋮ 10475	7	R/W	C	Output limiter (low) to 105.0 % Position proportioning PID control: Becomes valid only when there is feedback resistance (FBR) input and it does not break.	105.0
148	Output limiter (low) [heat-side] ♣	OL	CH1 ⋮ CH64	28EC ⋮ 292B	10476 ⋮ 10539	7	R/W	C	−5.0 % to Output limiter (high) Position proportioning PID control: Becomes valid only when there is feedback resistance (FBR) input and it does not break.	−5.0

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
149	Output change rate limiter (up) [cool-side] ♣	PX	CH1 ⋮ CH64	292C ⋮ 296B	10540 ⋮ 10603	7	R/W	C	0.0 to 100.0 % of manipulated output/seconds (0.0: OFF) Becomes invalid when in Position proportioning PID control.	0.0
150	Output change rate limiter (down) [cool-side] ♣	PY	CH1 ⋮ CH64	296C ⋮ 29AB	10604 ⋮ 10667	7	R/W	C		0.0
151	Output limiter (high) [cool-side] ♣	OX	CH1 ⋮ CH64	29AC ⋮ 29EB	10668 ⋮ 10731	7	R/W	C	Output limiter low [cool-side] to 105.0 %	105.0
152	Output limiter (low) [cool-side] ♣	OY	CH1 ⋮ CH64	29EC ⋮ 2A2B	10732 ⋮ 10795	7	R/W	C	−5.0 % to Output limiter high [cool-side]	−5.0
153	AT bias ♣	GB	CH1 ⋮ CH64	2A2C ⋮ 2A6B	10796 ⋮ 10859	7	R/W	C	−Input span to +Input span Varies with the setting of the decimal point position.	0 (0.0)
154	AT cycles ♣	G3	CH1 ⋮ CH64	2A6C ⋮ 2AAB	10860 ⋮ 10923	1	R/W	C	0: 1.5 cycles 1: 2.0 cycles 2: 2.5 cycles 3: 3.0 cycles	1
155	Output value with AT turned on ♣	OP	CH1 ⋮ CH64	2AAC ⋮ 2AEB	10924 ⋮ 10987	7	R/W	C	Output value with AT turned off to +105.0 % Actual output values become those restricted by the output limiter. Position proportioning PID control: Becomes valid only when there is feedback resistance (FBR) input and it does not break (high limit of feedback resistance input at AT).	105.0
156	Output value with AT turned off ♣	OQ	CH1 ⋮ CH64	2AEC ⋮ 2B2B	10988 ⋮ 11051	7	R/W	C	−105.0 % to Output value with AT turned on Actual output values become those restricted by the output limiter. Position proportioning PID control: Becomes valid only when there is feedback resistance (FBR) input and it does not break (low limit of feedback resistance input at AT).	−105.0
157	AT differential gap time ♣	GH	CH1 ⋮ CH64	2B2C ⋮ 2B6B	11052 ⋮ 11115	7	R/W	C	0.0 to 50.0 seconds	10.0
158	Proportional band adjusting factor [heat-side] ♣	KC	CH1 ⋮ CH64	2B6C ⋮ 2BAB	11116 ⋮ 11179	7	R/W	C	0.01 to 10.00 times	1.00
159	Integral time adjusting factor [heat-side] ♣	KD	CH1 ⋮ CH64	2BAC ⋮ 2BEB	11180 ⋮ 11243	7	R/W	C	0.01 to 10.00 times	1.00
160	Derivative time adjusting factor [heat-side] ♣	KE	CH1 ⋮ CH64	2BEC ⋮ 2C2B	11244 ⋮ 11307	7	R/W	C	0.01 to 10.00 times	1.00
161	Proportional band adjusting factor [cool-side] ♣	KF	CH1 ⋮ CH64	2C2C ⋮ 2C6B	11308 ⋮ 11371	7	R/W	C	0.01 to 10.00 times	1.00

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
162	Integral time adjusting factor [cool-side] ♣	KG	CH1 ⋮ CH64	2C6C ⋮ 2CAB	11372 ⋮ 11435	7	R/W	C	0.01 to 10.00 times	1.00
163	Derivative time adjusting factor [cool-side] ♣	KH	CH1 ⋮ CH64	2CAC ⋮ 2CEB	11436 ⋮ 11499	7	R/W	C	0.01 to 10.00 times	1.00
164	Proportional band limiter (high) [heat-side] ♣	P6	CH1 ⋮ CH64	2CEC ⋮ 2D2B	11500 ⋮ 11563	7	R/W	C	TC/RTD inputs: 0 (0.0) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position selection. Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of input span 0 (0.0): ON/OFF action (ON/OFF action for both heat and cool actions in case of a Heat/Cool PID control type.)	TC/RTD: Input span V/I: 1000.0
165	Proportional band limiter (low) [heat-side] ♣	P7	CH1 ⋮ CH64	2D2C ⋮ 2D6B	11564 ⋮ 11627	7	R/W	C		TC/RTD: 0 (0.0) V/I: 0.0
166	Integral time limiter (high) [heat-side] ♣	I6	CH1 ⋮ CH64	2D6C ⋮ 2DAB	11628 ⋮ 11691	7	R/W	C	PID control or Heat/Cool PID control: 0 to 3600 seconds or 0.0 to 1999.9 seconds Position proportioning PID control: 1 to 3600 seconds or 0.1 to 1999.9 seconds Varies with the setting of the Integral/Derivative time decimal point position selection.	3600
167	Integral time limiter (low) [heat-side] ♣	I7	CH1 ⋮ CH64	2DAC ⋮ 2DEB	11692 ⋮ 11755	7	R/W	C		PID control, Heat/Cool PID control: 0 Position proportioning PID control: 1
168	Derivative time limiter (high) [heat-side] ♣	D6	CH1 ⋮ CH64	2DEC ⋮ 2E2B	11756 ⋮ 11819	7	R/W	C	0 to 3600 seconds or 0.0 to 1999.9 seconds Varies with the setting of the Integral/Derivative time decimal point position selection.	3600
169	Derivative time limiter (low) [heat-side] ♣	D7	CH1 ⋮ CH64	2E2C ⋮ 2E6B	11820 ⋮ 11883	7	R/W	C		0
170	Proportional band limiter (high) [cool-side] ♣	P8	CH1 ⋮ CH64	2E6C ⋮ 2EAB	11884 ⋮ 11947	7	R/W	C	TC/RTD inputs: 1(1.0) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position selection. Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of input span	TC/RTD: Input span V/I: 1000.0
171	Proportional band limiter (low) [cool-side] ♣	P9	CH1 ⋮ CH64	2EAC ⋮ 2EEB	11948 ⋮ 12011	7	R/W	C		TC/RTD: 1 (0.1) V/I: 0.1
172	Integral time limiter (high) [cool-side] ♣	I8	CH1 ⋮ CH64	2EEC ⋮ 2F2B	12012 ⋮ 12075	7	R/W	C	0 to 3600 seconds or 0.0 to 1999.9 seconds Varies with the setting of the Integral/Derivative time decimal point position selection. If control is other than Heat/Cool PID control, set to RO (Only reading data is possible).	3600
173	Integral time limiter (low) [cool-side] ♣	I9	CH1 ⋮ CH64	2F2C ⋮ 2F6B	12076 ⋮ 12139	7	R/W	C		0
174	Derivative time limiter (high) [cool-side] ♣	D8	CH1 ⋮ CH64	2F6C ⋮ 2FAB	12140 ⋮ 12203	7	R/W	C	0 to 3600 seconds or 0.0 to 1999.9 seconds Varies with the setting of the Integral/Derivative time decimal point position selection. If control is other than Heat/Cool PID control, set to RO (Only reading data is possible).	3600
175	Derivative time limiter (low) [cool-side] ♣	D9	CH1 ⋮ CH64	2FAC ⋮ 2FEB	12204 ⋮ 12267	7	R/W	C		0

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
176	Open/Close output neutral zone ♣	V2	CH1 ⋮ CH64	2FEC ⋮ 301C	12268 ⋮ 12331	7	R/W	C	0.1 to 10.0 % of output	2.0
177	Action at feedback resistance (FBR) input error ♣	SY	CH1 ⋮ CH64	302C ⋮ 306B	12332 ⋮ 12395	1	R/W	C	0: Action depending on the valve action at STOP 1: Control action continued	0
178	Feedback adjustment ♣	FV	CH1 ⋮ CH64	306C ⋮ 30AB	12396 ⋮ 12459	1	R/W	C	0: Adjustment end 1: Open-side adjustment start 2: Close-side adjustment start	—
179	Control motor time ♣	TN	CH1 ⋮ CH64	30AC ⋮ 30EB	12460 ⋮ 12523	7	R/W	C	5 to 1000 seconds	10
180	Integrated output limiter ♣	OI	CH1 ⋮ CH64	30EC ⋮ 312B	12524 ⋮ 12587	7	R/W	C	0.0 to 200.0 % of control motor time (0.0: OFF) Becomes invalid when there is feedback resistance (FBR) input.	150.0
181	Valve action at STOP ♣	VS	CH1 ⋮ CH64	312C ⋮ 316B	12588 ⋮ 12651	1	R/W	C	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 Becomes valid when there is no feedback resistance (FBR) input or the feedback resistance (FBR) input is disconnected.	0
182	ST proportional band adjusting factor ♣	KI	CH1 ⋮ CH64	316C ⋮ 31AB	12652 ⋮ 12715	7	R/W	C	0.01 to 10.00 times	1.00
183	ST integral time adjusting factor ♣	KJ	CH1 ⋮ CH64	31AC ⋮ 31EB	12716 ⋮ 12779	7	R/W	C	0.01 to 10.00 times	1.00
184	ST derivative time adjusting factor ♣	KK	CH1 ⋮ CH64	31EC ⋮ 322B	12780 ⋮ 12843	7	R/W	C	0.01 to 10.00 times	1.00
185	ST start condition ♣	SU	CH1 ⋮ CH64	322C ⋮ 326B	12844 ⋮ 12907	1	R/W	C	0: Activate the Startup tuning (ST) function when the power is turned on; when transferred from STOP to RUN; or when the Set value (SV) is changed. 1: Activate the Startup tuning (ST) function when the power is turned on; or when transferred from STOP to RUN. 2: Activate the Startup tuning (ST) function when theSet value (SV) is changed.	0
186	Automatic temperature rise group ♣	Y7	CH1 ⋮ CH64	326C ⋮ 32AB	12908 ⋮ 12971	7	R/W	C	0 to 16 (0: Automatic temperature rise function OFF)	0
187	Automatic temperature rise dead time ♣	RT	CH1 ⋮ CH64	32AC ⋮ 32EB	12972 ⋮ 13035	7	R/W	C	0.1 to 1999.9 seconds	10.0
188	Automatic temperature rise gradient data ♣	R2	CH1 ⋮ CH64	32EC ⋮ 332B	13036 ⋮ 13099	7	R/W	C	1 (0.1) to Input span/minutes Varies with the setting of the decimal point position.	1 (0.1)

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
189	EDS transfer time decimal point position ♣	NS	CH1 ⋮ CH64	332C ⋮ 336B	13100 ⋮ 13163	1	R/W	C	0: 1 second setting (No decimal place) 1: 0.1 seconds setting (One decimal place)	0
190	Output average processing time for EDS ♣	NV	CH1 ⋮ CH64	336C ⋮ 33AB	13164 ⋮ 13227	7	R/W	C	0.1 to 200.0 seconds	1.0
191	Responsive action trigger point for EDS ♣	NW	CH1 ⋮ CH64	33AC ⋮ 33EB	13228 ⋮ 13291	7	R/W	C	TC/RTD inputs: 0 (0.0) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position selection. Voltage (V)/Current (I) inputs: 0.0 to Input span (Unit: %)	TC/RTD: 1 (1.0) V/I: 1.0
192	Setting change rate limiter unit time	HU	CH1 ⋮ CH64	33EC ⋮ 342B	13292 ⋮ 13355	7	R/W	C	1 to 3600 seconds	60
193	Soak time unit	RU	CH1 ⋮ CH64	342C ⋮ 346B	13356 ⋮ 13419	7	R/W	C	• RKC communication 0: 0:00 to 99:59 (hrs:min) [0 hours 00 minutes to 99 hours 59 minutes] 1: 0:00 to 199:59 (min:sec) [0 minutes 00 seconds to 199 minutes 59 seconds] • Modbus 0: 0 to 5999 minutes [0 hours 00 minutes to 99 hours 59 minutes] 1: 0 to 11999 seconds [0 minutes 00 seconds to 199 minutes 59 seconds] Set the data range of Memory area soak time monitor and Area soak time.	1
194	Setting limiter high	SH	CH1 ⋮ CH64	346C ⋮ 34AB	13420 ⋮ 13483	7	R/W	C	Setting limiter low to Input scale high Varies with the setting of the decimal point position.	Input scale high
195	Setting limiter low	SL	CH1 ⋮ CH64	34AC ⋮ 34EB	13484 ⋮ 13547	7	R/W	C	Input scale low to Setting limiter high Varies with the setting of the decimal point position.	Input scale low
196	PV transfer function	TS	CH1 ⋮ CH64	34EC ⋮ 352B	13548 ⋮ 13611	1	R/W	C	0: Unused 1: Used	0
197	Operation mode assignment 1 (Logic output selection function) Logic output 1 to 4	EA	CH1 ⋮ CH64	352C ⋮ 356B	13612 ⋮ 13675	7	R/W	C	0: No assignment 1: Operation mode (monitor, control) 2: Operation mode (monitor, event function, control) 3: Auto/Manual 4: Remote/Local 5: Unused (Do not set this one)	0
198	Operation mode assignment 2 (Logic output selection function) Logic output 5 to 8	EB	CH1 ⋮ CH64	356C ⋮ 35AB	13676 ⋮ 13739	7	R/W	C	0: No assignment 1: Operation mode (monitor, control) 2: Operation mode (monitor, event function, control) 3: Auto/Manual 4: Remote/Local 5: Unused (Do not set this one)	0

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
199	SV select function	KM	CH1 ⋮ CH64	35AC ⋮ 35EB	13740 ⋮ 13803	1	R/W	C	0: Remote SV function 1: Cascade control function 2: Ratio setting function 3: Cascade control 2 function	0
200	Remote SV function master channel module address	MC	CH1 ⋮ CH64	35EC ⋮ 362B	13804 ⋮ 13867	7	R/W	C	−1 (Master channel is selected from itself) 0 to 99 (Master channel is selected from other modules)	−1
201	Remote SV function master channel selection	MN	CH1 ⋮ CH64	362C ⋮ 366B	13868 ⋮ 13931	7	R/W	C	1 to 99	1
202	Output distribution master channel module address	DY	CH1 ⋮ CH64	366C ⋮ 36AB	13932 ⋮ 13995	7	R/W	C	−1 (Master channel is selected from itself) 0 to 99 (Master channel is selected from other modules)	−1
203	Output distribution master channel selection	DZ	CH1 ⋮ CH64	36AC ⋮ 36EB	13996 ⋮ 14059	7	R/W	C	1 to 99	1
204	Address of interacting modules	RL	CH1 ⋮ CH64	36EC ⋮ 372B	14060 ⋮ 14123	7	R/W	C	−1 (Interact with its own module address) 0 to 99 (Interact with the addresses of other modules)	−1
205	Channel selection of interacting modules	RM	CH1 ⋮ CH64	372C ⋮ 376B	14124 ⋮ 14187	7	R/W	C	1 to 99 Becomes valid when the selected module is “Z-TIO module.”	1
206	Selection switch of interacting modules	RN	CH1 ⋮ CH64	376C ⋮ 37AB	14188 ⋮ 14251	7	R/W	C	• RKC communication Least significant digit: Memory area number 2nd digit: Operation mode 3rd digit: Auto/Manual 4th digit: Remote/Local 5th digit EDS start signal 6th digit Interlock release Most significant digit: Suspension of area soak time Data 0: No interaction 1: Interact with other channels • Modbus Bit data 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 Bit 7 to Bit 15: Unused Data 0: No interaction 1: Interact with other channels [Decimal number: 0 to 127]	0
207	TIO Interval time	VG	CH1 ⋮ CH16	37AC ⋮ 37BB	14252 ⋮ 14267	7	R/W	M	0 to 250 ms	10
208	Unused	—	—	37BC ⋮ 386B	14268 ⋮ 14443	—	—	—	—	—

9.4 Memory Area Data Address of Z-TIO Module

The register addresses, 386CH to 3DABH are used for checking and changing each set value belonging to the memory area.

No.	Name	Chan-nel	Register address HEX	Register address DEC	Attri-bute	Struc-ture	Data range	Factory set value
1	Setting memory area number	CH1 ⋮ CH64	386C ⋮ 38AB	14444 ⋮ 14507	R/W	C	1 to 8	1
2	Event 1 set value (EV1)	CH1 ⋮ CH64	38AC ⋮ 38EB	14508 ⋮ 14571	R/W	C	Deviation action, Deviation action between channels, Temperatue rise completion range: −Input span to +Input span Process action, SV action: Input scale low to Input scale high MV action: −5.0 to +105.0 %	50 (50.0)
3	Event 2 set value (EV2)	CH1 ⋮ CH64	38EC ⋮ 392B	14572 ⋮ 14635	R/W	C		50 (50.0)
4	Event 3 set value (EV3)	CH1 ⋮ CH64	392C ⋮ 396B	14636 ⋮ 14699	R/W	C		50 (50.0)
5	Event 4 set value (EV4)	CH1 ⋮ CH64	396C ⋮ 39AB	14700 ⋮ 14763	R/W	C		50 (50.0)
6	Control loop break alarm (LBA) time	CH1 ⋮ CH64	39AC ⋮ 39EB	14764 ⋮ 14827	R/W	C	0 to 7200 seconds (0: Unused)	480
7	LBA deadband	CH1 ⋮ CH64	39EC ⋮ 3A2B	14828 ⋮ 14791	R/W	C	0 (0.0) to Input span Varies with the setting of the decimal point position.	0 (0.0)
8	Set value (SV)	CH1 ⋮ CH64	3A2C ⋮ 3A6B	14892 ⋮ 14955	R/W	C	Setting limiter low to Setting limiter high	TC/RTD: 0 (0.0) V/I: 0.0
9	Proportional band [heat-side]	CH1 ⋮ CH64	3A6C ⋮ 3AAB	14956 ⋮ 15019	R/W	C	TC/RTD inputs: 0 (0.0) to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of input span 0 (0.0): ON/OFF action (ON/OFF action for both heat and cool actions in case of a Heat/Cool PID control type.)	TC/RTD: 30 (30.0) V/I: 30.0
10	Integral time [heat-side]	CH1 ⋮ CH64	3AAC ⋮ 3AEB	15020 ⋮ 15083	R/W	C	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 PID control: 1 to 3600 seconds or 0.1 to 1999.9 seconds	240
11	Derivative time [heat-side]	CH1 ⋮ CH64	3AEC ⋮ 3B2B	15084 ⋮ 15147	R/W	C	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action)	60
12	Control response parameter	CH1 ⋮ CH64	3B2C ⋮ 3B6B	15148 ⋮ 15211	R/W	C	0: Slow 1: Medium 2: Fast When the P or PD action is selected, this setting becomes invalid.	PID control, Position proportioning PID control: 0 Heat/Cool PID control: 2
13	Proportional band [cool-side]	CH1 ⋮ CH64	3B6C ⋮ 3BAB	15212 ⋮ 15275	R/W	C	TC/RTD inputs: 1 to Input span or 0.1 to Input span (Unit: °C [°F]) Varies with the setting of the decimal point position. Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of input span	TC/RTD: 30 (30.0) V/I: 30.0

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No.	Name	Chan-nel	Register address		Attri-bute	Struc-ture	Data range	Factory set value
			HEX	DEC				
14	Integral time [cool-side]	CH1 ⋮ CH64	3BAC ⋮ 3BEB	15276 ⋮ 15339	R/W	C	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PD action)	240
15	Derivative time [cool-side]	CH1 ⋮ CH64	3BEC ⋮ 3C2B	15340 ⋮ 15403	R/W	C	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action)	60
16	Overlap/Deadband	CH1 ⋮ CH64	3C2C ⋮ 3C6B	15404 ⋮ 15467	R/W	C	TC/RTD inputs: −Input span to +Input span (Unit:°C [°F]) Varies with the setting of the decimal point position. Voltage (V)/Current (I) inputs: −100.0 to +100.0 % of input span	0 (0.0)
17	Manual reset	CH1 ⋮ CH64	3C6C ⋮ 3CAB	15468 ⋮ 15531	R/W	C	−100.0 to +100.0 %	0.0
18	Setting change rate limiter (up)	CH1 ⋮ CH64	3CAC ⋮ 3CEB	15532 ⋮ 15595	R/W	C	0 (0.0) to Input span/unit time * 0 (0.0): Unused Varies with the setting of the decimal point position.	0 (0.0)
19	Setting change rate limiter (down)	CH1 ⋮ CH64	3CEC ⋮ 3D2B	15596 ⋮ 15659	R/W	C	* Unit time: 60 seconds (factory set value)	0 (0.0)
20	Area soak time	CH1 ⋮ CH64	3D2C ⋮ 3D6B	15660 ⋮ 15723	R/W	C	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	0
21	Link area number	CH1 ⋮ CH64	3D6C ⋮ 3DAB	15724 ⋮ 15787	R/W	C	0 to 8 (0: No link)	0
22	Unused	—	3DAC ⋮ 3E6B	15788 ⋮ 15979	—	—	—	—

9.5 Communication Data of Z-DIO Module

☞ For details of Z-DIO module communication data, refer to **SRZ Instruction Manual (IMS01T04-E□)**.

No.	Name	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	Data range	Factory set value
1	Digital input (DI) state 1	L1	CH1 ⋮ CH16	3E6C ⋮ 3E7B	15980 ⋮ 15995	7	RO	M	• RKC communication Least significant digit: DI1 2nd digit: DI2 3rd digit: DI3 4th digit: DI4 5th digit to Most significant digit: Unused Data 0: Contact open 1: Contact closed • Modbus Bit data Bit 0: DI1 Bit 1: DI2 Bit 2: DI3 Bit 3: DI4 Bit 4: DI5 Bit 5: DI6 Bit 6: DI7 Bit 7: DI8 Bit 8 to Bit 15: Unused Data 0: Contact open 1: Contact closed [Decimal number: 0 to 255]	—
2	Digital input (DI) state 2	L6	CH1 ⋮ CH16	—	—	7	RO	M	Least significant digit: DI5 2nd digit: DI6 3rd digit: DI7 4th digit: DI8 5th digit to Most significant digit: Unused Data 0: Contact open 1: Contact closed	—
3	Digital output (DO) state 1	Q2	CH1 ⋮ CH16	3E7C ⋮ 3E8B	15996 ⋮ 16011	7	RO	M	• RKC communication Least significant digit: DO1 2nd digit: DO2 3rd digit: DO3 4th digit: DO4 5th digit to Most significant digit: Unused Data 0: OFF 1: ON • Modbus Bit data Bit 0: DO1 Bit 1: DO2 Bit 2: DO3 Bit 3: DO4 Bit 4: DO5 Bit 5: DO6 Bit 6: DO7 Bit 7: DO8 Bit 8 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 255]	—
4	Digital output (DO) state 2	Q3	CH1 ⋮ CH16	—	—	7	RO	M	Least significant digit: DO5 2nd digit: DO6 3rd digit: DO7 4th digit: DO8 5th digit to Most significant digit: Unused Data 0: OFF 1: ON	—

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No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
5	Unused	—	—	3E8C ⋮ 3FDB	16012 ⋮ 16347	—	—	—	—	—
6	DO manual output 1	Q4	CH1 ⋮ CH16	3FDC ⋮ 3FEB	16348 ⋮ 16363	7	R/W	M	• RKC communication Least significant digit: DO1 manual output 2nd digit: DO2 manual output 3rd digit: DO3 manual output 4th digit: DO4 manual output 5th digit to Most significant digit: Unused Data 0: OFF 1: ON • Modbus Bit data Bit 0: DO1 manual output Bit 1: DO2 manual output Bit 2: DO3 manual output Bit 3: DO4 manual output Bit 4: DO5 manual output Bit 5: DO6 manual output Bit 6: DO7 manual output Bit 7: DO8 manual output Bit 8 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 255]	0
7	DO manual output 2	Q5	CH1 ⋮ CH16	—	—	7	R/W	M	Least significant digit: DO5 manual output 2nd digit: DO6 manual output 3rd digit: DO7 manual output 4th digit: DO8 manual output 5th digit to Most significant digit: Unused Data 0: OFF 1: ON	0
8	DO output distribution selection	DO	CH1 ⋮ CH128	3FEC ⋮ 406B	16364 ⋮ 16491	1	R/W	C	0: DO output 1: Distribution output	0
9	DO output distribution bias	O8	CH1 ⋮ CH128	406C ⋮ 40EB	16492 ⋮ 16619	7	R/W	C	−100.0 to +100.0 %	0.0
10	DO output distribution ratio	O9	CH1 ⋮ CH128	40EC ⋮ 416B	16620 ⋮ 16747	7	R/W	C	−9.999 to +9.999	1.000
11	DO proportional cycle time	V0	CH1 ⋮ CH128	416C ⋮ 41EB	16748 ⋮ 16875	7	R/W	C	0.1 to 100.0 seconds	Relay contact output: 20.0 Open collector output: 2.0
12	DO minimum ON/OFF time of proportioning cycle	VJ	CH1 ⋮ CH128	41EC ⋮ 426B	16876 ⋮ 17003	7	R/W	C	0 to 1000 ms	0
13	Unused	—	—	426C ⋮ 433B	17004 ⋮ 17211	—	—	—	—	—
Set data No. 14 or later are for engineering setting [Writable in the STOP mode]										
14	DI function assignment	H2	CH1 ⋮ CH16	433C ⋮ 434B	17212 ⋮ 17227	7	R/W	M	0 to 29 (Refer to **P. 81**.)	Depends on model code. When not specifying: 0

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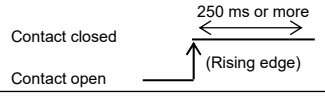
No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
15	Memory area setting signal	E1	CH1 ⋮ CH16	434C ⋮ 435B	17228 ⋮ 17243	1	R/W	M	0: Valid 1: Invalid	1
16	DO signal assignment module address 1 [DO1 to DO4]	LQ	CH1 ⋮ CH16	435C ⋮ 436B	17244 ⋮ 17259	7	R/W	M	−1, 0 to 99 When "−1" is selected, all of the signals of the same type (except temperature rise completion and DO manual output value) are *OR*-operated and produced as outputs from DO.	−1
17	DO signal assignment module address 2 [DO5 to DO8]	LR	CH1 ⋮ CH16	436C ⋮ 437B	17260 ⋮ 17275	7	R/W	M	−1, 0 to 99 When "−1" is selected, all of the signals of the same type (except temperature rise completion and DO manual output value) are *OR*-operated and produced as outputs from DO.	−1
18	DO output assignment 1 [DO1 to DO4]	LT	CH1 ⋮ CH16	437C ⋮ 438B	17276 ⋮ 17291	7	R/W	M	0 to 13 (Refer to **P. 82**.)	Based on model code. When not specifying: 0
19	DO output assignment 2 [DO5 to DO8]	LX	CH1 ⋮ CH16	438C ⋮ 439B	17292 ⋮ 17307	7	R/W	M	0 to 13 (Refer to **P. 82**.)	Based on model code. When not specifying: 0
20	DO energized/de-energized	NB	CH1 ⋮ CH128	439C ⋮ 441B	17308 ⋮ 17435	7	R/W	C	0: Energized 1: De-energized	0
21	DO output distribution master channel module address	DD	CH1 ⋮ CH128	441C ⋮ 449B	17436 ⋮ 17563	7	R/W	C	−1 (Master channel is selected from itself) 0 to 99 (Master channel is selected from other modules)	−1
22	DO output distribution master channel selection	DJ	CH1 ⋮ CH128	449C ⋮ 451B	17564 ⋮ 17691	7	R/W	C	1 to 99	1
23	DO manipulated output value (MV) at STOP mode	OJ	CH1 ⋮ CH128	451C ⋮ 459B	17692 ⋮ 17819	7	R/W	C	−5.0 to +105.0 %	−5.0
24	DO output limiter (high)	D3	CH1 ⋮ CH128	459C ⋮ 461B	17820 ⋮ 17947	7	R/W	C	DO output limiter (low) to 105.0 %	105.0
25	DO output limiter (low)	D4	CH1 ⋮ CH128	461C ⋮ 469B	17948 ⋮ 18075	7	R/W	C	−5.0 % to DO output limiter (high)	−5.0
26	Z-DIO Interval time	VF	CH1 ⋮ CH16	469C ⋮ 46AB	18076 ⋮ 18091	7	R/W	M	0 to 250 ms	10
27	Unused	—	—	46AC ⋮ 46BB	18092 ⋮ 18107	—	—	—	—	—

Table 1: DI assignment table

<table>
<tr><th>Set value</th><th>DI1</th><th>DI2</th><th>DI3</th><th>DI4</th><th>DI5</th><th>DI6</th><th>DI7</th><th>DI8</th></tr>
<tr><td>0</td><td colspan="8">No assignment</td></tr>
<tr><td>1</td><td colspan="3" rowspan="25">Memory area transfer (1 to 8) [1]</td><td rowspan="25">Area set [2]</td><td colspan="2" rowspan="15">Operation mode [3]</td><td rowspan="5">Interlock release</td><td>AUTO/MAN [4]</td></tr>
<tr><td>2</td><td>REM/LOC [4]</td></tr>
<tr><td>3</td><td>EDS start signal 1</td></tr>
<tr><td>4</td><td>Soak stop</td></tr>
<tr><td>5</td><td>RUN/STOP [4]</td></tr>
<tr><td>6</td><td rowspan="4">AUTO/MAN [4]</td><td>REM/LOC [4]</td></tr>
<tr><td>7</td><td>EDS start signal 1</td></tr>
<tr><td>8</td><td>Soak stop</td></tr>
<tr><td>9</td><td>RUN/STOP [4]</td></tr>
<tr><td>10</td><td rowspan="3">REM/LOC [4]</td><td>EDS start signal 1</td></tr>
<tr><td>11</td><td>Soak stop</td></tr>
<tr><td>12</td><td>RUN/STOP [4]</td></tr>
<tr><td>13</td><td rowspan="2">EDS start signal 1</td><td>Soak stop</td></tr>
<tr><td>14</td><td rowspan="2">RUN/STOP [4]</td></tr>
<tr><td>15</td><td>Soak stop</td></tr>
<tr><td>16</td><td rowspan="10">Interlock release</td><td rowspan="10">AUTO/MAN [4]</td><td rowspan="3">REM/LOC [4]</td><td>EDS start signal 1</td></tr>
<tr><td>17</td><td>Soak stop</td></tr>
<tr><td>18</td><td>RUN/STOP [4]</td></tr>
<tr><td>19</td><td rowspan="2">EDS start signal 1</td><td>Soak stop</td></tr>
<tr><td>20</td><td rowspan="2">RUN/STOP [4]</td></tr>
<tr><td>21</td><td>Soak stop</td></tr>
<tr><td>22</td><td rowspan="3">AUTO/MAN</td><td rowspan="3">REM/LOC</td><td rowspan="2">EDS start signal 1</td><td>Soak stop</td></tr>
<tr><td>23</td><td rowspan="3">RUN/STOP [4]</td></tr>
<tr><td>24</td><td rowspan="2">Soak stop</td></tr>
<tr><td>25</td><td>REM/LOC</td><td>EDS start signal 1</td></tr>
<tr><td>26</td><td>Memory area transfer (1, 2) [1]</td><td>Area set [2]</td><td>Interlock release</td><td>RUN/STOP [4]</td><td>AUTO/MAN [4]</td><td>REM/LOC [4]</td><td colspan="2">Operation mode [3]</td></tr>
<tr><td>27</td><td colspan="3">Memory area transfer (1 to 8) [1]</td><td>Area set [2]</td><td colspan="2">Operation mode [3]</td><td rowspan="2">EDS start signal 1</td><td rowspan="2">EDS start signal 2</td></tr>
<tr><td>28</td><td>Memory area transfer (1, 2) [1]</td><td>Area set [2]</td><td rowspan="2">Interlock release</td><td>RUN/STOP [4]</td><td>AUTO/MAN [4]</td><td>REM/LOC [4]</td></tr>
<tr><td>29</td><td>EDS start signal 1</td><td>EDS start signal 2</td><td colspan="4">Operation mode [3]</td></tr>
</table>

RUN/STOP: RUN/STOP transfer (Contact closed: RUN)
AUTO/MAN: Auto/Manual transfer (Contact closed: Manual mode)
REM/LOC: Remote/Local transfer (Contact closed: Remote mode)
Interlock release (Interlock release when rising edge is detected)
EDS start signal 1 (EDS start signal ON when rising edge is detected [for disturbance 1])
EDS start signal 2 (EDS start signal ON when rising edge is detected [for disturbance 2])
Soak stop (Contact closed: Soak stop)

DI signal will become valid at rising edge after the closed contact is held for 250 ms.



[1] Memory area transfer

(×:Contact open –: Contact closed)

	Memory area number							
	1	2	3	4	5	6	7	8
DI1	×	–	×	–	×	–	×	–
DI2	×	×	–	–	×	×	–	–
DI3	×	×	×	×	–	–	–	–

[2] Area set becomes invalid prior to factory shipment.

[3] Operation mode transfer

(×:Contact open –: Contact closed)

	Operation mode			
	Unused	Monitor	Monitor + Event function	Control
DI5 (DI7)	×	–	×	–
DI6 (DI8)	×	×	–	–

[4] Actual device states (AUTO/MAN, REM/LOC, RUN/STOP)

	DI-switched state	Communication-switched state	Actual device state
Auto/Manual transfer [a] (AUTO/MAN)	Manual (Contact closed)	Manual → Auto	Manual mode
		Auto → Manual	
	Auto (Contact open)	Manual → Auto	Auto mode
		Auto → Manual	
Remote/Local transfer [a] (REM/LOC)	Remote (Contact closed)	Remote → Local	Remote mode
		Local → Remote	
	Local (Contact open)	Remote → Local	Local mode
		Local → Remote	
RUN/STOP [b]	RUN (Contact closed)	STOP → RUN	RUN
		RUN → STOP	STOP
	STOP (Contact open)	STOP → RUN	STOP

[a] Device state when AUTO/MAN or REM/LOC assigned to DI is set so that the Z-TIO module and Z-DIO module are linked using the Master-slave mode of the Z-TIO module.

[b] STOP of RUN/STOP switching is given priority regardless of communication or DI switching.

Table 2: DO assignment table

[DO1 to DO4]

Set value	DO1	DO2	DO3	DO4
0	No assignment			
1	DO1 manual output	DO2 manual output	DO3 manual output	DO4 manual output
2	Event 1 comprehensive output [1]	Event 2 comprehensive output [2]	Event 3 comprehensive output [3]	Event 4 comprehensive output [4]
3	Event 1 (CH1)	Event 2 (CH1)	Event 3 (CH1)	Event 4 (CH1)
4	Event 1 (CH2)	Event 2 (CH2)	Event 3 (CH2)	Event 4 (CH2)
5	Event 1 (CH3)	Event 2 (CH3)	Event 3 (CH3)	Event 4 (CH3)
6	Event 1 (CH4)	Event 2 (CH4)	Event 3 (CH4)	Event 4 (CH4)
7	Event 1 (CH1)	Event 1 (CH2)	Event 1 (CH3)	Event 1 (CH4)
8	Event 2 (CH1)	Event 2 (CH2)	Event 2 (CH3)	Event 2 (CH4)
9	Event 3 (CH1)	Event 3 (CH2)	Event 3 (CH3)	Event 3 (CH4)
10	Event 4 (CH1)	Event 4 (CH2)	Event 4 (CH3)	Event 4 (CH4)
11	HBA (CH1) of Z-TIO module	HBA (CH2) of Z-TIO module	HBA (CH3) of Z-TIO module	HBA (CH4) of Z-TIO module
12	Burnout status (CH1)	Burnout status (CH2)	Burnout status (CH3)	Burnout status (CH4)
13	Temperature rise completion [5]	HBA comprehensive output [6]	Burnout state comprehensive output [7]	DO4 manual output

[DO5 to DO8]

Set value	DO5	DO6	DO7	DO8
0	No assignment			
1	DO5 manual output	DO6 manual output	DO7 manual output	DO8 manual output
2	Event 1 comprehensive output [1]	Event 2 comprehensive output [2]	Event 3 comprehensive output [3]	Event 4 comprehensive output [4]
3	Event 1 (CH1)	Event 2 (CH1)	Event 3 (CH1)	Event 4 (CH1)
4	Event 1 (CH2)	Event 2 (CH2)	Event 3 (CH2)	Event 4 (CH2)
5	Event 1 (CH3)	Event 2 (CH3)	Event 3 (CH3)	Event 4 (CH3)
6	Event 1 (CH4)	Event 2 (CH4)	Event 3 (CH4)	Event 4 (CH4)
7	Event 1 (CH1)	Event 1 (CH2)	Event 1 (CH3)	Event 1 (CH4)
8	Event 2 (CH1)	Event 2 (CH2)	Event 2 (CH3)	Event 2 (CH4)
9	Event 3 (CH1)	Event 3 (CH2)	Event 3 (CH3)	Event 3 (CH4)
10	Event 4 (CH1)	Event 4 (CH2)	Event 4 (CH3)	Event 4 (CH4)
11	HBA (CH1) of Z-TIO module	HBA (CH2) of Z-TIO module	HBA (CH3) of Z-TIO module	HBA (CH4) of Z-TIO module
12	Burnout status (CH1)	Burnout status (CH2)	Burnout status (CH3)	Burnout status (CH4)
13	Temperature rise completion [5]	HBA comprehensive output [6]	Burnout state comprehensive output [7]	DO8 manual output

[1] Logical *OR* of Event 1 (ch1 to ch4)
[2] Logical *OR* of Event 2 (ch1 to ch4)
[3] Logical *OR* of Event 3 (ch1 to ch4)
[4] Logical *OR* of Event 4 (ch1 to ch4)
[5] Temperature rise completion status (ON when temperature rise completion occurs for all channels for which event 3 is set to temperature rise completion.)
[6] The following signals are output depending on the setting of the DO signal assignment module address.
- Logical *OR* of HBA (ch1 to ch4) of Z-TIO module
- Logical *OR* of HBA (ch1 to ch12) of Z-CT module
- Logical *OR* of HBA (ch1 to ch4) of Z-TIO module and HBA (ch1 to ch12) of Z-CT module

[7] Logical *OR* of burnout state (ch1 to ch4)

To output the HBA signal of a Z-CT module from DO, set “13.” For details of the Z-CT module, refer to **Z-CT Instruction Manual [Detailed version] (IMS01T21-E□)**.

9.6 Communication Data of Z-CT Module

☞ For details of Z-CT module communication data, refer to **Z-CT Instruction Manual [Detailed version] (IMS01T21-E□)**.

No.	Name	Iden-tifier	Chan-nel	Resister address		Digits	Attri-bute	Struc-ture	Data range	Factory set value
				HEX	DEC					
1	Current transformer (CT) input value monitor	M4	CH1 ⋮ CH192	46BC ⋮ 477B	18108 ⋮ 18299	7	RO	C	CTL-6-P-Z: 0.0 to 10.0 A CTL-6-P-N: 0.0 to 30.0 A CTL-12-S56-10L-N: 0.0 to 100.0 A	—
2	Load factor conversion CT monitor	M5	CH1 ⋮ CH192	477C ⋮ 483B	18300 ⋮ 18491	7	RO	C	0.0 to 100.0 A	—
3	Heater break alarm (HBA) state monitor	AF	CH1 ⋮ CH192	483C ⋮ 48FB	18492 ⋮ 18683	1	RO	C	0: Normal 1: Break 2: Melting	—
4	Heater overcurrent alarm state monitor	AG	CH1 ⋮ CH192	48FC ⋮ 49BB	18684 ⋮ 18875	1	RO	C	0: Normal 1: Heater overcurrent	—
5	Automatic setting state monitor [1]	CJ	CH1 ⋮ CH16	49BC ⋮ 49CB	18876 ⋮ 18891	1	RO	M	0: Normal state 1: Automatic setting execution 2: Automatic setting failure	—
6	Unused	—	—	49CC ⋮ 4FCB	18892 ⋮ 20427	—	—	—	—	—
7	Heater break/Heater overcurrent alarm automatic setting selection	BT	CH1 ⋮ CH192	4FCC ⋮ 508B	20428 ⋮ 20619	1	R/W	C	0: Automatic setting is disabled. (Alarm set value cannot be automatically set by the push button and communication.) 1: Automatic setting for heater break alarm (HBA) is enabled. 2: Automatic setting for heater overcurrent alarm set value is enabled. 3: Automatic setting for heater break alarm (HBA) and heater overcurrent alarm set values are enabled.	1
8	Automatic setting transfer [2]	BU	CH1 ⋮ CH192	508C ⋮ 514B	20620 ⋮ 20811	1	R/W	C	0: Normal state 1: Automatic setting execution When automatic setting ends normally, this reverts to "0: Normal state." 2: Automatic setting failure (RO)	0
9	Heater break alarm (HBA) set value	A8	CH1 ⋮ CH192	514C ⋮ 520B	20812 ⋮ 21003	1	R/W	C	0.0 to 100.0 A 0.0: Heater break alarm function (HBA) OFF (HBA function OFF: The current transformer (CT) input value monitoring is available.)	0.0
10	Heater break alarm (HBA) selection	BZ	CH1 ⋮ CH192	520C ⋮ 52CB	21004 ⋮ 21195	1	R/W	C	0: Heater break alarm (HBA) unused 1: Heater break alarm (HBA) 2: Heater break alarm (HBA) (With alarm interlock function)	1

[1] This is linked to the solid lighting or blinking state of the automatic setting state indication lamp (SET).

[2] Automatic setting is only possible for channels that have been set to other than "0: Automatic setting is disabled" in heater break/heater overcurrent alarm automatic setting selection.

Continued on the next page.

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No.	Name	Iden-tifier	Chan-nel	Resister address		Digits	Attri-bute	Struc-ture	Data range	Factory set value
				HEX	DEC					
11	Heater overcurrent alarm set value	A6	CH1 ⋮ CH192	52CC ⋮ 538B	21196 ⋮ 21387	7	R/W	C	0.0 to 105.0 A 0.0: Heater overcurrent alarm function OFF	0.0
12	Heater overcurrent alarm selection	BO	CH1 ⋮ CH192	538C ⋮ 544B	21388 ⋮ 21579	1	R/W	C	0: Heater overcurrent alarm unused 1: Heater overcurrent alarm 2: Heater overcurrent alarm (With alarm interlock function)	1
13	Heater break alarm (HBA) interlock release	CX	CH1 ⋮ CH192	544C ⋮ 550B	21580 ⋮ 21771	1	R/W	C	0: Normal state 1: Interlock release execution After the interlock is released, this automatically returns to "0."	0
14	Heater overcurrent alarm interlock release	CY	CH1 ⋮ CH192	550C ⋮ 55CB	21772 ⋮ 21963	1	R/W	C	0: Normal state 1: Interlock release execution After the interlock is released, this automatically returns to "0."	0
15	Unused	—	—	55CC ⋮ 5E0B	21964 ⋮ 24075	—	—	—	—	—
16	Set lock [1]	LK	CH1 ⋮ CH16	5E0C ⋮ 5E1B	24076 ⋮ 24091	1	R/W	M	0: Unlock 1: Lock	0
Set data No. 17 or later are for engineering setting [Writable in the STOP mode]										
17	CT type [2]	BV	CH1 ⋮ CH192	5E1C ⋮ 5EDB	24092 ⋮ 24283	1	R/W [3]	C	0: CTL-6-P-N (0.0 to 30.0 A) 1: CTL-12-S56-10L-N (0.0 to 100.0 A) 2: CTL-6-P-Z (0.0 to 10.0 A)	Based on model code. When not specifying: 0
18	CT ratio [4] (CT number of winds)	XT	CH1 ⋮ CH192	5EDC ⋮ 5F9B	24284 ⋮ 24475	7	R/W [3]	C	0 to 9999	CTL-6-P-N, CTL-6-P-Z: 800 CTL-12-S56-10L-N: 1000
19	Number of heater break alarm (HBA) delay times	DI	CH1 ⋮ CH192	5F9C ⋮ 605B	24476 ⋮ 24667	7	R/W [3]	C	0 to 255 times	5
20	Automatic setting factor for heater break alarm (HBA)	BW	CH1 ⋮ CH192	605C ⋮ 611B	24668 ⋮ 24859	7	R/W [3]	C	1 to 100 %	75
21	Automatic setting factor for heater overcurrent alarm	B9	CH1 ⋮ CH192	611C ⋮ 61DB	24860 ⋮ 25051	7	R/W [3]	C	100 to 1000 %	200
22	Determination current value for automatic setting	BP	CH1 ⋮ CH192	61DC ⋮ 629B	25052 ⋮ 25243	7	R/W [3]	C	0.0 to 100.0 A	1.0
23	Automatic setting time	BQ	CH1 ⋮ CH192	629C ⋮ 635B	25244 ⋮ 25435	7	R/W [3]	C	10 to 250 seconds	60

[1] When the RUN/STOP transfer (Identifier: SR, Resister address: 0133H) of the COM-ML becomes STOP, set lock becomes "0: Unlock." (i.e. The engineering setting data is writable.)

[2] When using a non-specified CT, set to "1: CTL-12-S56-10L-N (0.0 to 100.0 A)."

[3] When the set lock (Identifier: LK, Resister address: 5E0CH to 5E1BH) is set to "0: Unlock" (the RUN/STOP transfer of the COM-ML becomes STOP), writing data is possible.

[4] When using a non-specified CT, set the number of winds of the CT.

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No.	Name	Iden-tifier	Chan-nel	Resister address		Digits	Attri-bute	Struc-ture	Data range	Factory set value
				HEX	DEC					
24	Module address assignments for CT input	BX	CH1 ⋮ CH192	635C ⋮ 641B	25436 ⋮ 25627	7	R/W [1]	C	0 to 99	0
25	Module channel assignments for CT input	BY	CH1 ⋮ CH192	641C ⋮ 64DB	25628 ⋮ 25819	7	R/W [1]	C	1 to 99	1
26	Load factor conversion method [2]	IC	CH1 ⋮ CH192	64DC ⋮ 659B	25820 ⋮ 26011	1	R/W [1]	C	0: Mean conversion 1: Root mean squared value conversion	0
27	CT Interval time	VH	CH1 ⋮ CH16	659C ⋮ 65AB	26012 ⋮ 26027	7	R/W [1]	M	0 to 250 ms	10
28	Unused	—	—	65AC ⋮ 666B	26028 ⋮ 26219	—	—	—	—	—

[1] When the set lock (Identifier: LK, Resister address: 5E0CH to 5E1BH) is set to "0: Unlock" (the RUN/STOP transfer of the COM-ML becomes STOP), writing data is possible.

[2] For monitoring using "0: Mean conversion" or "1: Root mean squared value conversion," the following settings are required:

- Module address assignments for CT input must be set.
- Module channel assignments for CT input must be set.
- The heater break alarm (HBA) value must be set to other than "0.0."

10. PLC COMMUNICATION (MAPMAN)

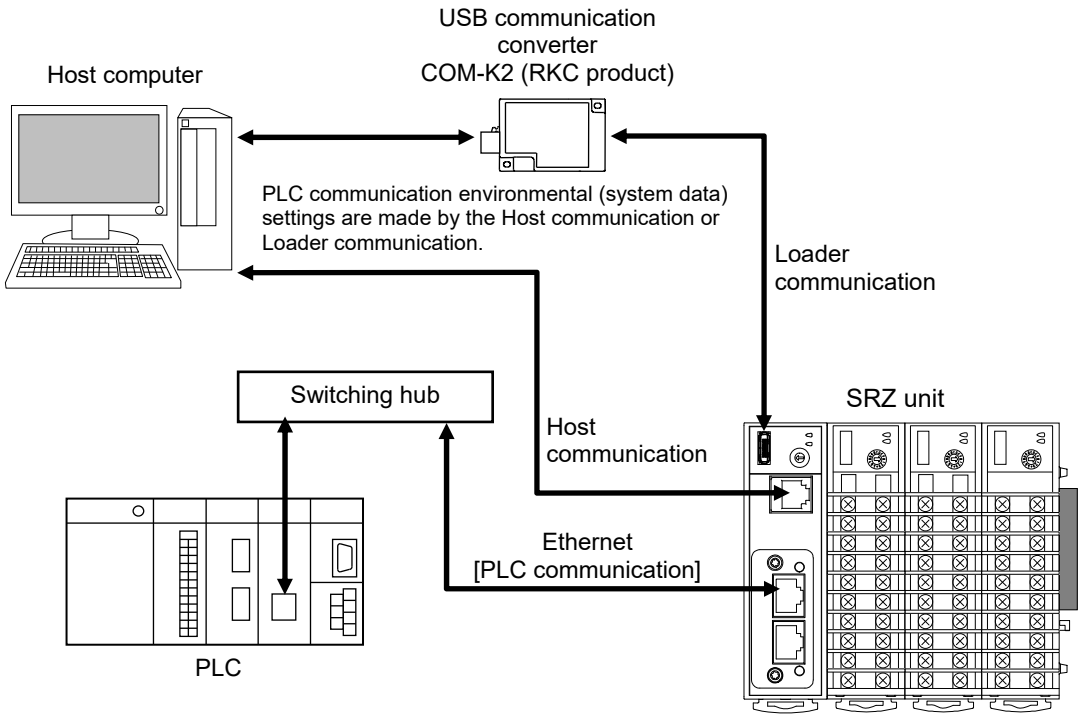
10.1 PLC Communication Environment Setting

The PLC communication environment (system data) settings must be made to perform PLC communication. The system data settings are made by the Host communication or Loader communication.
The system data contains setting items and monitor items. The monitor items require space (8-word) in the PLC register.

NOTE

After each item of the system data is set, the power of the SRZ unit must be turned off and then on to enable the data.
The items will also become valid by switching control from STOP to RUN.

- For connection with host computer, refer to **4.4 Connection to Host Computer (P. 16)**.
- For communication protocol of host communication, refer to **APPENDIX. HOST COMMUNICATION PROTOCOL (P. 144)**.
- For setting about host communication, refer to **5. HOST COMMUNICATION SETTINGS (P. 21)**.
- For setting about loader communication, refer to **7.2 Loader Communication Settings (P. 28)**.



■ System data (setting items) list

The following items are set to the COM-NL (SRZ unit).

All of the following items can be read and written (R/W). 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		
System data Register type *	**QZ**	7	800A	32778	MITSUBISHI MELSEC series 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.) 4 to 29: Unused Set the register types used in PLC communication. (Refer to **P. 88**.)	0
System data Register start number * (High-order 4-bit)	**QS**	7	800B	32779	0 to 15 Set the start number of the register used in PLC communication. Set this if the register address 65535 is exceeded in the ZR register. (For the setting procedure, refer to **P. 88**.)	0
System data Register start number * (Low-order 16-bit)	**QX**	7	800C	32780	0 to 65535 Set the start number of the register used in PLC communication. (For the setting procedure, refer to **P. 88**.)	1000
System data address bias *	**QQ**	7	800D	32781	0 to 65535	0
Slave mapping method	**RK**	7	8012	32786	0: Bias from the address setting switch [Register address + (Address setting switch set value × System data address bias)] 1: Bias disabled This setting determines whether or not the bias set in "System data address bias" is applied to register addresses. (Refer to **P. 89**.)	1

* Usable register ranges and types vary depending on used CPU types. For register ranges and types that can actually be used, refer to the PLC instruction manual.

NOTE

Usable register ranges and types vary depending on used CPU types. For register ranges and types that can actually be used, refer to the PLC instruction manual.

■ 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).

■ Setting method of the register start number

The start number of the register used for PLC communication can be changed. The factory set value is start from D01000 of the D register (data register). Refer to the example below for the procedure for changing the start number.

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

2. Set the register start number (High-order 4-bit) [identifier: QS, register address: 800BH] to 0.

3. In the register start number (Low-order 16-bit) [identifier: QX, register address: 800CH], 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 **1** Low-order **0000** (Hexadecimal)

↓

Separately convert the upper digits and the lower digits back to decimal.
High-order **1** Low-order **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 **1** Low-order **86A0** (Hexadecimal)

↓

Separately convert the upper digits and the lower digits back to decimal.
High-order **1** Low-order **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 **F** Low-order **DFCC** (Hexadecimal)

↓

Separately convert the upper digits and the lower digits back to decimal.
High-order **15** Low-order **57292** (Decimal)

↓

Set the register start number (High-order 4-bit) to “**15**.”

Set the register start number (Low-order 16-bit) to “**57292**.”

■ System data address bias and Slave mapping method

Setting the slave mapping method and the system data address bias prevents duplication of system data addresses of each SRZ unit by the address setting switch of COM-ML.

- System data address bias: Set the bias value of system data address.
  Factory set value is "0."
- Slave mapping method: Sets bias validate/invalidate.
  The factory set value is "1: Bias disabled."

When the bias is enabled, a system data address is calculated as shown below.

System data address when bias is enabled =

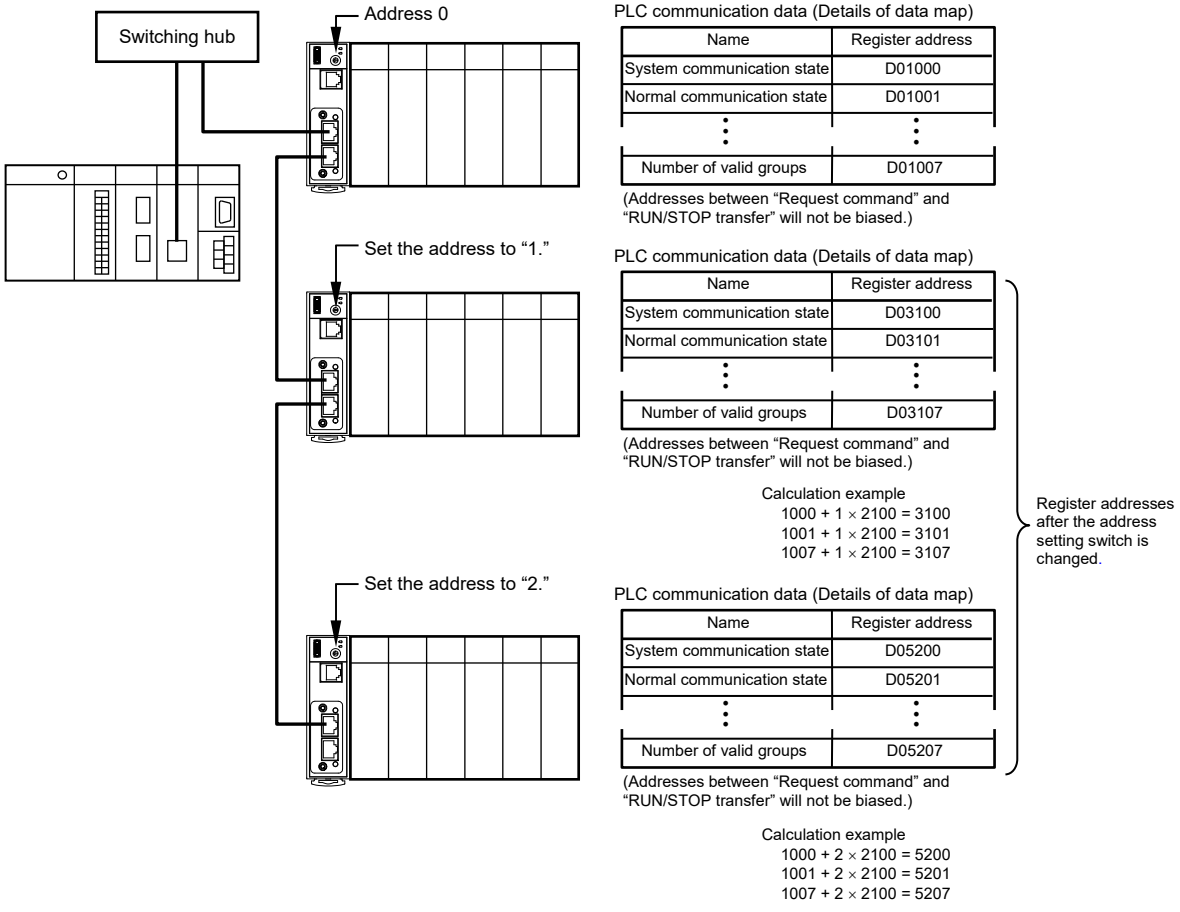
System data address + (Address setting switch set value × System data address bias)

Register address when bias is disabled	0 to F (HEX) → 0 to 15 (DEC)	Factory set value: 0

Setting example

Condition: PLC: 1
SRZ unit: 3
System data address bias: 2100 (factory set value: 0)
Slave mapping method: 0 (factory set value: 1)

Change the address by the address setting switch. When the value of slave mapping method is 0, the system data address bias is enabled and there is no longer duplication of system data addresses.



■ System data (monitor items) list

When System data (setting items) are set, the following System data (monitor items) are written to the register of the PLC when PLC communication is performed. (Following register address is the factory set value.)

All of the following items are read only (RO).

Details of System data (monitor items) can be checked via Host communication or Loader communication.

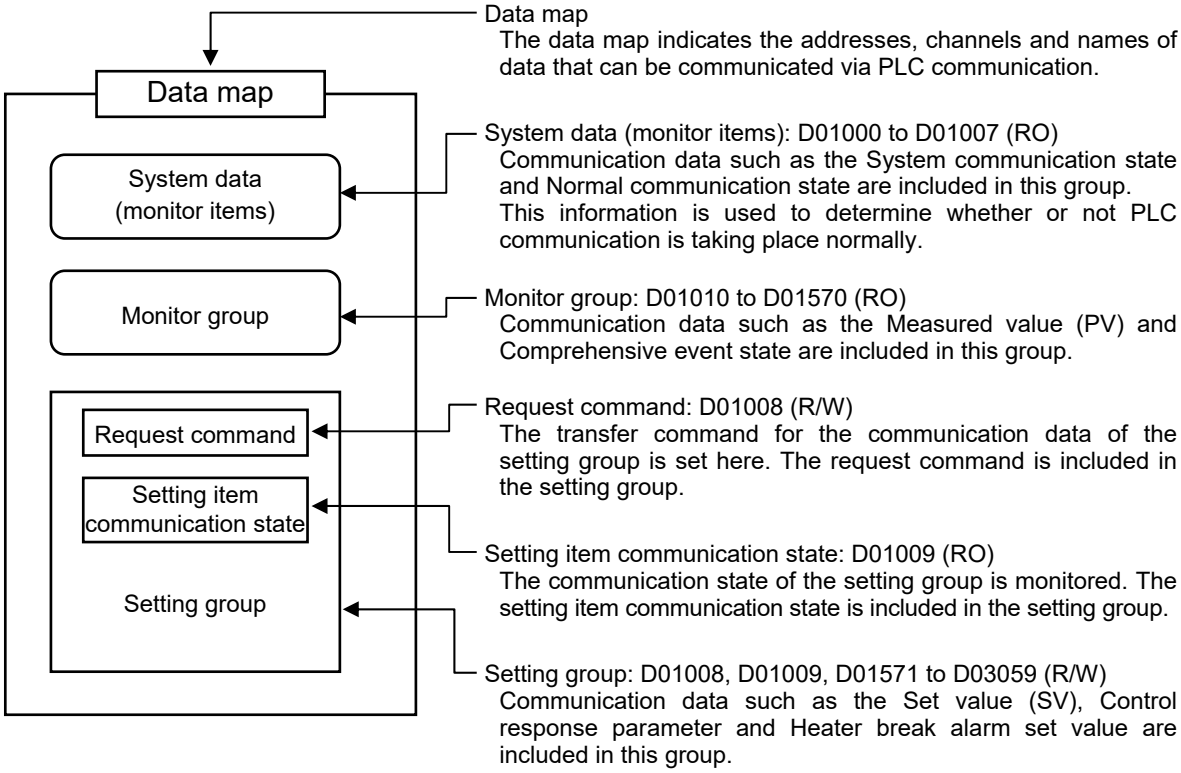
For details of System data (monitor items), refer to **10.3 PLC Communication Data Map (P. 102)**.

Name	Register address	Structure	Attribute	Data range	Factory set value
System communication state	D01000	U	RO	Bit data Bit 0: Data collection condition Bit 1 to Bit 15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0 to 1] This is the communication data collection state of the function module joined to the COM-ML.	0
Normal communication state	D01001	U	RO	0/1 transfer or Count up at 0 to 30000 (For communication checking) "0" and "1" are repeated for each communication period. Or 1 is added in the range of 0 to 30000 for each communication cycle. (The count is reset to zero when 30000 is reached).	—
Unused	D01002	—	—	Do not use this register address as it is used for the internal processing.	—
Unused	D01003	—	—		—
PLC communication error code	D01004	U	RO	Bit data Bit 0: Unused Bit 1: PLC register read/write error Bit 2: Unused Bit 3: Unused Bit 4: Internal communication error Bit 5 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31]	—
PLC communication Unit recognition flag	D01005	U	RO	Bit data Bit 0: SRZ unit Bit 1 to Bit 15: Unused Data 0: No unit exists 1: Unit exists [Decimal number: 0 to 1]	—
Monitor for the number of connected modules	D01006	U	RO	0 to 31	—
Number of valid groups	D01007	U	RO	0 to 30	—

10.2 Data Transfer

10.2.1 PLC communication data transfer

The data transmitted between the PLC and the COM-ML 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 items), Request command, Monitor group, and Setting group. The communication data is transmitted to every group.



Register address explaining in this section is factory set value for MITSUBISHI MELSEC series (64CH).

For the communication data, refer to **10.3 PLC Communication Data Map (P. 102).**

■ Request command

Data transfer between PLC and COM-ML are executed by Request command. For the Request command, both Setting request bit and Monitor request bit are available.

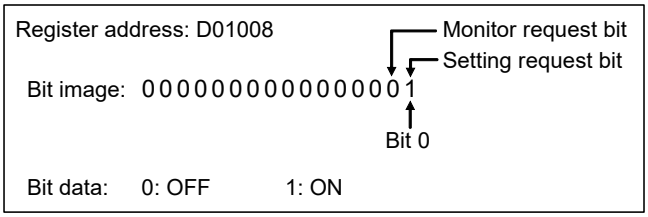
Request command	The Setting request bit and Monitor request bit of the Request command are assigned to each bit datum as a binary number. [Register address: D01008 (Factory set value)] Monitor request bit Setting request bit Bit image: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Bit 15 ---------- Bit 0 Bit data: 0: OFF 1: ON

● Setting request bit (PLC → COM-ML)

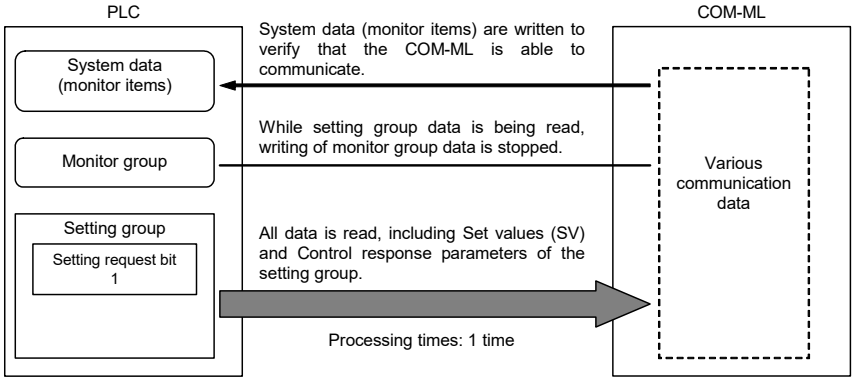
This command requests that the COM-ML read the communication data of the setting group on the PLC side.

[Processing]

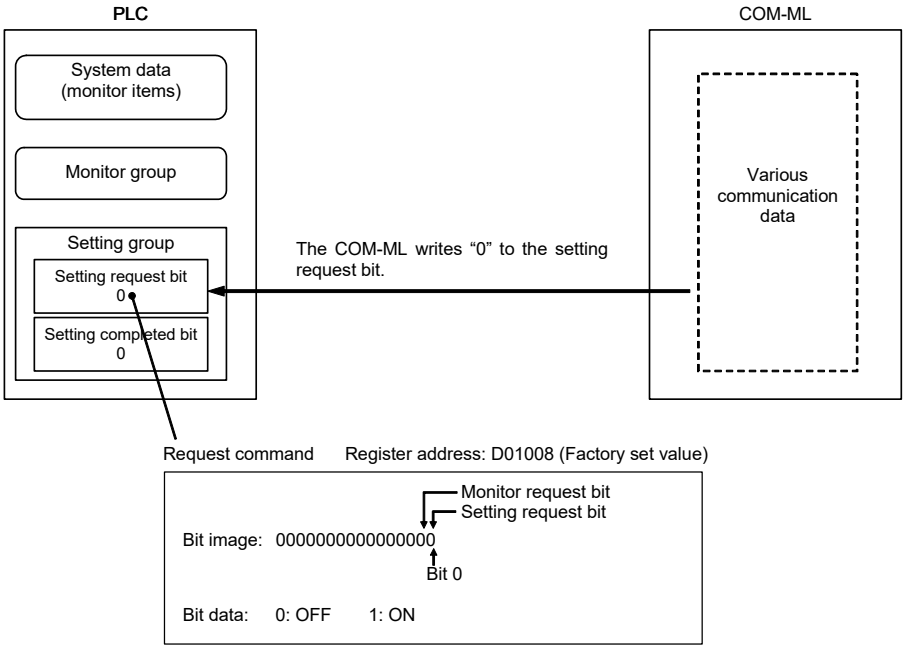
1. When the Setting request bit of the Request command (D01008) is set to "1," the COM-ML starts to read the communication data of the setting group from the PLC.



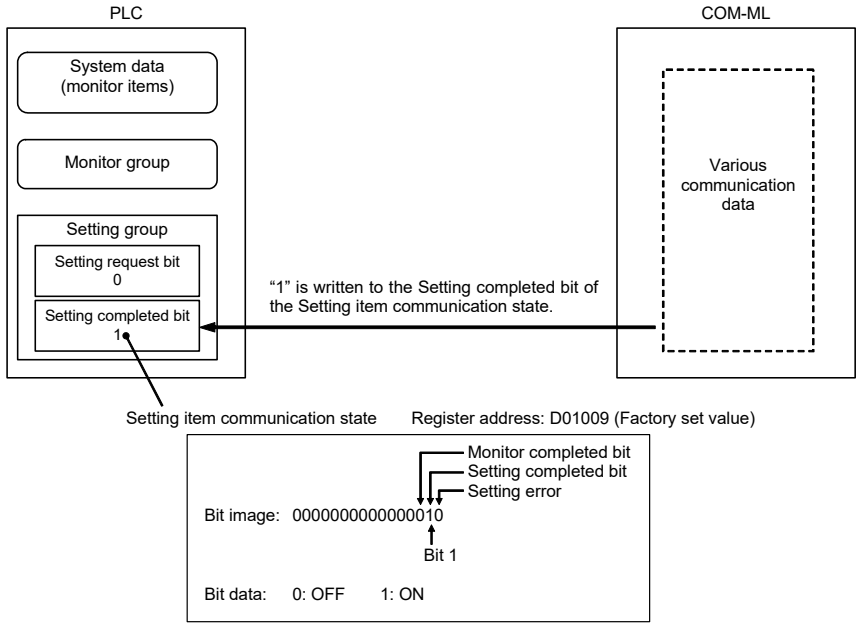
2. All data of the setting group is transferred from PLC to the COM-ML.



3. When reading is finished, the Setting request bit will change to "0" to indicate that reading of data from the PLC is finished.



4. The COM-ML writes the communication state of the setting group to the Setting completed bit of setting item communication state.



At the timing when the Setting completion bit gets 1 (edge), monitor the setting error flag at the same time.
If there is an error in the setting range of the data, the flag of Setting error will change to "1." Check and see if there is an error in the values set in the PLC register.
When Setting error is "1" (ON), it will return to "0" (OFF) the next time data is set normally.

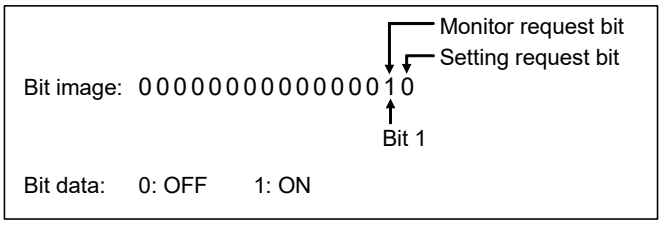
5. If the Setting request bit is 0 at the timing of the next update of the "Setting item communication state", the Setting completion bit returns to 0.

● Monitor request bit (PLC ← COM-ML)

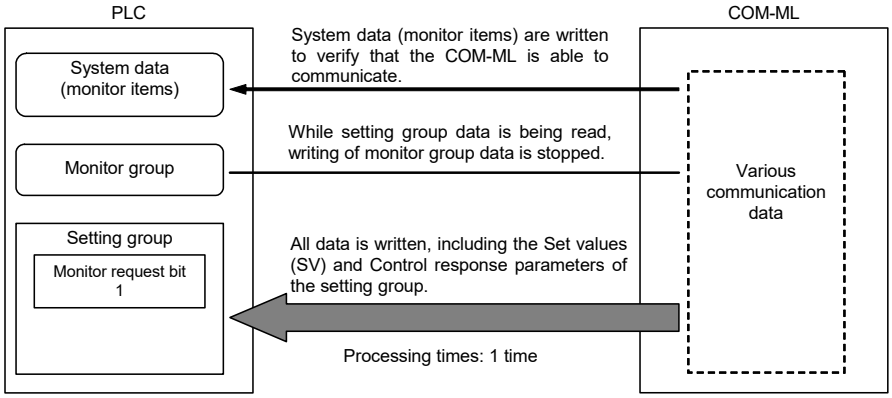
This command requests that the COM-ML write the communication data of the setting group on the PLC side.

[Processing]

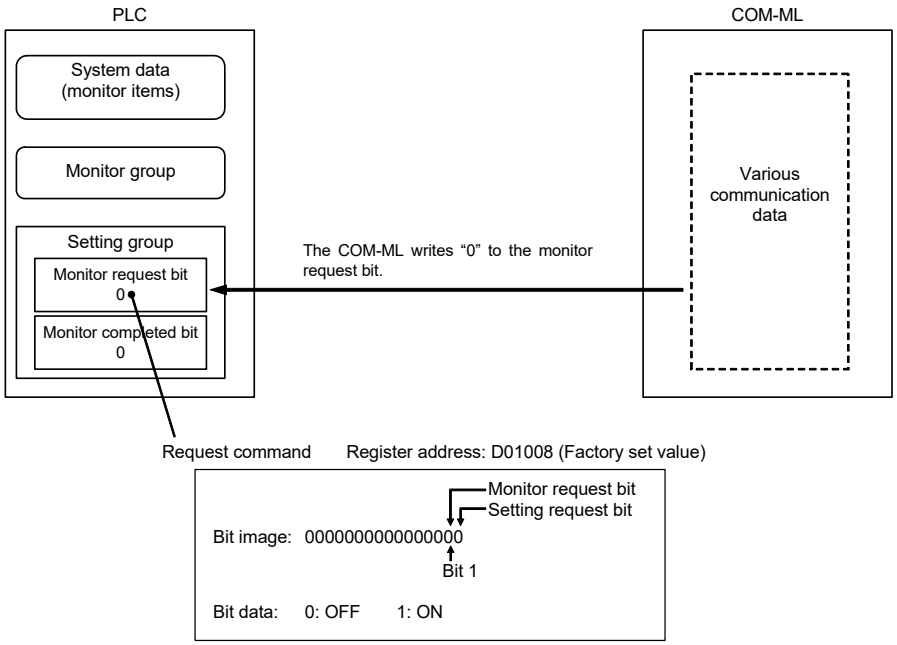
1. When the Monitor request bit of the Request command (D01008) is set to "1," the COM-ML starts to write the communication data of the setting group to the PLC.



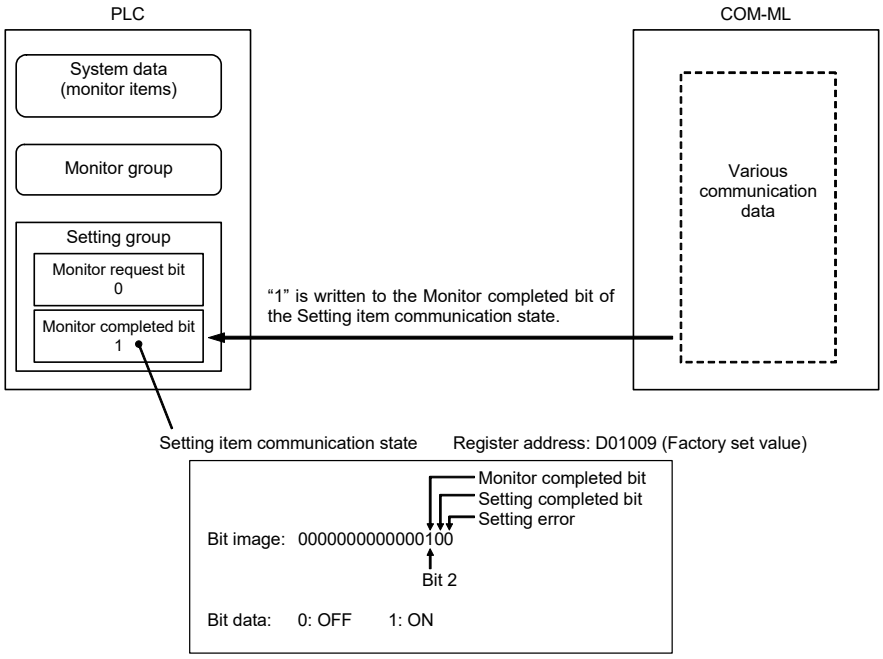
2. Setting group data is written from the COM-ML to the PLC.



3. When writing is finished, the Monitor request bit will change to "0" to indicate that writing of data to the PLC is finished.



4. When writing is finished, the COM-ML writes the communication state of the setting group to the Monitor completed bit of setting item communication state.



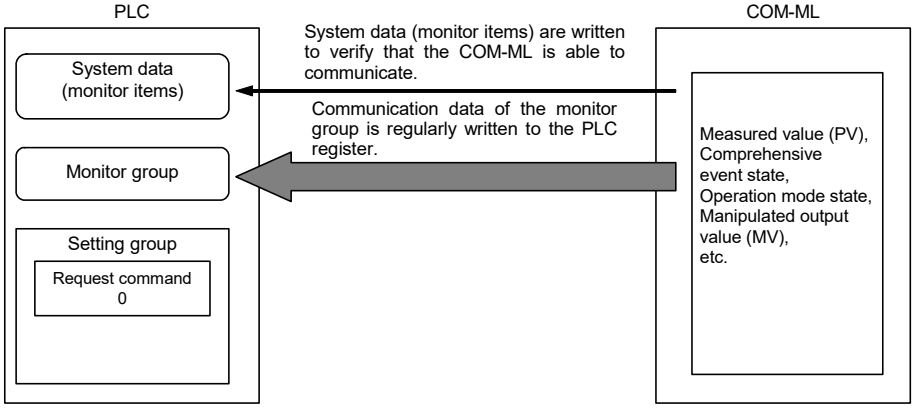
5. If the Monitor request bit is 0 at the timing of the next update of the "Setting item communication state", the Monitor completion bit returns to 0.

● Caution for Request command

The Request command is bit data, however, actual reading/writing of the register takes place in words. For example, after the Setting request bit is set to "1," if the Monitor request bit is set to "1" before the Setting request bit returns to "0," when the Setting request bit returns to "0," the Monitor request bit will be overwritten with the state (Monitor request bit "0") that obtained when the Setting request bit was set to "1."

■ Monitor group (PLC ← COM-ML)

The communication data of the monitor group does not have a Request command setting. The COM-ML regularly repeats writing of communication data to the PLC each communication period.
Note that writing of monitor group data is stopped while the setting group reads or writes by Request command.

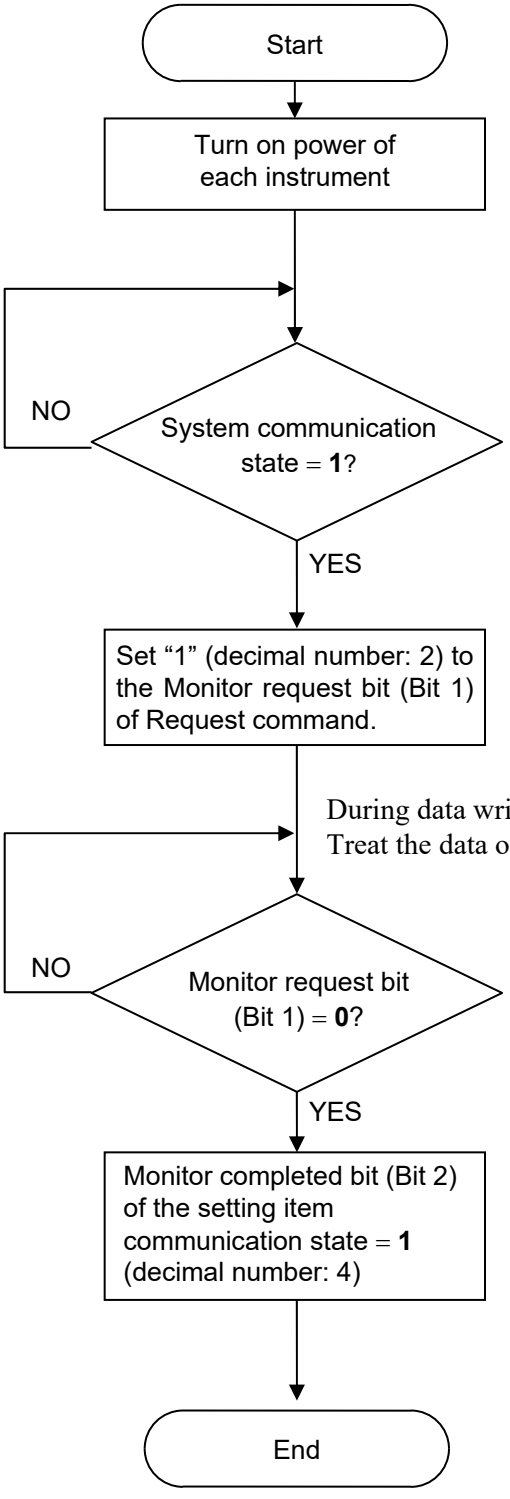


10.2.2 Data transfer procedures

NOTE

Change each set value of SRZ unit from the PLC after the initial settings is made.
If each set value of SRZ unit 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



When the power of the SRZ unit is turned on, data collection of the function modules (Z-TIO, Z-DIO and Z-CT modules) joined to the COM-ML starts.

When data collection is finished, the COM-ML starts 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 state becomes "**1**," PLC communication can be performed.

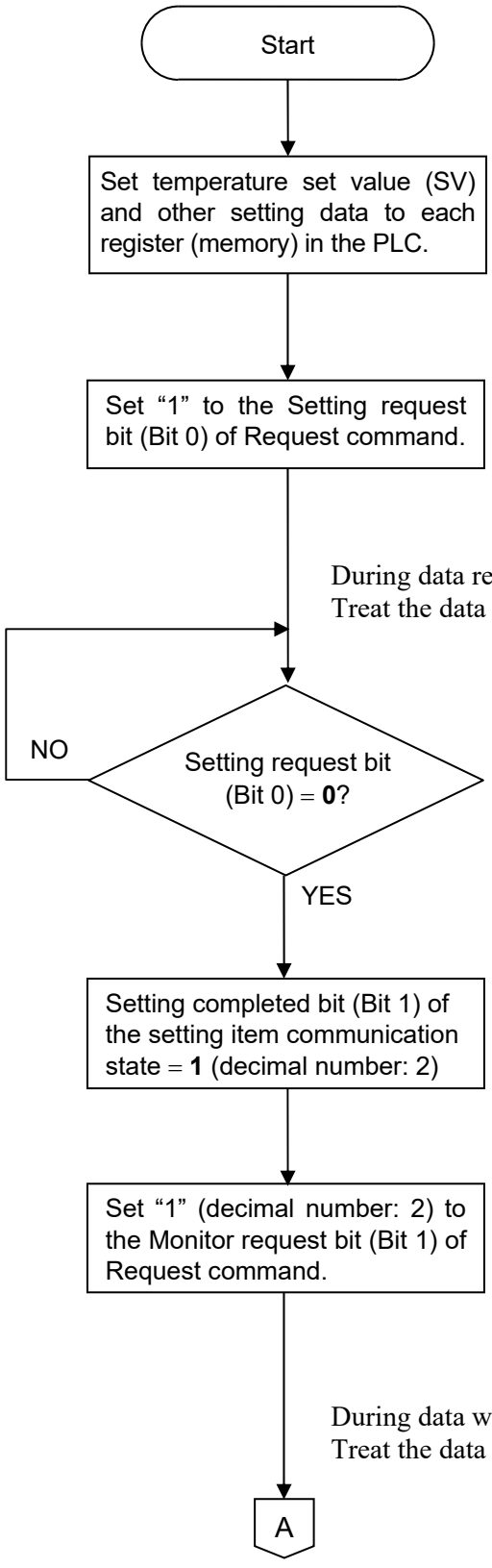
When the Monitor request bit (Bit 1) of the Request command of the PLC register is set to "**1**" (decimal number: 2), the COM-ML starts writing the setting group data to the PLC.

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

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 writing is finished, the COM-ML writes the communication state of the setting group to the Monitor completed bit (Bit 2) of the setting item communication state of the PLC.

■ When the setting group communication data is transferred from PLC to the COM-ML



[Data setting]
When the Setting request bit (Bit 0) of the Request command of the PLC register is set to "**1**," the COM-ML starts reading the setting group data that is set in the register (memory) of the PLC.

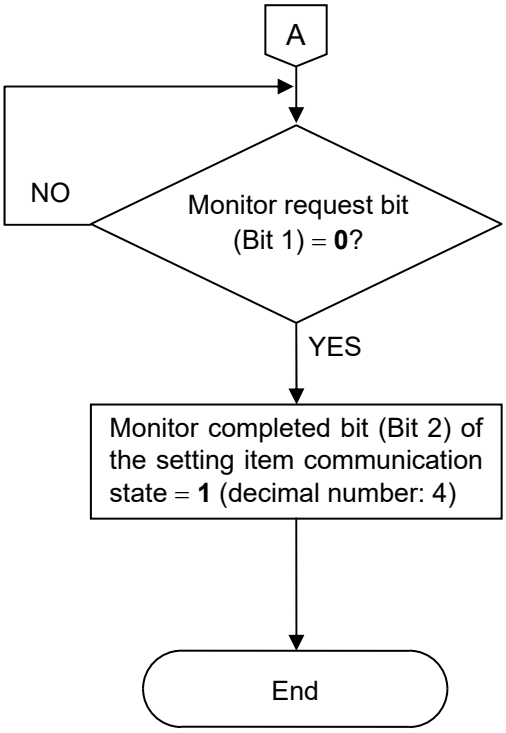
During data read:
Treat the data of all items as inconsistent during the data read.

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.

When reading is finished, the COM-ML writes the communication state of the setting group to the Setting completed bit (Bit 1) of the setting item communication state of the PLC.

[Confirmation of setting data]
To check the data read by the COM-ML from the PLC, the S COM-ML starts writing the setting group data to the PLC when the Monitor request bit (Bit 1) of the Request command of the PLC register is set to "**1**" (decimal number: 2).

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



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 writing is finished, the COM-ML writes the communication state of the setting group to the Monitor completed bit (Bit 2) of the setting item communication state of the PLC.

10.2.3 Data processing precautions

- 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

- Any attempt to write to an unused channel is not processed as an error.

- 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 are updated.

- 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.

10.2.4 When set register address with Zeal

Zeal was originally developed for the Z-COM module in the SRZ series to map the PLC register address, but it can be also used with the COM-ML. It should be noted, however, that "COM-ML" is not displayed on the screen. Replace the “Z-COM” with the “COM-ML” when using it.
If Zeal is not used, Host communication or Loader communication is used to set only the Register start number for the PLC register address. If Zeal is used, the following settings are possible.

- Assigning register addresses for each data item
- Group setting
- Communication mode (attribute) setting, etc.

NOTE

To assign Z-CT module data to register addresses, Zeal must be used.

Zeal communicates with the COM-ML via Loader communication.
In addition, Zeal can be downloaded from the RKC official website.

For the operation of Zeal, refer to Help of Zeal.

■ Assigning register addresses for each data item

In Zeal, the data of each SRZ module used in PLC communication is pre-registered, and thus you select the data that you actually wish to use in PLC communication and set a register address for each selected item.

Because Zeal uses Loader communication, only one COM-ML can be accessed at a time. When multiple SRZ units are connected to one PLC, a register address is set for each unit, and thus duplicate register addresses must not be set for the units.

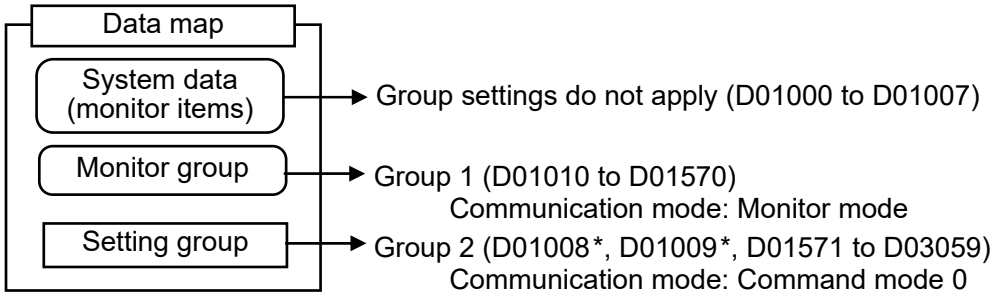
■ Group setting

When setting PLC register addresses using Zeal, the data can be divided into groups (maximum of 30 groups).
When registering an additional register address, the register address will be added as a new group if any of the following apply:

- The Register address number does not immediately follow the previous address.
- The Communication mode (attribute) differs before and after the register address.
- The Auto update setting differs before and after the register address.

Group numbers are automatically assigned in order from 1.

Two groups are set by factory default.



* The D01008 (Request command) and D01009 (Communication state) register addresses are used to set and monitor groups. These are set separately from the other data (D01571 to D03059), and thus the same group applies even if the register address is separate.

■ Communication mode (attribute) setting

The Communication mode (attribute) stipulates the data communication direction and the number of processing times, and thus is specified when the register address is set.

Communication mode (attribute)	Request command	Communication direction	Processing times	Description
Command mode 0	Setting request bit (Cleared after communication)	PLC → COM-ML	1 time	Setting communication is performed when the Setting request bit becomes "1." After communication, the Setting request bit is cleared.
	Monitor request bit (Cleared after communication)	COM-ML → PLC	1 time	Monitor communication is performed when the Monitor request bit becomes "1." After communication, the Monitor request bit is cleared.
Command mode 1	Setting request bit (Cleared after communication)	PLC → COM-ML	1 time	Setting communication is performed when the Setting request bit becomes "1." After communication, the Setting request bit is cleared.
	Monitor request bit (Held after communication)	COM-ML → PLC	Repeat	Monitor communication is performed when the Monitor request bit becomes "1." (The Monitor request bit is not cleared after communication.)
Command mode 2	Setting request bit (Held after communication)	PLC → COM-ML	Repeat	Setting communication is performed when the Setting request bit becomes "1." (The Setting request bit is not cleared after communication.)
	Monitor request bit (Cleared after communication)	COM-ML → PLC	1 time	Monitor communication is performed when the Monitor request bit becomes "1." After communication, the Monitor request bit is cleared.
Command mode 3	Setting request bit (Held after communication)	PLC → COM-ML	Repeat	Setting communication is performed when the Setting request bit becomes "1." (The Setting request bit is not cleared after communication.)
	Monitor request bit (Held after communication)	COM-ML → PLC	Repeat	Monitor communication is performed when the Monitor request bit becomes "1." (The Monitor request bit is not cleared after communication.)
Setting mode	—	PLC → COM-ML	Repeat	Setting communication is performed repeatedly regardless of the request command value.
Monitor mode	—	COM-ML → PLC	Repeat	Monitor communication is performed repeatedly regardless of the request command value.

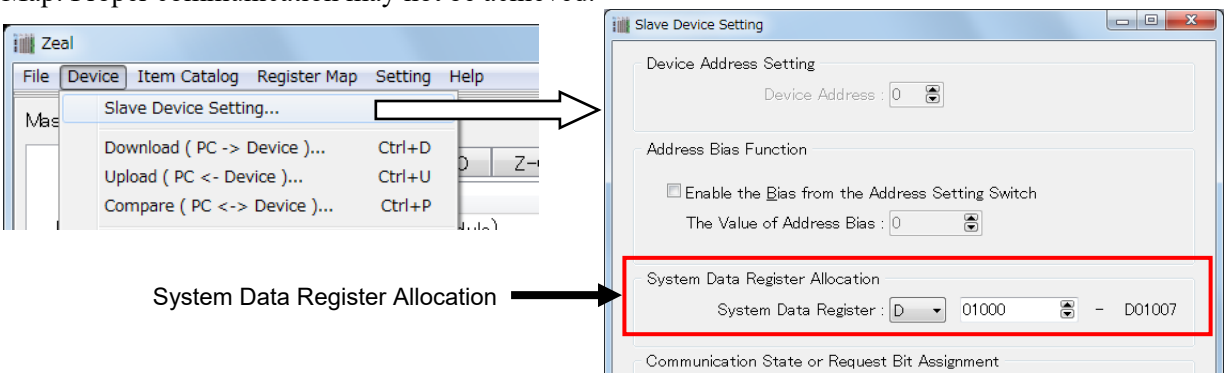
When a command mode from 0 to 3 is set, the register address of the Request command (Setting/Monitor request bit) must be specified. The register address of the command communication state is specified at the same time.

Factory set value
Group 1 (Monitor group): Monitor communication mode
Group 2 (Setting group): Command mode 0 Request command (Setting request bit): D01008, Bit 0
Request command (Monitor request bit): D01008, Bit 1
Communication state: D01009

For processing of the Request command, refer to **10.2.1 PLC communication data transfer (P. 91)**.

■ System data (monitor items) setting

Perform system data allocation in the system data register allocation by following the menu command sequence; “Device,” “Slave Device Setting,” and “System Data Register Allocation.”
Do not assign system data (monitor items) by selecting from Item Catalog and adding to the Register Map. Proper communication may not be achieved.



10.3 PLC Communication Data Map

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

10.3.1 Reference to data map

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

Name	Register address				Struc-ture	Attri-bute	Data range	Factory set value
	16CH	32CH	48CH	64CH				
System communication state	D01000	D01000	D01000	D01000	U	RO	Bit data Bit 0: Data collection condition Bit 1 to Bit 15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0 to 1]	—

(1) Name: Name of communication data

(2) Register address:

A register address of communication data in PLC communication
(Excluding data of the Z-CT module)

16CH: The number of correspondence channel is the register address of 16 channels
32CH: The number of correspondence channel is the register address of 32 channels
48CH: The number of correspondence channel is the register address of 48 channels
64CH: The number of correspondence channel is the register address of 64 channels

If a "Quick start code" was not specified when the order was placed, the register address is 64CH.

Register addresses in this manual are those assigned when the PLC communication environment is set as follows

- Register type: 0 (MITSUBISHI MELSEC series: D register)
- Register start number: 1000

The number of data handled on the SRZ unit is indicated below.

- Number of data per data item in each channel: 16CH: 16, 32CH: 32, 48CH: 48, 64CH: 64
- Number of data per data item in each module: 16CH: 4, 32CH: 8, 48CH: 12, 64CH: 16
- Number of data per data item in each unit: 1
- The total number of communication data: 16CH: 524 items * 32CH: 1036 items * 48CH: 1548 items * 64CH: 2060 items *

* The total number of communication data of the Z-CT module is not included.

Register address assignment will vary depending on the Register type, Register start number, and the Maximum channel data specified when the order was placed. However, when the Zeal PLC register mapping software tool is used, register addresses can be assigned freely.

For the PLC communication environment setting, refer to **10.1 PLC Communication Environment Setting (P. 86)**.

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

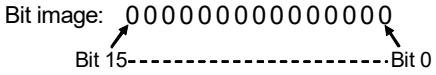
[1] On a Z-TIO module (2-channel type), the communication data of the CH3 and CH4 becomes invalid.

[2] Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data (indicated by ♣ in the name column) for CH2 and CH4 of Z-TIO modules are unused. [Read is possible (0 is shown), but the result of Write is disregarded.]

(4) Attribute: RO: At the time of Monitor request bit "1," COM-ML writes in data to the PLC. (PLC ← COM-ML)

R/W: At the time of Setting request bit "1," COM-ML read out data from the PLC. At the time of Monitor request bit "1," COM-ML writes in data to the PLC. (PLC ↔ COM-ML)

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



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

NOTE

The COM-ML occupies the number of PLC registers that corresponds to the number of channels specified for "Maximum channel data" when the order was placed. Even when the number of function modules (Z-TIO and Z-DIO modules) to be connected to the COM-ML is small, or there is unused communication data, the number of occupied registers does not change. "0" is sent from the COM-ML for function modules (Z-TIO and Z-DIO modules) that are not connected and for unused data.
However, if the data is edited using the Zeal PLC register mapping software tool, register assignments can be performed freely, including adjusting the number of registers to the actual number of channels and deleting unneeded data.

Communication data in the data map is grouped as shown below.

Maximum channel data	Data group	Register address range
16CH	System data (monitor items)	D01000 to D01007
	Monitor group	D01010 to D01150
	Setting group	D01008, D01009, D01151 to D01523
32CH	System data (monitor items)	D01000 to D01007
	Monitor group	D01010 to D01290
	Setting group	D01008, D01009, D01291 to D02035
48CH	System data (monitor items)	D01000 to D01007
	Monitor group	D01010 to D01430
	Setting group	D01008, D01009, D01431 to D02547
64CH	System data (monitor items)	D01000 to D01007
	Monitor group	D01010 to D01570
	Setting group	D01008, D01009, D01571 to D03059

10.3.2 Data map list (COM-ML, Z-TIO and Z-DIO module)

Communication data of Z-CT module is not included in this data map. For communication data of Z-CT module, refer to **10.3.3 Data map list (Z-CT module) (P. 113)**.

Name	Register address				Structure	Attribute	Data range	Factory set value
	16CH	32CH	48CH	64CH				
System communication state [1]	D01000	D01000	D01000	D01000	U	RO	Bit data Bit 0: Data collection condition Bit 1 to Bit 15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0 to 1]	—
Normal communication state [2]	D01001	D01001	D01001	D01001	U	RO	0/1 transfer or Count up at 0 to 30000 (For communication checking) "0" and "1" are repeated for each communication period. Or 1 is added in the range of 0 to 30000 for each communication cycle. (The count is reset to zero when 30000 is reached).	—
Unused	D01002	D01002	D01002	D01002	—	—	—	—
Unused	D01003	D01003	D01003	D01003	—	—	—	—
PLC communication error code [3]	D01004	D01004	D01004	D01004	U	RO	Bit data Bit 0: Unused Bit 1: PLC register read/write error Bit 2: Unused Bit 3: Unused Bit 4: Internal communication error Bit 5 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31]	—

[1] When the power of the SRZ unit is turned on, the COM-ML begins collecting the data of the connected Z-TIO and Z-DIO modules. When System communication state becomes "1," PLC communication can be performed.

[2] The COM-ML writes alternating zeros and ones (0→1→0) to this area each communication period. Or 1 is added in the range of 0 to 30000 for each communication cycle. The count is reset to zero when 30000 is reached. By periodically monitoring this area in the PLC program, it can be determined whether or not the COM-ML has stopped communicating.

[3] Bit 1: 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.

Bit 4: Internal communication error
This turns ON when an internal communication error occurs in the SRZ unit.

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Name	Register address				Structure	Attribute	Data range	Factory set value
	16CH	32CH	48CH	64CH				
PLC communication Unit recognition flag [1]	D01005	D01005	D01005	D01005	U	RO	Bit data Bit 0: SRZ unit Bit 1 to Bit 15: Unused Data 0: No unit exists 1: Unit exists [Decimal number: 0 to 1]	—
Monitor for the number of connected modules	D01006	D01006	D01006	D01006	U	RO	0 to 31 Number of function modules connected to one COM-ML.	—
Number of valid groups	D01007	D01007	D01007	D01007	U	RO	0 to 30	—
Request command [2]	D01008	D01008	D01008	D01008	U	R/W	Bit data Bit 0: Setting request bit Bit 1: Monitor request bit Data 0: OFF 1: ON [Decimal number: 0 to 3]	0
Setting item communication state [3]	D01009	D01009	D01009	D01009	U	RO	Bit data Bit 0: Setting error Bit 1: Setting completed bit Bit 2: Monitor completed bit Data 0: OFF 1: ON [Decimal number: 0 to 7]	—

[1] Indicates the connection state of the SRZ unit.

[2] Request command
Bit 0: Setting request bit
This command requests that the COM-ML read the communication data of the setting group on the PLC side
Bit 1: Monitor request bit
This command requests that the COM-ML write the communication data of the setting group on the PLC side.

[3] This is the communication state of setting group.
Bit 0: Setting error
Turns ON when the PLC data and COM-ML 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.
Bit 1: 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.
Bit 2: Monitor completed bit
When there is a request by Monitor request bit for a COM-ML setting data write, this will turn ON when the COM-ML setting data write is finished.

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Name	Register address				Structure	Attribute	Data range	Factory set value
	16CH	32CH	48CH	64CH				
Measured value (PV)	D01010 ⋮ D01025	D01010 ⋮ D01041	D01010 ⋮ D01057	D01010 ⋮ D01073	C	RO	Input scale low to Input scale high	—
Comprehensive event state	D01026 ⋮ D01041	D01042 ⋮ D01073	D01058 ⋮ D01105	D01074 ⋮ D01137	C	RO	Bit data Bit 0: Event 1 Bit 1: Event 2 Bit 2: Event 3 Bit 3: Event 4 Bit 4: Heater break alarm (HBA) Bit 5: Temperature rise completion Bit 6: Burnout Bit 7 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 127]	—
Operation mode state monitor	D01042 ⋮ D01057	D01074 ⋮ D01105	D01106 ⋮ D01153	D01138 ⋮ D01201	C	RO	Bit data Bit 0: STOP Bit 1: RUN Bit 2: Manual mode Bit 3: Remote mode Bit 4 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15]	—
Manipulated output value (MV) monitor [heat-side] [1] ♣	D01058 ⋮ D01073	D01106 ⋮ D01137	D01154 ⋮ D01201	D01202 ⋮ D01265	C	RO	PID control or Heat/Cool PID control: −5.0 to +105.0 % Position proportioning PID control with feedback resistance (FBR) input: 0.0 to 100.0 %	—
Manipulated output value (MV) monitor [cool-side] [2] ♣	D01074 ⋮ D01089	D01138 ⋮ D01169	D01202 ⋮ D01249	D01266 ⋮ D01329	C	RO	−5.0 to +105.0 %	—
Current transformer (CT) input value monitor [3]	D01090 ⋮ D01105	D01170 ⋮ D01201	D01250 ⋮ D01297	D01330 ⋮ D01393	C	RO	CTL-6-P-N: 0.0 to 30.0 A CTL-12-S56-10L-N: 0.0 to 100.0 A	—
Set value (SV) monitor	D01106 ⋮ D01121	D01202 ⋮ D01233	D01298 ⋮ D01345	D01394 ⋮ D01457	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.	—

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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

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

[2] Cool-side output value of Heat/Cool PID control. This item is valid only during Heat/Cool PID control.

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

NOTE

The CT input cannot measure less than 0.4 A.

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Name	Register address				Structure	Attribute	Data range	Factory set value
	16CH	32CH	48CH	64CH				
Remote setting (RS) input value monitor *	D01122 ⋮ D01137	D01234 ⋮ D01265	D01346 ⋮ D01393	D01458 ⋮ D01521	C	RO	Setting limiter low to Setting limiter high	—
Output state monitor	D01138 ⋮ D01141	D01266 ⋮ D01273	D01394 ⋮ D01405	D01522 ⋮ D01537	M	RO	Bit data Bit 0: OUT1 Bit 1: OUT2 Bit 2: OUT3 Bit 3: OUT4 Bit 4 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15]	—
Digital input (DI) state	D01142 ⋮ D01145	D01274 ⋮ D01281	D01406 ⋮ D01417	D01538 ⋮ D01553	M	RO	Bit data Bit 0: DI1 Bit 1: DI2 Bit 2: DI3 Bit 3: DI4 Bit 4: DI5 Bit 5: DI6 Bit 6: DI7 Bit 7: DI8 Bit 8 to Bit 15: Unused Data 0: Contact open 1: Contact closed [Decimal number: 0 to 255]	—
Digital output (DO) state	D01146 ⋮ D01149	D01282 ⋮ D01289	D01418 ⋮ D01429	D01554 ⋮ D01569	M	RO	Bit data Bit 0: DO1 Bit 1: DO2 Bit 2: DO3 Bit 3: DO4 Bit 4: DO5 Bit 5: DO6 Bit 6: DO7 Bit 7: DO8 Bit 8 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 255]	—
Error code (COM-ML)	D01150	D01290	D01430	D01570	U	RO	Bit data Bit 0: Unused Bit 1: Data back-up error Bit 2 to Bit 5: Unused Bit 6: Stack overflow Bit 7 to Bit 9: Unused Bit 10: Network module error Bit 11 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 1090]	—

* Input value when remote mode is used. This monitors the remote SV of the action selected by the SV selection function.

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Name	Register address				Structure	Attribute	Data range	Factory set value
	16CH	32CH	48CH	64CH				
PID/AT transfer *	D01151 ⋮ D01166	D01291 ⋮ D01322	D01431 ⋮ D01478	D01571 ⋮ D01634	C	R/W	0: PID control 1: Autotuning (AT) When the Autotuning (AT) is finished, the control will automatically returns to 0: PID control.	0

* 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 not be finished normally. 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 over-scale.
		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 over-scale.
	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.

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Name	Register address				Structure	Attribute	Data range	Factory set value
	16CH	32CH	48CH	64CH				
Auto/Manual transfer	D01167 ⋮ D01182	D01323 ⋮ D01354	D01479 ⋮ D01526	D01635 ⋮ D01698	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.	0
Event 1 set value	D01183 ⋮ D01198	D01355 ⋮ D01386	D01527 ⋮ D01574	D01699 ⋮ D01762	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.	50 (50.0)
Event 2 set value	D01199 ⋮ D01214	D01387 ⋮ D01418	D01575 ⋮ D01622	D01763 ⋮ D01826	C	R/W		50 (50.0)
Event 3 set value	D01215 ⋮ D01230	D01419 ⋮ D01450	D01623 ⋮ D01670	D01827 ⋮ D01890	C	R/W		50 (50.0)
Event 4 set value	D01231 ⋮ D01246	D01451 ⋮ D01482	D01671 ⋮ D01718	D01891 ⋮ D01954	C	R/W		50 (50.0)
Set value (SV)	D01247 ⋮ D01262	D01483 ⋮ D01514	D01719 ⋮ D01766	D01955 ⋮ D02018	C	R/W	Setting limiter low to Setting limiter high Set value (SV) is desired value of the control.	TC/RTD: 0 (0.0) V/I: 0.0
Proportional band [heat-side] ♣	D01263 ⋮ D01278	D01515 ⋮ D01546	D01767 ⋮ D01814	D02019 ⋮ D02082	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.	TC/RTD: 30 (30.0) V/I: 30.0
Integral time [heat-side] ♣	D01279 ⋮ D01294	D01547 ⋮ D01578	D01815 ⋮ D01862	D02083 ⋮ D02146	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 PID 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.	240
Derivative time [heat-side] ♣	D01295 ⋮ D01310	D01579 ⋮ D01610	D01863 ⋮ D01910	D02147 ⋮ D02210	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.	60

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

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Name	Register address				Structure	Attribute	Data range	Factory set value
	16CH	32CH	48CH	64CH				
Proportional band [cool-side] ♣	D01311 ⋮ D01326	D01611 ⋮ D01642	D01911 ⋮ D01958	D02211 ⋮ D02274	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.	TC/RTD: 30 (30.0) V/I: 30.0
Integral time [cool-side] ♣	D01327 ⋮ D01342	D01643 ⋮ D01674	D01959 ⋮ D02006	D02275 ⋮ D02338	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.	240
Derivative time [cool-side] ♣	D01343 ⋮ D01358	D01675 ⋮ D01706	D02007 ⋮ D02054	D02339 ⋮ D02402	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.	60
Control response parameter * ♣	D01359 ⋮ D01374	D01707 ⋮ D01738	D02055 ⋮ D02102	D02403 ⋮ D02466	C	R/W	0: Slow 1: Medium 2: Fast When the P or PD action is selected, this setting becomes invalid.	PID control, Position proportioning PID control: 0 Heat/Cool PID control: 2

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

* 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.

When the P or PD action is selected, this setting becomes invalid.

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Name	Register address				Structure	Attribute	Data range	Factory set value
	16CH	32CH	48CH	64CH				
Overlap/Deadband [1] ♣	D01375 ⋮ D01390	D01739 ⋮ D01770	D02103 ⋮ D02150	D02467 ⋮ D02530	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	0 (0.0)
Setting change rate limiter (up)	D01391 ⋮ D01406	D01771 ⋮ D01802	D02151 ⋮ D02198	D02531 ⋮ D02594	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)	D01407 ⋮ D01422	D01803 ⋮ D01834	D02199 ⋮ D02246	D02595 ⋮ D02658	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).	0 (0.0)
Heater break alarm (HBA) set value [2]	D01423 ⋮ D01438	D01835 ⋮ D01866	D02247 ⋮ D02294	D02659 ⋮ D02722	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)	0.0
Heater break determination point	D01439 ⋮ D01454	D01867 ⋮ D01898	D02295 ⋮ D02342	D02723 ⋮ D02786	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.	30.0

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

[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 [for time proportional output],
- 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 [for continuous output],
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.

The heater break alarm (HBA) type sets it by Host communication or Loader communication.

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Name	Register address				Structure	Attribute	Data range	Factory set value
	16CH	32CH	48CH	64CH				
Heater melting determination point	D01455 ⋮ D01470	D01899 ⋮ D01930	D02343 ⋮ D02390	D02787 ⋮ D02850	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.	30.0
PV bias	D01471 ⋮ D01486	D01931 ⋮ D01962	D02391 ⋮ D02438	D02851 ⋮ D02914	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.	0 (0.0)
Manual manipulated output value ♣	D01487 ⋮ D01502	D01963 ⋮ D01994	D02439 ⋮ D02486	D02915 ⋮ D02978	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 PID control (with FBR input): Output limiter low to Output limiter high Position proportioning PID 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.	0.0
Operation mode	D01503 ⋮ D01518	D01995 ⋮ D02026	D02487 ⋮ D02534	D02979 ⋮ D03042	C	R/W	0: Unused 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	3
DO manual output	D01519 ⋮ D01522	D02027 ⋮ D02034	D02535 ⋮ D02546	D03043 ⋮ D03058	M	R/W	Bit data Bit 0: DO1 manual output Bit 1: DO2 manual output Bit 2: DO3 manual output Bit 3: DO4 manual output Bit 4: DO5 manual output Bit 5: DO6 manual output Bit 6: DO7 manual output Bit 7: DO8 manual output Bit 8 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 255]	0
RUN/STOP transfer (Each unit)	D01523	D02035	D02547	D03059	U	R/W	0: STOP (Control stop) 1: RUN (Control start)	0

♣ Parameters only used for Heat/Cool PID control or Position proportioning PID control, therefore data for CH2 and CH4 of Z-TIO modules are unused.

10.3.3 Data map list (Z-CT module)

The communication data of the Z-CT module is not assigned to PLC register addresses prior to shipment, and thus the customer must assign the communication data to the PLC registers.
The Zeal PLC register mapping software tool is used to perform register address assignment. Refer to Help in Zeal to assign the communication data to PLC registers.

Zeal communicates with the COM-ML via Loader communication.
In addition, Zeal can be downloaded from the RKC official website.

Name	Register address	Structure	Attribute	Data range	Number of data *	Factory set value
Current transformer (CT) input value monitor	Not assigned prior to shipment	C	RO	CTL-6-P-Z: 0.0 to 10.0 A CTL-6-P-N: 0.0 to 30.0 A CTL-12-S56-10L-N: 0.0 to 100.0 A	192	—
Load factor conversion CT monitor	Not assigned prior to shipment	C	RO	0.0 to 100.0 A	192	—
Heater break alarm (HBA) state monitor	Not assigned prior to shipment	C	RO	0: Normal 1: Break 2: Melting	192	—
Heater overcurrent alarm state monitor	Not assigned prior to shipment	C	RO	0: Normal 1: Heater overcurrent	192	—
Automatic setting state monitor	Not assigned prior to shipment	M	RO	0: Normal state 1: Automatic setting execution 2: Automatic setting failure	16	—
Heater break/ Heater overcurrent alarm automatic setting selection	Not assigned prior to shipment	C	R/W	0: Automatic setting is disabled. (Alarm set value cannot be automatically set by the push button and communication.) 1: Automatic setting for heater break alarm is enabled. 2: Automatic setting for heater overcurrent alarm set value is enabled. 3: Automatic setting for heater break alarm (HBA) and heater overcurrent alarm set values are enabled.	192	1
Automatic setting transfer	Not assigned prior to shipment	C	R/W	0: Normal state 1: Automatic setting execution 2: Automatic setting failure (RO)	192	0
Heater break alarm (HBA) set value	Not assigned prior to shipment	C	R/W	0.0 to 100.0 A 0.0: Heater break alarm (HBA) function OFF [HBA function OFF: The current transformer (CT) input value monitoring is available.]	192	0.0
Heater break alarm (HBA) selection	Not assigned prior to shipment	C	R/W	0: Heater break alarm (HBA) unused 1: Heater break alarm (HBA) 2: Heater break alarm (HBA) (With alarm interlock function)	192	1
Heater overcurrent alarm set value	Not assigned prior to shipment	C	R/W	0.0 to 105.0 A 0.0: Heater overcurrent alarm function OFF	192	0.0
Heater overcurrent alarm selection	Not assigned prior to shipment	C	R/W	0: Heater overcurrent alarm unused 1: Heater overcurrent alarm 2: Heater overcurrent alarm (With alarm interlock function)	192	1
Heater break alarm (HBA) interlock release	Not assigned prior to shipment	C	R/W	0: Normal state 1: Interlock release execution	192	0
Heater overcurrent alarm interlock release	Not assigned prior to shipment	C	R/W	0: Normal state 1: Interlock release execution	192	0

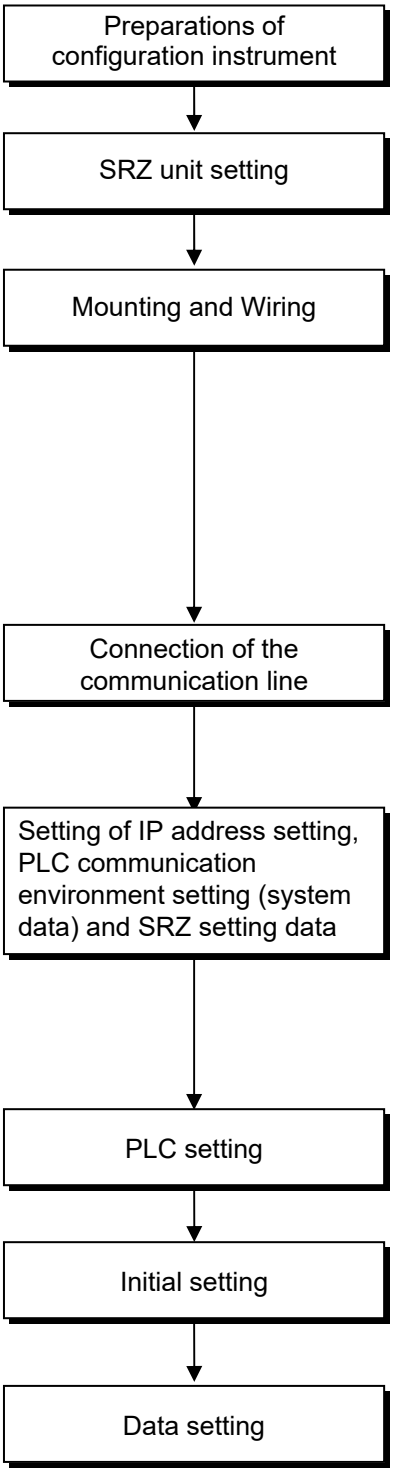
* Maximum number of data (Max 12 channels per one module, Max 16 modules per one unit)

For the communication data of Z-CT module, refer to **Z-CT Instruction Manual [Detailed version] (IMS01T21-E□)**.

10.4 Usage Example

In this Chapter, an example of data setting procedure is explained when the COM-ML (SRZ unit) is connected to a PLC of MITSUBISHI MELSEC series. In this example, PLC communication environment settings (system data) and SRZ setting data settings are configured by loader communication.

10.4.1 Handling procedures



☞ Refer to **10.4.2 System configuration (P. 115)**.

☞ Refer to **10.4.3 SRZ unit setting (P. 117)**.

☞ For information on joining the COM-ML to function modules and mounting, refer to **3. MOUNTING (P. 7)**.

☞ For the power supply wiring, refer to **4. WIRING (P. 12)**.

☞ For the Input/Output wiring of Z-TIO, Z-DIO module, refer to **SRZ Instruction Manual (IMS01T04-E☐)**.
For the Input/Output wiring of Z-CT module, refer to **Z-CT Instruction Manual (IMS01T16-E☐)**.

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

☞ For information on connecting the Loader communication, refer to **10.4.4 Connection of Loader communication (P. 118)**.

☞ For information on connecting the SRZ unit to a PLC, refer to **10.4.5 Connection with PLC (P. 118)**.

☞ Refer to **10.4.6 Setting of IP address setting, PLC communication environment setting and SRZ setting data (P. 119)**.

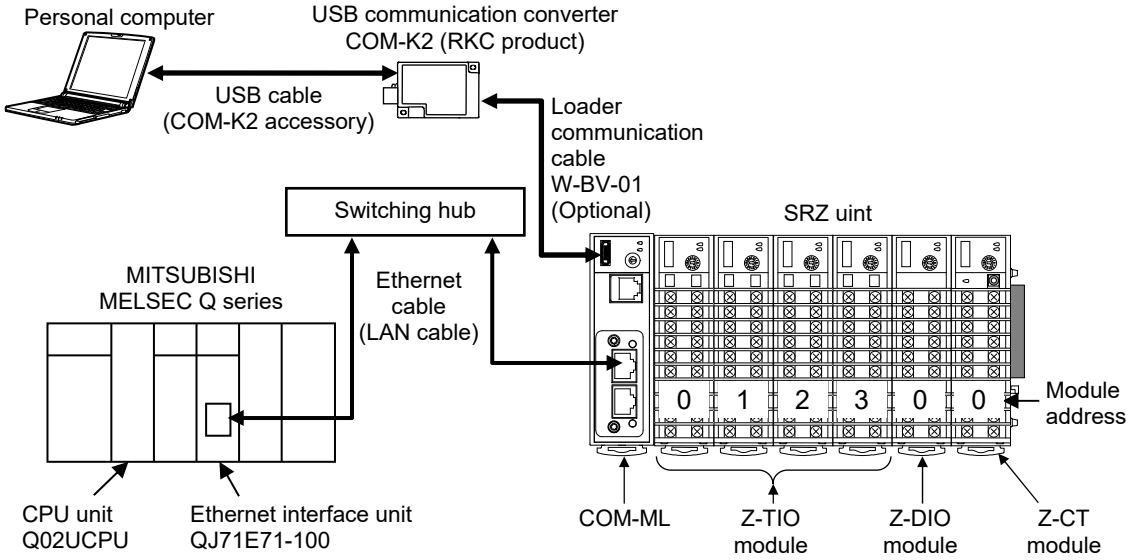
☞ For the communication data description of Z-TIO, Z-DIO module, refer to **SRZ Instruction Manual (IMS01T04-E☐)**.
For the communication data description of Z-CT module, refer to **Z-CT Instruction Manual [Detailed version] (IMS01T21-E☐)**.

☞ Refer to **10.4.7 PLC setting (P. 129)**.

☞ Refer to **10.4.8 Initial setting (P. 130)**.

☞ Refer to **10.4.9 Data setting (P. 131)**.

10.4.2 System configuration



■ Use instruments

- **MITSUBISHI MELSEC Q series**
  CPU unit Q02UCPU 1
  Ethernet interface unit QJ71E71-100 1
  Power supply, I/O module, etc.

- **Ethernet communication converter COM-ML**
  COM-ML-14 ∗02/113A: 1

- **SRZ function module**
  Temperature control module Z-TIO-A 4
  Digital I/O module Z-DIO-A 1
  Current transformer (CT) input module Z-CT-A 1

- **Communication converter**
  USB communication converter COM-K2 (RKC product) 1

- **Connection cable for connecting COM-ML and personal computer**
  USB cable (COM-K2 accessory) [Cable length: 1 m] 1
  W-BV-01 (COM-K2 optional) [Cable length: 1.5 m] 1

- **Others**
  Switching hub 1
  Ethernet cable (LAN cable) 2

- **Personal computer**
  Software of the following must be installed in a personal computer.
  - Communication tool PROTEM2
  - PLC register mapping software tool “Zeal” (for register address assignment of Z-CT module)

  The above software can be downloaded from the RKC official website.

■ Communication software

● Communication tool “PROTEM2”

Use the PROTEM2 to configure the PLC communication environment setting and the data setting of each module.
PROTEM2 is an integrated configuration support software to manage parameter setting and measured values of our controllers.

The PROTEM2 can be downloaded from the official RKC website. Check our website for more details and operating environment of the PROTEM2.

● PLC register mapping software tool “Zeal”

Z-CT module data has not been assigned to PLC register addresses, and thus this must be done using Zeal.

[Using a default project]
The PLC register addresses indicated in **10.3 PLC Communication Data Map (P. 102)** are registered in the Zeal default project. The default project can be selected in the “Welcome” window to use the factory set register addresses.
As such, when assigning Z-CT module data, the default project can be used to add only Z-CT module data, leaving the data of other modules unchanged.

📖 Zeal was originally developed for the Z-COM module in the SRZ series to map the PLC register address, but it can be also used with the COM-ML. It should be noted, however, that "COM-ML" is not displayed on the screen. Replace the "Z-COM" with the "COM-ML" when using it.

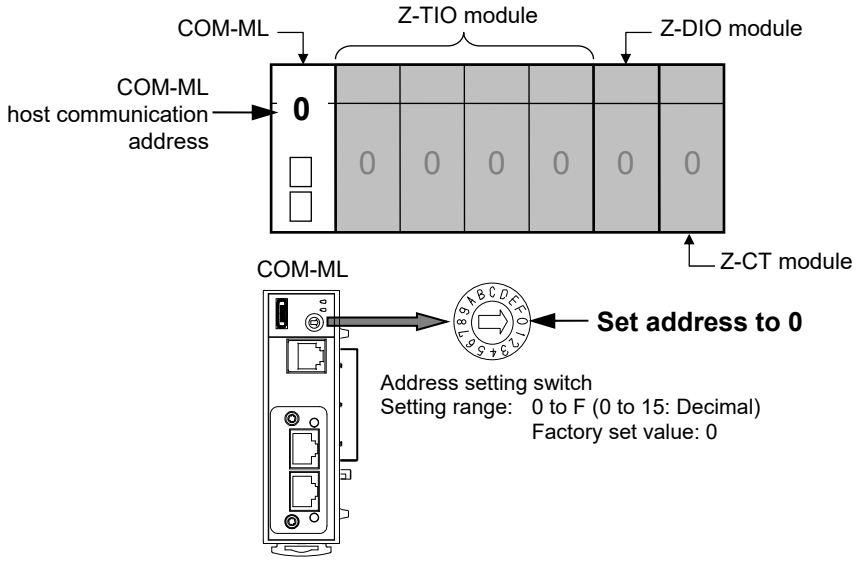
☞ For details, refer to Help of Zeal.

10.4.3 SRZ unit setting

■ COM-ML host communication address setting

Set the COM-ML host communication address by address setting switch of front of COM-ML. For this setting, use a small blade screwdriver. In this application, make the setting as follows.

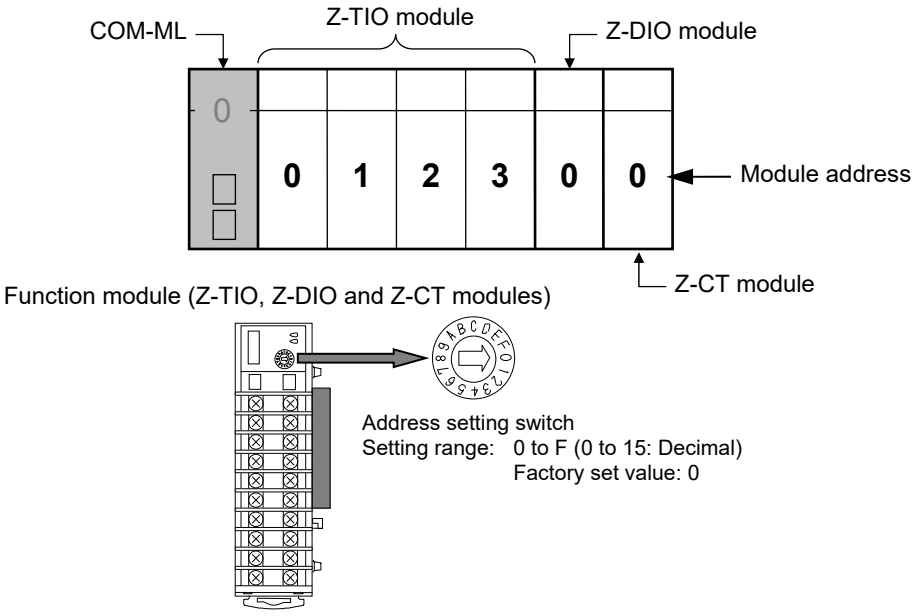
COM-ML host communication address: 0



■ Function modules (Z-TIO, Z-DIO and Z-CT modules) address setting

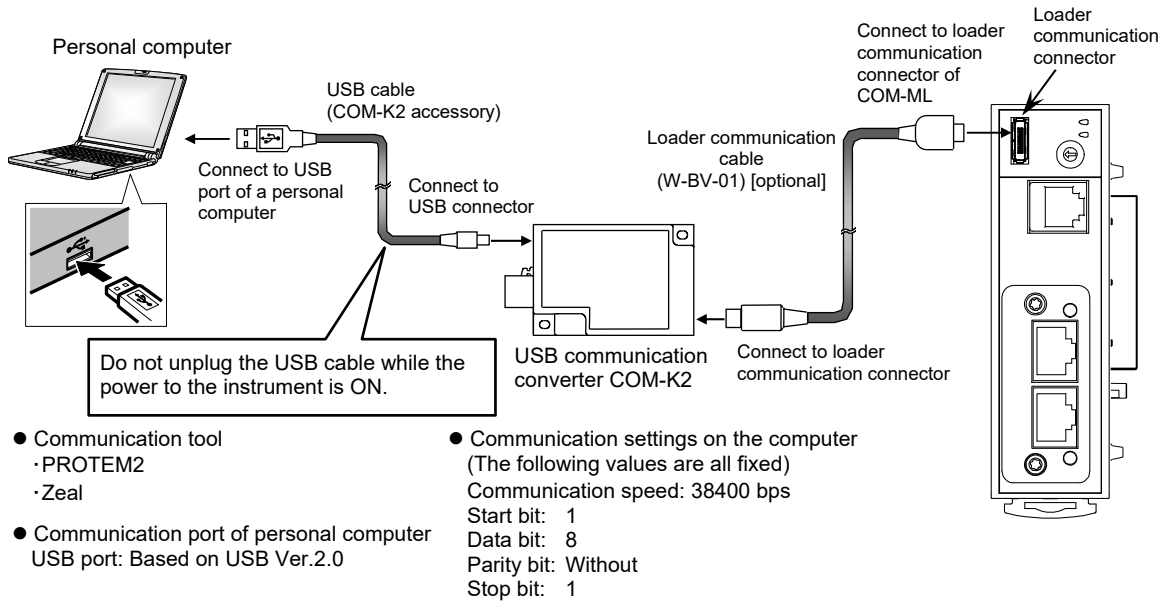
Set the module address by address setting switch of front of module. For this setting, use a small blade screwdriver. In this application, make the setting as follows.

Z-TIO module address: 0, 1, 2, 3
Z-DIO module address: 0
Z-CT module address: 0



10.4.4 Connection of loader communication

Connect a personal computer, COM-K2 and COM-ML (SRZ unit).

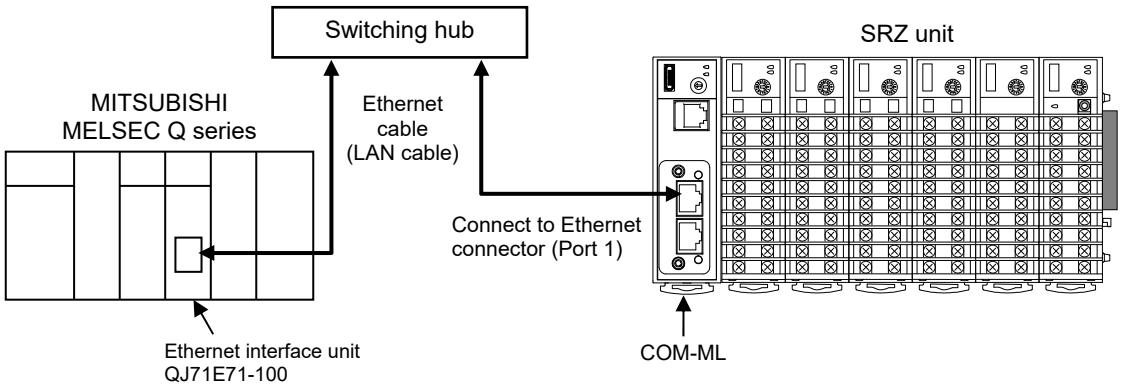


During the loader communication, the COM-ML requires an external power source. The COM-ML will not function on the USB power from a personal computer alone.

For the COM-K2, refer to **COM-K2 Instruction Manual (IMR01Z02-E□)**.

10.4.5 Connection with PLC

Connect the converter to Ethernet via a switching hub.
Can connect with the Ethernet cable (LAN cable) which is marketed.



The details of the connectable connector for the PLC, refer to the instruction manual for the used PLC.

10.4.6 Setting of IP address, PLC communication environment setting and SRZ setting data

■ Turn on the power of the personal computer and SRZ unit

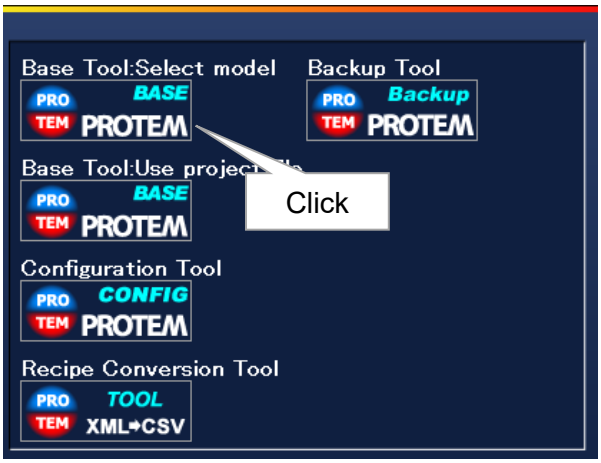
The COM-ML starts collecting data on function modules (Z-TIO, Z-DIO and Z-CT modules) jointed from the time when the power is turned on. Data collection takes about 8 seconds.
If you will use Loader communication to configure the COM-ML System data (setting items) and the communication data of the function modules (Z-TIO, Z-DIO and Z-CT modules), do so after data collection is finished.

■ Setting the IP address

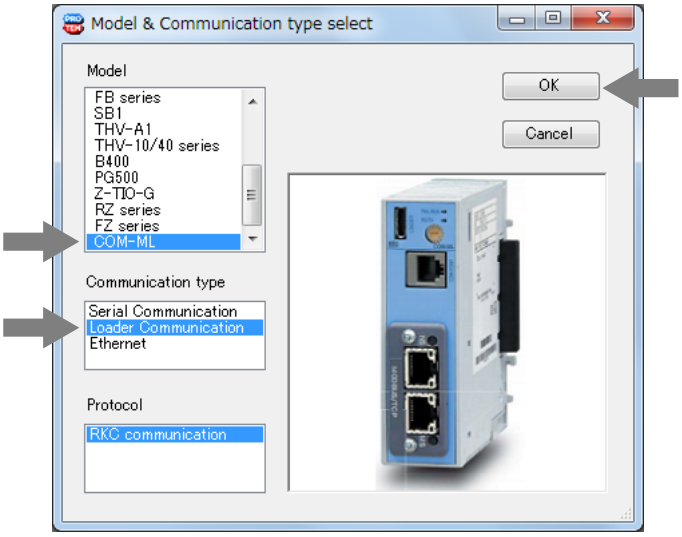
Use PROTEM2 to set the IP address of the COM-ML and the IP address (remote IP address) and the TCP port number of the PLC to be connected.

1. Start PPROTEM 2
If you use the PROTEM 2 for the first time, you have to create a new project and set a communication port.

2. Click “Base Tool: Select model”

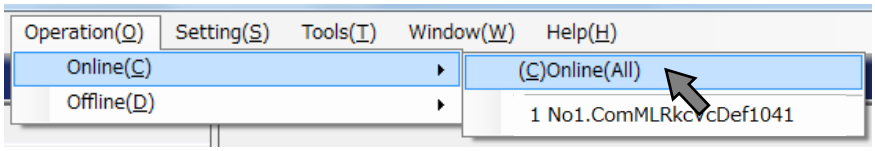


3. Select the “COM-ML” and “Loader Communication,” and click “OK”

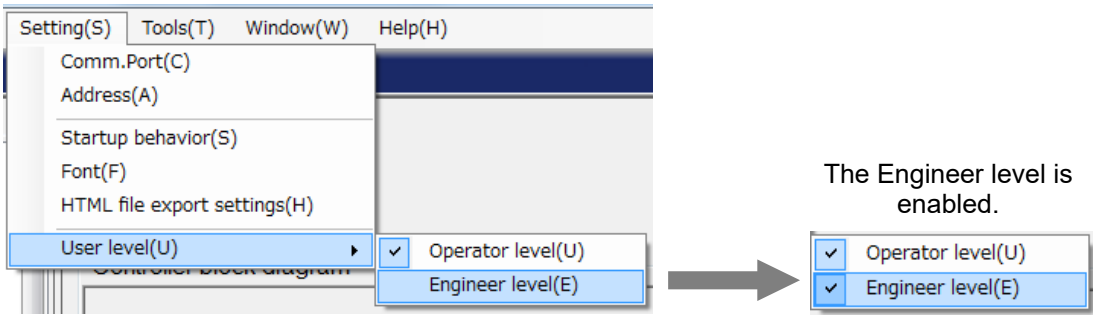


4. Set “Address” setting “0” and “Comm. Port” setting “38400 bps, Data 8-bit, Without parity, Stop 1-bit.” (The COM port number depends on the connected personal computer.)

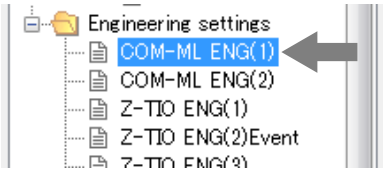
5. Click the menu bar in order of “Operation,” “Online,” and “Online(All).”



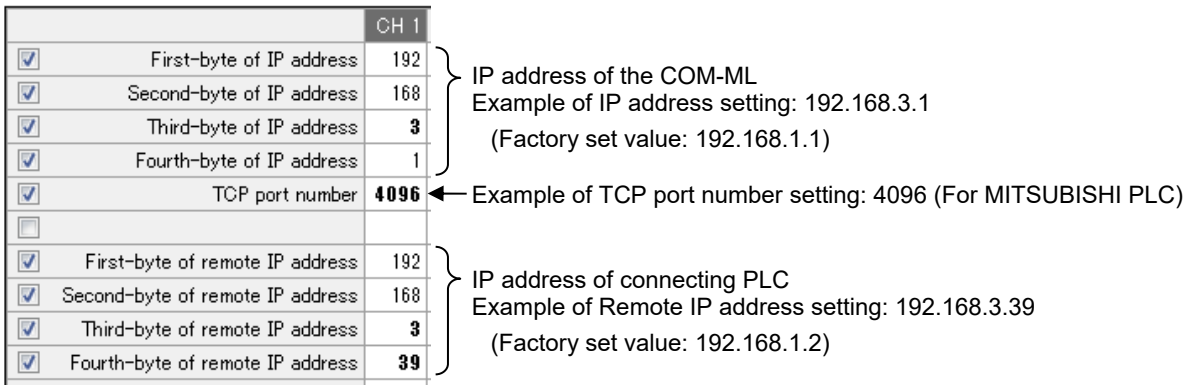
6. Click the menu bar in order of “Setting” and “User level” to activate the “Engineer level.”



7. Select “COM-ML ENG(1)” under the “Engineering settings.”



8. Set IP address, TCP port number and Remote IP address.



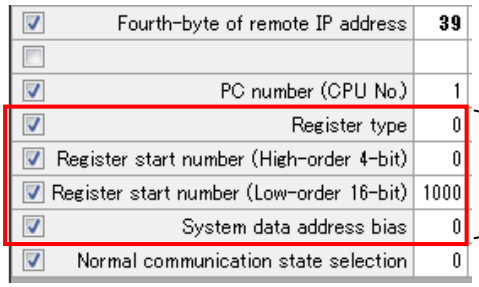
■ Set the PLC communication environment setting (system data)

After the IP address setting, set the system data (setting items). In this application, use the factory set value.

Setting items	Identifier	Set value (Factory set value)
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
System data address bias	QQ	0

These values can be changed to change the starting number of the PLC communication data register.

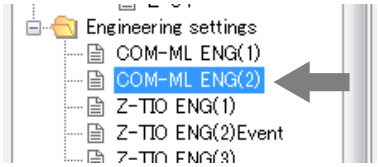
Set “Register type,” “Eegister start number” and “System data address baias.”



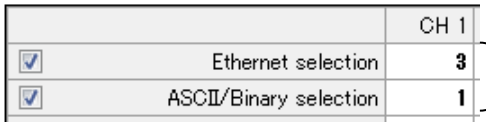
●PLC communication environment setting (system data)
Register type: 0 (D register)
Register start number (High-order 4-bit): 0
Register start number (Low-order 16-bit): 1000
System data address bias: 0

■ Confirm the Ethernet selection

1. Select “COM-ML ENG(2)” under the “Engineering settings.”



2. Confirm that the Ethernet selection is “MITSUBISHI MELSEC series (QnA-compatible 3E frame [SLMP])” and the ASCII/Binary selection is “Binary.”



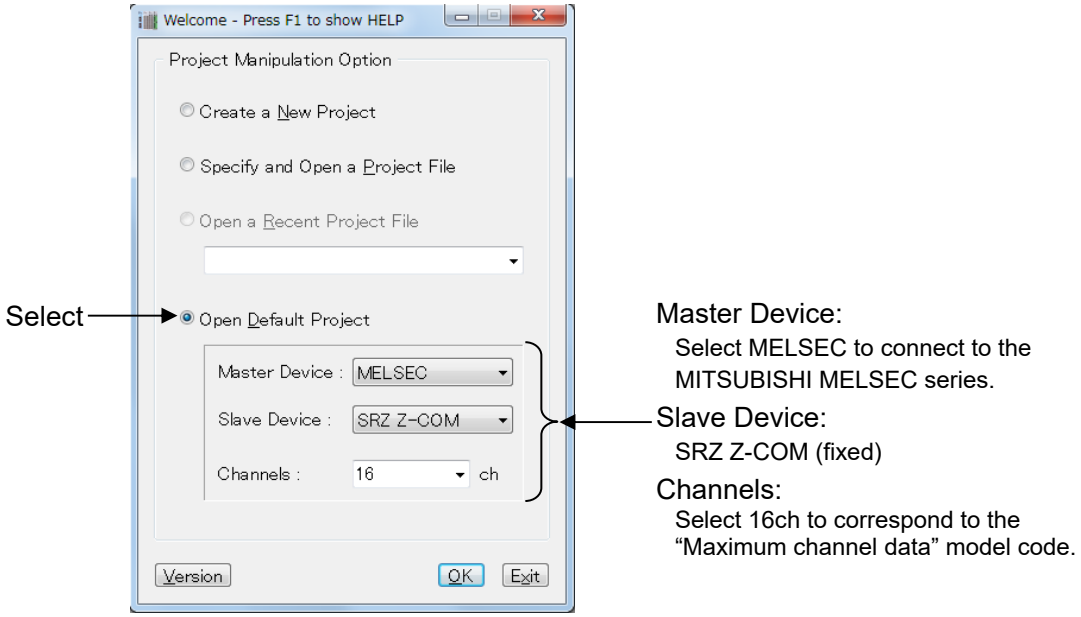
Ethernet selection: 3 (MITSUBISHI MELSEC series QnA-compatible 3E frame [SLMP])
ASCII/Binary selection: 1 (Binary)

■ Assigning Z-CT module data

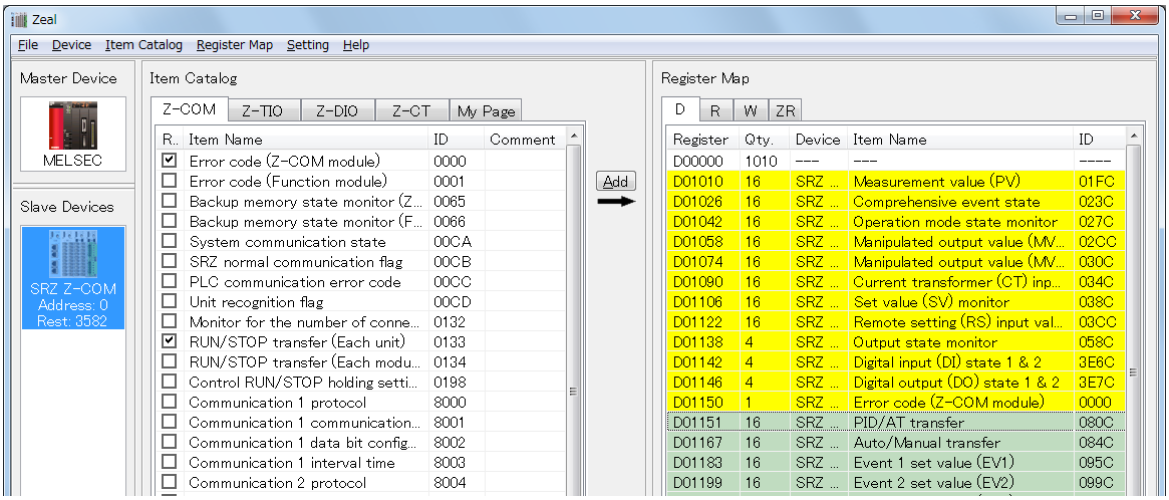
Z-CT module data has not been assigned to PLC register addresses, and thus this must be done using Zeal. An example of assigning Z-CT module data using Zeal is shown below.

☞ Refer to **10.2.4 When set register address with Zeal (P. 99)**.

1. Start Zeal. The "Welcome" window will appear.
For data other than that of the Z-CT module, the factory set values will be used, so select Open Default Project and click the [OK] button. If the Master Device or Channels setting is different from the connection configuration, change the setting and click the [OK] button.



2. The main window will open. The Item Catalog and Register Map appear in the main window.
The Item Catalog shows the data for which PLC communication is possible for each module type. The Register Map shows the register addresses of registered (factory set value) PLC communication data. At this point, Z-CT module data has not been registered.



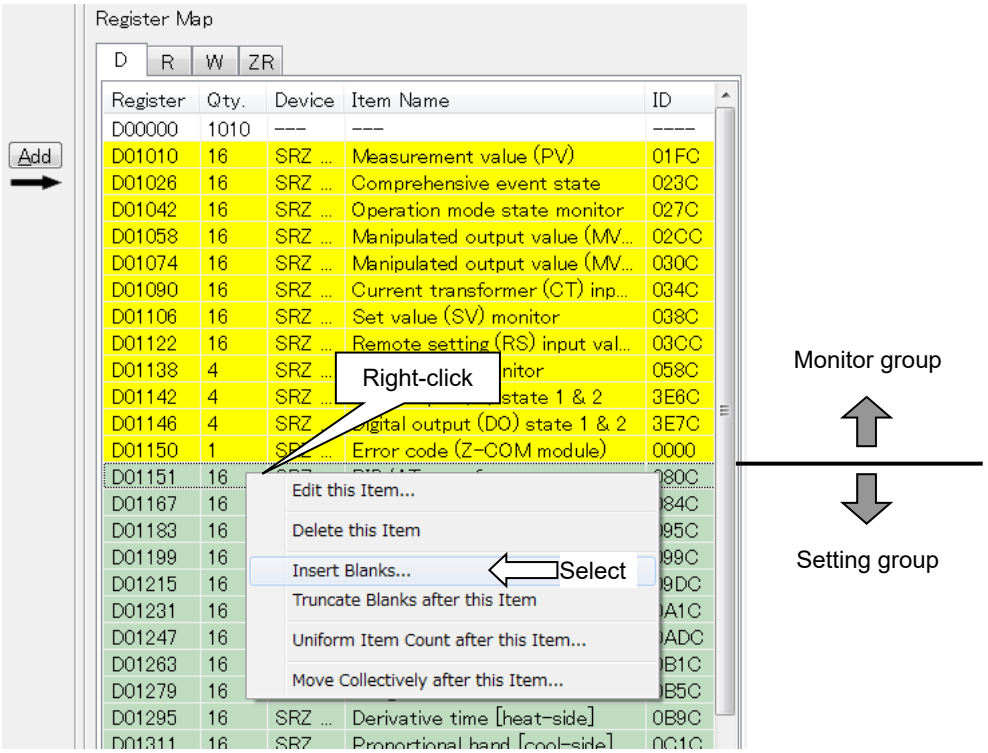
3. Click a Z-CT tab of Item Catalog, and display data of the Z-CT module.
Register the following data here.

Name	Q'ty	Communication mode (attribute)	Group
Current transformer (CT) input value monitor [1]	12	Monitor mode	Monitor group
Heater break alarm (HBA) state monitor [1]	12	Monitor mode	
Automatic setting state monitor [1]	4	Monitor mode	
Heater break/Heater overcurrent alarm automatic setting selection [2]	12	Command mode 0	Setting group
Automatic setting transfer [2]	12	Command mode 0	
Heater break alarm (HBA) set value [2]	12	Command mode 0	
Heater break alarm (HBA) selection [2]	12	Command mode 0	
Heater break alarm (HBA) interlock release [2]	12	Command mode 0	

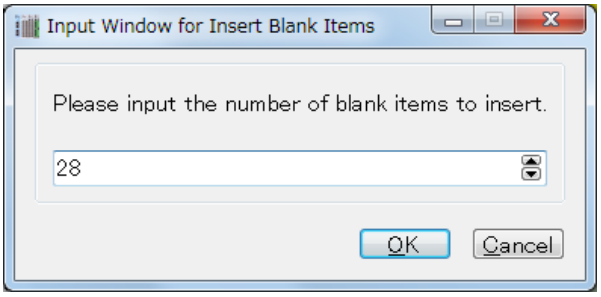
[1] This is added to the monitor group of the registered register map.
[2] This is added to the setting group of the registered register map.

☞ For data items, refer to **10.3.3 Data map list (Z-CT module) (P. 113)** or **Z-CT Instruction Manual [Detailed version] (IMS01T21-E☐)**.
For attribute and groups, refer to **10.2.4 When set register address with Zeal (P. 99)** or **Help of Zeal**.

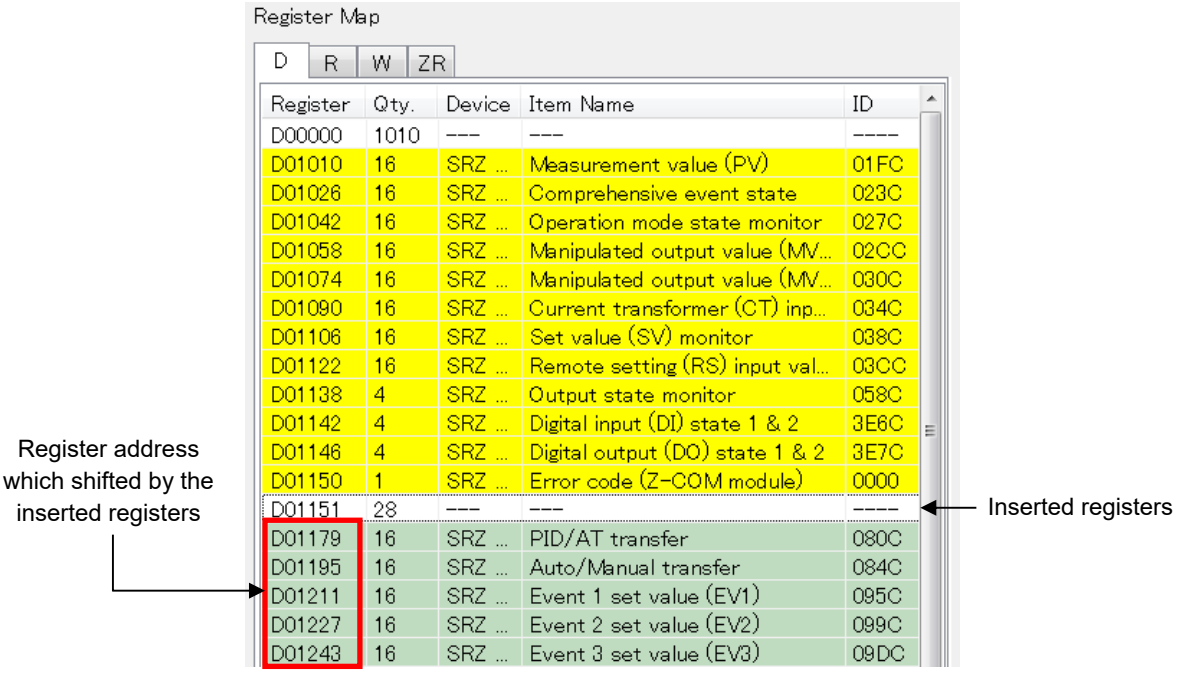
4. To add the [Current transformer (CT) input value monitor], [Heater break alarm (HBA) state monitor], and [Automatic setting state monitor] monitor items of the Z-CT module to the registered register map, blank registers for the monitor items to be added must be inserted between the monitor group and setting group in the register map.
Right-click the communication item (at the top of the setting group) immediately under the monitor group in the register map and select "Insert Blanks…".



5. The Input Window for Insert Blank Items dialog box appears. Enter “28” (12+12+4) for the number of register addresses of the monitor items to be inserted, and click [OK].



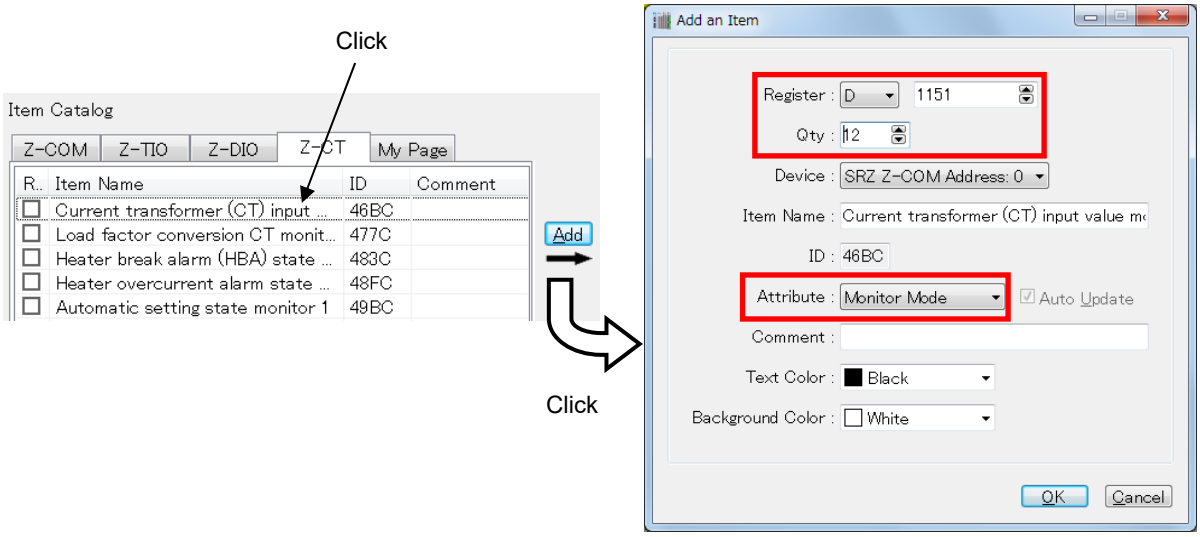
6. Blank registers for 28 items are allocated between the monitor group and setting group. The register addresses of the setting group automatically shift by an amount equal to the inserted registers.



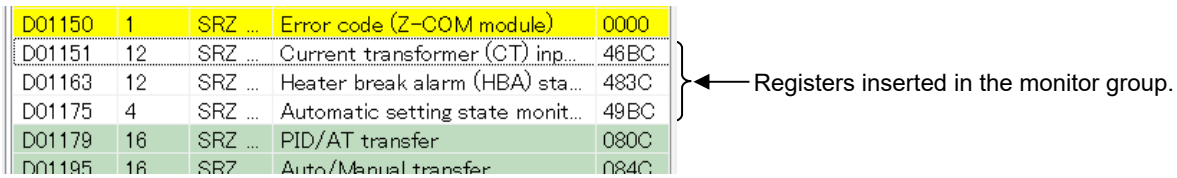
Register	Qty.	Device	Item Name	ID
D00000	1010	---	---	----
D01010	16	SRZ ...	Measurement value (PV)	01FC
D01026	16	SRZ ...	Comprehensive event state	023C
D01042	16	SRZ ...	Operation mode state monitor	027C
D01058	16	SRZ ...	Manipulated output value (MV...	02CC
D01074	16	SRZ ...	Manipulated output value (MV...	030C
D01090	16	SRZ ...	Current transformer (CT) inp...	034C
D01106	16	SRZ ...	Set value (SV) monitor	038C
D01122	16	SRZ ...	Remote setting (RS) input val...	03CC
D01138	4	SRZ ...	Output state monitor	058C
D01142	4	SRZ ...	Digital input (DI) state 1 & 2	3E6C
D01146	4	SRZ ...	Digital output (DO) state 1 & 2	3E7C
D01150	1	SRZ ...	Error code (Z-COM module)	0000
D01151	28	---	---	----
D01179	16	SRZ ...	PID/AT transfer	080C
D01195	16	SRZ ...	Auto/Manual transfer	084C
D01211	16	SRZ ...	Event 1 set value (EV1)	095C
D01227	16	SRZ ...	Event 2 set value (EV2)	099C
D01243	16	SRZ ...	Event 3 set value (EV3)	09DC

7. Add the data of the monitor group.
Click Current transformer (CT) input value monitor in the Item Catalog and click [Add]. The Add an Item window opens. Set the values below and click [OK].

Register: Set D01151, the first address of the inserted registers.
Qty: Set 12 for the quantity of register address data.
Attribute: Select Monitor Mode
Other items are used as they appear.



8. Set Heater break alarm (HBA) state monitor and Automatic setting state monitor similarly.
Set the register addresses so that they follow in succession after Current transformer (CT) input value monitor.



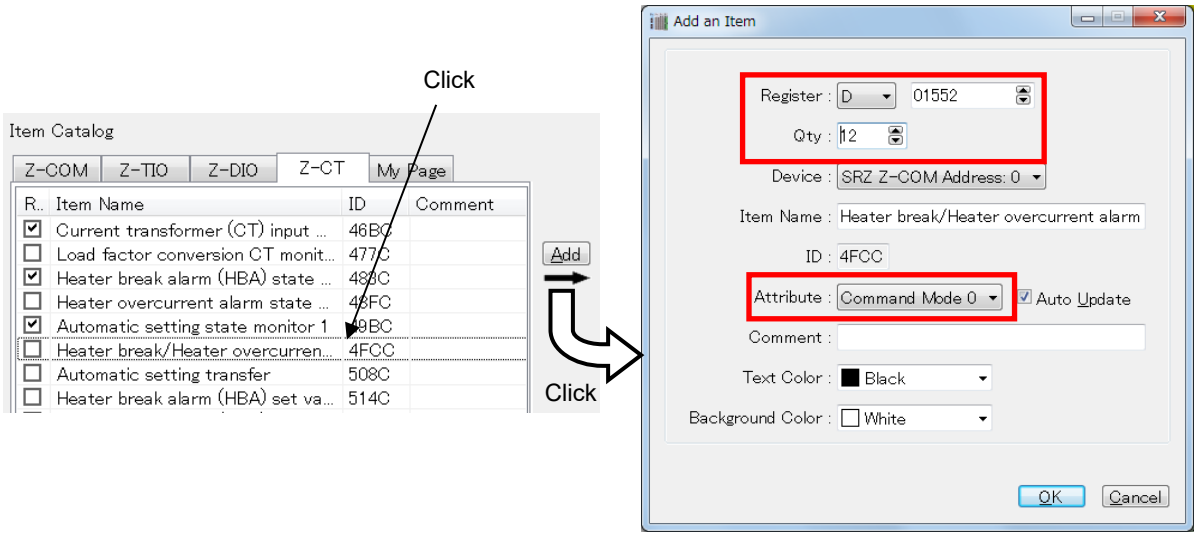
9. Add the data of the setting group.
Click Heater break/Heater overcurrent alarm automatic setting selection in the Item Catalog and click [Add]. The Add an Item window opens. Set the values below and click [OK].

Register: The subsequent address (the next address after the last address of the setting group) of the registered register map appears automatically. Use that address.

Qty: Set 12 for the quantity of register address data.

Attribute: Select Command Mode 0

Other items are used as they appear.



10. Enter the remaining items, referring to the table in step ***3***.

11. After entering the items, check the connection to the device. If there is no problem, the edited data will be downloaded to the COM-ML.
Select Device → Download (PC -> Device)(D)… in the menu bar to check the data. If there is no problem, downloading begins. A window will open to show the progress of the download.

12. When the download is finished, disconnect the loader cable. Turn off the power of the COM-ML (SRZ unit) and then turn it back on to make the downloaded data take effect.

■ PLC communication register address

When the register type is set to "D register" and the register start number is set to "1000" in the system data (setting item), the register addresses of the data in PLC communication after the addition of the Z-CT module data using Zeal are as shown below.

In this example, the "Maximum channel data" of the COM-ML is specified as 16 channels, and thus the register addresses of PLC communication are based on the 16CH specification (refer to **10.3 PLC Communication Data Map, P. 102**); however, because Z-CT module data was added in Zeal, the register addresses of PLC communication differ from the 16CH specification.

Register address	Communication items		Group
D01000	System communication state		System data (monitor items)
D01001	Normal communication state		
D01002	Do not use this register address as it is used for the internal processing.		
D01003			
D01004	PLC communication error code		
D01005	PLC communication unit recognition flag		
D01006	Monitor for the number of connected modules		
D01007	Number of valid groups		
D01008	Request command		Setting group
D01009	Setting item communication state		
D01010 to D01025	Measured value (PV)	CH1 to CH16	Monitor group
D01026 to D01041	Comprehensive event monitor	CH1 to CH16	
D01042 to D01057	Operation mode state monitor	CH1 to CH16	
D01058 to D01073	Manipulated output value (MV) monitor [heat-side]	CH1 to CH16	
D01074 to D01089	Manipulated output value (MV) monitor [cool-side]	CH1 to CH16	
D01090 to D01105	Current transformer (CT) input value monitor	CH1 to CH16	
D01106 to D01121	Set value (SV) monitor	CH1 to CH16	
D01122 to D01137	Remote setting (RS) input value monitor	CH1 to CH16	
D01138 to D01141	Output state monitor	CH1 to CH4	
D01142	Digital input (DI) state	CH1*	
D01143 to D01145	Unused	CH2 to CH4	
D01146	Digital output (DO) state	CH1*	
D01147 to D01149	Unused	CH2 to CH4	
D01150	Error code (COM-ML)	CH1	
D01151 to D01162	Current transformer (CT) input value monitor	CH1 to CH12	
D01163 to D01174	Heater break alarm (HBA) state monitor	CH1 to CH12	
D01175 to D01178	Automatic setting state monitor	CH1 to CH4	
D01179 to D01194	PID/AT transfer	CH1 to CH16	Setting group
D01195 to D01210	Auto/Manual transfer	CH1 to CH16	
D01211 to D01226	Event 1 set value	CH1 to CH16	
D01227 to D01242	Event 2 set value	CH1 to CH16	
D01243 to D01258	Event 3 set value	CH1 to CH16	

* The data of one Z-DIO module (DI: 8 channels, DO: 8 channels) is handled in 1 channel, and thus CH2 to CH4 are not used.

Continued on the next page.

Continued from the previous page.

Register address	Communication items		Group
D01259 to D01274	Event 4 set value	CH1 to CH16	Setting group
D01275 to D01290	Set value (SV)	CH1 to CH16	
D01291 to D01306	Proportional band [heat-side]	CH1 to CH16	
D01307 to D01322	Integral time [heat-side]	CH1 to CH16	
D01323 to D01338	Derivative time [heat-side]	CH1 to CH16	
D01339 to D01354	Proportional band [cool-side]	CH1 to CH16	
D01355 to D01370	Integral time [cool-side]	CH1 to CH16	
D01371 to D01386	Derivative time [cool-side]	CH1 to CH16	
D01387 to D01402	Control response parameter	CH1 to CH16	
D01403 to D01418	Overlap/Deadband	CH1 to CH16	
D01419 to D01434	Setting change rate limiter (up)	CH1 to CH16	
D01435 to D01450	Setting change rate limiter (down)	CH1 to CH16	
D01451 to D01466	Heater break alarm (HBA) set value	CH1 to CH16	
D01467 to D01482	Heater break determination point	CH1 to CH16	
D01483 to D01498	Heater melting determination point	CH1 to CH16	
D01499 to D01514	PV bias	CH1 to CH16	
D01515 to D01530	Manual manipulated output value	CH1 to CH16	
D01531 to D01546	Operation mode	CH1 to CH16	
D01547	DO manual output	CH1*	
D01548 to D01550	Unused	CH2 to CH4	
D01551	RUN/STOP transfer (Each unit)	CH1	
D01552 to D01563	Heater break/Heater overcurrent alarm automatic setting selection	CH1 to CH12	
D01564 to D01575	Automatic setting transfer	CH1 to CH12	
D01576 to D01587	Heater break alarm (HBA) set value	CH1 to CH12	
D01588 to D01599	Heater break alarm (HBA) selection	CH1 to CH12	
D01600 to D01611	Heater break alarm (HBA) interlock release	CH1 to CH12	

* The data of one Z-DIO module (DI: 8 channels, DO: 8 channels) is handled in 1 channel, and thus CH2 to CH4 are not used.

NOTE

In this example, since "Open default project" is selected at the beginning, system data (monitor items) are already assigned.
Do not assign system data (monitor items) by selecting from Item Catalog and adding to the Register Map. Proper communication may not be achieved.

☞ For how to assign system data (monitor items), refer to ■ **System data (monitor items) setting (P. 101)**.

■ Setting SRZ setting data by Loader communication

Communication data of function modules (Z-TIO, Z-DIO and Z-CT modules) that cannot be set using PLC communication are set using Loader communication (engineering data, operation data, etc.).
PROTEM2 activated to set "**■Setting the IP address (P.119)**" can be used without any changes.

NOTE

If the control is the control start (RUN), transfer to the control stop (STOP).
Engineering data can only be set in Z-TIO, Z-DIO and Z-CT modules when the SRZ unit is stopped.

☞ For the data range of function modules (Z-TIO, Z-DIO and Z-CT modules), refer to **9. COMMUNICATION DATA LIST (P. 46)**.

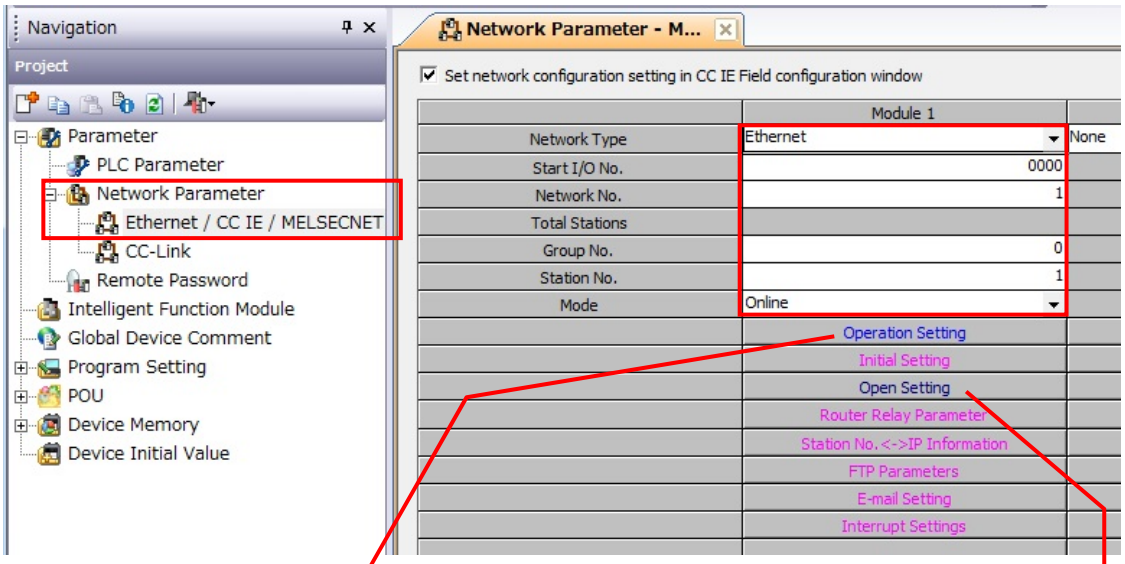
☞ For the function description of Z-TIO and Z-DIO modules communication data, refer to **SRZ Instruction Manual (IMS01T04-E□)**.
For the function description of Z-CT module communication data, refer to **Z-CT Instruction Manual [Detailed version] (IMS01T21-E□)**.

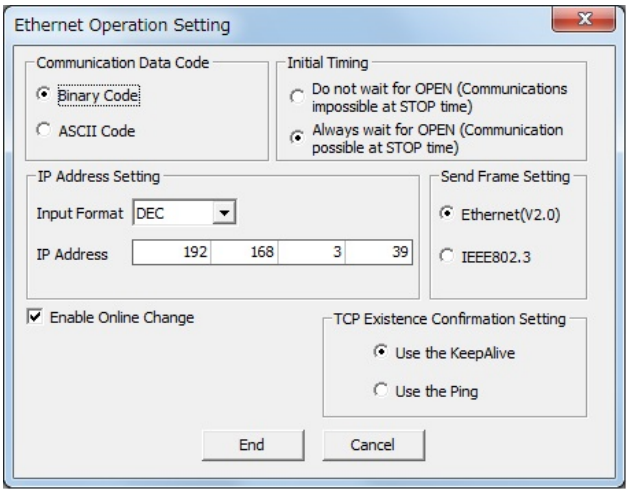
■ Turn off the power of the host computer and SRZ unit

To make the newly configured system data (settings) take effect, turn off the power of the host computer and SRZ unit.
The settings will take effect the next time the power is turned on.

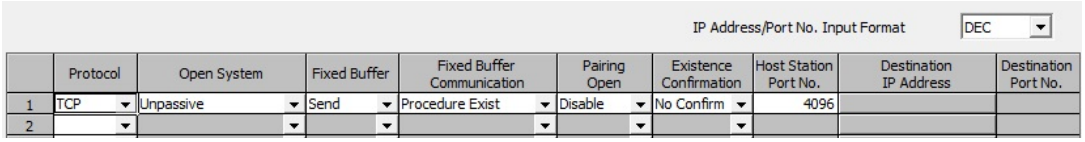
10.4.7 PLC setting

Set the Ethernet Interface Unit (QJ71E71-100) of MITSUBISHI MELSEC Q series as follows. Use GX Works 2 (Programming software for MITSUBISHI MELSEC) to do this setting.





Open Setting

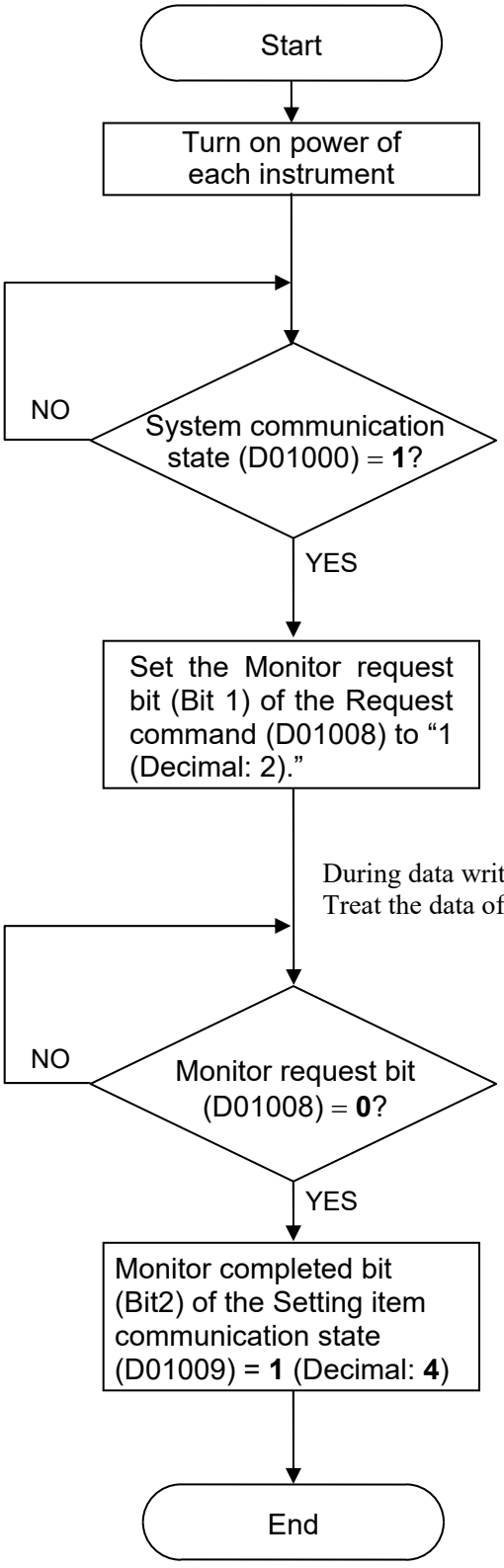


☞ For detailed settings of the PLC, refer to the instruction manual for the PLC being used.

10.4.8 Initial setting

NOTE

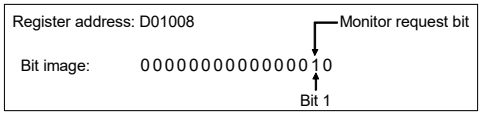
Change each set value of SRZ unit from the PLC after the initial settings are made.



Turn on the power of the SRZ unit, the PLC, and the host computer. The COM-ML starts collecting data on function modules (Z-TIO, Z-DIO and Z-CT modules) jointed from the time when the power is turned on.

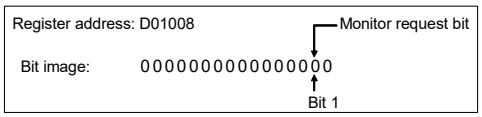
When data collection is finished, the COM-ML starts writing the communication data of the monitor group to the PLC.
When monitor group writing starts, System communication state changes to "**1**."
When the System communication state becomes "**1**," PLC communication can be performed.

When the Monitor request bit (Bit 1) of Request command (**D01008)** of the PLC register is set to "**1** (Decimal: **2**)," the COM-ML begins writing the setting group to the PLC.



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

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.



When writing is finished, the COM-ML writes the communication state of the setting group to the Monitor completed bit (Bit 2) of the Setting item communication state (**D01009**) of the PLC.

10.4.9 Data setting

It is assumed that initial setting is finished.

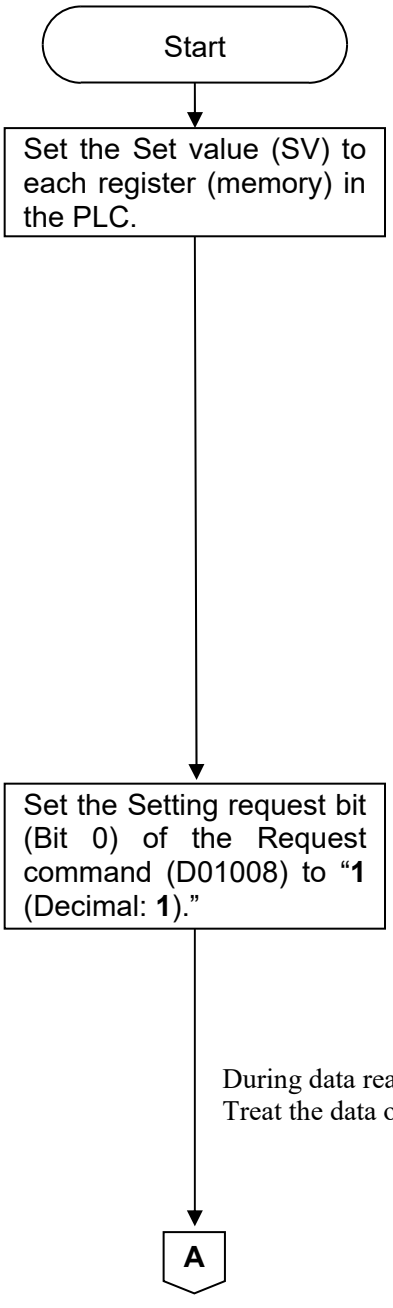
NOTE

If each set value of SRZ unit 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 SRZ unit as follows:

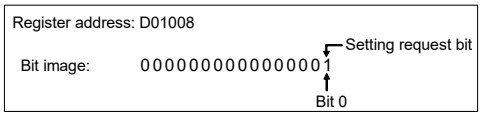
Set value (SV): CH1 = 100 CH2 = 100 CH3 = 110 CH4 = 110 CH5 = 120 CH6 = 120
CH7 = 130 CH8 = 130 CH9 = 140 CH10 = 140 CH11 = 150 CH12 = 150
CH13 = 80 CH14 = 80 CH15 = 50 CH16 = 50



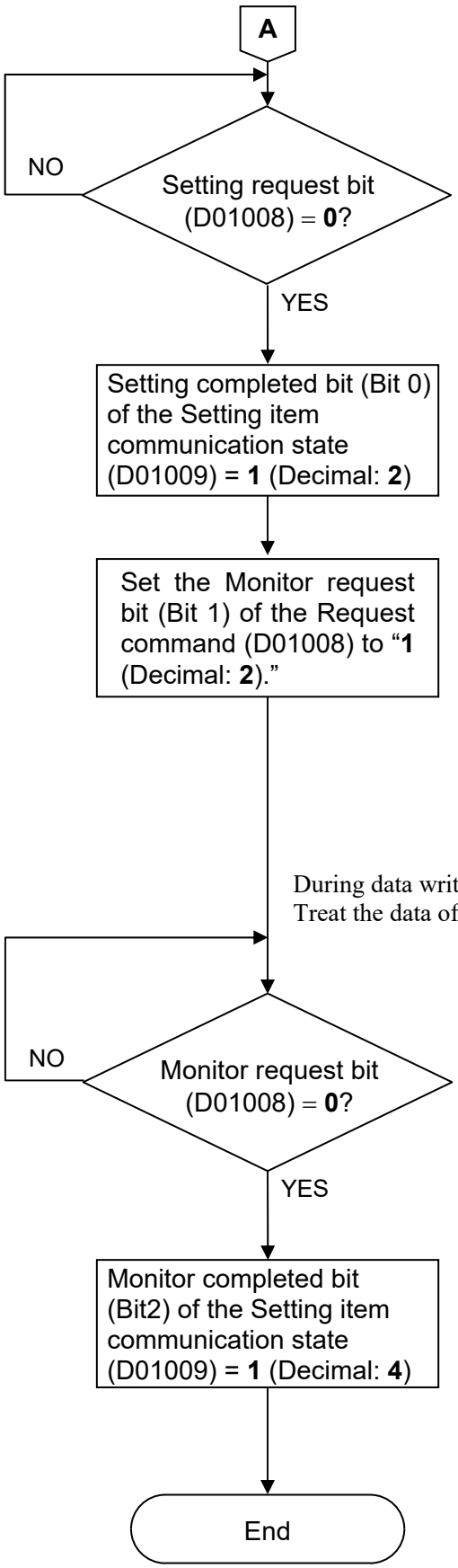
Register address of Set value (SV) (refer to P. 127)

Register address	Communication item	Set value
D01275	Set value (SV) CH1	100
D01276	Set value (SV) CH2	100
D01277	Set value (SV) CH3	110
D01278	Set value (SV) CH4	110
D01279	Set value (SV) CH5	120
D01280	Set value (SV) CH6	120
D01281	Set value (SV) CH7	130
D01282	Set value (SV) CH8	130
D01283	Set value (SV) CH9	140
D01284	Set value (SV) CH10	140
D01285	Set value (SV) CH11	150
D01286	Set value (SV) CH12	150
D01287	Set value (SV) CH13	80
D01288	Set value (SV) CH14	80
D01289	Set value (SV) CH15	50
D01290	Set value (SV) CH16	50

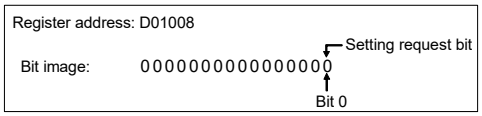
When the Setting request bit (Bit 0) of Request command (**D01008**) of the PLC register is set to "**1** (Decimal: **1**) ," the COM-ML begins reading the setting group data set in the PLC register (memory).



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

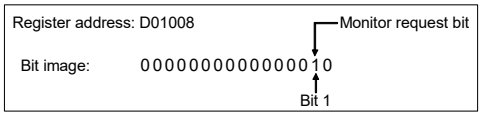


If the Setting request bit (Bit 0) of the Request command (**D01008**) of the PLC register is "**0**," this indicates that reading of data from the PLC is finished.



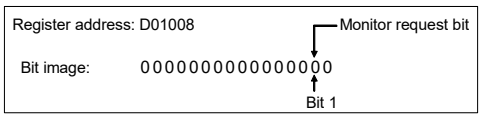
When reading of the setting group data ends, the COM-ML writes the setting group communication state to the Setting completed bit (Bit 1) of PLC setting item communication state (**D01009**).

[Confirmation of setting data]
To confirm the data read by the COM-ML from the PLC, the COM-ML will begin writing the setting group data to the PLC when "**1**" (Decimal: **2**) is set in Monitor request bit (Bit 1) of Request command (**D01008)** of the PLC register.



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

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.



When writing is finished, the COM-ML writes the communication state of the setting group to the Monitor completed bit (Bit 2) of the Setting item communication state (**D01009**) of the PLC.

11. TROUBLESHOOTING

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

If the instrument needs to replaced, 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. Make sure that the wiring is correct before applying power to the instrument.
- 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

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

NOTE

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.

■ COM-ML

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 COM-ML
The FAIL/RUN lamp flashes (green): Recoverable fault occur	Data bac-kup error (Error code 2) EEPROM read/write 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.
	Stack overflow (Error code 64) Runaway of the program, etc.	
	Network module error (Error code 512) Operational failure of the network module in the COM-ML	Confirm the wiring, remove the noise, and 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.
The FAIL/RUN lamp flashes (red): Major fault occur	RAM value abnormal Power suooly voltage monitoring error Watchdog timer 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.

■ Ethernet

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
	IP address acquisition by DHCP is enabled and the IP address changes each time the device connects to the network	Set the fixed IP address
	Wrong IP address setting	Confirm the settings and set them correctly
NS lamp: OFF MS lamp: ON (green)	No IP address	Confirm the settings and set them correctly
NS lamp: Flashs (green) MS lamp: ON (green)	Modbus/TCP: Waiting for connection	Confirm the settings and set them correctly
	PLC communication (MAPMAN): Normal operation	
NS lamp: Flashs (red) MS lamp: ON (green)	Process Active Timeout	Confirm the wiring or condition of scanner side and connect correctly
NS lamp: ON (red) MS lamp: ON (green)	Duplicate IP address, or FATAL error	Restart after the resetting is made so that IP address is not duplicated If the error is repeated after the restart, please contact RKC sales office or the agent.
MS lamp: Flashs (red)	Recoverable fault	Turn off the power once and then turn it on again.
MS lamp: ON (red)	Major fault (COM-ML failure)	Replace COM-ML
Link/Activity lamp: OFF	Link has not been established. Destination is not on Ethernet.	Confirm that the power supply is ON and the Ethernet cable is connected correctly. Then permit the connection of the destination device.
An IP address cannot be acquired by DHCP	The IP address of the COM-ML is set to other than 0.0.0.0.	Set the IP address to 0.0.0.0.
	Problem on the network	Consult your network administrator.

■ Modbus/TCP

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
	Wrong IP address setting	Confirm the settings and set them correctly
	There is length of query message exceeds set range	
	The number of data points is not twice the specified number of data points at the time of data write	
Exception code: 01H	Illegal function code (An unsupported function code was specified)	Confirm the function code
Exception code: 02H	Illegal register address (When the mismatched register address is specified)	Confirm the address of holding register
Exception code: 03H	Illegal data value • The number of specified data points was out of the following range during data read or write. Function code 03H: 1 to 125 Function code 10H: 1 to 123 • When the data written exceeds the setting range	Confirm the setting data

■ PLC communication (MAPMAN)

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" • 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 COM-ML DIP switch and set them correctly • If the communication settings of COM-ML are set via Host or Loader communications, confirm the communication settings of Host communication and set them correctly.
	Wrong setting of COM-ML communication data IP address Remote IP address TCP port number etc.	Confirm the COM-ML communication settings and set them correctly
	Wrong setting of PLC communication data	Confirm the PLC communication settings and set them correctly
	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
When the setting request command of request command is set in "1," setting error (Bit 0 of setting item communication state) is become	Data range error	Confirm the setting range of set value and set them correctly

☞ For the "PLC communication environment setting," refer to **10.1 PLC Communication Environment Setting (P. 86)**.

■ Host communication (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 136 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

■ Host communication (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 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.

12. SPECIFICATIONS

■ Ethernet communication

● Modbus/TCP

Physical layer: 10BASE-T/100BASE-TX automatic recognition

User layer: Modbus/TCP

Communication data: Based on host communication (Modbus) map

Connector type: RJ-45 (2 ports)

● PLC communication (MAPMAN)

Physical layer: 10BASE-T/100BASE-TX automatic recognition

User layer: TCP/IP
MITSUBISHI MELSEC series special protocol
Frame: QnA-compatible 3E fame (SLMP 3E frame)
Code: Binary or ASCII

Connector type: RJ-45 (2 ports) [Only a single PLC is connectable]

■ Host communication

● RKC communication

Interface: Based on RS-485, EIA standard
Based on RS-422A, EIA standard

Connection method: RS-485: 2-wire system, half-duplex multi-drop connection
RS-422A: 4-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: ANSI X3.28-1976 subcategories 2.5 and B1
Polling/Selecting type

Error control: Vertical parity (With parity bit selected)
Horizontal parity (BCC check)

Communication code: JIS/ASCII 7-bit code

Interval time: 0 to 250 ms

Maximum connections: 16 SRZ units per communication port of host computer

Connection method: Modular juck (6-pin)

Termination resistor: External connection is necessary (Example: 120 Ω, 1/2 W)

● Modbus

Interface:	Based on RS-485, EIA standard Based on RS-422A, EIA standard
Connection method:	RS-485: 2-wire system, half-duplex multi-drop connection RS-422A: 4-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: 8 Parity bit: Without, Odd or Even Stop bit: 1
Protocol:	Modbus
Signal transmission mode:	Remote Terminal Unit (RTU) mode
Function code:	03H (Read holding registers) 06H (Preset single register) 08H (Diagnostics: loopback test) 10H (Preset multiple registers)
Error check method:	CRC-16
Error code:	1: Function code error (An unsupported function code was specified) 2: When the mismatched address is specified. 3: • When the data written exceeds the setting range. • When the specified number of data items in the query message exceeds the maximum number of data items available 4: Self-diagnostic error response
Interval time:	0 to 250 ms
Maximum connections:	16 SRZ units per communication port of host computer
Connection method:	Modular juck (6-pin)
Termination resistor:	External connection is necessary (Example: 120 Ω, 1/2 W)

■ Loader communication

Interface: Connection with a loader communication cable for our USB converter COM-K2 (sold separately).

Protocol: RKC communication (ANSI X3.28-1976 subcategories 2.5 and B1)

Synchronous method: Start/Stop synchronous type

Communication speed: 38400 bps

Data bit configuration:
Start bit: 1
Data bit: 8
Parity bit: Without
Stop bit: 1

Maximum connections: One SRZ unit

■ Self-diagnostic function

● Major fault

Action stop:
RAM value abnormal
Power supply voltage monitoring error
Watchdog timer error

Instrument status:
Display: A red lamp (FAIL/RUN) is on
Host communication:
Receive mode
Network communication:
Receive mode

Error recovery: Recovery by device power restart after cause of error is removed

● Recoverable fault

Data back-up error:
Display: A green lamp (FAIL/RUN) frashes
Status: Error code 2

Stack overflow:
Display: A green lamp (FAIL/RUN) frashes
Status: Error code 64

Network module error:
Display: A green lamp (FAIL/RUN) frashes
Status: Error code 512

■ General specifications

Power supply voltage: 21.6 to 26.4 V DC [Including power supply voltage variation]
(Rating 24 V DC)

Power consumption: 120 mA max. (at 24 V DC)

Rush current: 12 A or less

Insulation resistance: Between power supply terminal and grounding:
20 MΩ or more at 500 V DC
Between host communication and grounding:
20 MΩ or more at 500 V DC
Between power supply terminal and host communication:
20 MΩ or more at 500 V DC
Between power supply terminal and network communication:
20 MΩ or more at 250 V DC

Withstand voltage: Refer to table shown below

Time: 1 min.	①	②	③
① Grounding			
② Power supply terminal	750 V AC		
③ Host communication	750 V AC	750 V AC	
④ Network communication	750 V AC	250 V AC	750 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
Number of writing: Approx. 1,000,000 times
Data storage period: Approx. 10 years

Vibration: Equivalent to JIS C1805-3 Clause 7 conformance test
Frequency range: 10 to 150 Hz
Amplitude: < 0.075 mm
Acceleration: < 9.8 m/s^2
Each direction of XYZ axes

Shock: Free fall: Height 50 mm or less
Each direction of XYZ axes (de-energized state)

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

Operating environment: Avoid the following conditions when selecting the mounting location.
- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Water, oil, chemicals, vapor or steam splashes.
- Direct air flow from an air conditioner.
- Exposure to direct sunlight.
- Excessive heat accumulation.

Weight: Approx. 130 g

Dimensions: 30.0 × 100.0 × 81.6 mm (W×H×D) (Not including protruding parts)

APPENDIX.
HOST COMMUNICATION PROTOCOL

A.1 Communication Requirements

■ Processing times during data send/receive

When the host computer is using either the polling or selecting procedure for communication, the following processing times are required for SRZ unit to send data:
- Response wait time after SRZ unit sends BCC in polling procedure
- Response wait time after SRZ unit sends ACK or NAK in selecting procedure

RKC communication (Polling procedure)

Procedure details	Time
Response send time after controller receives ENQ	60 ms max.
Response send time after controller receives ACK	60 ms max.
Response send time after controller receives NAK	60 ms max.
Response send time after controller sends BCC	2 ms max.

RKC communication (Selecting procedure)

Procedure details	Time
Response send time after controller receives BCC	60 ms max. [1, 2]
Response wait time after controller sends ACK	2 ms max.
Response wait time after controller sends NAK	2 ms max.

Modbus

Procedure details	Time
Read holding registers [03H] Response send time after the slave receives the query message	60 ms max.
Preset single register [06H] Response send time after the slave receives the query message	100 ms max.
Diagnostics (loopback test) [08H] Response send time after the slave receives the query message	30 ms max.
Preset multiple registers [10H] Response send time after the slave receives the query message	100 ms max. [2]

[1] When selecting is performed for 128 or more channels on a Z-CT module, the maximum time is 90 ms.

[2] In the case of RKC communication (selecting procedure), the time will be "the time after BCC reception until an acknowledgment [ACK] is sent."
- When successive changes are made to the setting of the same item
  [Example] Successive changes to a Set value (SV), control by manual manipulated output value, etc.
- When successive changes are made to multiple items
  [Example] Configuring initial settings

Processing times (Varies with the function module types.)

Function module (When connected maximum connection number)	Time
Setting items of the Z-TIO module	750 ms max.
Setting items of the Z-DIO module	2000 ms max.
Setting items of the Z-CT module	5000 ms max.

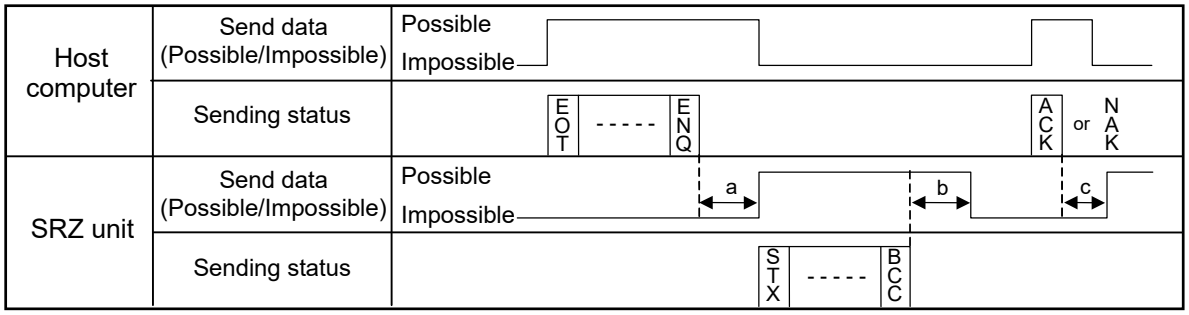
■ Caution for selecting

When selecting of the following communication data of a Z-TIO module is performed, the next selecting procedure for the changed Z-TIO module will not be possible for 4 to 6 seconds.
For this reason, when there are many channels to be changed, do not perform selecting for each channel individually; perform selecting for all channels at once. Note that if the communication data exceeds 136 bytes, the data will be separated into blocks by ETB.
- Input type
- Decimal point position
- Integral/Derivative time decimal point position

■ RS-485 (2-wire system) send/receive timing

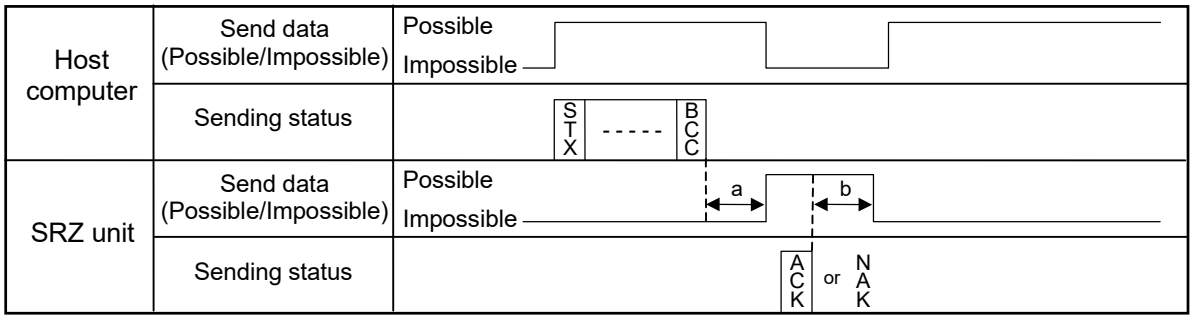
RS-485 communication is conducted through two wires, therefore the transmission and reception of data requires precise timing.

● Polling procedure



a: Response send time after the controller receives [ENQ] + Interval time
b: Response send time after the controller sends BCC
c: Response send time after the controller receives [ACK] + Interval time or
Response send time after the controller receives [NAK] + Interval time

● Selecting procedure



a: Response send time after the controller receives BCC + Interval time
b: Response wait time after the controller sends ACK or Response wait time after the controller sends NAK

To switch the host computer from transmission to reception, send data must be on line.

The following processing times are requires for the SRZ unit to process data.
- In Polling procedure, Response wait time after the SRZ unit sends BCC
- In Selecting procedure, Response wait time after the SRZ unit sends ACK or NAK

■ Fail-safe

A transmission error may occur with the transmission line disconnected, shorted or set to the high-impedance state. In order to prevent the above error, it is recommended that the fail-safe function be provided on the receiver side of the host computer. The fail-safe function can prevent a framing error from its occurrence by making the receiver output stable to the MARK (1) when the transmission line is in the high-impedance state.

A.2 RKC Communication Protocol

RKC communication uses the Polling/Selecting method to establish a data link. The basic procedure is followed ANSI X3.28-1976 subcategories 2.5 and B1 basic mode data transmission control procedure (Fast selecting is the selecting method used in SRZ unit).

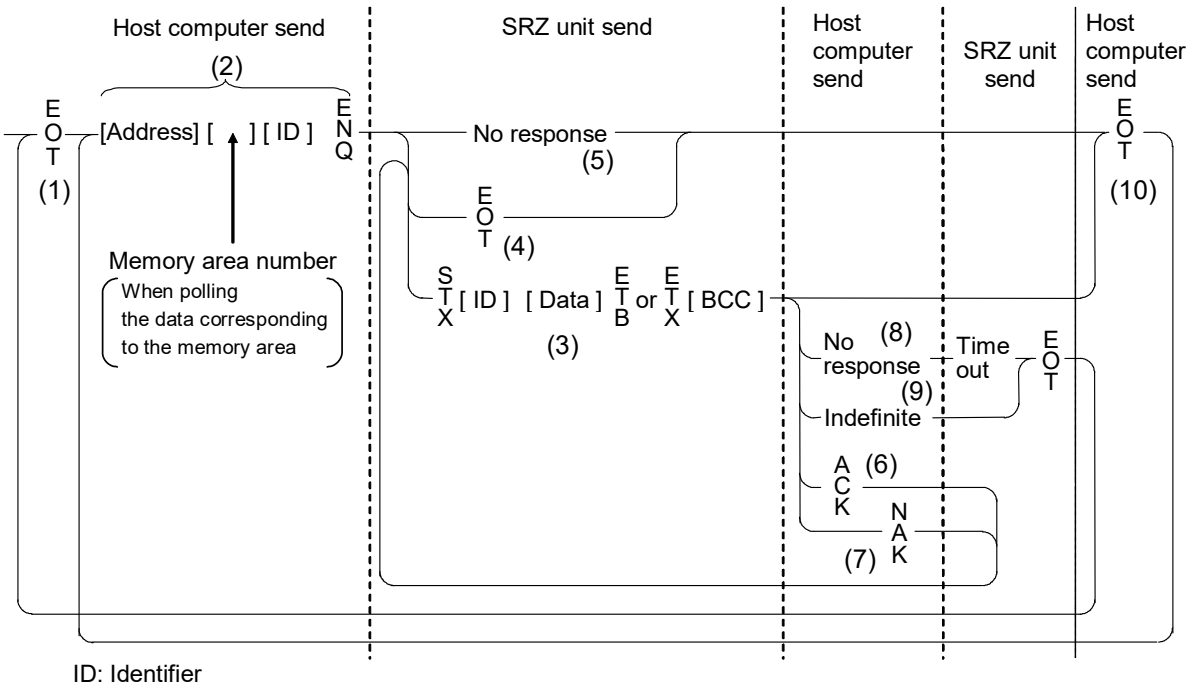
- The Polling/Selecting procedures are a centralized control method where the host computer controls the entire process. The host computer initiates all communication so the SRZ unit responds according to queries and commands from the host.

- The code use in communication is 7-bit ASCII code including transmission control characters.
  Transmission control characters used in SRZ unit:
  EOT (04H), ENQ (05H), ACK (06H), NAK (15H), STX (02H), ETB (17H), ETX (03H)
  ( ): Hexadecimal

Data send/receive state (communication data monitoring and setting) of RKC communication can be checked by using the following software:
Communication Tool "PROTEM2"
The software can be downloaded from the official RKC website.

A.2.1 Polling procedures

Polling is the action where the host computer requests one of the connected SRZ units to transmit data. An example of the polling procedure is shown below:



(1) Data link initialization

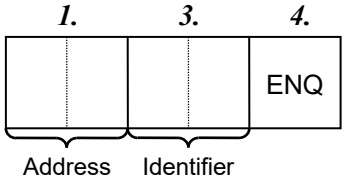
Host computer sends EOT to the controllers to initiate data link before polling sequence.

(2) Data sent from host computer - Polling sequence

The host computer sends the polling sequence in the following two types of formats:
- Format in which no memory area number is specified, and
- Format in which the memory area number is specified.

- When no memory area number is specified

To be sent in this format for any identifier not corresponding to the memory area.

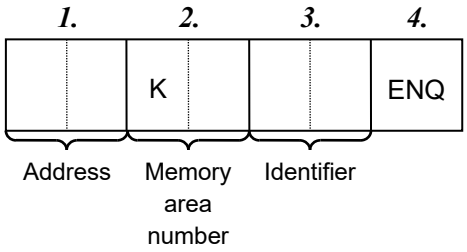


Example:

0	1	M	1	ENQ

- When the memory area number is specified

To be sent in this format for any identifier corresponding to the memory area.



Example:

0	1	K	1	S	1	ENQ

1. Address (2 digits)
This data is a host communication address of the COM-ML for polled and must be the same as the unit address set value in item **5.1 Address Setting (P. 21)**.


The polling address which transmitted a message once becomes effective so long as data link is not initialized by transmit and receive of EOT.

2. Memory area number (2 digits)
This is the identifier to specify the memory area number. It is expressed by “K1” to “K8” to each memory area number (from 1 to 8). If the memory area number is assigned with “K0,” this represents that control area is specified.


The memory area now used for control is called “Control area.”


If the memory area number is not specified when polling the identifier corresponding to the memory area, this represents that the control area is specified.


If any identifier not corresponding to the memory area is assigned with a memory area number, this memory area number is ignored.

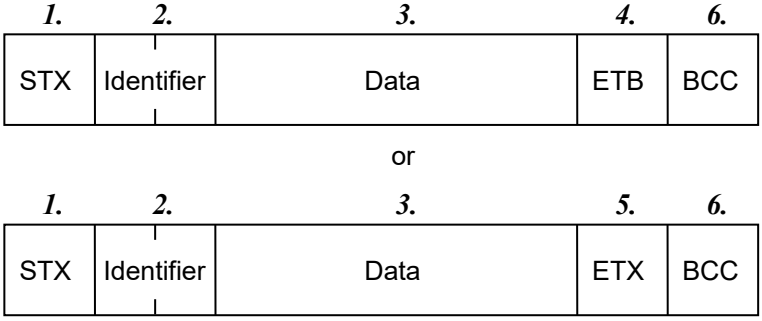
3. Identifier (2 digits)
The identifier specifies the type of data that is requested from the SRZ unit. Always attach the ENQ code to the end of the identifier.

☞ Refer to **9. COMMUNICATION DATA LIST (P. 46)**.

4. ENQ
The ENQ is the transmission control character that indicates the end of the polling sequence. The host computer then must wait for a response from the SRZ unit.

(3) Data sent from the SRZ unit

If the polling sequence is received correctly, the SRZ unit sends data in the following format:



If the length of send data (from STX to BCC) exceeds 136 bytes, it is divided into blocks by ETB. In this case, the succeeding divided data is sent after STX.

1. STX
STX is the transmission control character which indicates the start of the text transmission (identifier and data).

2. Identifier (2 digits)
The identifier indicates the type of data (measured value, status and set value) sent to the host computer.

☞ Refer to **9. COMMUNICATION DATA LIST (P. 46)**.

3. Data
Data which is indicated by an identifier of SRZ unit, consisting of channel numbers, data, etc. Each channel number and data are delimited by a space (20H). The data and the next channel number are delimited by a comma (2CH).

- Channel number: 3-digit ASCII code, not zero-suppressed. Channels without channel numbers may exist depending on the type of identifier.
- Data: ASCII code, zero-suppressed with spaces (20H). The number of digits varies depending on the type of identifier.

Memory area soak time monitor and area soak time become the following data:
- When data range is 0 hour 00 minute to 99 hours 59 minutes:
  Data range is 0:00 to 99:59, punctuation of time unit is expressed in colon ": (3AH)."
- When data range is 0 minute 00 second to 199 minutes 59 seconds:
  Data range is 0:00 to 199:59, punctuation of time unit is expressed in colon ": (3AH)."

"0" (without a decimal point) is sent for unused channels and for data that is invalid due to the function selection.

4. ETB
Transmission control character indicating the end of the block.

5. ETX
Transmission control character indicating the end of the text.

6. BCC
BCC (Block Check Character) detects error by using horizontal parity (even number).

Calculation method of BCC: *Exclusive OR* all data and characters from STX through ETB or ETX, not including STX.

Example:

STX	M	1	0	1			1	5	0	.	0	ETX	BCC
	4DH	31H	30H	31H	20H	20H	31H	35H	30H	2EH	30H	03H	←

Hexadecimal numbers

BCC = 4DH ⊕ 31H ⊕ 30H ⊕ 31H ⊕ 20H ⊕ 20H ⊕ 31H ⊕ 35H ⊕ 30H ⊕ 2EH ⊕ 30H ⊕ 03H = 54H
(⊕: *Exclusive OR*)
Value of BCC becomes 54H

(4) EOT send (Ending data transmission from the SRZ unit)

In the following cases, the SRZ unit sends EOT to terminate the data link:
- When the specified identifier is invalid
- When there is an error in the data format
- When all the data has been sent
- When the module that relates to the identifier is not connected

(5) No response from the SRZ unit

The SRZ unit will not respond if the polling address is not received correctly. It may be necessary for the host computer to take corrective action such as a time-out.

(6) ACK (Acknowledgment)

An acknowledgment ACK is sent by the host computer when data received is correct. When the SRZ unit receives ACK from the host computer, the SRZ unit will send any remaining data of the next identifier without additional action from the host computer. When host computer determines to terminate the data link, EOT is sent from the host computer.

- When ACK is received after ETX and BCC are sent, the next identifier data is sent according to the order of the communication data list.
- When ACK is received after ETB and BCC are sent, the data after ETB is sent.

(7) NAK (Negative acknowledge)

If the host computer does not receive correct data from the SRZ unit, it sends a negative acknowledgment NAK to the SRZ unit. The SRZ unit will re-send the same data when NAK is received. This cycle will go on continuously until either recovery is achieved or the data link is corrected at the host computer.
The format of the data that an SRZ unit re-sends is as follows.

STX	Identifier	Data	ETB or ETX	BCC

(8) No response from host computer

When the host computer does not respond within approximately three seconds after the SRZ unit sends data, the SRZ unit sends EOT to terminate the data link (time-out time: about 3 seconds).

(9) Indefinite response from host computer

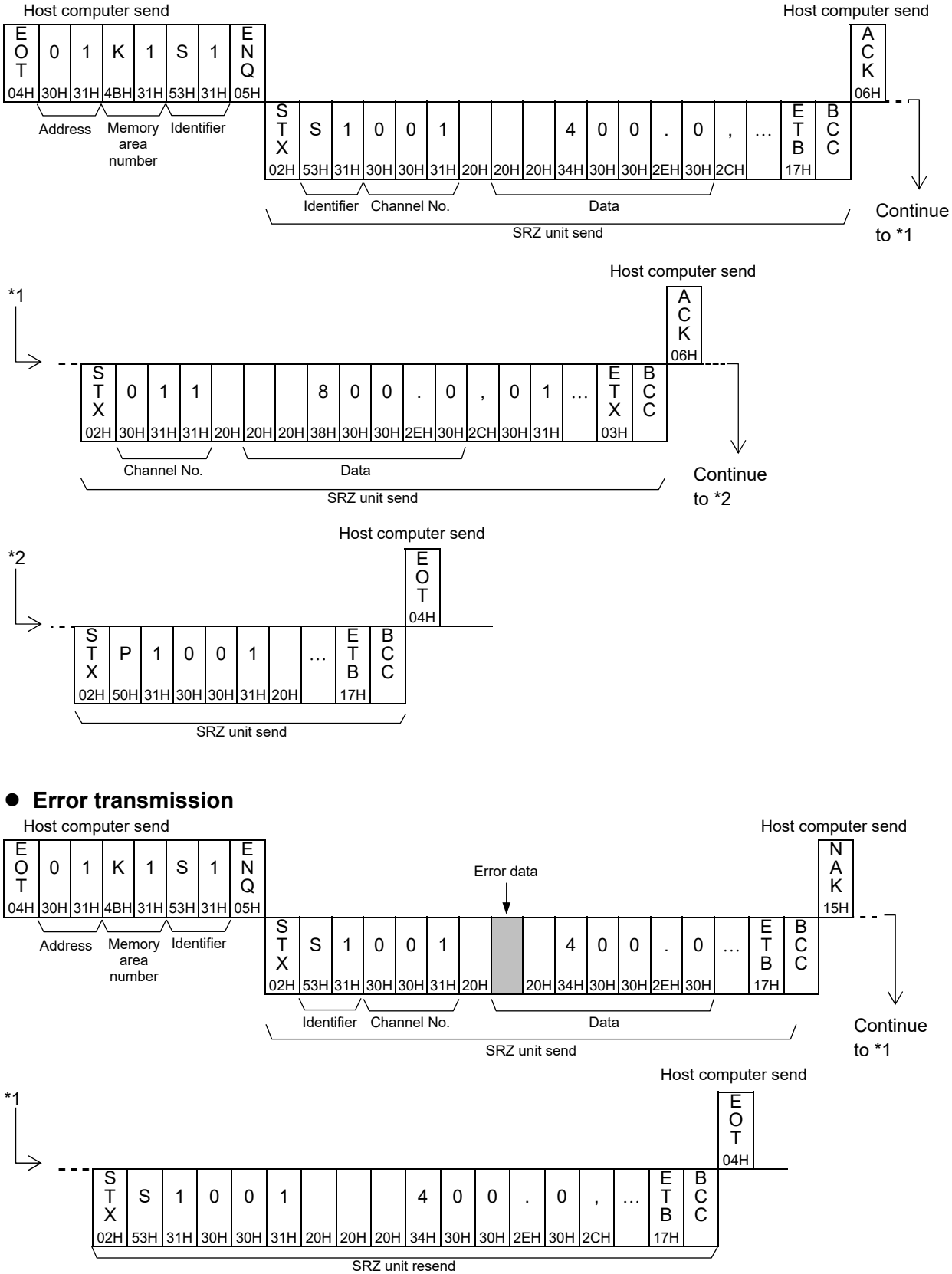
The SRZ unit sends EOT to terminate the data link when the host computer response is indefinite.

(10) EOT (Data link termination)

The host computer sends EOT message when it is necessary to suspend communication with the SRZ unit or to terminate the data link due lack of response from the SRZ unit.

■ Polling procedure example (When the host computer requests data)

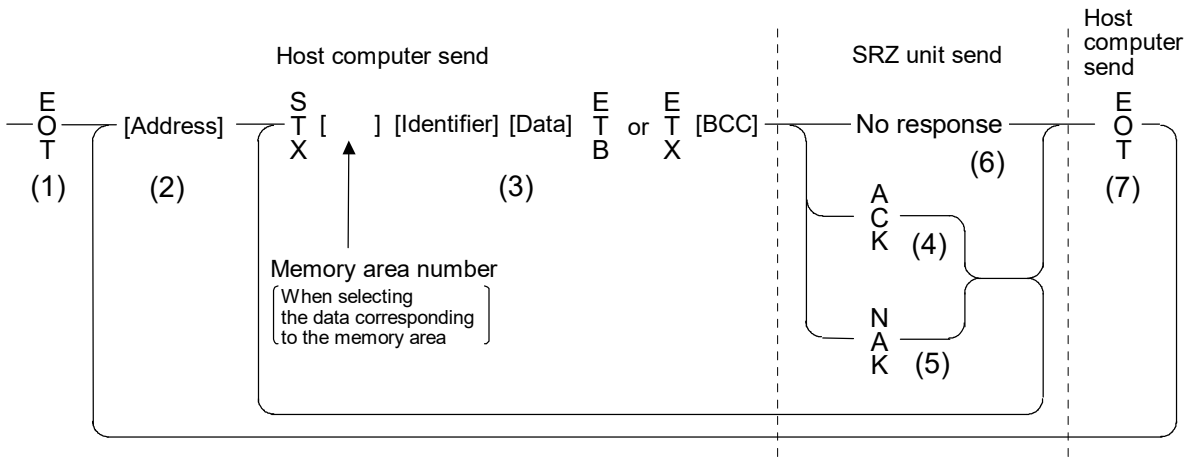
● Normal transmission



● Error transmission

A.2.2 Selecting procedures

Selecting is the action where the host computer requests one of the connected SRZ units to receive data. An example of the selecting procedure is shown below:



(1) Data link initialization

Host computer sends EOT to the SRZ unit to initiate data link before selecting sequence.

(2) Sending selecting address from the host computer

Host computer sends selecting address for the selecting sequence.

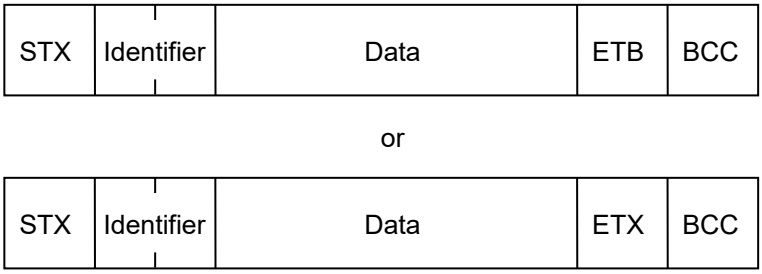
Address (2 digits):
This data is a host communication address of the COM-ML to be selected and must be the same as the unit address set value in item **5.1 Address Setting (P. 21)**.

As long as the data link is not initialized by sending or receiving EOT, the selecting address once sent becomes valid.

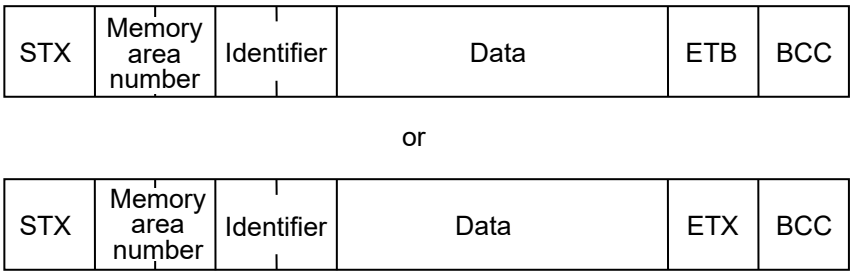
(3) Data sent from the host computer

The host computer sends data for the selecting sequence with the following format:

- When no memory area number is specified



- When the memory area number is specified



☞ For the STX, Memory area number Identifier, Data, ETB, ETX and BCC, refer to **A.2.1 Polling procedures (P. 147)**.

📖 If the length of send data (from STX to BCC) exceeds 136 bytes, it is divided into blocks by ETB. In this case, the succeeding divided data is sent after STX.

📖 Area soak time set data as the following:

- When data range is 0 hour 00 minute to 99 hours 59 minutes:
  Data range is 0:00 to 99:59, punctuation of time unit is expressed in colon ": (3AH)."
- When data range is 0 hour 00 minute to 99 hours 59 minutes:
  Data range is 0:00 to 99:59, punctuation of time unit is expressed in colon ": (3AH)."

In addition to above, when minute and second data are set in more than 60, become as the following:

Example: 1:65 (1 hour 65 minutes) → 2:05 (2 hours 05 minutes)
0:65 (0 minute 65 seconds)→ 1:05 (1 minute 05 seconds)

- **About numerical data**

[The data that receipt of letter is possible]

- Data with numbers below the decimal point omitted or zero-suppressed data can be received.

  (Number of digits: Within 7 digits)

  <Example>

  When data send with −001.5, −01.5, −1.5, −1.50, −1.500 at the time of −1.5, SRZ unit can receive a data.

- When the host computer sends data with decimal point to item of without decimal point, the SRZ unit receives a message with the value that cut off below the decimal point.

  <Example>

  When setting range is 0 to 200, the SRZ unit receives as a following.

Send data	0.5	100.5
Receive data	0	100

- The SRZ unit receives value in accordance with decided place after the decimal point. The value below the decided place after the decimal point is cut off.

  <Example>

  When setting range is −10.00 to +10.00, the controller receives as a following.

Send data	−.5	−.058	.05	−0
Receive data	−0.50	−0.05	0.05	0.00

If the host computer sends “decimal point only (.)” or “minus sign and decimal point only (-.),” the SRZ unit receives this as “0.” However, the decimal point position will be the same as the decimal point position of the transmitted data item.

[The data that receipt of letter is impossible]

The SRZ unit sends NAK when received a following data.

+	Plus sign and the data that gained plus sing
−	Only minus sign (there is no figure)

(4) ACK (Acknowledgment)

An acknowledgment ACK is sent by the SRZ unit when data received is correct. When the host computer receives ACK from the SRZ unit, the host computer will send any remaining data. If there is no more data to be sent to the SRZ unit, the host computer sends EOT to terminate the data link.

(5) NAK (Negative acknowledge)

If the SRZ unit does not receive correct data from the host computer, it sends a negative acknowledgment NAK to the host computer. Corrections, such as re-send, must be made at the host computer.

The send conditions of NAK (after reception of ETX or BCC)

- When an error occurs on communication the line (parity, framing error, etc.)
- When a BCC check error occurs
- When the specified identifier is invalid
- When receive data exceeds the setting range
- When receive data is the identifier of RO (read only)
- When the module related to the identifier received by the SRZ is not connected

The send conditions of NAK (after reception of ETB or BCC)

- When a BCC check error occurs

(6) No response from SRZ unit

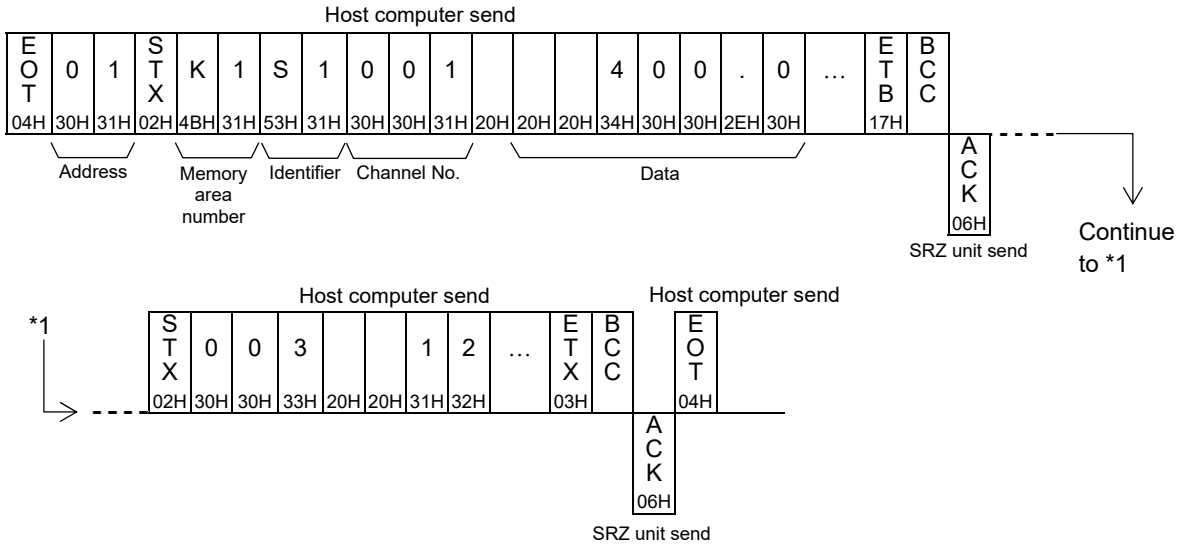
The SRZ unit does not respond when it cannot receive the selecting address, STX, ETB, ETX or BCC.

(7) EOT (Data link termination)

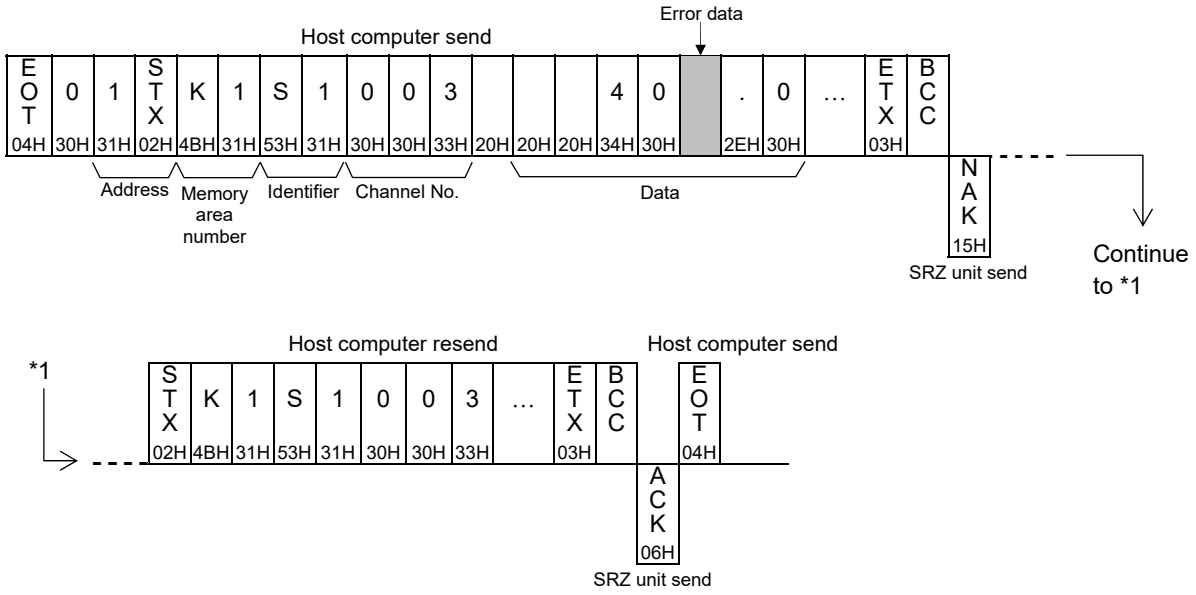
The host computer sends EOT when there is no more data to be sent from the host computer or there is no response from the SRZ unit.

■ Selecting procedure example (when the host computer sends data)

● Normal transmission



● Error transmission



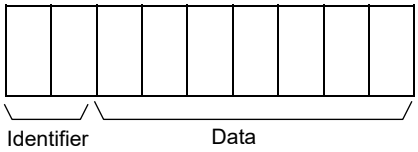
A.2.3 Communication data structure

■ Data description

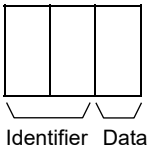
Part of the data above is shown below.

● Data for each unit (Without channel)

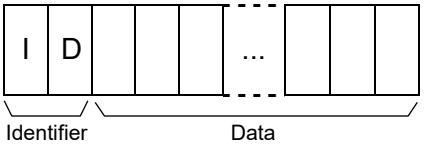
Data length 7 digits



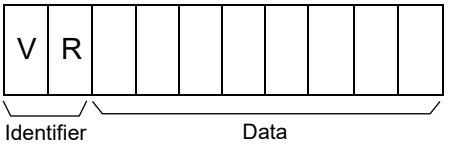
Data length 1 digit



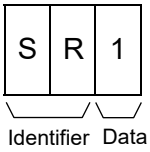
Data length 32 digits (Model code)



Data length 8 digits (ROM version)

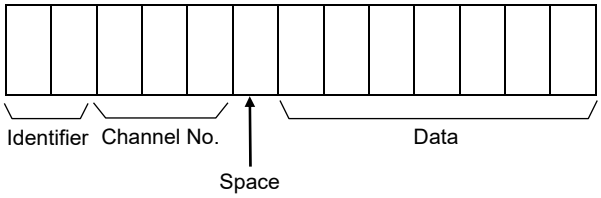


Example) Data structure for control RUN/STOP switching in each SRZ unit

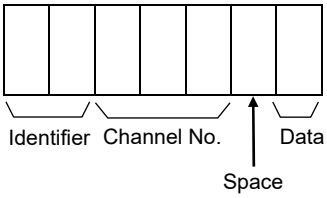


● Data for each module

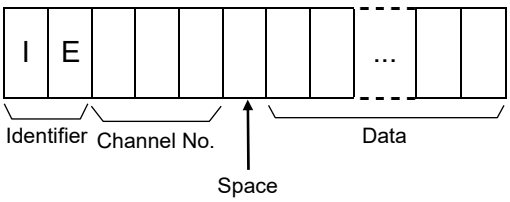
Data length 7 digits



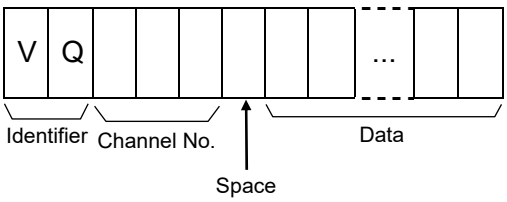
Data length 1 digit



Data length 32 digits (Model code)

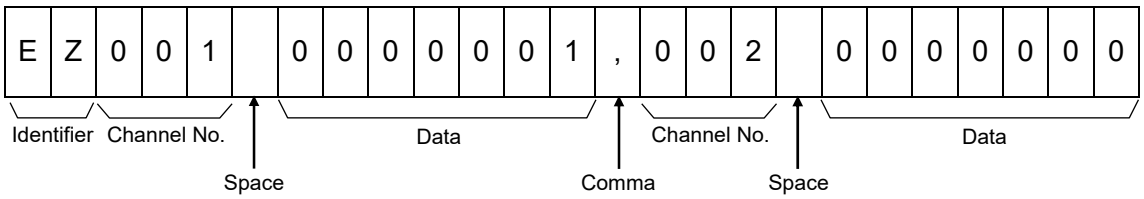


Data length 8 digits (ROM version)



Continued on the next page.

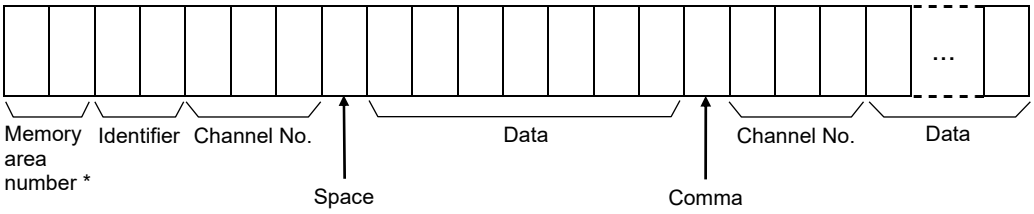
Example) Data structure of error codes of Z-TIO, Z-DIO and Z-CT modules



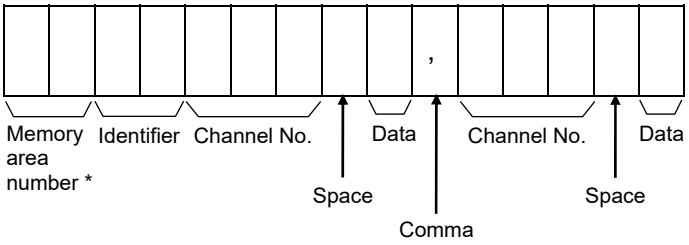
☞ For the calculation method of the channel number, refer to **6.2 Temperature Control Channel of the SRZ (P. 24)** and **6.3 Digital Input/Output Channel of Z-DIO Module (P. 25)**.

- **Data for each channel**

Data length 7 digits

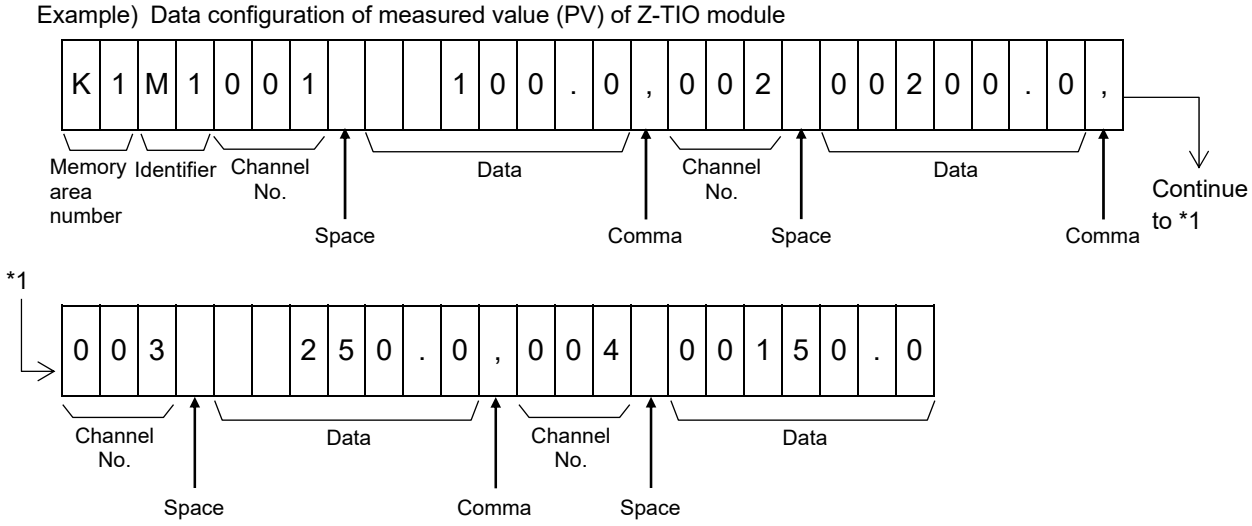


Data length 1 digit



* To select data corresponding to a memory area, specify the number of the appropriate memory area.
If a memory area number is specified for data that does not correspond to a memory area, the specification will be invalid.

Example) Data configuration of measured value (PV) of Z-TIO module



☞ For the calculation method of the channel number, refer to **6.2 Temperature Control Channel of the SRZ (P. 24)** and **6.3 Digital Input/Output Channel of Z-DIO Module (P. 25)**.

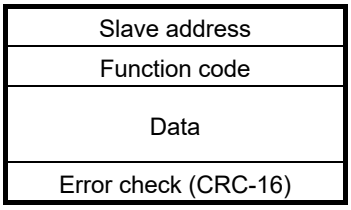
A.3 Modbus Protocol

The master controls communication between master and slave. A typical message consists of a request (query message) sent from the master followed by an answer (response message) from the slave (SRZ unit). 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.

Data send/receive state (communication data monitoring and setting) of Modbus can be checked by using the following software:
Communication Tool "PROTEM2"
The software can be downloaded from the official RKC website.

A.3.1 Message format

The message consists of four parts: slave address, function code, data, and error check code which are always transmitted in the same sequence.



Message format

■ Slave address

The slave address is a number from 0 to F manually set at the address setting switch located at the front of COM-ML.

For details, refer to **5.1 Address Setting (P. 21)**.

Although all connected slave units receive the query message sent from the master, only the slave with the slave address coinciding with the query message will accept the message.

■ Function code

The function codes are the instructions set at the master and sent to the slave describing the action to be executed. The function codes are included when the slave responds to the master.

For details, refer to **A.3.2 Function code (P. 161)**.

■ Data

The data to execute the function specified by the function code is sent to the slave and corresponding data returned to the master from the slave.

For details, refer to **A.3.6 Register read and write (P. 166)**, **A.3.7 Caution for handling communication data (P. 170)** and **9. COMMUNICATION DATA LIST (P. 46)**.

■ Error check

An error checking code (CRC-16: Cyclic Redundancy Check) is used to detect an error in the signal transmission.

For details, refer to **A.3.5 Calculating CRC-16 (P. 163)**.

A.3.2 Function code

- **Function code contents**

Function code (Hexadecimal)	Function	Contents
03H	Read holding registers	Measured value, control output value, current transformer input value, Event status, etc.
06H	Preset single register	Set value, PID constants, event set value, etc.
08H	Diagnostics (loopback test)	Loopback test
10H	Preset multiple registers	Set value, PID constants, event set value, etc.

- **Message length of each function (Unit: byte)**

Function code (Hexadecimal)	Function	Query message		Response message	
		Min	Max	Min	Max
03H	Read holding registers	8	8	7	255
06H	Preset single register	8	8	8	8
08H	Diagnostics (loopback test)	8	8	8	8
10H	Preset multiple registers	11	255	8	8

A.3.3 Communication mode

Signal transmission between the master and slaves is conducted in Remote Terminal Unit (RTU) mode.

Items	Contents
Data bit length	8-bit (Binary)
Start mark of message	Unused
End mark of message	Unused
Message length	Refer to **A.3.2 Function code**
Data time interval	Less than 24 bits' time *
Error check	CRC-16 (Cyclic Redundancy Check)

* When sending a command message from the master, set intervals of data configuring one message to time shorter than the 24 bits' time. If time intervals become time longer than the 24 bits' time the relevant slave assumes that message sending from the master is terminated to deform the message format. As a result, the slave does not make a response.

A.3.4 Slave responses

(1) Normal response

- In the response message of the Read Holding Registers, the slave returns the read out data and the number of data items with the same slave address and function code as the query message.
- In the response message of the Preset Single Register, the slave returns the same message as the query message.
- In the response message of the Diagnostics (Loopback test), the slave returns the same message as the query message.
- In the response message of the Preset Multiple Registers, the slave returns the slave address, the function code, starting number, and number of holding registers in the multi-query message.

(2) Defective message response

- If the query message from the master is defective, except for transmission error, the slave (SRZ unit) returns the error response message without any action.

  Example: If there is a problem in the data range of CH3 when writing data of four channels, the data of CH1 and CH2 will be written. The data of CH3 and CH4 will be disregarded and an error response message will be returned.

Slave address
Function code
Error code
Error check CRC-16

Error response message

- If the self-diagnostic function of the slave (SRZ unit) detects an error, the slave (SRZ unit) will return an error response message to all query messages.
- The function code of each error response message is obtained by adding 80H to the function code of the query message.

Error code	Contents
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

(3) No response

The slave (SRZ unit) ignores the query message and does not respond when:

- The slave address in the query message does not coincide with any slave address settings.
- The CRC code of the master does not coincide with that of the slave.
- Transmission error such as overrun, framing, parity and etc., is found in the query message.
- Data time interval in the query message from the master exceeds 24 bit's time.

A.3.5 Calculating CRC-16

The Cyclic Redundancy Check (CRC) is a 2 byte (16-bit) error check code. After constructing the data message, not including start, stop, or parity bit, the master calculates a CRC code and appends this to the end of the message. The slave will calculate a CRC code from the received message, and compare it with the CRC code from the master. If they do not match, a communication error has occurred and the slave does not respond.

The CRC code is formed in the following sequence:

1. Load FFFFH to a 16-bit CRC register.

2. *Exclusive OR* (⊕) the first byte (8 bits) of the message with the CRC register. Return the result to the CRC register.

3. Shift the CRC register 1 bit to the right.

4. If the carry flag is 1, *exclusive OR* the CRC register with A001 hex and return the result to the CRC register. If the carry flag is 0, repeat step ***3***.

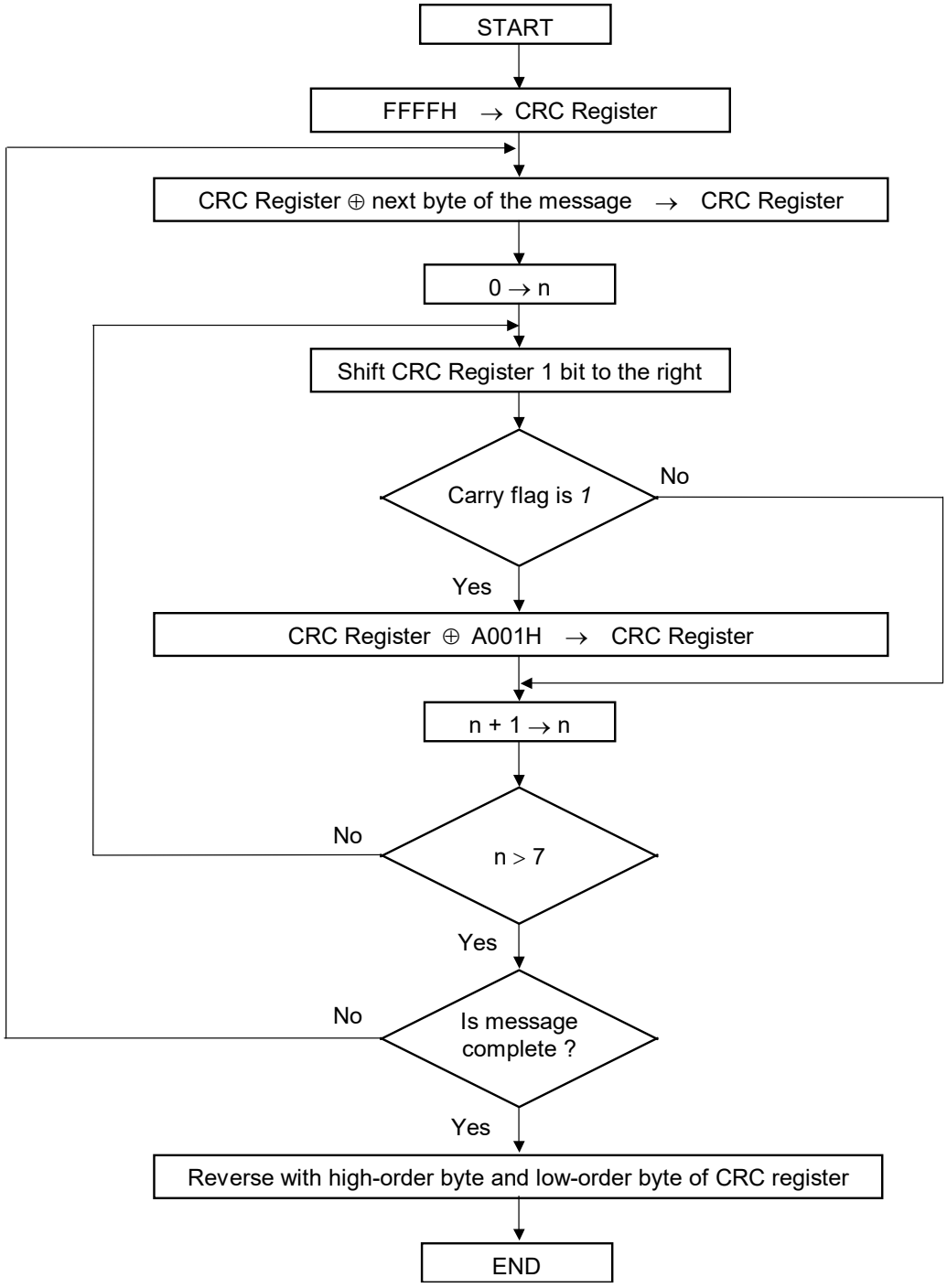
5. Repeat step ***3*** and ***4*** until there have been 8 shifts.

6. *Exclusive OR* the next byte (8 bits) of the message with the CRC register.

7. Repeat step ***3*** through ***6*** for all bytes of the message (except the CRC).

8. The CRC register contains the 2 byte CRC error code. When they are appended to the message, the low-order byte is appended first, followed by the high-order byte.

■ The flow chart of CRC-16



The ⊕ symbol indicates an *exclusive OR* operation. The symbol for the number of data bits is *n*.

■ Example of a CRC calculation in the 'C' language

This routine assumes that the data types 'uint16' and 'uint8' exists. Theses are unsigned 16-bit integer (usually an 'unsigned short int' for most compiler types) and unsigned 8-bit integer (unsigned char). 'z_p' is a pointer to a Modbus message, and 'z_messaage_length' is its length, excluding the CRC. Note that the Modbus message will probably contain NULL characters and so normal C string handling techniques will not work.

uint16 calculate_crc （byte *z_p, unit16 z_message_length）

```
/* CRC runs cyclic Redundancy Check Algorithm on input z_p  */
/* Returns value of 16 bit CRC after completion and         */
/* always adds 2 crc bytes to message                       */
/* returns 0 if incoming message has correct CRC            */

{
    uint16 CRC= 0xffff;
    uint16 next;
    uint16 carry;
    uint16 n;
    uint8 crch, crcl;

    while (z_messaage_length--) {
        next = (uint16) *z_p;
        CRC ^= next;
        for (n = 0; n < 8; n++) {
            carry = CRC & 1;
            CRC >>= 1;
            if (carry) {
              CRC ^= 0xA001;
            }
        }
        z_p++;
    }
    crch = CRC / 256;
    crcl = CRC % 256
    z_p [z_messaage_length++] = crcl;
    z_p [z_messaage_length] = crch;
    return CRC;
}
```

A.3.6 Register read and write

■ Read holding registers [03H]

The query message specifies the starting register address and quantity of registers to be read.
The contents of the holding registers are entered in the response message as data, divided into two parts: the high-order 8-bit and the low-order 8-bit, arranged in the order of the register numbers.

Example: The contents of the four holding registers from 01FCH to 01FFH are the read out from slave address 2.

Query message

Slave address		02H	
Function code		03H	
Starting number	High	01H	First holding register address
	Low	FCH	
Quantity	High	00H	The setting must be between 1 (0001H) and 125 (007DH).
	Low	04H	
CRC-16	High	85H	
	Low	F6H	

Normal response message

Slave address		02H	
Function code		03H	
Number of data		08H	→ Number of holding registers × 2
First holding register contents	High	01H	
	Low	24H	
Next holding register contents	High	01H	
	Low	1BH	
Next holding register contents	High	01H	
	Low	2BH	
Next holding register contents	High	01H	
	Low	22H	
CRC-16	High	AAH	
	Low	F3H	

Error response message

Slave address		02H
80H + Function code		83H
Error code		03H
CRC-16	High	F1H
	Low	31H

■ Preset single register [06H]

The query message specifies data to be written into the designated holding register. The write data is arranged in the query message with high-order 8-bit first and low-order 8-bit next. Only R/W holding registers can be specified.

Example: Data is written into the holding register 0ADCH of slave address 1.

Query message

Slave address		01H
Function code		06H
Holding register number	High	0AH
	Low	DCH
Write data	High	00H
	Low	64H
CRC-16	High	4AH
	Low	03H

} Any data within the range

Normal response message

Slave address		01H
Function code		06H
Holding register number	High	0AH
	Low	DCH
Write data	High	00H
	Low	64H
CRC-16	High	4AH
	Low	03H

} Contents will be the same as query message data.

Error response message

Slave address		01H
80H + Function code		86H
Error code		02H
CRC-16	High	C3H
	Low	A1H

■ Diagnostics (Loopback test) [08H]

The master's query message will be returned as the response message from the slave (SRZ unit).
This function checks the communication system between the master and slave (SRZ unit).

Example: Loopback test for slave address 1

Query message

Slave address		01H	
Function code		08H	
Test code	High	00H	Test code must be set to 00.
	Low	00H	
Data	High	1FH	Any pertinent data
	Low	34H	
CRC-16	High	E9H	
	Low	ECH	

Normal response message

Slave address		01H	Contents will be the same as query message data.
Function code		08H	
Test code	High	00H	
	Low	00H	
Data	High	1FH	
	Low	34H	
CRC-16	High	E9H	
	Low	ECH	

Error response message

Slave address		01H
80H + Function code		88H
Error code		03H
CRC-16	High	06H
	Low	01H

■ Preset multiple registers [10H]

The query message specifies the starting register address and quantity of registers to be written.
The write data is arranged in the query message with high-order 8-bit first and low-order 8-bit next.
Only R/W holding registers can be specified.

Example: Data is written into the two holding registers from 0ADCH to 0ADDH of slave address 1.

Query message

Slave address		01H	
Function code		10H	
Starting number	High	0AH	First holding register address
	Low	DCH	
Quantity	High	00H	The setting must be between 1 (0001H) and 123 (007BH).
	Low	02H	
Number of data		04H	→ Number of holding registers × 2
Data to first register	High	00H	Any pertinent data
	Low	64H	
Data to next register	High	00H	
	Low	64H	
CRC-16	High	C0H	
	Low	32H	

Normal response message

Slave address		01H
Function code		10H
Starting number	High	0AH
	Low	DCH
Quantity	High	00H
	Low	02H
CRC-16	High	83H
	Low	EAH

Error response message

Slave address		01H
80H + Function code		90H
Error code		02H
CRC-16	High	CDH
	Low	C1H

A.3.7 Caution for handling communication data

- The numeric range of data used in Modbus protocol is 0000H to FFFFH. Only the set value within the setting range is effective.

  FFFFH represents –1.

- The Modbus protocol does not recognize data with decimal points during communication.

  Example1: When Heater break alarm (HBA) set value is 20.0 A, 20.0 is processed as 200, 200 = 00C8H

Heater break alarm (HBA) set value	High	00H
	Low	C8H

  Example2: When Set value (SV) is –20.0 °C, –20.0 is processed as –200, –200 = 0000H – 00C8H = FF38H

Set value (SV)	High	FFH
	Low	38H

- In this communication, the data that memory area includes handles different address with for Control area and for setting area.
- If data (holding register) exceeding the accessible address range is accessed, an error response message is returned.
- Read data of unused item is a default value.
- Any attempt to write to an unused item is not processed as an error. Data cannot be written into an unused item.
- If an error (data range error or address error) is detected in the data writing process, an error is returned. Writing is aborted at and after the addresses where an error occurred. After having completed the setting, check to see if the data was properly written.
- An attribute of the item for functions which are not in the controller is RO (read only). If read action to this item is performed, the read data will be "0." If write action to this item is performed, no error message is indicated and no data is written.

  For details, refer to **9. COMMUNICATION DATA LIST (P. 46)**.

- Send the next command message at time intervals of 24 bits after the master receives the response message.

A.3.8 How to use memory area data

Memory area function can store up to 8 individual sets of SVs and parameters. One of the areas is used for control, and the currently selected area is "Control area."
Memory area data can be used to check and change settings that belong to memory areas other than the control area. Reading and writing of memory area data is performed by channel.

■ Read and write of memory area data

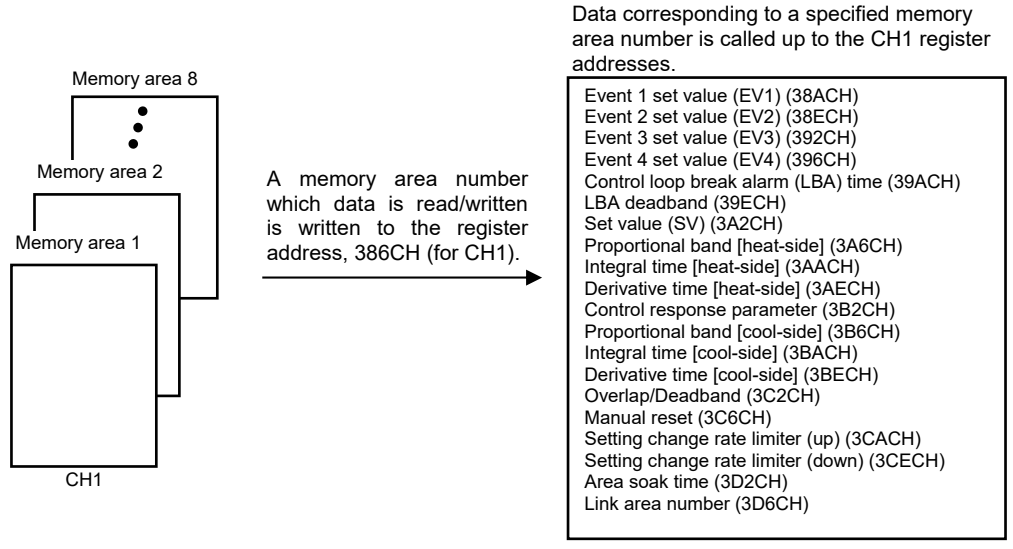
If any memory area number to perform data read and write is specified by the setting memory area number (386CH to 38ABH), data corresponding to the specified memory area number is called up to the register addresses from 38ACH to 3DABH. By using these register addresses from 38ACH to 3DABH, it becomes possible to read and write data in any memory area.

	Register address			
	CH1	CH2	·····	CH64
Setting memory area number	386CH	386DH	·····	38ABH
Event 1 set value (EV1)	38ACH	38ADH	·····	38EBH
Event 2 set value (EV2)	38ECH	38EDH	·····	392BH
Event 3 set value (EV3)	392CH	392DH	·····	396BH
Event 4 set value (EV4)	396CH	396DH	·····	39ABH
Control loop break alarm (LBA) time	39ACH	39ADH	·····	39EBH
LBA deadband	39ECH	39EDH	·····	3A2BH
Set value (SV)	3A2CH	3A2DH	·····	3A6BH
Proportional band [heat-side]	3A6CH	3A6DH	·····	3AABH
Integral time [heat-side]	3AACH	3AADH	·····	3AEBH
Derivative time [heat-side]	3AECH	3AEDH	·····	3B2BH
Control response parameter	3B2CH	3B2DH	·····	3B6BH
Proportional band [cool-side]	3B6CH	3B6DH	·····	3BABH
Integral time [cool-side]	3BACH	3BADH	·····	3BEBH
Derivative time [cool-side]	3BECH	3BEDH	·····	3C2BH
Overlap/Deadband	3C2CH	3C2DH	·····	3C6BH
Manual reset	3C6CH	3C6DH	·····	3CABH
Setting change rate limiter (up)	3CACH	3CADH	·····	3CEBH
Setting change rate limiter (down)	3CECH	3CEDH	·····	3D2BH
Area soak time	3D2CH	3D2DH	·····	3D6BH
Link area number	3D6CH	3D6DH	·····	3DABH

← Register address to specify memory area

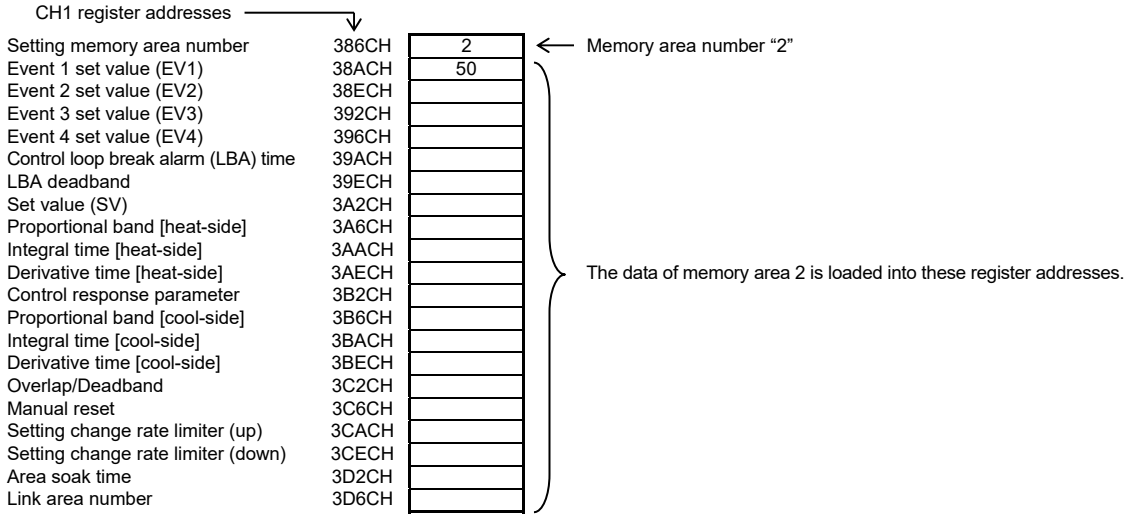
Register address of memory area data

☞ For the Memory area data list, refer to **9.4 Memory Area Data Address of Z-TIO Module (P. 76)**.



[Example 1] When data on the Event 1 set value in Memory area 2 of CH1 is read

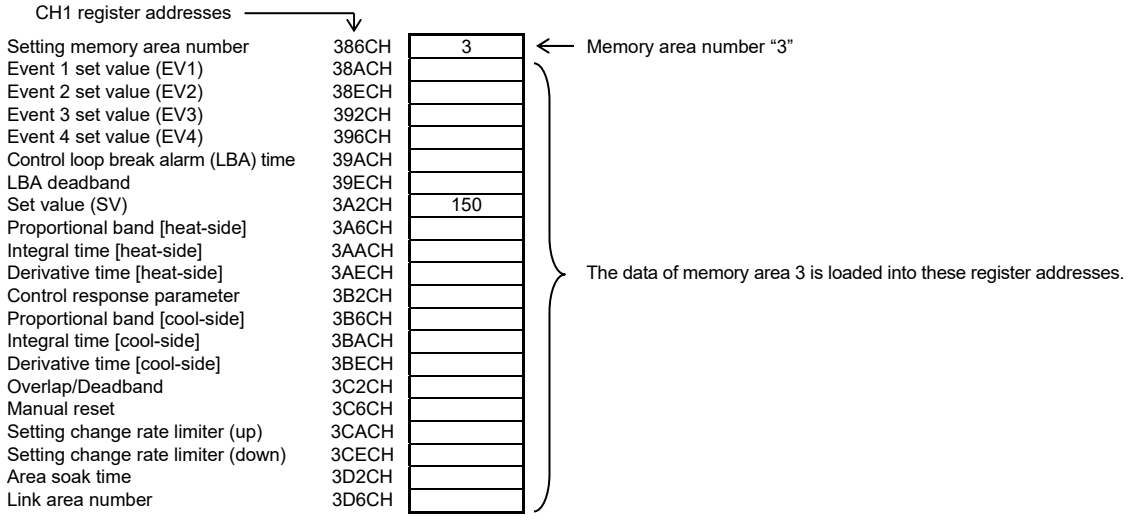
1. The memory area number, "2" is written to the CH1 setting memory area number (386CH). Data in Memory area 2 is called up to the CH1 register addresses.



2. Data "50" on Event 1 set value (38ACH) is read.

[Example 2] When the set value (SV) in Memory area 3 of CH1 is changed to 200

1. The memory area number, "3" is written to the CH1 setting memory area number (386CH). Data in Memory area 3 is called up to the CH1 register addresses.



2. "200" is written to the set value (SV) (3A2CH).

■ Control area transfer

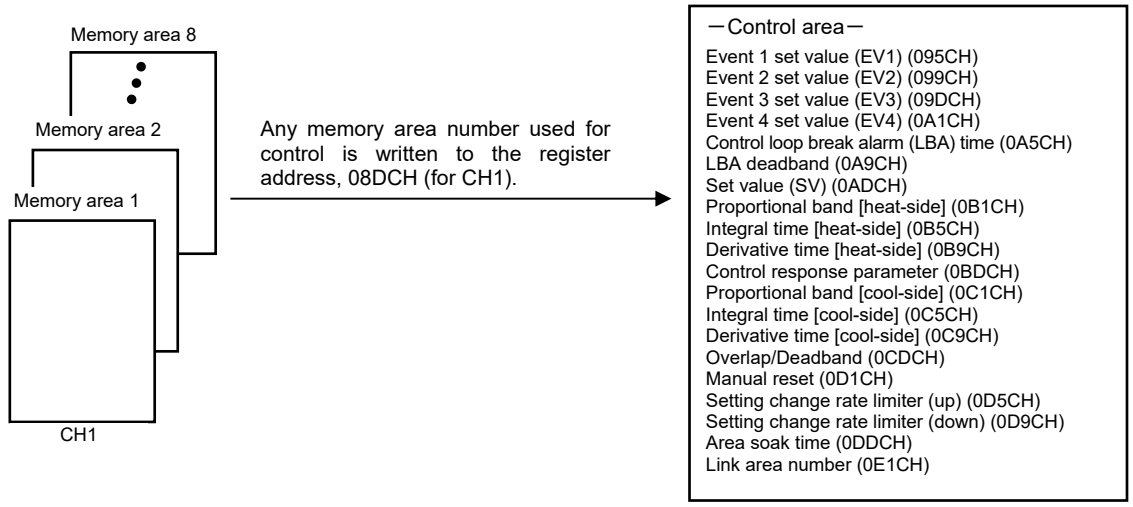
Any memory area used for control is specified by the memory area transfer (08DCH to 091BH). The area (095CH to 0E5BH) now used for control is called “Control area.”

The memory area number (control area) can be changed at either RUN or STOP.

	Register address			
	CH1	CH2	·····	CH64
Memory area transfer	08DCH	08DDH	·····	091BH
Event 1 set value (EV1)	095CH	095DH	·····	099BH
Event 2 set value (EV2)	099CH	099DH	·····	09DBH
Event 3 set value (EV3)	09DCH	09DDH	·····	0A1BH
Event 4 set value (EV4)	0A1CH	0A1DH	·····	0A5BH
Control loop break alarm (LBA) time	0A5CH	0A5DH	·····	049BH
LBA deadband	0A9CH	0A9DH	·····	0ADBH
Set value (SV)	0ADCH	0ADDH	·····	0B1BH
Proportional band [heat-side]	0B1CH	0B1DH	·····	0B5BH
Integral time [heat-side]	0B5CH	0B5DH	·····	0B9BH
Derivative time [heat-side]	0B9CH	0B9DH	·····	0BDBH
Control response parameter	0BDCH	0BDDH	·····	0C1BH
Proportional band [cool-side]	0C1CH	0C1DH	·····	0C5BH
Integral time [cool-side]	0C5CH	0C5DH	·····	0C9BH
Derivative time [cool-side]	0C9CH	0C9DH	·····	0CDBH
Overlap/Deadband	0CDCH	0CDDH	·····	0CDCH
Manual reset	0D1CH	0D1DH	·····	0D5BH
Setting change rate limiter (up)	0D5CH	0D5DH	·····	0D9BH
Setting change rate limiter (down)	0D9CH	0D9DH	·····	0DDBH
Area soak time	0DDCH	0DDDH	·····	0E1BH
Link area number	0E1CH	0E1CH	·····	0E5BH

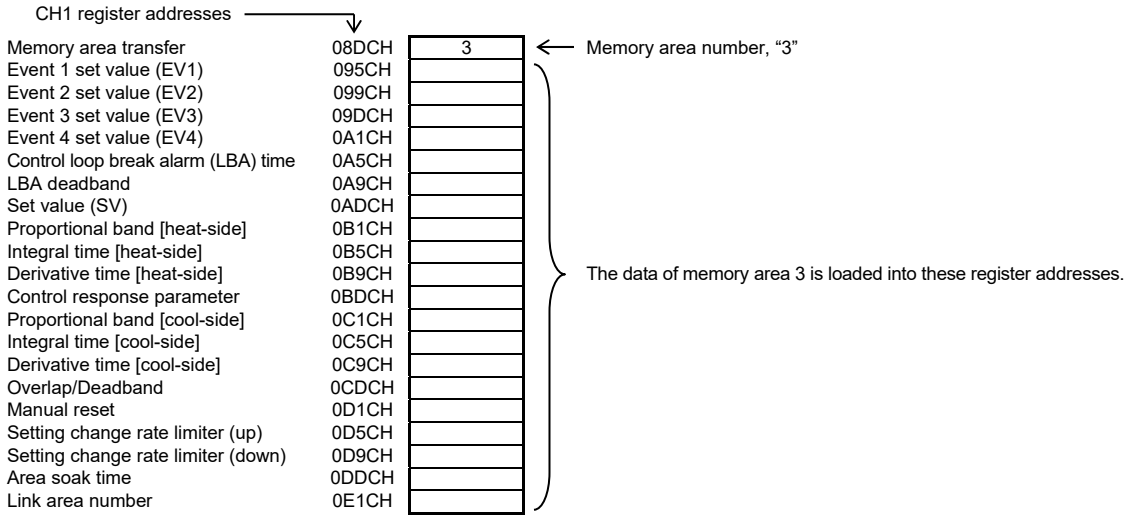
← Register address to specify control area

Register address of memory area data



[Example] When performing control by calling up data in Memory area 3 of CH1

1. The memory area number, “3” is written to the memory area transfer (08DCH).
Data in Memory area 3 is called up to the CH1 register addresses.



2. Control of CH1 is performed by using data in the register addresses.

If the memory area transfer (08DCH to 091BH) and the setting memory area number (386CH to 38ABH) are set to the same memory area number, the respective data can be synchronized.

- Values in the control areas (095CH to 0E5BH) and the setting memory area number (38ACH to 3DABH) are set to the same memory area number, the respective data can be synchronized.
- If data in the control area is changed, data in the memory area is also changed.
- If data in the memory area is changed, data in the control area is also changed.

■ Data mapping function

When using a COM-ML joined to function modules, the data mapping function cannot be used.

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