EtherNet/IP
Communication Converter

COM-ML

[For SRZ]

Instruction Manual

RKC® RKC INSTRUMENT INC. IMR02E08-E3

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.
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- ControlLogix and RSLogix are trademarks of Rockwell Automation. RSLinx is a registered trademark of Rockwell Automation.
- 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.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock 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 four 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.com/english/manual_load.htm.

Manual	Manual Number	Remarks
EtherNet/IP Communication Converter COM-ML [For SRZ] Installation Manual	IMR02E05-E☐	This manual is enclosed with instrument. This manual explains the mounting and wiring.
EtherNet/IP Communication Converter COM-ML [For SRZ] Quick Operation Manual	IMR02E06-E☐	This manual is enclosed with instrument. This manual explains the communication setting and the basic operation method.
EtherNet/IP Communication Converter COM-ML [For SRZ] Host Communication Data List	IMR02E07-E☐	This manual is enclosed with instrument. This list is a compilation of the host communication data items.
EtherNet/IP Communication Converter COM-ML [For SRZ] Instruction Manual	**IMR02E08-E3**	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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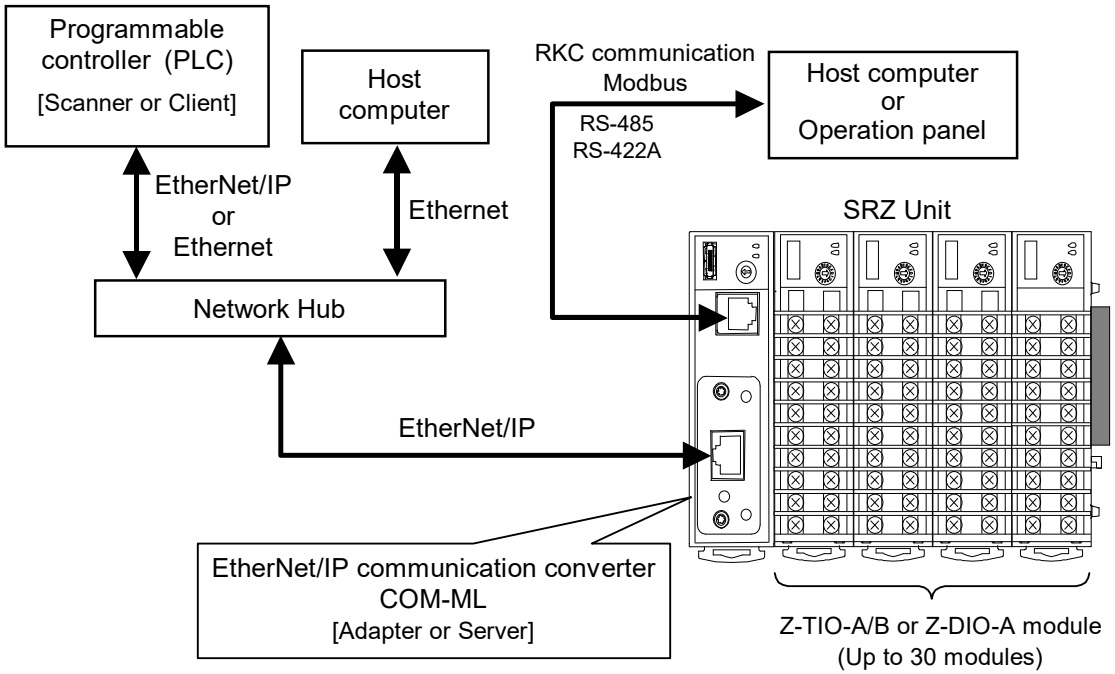
MEMO

1. OUTLINE

EtherNet/IP communication converter COM-ML [For SRZ] (hereafter called COM-ML) is communication converter to connect the RKC module type controller SRZ to the EtherNet/IP.
This chapter describes features, package contents, model code, system configuration, etc.

- EtherNet/IP is an implementation of CIP (Common Industrial Protocol) on Ethernet and TCP/IP.
- COM-ML supports "I/O communication" and "Explicit message communication" for EtherNet/IP.
- Scanner/adapter (multicast: 1 to N) communication is used in I/O communication.
  Client/server (peer to peer: 1 to 1) communication is used in explicit message communication.
- In scanner/adapter communication, COM-ML corresponds to the adapter. In client/server communication, COM-ML corresponds to the server.
- Up to 30 function modules (Z-TIO and Z-DIO) can be connected to one COM-ML with SRZ unit. (However, the maximum joinable number of function modules of the same type is 16.)



☞ For EtherNet/IP, see the website of ODVA (Open DeviceNet Vendor Association).
URL: https://www.odva.org/

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. (See below)

Name	Q'TY	Remarks
☐ COM-ML [For SRZ] Installation Manual (IMR02E05-E☐)	1	Enclosed with instrument
☐ COM-ML [For SRZ] Quick Instruction Manual (IMR02E06-E☐)	1	Enclosed with instrument
☐ COM-ML [For SRZ] Communication Data List (IMR02E07-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 [For SRZ] Instruction Manual (IMR02E08-E3)	1	This manual (sold separately) This manual can be downloaded from the official RKC website: https://www.rkcinst.com/english/manual_load.htm

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

EDS file
The EDS file is used for recognition of the COM-ML on EtherNet/IP in the configuration tool (software for environment settings and creating programs); however, EtherNet/IP communication is possible without using the EDS file.
If you require the EDS file, download it from the official RKC website.
https://www.rkcinst.com/english/manual_load.htm

■ 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)	1	For host communication Modular connector and Spade lug terminal
☐ Connection cable (W-BF-02-☐, ☐: cable length)	1	For host communication Modular connectors (at both ends)
☐ Connection cable (W-BF-28-☐, ☐: cable length)	1	For host communication 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 - 2 □ ∗ 02
(1) (2) (3)

(1) Ethernet communication type

2: EtherNet/IP

(2) Host communication interface (COM. PORT)

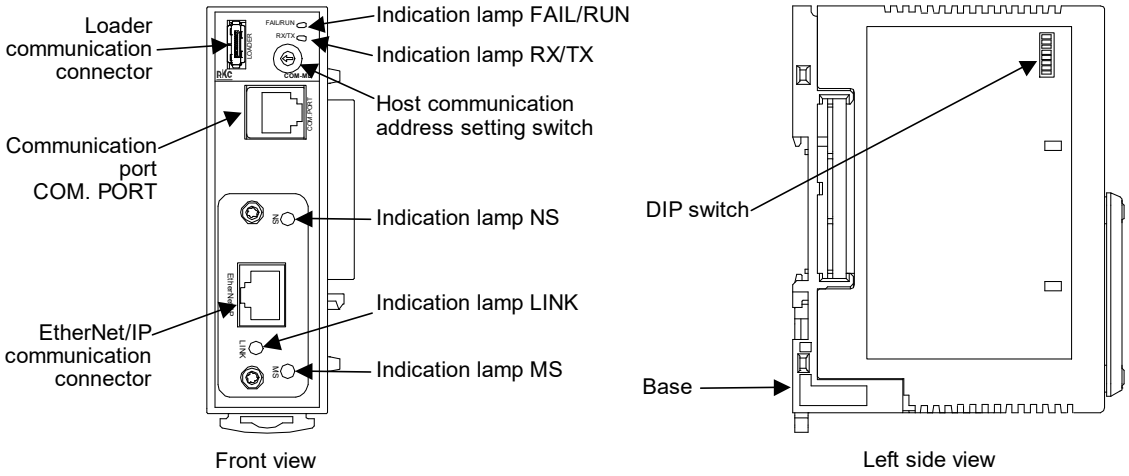
4: RS-422A
5: RS-485

(3) Corresponding to the RKC controller

02: SRZ

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 • Online, no connection established: A green lamp flashes • Online, connections established: A green lamp turns on • I/O connection is timeout: A red lamp flashes • A fatal communications error has occurred (Duplicate IP address): A red lamp turns on
LINK (Link/Activity) [Green]	• No link, no activity: Turns off • Activity (During data send): A green lamp flashes • Link established: A green lamp turns on
MS (Module status) [Green or Red]	• No power: Turns off • Controlled by a Scanner in Run state: A green lamp turns on • Not configured, or Scanner in idle state: A green lamp flashes • Recoverable fault: A red lamp flashes • Major fault: A red lamp turns on

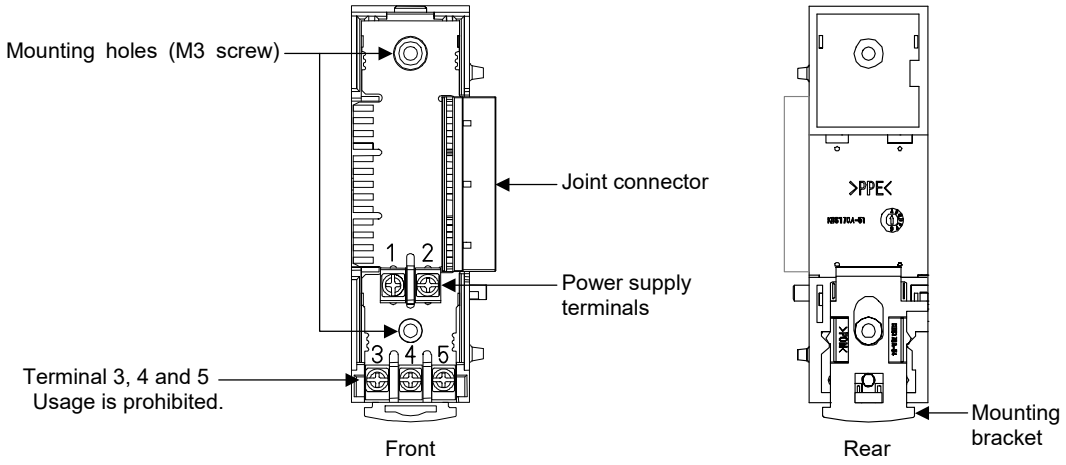
● Communication port (modular connector) and communication connector

COM. PORT	Use to connecting the Operation panel or Host computer. [RS-485 or RS-422A]
EtherNet/IP communication connector	Use to connecting the EtherNet/IP.
Loader communication connector	Use to connecting the communication converter and personal computer when loader communication is performed.

● 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 module.
Power supply terminals	These are terminals to supply power to the COM-ML and joined function modules. Terminal number / Signal name 1 / 24 V DC (+) 2 / 24 V DC (–)
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 module on DIN rails and also to fix each module joined together.

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.

☞ See **5. HOST COMMUNICATION SETTINGS (P. 21)**.

Mounting

Install the COM-ML.

☞ • See **3. MOUNTING (P. 7)**.
• For controller (SRZ), see **Z-TIO Instruction Manual (IMS01T01-E□)** and **Z-DIO Instruction Manual (IMS01T03-E□)**.

Wiring

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

☞ • See **4. WIRING (P. 12)**
• For controller (SRZ), see **Z-TIO Instruction Manual (IMS01T01-E□)** and **Z-DIO Instruction Manual (IMS01T03-E□)**.

Controller (SRZ) settings

Set the communication setting of controller (SRZ).

☞ • See **6. COMMUNICATIOM SETTING OF SRZ FUNCTION MODULE (P. 23)**.
• For controller (SRZ), see **Z-TIO Instruction Manual (IMS01T01-E□)** and **Z-DIO Instruction Manual (IMS01T03-E□)**.

IP address settings

Set the IP address of COM-ML.

☞ See **7.1 IP Address Settings (P. 26)**.

EtherNet/IP communication settings

Configure initial settings for EtherNet/IP communication.

☞ • See **7.2 EtherNet/IP Communication Setting (P. 29)**.
• See **10.5 Tool Settings (P. 76)**.

Other communication data settings

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

☞ • See **7.3 Other Communication Data Settings (P. 34)**.
• See **9. COMMUNICATION DATA LIST (P. 38)**.

EtherNet/IP communication

Execute I/O communication or explicit message communication.

☞ • See **10.6 I/O Communication (P. 84)**.
• See **10.7 Explicit Message Communication (P. 87)**.

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) This instrument is intended to be used under the following environmental conditions.
(IEC 61010-1) [POLLUTION DEGREE 2]

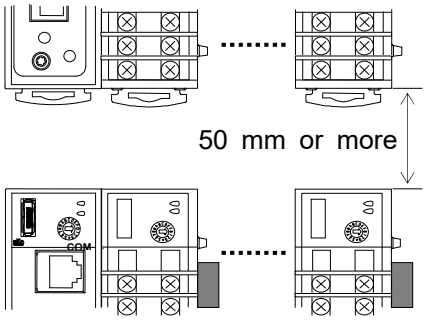
(2) Use this instrument within the following environment conditions.
- Allowable ambient temperature: −10 to +50 °C
- Allowable ambient humidity: 5 to 95 %RH
  (Absolute humidity: MAX.W.C 29.3 g/m^3 dry air at 101.3 kPa)
- Installation environment conditions: Indoor use
  Altitude up to 2000 m

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

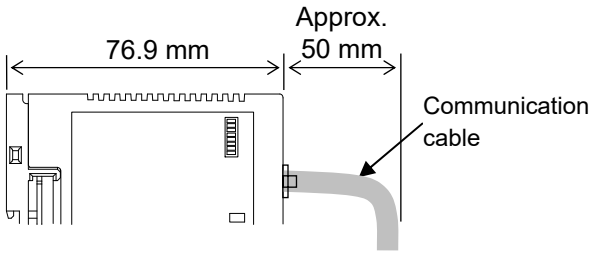
(4) Mount this instrument in the panel considering the following conditions:
- Provide adequate ventilation space so that heat does not build up.
- Do not mount this instrument directly above the equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors.)
- If the ambient temperature rises above 50 °C, 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.

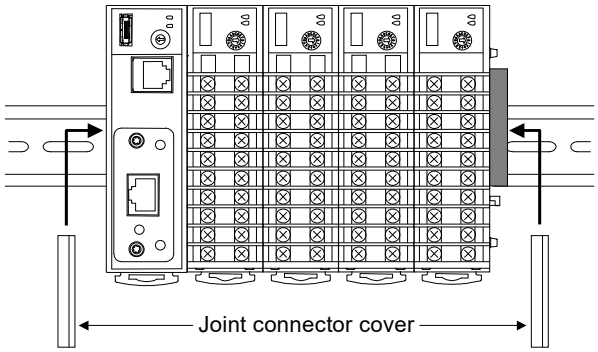
- Space required between each module vertically
  When the module is mounted on the panel, allow a minimum of 50 mm at the top and bottom of the module to attach the module to the mainframe.



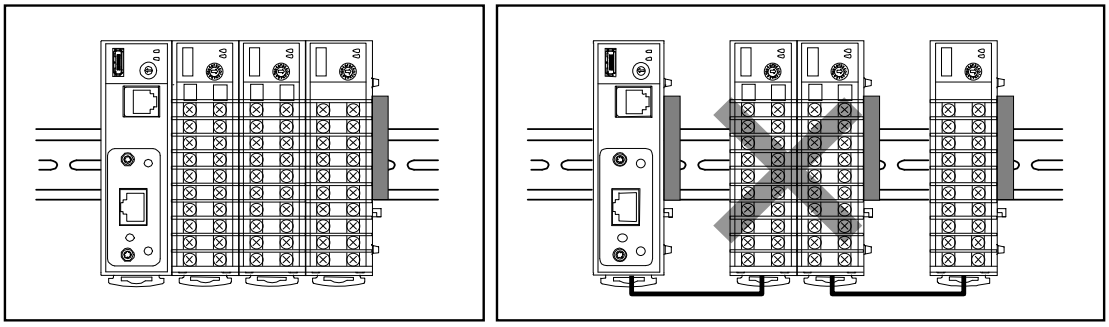
- Depth for modular cables mount type module
  Space for modular cables must be considered when installing.



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



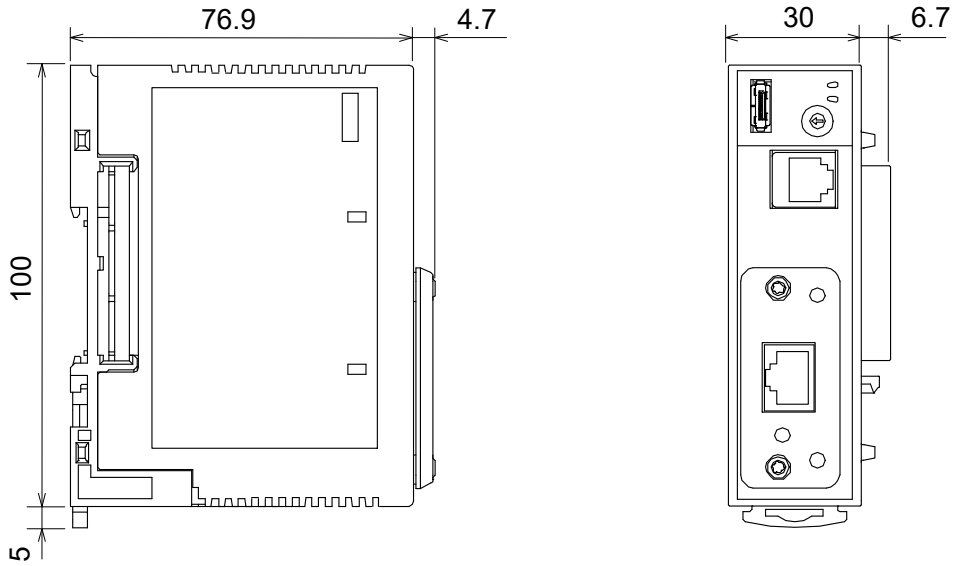
- Be sure the COM-ML and SRZ function modules (Z-TIO and Z-DIO modules) are joined when using them.



(5) 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)

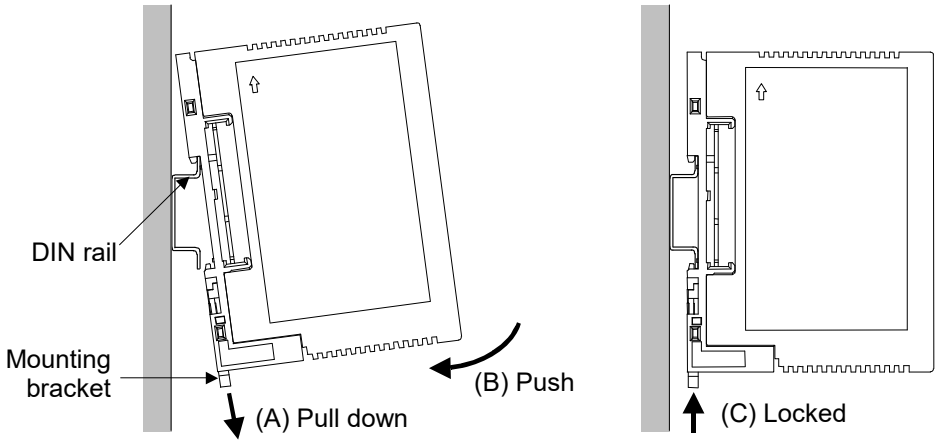


3.3 DIN Rail Mounting

■ Mounting procedures

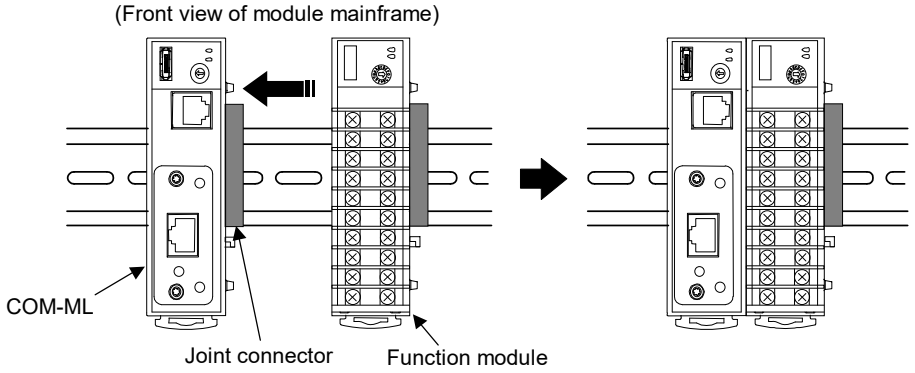
1. Pull down the mounting bracket at the bottom of the module (A). Attach the hooks on the top of the module to the DIN rail and push the lower section into place on the DIN rail (B).

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

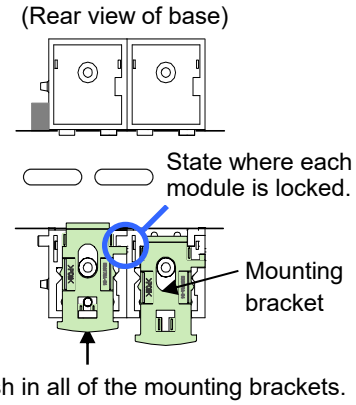


■ Module joining procedures

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. (See P. 8)

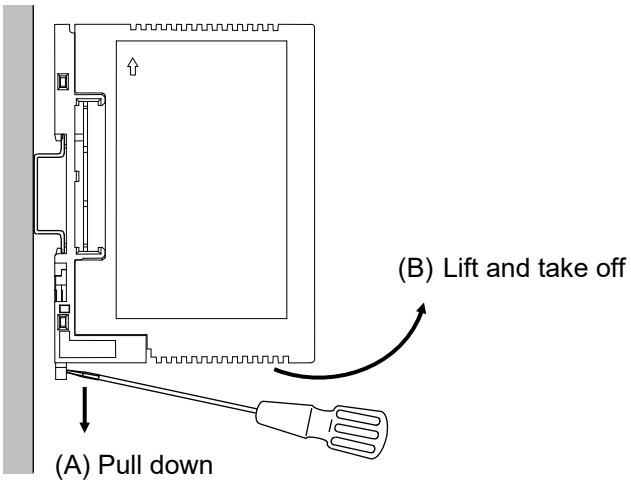
To firmly fix the modules, use end plates (DEP-01) sold separately on both sides of the mounted modules.

■ Removing procedures

1. Turn the power OFF.

2. Remove the wiring.

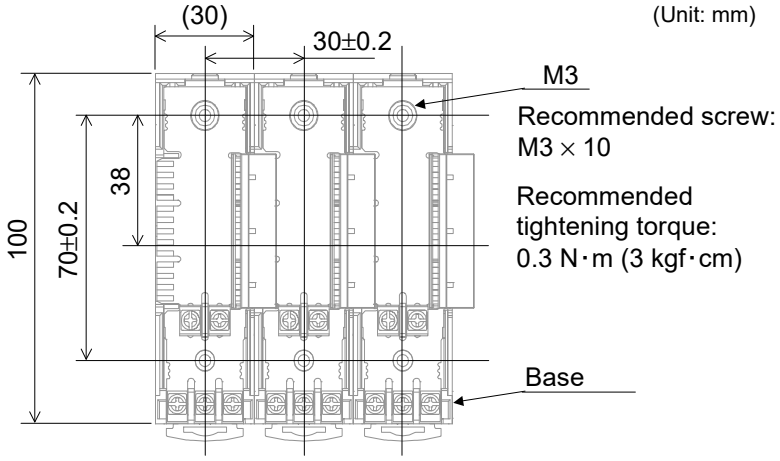
3. Pull down a mounting bracket with a blade screwdriver (A). Lift the module from bottom, and take it off (B).



3.4 Panel Mounting

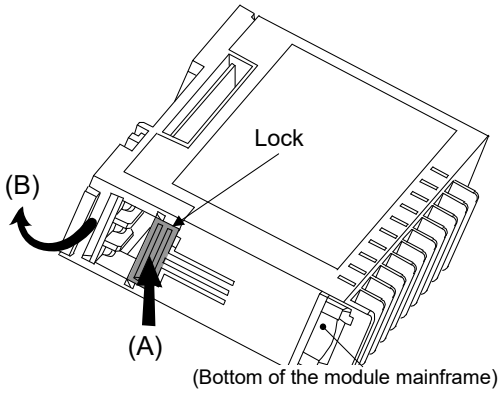
■ Mounting procedures

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



Mounting dimensions

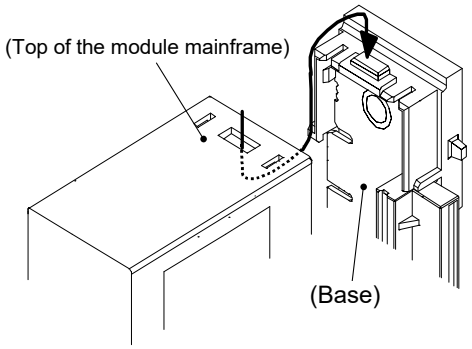
2. Remove the base from the module (B) while the lock is pressed (A).



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

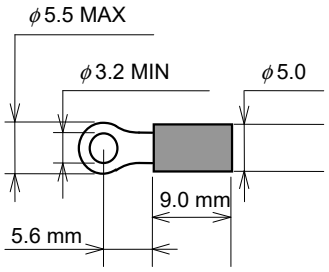
⚠ WARNING

To prevent electric shock or instrument failure, do not turn on the power until all the 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 the end-use equipment. The power supply must be in compliance with a limited-energy circuits (maximum available current of 8 A).
- Supply the power to only one of the joined modules 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.

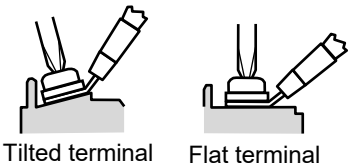
  Power consumption (at maximum load): 120 mA max. (at 24 V DC)
  Rush current: 12 A or less
- When connecting the wiring to the power supply terminals on the base, use the specified solderless terminals. Only these specified solderless terminals can be used due to the insulation between the terminals.

  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
  (M3 screw, width 5.5 mm, hole diameter 3.2 mm)



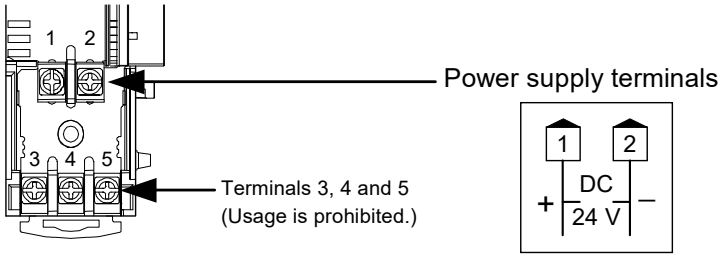
- Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.

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

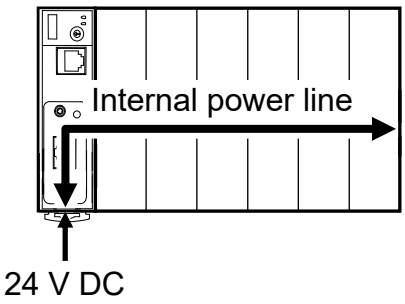
When using the COM-ML connected to function modules, terminals 3, 4 and 5 are not used. Do not connect anything to terminals 3, 4 and 5. In addition, do not use terminals 3, 4 and 5 of function modules.

■ Wiring method

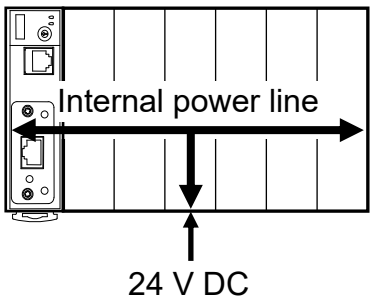
When using the COM-ML connected to function modules, the power supply wiring is connected to any one of the modules. Power is supplied from the module with the power wiring to the other modules.

[Wiring example]

When supplied a power supply to a COM-ML

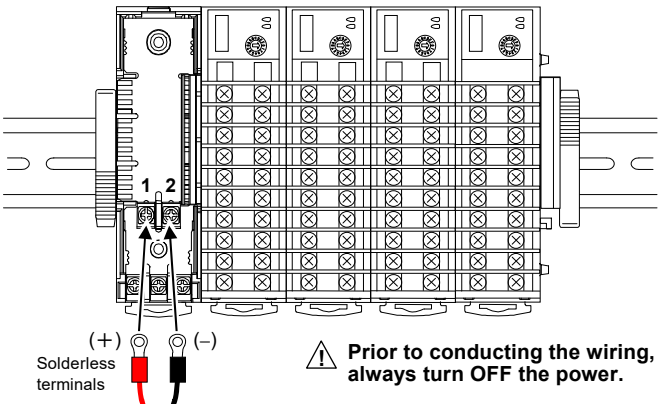


When supplied a power supply to a function module



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.

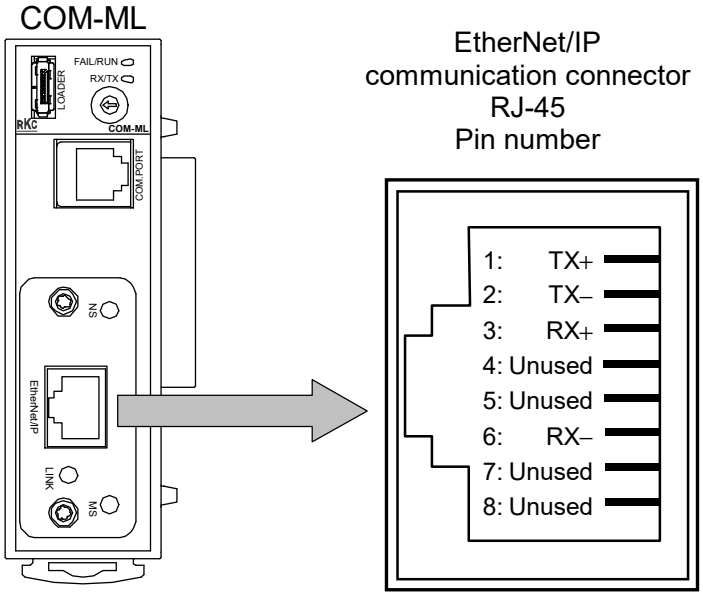


3. Return the module mainframe to the base. This completes the wiring work.

4.3 Connection to EtherNet/IP

Connect COM-ML to EtherNet/IP.

■ Pin layout of connector



■ Connector pin number and signal details

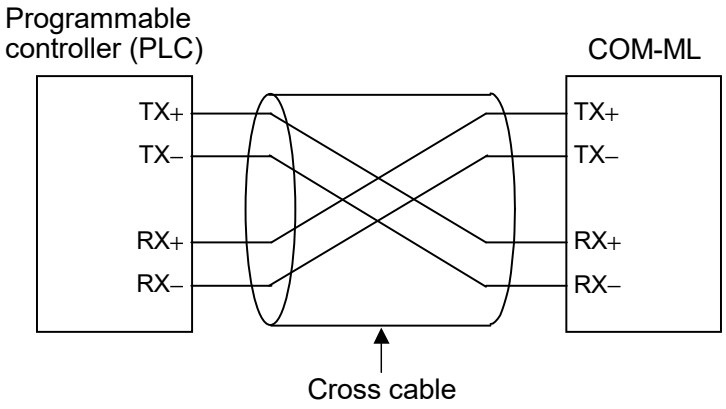
Pin No.	Signal name	Symbol
1	Send data +	TX+
2	Send data –	TX–
3	Receive data +	RX+
4	Unused	—
5	Unused	—
6	Receive data –	RX–
7	Unused	—
8	Unused	—

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

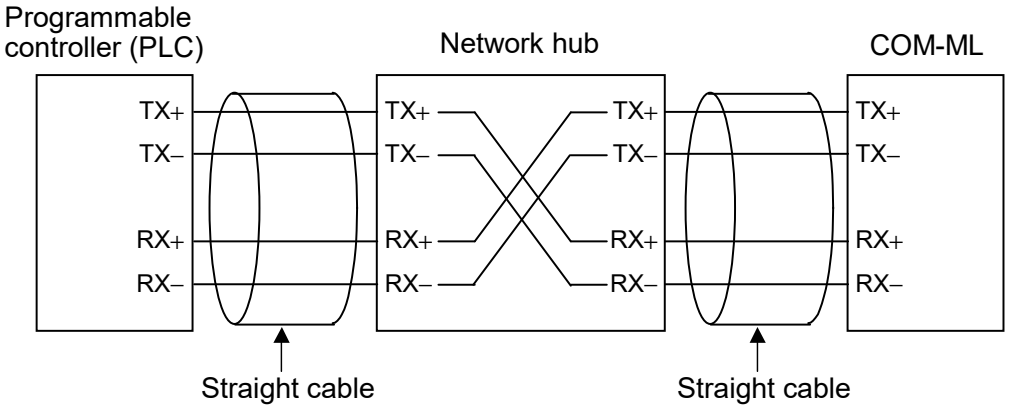
● When directly connected to scanner or client

Use a cross cable when directly connected to the scanner or client (such as PLC or computer, etc.).



● When use network hub

Use straight cables when connected to the network hub.



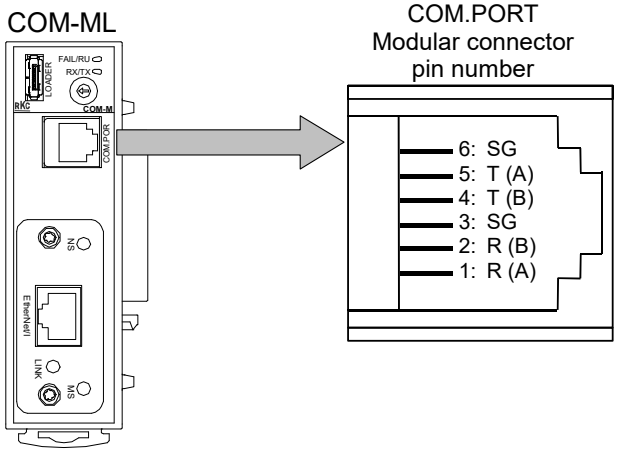
Cross cables may be used depending on the connecting device used. Therefore, follow the instructions for the respective device.

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

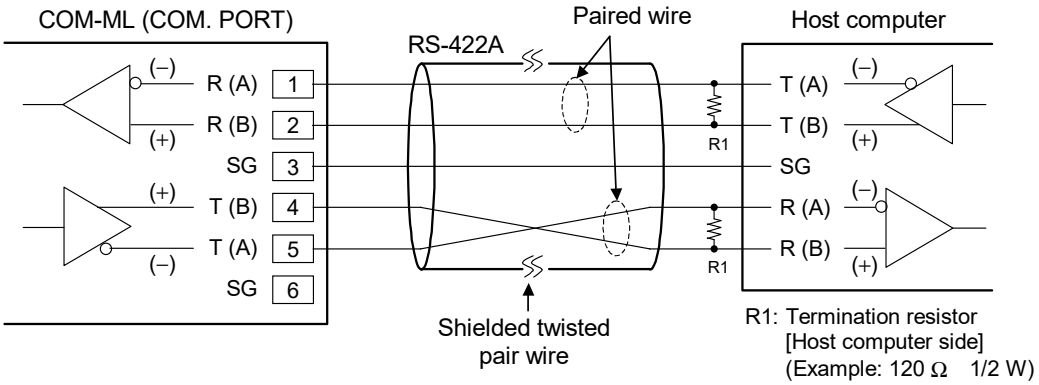


■ Connector pin number and signal details

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



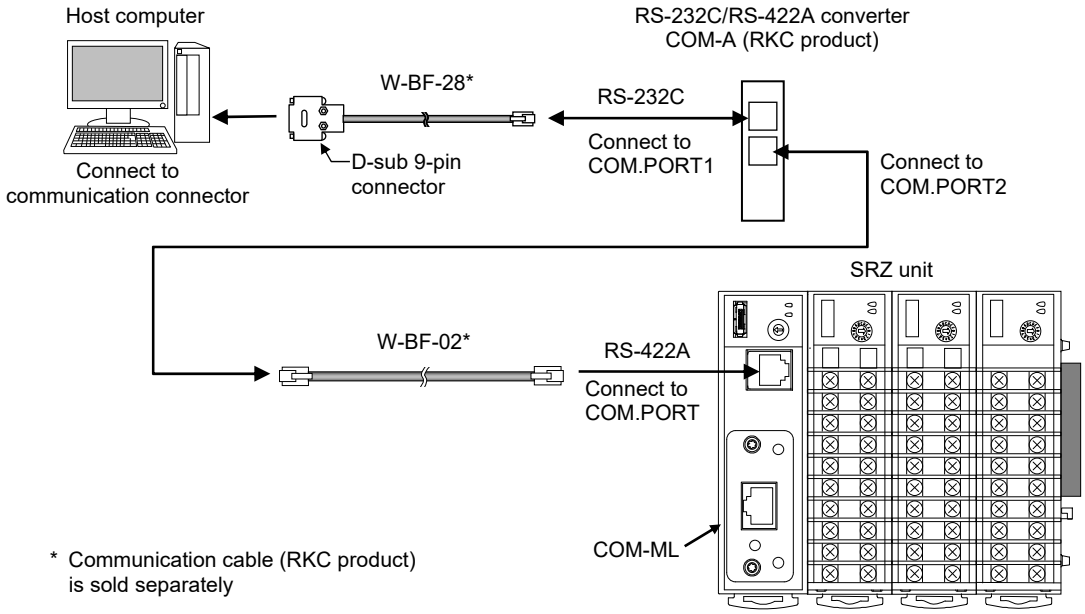
NOTE

If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors to the host computer side.

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.

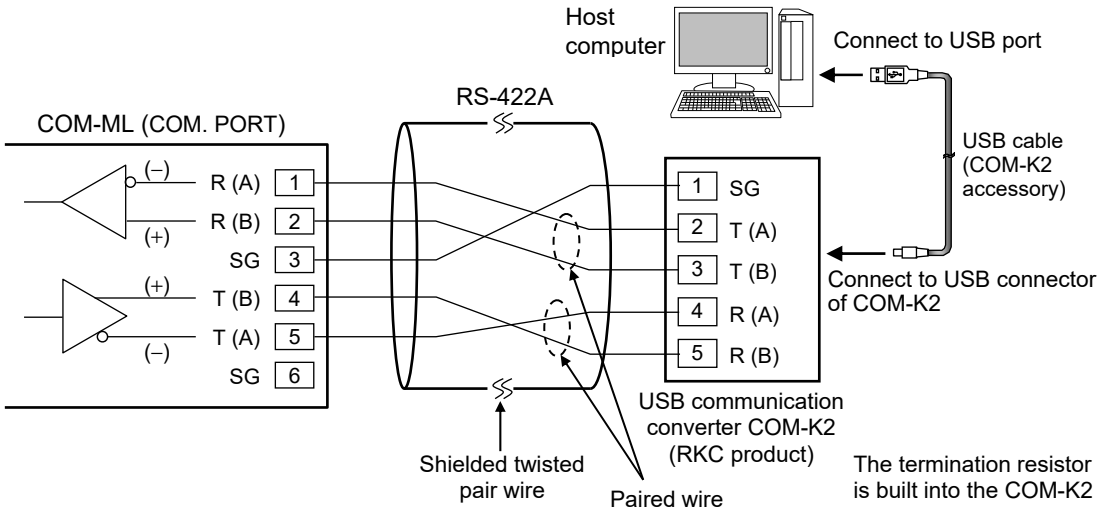


W-BF-02 and W-BF-28 communication cable (RKC product) can be used as communication cable. If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.

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

■ When the host computer has a USB connector

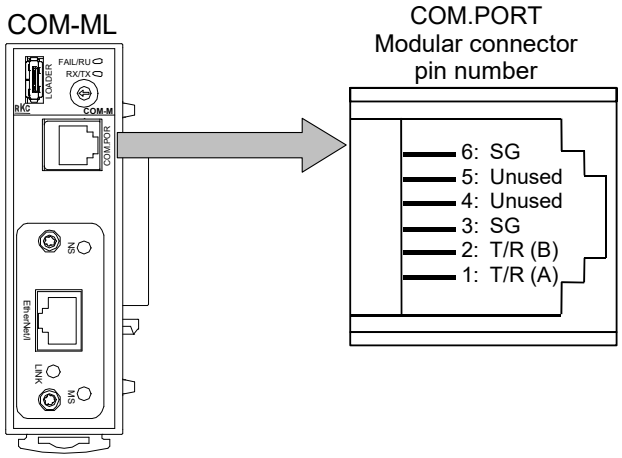
Connect the USB communication converter between the host computer and the COM-ML.



For the COM-K2, see the **COM-K2 Instruction Manual**.

4.4.2 When connected with RS-485

■ Pin layout of connector

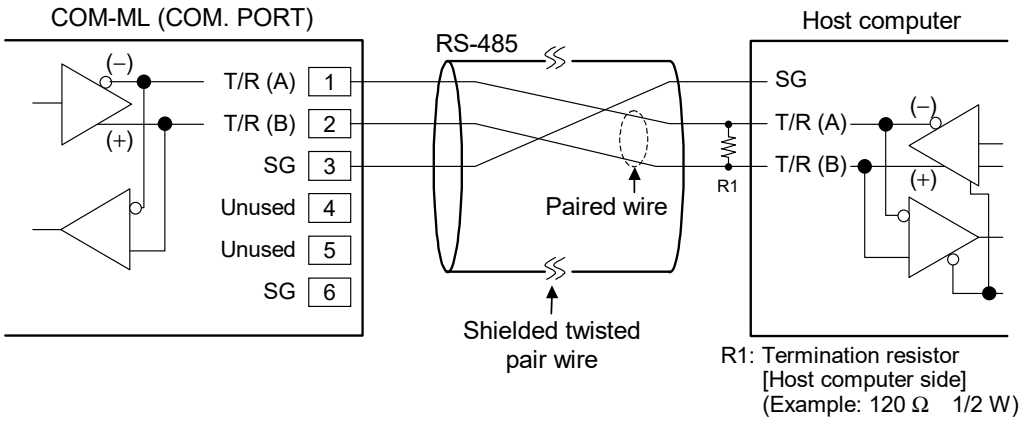


■ Connector pin number and signal details

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



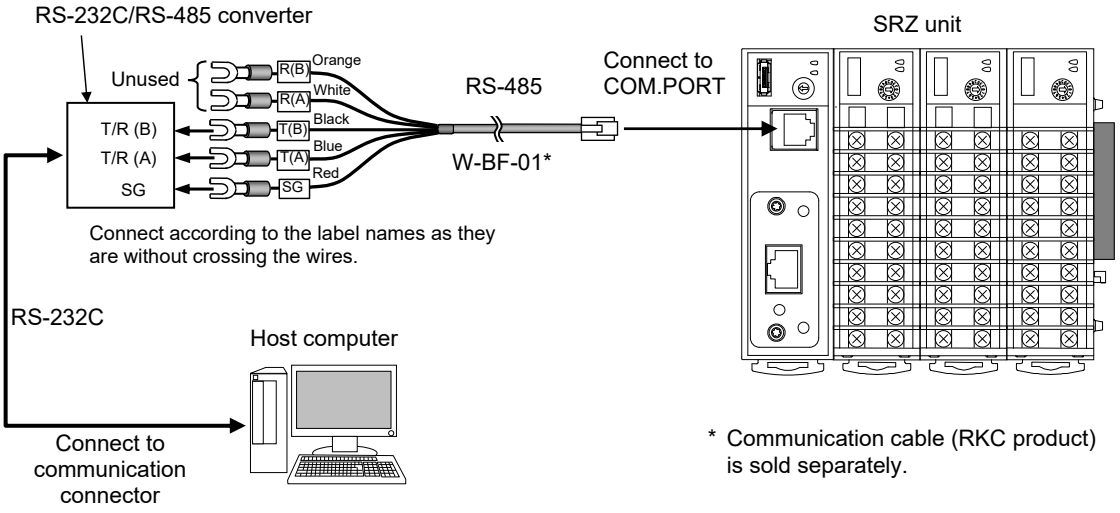
NOTE

If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors to the host computer side.

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

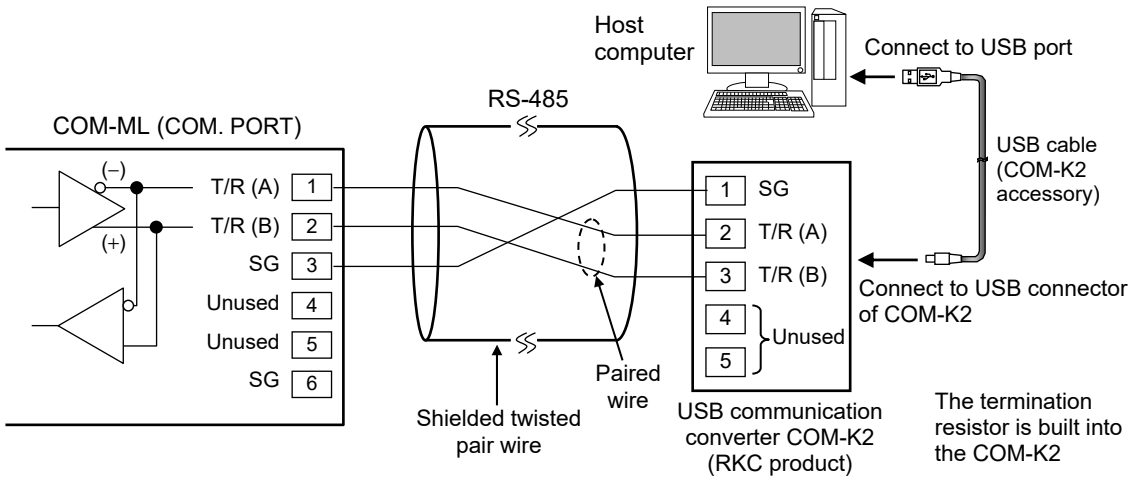
Be sure to insulate the wires that are not used by covering them with insulating tape.

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.

■ When the host computer has a USB connector

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

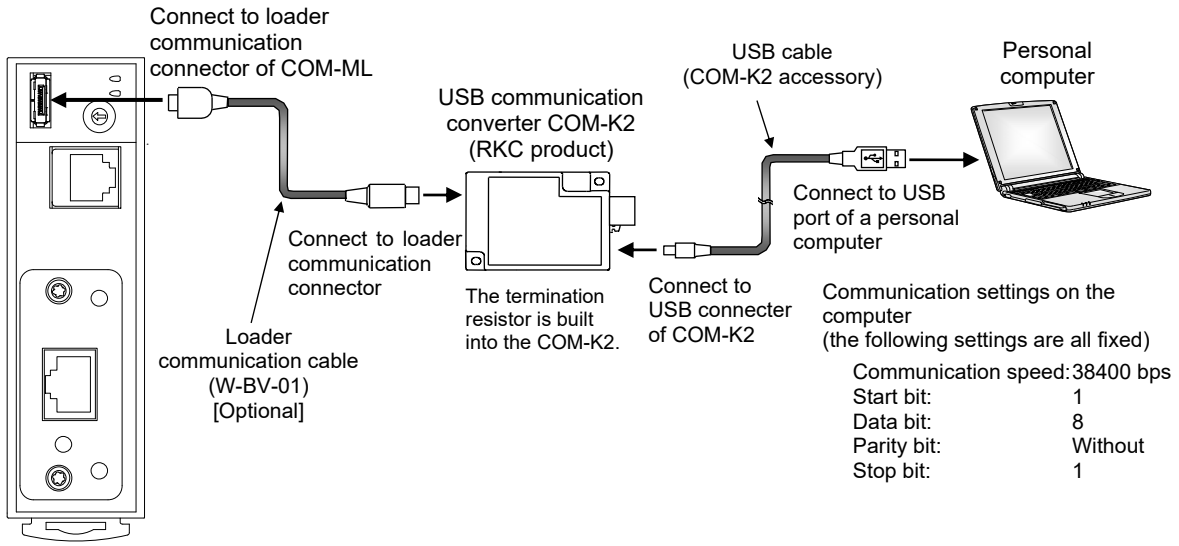


For the COM-K2, see the **COM-K2 Instruction Manual**.

4.4.3 Connections for loader communication

Connect a USB communication converter COM-K2 (sold separately)* between the host computer and the COM-ML.
Loader communication makes it possible to check and set data of the COM-ML and the controller (SRZ).

* A loader communication cable (option) 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 m])



NOTE

The Loader port is only for parameter setup. Not used for data logging during operation.

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, see the **COM-K2 Instruction Manual**.

5. HOST COMMUNICATION SETTING

⚠ WARNING

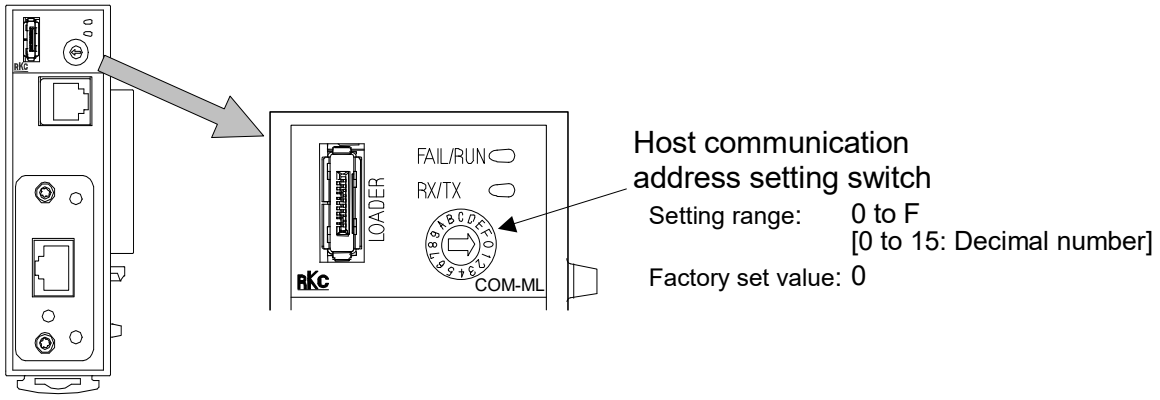
- To prevent electric shock or instrument failure, always turn off the power before setting the switch.
- To prevent electric shock or instrument failure, never touch any section other than those instructed in this manual.

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.

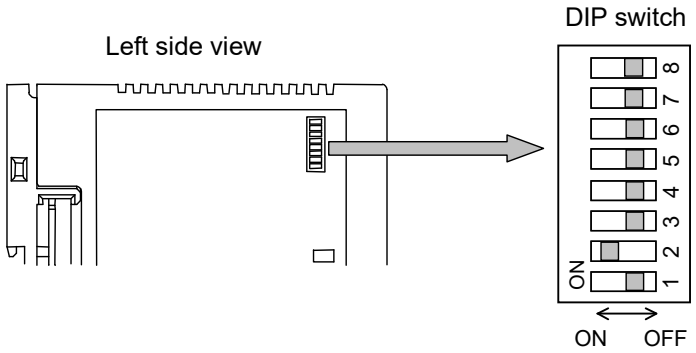
NOTE

When two or more COM-ML (SRZ unit) are connected, to avoid problems or malfunction, do not duplicate an address on the same communication line.



5.2 DIP Switch Setting

Use the DIP switch at the left side of the COM-ML 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)

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 *

* See ■ Default IP address setting (P. 28).

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.

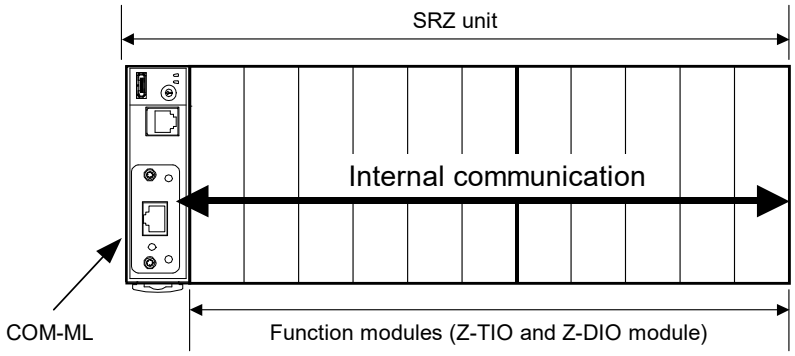
4	5	
OFF	OFF	Fixed

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 SRZ FUNCTION MODULE

Only make the module address setting to make the SRZ function module (Z-TIOA/B and Z-DIO-A 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.

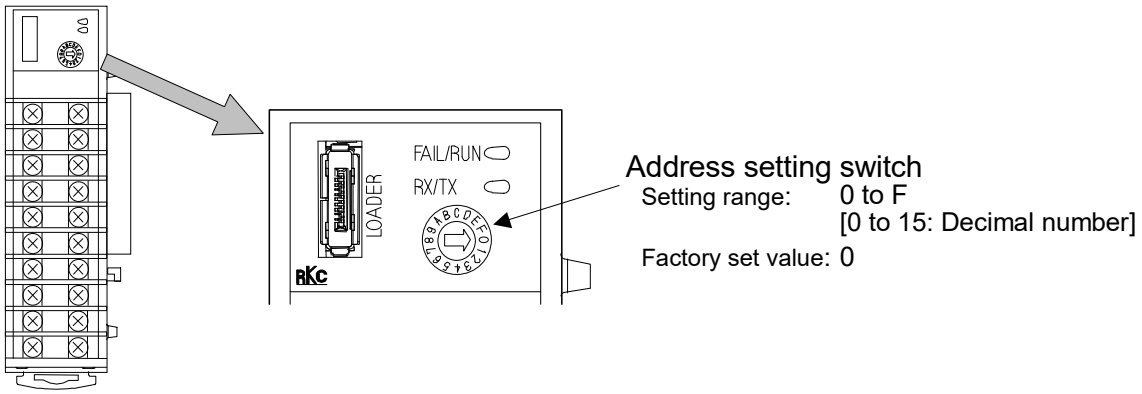
☞ For relation of the module address and channel number, see **6.2 Temperature Control Channel of SRZ Unit (P. 24)** and **6.3 Digital Input/Output Channel of Z-DIO Module (P. 25)**.

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 a module address on the same communication line.

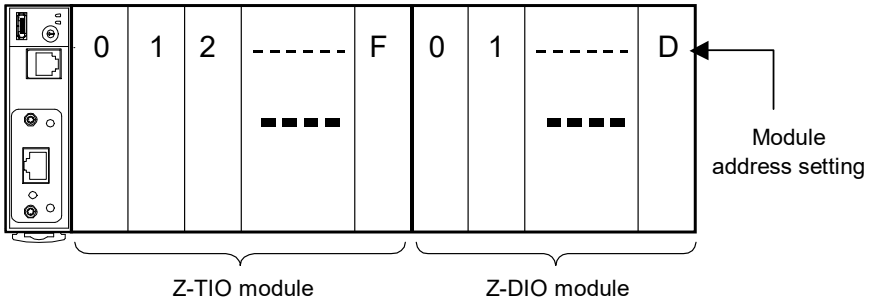


The maximum number of function modules (Z-TIO-A/B and Z-DIO-A modules) described in the following can be joined per COM-ML.

- When joining function modules of the same type: Up to 16 modules
- When joining function modules of two or more different types: Up to 31 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, 14 Z-DIO module):



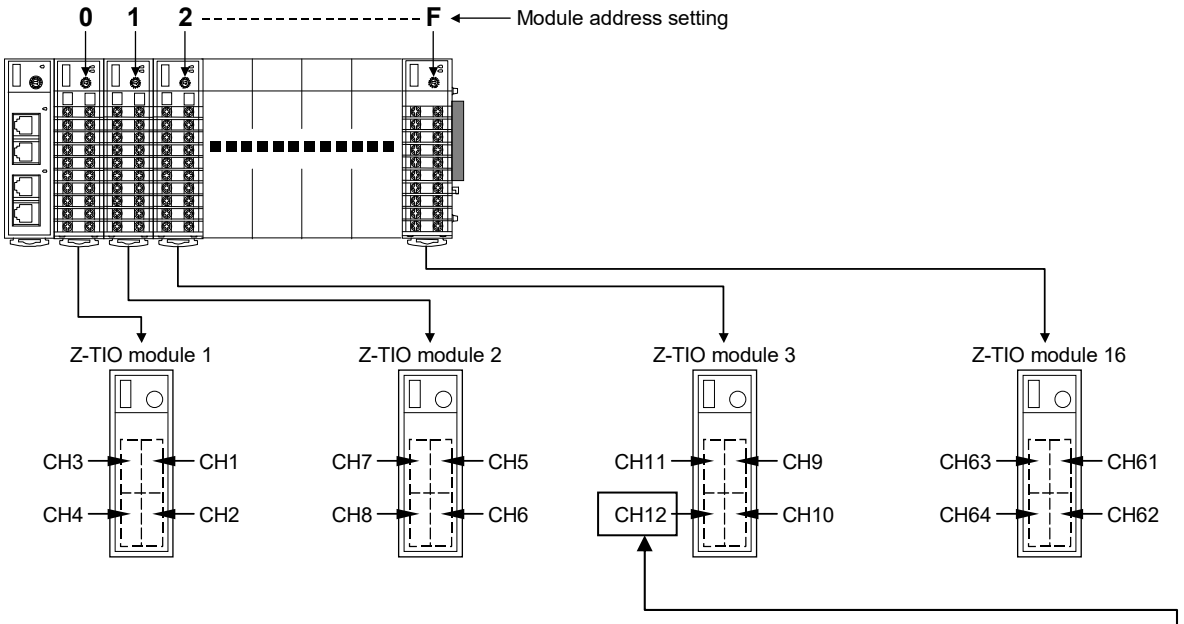
6.2 Temperature Control Channel of the SRZ Unit

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 =

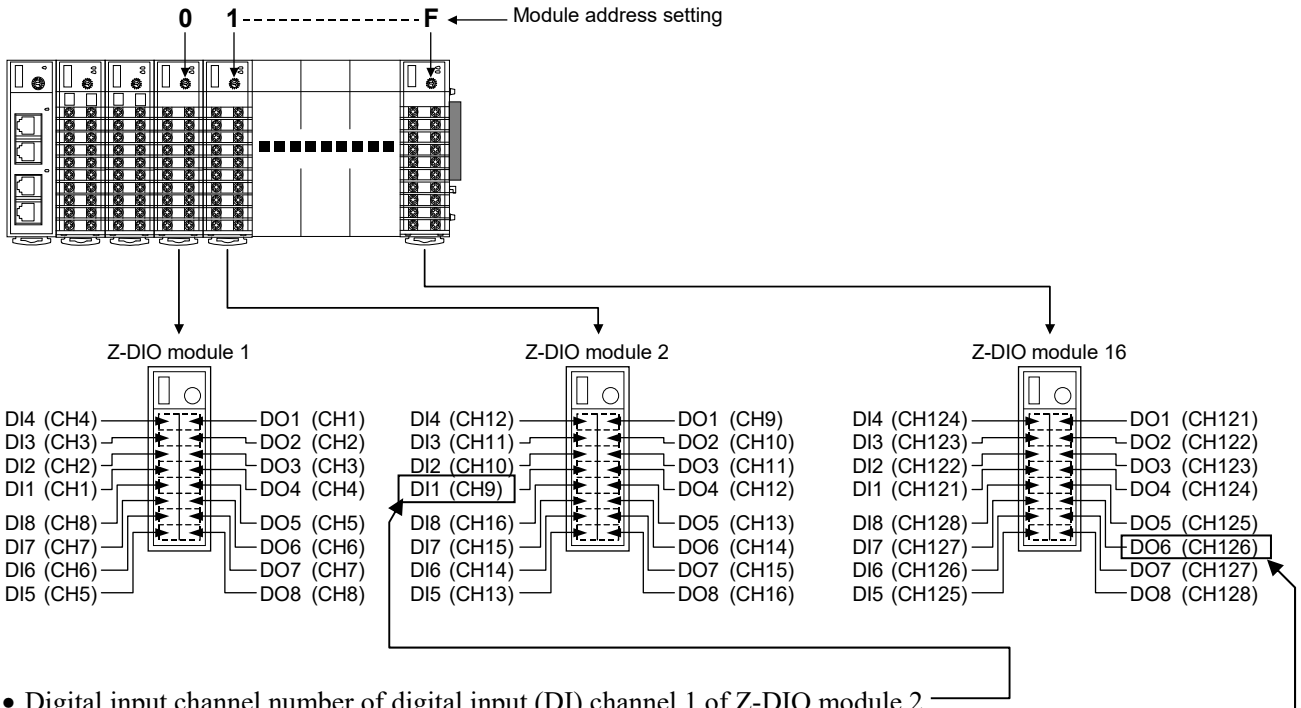
[Module address setting [a]] × [Maximum channel number of the function module [b]]

+ [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
  $15 \times 8 + 6 = 126$

7. INITIAL COMMUNICATION DATA SETTINGS

Configure the initial communication data settings for EtherNet/IP communication.

7.1 IP Address Setting

■ Fixed IP address setting

Set the fixed IP address to the COM-ML.
The IP address can be set in host communication or loader 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, see ■ **Default IP address setting (P. 28)**.

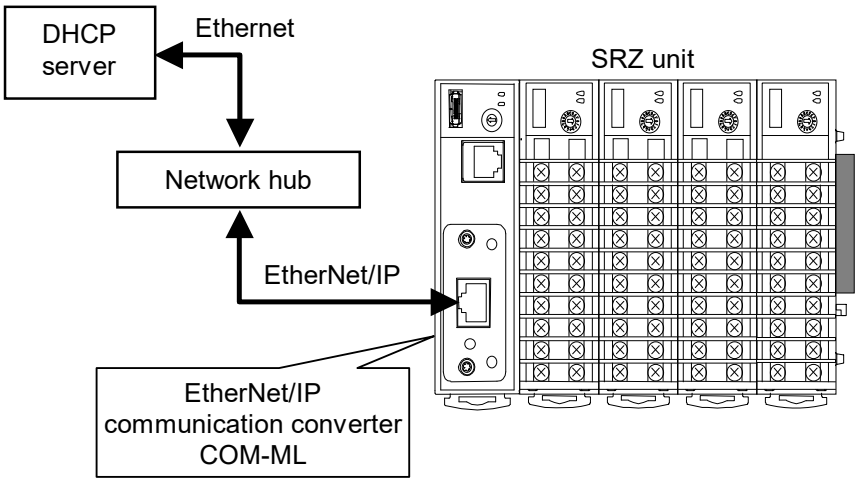
For information on connecting the COM-ML to a host computer, see **4.4 Connection to Host Computer (P. 16)**.

■ Acquisition of the IP address by the DHCP

The acquisition of the IP address by the DHCP is possible.
Use host communication or loader communication to set "DHCP selection" to "1 (valid)," and then connect to Ethernet to acquire an IP address from the DHCP server.
The IP address which was acquired, 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		
DHCP selection	QF	801F	32799	0: DHCP is invalid 1: DHCP is valid	0

[Connection example]



NOTE

For information on acquiring an IP address by DHCP, check with the administrator of the network (LAN) to which the COM-ML is connected.

NOTE

When an IP address is acquired by DHCP, an IP address is acquired each time the COM-ML connects to the network, and thus the IP address will be different each time. Note that some programs will require settings to be changed when the IP address changes.

When the default IP address setting is executed using the DIP switches, the DHCP selection will change to "0: DHCP is invalid."

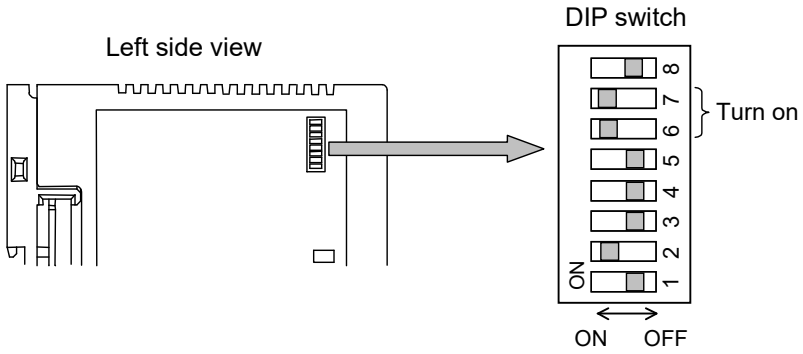
■ Default IP address setting

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

● Operation procedure

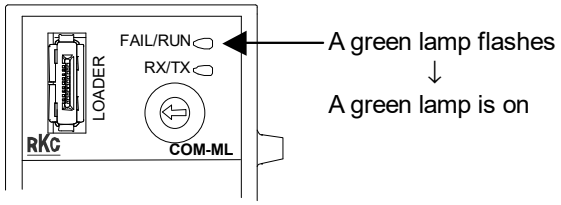
1. Turn off the power of COM-ML.

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" and the DHCP selection will change to "0: DHCP is invalid."



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.

7.2 EtherNet/IP Communication Settings

Configure settings necessary for EtherNet/IP communication.
EtherNet/IP communication methods supported by the COM-ML are "I/O Communication" and "Explicit Message Communication." And the setting of three objects to show below is necessary.

- Controller communication data item setting object (0xC5: C5Hex) [hereafter called 0xC5]
  (Set the first Modbus address of the communication items used in EtherNet/IP communication.)
- Controller communication measurement item (IN) setting object (0xC6: C6Hex)
  [hereafter called 0xC6] *
  (Set the number of communication items used for monitor in I/O communication.)
- Controller communication setting item (OUT) setting object (0xC7: C7Hex)
  [hereafter called 0xC7] *
  (Set the number of communication items used for setting in I/O communication.)

* Use it in case of I/O communication.

The content of these objects can be set by host communication or loader communication. Explicit message communication of EtherNet/IP communication can also be used.

When host communication or loader communication is used to set the content of the objects, the objects correspond to the RKC identifiers and Modbus register addresses shown below.

Name and Object	RKC identifier	Modbus register address		Data range (data size indicated in brackets [ ])	Factory set value
		HEX	DEC		
Communication data items setting [Object: 0xC5]	QG	8020 ⋮ 8051	32800 ⋮ 32849	RKC communication: 0 to 65535 Modbus: 0000H to FFFFH [50]	65535 (FFFFH)
Number of measured data items (IN) [Object: 0xC6]	QH	8052 ⋮ 8083	32850 ⋮ 32899	0 to 128 0: Unused [50]	0
Number of setting data items (OUT) [Object: 0xC7]	QI	8084 ⋮ 80B5	32900 ⋮ 32949	0 to 127 0: Unused [50]	0

☞ For information on explicit message communication setting, see **10.5 Tool Settings (P. 76)** and **10.7 Explicit Message Communication (P. 87)**.

■ Communication data items setting

Set the communication items used in EtherNet/IP communication.
These apply to the object model "Controller communication data item setting object (0xC5: C5Hex)."

- Up to 50 communication items (attributes 100 to 149) can be set.
- 0xC5 attributes 100 to 149 (50 items) correspond to CH1 to CH50 of identifier QG of RKC communication, and to Modbus register addresses 8020H to 8051H.
- In each item, set the Modbus register address (first address only) of all communication items used in EtherNet/IP communication (I/O communication and explicit message communication).
- Set items used in I/O communication (these can also be used in explicit message communication) in attributes 100 and following without any intervals, and then set items that are only used in explicit message communication.

- The data order in I/O communication is the same as the 0xC5 attribute order. Set the number of data used in each item in 0xC6 and 0xC7.
- Set 65535 (FFFFH) in unused items. Communication items following attributes set to 65535 (FFFFH) are not used in I/O communication.

☞ For object models, see **13. OBJECT MODELS (P. 102)**. In addition, for Modbus register addresses of communication items, see **9. COMMUNICATION DATA LIST (P. 38)**.

☞ For setting configuration, see ■ **Setting example (P. 32)**.

■ Number of measured data items (IN)

Set the number of communication items used for monitor in I/O communication of EtherNet/IP.
These apply to the object model "Controller communication measurement item (IN) setting object (0xC6: C6Hex)."

- Up to 50 communication items (attributes 100 to 149) can be set.
- In the attribute numbers of 0xC6 that are the same as the attribute numbers of the communication items used in the measurement items (IN) of I/O communication (in the communication items set in 0xC5), set the data size used.
- 0xC6 attributes 100 to 149 (50 items) correspond to CH1 to CH50 of identifier QH of RKC communication and to Modbus register addresses 8052H to 8083H.
- Data up to a total of the set values in the attributes of 0xC6 (cumulative total from attribute 100) of 128 (0080H) are valid. Any data after that are disregarded.

☞ For object models, see **13. OBJECT MODELS (P. 102)**.

☞ For setting configuration, see ■ **Setting example (P. 32)**.

■ Number of setting data items (OUT)

Set the number of communication items used for setting in I/O communication of EtherNet/IP.
These apply to the object model "Controller communication setting item (OUT) setting object (0xC7: C7Hex)."

- Up to 50 communication items (attributes 100 to 149) can be set.
- In the attribute numbers of 0xC7 that are the same as the attribute numbers of the communication items used in the setting items (OUT) of I/O communication (in the communication items set in 0xC5), set the data size used.
- 0xC7 attributes 100 to 149 (50 items) correspond to CH1 to CH50 of identifier QI of RKC communication and to Modbus register addresses 8084H to 80B5H.
- Data up to a total of the set values in the attributes of 0xC7 (cumulative total from attribute 100) of 127 (007FH) are valid. Any data after that are disregarded.
- Regardless of the setting of 0xC7, "setting state selection" is assigned to the first-word of the setting data item (OUT).

☞ For object models, see **13. OBJECT MODELS (P. 102)**.

☞ For setting configuration, see ■ **Setting example (P. 32)**.

■ Data setting of each items

Set the data of the communication items set in 0xC5.
The content of these objects can be set by host communication or loader communication. Explicit message communication of EtherNet/IP communication can also be used.

● Host communication and Loader communication

Set the data for the communication items corresponding to the Modbus register addresses set in 0xC5.

[Example]
Setting the data of CH1 to "100" when "set value (SV)" is specified in the communication item setting (0xC5)

Modbus: Write "100" to the Modbus register address "0ADCH" of CH1 of the set value (SV).
RKC communication:
Write "100" to CH1 of the RKC communication identifier "S1" of the set value (SV).

● Explicit message communication

These apply to the object model "Controller object (0x64: 64Hex)" [hereafter called 0x64].

- 0x64 attributes 100 to 149 correspond to 0xC5 attributes 100 to 149.
- The instance number of 0x64 indicates what number the data is from the Modbus register address specified in the attribute number of 0xC5.
- If data was set for a read-only (RO) item, the data will revert to the data that was read after several seconds. The attribute of unused items is read-only (RO), and the data is 0.

☞ For object models, see **13. OBJECT MODELS (P. 102)**. In addition, for Modbus register addresses of communication items, see **9. COMMUNICATION DATA LIST (P. 38)**.

☞ For setting configuration, see ■ **Setting example (P. 32)**.

■ Setting example

If one Z-TIO module is joined to the COM-ML, set the following conditions:

- For I/O communication, use CH1 to CH4 of "measured value (PV)" and "set value (SV)" of the Z-TIO module.
- For explicit message communication, use "RUN/STOP transfer (each units)."
- Setting condition: Measured data items (IN): Measured value (PV), Set value (SV)
  Setting data items (OUT): Set value (SV)
  Assigned destination of communication item:
  Measured value (PV): Attribute 100
  Set value (SV): Attribute 101
  RUN/STOP transfer: Attribute 102
  Set value (SV): CH1: 150, CH2: 200, CH3: 250, CH4: 300
  RUN/STOP transfer: 0 (STOP), 1 (RUN)

Setting of object models

● 0xC5 setting [Communication data items]

Attribute 100: 01FCH [First Modbus register address of measured value (PV)]
Attribute 101: 0ADCH [First Modbus register address of set value (SV)]
Attribute 102: 0133H [First Modbus register address of RUN/STOP transfer (each units)]
Attribute 103 to 149: FFFFH [Unused]

● 0xC6 setting [Number of measured data items (IN)]

Attribute 100: 0004H [Number of measured value (PV): For 4 channels]
Attribute 101: 0004H [Number of set value (SV): For 4 channels]
Attribute 102 to 149: 0000H [Unused]

● 0xC7 setting [Number offsetting data items (OUT)]

Attribute 100: 0000H [Unused]
Attribute 101: 0004H [Number of set value (SV): For 4 channels]
Attribute 102 to 149: 0000H [Unused]

● 0x64 setting [Data of each communication items] *

Object instance 1: Attribute 100: CH1 of measured value (PV): Read value
Attribute 101: CH1 of set value (SV): 0096H (150)
Attribute 102: RUN/STOP transfer (each units): 0000H (0), 0001H (1)
Attribute 103 to 149: 0 [Unused]
Object instance 2: Attribute 100: CH2 of measured value (PV): Read value
Attribute 101: CH2 of set value (SV): 00C8H (200)
Attribute 102 to 149: 0 [Unused]
Object instance 3: Attribute 100: CH3 of measured value (PV): Read value
Attribute 101: CH3 of set value (SV): 00FAH (250)
Attribute 102 to 149: 0 [Unused]
Object instance 4: Attribute 100: CH4 of measured value (PV): Read value
Attribute 101: CH4 of set value (SV): 0012CH (300)
Attribute 102 to 149: 0 [Unused]

* Use it in case of explicit message communication

Setting of RKC communication (Set value is a decimal number.)

- **Communication data items**

CH1 of identifier QG: 508 [First Modbus register address of measured value (PV)]
CH2 of identifier QG: 2780 [First Modbus register address of set value (SV)]
CH3 of identifier QG: 307 [First Modbus register address of RUN/STOP transfer (each units)]
CH4 to 50 of identifier QG: 65535 [Unused]

- **Number of measured data items (IN)**

CH1 of identifier QH,: 4 [Number of measured value (PV): For 4 channels]
CH2 of identifier QH: 4 [Number of set value (SV): For 4 channels]
CH3 to 50 of identifier QH: 0 [Unused]

- **Number offsetting data items (OUT)**

CH1 of identifier QI: 0 [[Unused]
CH2 of Identifier QI: 4 [Number of set value (SV): For 4 channels]
CH3 to 50 of identifier QI: 0 [[Unused]

- **Data setting of communication items**

CH1 of identifier S1: 150 [CH1 of set value (SV)]
CH2 of identifier S1: 200 [CH2 of set value (SV)]
CH3 of identifier S1: 250 [CH3 of set value (SV)]
CH4 of identifier S1: 300 [CH4 of set value (SV)]
CH1 of identifier SR: 0 [RUN/STOP transfer (each units): STOP]
1 [RUN/STOP transfer (each units): RUN]

Setting of Modbus

- **Communication data items**

8020H: 01FCH [First Modbus register address of measured value (PV)]
8021H: 0ADCH [First Modbus register address of set value (SV)]
8022H: 0133H [First Modbus register address of RUN/STOP transfer (each units)]
8023H to 8051H: FFFFH [Unused]

- **Number of measured data items (IN)**

8052H: 0004H [Number of measured value (PV): For 4 channels]
8053H: 0004H [Number of set value (SV): For 4 channels]
8054H to 8083H: 0000H [Unused]

- **Number offsetting data items (OUT)**

8084H: 0000H [Unused]
8085H: 0004H [Number of set value (SV): For 4 channels]
8086H to 80B5H: 0000H [Unused]

- **Data setting of communication items**

0ADCH: 0096H [CH1 of set value (SV)]
0ADDH: 00C8H [CH2 of set value (SV)]
0ADEH: 00FAH [CH3 of set value (SV)]
0ADFH: 012CH [CH4 of set value (SV)]
0133H: 0000H [RUN/STOP transfer (each units): STOP]
0001H [RUN/STOP transfer (each units): RUN]

7.3 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.) other than the items set in **7.2 EtherNet/IP Communication Settings (P. 29)** using host communication, loader communication, or explicit message communication of EtherNet/IP communication.

Host communication or loader communication is used for “IP address settings,” and thus if “EtherNet/IP communication settings” or “other communication data settings” are configured immediately after the IP address settings, the items can be set without changing the communication method.

For each of the communication setting items, see **9. COMMUNICATION DATA LIST (P. 38)**.

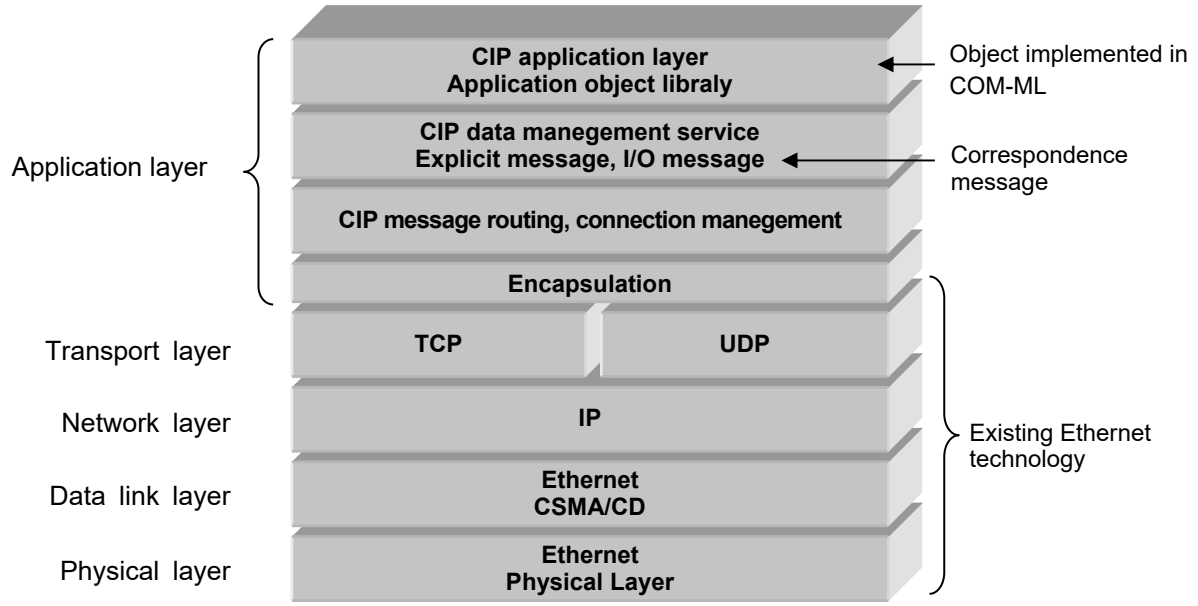
8. EtherNet/IP

8.1 Outline of EtherNet/IP

EtherNet/IP is an implementation of CIP (Common Industrial Protocol) on Ethernet and TCP/IP. CIP is an application layer protocol that does not depend on the physical layer, and which realizes the product (communication) functions by means of object models.

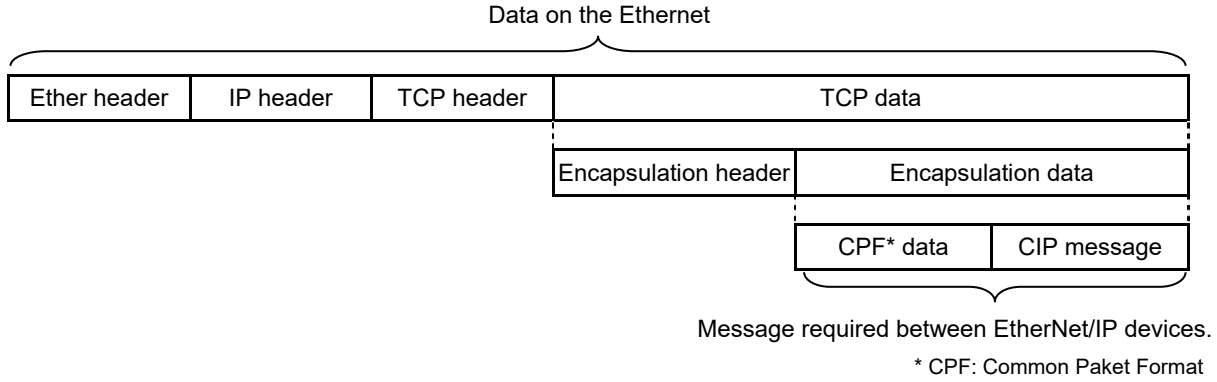
■ OSI model of EtherNet/IP

EtherNet/IP uses existing Ethernet technology for data communication.
To transmit the CIP message (which is the communication protocol between devices) as TCP/UDP data, the encapsulation layer encapsulates the data.



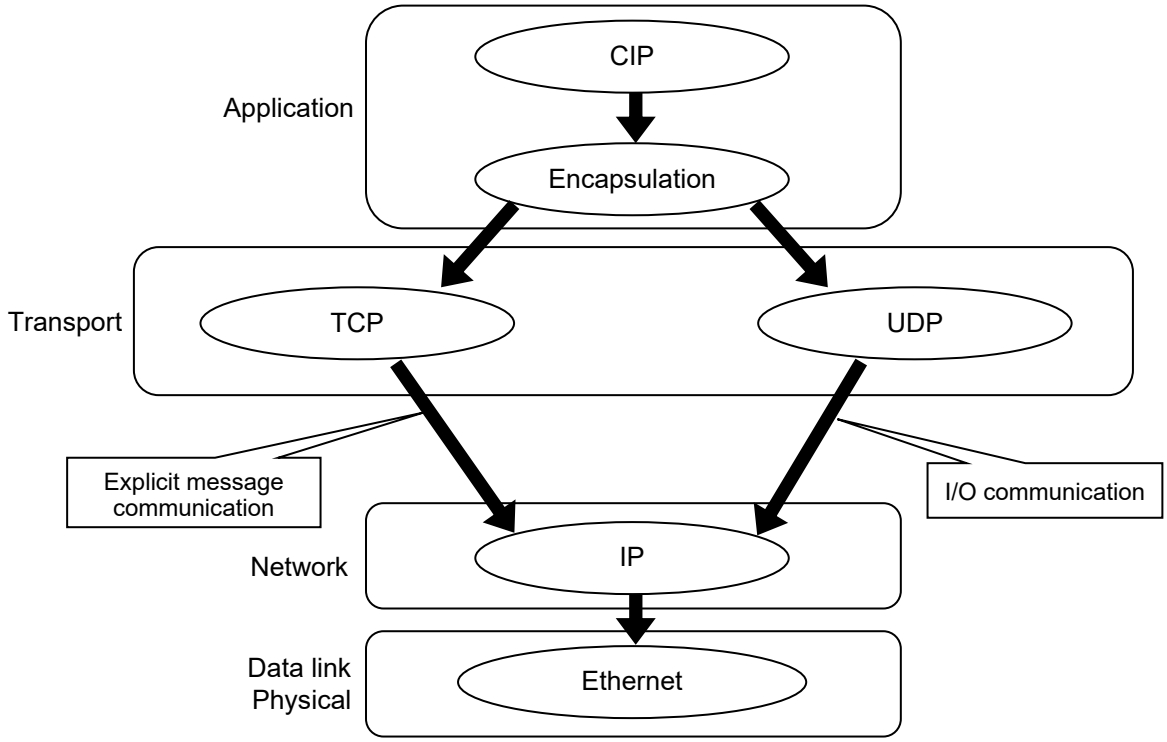
■ Message structure of EtherNet/IP

An EtherNet/IP message packet has the following structure.



■ Communication flow

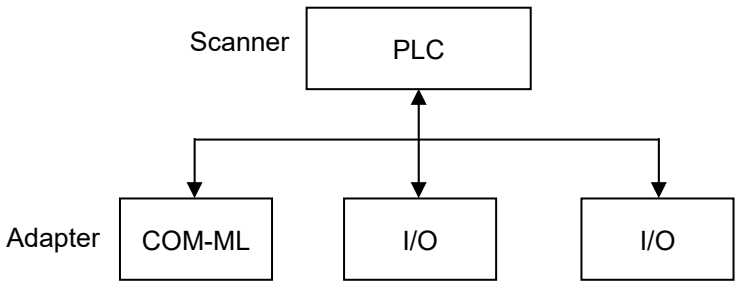
Explicit message communication uses TCP to transmit data. I/O communication uses UDP to transmit data.



■ CIP communication model

CIP uses the “producer/consumer model” as a communication model.
As communication methods that are possible in the producer/consumer model, scanner/adapter (multi-cast: 1 to N) communication and client/server (peer-to-peer: 1 to 1) communication are used.

[Multi-cast]



[Peer-to-peer]

8.2 Communication Method

COM-ML supports “I/O communication” and “Explicit message communication” for EtherNet/IP.

■ I/O communication

I/O communication is mainly used in adapter/scanner (multi-cast: 1 to N) communication.
Data is periodically exchanged between the scanner and adapter.
To perform I/O communication, the following items must be set.

Setting item	Description
Controller communication data item setting object (0xC5: C5Hex)	Set the first Modbus address of the communication items used in communication.
Controller communication measurement item (IN) setting object (0xC6: C6Hex)	Set the number of communication items used for monitor.
Controller communication setting item (OUT) setting object (0xC7: C7Hex)	Set the number of communication items used for setting.

In the case of I/O communication, data is sent and received using the “Assembly object (0x04: 04Hex)” object model. Measurement items (IN) use attribute 3 of instance 100, and setting items (OUT) use attribute 3 of instance 101.
To check and set measurement items (IN) and settings items (OUT), a tool is used.

■ Explicit message communication

Explicit message communication is mainly used in client/server (peer-to-peer: 1 to 1) communication.
Data communication between the client and server only takes place when necessary (at an event).
To use explicit message communication, the following items must be set.

Setting item	Description
Controller communication data item setting object (0xC5: C5Hex)	Set the first Modbus address of the communication items used in communication.
Controller object (0x64: 64Hex)	Set the Modbus register address data specified in 0xC5. The order of the data is as specified in 0xC5.

For setting contents, see **7.2 EtherNet/IP Communication Settings (P. 29)**.

For object model, see **13. OBJECT MODEL (P. 102)**. In addition, for Modbus register address of each communication data items, see **9. COMMUNICATION DATA LIST (P. 38)**.

9. COMMUNICATION DATA LIST

9.1 Reference to Communication Data List

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

No.	Name	Identifier	Channel	Register address		Digits	Attribute	Structure	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	—

(1) Name: Communication data name

(2) Identifier: Communication identifier of RKC communication

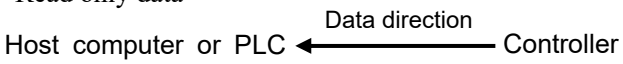
(3) Channel: Channel number of data of one unit

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

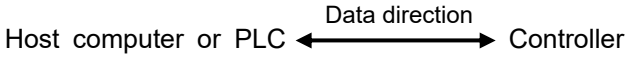
(5) Digits: The number of communication data digits in RKC communication

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

RO: Read only data



R/W: Read and Write data



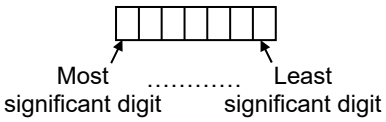
(7) Structure: U: Data for each SRZ unit
M: Data for each module
C: Data for each channel [1, 2]

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

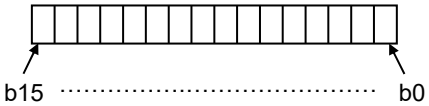
[2] Parameters only used for heat/cool control or position proportioning control, therefore data (indicated by ♣ in the name column) for CH2 and CH4 of Z-TIO modules are unused. [Read is possible (0 is shown), but the result of Write is disregarded.]

(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. 18 to 38

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

9.2 Communication Data of COM-ML

No.	Name	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	Data range	Factory set value
1	Model code (COM-ML)	ID	CH1	—	—	32	RO	M	Model code (character)	—
2	Model code (Function module*)	IE	CH1 : CH100	—	—	32	RO	M	Model code (character)	—
3	ROM version (COM-ML)	VR	CH1	—	—	8	RO	M	ROM version	—
4	ROM version (Function module*)	VQ	CH1 : CH100	—	—	8	RO	M	ROM version	—
5	Integrated operating time monitor (COM-ML)	UT	CH1	—	—	7	RO	M	0 to 19999 hours	—
6	Integrated operating time monitor (Function module*)	UV	CH1 : CH100	—	—	7	RO	M	0 to 19999 hours	—
7	Error code (COM-ML)	ER	CH1	0000	0	7	RO	U	• RKC communication 1: Adjustment data error 2: Data back-up error [1] 4: A/D conversion error 32: Logic output data error 64: Stack overflow [2] 512: Network module error [2] • Modbus Bit data b0: Adjustment data error b1: Data back-up error [1] b2: A/D conversion error b3 and b4: Unused b5: Logic output data error b6: Stack overflow [2] b7 and b8: Unused b9: Network module error [2] b10 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 615] The error condition is shown by the *OR* of each module. When multiple errors occur, the error No. is the sum value. [1] Common item of the COM-ML and function module [2] Item of the COM-ML	—
8	Error code (Function module*)	EZ	CH1 : CH100	0001 : 0064	1 : 100	7	RO	M		—
9	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.	—
10	Backup memory state monitor (Function module*)	CZ	CH1 : CH100	0066 : 00C9	102 : 201	1	RO	M		—
11	Unused	—	—	00CA 00CB	202 203	—	—	—	—	—
12	Network error code	ES	CH1	00CC	204	7	RO	U	0: Normal 1: Network operation not possible	—
13	Unused	—	—	00CD : 0131	205 : 305	—	—	—	—	—

* Function module: Z-TIO-A/B module or Z-DIO module

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No.	Name	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	Data range	Factory set value
14	Monitor for the number of connected modules	QK	CH1	0132	306	7	RO	U	0 to 31	—
15	RUN/STOP transfer (Each unit)	SR	CH1	0133	307	1	R/W	U	0: STOP (Control stop) 1: RUN (Control start)	0
16	RUN/STOP transfer (Each module)	SW	CH1 ⋮ CH100	0134 ⋮ 0197	308 ⋮ 407	1	R/W	M	0: STOP (Control stop) 1: RUN (Control start)	0
17	Control RUN/STOP holding setting (Each module)	X1	CH1 ⋮ CH100	0198 ⋮ 01FB	408 ⋮ 507	1	R/W	M	0: Not holding (STOP start) 1: Holding (RUN/STOP hold)	1
The following items are enabled when the power is turned on again or when control is changed from STOP to RUN.										
18	Unused	—	—	8000 ⋮ 8003	32768 ⋮ 32771	—	—	—	—	—
19	Communication protocol	VP	CH1	8004	32772	1	R/W	U	0: RKC communication 1: Modbus	0
20	Communication communication speed	VU	CH1	8005	32773	1	R/W	U	0: 4800 bps 2: 19200 bps 1: 9600 bps 3: 38400 bps	2
21	Communication data bit configuration	VW	CH1	8006	32774	7	R/W	U	0 to 5 See **Table 1: Data bit configuration**	0
22	Communication interval time	VX	CH1	8007	32775	7	R/W	U	0 to 250 ms	10
23	Unused	—	—	8008 ⋮ 8010	32776 ⋮ 32784	—	—	—	—	—
24	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
25	Unused	—	—	8012	32786	—	—	—	—	—
26	Number of connected modules * (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.	—
27	Number of connected modules * (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.	—

* 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).

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		Digits	Attri-bute	Struc-ture	Data range	Factory set value
				HEX	DEC					
28	Unused	—	—	8015 ⋮ 801A	32789 ⋮ 32794	—	—	—	—	—
29	First-byte of IP address	QB	CH1	801B	32795	7	R/W	U	0 to 255	192
30	Second-byte of IP address	QC	CH1	801C	32796	7	R/W	U	0 to 255	168
31	Third-byte of IP address	QD	CH1	801D	32797	7	R/W	U	0 to 255	1
32	Fourth-byte of IP address	QE	CH1	801E	32798	7	R/W	U	0 to 255	1
33	DHCP selection	QF	CH1	801F	32799	1	R/W	U	0: DHCP is invalid 1: DHCP is valid	0
34	Communication data items setting	QG	CH1 ⋮ CH50	8020 ⋮ 8051	32800 ⋮ 32849	7	R/W	M	0 to 65535	65535
35	Number of measured data items (IN)	QH	CH1 ⋮ CH50	8052 ⋮ 8083	32850 ⋮ 32899	7	R/W	M	0 to 128 0: Unused	0
36	Number of setting data items (OUT)	QI	CH1 ⋮ CH50	8084 ⋮ 80B5	32900 ⋮ 32949	7	R/W	M	0 to 127 0: Unused	0
37	Unused	—	—	80B6	32950	—	—	—	—	—
38	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

9.3 Communication Data of Z-TIO Module

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

No.	Name	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	Data range	Factory set value
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 6th digit: Temperature rise completion 7th digit: Burnout Data 0: OFF 1: ON • Modbus Bit data b0: Event 1 b1: Event 2 b2: Event 3 b3: Event 4 b4: Heater break alarm b5: Temperature rise completion b6: Burnout b7 to b15: 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 b0: Control STOP b1: Control RUN b2: Manual mode b3: Remote mode b4 to b15: 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 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 %	—
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	—

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No.	Name	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	Data range	Factory set value
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: 023C to 027B). (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 b0: OUT1 b1: OUT2 b2: OUT3 b3: OUT4 b4 to b15: 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.	—
18	Unused	—	—	05DC ⋮ 05EB	1500 ⋮ 1515	—	—	—	—	—

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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
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 b0: Logic output 1 b1: Logic output 2 b2: Logic output 3 b3: Logic output 4 b4: Logic output 5 b5: Logic output 6 b6: Logic output 7 b7: Logic output 8 b8 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 255]	—
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
29	Interlock release	AR	CH1 ⋮ CH64	091C ⋮ 095B	2332 ⋮ 2395	1	R/W	C	0: Normal state 1: Interlock release execution	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
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
31	Event 2 set value (EV2) ★	A2	CH1 ⋮ CH64	099C ⋮ 09DB	2460 ⋮ 2523	7	R/W	C		50
32	Event 3 set value (EV3) ★	A3	CH1 ⋮ CH64	09DC ⋮ 0A1B	2524 ⋮ 2587	7	R/W	C		50
33	Event 4 set value (EV4) ★	A4	CH1 ⋮ CH64	0A1C ⋮ 0A5B	2588 ⋮ 2651	7	R/W	C		50
34	Control loop break alarm (LBA) time ★	A5	CH1 ⋮ CH64	0A5C ⋮ 0A9B	2652 ⋮ 2715	7	R/W	C	0 to 7200 seconds (0: Unused) If Event 4 is other than "9: Control loop break alarm (LBA)," set to RO (Only reading data is possible).	480
35	LBA deadband ★	N1	CH1 ⋮ CH64	0A9C ⋮ 0ADB	2716 ⋮ 2779	7	R/W	C	0 (0.0) to Input span If Event 4 is other than "9: Control loop break alarm (LBA)," set to RO (Only reading data is possible).	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 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 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.	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 selection.	60
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 control: 0 Heat/cool PID control: 2

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No.	Name	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	Data range	Factory set value
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
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 * Unit time: 60 seconds (factory set value)	0 (0.0)
47	Setting change rate limiter (down) ★	HL	CH1 : CH64	0D9C : 0DDB	3484 : 3547	7	R/W	C		0 (0.0)
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

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No.	Name	Iden-tifier	Chan-nel	Register address		Digits	Attri-bute	Struc-ture	Data range	Factory set value
				HEX	DEC					
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	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	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
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

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

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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
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 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
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

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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
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 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
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 b0: Communication switch 1 b1: Communication switch 2 b2: Communication switch 3 b3: Communication switch 4 b4 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15]	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
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. See **SRZ Instruction Manual (IMS01T04-E□)**.	Depends 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.	0
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.	Depends on model code When not specifying: TC/RTD: 1 V/I: 1

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No.	Name	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	Data range	Factory set value
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)	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)	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 control, set to the feedback resistance (FBR) input value.	Depends 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) 2: Re-hold action ON (When power turned on and 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.	Depends 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 to Input span (Unit: °C [°F]) 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 b0: Event output turned on at input error occurrence b1: Event output turned on in manual mode b2: Event output turned on during the autotuning (AT) function is being executed b3: Event output turned on during the setting change rate limiter is being operated b4 to b15: 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 control, set to the feedback resistance (FBR) input value.	Depends 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) 2: Re-hold action ON (When power turned on and 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.	Depends 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 to Input span (Unit: °C [°F]) 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 b0: Event output turned on at input error occurrence b1: Event output turned on in manual mode b2: Event output turned on during the autotuning (AT) function is being executed b3: Event output turned on during the setting change rate limiter is being operated b4 to b15: 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: Temperature rise completion 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 control, set to the feedback resistance (FBR) input value.	Depends 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) 2: Re-hold action ON (When power turned on and 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.	Depends 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, Deviation action between channels, or Temperature rise completion: 0 to Input span (Unit: °C [°F]) 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 b0: Event output turned on at input error occurrence b1: Event output turned on in manual mode b2: Event output turned on during the autotuning (AT) function is being executed b3: Event output turned on during the setting change rate limiter is being operated b4 to b15: 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 control, set to the feedback resistance (FBR) input value.	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
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) 2: Re-hold action ON (When power turned on and 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.	Depends 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 to Input span (Unit: °C [°F]) 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 b0: Event output turned on at input error occurrence b1: Event output turned on in manual mode b2: Event output turned on during the autotuning (AT) function is being executed b3: Event output turned on during the setting change rate limiter is being operated b4 to b15: 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	1
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)	1
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 to Input span (The unit is the same as input value.) (0: Action depending on the Hot/Cold start selection)	Depends 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: Position proportioning control Odd channel: From 0 to 5 can be set. Even channel: Only 0 or 1 can be set. * * In heat/cool control and position proportioning control, control action is not performed. Only PV monitor and event action is performed.	Depends 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

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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 to Input span (Unit: °C [°F]) 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 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 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 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 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 control: Becomes valid only when there is feedback resistance (FBR) input and it does not break.	−5.0

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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
149	Output change rate limiter (up) [cool-side] ♣	PX	CH1 ⋮ CH64	292C ⋮ 296B	10540 ⋮ 10603	7	R/W	C	0.0 to 100.0 %/seconds (0.0: OFF) Becomes invalid when in position proportioning 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	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 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 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

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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 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 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 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

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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 %	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 the set 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	0.1 to Input span/minutes	1.0
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

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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
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	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)	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 (Don't 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 (Don't set this one)	0
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

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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
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 b0: Memory area number b1: Operation mode b2: Auto/Manual b3: Remote/Local b4: EDS start signal b5: Interlock release b6: Suspension of area soak time b7 to b15: 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		Attri-bute	Struc-ture	Data range	Factory set value
			HEX	DEC				
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
3	Event 2 set value (EV2)	CH1 ⋮ CH64	38EC ⋮ 392B	14572 ⋮ 14635	R/W	C		50
4	Event 3 set value (EV3)	CH1 ⋮ CH64	392C ⋮ 396B	14636 ⋮ 14699	R/W	C		50
5	Event 4 set value (EV4)	CH1 ⋮ CH64	396C ⋮ 39AB	14700 ⋮ 14763	R/W	C		50
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	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 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]) 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
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 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 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]) Voltage (V)/current (I) inputs: 0.1 to 1000.0 % of input span	TC/RTD: 30 (30.0) V/I: 30.0
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

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No.	Name	Chan-nel	Register address		Attri-bute	Struc-ture	Data range	Factory set value
			HEX	DEC				
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]) Voltage (V)/current (I) inputs: −100.0 to +100.0 % of input span	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	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, see **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	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 b0: DI1 b1: DI2 b2: DI3 b3: DI4 b4: DI5 b5: DI6 b6: DI7 b7: DI8 b8 to b15: 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 b0: DO1 b1: DO2 b2: DO3 b3: DO4 b4: DO5 b5: DO6 b6: DO7 b7: DO8 b8 to b15: 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	Identifier	Channel	Register address HEX	Register address DEC	Digits	Attribute	Structure	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 b0: DO1 manual output b1: DO2 manual output b2: DO3 manual output b3: DO4 manual output b4: DO5 manual output b5: DO6 manual output b6: DO7 manual output b7: DO8 manual output b8 to b15: 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 (see **P. 71**.)	Depends on model code. When not specifying: 0

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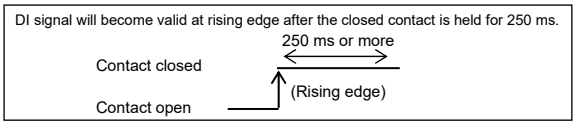
No.	Name	Iden-tifier	Chan-nel	Register address HEX	Register address DEC	Digits	Attri-bute	Struc-ture	Data range	Factory set value
15	Memory area setting signal	E1	CH1 : CH16	434C : 435B	17228 : 17243	1	R/W	M	0: Valid 1: Invalid	1
16	DO signal assignment module address 1 [DO1 to DO4]	LQ	CH1 : CH16	435C : 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 (see **P. 72**.)	Depends 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 (see **P. 72**.)	Depends 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="9">Interlock release</td><td rowspan="9">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="3">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)



[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)	HBA (CH2)	HBA (CH3)	HBA (CH4)
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]

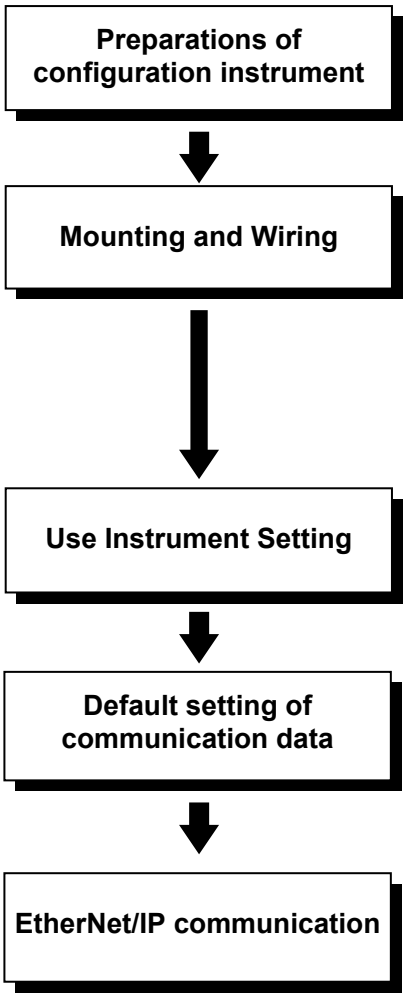
Set value	DO5	DO6	DO7	DO8
0	No assignment			
1	DO5 manual output	DO6 manual output	DO7 manual output	DO8 manual output
2	Event 1 comprehensive output [1]	Event 2 comprehensive output [2]	Event 3 comprehensive output [3]	Event 4 comprehensive output [4]
3	Event 1 (CH1)	Event 2 (CH1)	Event 3 (CH1)	Event 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)	HBA (CH2)	HBA (CH3)	HBA (CH4)
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] Logical *OR* of HBA (ch1 to ch4)
[7] Logical *OR* of burnout state (ch1 to ch4)

10. USAGE EXAMPLE

This chapter describes an usage example of EtherNet/IP communication when connected with the COM-ML and controller (SRZ) with the PLC set to a scanner or client.

10.1 Handling Procedures



☞ See **10.2 System Configuration (P. 74)**.

☞
- For mounting and wiring of the COM-ML, see **3. MOUNTIMG (P. 7)** and **4. WIRING (P. 12)**.
- For mounting and wiring of the controller (SRZ), see **Z-TIO INSTRUCTION MANUAL (IMS01T01-E□)** or **Z-DIO INSTRUCTION MANUAL (IMS01T03-E□)**.
- For mounting and wiring of PLC, see **PLC Instruction Manual**.

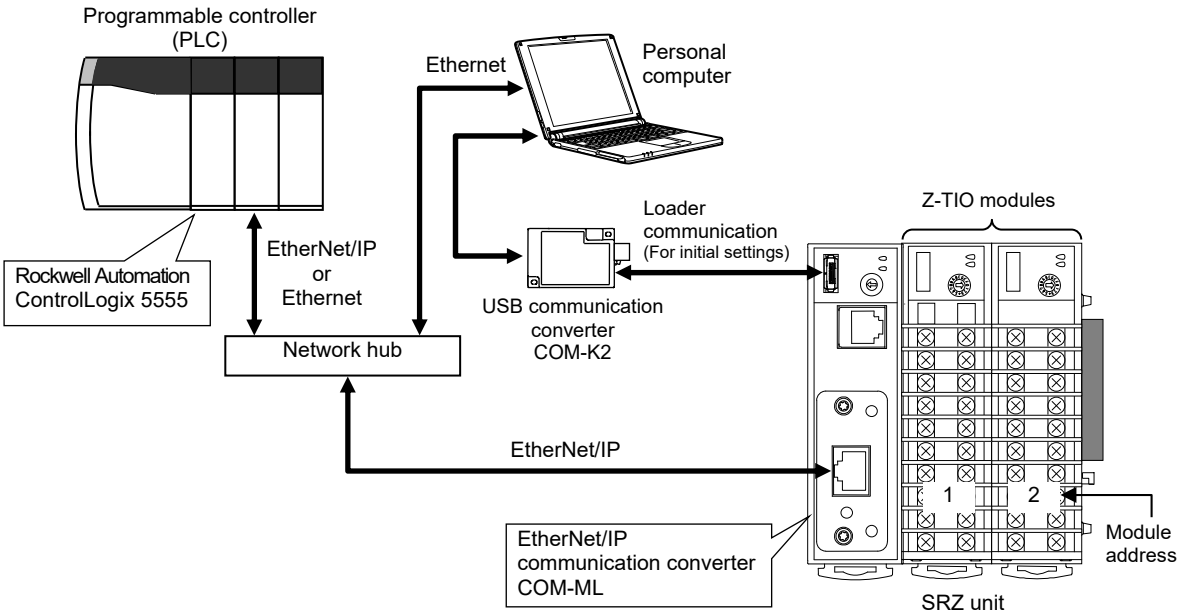
☞ See **10.3 Use Instruments Settings (P. 75)**.

☞ See **7. INITIAL COMMUNICATION DATA SETTINGS (P. 26)**, **10.4 Initial Communication Data Settings (P. 75)** and **10.5 Tool Settings (P. 76)**.

☞ See **10.6 I/O Communication (P. 84)** and **10.7 Explicit Message Communication (P. 87)**.

10.2 System Configuration

The example given in this section is based on the system configuration below.



Loader communication is used for the initial communication data settings.

■ Devices used

- EtherNet/IP communication converter: COM-ML..... 1
- Controller (SRZ): Z-TIO module..... 2 (4-channel type)
- Programmable controller (PLC)
  ControlLogix 5555 (Rockwell Automation)
  - CPU module: 1756-L55 1
  - Power module: 1756-PA72/C 1
  - EtherNet/IP module: 1756-ENBT 1
  - Chassis: 1756-A4..... 1
- USB communication converter: COM-K2 (for loader communication)
- Network hub
- Various cables
- Personal computer
  RSLogix 5000 and RSLinx Classic Lite (RSLinx Classic is also acceptable) programming software (Rockwell Software) must be installed.

10.3 Use Instruments Settings

■ COM-ML setting

There is not the setting of the hardware.

In this example the initial settings for COM-ML communication data are configured using loader communication, and thus COM-ML host communication settings are not necessary.

■ Controller (SRZ) setting

The COM-ML and controllers (Z-TIO modules) are connected by internal communication, and settings for the Z-TIO modules such as communication speed, protocol, and data bit configuration are not necessary.
The only setting that is configured for the controllers is the module address. The same is true when a Z-DIO module is used.

- Module address: Z-TIO module: 1, 2

For the procedure for module address settings, see **Z-TIO Host Communication Quick Instruction Manual (IMS01T02-E□)** or **Z-DIO INSTRUCTION MANUAL (IMS01T03-E□)**.

■ PLC setting

There is not the setting of the hardware. Use programming software to configure EtherNet/IP settings.

For details, see **10.5 Tool Settings (P. 76)**.

10.4 Initial Communication Data Settings

Use loader communication to configure the initial communication data settings.

[Set values]

- IP address of COM-ML: 192.168.1.3
- EtherNet/IP communication settings:
  - Measured data items (IN): Measured value (PV) [4 channels × 2 = 8 channels]
    Set value (SV) [4 channels × 2 = 8 channels]
  - Setting data items (OUT): Set value (SV) [4 channels × 2 = 8 channels]
  - Assigned destination of communication item:
    Measured value (PV): Attribute 100
    Set value (SV): Attribute 101
- Other communication data: Set other required items.

For the setting procedures, see **7. INITIAL COMMUNICATION DATA SETTINGS (P. 26)**.
For information on each communication item, see **9. COMMUNICATION DATA LIST (P. 38)**.

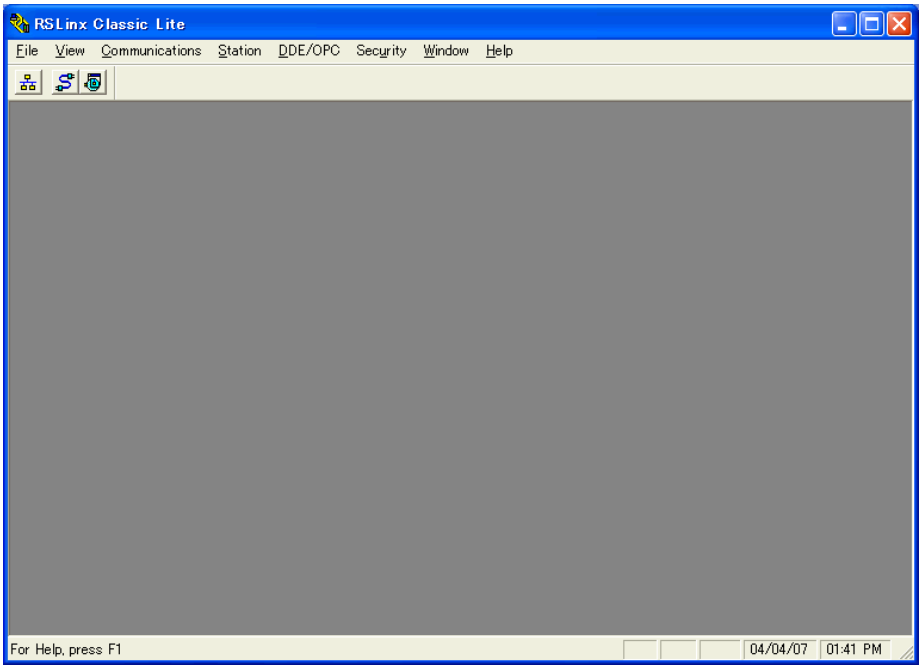
10.5 Tool Settings

The RSLogix 5000 and RSLinx Classic Lite (or RSLinx Classic) programming software are used to configure the various settings.

■ EtherNet/IP module driver settings

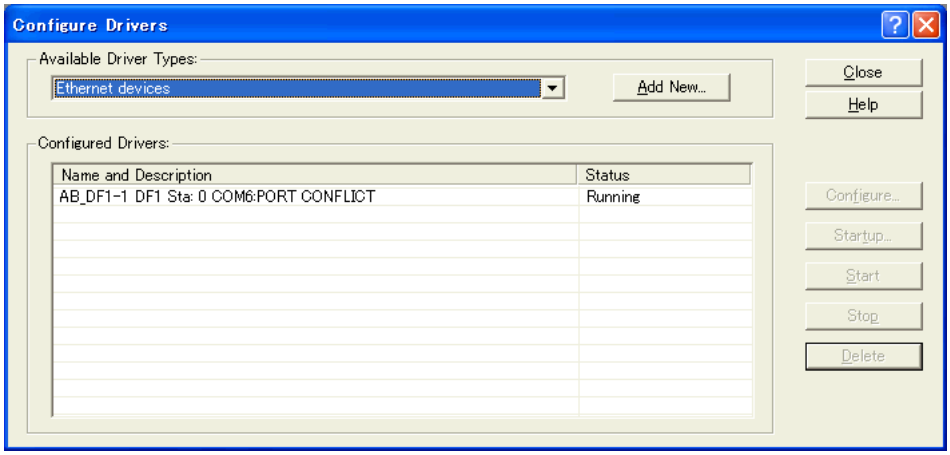
Set the IP address of the EtherNet/IP module (1756-ENBT) used to connect the PLC to EtherNet/IP, and register the driver.

1. Start RSLinx Classic Lite.

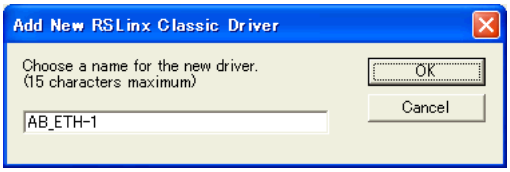


2. Select “Configure Drivers” from “Communications” in the menu bar.

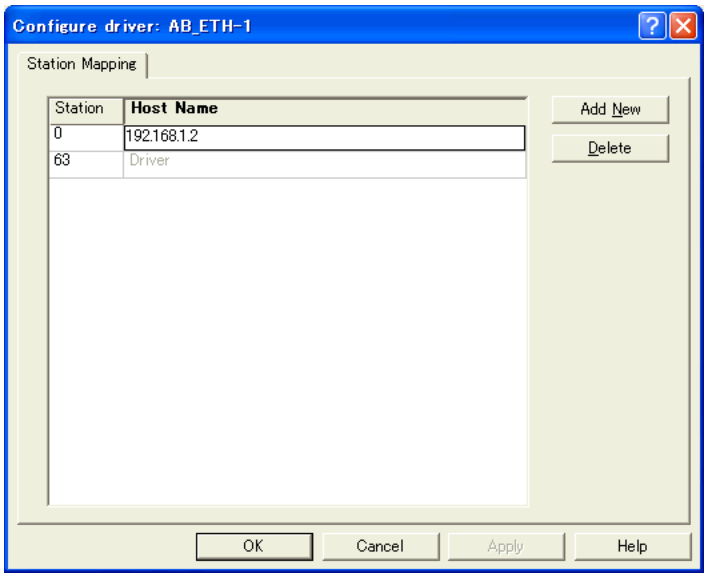
3. Select “Ethernet devices” in “Available Driver Types:” in the “Configure Drivers” window.



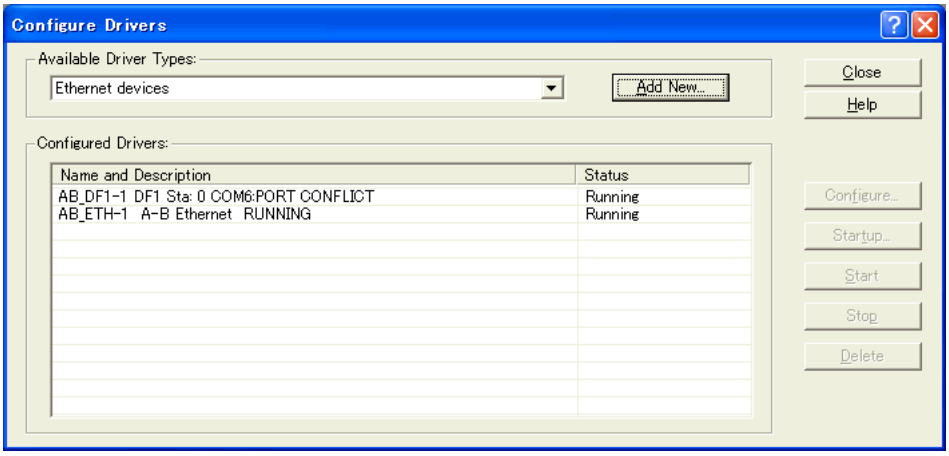
4. Click the [Add New] button to display “Add New RSLinx Classic Driver.”
The driver name can be entered here; however, the displayed name “AB_ETH-1” will be used, so simply click [OK].



5. In “Station Mapping” in the “Configure drivers: AB_ETH-1” window, enter the IP address of the EtherNet/IP module and click [OK].
In this example, the IP address of the EtherNet/IP module is set to “192.168.1.2.”



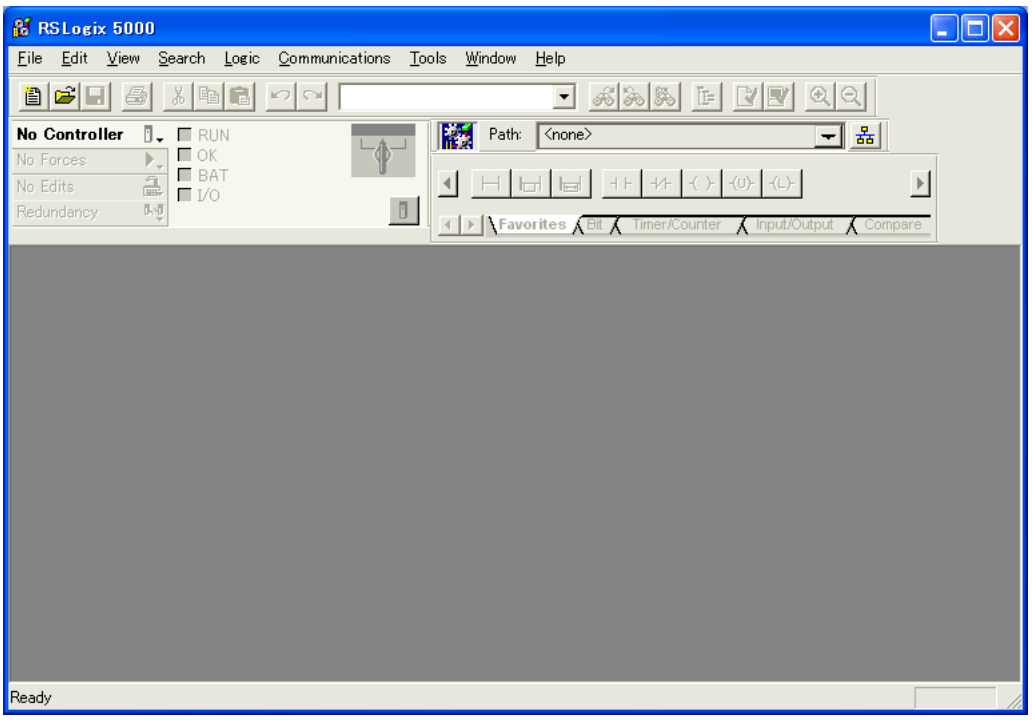
6. The “AB_ETH-1” driver of the EtherNet/IP module is added to “Configured Driver:” of the “Configure Drivers” window.



■ Creating a new project

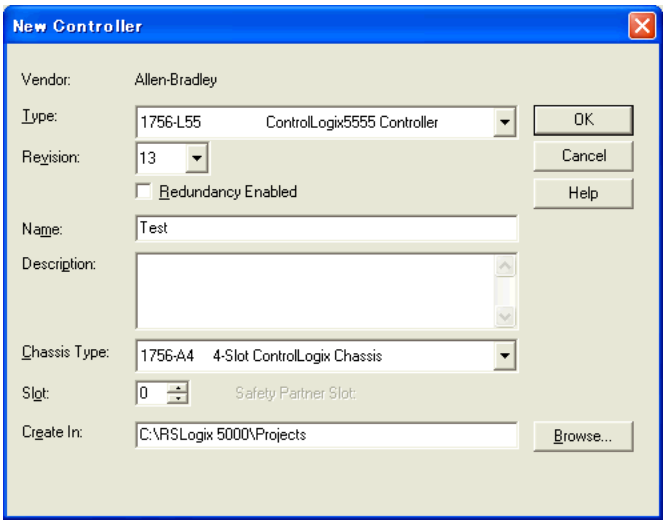
To build the system of this example in the RSLogix 5000 programming software, create a new project.

1. Start the RSLogix 5000 programming software.



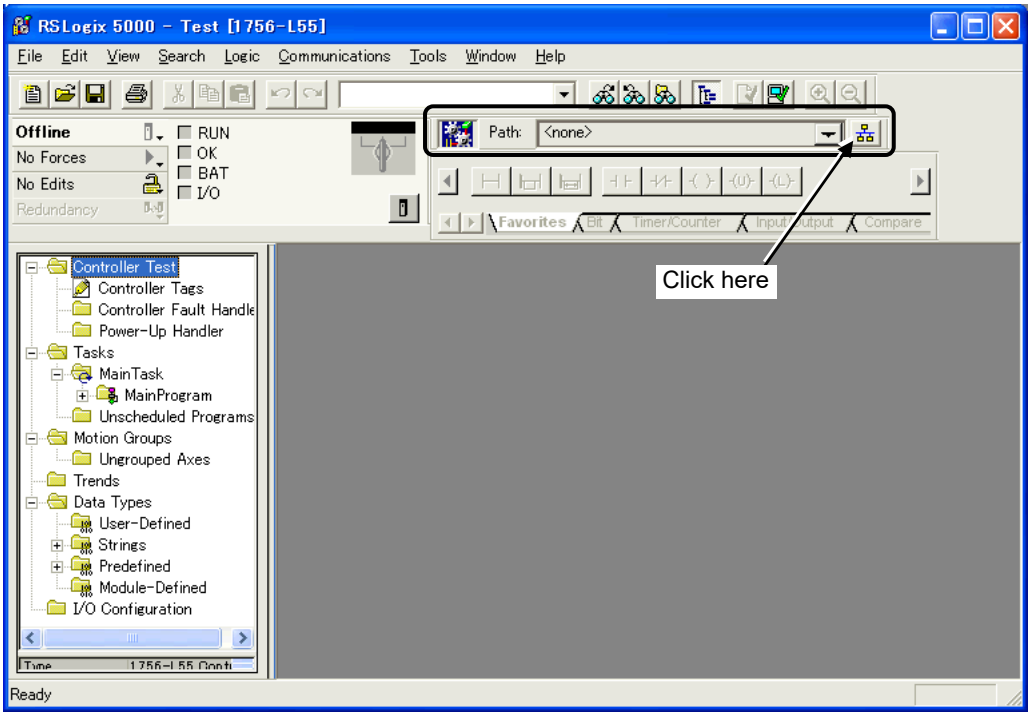
2. Select “New” from the “File” in the menu bar to open the “New Controller” window and create a new project. Configure the following settings in “New Controller.”

Type: 1756-L55 (CPU module type)
Revision: 13 (CPU module version)
Name: Test (Project name)
Chassis Type: 1756-A4 (Chassis type)
Slot: 0 (Chassis slot number where CPU module is inserted)

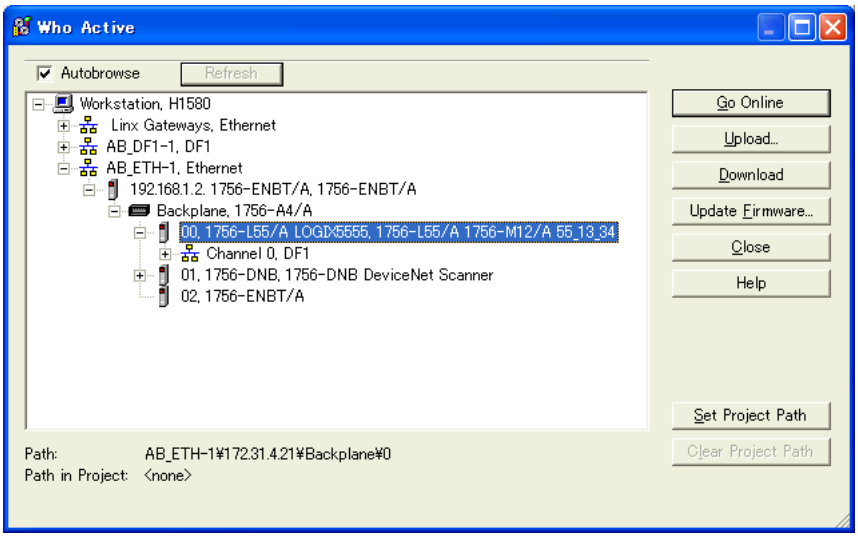


3. Click [OK] to store the project settings.

4. Set the path of the CPU module in the test project window. Click “Path” at the upper right of the screen to display the “Who Active” window.



5. Select CPU module “1756-L55” and click the [Set Project Path] button.

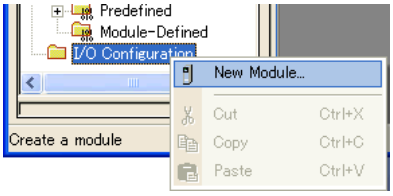


6. Click the [Close] button to store the path that is selected in “Path” on the test project screen.

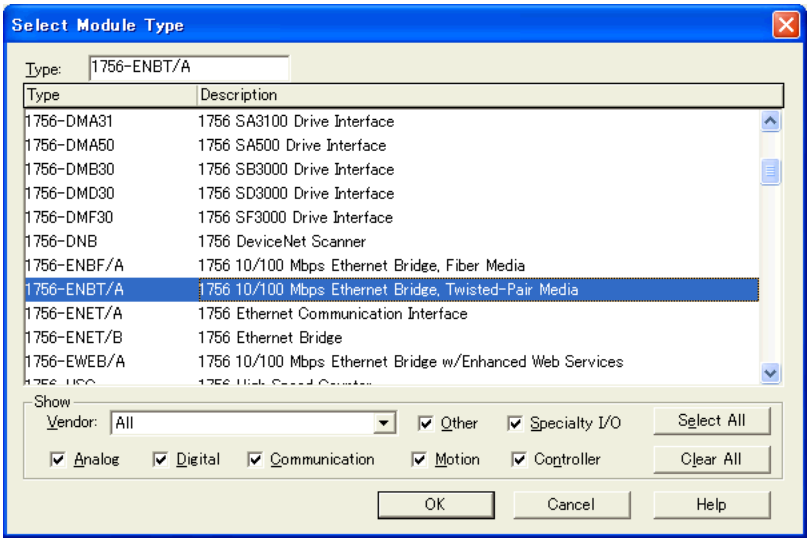
■ EtherNet/IP module settings

Add an EtherNet/IP module to the project.

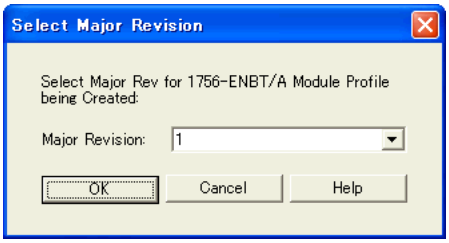
1. Select “I/O Configuration” from the tree on the left side of the test project screen and right-click “New Module.”



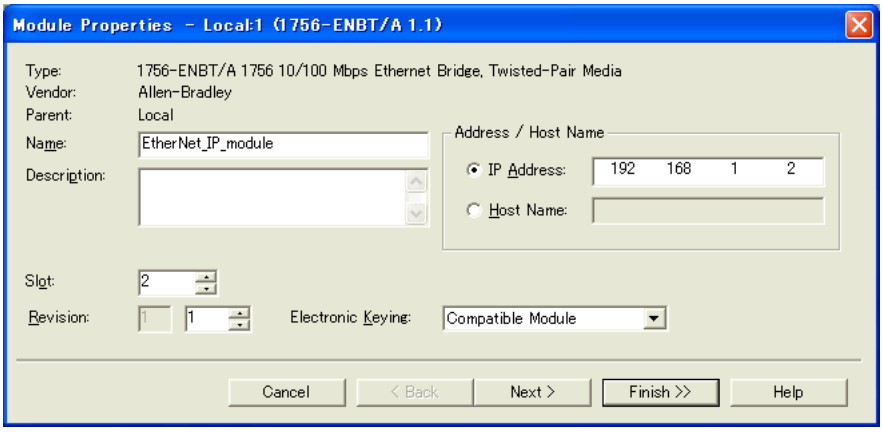
2. The “Select Module Type” window will open. Select EtherNet/IP module “1756-ENBT” and click [OK].



3. The “Select Major Revision” window will open. Enter the current version number (Major Revision) of the EnterNet/IP module and click [OK].



4. The “Module Properties” window will open. Set the name of the EtherNet/IP module, the IP address, the chassis slot number, and the version number (2nd digit).
In this example, the “Module Properties” is set as follows:
Name: EtherNet_IP_module
IP address: 192.168.1.2
Slot: 2
Revision: 1

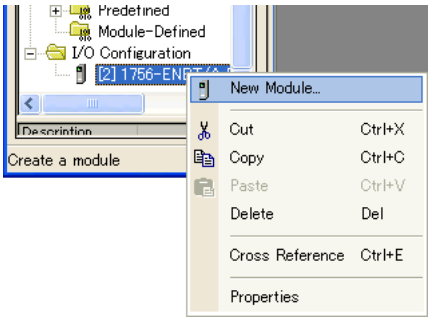


5. Click the [Finish] button to store the EtherNet/IP module settings.

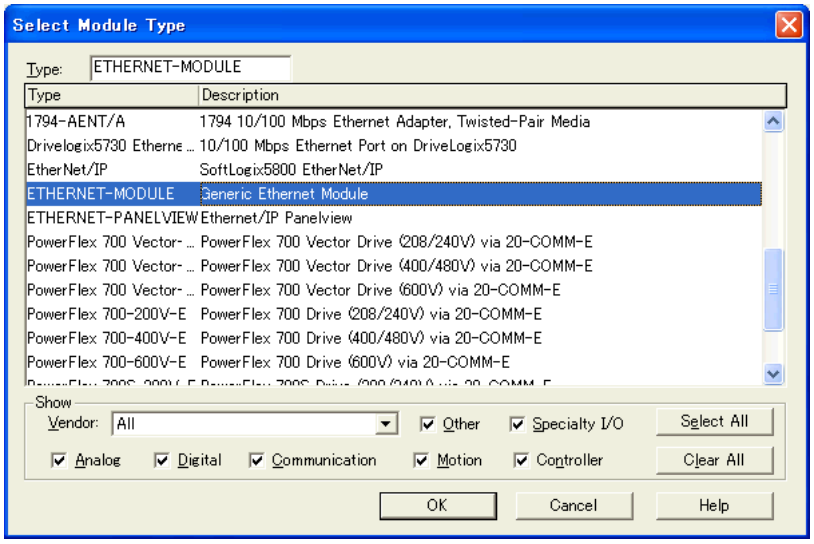
■ COM-ML settings

Add a COM-ML to the project.

1. Right-click “1756-ENBT/A” under “I/O Configuration” in the tree at the left side of the test project screen and select “New Module.”



2. The “Select Module Type” window will open. Select “ETHERNET-MODULE” and click [OK].



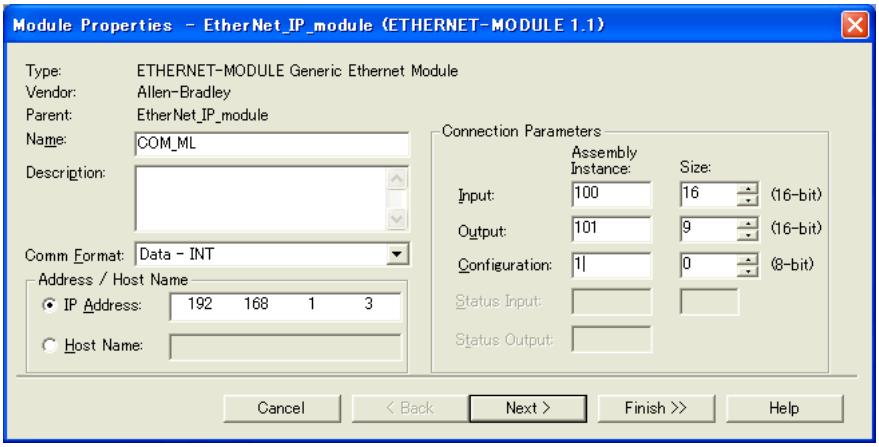
3. The “Module Properties” window will open. Set the name of the ETHERNET-MODULE, the data format, and the IP address.
Configure the I/O communication settings (Connection Parameters).
Set the assembly object instance numbers and the total data sizes of measured data items (IN) and setting data items (OUT) in “Assembly Instance” and “Size” of “Input” and “Output.”

In the case of I/O communication, data is sent and received using the “Assembly object (0x04: 04Hex)” object model. Measurement items (IN) use attribute 3 of instance 100, and setting items (OUT) use attribute 3 of instance 101.

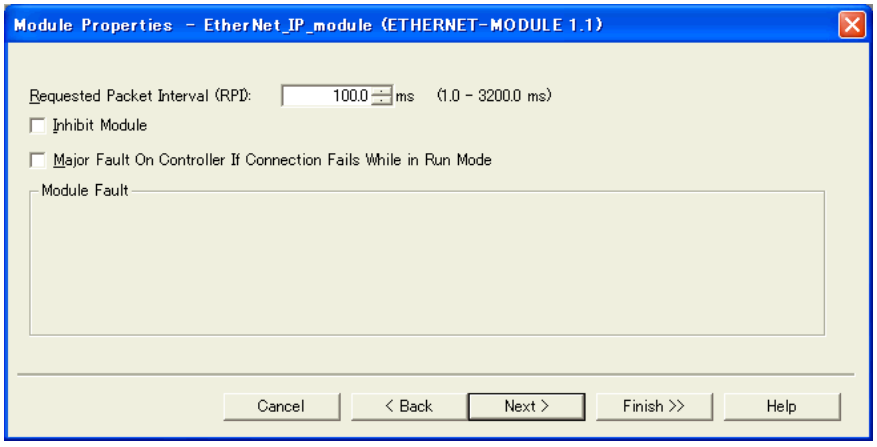
Continued on the next page.

In this example, the “Module Properties” is set as follows:

Name: COM_ML
Comm Format: Data - INT
IP Address: 192.168.1.3
Connection Parameters
Input: Assembly Instance: 100
Size: 16 [Measured value (PV): 8 channels + Set value (SV): 8 channels = 16]
Output: Assembly Instance: 101
Size: 9 [Setting state change (1 word) * + Set value (SV): 8 channels = 9]
* Always assigned to setting data item (OUT).



4. Click the [Next] button to display the next page.
Set the “Requested Packet Interval (RPI),” which is the interval between message responses in I/O communication.
In this example, “Requested Packet Interval (RPI)” is set to 100.0 ms.



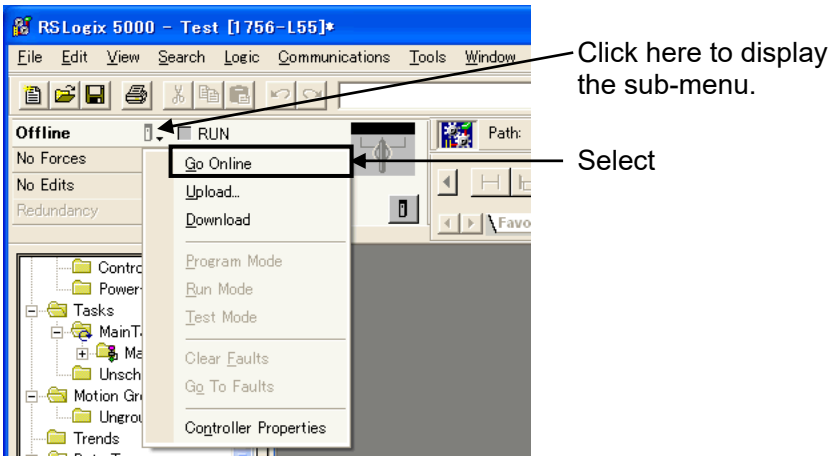
5. Click the [Finish] button to store the COM-ML settings.

This completes the configuration of the initial settings using the tool.

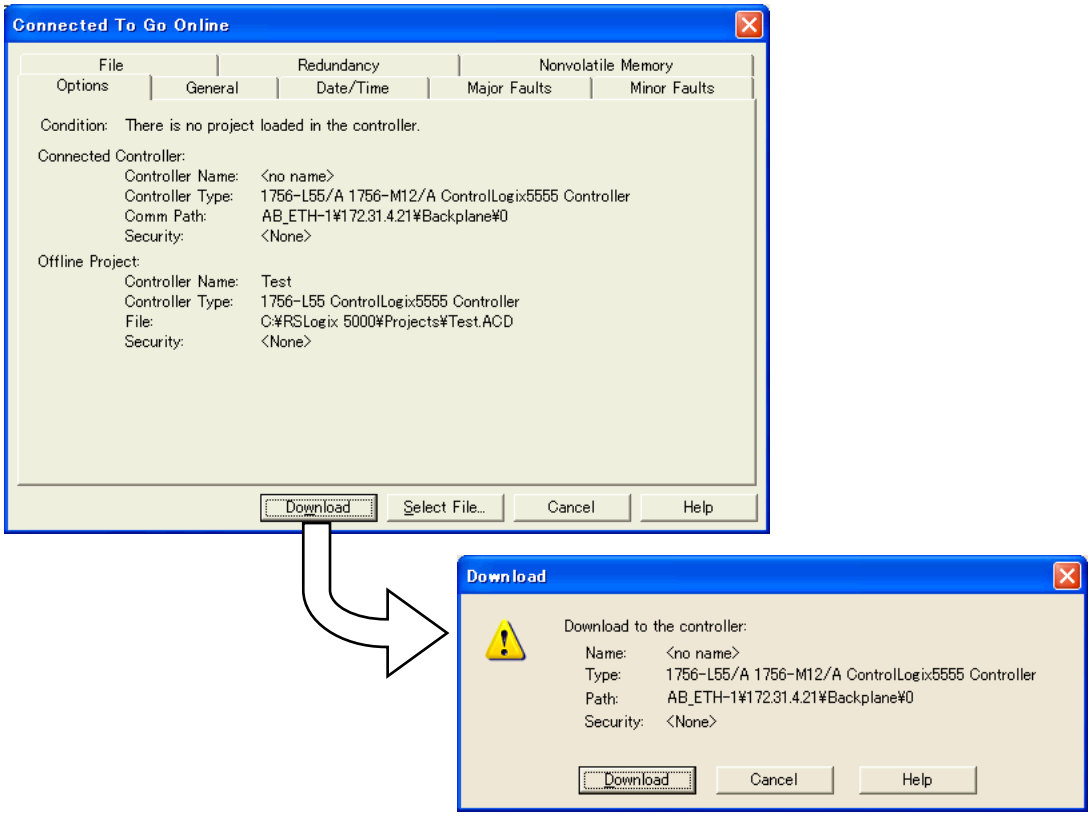
10.6 I/O Communication

This section explains how to execute I/O communication and check data.

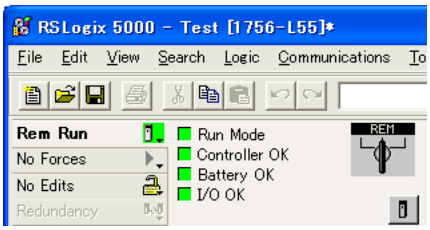
1. Click “Off line” at the upper left of the test project screen and select “Go Online” in the sub-menu.



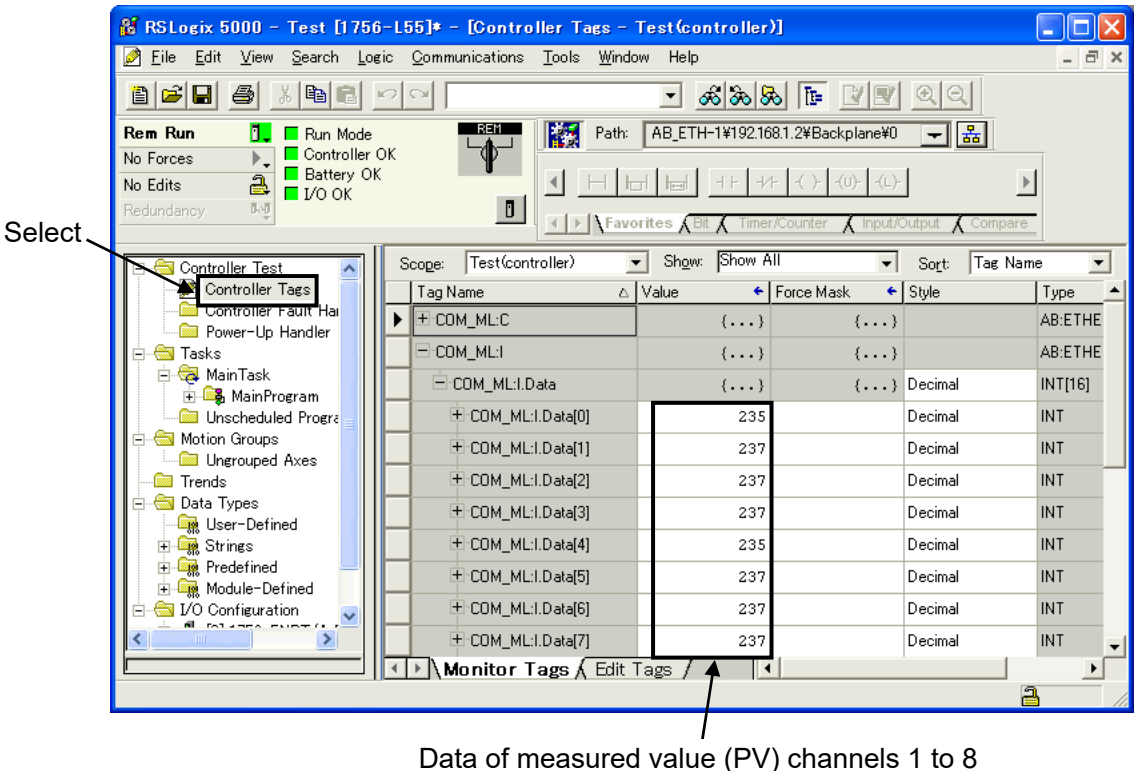
2. The “Connect To Go Online” window will open. Click the [Download] button. A confirmation window will appear. Click the [Download] button again.



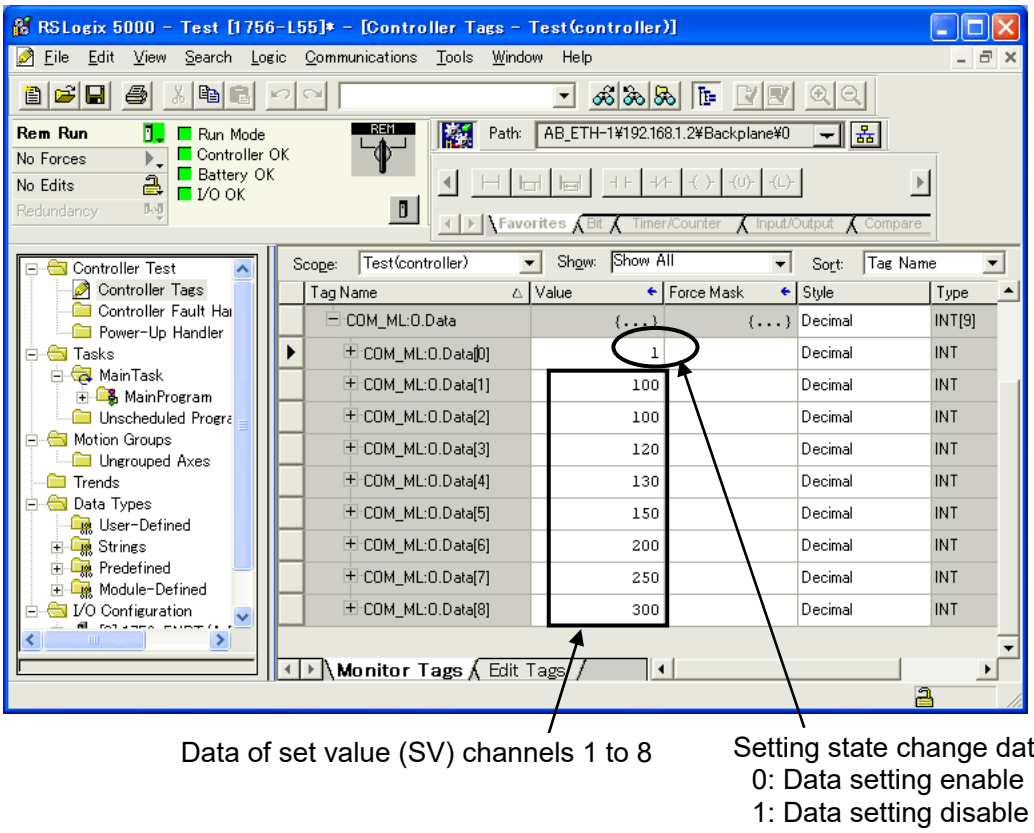
3. "Off line" at the upper left of the test project screen will change to "Rem Run," and I/O communication will be executed. If communication is normal, the display to the right of "Rem Run" will change to Run Mode, Controller OK, Battery OK, and I/O OK.



4. Select "Controller Tags" under "Controller Test" in the tree at the left side of the test project screen. "COM_ML: I" in Monitor Tags at the right side of the screen shows the measured data items (IN) data.
Values of COM_ML: I. Data [0] to [7]: Data of measured value (PV) channels 1 to 8.
Values of COM_ML: I. Data [8] to [15]: Data of set value (SV) channels 1 to 8.



5. "COM_ML: O" in Monitor Tags at the right side of the screen shows the set value (OUT) data. The Value cell of any data can be clicked to change the set value.
Value of COM_ML: O. Data [0]: Setting state change data
Values of COM_ML: O. Data [1] to [8]: Data of set value (SV) channels 1 to 8

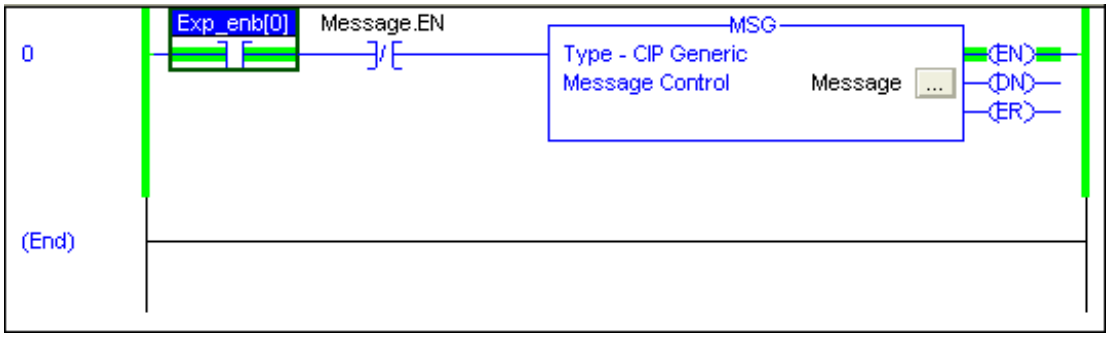


10.7 Explicit Message Communication

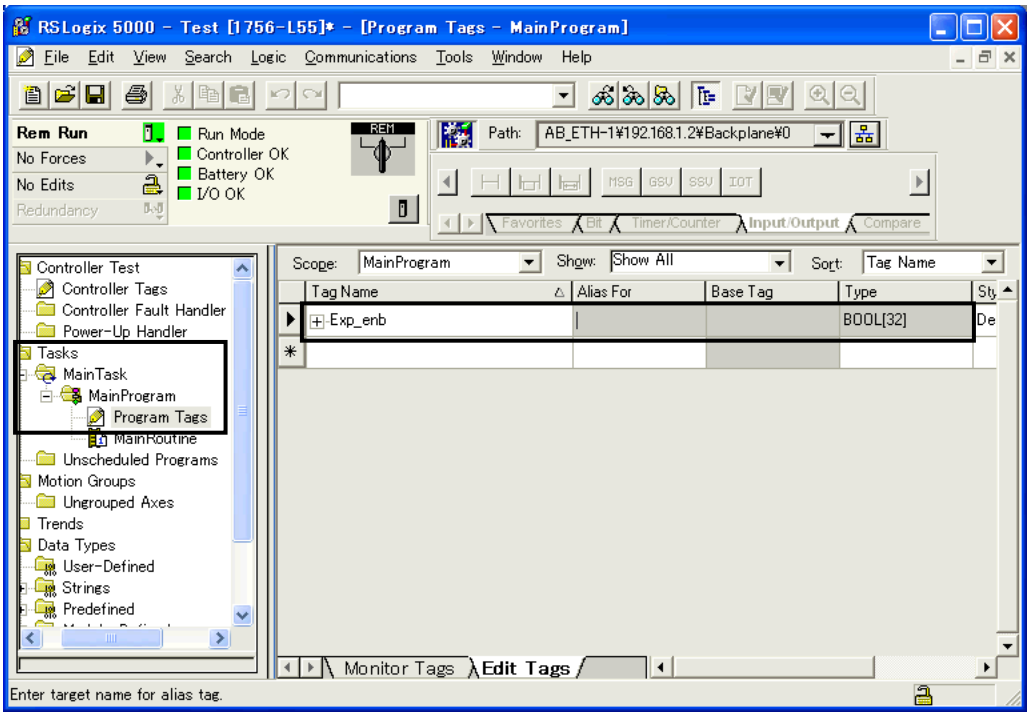
An example of using explicit message communication to set the value of set value (SV) channel 2 to “200” is shown below.

■ Creating a ladder program

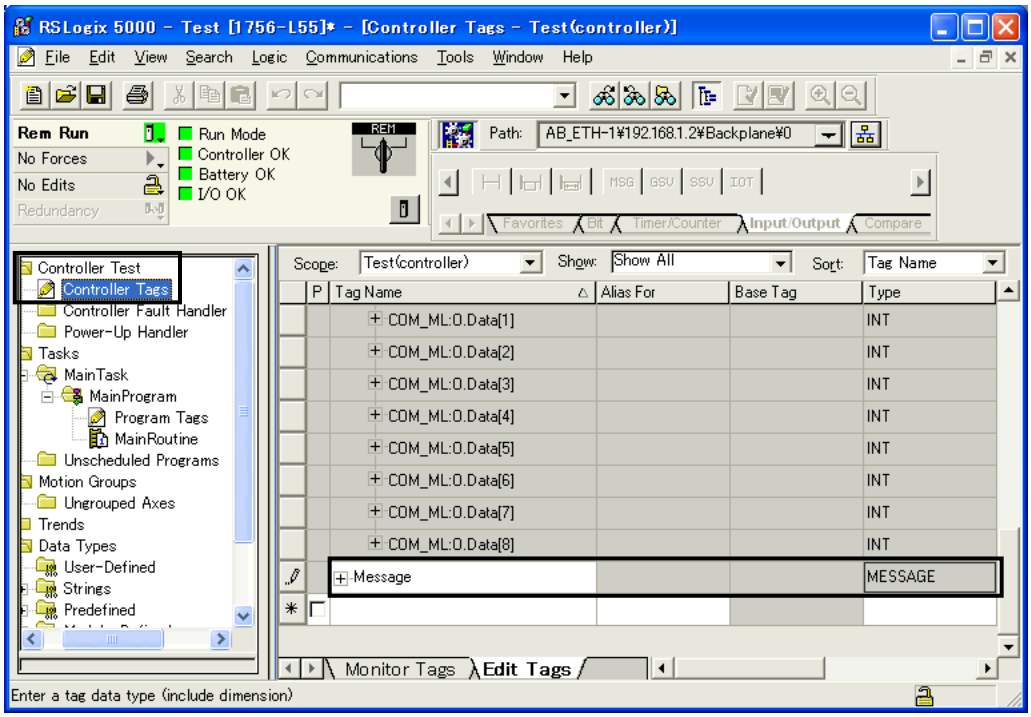
To send an explicit message, create a program similar to the program below.



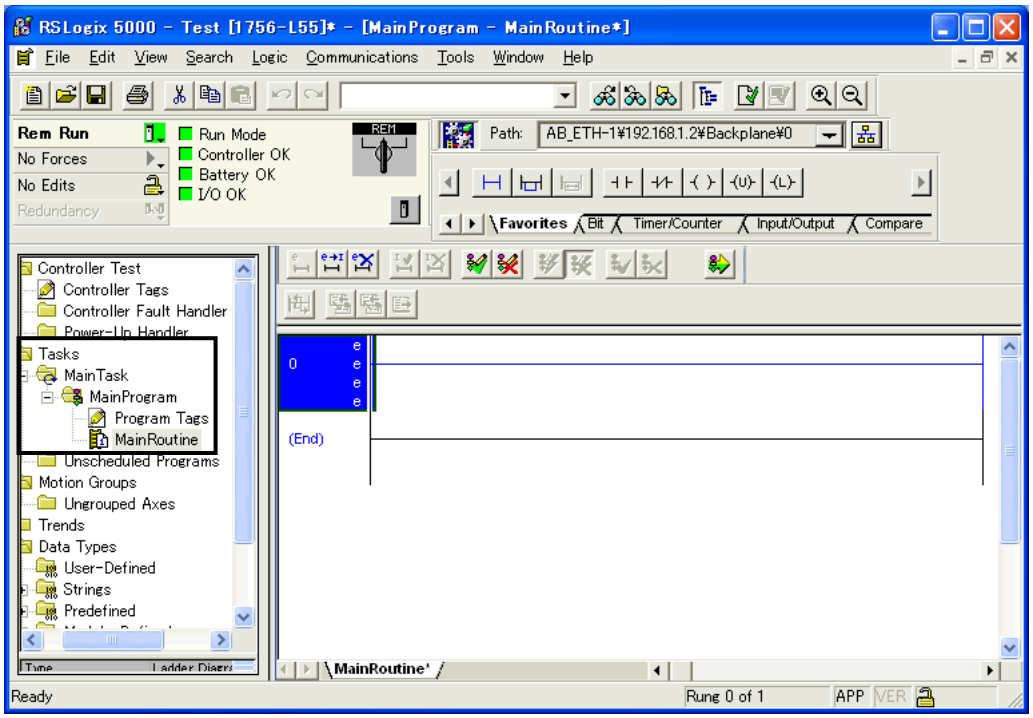
1. Register the “Exp_enb” relay (contact a), which is the trigger for explicit message transmission, ahead of time in “Tasks” → “Main Task” → “Main Program” → “Program Tags” in the tree at the left side of the test project screen.
In this example, the Tag Name is “Exp_enb” and the Type is “BOOL.”



2. Store “Message” in Edit Tags of “Controller Test” → “Controller Tags” in the tree at the left side of the test project screen.
In this example, “Message” is entered for the Tag Name under “COM_ML: O” of I/O communication, and “MESSAGE” is selected for the Type.

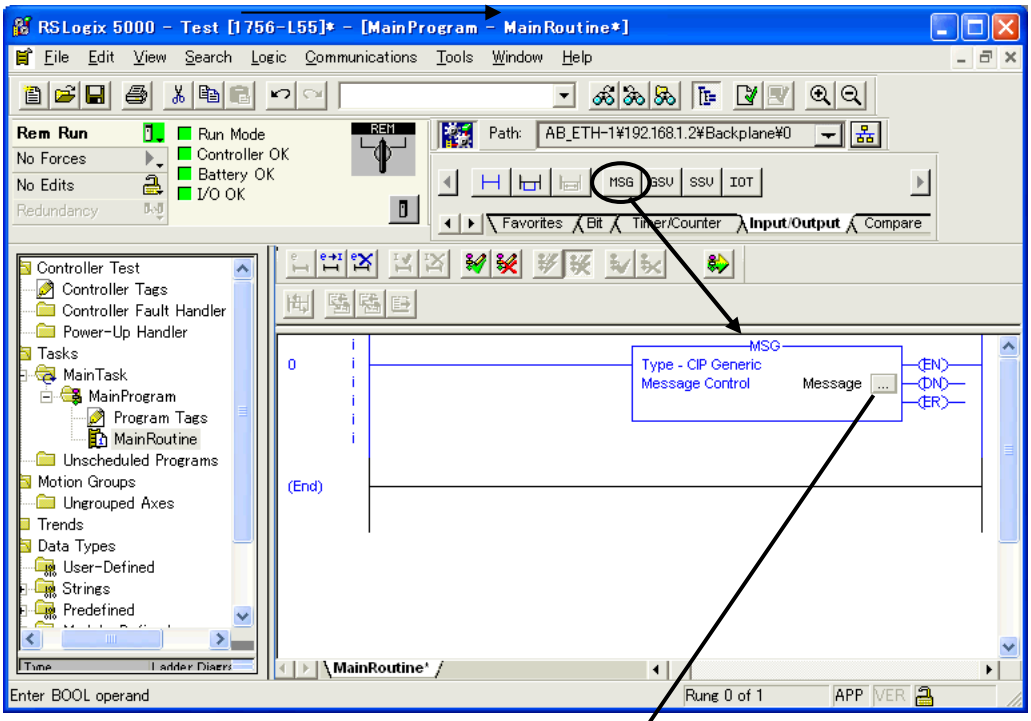


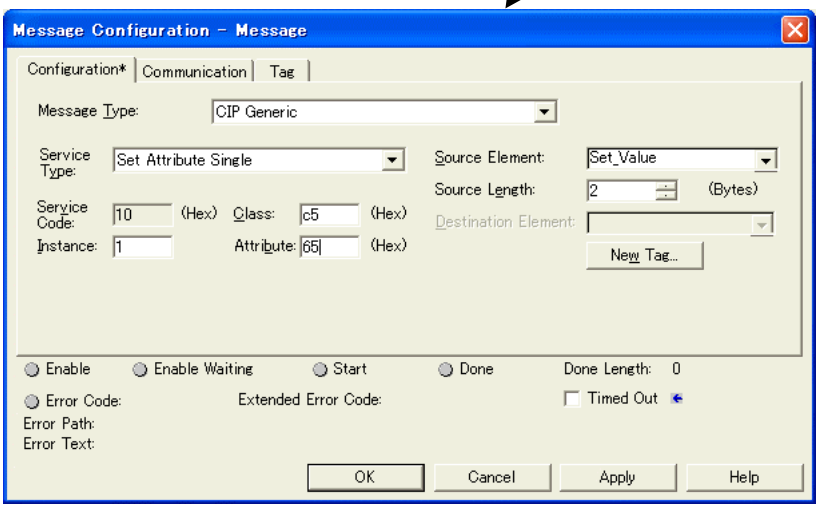
3. Create the program in the screen that appears when “Tasks” → “Main Task” → “Main Program” → “Main Routine” is selected in the tree on the left side of the test project screen.



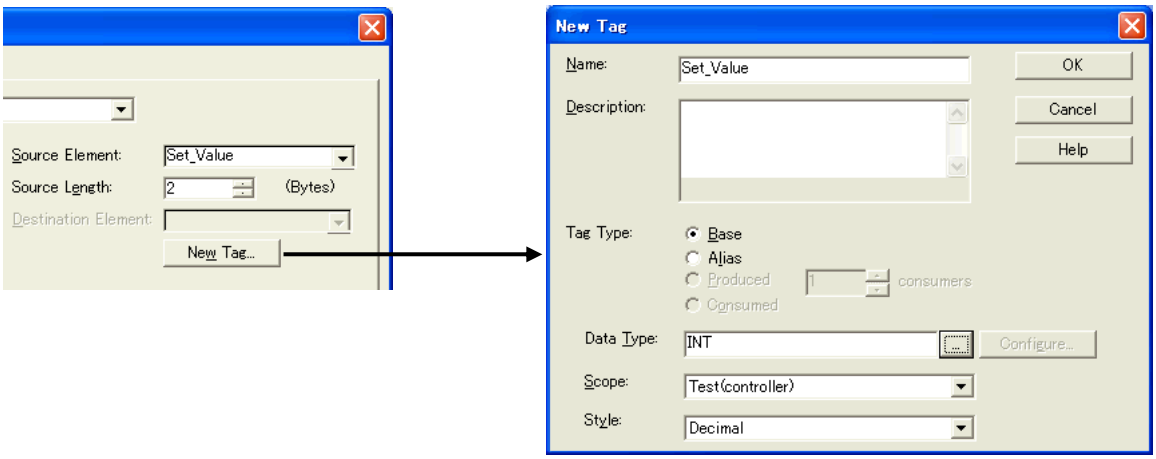
4. Edit the commands in the screen using the icons.
After assigning MSG, click [...] in the MSG frame to set the "Message Configuration."
In this example, the "Message Configuration" is set as follows:

Message Type: CIP Generic
Service Type: Set_Attribute_Single
Class: 64 Hex
Instance: 2
Attribute: 65 Hex
Source Element: Set_Value
Source Length: 2

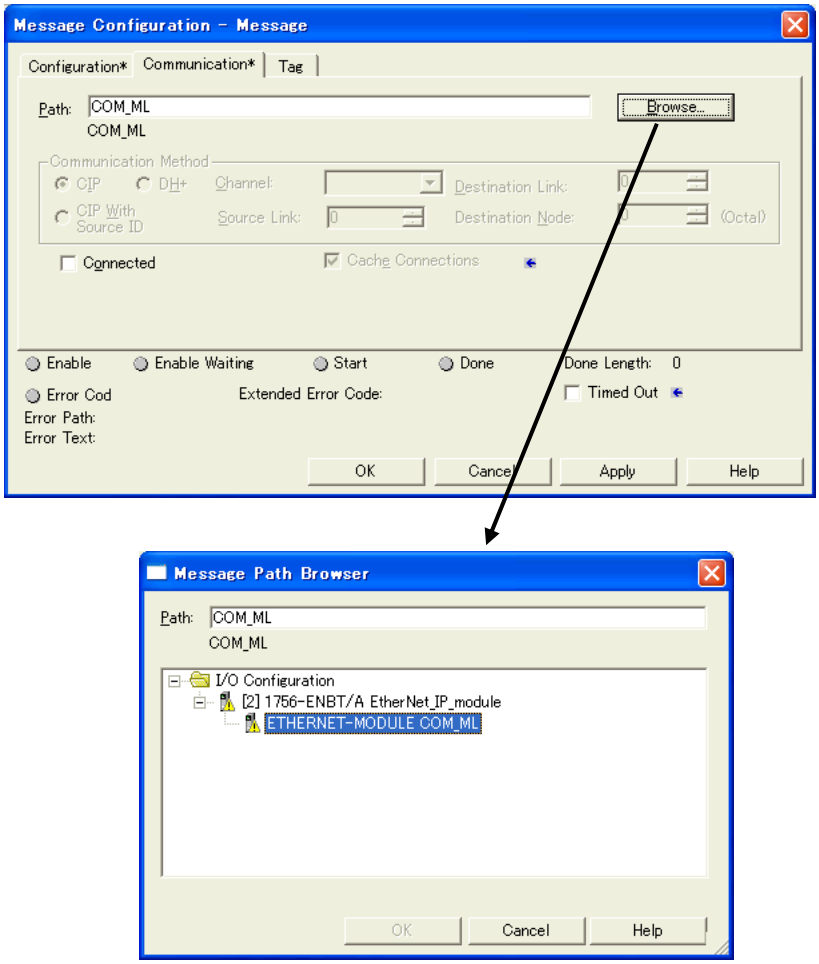




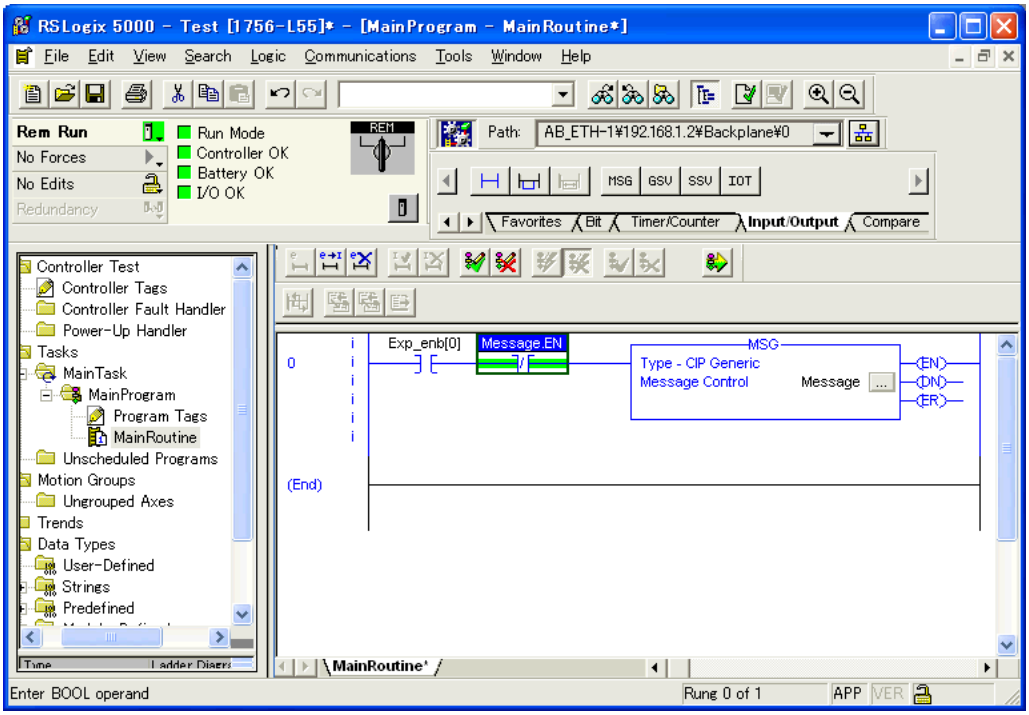
5. Click the [New Tag] button in the same screen to store the “Set_Value” of Source Element.
The “New Tag” window will open, specify “Set_Value” for the name and select “INT” for the Data Type.



6. Set the path in the Communication tag of the Message Confirmation window.
Click the [Browse] button and select “ETHERNET-MODULE COM_ML” in the Message Path Browser window.



7. After the “Exp_enb” relay, connect the Message output EN using contact b. This completes the program.

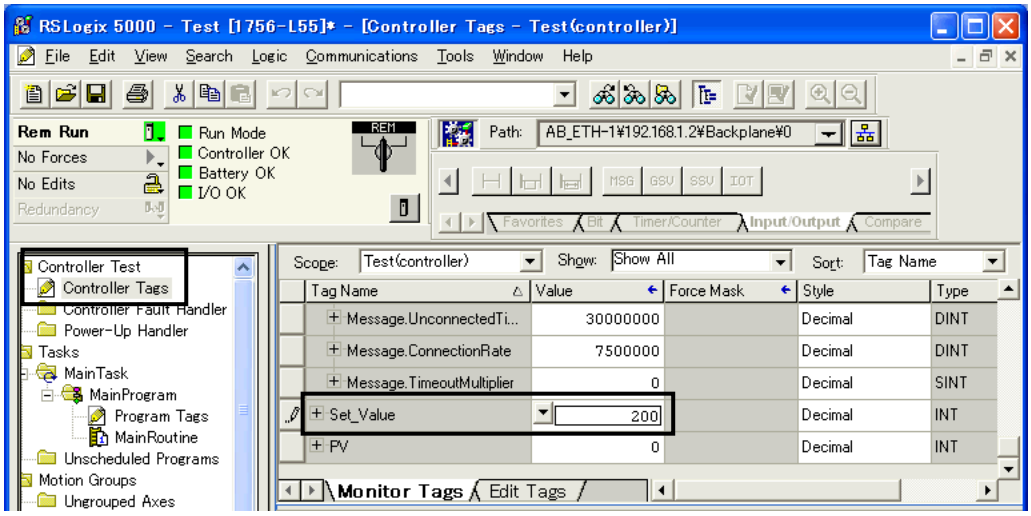


■ Running the program

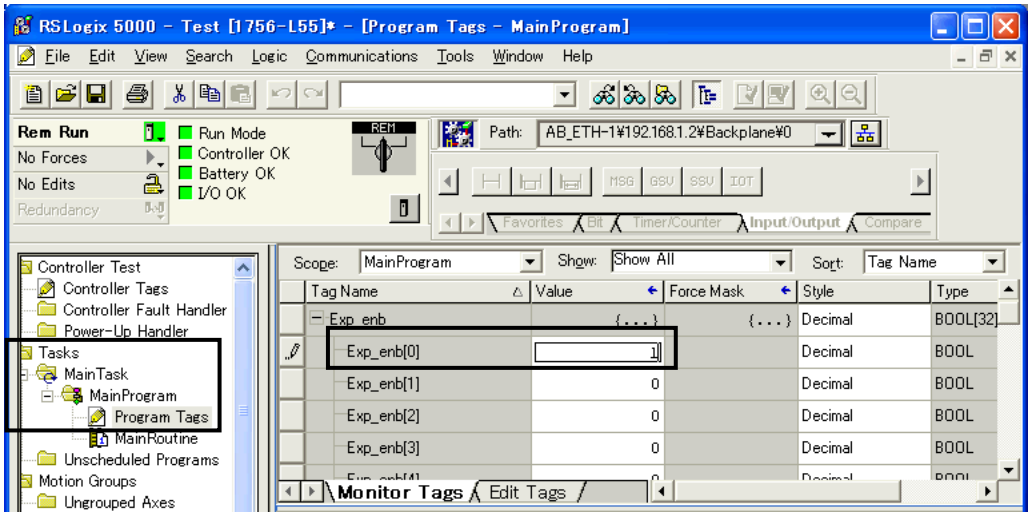
In the program that was created for explicit message communication, set the value of channel 2 of the set value (SV) to “200.”

1. Follow steps *1* and *2* of **10.6 I/O Communication (P. 84)** to download the ladder program that was created.

2. In Monitor Tags of “Controller Test” → “Controller Tags” in the tree at the left side of the test project screen, set the value of “Set_Value” to “200.”



3. Set the value of “Exp_enb [0]” to “1” in “Tasks” → “Main Task” → “Main Program” → “Program Tags” in the tree at the left side of the test project screen. Explicit message communication will be executed, and the value of set value (SV) channel 2 will be “200.”



11. TROUBLESHOOTING

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

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

⚠ WARNING

- To prevent electric shock or instrument failure, always turn off the system power before replacing the instrument.
- To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.
- To prevent electric shock or instrument failure, do not turn on the power until all the wiring is completed. 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

All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.

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)	Changing to the IP address default setting is in progress	When the power is turned on after the IP address default setting is enabled in the DIP switches, this lamp flashes for about 5 seconds. After flashing, the lamp automatically changes to solid green. At this point, the IP address becomes the factory set value.
The FAIL/RUN lamp flashes (green): Recoverable fault occur	Data backup 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/IP

Problem	Probable cause	Solution
An IP address cannot be acquired by DHCP	DHCP selection is invalid	Enable DHCP selection
	Problem on the network	Consult your network administrator.
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)	An invalid IP address is being used	Confirm the settings and set them correctly
NS lamp: Flashs (green) MS lamp: ON (green)	Online, no communication established	Confirm the I/O communication settings and set them correctly
NS lamp: Flashs (red) MS lamp: ON (green)	I/O connection is timeout	Confirm the wiring or condition of scanner side and connect correctly
NS lamp: ON (red) MS lamp: ON (green)	Duplicate IP address	Restart after the resetting is made so that IP address is not duplicated
MS lamp: Flashs (green)	Do not use connection type message in explicit message communication	Confirm the setting of scanner side and set them correctly
MS lamp: Flashs (red)	Duplication of the IP address	Restart after the resetting is made so that IP address is not duplicated
	IP address is changed during I/O communication	Turn off the power once and then turn it on again.
MS lamp: ON (red)	Network module (COM-ML) failure	Replace COM-ML
Data cannot be set	When a setting item (OUT) is set by I/O communication, setting state selection is not assigned to the first word.	Confirm the settings and set them correctly
Data content does not match	The data specified in the communication item settings is different from the data actually handled in I/O communication or explicit message communication	Confirm the settings and set them correctly
Data numbers do not match	In I/O communication, the number of measurement items (IN) used and the number of setting items (OUT) used do not match the set numbers	Confirm the settings and set them correctly

■ RKC communication

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

■ Modbus

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

12. SPECIFICATIONS

■ Ethernet communication

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

Application layer: EtherNet/IP

Corresponding message: I/O communicarion, Explicit massage communication

Connector type: RJ-45

■ Host communication

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

Protocol:
- RKC communication
  Based on ANSI X3.28-1976 subcategories 2.5 and B1
  Polling/selecting type
  Error control: Vertical parity (with parity bit selected)
  Horizontal parity (BCC check)
  Data types: ASCII 7-bit code
- Modbus
  Signal transmission mode:
  Remote Terminal Unit (RTU) mode
  Function codes: 03H Read holding registers
  06H Preset single register
  08H Diagnostics (loopback test)
  10H Preset multiple registers
  Error check method:
  CRC-16
  Error codes: 1: Function code error
  (An unsupported function code was specified)
  2: When the mismatched address is specified.
  3: • When the 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

Synchronous method: Start/stop synchronous type

Connection method: RS-422A: 4-wire system, half-duplex multi-drop connection
RS-485: 2-wire system, half-duplex multi-drop connection

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

Data bit configuration: Start bit: 1
Data bit: 7 or 8 (Modbus: 8 fixed)
Parity bit: Without, Odd or Even
Stop bit: 1

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 (Based on 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 backup 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 (at maximum load):
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 terminal and grounding:
20 MΩ or more at 500 V DC
Between power supply terminal and host communication terminal:
20 MΩ or more at 500 V DC
Between power supply terminal and network communication terminal:
20 MΩ or more at 250 V DC

Withstand voltage: See table shown below

Time: 1 min.	①	②	③
① Grounding terminal			
② Power supply terminal	750 V AC		
③ Host communication terminal	750 V AC	750 V AC	
④ Network communication terminal	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)

■ Standard

Safety standards:	UL: UL 61010-1 cUL: CAN/CSA-C22.2 No.61010-1
CE marking:	LVD: EN61010-1 POLLUTION DEGREE 2, Class II (Reinforced insulation) EMC: EN61326-1
RCM:	EN55011

13. OBJECT MODEL

EtherNet/IP is an implementation of CIP (Common Industrial Protocol) on Ethernet and TCP/IP. CIP is defined by means of an object model.

13.1 CIP Common Object

■ Identity Object (0x01: 01Hex)

● Object class

	ID	Description	Get	Set	Type	Value
Attributes	1	Revision	Yes	No	UINT	1

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x01	Get_Attribute_All	None

● Object instance 1

	ID	Description	Get	Set	Type	Value
Attributes	1	Vendor ID	Yes	No	UINT	394
	2	Device type	Yes	No	UINT	0
	3	Product code	Yes	No	UINT	8
	4	Revision	Yes	No	Struct	
		Major revision			USINT	1
		Minor revision			USINT	1
	5	Status	Yes	No	WORD	Note
	6	Serial number	Yes	No	UDINT	(Unique serial number)
	7	Product name	Yes	No	Struct	
		Length			SHORT	8
		Name			SHORT_ STRING	“COM-ML-2”
	11	Active Language	Yes	Yes	Struct	
					USINT	“e”
					USINT	“n”
					USINT	“g”
	12	Supported Language List	Yes	No	Any of Struct	
					USINT	“e”
					USINT	“n”
					USINT	“g”

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x10	Set_Attribute_Single	None
	0x05	Reset	0
	0x01	Get_Attribute_All	None

Note: A bit layout of “Status”

bit 0: Owned
bit 2: Configured
bit 4 to 7: Extended Device Status
bit 8: Minor Recover Fault
bit 9: Minor Unrecoverable Fault
bit 10: Major Recoverable Fault
bit 11: Major Unrecoverable Fault
(Bit 1, bit 3 and bit 12 to 15 is always 0.)

■ Message Router Object (0x02: 02Hex)

● Object class

Attributes	Not supported
Services	Not supported

● Object instance

Attributes	Not supported
Services	Not supported

■ Assembly Object (0x04: 04Hex)

● Object class

	ID	Description	Get	Set	Type	Value
Attributes	1	Revision	Yes	No	UINT	2
	2	Max Instance	Yes	No	UINT	(Highest Instance number)

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None

● Object instance 100

	ID	Description	Get	Set	Type	Value
Attributes	3	Produced Data	Yes	No	Array of BYTE	

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None

● Object instance 101

	ID	Description	Get	Set	Type	Value
Attributes	3	Consumed Data	Yes	Yes	Array of BYTE	

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x10	Set_Attribute_Single	None

■ Connection Manager Object (0x06: 06Hex)

● Object class

Attributes	Not supported
Services	Not supported

● Object instance

Attributes	Not supported

	EtherNet/IP service		Parameter option
Services	0x4E	Forward_Close	None
	0x54	Forward_Open	None

■ TCP/IP Interface Object (0xF5: F5Hex)

● Object class

	ID	Description	Get	Set	Type	Value
Attributes	1	Revision	Yes	No	UINT	1

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x01	Get_Attribute_All	None

● Object instance 1

	ID	Description	Get	Set	Type	Value
Attributes	1	Status	Yes	No	DWORD	1
	2	Configuration Capability	Yes	No	DWORD	0000 0014h or 0000 0004h bit 0 to 1: 0 (fixed) bit 2: DHCP Client bit 3: 0 (fixed) bit 4: Configuration Settable bit 5 to 31: 0 (fixed)
	3	Configuration Control	Yes	Yes	DWORD	0: non-volatile memory 2: DHCP
	4	Physical Link Object Path Size Path	Yes	No	Struct USINT Padded EPATH	 2 20 F6 24 01h
	5	Interface Configuration IP Address Network Mask Gateway Address Name Server 1 Name Server 2 Domain Name	Yes	Yes	Struct UDINT UDINT UDINT UDINT UDINT STRING	 ---- ---- ---- ---- ---- ----
	6	Host Name	Yes	Yes	STRING	----

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x01	Get_Attribute_All	None
	0x10	Set_Attribute_Single	None

■ Ethernet Link Object (0xF6: F6Hex)

● Object class

	ID	Description	Get	Set	Type	Value
Attributes	1	Revision	Yes	No	UINT	2

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x01	Get_Attribute_All	None

● Object instance 1

	ID	Description	Get	Set	Type	Value
Attributes	1	Interface Speed	Yes	No	UDINT	10 or 100
	2	Interface Flags	Yes	No	DWORD	----
	3	Physical address	Yes	No	6 USINT	(MAC ID)
	4	Interface Counters	Yes	No	Struct	
		In Octets			UDINT	----
		In Ucast Packets			UDINT	----
		In NUcast Packets			UDINT	----
		In Discards			UDINT	----
		In Errors			UDINT	----
		In Unknown Protos			UDINT	----
		Out Octets			UDINT	----
		Out Ucast Packets			UDINT	----
		Out NUcast Packets			UDINT	----
		Out Discards			UDINT	----
		Out Errors			UDINT	----
	5	Media Counters	Yes	No	Struct	
		Alignment Errors			UDINT	----
		FCS Errors			UDINT	----
		Single Collisions			UDINT	----
		Multiple Collisions			UDINT	----
		SQE Test Errors			UDINT	0
		Deferred Transmissions			UDINT	----
		Late Collisions			UDINT	----
		Excessive Collisions			UDINT	----
		MAC Transmit Errors			UDINT	----
		Carrier Sense Errors			UDINT	----
		Frame Too Long			UDINT	----
		MAC Receive Errors			UDINT	----
	6	Interface Control	Yes	Yes	Struct	
		Control Bits			WORD	----
		Forced Interface Speed			UINT	----

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x01	Get_Attribute_All	None
	0x10	Set_Attribute_Single	None
	0x4C	Get_And_Clear	None

13.2 Application Object

■ Controller Object (0x64: 64Hex)

● Object class

Attributes	Not supported
Services	Not supported

● Object instance □ (□: 1 to 255)

	ID	Description	Get	Set	Type	Value
Attributes	100	Data 0	Yes	Yes	UINT	Note
	101	Data 1	Yes	Yes	UINT	Note
	⋮	⋮	⋮	⋮	⋮	⋮
	148	Data 48	Yes	Yes	UINT	Note
	149	Data 49	Yes	Yes	UINT	Note

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x10	Set_Attribute_Single	None

Note: Modbus address data specified in the Controller Communication Item Setting Object (0xC5).
The instance number indicates how many data items the data is from the Modbus address data specified in the attribute ID of 0xC5.
When an RO item is written to, the value reverts to the original value several seconds later. Items that are not used are RO, and the data is 0.

Example: Data of instance 2, attribute 100 is the data of "first Modbus address + 1" specified in attribute 100 of 0xC5.

■ Controller Communication Item Setting Object (0xC5: C5Hex)

● Object class

Attributes	Not supported
Services	Not supported

● Object instance 1

	ID	Description	Get	Set	Type	Value
Attributes	100	Item setting of Data 0	Yes	Yes	UINT	Note
	101	Item setting of Data 1	Yes	Yes	UINT	Note
	⋮	⋮	⋮	⋮	⋮	⋮
	148	Item setting of Data 48	Yes	Yes	UINT	Note
	149	Item setting of Data 49	Yes	Yes	UINT	Note

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x10	Set_Attribute_Single	None

Note: Set the first Modbus address of the data used in the Controller Object (0x64).
If not used, set 0xFFFF.

■ Controller Communication Measured Data Item (IN) Setting Object (0xC6: C6Hex)

● Object class

Attributes	Not supported
Services	Not supported

● Object instance 1

	ID	Description	Get	Set	Type	Value
Attributes	100	The number of Measured Data Item (IN) of Data 0	Yes	Yes	USINT	0 to 128 (0: Unused)
	101	The number of Measured Data Item (IN) of Data 1	Yes	Yes	USINT	0 to 128 (0: Unused) *
	⋮	⋮	⋮	⋮	⋮	⋮
	148	The number of Measured Data Item (IN) of Data 48	Yes	Yes	USINT	0 to 128 (0: Unused) *
	149	The number of Measured Data Item (IN) of Data 49	Yes	Yes	USINT	0 to 128 (0: Unused) *

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x10	Set_Attribute_Single	None

* A cumulative number of data items of up to 128 from attribute 100 is valid. A setting above this will be disregarded.

■ Controller Communication Set Data Item (OUT) Setting Object (0xC7: C7Hex)

● Object class

Attributes	Not supported
Services	Not supported

● Object instance 1

	ID	Description	Get	Set	Type	Value
Attributes	100	The number of Set Data Item (OUT) of Data 0	Yes	Yes	USINT	0 to 127 (0: Unused)
	101	The number of Set Data Item (OUT) of Data 1	Yes	Yes	USINT	0 to 127 (0: Unused) *
	⋮	⋮	⋮	⋮	⋮	⋮
	148	The number of Set Data Item (OUT) of Data 48	Yes	Yes	USINT	0 to 127 (0: Unused) *
	149	The number of Set Data Item (OUT) of Data 49	Yes	Yes	USINT	0 to 127 (0: Unused) *

	EtherNet/IP service		Parameter option
Services	0x0E	Get_Attribute_Single	None
	0x10	Set_Attribute_Single	None

* A cumulative number of data items of up to 127 from attribute 100 is valid. A setting above this will be disregarded.

Regardless of the setting of this object, “setting state selection” is assigned to the first-word of the set data item (OUT).

	Description	Get	Set	Type	Value
First-word of the set data item (OUT)	Setting state selection	Yes	Yes	UINT	Bit data bit 0: Data setting disabled/enabled 0: Setting disable 1: Setting enable bit 1 to 15: Unused

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. *
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. *

* In the case of RKC communication (selecting procedure), the time will be "the time after BCC reception until an acknowledgement [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.

■ Caution for selecting

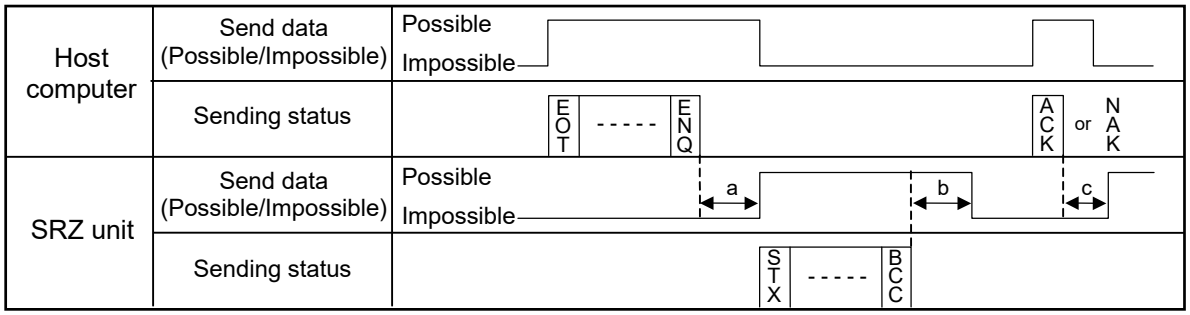
When selecting of the following communication data of a Z-TIO module is performed, the next selecting procedure for the changed Z-TIO module will not be possible for 4 to 6 seconds.
For this reason, when there are many channels to be changed, do not perform selecting for each channel individually; perform selecting for all channels at once. Note that if the communication data exceeds 128 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

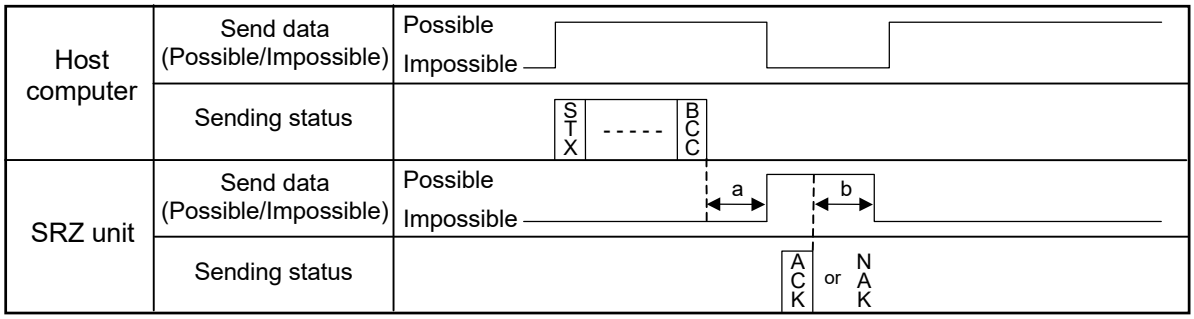
RS-485 communication is conducted through two wires, therefore the transmission and reception of data requires precise timing.

● 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

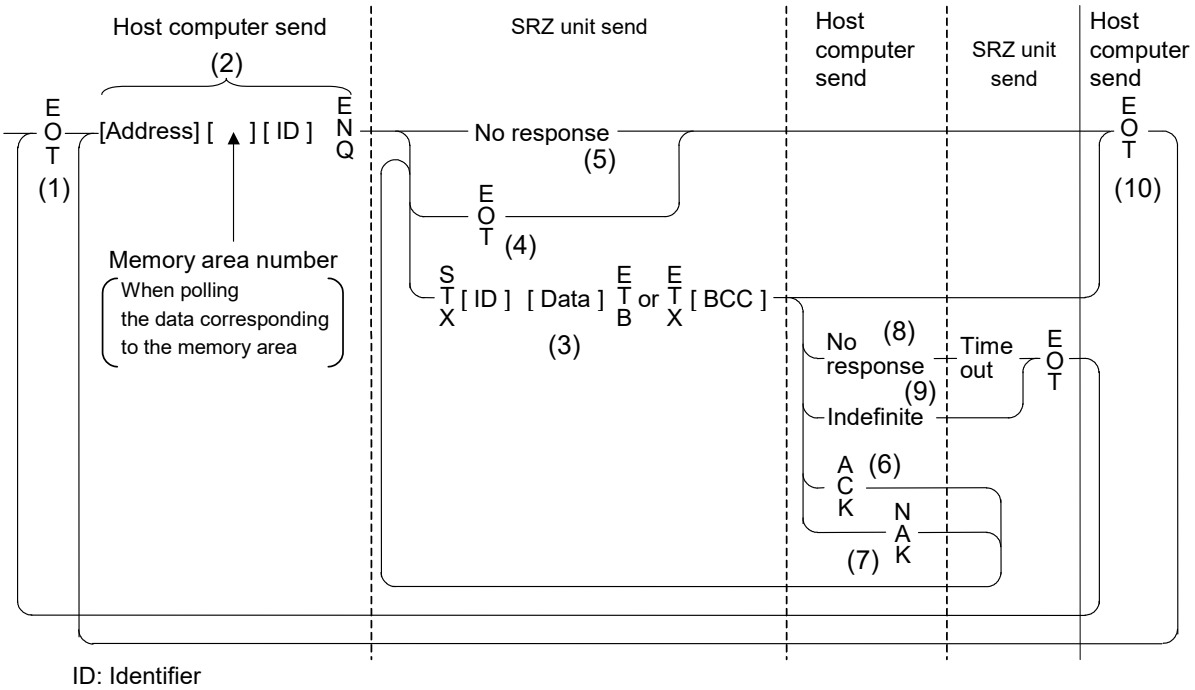
RKC communication uses the polling/selecting method to establish a data link. The basic procedure is followed ANSI X3.28-1976 subcategories 2.5 and B1 basic mode data transmission control procedure (Fast selecting is the selecting method used in SRZ unit).

- 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

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

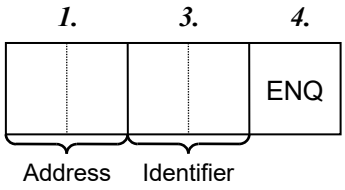
Host computer sends EOT to the controllers to initiate data link before polling sequence.

(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.

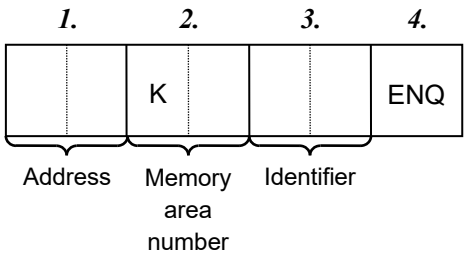


Example:

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 unit address of the SRZ 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.

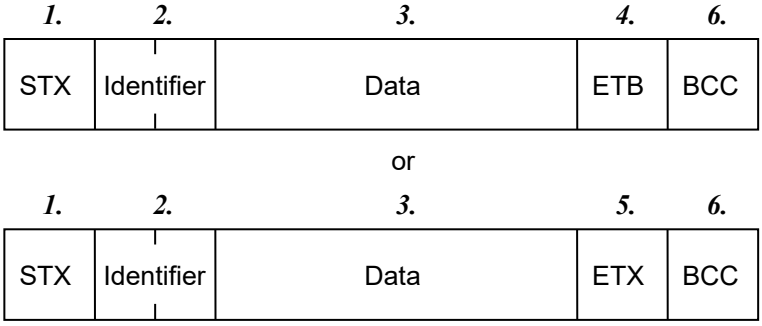
3. Identifier (2 digits)
The identifier specifies the type of data that is requested from the SRZ unit. Always attach the ENQ code to the end of the identifier.


See **9. COMMUNICATION DATA LIST (P. 38)**.

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 128 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.

For the communication data, see **9. COMMUNICATION DATA LIST (P. 38)**.

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.

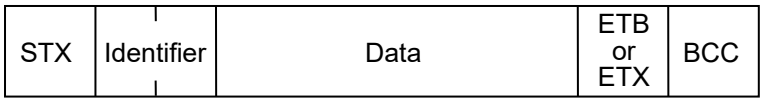
(6) ACK (Acknowledgment)

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.



(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

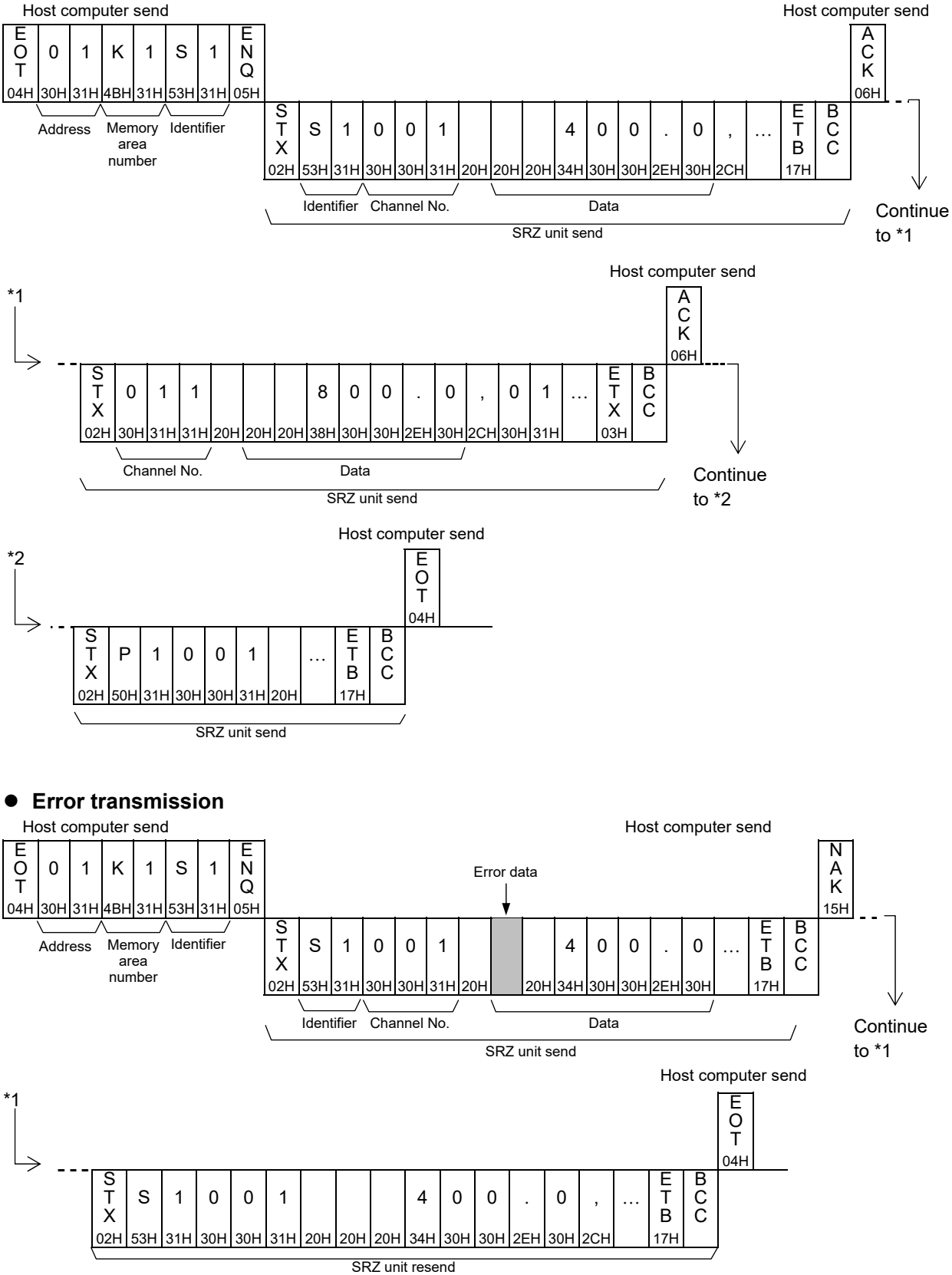
The SRZ unit sends EOT to terminate the data link when the host computer response is indefinite.

(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)

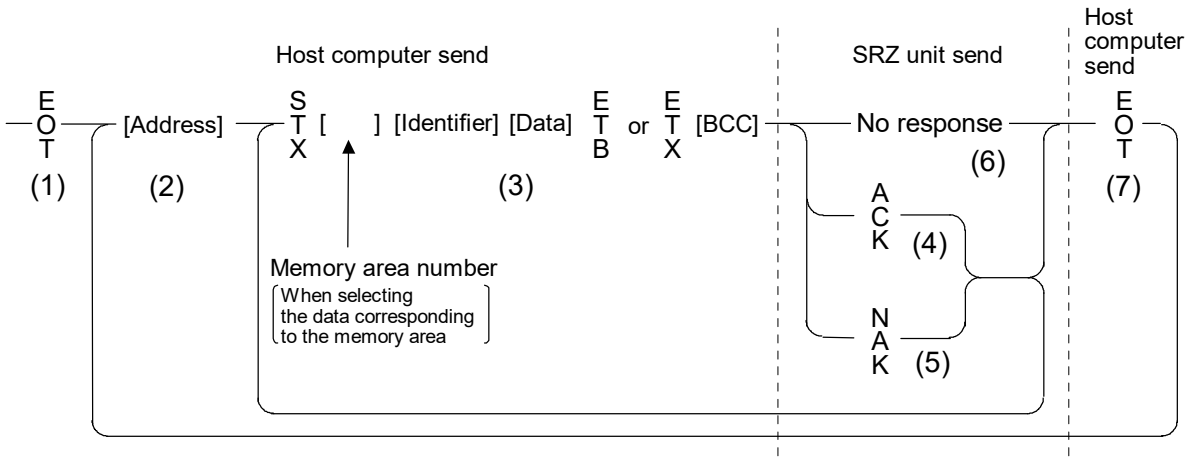
● Normal transmission



● 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 unit address of the SRZ 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

STX	Identifier	Data	ETB	BCC

or

STX	Identifier	Data	ETX	BCC

- When the memory area number is specified

STX	Memory area number	Identifier	Data	ETB	BCC

or

STX	Memory area number	Identifier	Data	ETX	BCC

☞ For the STX, Memory area number Identifier, Data, ETB, ETX and BCC, see **A.2.1 Polling procedures (P. 110)**.

If the length of send data (from STX to BCC) exceeds 128 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 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)."

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

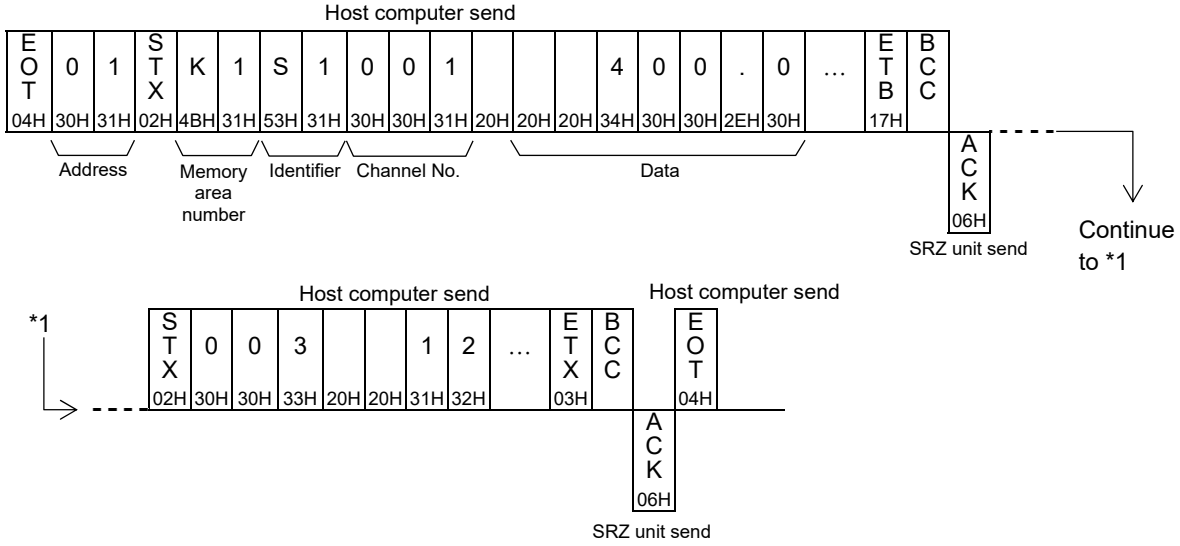
The SRZ unit does not respond when it can not receive the selecting address, STX, ETB, ETX or BCC.

(7) EOT (Data link termination)

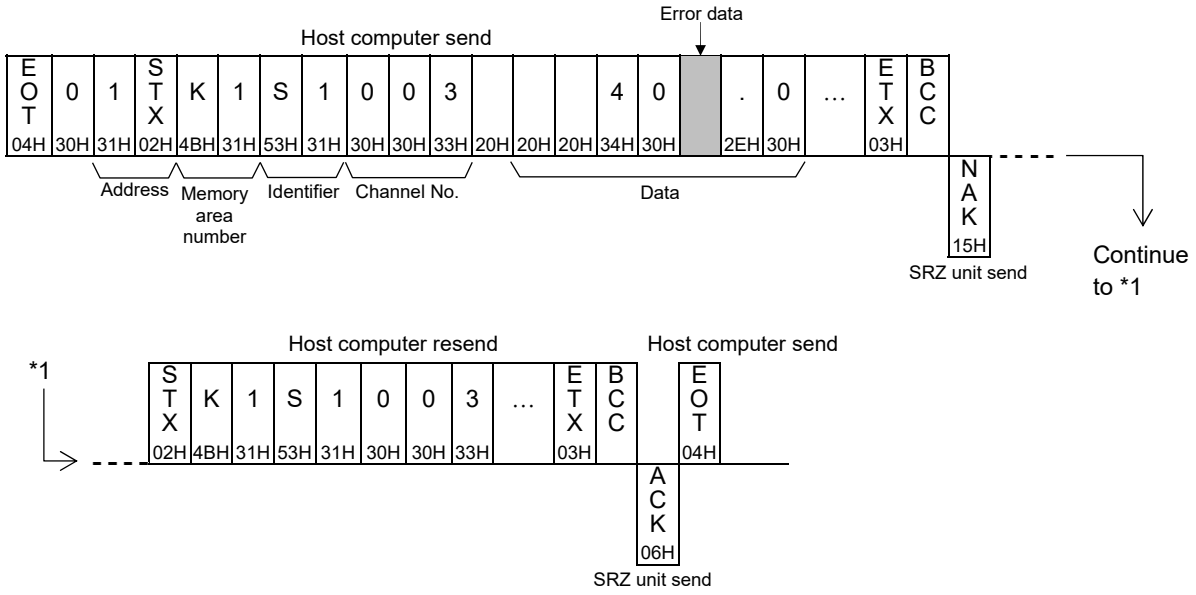
The host computer sends EOT when there is no more data to be sent from the host computer or there is no response from the SRZ unit.

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

● Normal transmission



● Error transmission



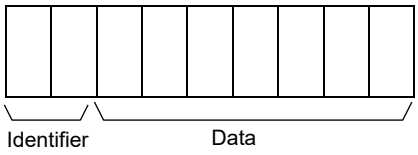
A.2.3 Communication data structure

■ Data description

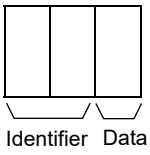
Part of the data above is shown below.

- **Data for each unit (Without channel)**

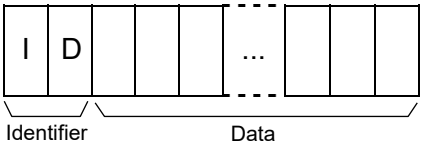
Data length 7 digits



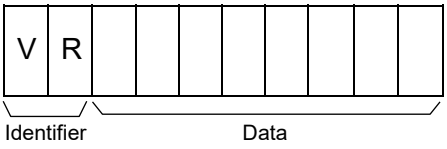
Data length 1 digit



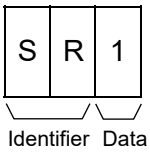
Data length 32 digits (Model code)



Data length 8 digits (ROM version)

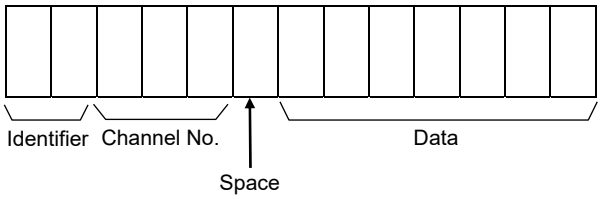


Example) Data structure for control RUN/STOP switching in each SRZ unit

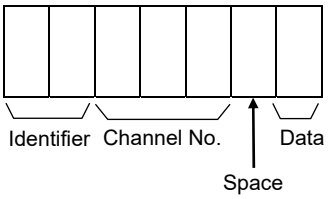


- **Data for each module**

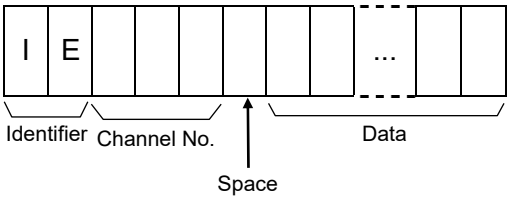
Data length 7 digits



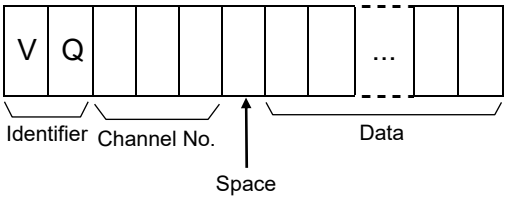
Data length 1 digit



Data length 32 digits (Model code)

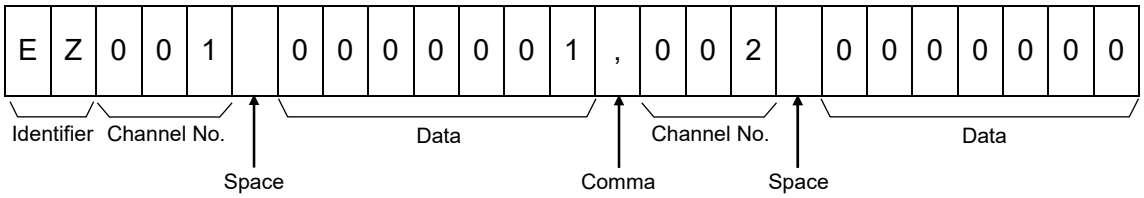


Data length 8 digits (ROM version)



Continued on the next page.

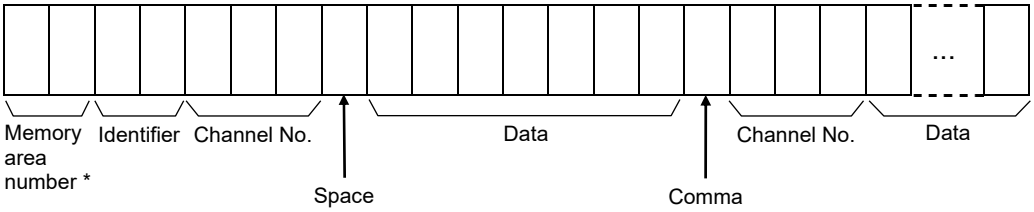
Example) Data structure of error codes of Z-TIO, Z-DIO and Z-CT modules



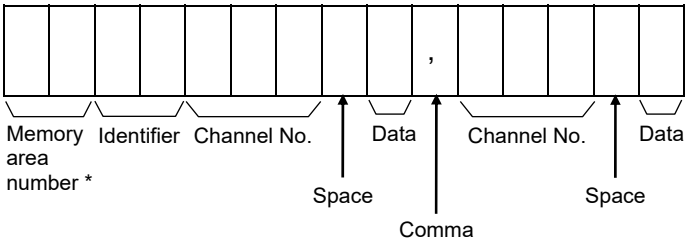
☞ For the calculation method of the channel number, see **6.2 Temperature Control Channel of the SRZ (P. 24)** and **6.3 Digital Input/Output Channel of Z-DIO Module (P. 25)**.

- **Data for each channel**

Data length 7 digits

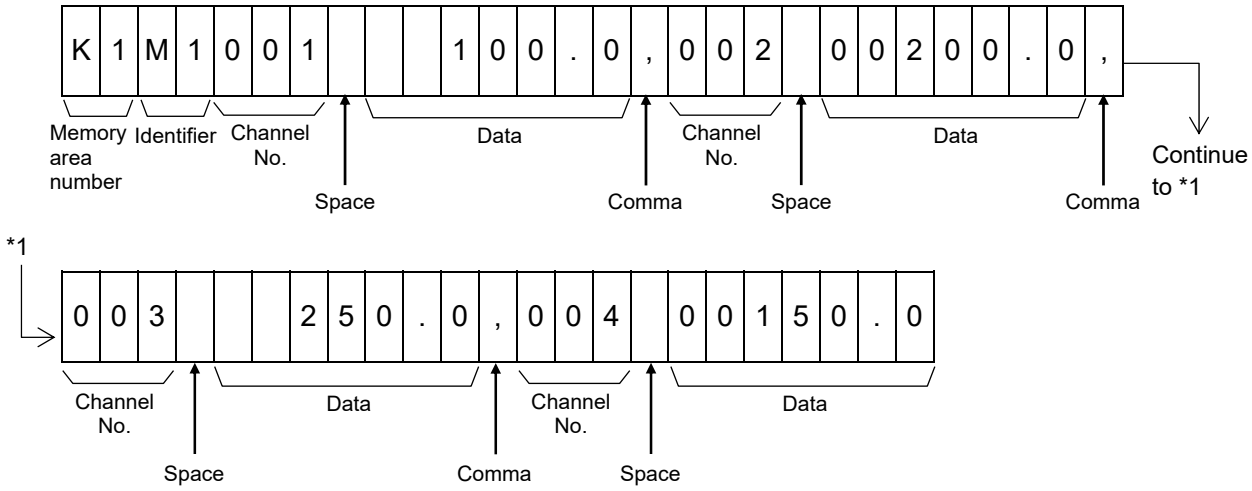


Data length 1 digit



* 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



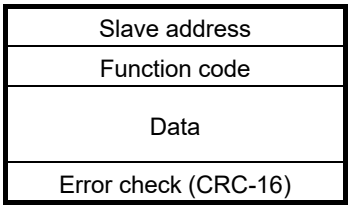
☞ For the calculation method of the channel number, see **6.2 Temperature Control Channel of the SRZ (P. 24)** and **6.3 Digital Input/Output Channel of Z-DIO Module (P. 25)**.

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.

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 Z-COM module.

☞ For details, see **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, see **A.3.2 Function code (P. 124)**.

■ 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, see **A.3.6 Register read and write (P. 129)**, **A.3.7 Data processing precautions (P. 133)** and **9. COMMUNICATION DATA LIST (P. 38)**.

■ Error check

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

☞ For details, see **A.3.5 Calculating CRC-16 (P. 126)**.

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 measured 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	See **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.

- 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.

Slave address
Function code
Error code
Error check CRC-16

Error response 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***.

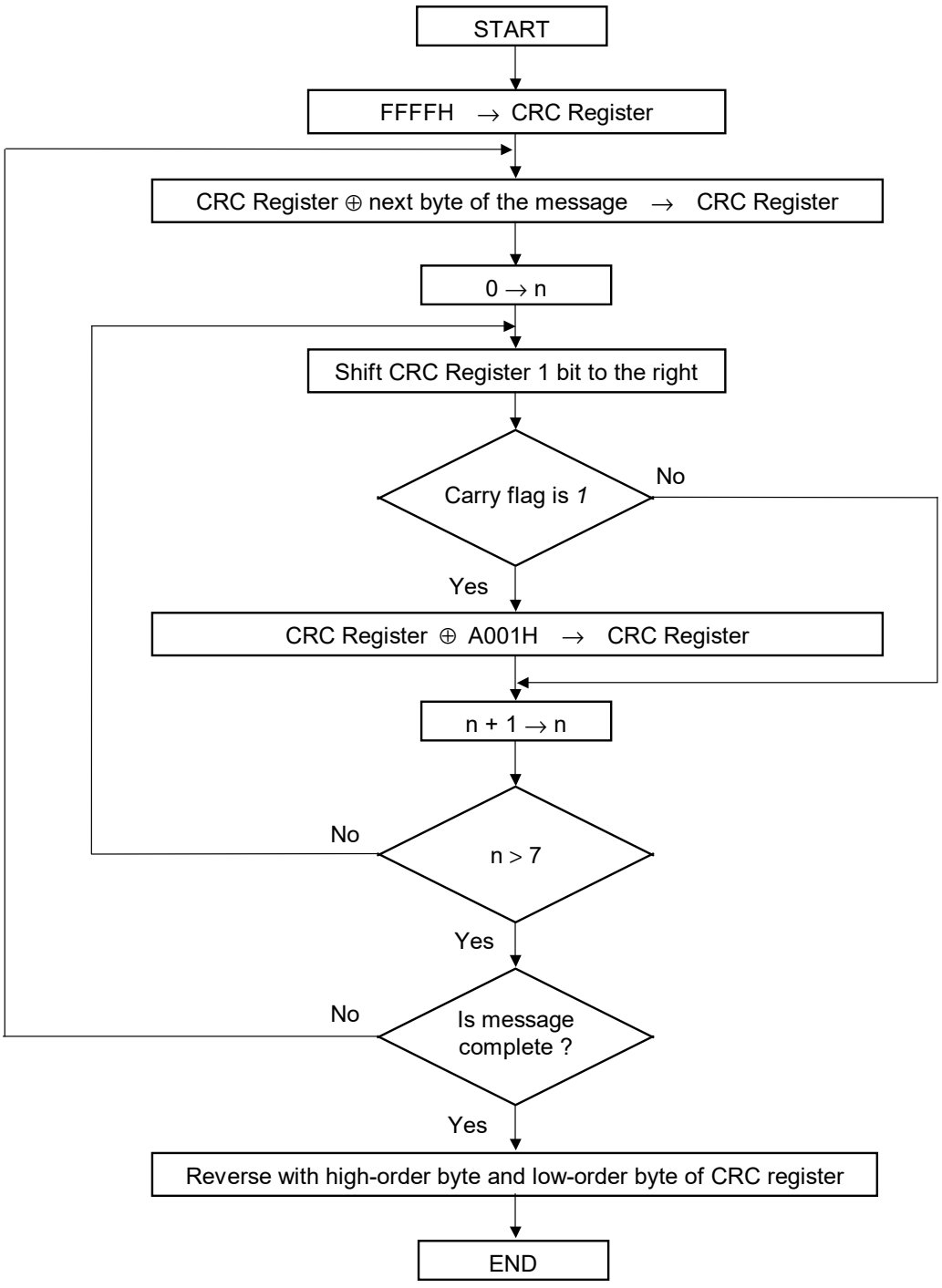
5. Repeat step ***3*** and ***4*** until there have been 8 shifts.

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 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 (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 data range or address error occurs during data writing, it is not processed as an error. Except the data that error occurred, normal data is written in data register. Therefore, it is necessary to confirm data after the end of setting data.
- Communication data includes data that becomes RO (read only) depending on the specification. No error occurs even if data is written when set to RO. However in this case, no data is written.

  For details, see **9. COMMUNICATION DATA LIST (P. 38)**.

- 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

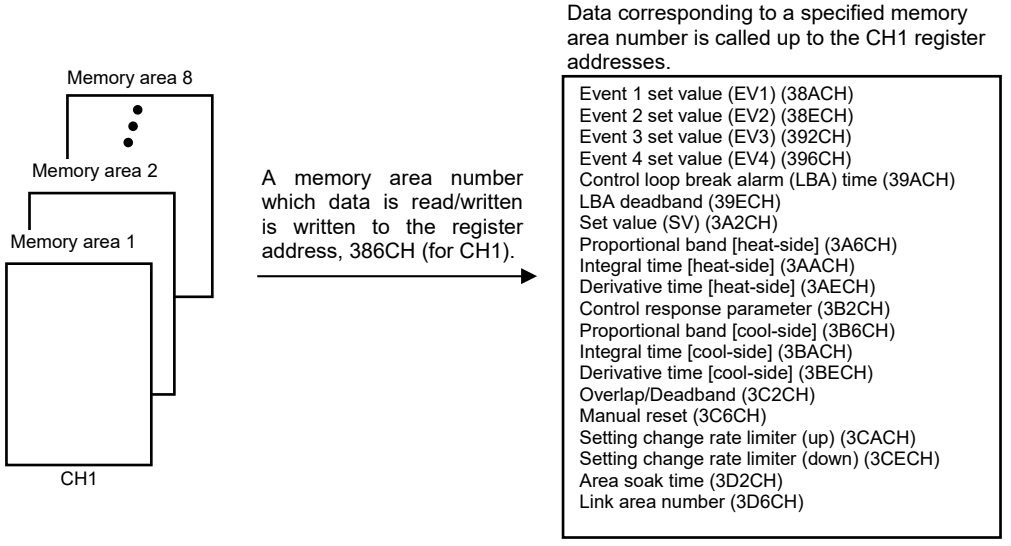
If any memory area number to perform data read and write is specified by the setting memory area number (386CH to 38ABH), data corresponding to the specified memory area number is called up to the register addresses from 38ACH to 3DABH. By using these register addresses from 38ACH to 3DABH, it becomes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

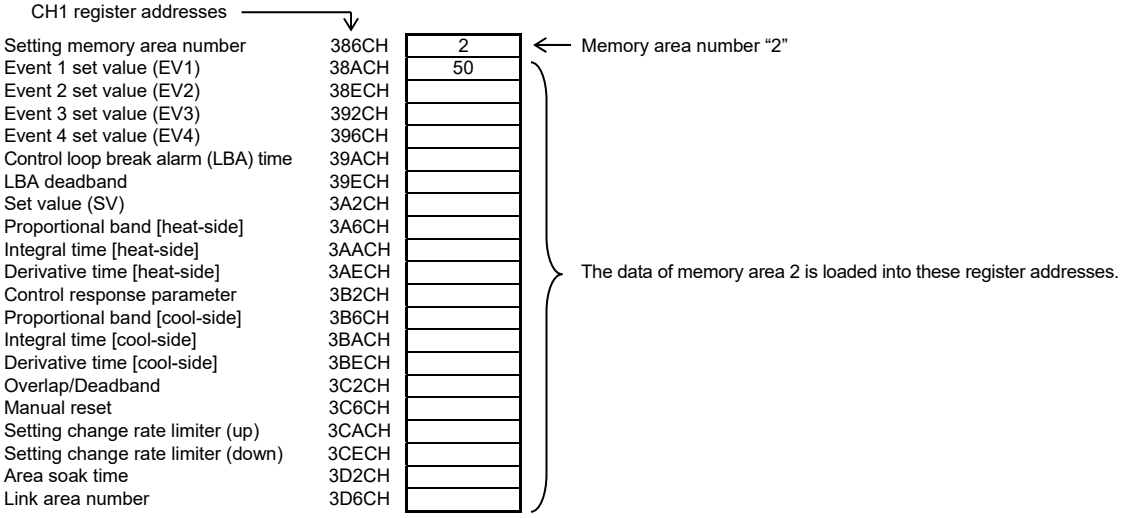
Register address of memory area data

☞ For the Memory area data list, see **9.4 Memory Area Data Address of Z-TIO Module (P. 66)**.



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

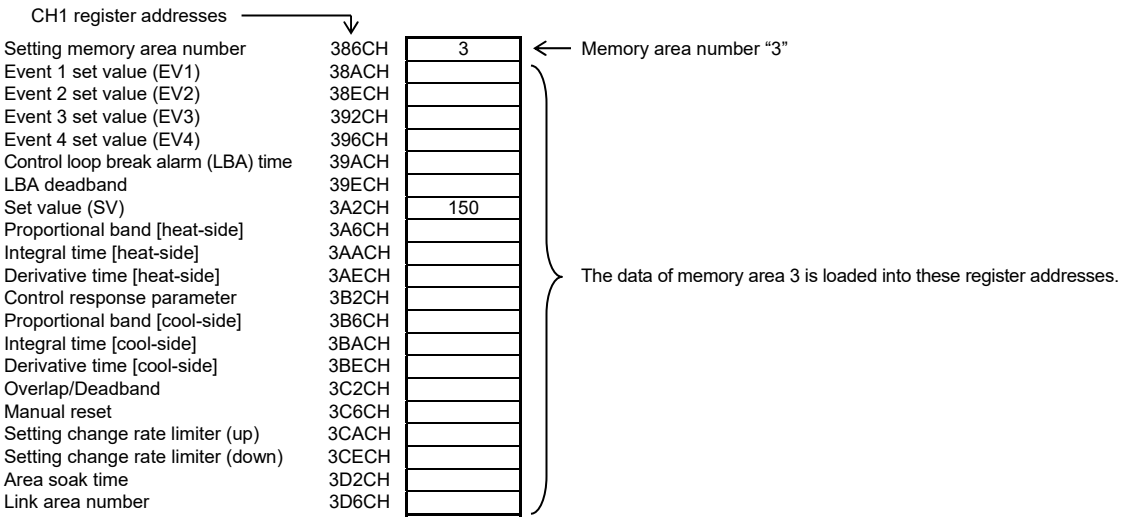
1. The memory area number, "2" is written to the CH1 setting memory area number (386CH). Data in Memory area 2 is called up to the CH1 register addresses.



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

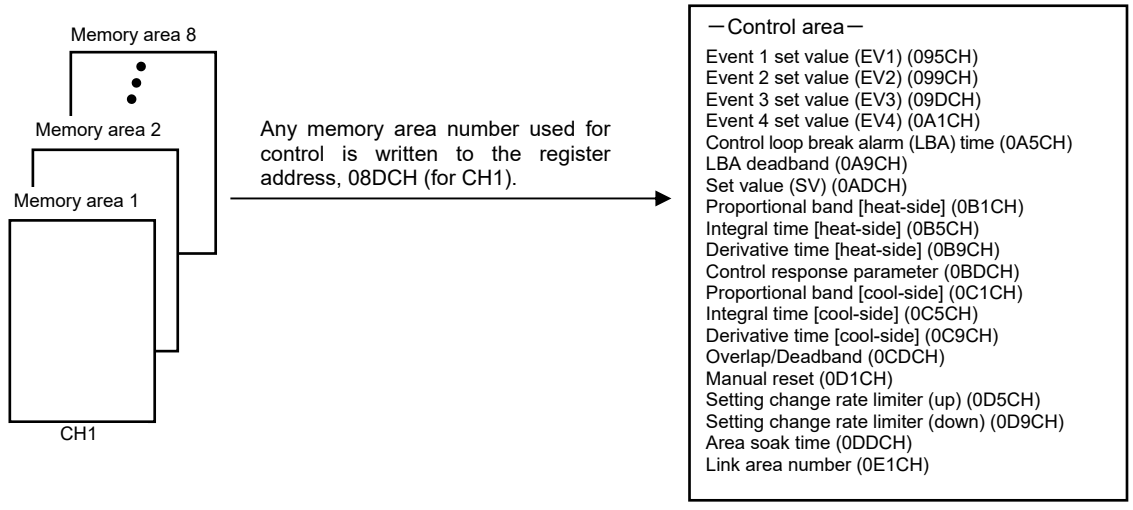
Any memory area used for control is specified by the memory area transfer (08DCH to 091BH). The area (095CH to 0E5BH) now used for control is called “Control area.”

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

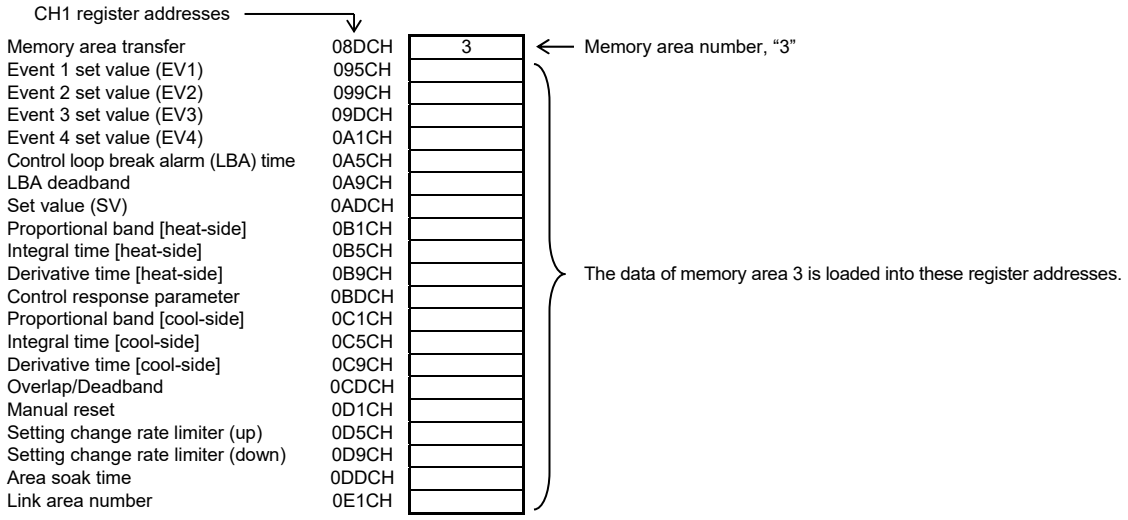
← Register address to specify control area

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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