

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

This manual describes the host communication, module address setting of the Z-TIO module. For the address setting of any other module, refer to the Instruction Manual for the respective module. For detailed handling procedures and various function settings, please refer to separate SRZ Instruction Manual (IMS01T04 -E□).

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

1. COMMUNICATION SETTING

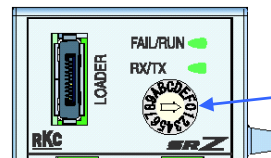
Set communication setting before mounting and wiring of the Z-TIO.

CAUTION

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

1.1 Module Address Setting

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

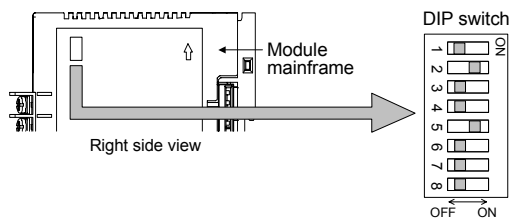


Address setting switch
Setting range: 0 to F [0 to 15: Decimal]
Factory set value: 0

- For Modbus, the value obtained by adding "1" to the set address corresponds to the address used for the actual program.
- To avoid problems or malfunction, do not duplicate an address on the same communication line.

1.2 Protocol Selections and Communication Speed Setting

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



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

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

Factory set value: 19200 bps

3	4	5	Data bit configuration
OFF	OFF	OFF	Data 7-bit, without parity, Stop 1-bit *
ON	OFF	OFF	Don't set this one
OFF	ON	OFF	Data 7-bit, Even parity, Stop 1-bit *
ON	ON	OFF	Data 7-bit, Odd parity, Stop 1-bit *
OFF	OFF	ON	Data 8-bit, without parity, Stop 1-bit
ON	OFF	ON	Don't set this one
OFF	ON	ON	Data 8-bit, Even parity, Stop 1-bit
ON	ON	ON	Data 8-bit, Odd parity, Stop 1-bit

* When the Modbus communication protocol is selected, this setting becomes invalid.
Factory set value: Data 8-bit, without parity, Stop 1-bit

6	Protocol
OFF	RKC communication
ON	Modbus

Factory set value: RKC communication

- Switch No. 7 and 8 must be always OFF. Do not set to ON.
- When two or more modules are connected on the same communication line, the DIP switch settings of all modules must be the same.

2. CONNECTION TO HOST COMPUTER



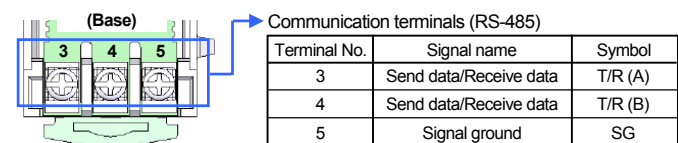
WARNING

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

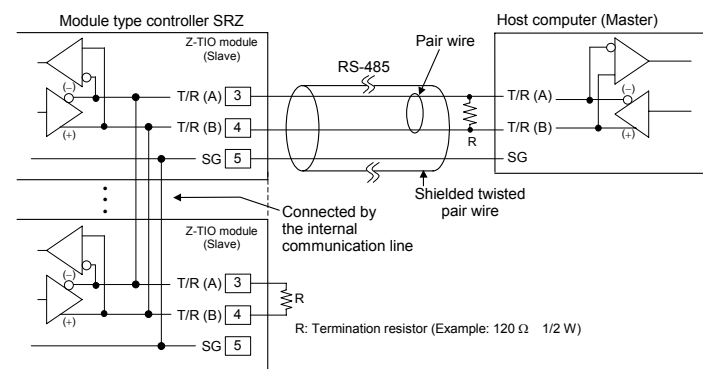
Connect a termination resistor between the communication terminals (No.3 and No. 4) of the module at the end of the communication line from the host computer.

The cable must be provided by the customer.

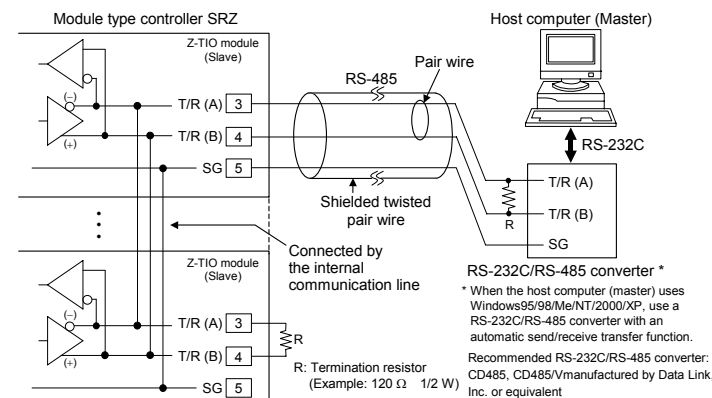
The Z-TIO has RS-485 communication terminals for RKC communication or Modbus/RTU communication protocol. Communication terminals are on the base side.



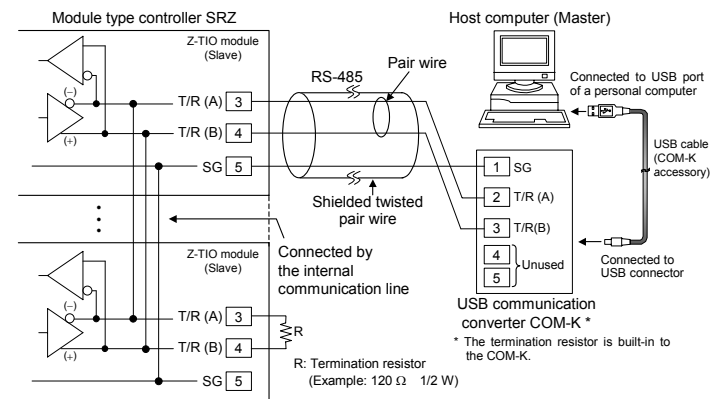
Connection to the RS-485 port of the host computer (master)



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



Connection to the USB of the host computer (master)



3. 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 controller to send data:

- Response wait time after controller sends BCC in polling procedure
- Response wait time after controller sends ACK or NAK in selecting procedure

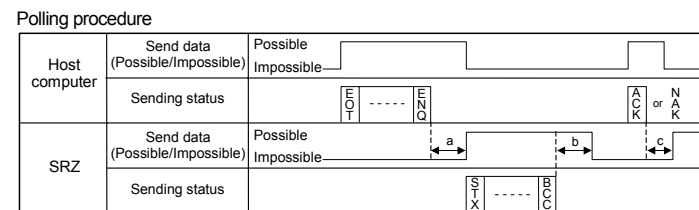
Procedure details	Time
Response send time after controller receives ENQ	50 ms max.
Response send time after controller receives ACK	50 ms max.
Response send time after controller receives NAK	50 ms max.
Response send time after controller sends BCC	2 ms max.

Procedure details	Time
Response send time after controller receives BCC	50 ms max.
Response wait time after controller sends ACK	2 ms max.
Response wait time after controller sends NAK	2 ms max.

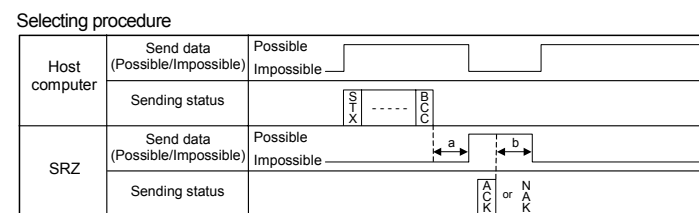
Procedure details	Time
Read holding registers [03H] Response send time after the slave receives the query message	50 ms max.
Preset single register [06H] Response send time after the slave receives the query message	30 ms max.
Diagnostics (loopback test) [08H] Response send time after the slave receives the query message	30 ms max.
Preset multiple registers [10H] Response send time after the slave receives the query message	100 ms max.

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.



- 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



- 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 required for the controller to process data.

- In Polling procedure, Response wait time after the controller sends BCC
- In Selecting procedure, Response wait time after the controller 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.

Modbus data processing precautions

- Data with decimal point is treated as data without decimal point on the Modbus protocol.
- With Modbus protocol, the maximum number of channels per slave address is 4.
- Do not write data to any address which is not described in a list of data maps.
- If data range or address error occurs during data writing, the data written before error is in effect.
- When communication data is sent to the controller that does not correctly match the connected module or selected functions on the modules, the data will be invalid. If the data is within a setting range, no error message is sent from the controller. The read data is "0".
- Send the next command message at time intervals of 24 bits after the master receives the response message.

4. HOST COMMUNICATION DATA MAP

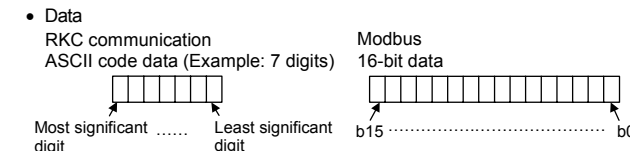
Explanation of items shown in the communication data maps are as follows.

- Modbus register address (HEX: Hexadecimal DEC: Decimal)
- For a 4CH type, follow the chart exactly. For the 2CH type, the register addresses for Channel 3 and 4 are unused. For communication parameters for heat/cool control, the register addresses for Channel 2 and 4 are unused.

Example: The register addresses of 0092 (HEX) to 0095 (HEX)

CH#	Address
CH1	0092
CH2	0093 (This address is unused with heat/cool control.)
CH3	0094 (This address is unused with 2CH type.)
CH4	0095 (This address is unused with heat/cool control or 2CH type.)

- Digits: The number of communication data digits in RKC communication
- Attribute: RO: Read only data (Host computer ← The controller) R/W: Read and Write data (Host computer ↔ The controller)



- Symbols used in MAP:
 - ★: Parameters only used for heat/cool control or position proportioning control, therefore data for CH2 and CH4 are unused.
 - ☆: Parameters which can be used in multi-memory area function.
 - ◆: Data for each module
 - ▲: Data for each channel

For details on the data, see the SRZ Instruction Manual (IMS01T04-E□).

Communication data (RKC communication/Modbus)

Name	RKC Identifier	Modbus register address HEX DEC	Digits	Attribute	Data range	Factory set value
Model code	ID	— —	32	RO	Model code (character)	—
ROM version	VR	— —	8	RO	ROM version	—
Measured value (PV)	M1	0000 : 0003	0 : 3	RO	Input scale low to Input scale high	—
Comprehensive event state	AJ	0004 : 0007	4 : 7	RO	RKC communication Least significant digit to 4th digit: Event 1 state Heater break alarm state 5th digit: Temperature rise completion 6th digit: Burnout 7th digit: Data 0: OFF 1: ON Modbus b0 to b3: Event 1 state to Event 4 state b4: Heater break alarm state b5: Temperature rise completion b6: Burnout b7 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 127]	—
Operation mode state monitor	L0	0008 : 000B	8 : 11	RO	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 [Decimal number: 0 to 15] Modbus 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]	—
Error code	ER	000C	12	RO	RKC communication 1: Adjustment data error 2: Data back-up error 4: A/D conversion error 32: Logic output data error Modbus b0: Adjustment data error b1: Data back-up error b2: A/D conversion error b3: Unused b4: Unused b5: Logic output data error b6 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 63]	—

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