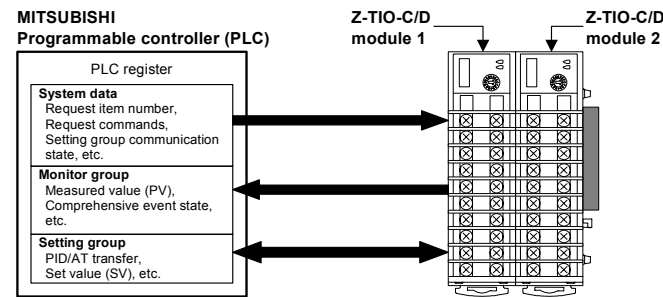


Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place this manual in a convenient location for easy reference.

## 1. PLC COMMUNICATION DATA TRANSFER

This manual describes the case of connecting two Z-TIO-C modules or two Z-TIO-D modules to Mitsubishi Electric Corporation's MELSEC series of programmable controllers (PLC). The data transmitted between the PLC and the Z-TIO-C/D module is compiled in the PLC communication data map. In the PLC communication data map the communication data is classified into system data, monitor groups, and setting groups.



For the communication data, see 2. PLC COMMUNICATION DATA MAP.

### 1.1 Data Transfer Type

Data transfer between PLC and Z-TIO-C/D module are executed by the request item number and the request command.

#### Request item number

This command sets the communication data of the setting group that is transferred. Set transfer of all communication data of the setting group, or transfer by one data item. Data transfer are executed by request command.

Setting range: 0 or 1 to 64 (Item number)

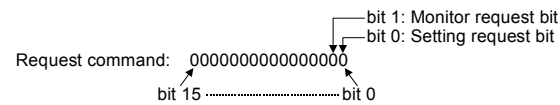
- When set to 0, all communication data of the setting group is transferred.
- When set to a number from 1 to 64 (item number), only the set communication data item is transferred (transfer by one data item).

Note that communication data that is not selected (set to binary: 0) in setting item selection of the PLC communication environment is not transferred.

For the item number 1 to 64, see "Table 2: Setting item selection (Communication data of setting group)" of Z-TIO PLC Communication Quick Instruction Manual [PART1: Preparation] (IMS01T11-ED).

#### Request command

For the request command, both "setting request bit" and "monitor request bit" are available.



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

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

[Processing]

- (1) Just when "1 (decimal numbers: 1)" is set to the setting request bit, the Z-TIO-C/D module starts reading the data from the PLC side.
- (2) The setting group communication data set in "Request item number" is transferred from the PLC to the Z-TIO-C/D module.
- (3) After data transmission is completed, the setting request bit becomes "0."

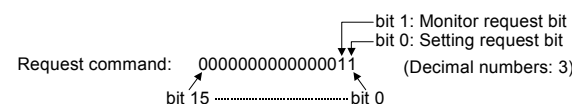
#### Monitor request bit (PLC ← Z-TIO-C/D module)

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

[Processing]

- (1) Just when "1 (decimal numbers: 2)" is set to the monitor request bit, the Z-TIO-C/D starts writing the data to the PLC side.
- (2) The setting group communication data set in "request item number" is transferred from the Z-TIO-C/D module to the PLC.
- (3) After data transmission is completed, the monitor request bit becomes "0."

- If the bit of one request command is set to "1", do not set the bit of the other request command to "1" until the bit of the first request command reverts to "0."
- When setting both the setting request bit and the monitor request bit to "1," set the bits simultaneously. If set separately, the bit set later may be disregarded.



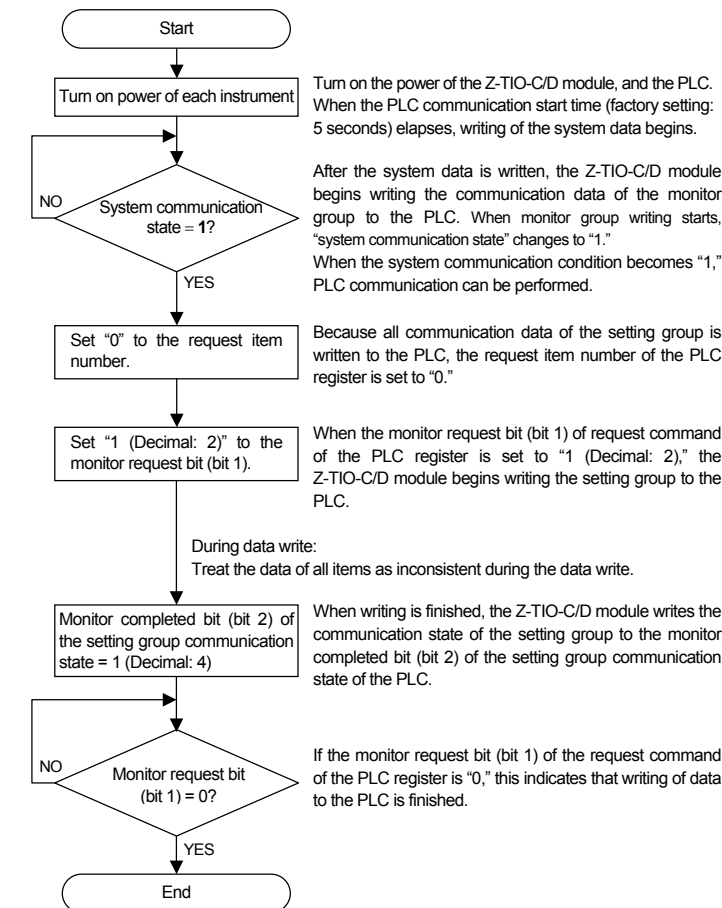
### Monitor group

The monitor group communication data is always transferred as monitor item data between the PLC and the Z-TIO-C/D module regardless of the request command setting.

### 1.2 Data Transfer Procedures

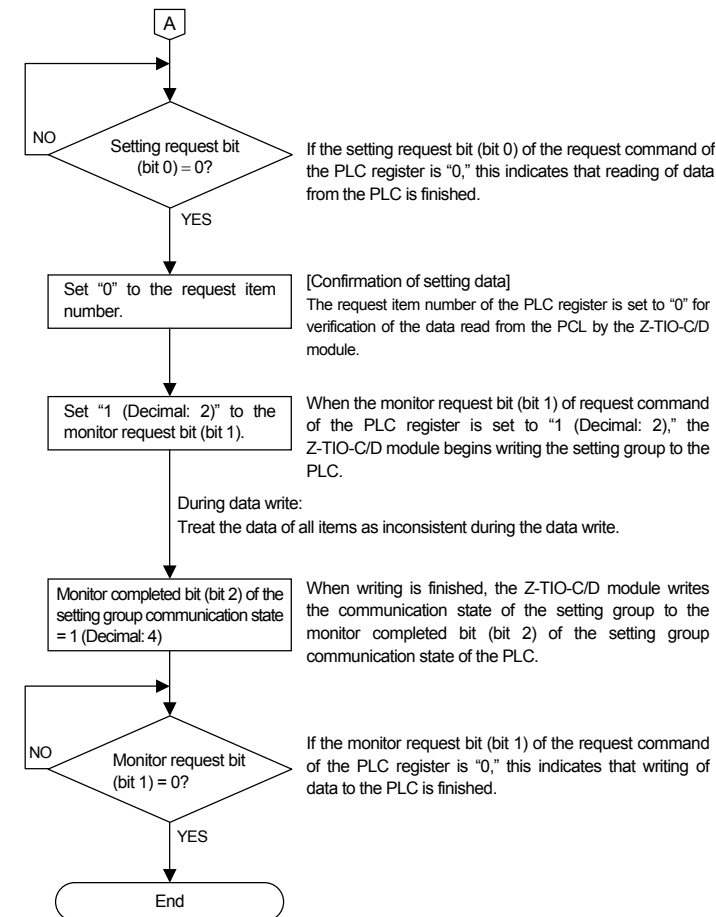
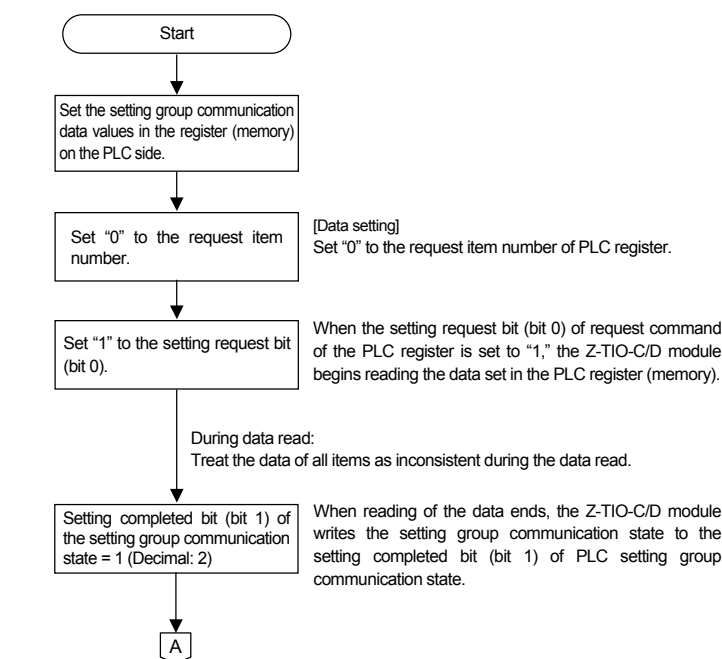
Change each set value of Z-TIO-C/D module from the PLC after the initial settings are made. If each set value of Z-TIO-C/D module is changed from the PLC without setting the initial values, it is re-written to "0" with each set value of the PLC at that time set to "0."

#### Initial setting



#### Data setting

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



#### Data processing precautions

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

## 2. PLC COMMUNICATION DATA MAP

The data that can be communicated by the PLC and Z-TIO-C/D module is compiled in the PLC communication data map. The data map indicated in this manual is the data map of factory set value. The data map can be changed using the PLC communication environment items below.

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

For the PLC communication environment item, see Z-TIO PLC Communication Quick Instruction Manual [PART1: Preparation] (IMS01T11-ED).

For communication data not described in this manual, see the SRZ Instruction Manual [for PLC Communication] (IMS01T13-ED).

### 2.1 Explanation of Data Map Items

Name:	Name of communication data
Register address:	A register address of communication data in PLC communication (MITSUBISHI MELSEC series)
Structure:	C: Data for each channel M: Data for each module
Attribute:	RO: Read only data (PLC ← Z-TIO-C/D module) R/W: Read and Write data (PLC ↔ Z-TIO-C/D module)
Data range and Number of data:	Data range: Read or write range of communication data Number of data: This is the maximum number per communication data that can be handled by one Z-TIO-C/D module *. (Numerical value in the [ ] at the lower right) The total number of communication data is 150 items. * In the case of two-channel type (Z-TIO-D modules), the number of the data per one module is the same as four-channel type (Z-TIO-C modules).
Factory set value:	Factory set value of communication data

### 2.2 Data Map

The data map register address is the address when the following items are used at their factory set values.

Register start number (Low-order 16-bit):	1000
Register type:	0 (D register)
Monitor item register bias:	10
Setting item register bias:	0
Monitor item selection:	33535
Setting item selection:	Setting group 1: 62427    Setting group 2: 15583 Setting group 3: 512    Setting group 4: 512
Slave register bias:	150

Register range for each data

	Z-TIO-C/D module 1	Z-TIO-C/D module 2
System data	D01000 to D01009	D01150 to D01159
Monitor group	D01010 to D01049	D01160 to D01199
Setting group	D01050 to D01149	D01200 to D01299

#### Data map of Z-TIO-C/D module 1

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
System communication state	D01000	M	RO	Bit data b0: Data collection condition b1 to b15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0, 1]	—
Z-TIO normal communication flag	D01001	M	RO	0/1 transfer (For communication checking) "0" and "1" are repeated for each communication period. [1]	—
Unused	D01002	—	RO	Internal processing Do not use the register address [1]	—
Unused	D01003	—	RO	Internal processing Do not use the register address [1]	—
PLC communication error code	D01004	M	RO	Bit data b0: PLC register read/write error b1: Slave communication timeout b2: Unused b3: Unused b4: Master communication timeout b5 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31] [1]	—
Z-TIO module recognition flag	D01005	M	RO	Bit data b0: Z-TIO module 1 b1: Z-TIO module 2 b2: Z-TIO module 3 b3: Z-TIO module 4 b4: Z-TIO module 5 b5: Z-TIO module 6 b6: Z-TIO module 7 b7: Z-TIO module 8 b8: Z-TIO module 9 b9: Z-TIO module 10 b10: Z-TIO module 11 b11: Z-TIO module 12 b12: Z-TIO module 13 b13: Z-TIO module 14 b14: Z-TIO module 15 b15: Z-TIO module 16 Data 0: No module exists 1: Module exists [Decimal number: 0 to 65535] [1]	—
Unused	D01006	—	—	Internal processing Do not use the register address [1]	—
Request item number	D01007	M	R/W	0 or 1 to 64 0: Transfer all communication data of the setting group. * 1 to 64: Transfer only the communication data of the selected item number. * [1]	0
Request command	D01008	M	R/W	Bit data b0: Setting request bit b1: Monitor request bit Data 0: OFF 1: ON [Decimal number: 0 to 3] [1]	0
Setting group communication state	D01009	M	RO	Bit data b0: Setting error bit b1: Setting completed bit b2: Monitor completed bit Data 0: OFF 1: ON [Decimal number: 0 to 7] [1]	—

\* Note that communication data that is not selected (set to binary: 0) in setting item selection of the PLC communication environment is not transferred.

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Measured value (PV)	D01010 to D01013	C	RO	Input scale low to Input scale high [4]	—
Comprehensive event state	D01014 to D01017	C	RO	Bit data b0: Event 1 state b1: Event 2 state b2: Event 3 state b3: Event 4 state b4: Heater break alarm state b5: Temperature rise completion b6: Burnout b7 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 127] [4]	—
Operation mode state monitor	D01018 to D01021	C	RO	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]	—
Error code *	D01022 to D01025	M	RO	1: Adjustment data error 2: Data back-up error 4: A/D conversion error 32: Logic output data error [4]	—
Manipulated output value (MV) monitor [heat-side] ★	D01026 to D01029	C	RO	PID control or heat/cool PID control: -5.0 to +105.0 % Position proportioning control with feedback resistance (FBR) input: 0.0 to 100.0 % [4]	—
Manipulated output value (MV) monitor [cool-side] ★	D01030 to D01033	C	RO	-5.0 to +105.0 % [4]	—
Current transformer (CT) input value monitor	D01034 to D01037	C	RO	CTL-6-P-N: 0.0 to 30.0 A CTL-12-S56-10L-N: 0.0 to 100.0 A [4]	—
Set value (SV) monitor	D01038 to D01041	C	RO	Setting limiter (low) to Setting limiter (high) [4]	—
Output state monitor *	D01042 to D01045	M	RO	Bit data b0: OUT1 b1: OUT2 b2: OUT3 b3: OUT4 b4 to b15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15] [4]	—
Memory area number monitor	D01046 to D01049	C	RO	1 to 8 [4]	—
PID/AT transfer	D01050 to D01053	C	R/W	0: PID control 1: Autotuning (AT) [4]	0
Auto/Manual transfer	D01054 to D01057	C	R/W	0: Auto mode 1: Manual mode [4]	0
RUN/STOP transfer *	D01058 to D01061	M	R/W	0: STOP (Control stop) 1: RUN (Control start) [4]	0
Memory area transfer	D01062 to D01065	C	R/W	1 to 8 [4]	1
Event 1 set value (EV1) ★	D01066 to D01069	C	R/W	Deviation action, Deviation action between channels, Temperature rise completion range <sup>1</sup> : [4]	50
Event 2 set value (EV2) ★	D01070 to D01073	C	R/W	-Input span to +Input span Process action, SV action: [4]	50
Event 3 set value (EV3) ★	D01074 to D01077	C	R/W	Input scale low to Input scale high MV action: -5.0 to +105.0 % [4]	50
Event 4 set value (EV4) ★	D01078 to D01081	C	R/W	When temperature rise completion is selected at Event 3 action type. [Each 4]	50
Set value (SV) ★	D01082 to D01085	C	R/W	Setting limiter (low) to Setting limiter (high) [4]	TC/RTD: 0 V/I: 0.0
Proportional band [heat-side] ★★	D01086 to D01089	C	R/W	TC/RTD inputs: 0 (0.0) to Input span (Unit: °C [°F]) Voltage (V)/current (I) inputs: 0.0 to 1000.0 % of Input span 0 (0.0): ON/OFF action [4]	TC/RTD: 30 (30.0) V/I: 30.0

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

★ When heat/cool control or position proportioning control is performed, there will be communication data (indicated by ★ in the name column) for which the CH2 and CH4 will be invalid. [Read is possible (0 is shown), but the result of Write is disregarded.]

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

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
Integral time [heat-side] ★★	D01090 to D01093	C	R/W	PID control or heat/cool PID control: 0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PD action) Position proportioning control: 1 to 3600 seconds or 0.1 to 1999.9 seconds [4]	240
Derivative time [heat-side] ★★	D01094 to D01097	C	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action) [4]	60
Control response parameter ★★	D01098 to D01101	C	R/W	0: Slow 1: Medium 2: Fast When the P or PD action is selected, this setting becomes invalid. [4]	PID control, Position proportioning control: 0 Heat/cool PID control: 2
Proportional band [cool-side] ★★	D01102 to D01105	C	R/W	TC/RTD inputs: 1 (0.1) to Input span (Unit: °C [°F]) Voltage (V)/current (I) inputs: 0.1 to 1000.0 % of Input span [4]	TC/RTD: 30 (30.0) V/I: 30.0
Integral time [cool-side] ★★	D01106 to D01109	C	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PD action) [4]	240
Derivative time [cool-side] ★★	D01110 to D01113	C	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action) [4]	60
Overlap/Deadband ★★	D01114 to D01117	C	R/W	TC/RTD inputs: -Input span to +Input span (Unit: °C [°F]) Voltage (V)/current (I) inputs: -100.0 to +100.0 % of Input span [4]	0
Setting change rate limiter (up) ★	D01118 to D01121	C	R/W	0 (0.0) to Input span/unit time 0 (0.0): Unused	0 (0.0)
Setting change rate limiter (down) ★	D01122 to D01125	C	R/W	Unit time: 60 seconds (factory set value) [4]	0 (0.0)
Heater break alarm (HBA) set value	D01126 to D01129	C	R/W	When CT is CTL-6-P-N: 0.0 to 30.0 A (0.0: Not used) When CT is CTL-12-S56-10L-N: 0.0 to 100.0 A (0.0: Not used) [4]	0.0
Heater break determination point	D01130 to D01133	C	R/W	0.0 to 100.0 % of HBA set value (0.0: Heater break determination is invalid) [4]	30.0
Heater melting determination point	D01134 to D01137	C	R/W	0.0 to 100.0 % of HBA set value (0.0: Heater melting determination is invalid) [4]	30.0
PV bias	D01138 to D01141	C	R/W	-Input span to +Input span [4]	0
Manual manipulated output value ★	D01142 to D01145	C	R/W	PID control: Output limiter (low) to Output limiter (high) Heat/cool PID control: Heat/cool output limiter (high) to Heat/cool output limiter (low) Position proportioning control (with FBR input): Output limiter (low) to Output limiter (high) Position proportioning control (without FBR input): 0: Close-side output OFF, Open-side output OFF 1: Close-side output ON, Open-side output OFF 2: Close-side output OFF, Open-side output ON [4]	0.0
Operation mode	D01146 to D01149	C	R/W	0: Unused 1: Monitor 2: Monitor + Event function 3: Control [4]	3

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

★ When heat/cool control or position proportioning control is performed, there will be communication data (indicated by ★ in the name column) for which the CH2 and CH4 will be invalid. [Read is possible (0 is shown), but the result of Write is disregarded.]

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

### Data map of Z-TIO-C/D module 2

Name	Register address	Structure	Attribute	Data range and Number of data	Factory set value
System communication state	D01150	M	RO	Same as Z-TIO-C/D module 1	—
Z-TIO normal communication flag	D01151	M	RO	Same as Z-TIO-C/D module 1	—
Unused	D01152	—	RO	Same as Z-TIO-C/D module 1	—
Unused	D01153	—	RO	Same as Z-TIO-C/D module 1	—
PLC communication error code	D01154	M	RO	Same as Z-TIO-C/D module 1	—
Z-TIO module recognition flag	D01155	M	RO	Same as Z-TIO-C/D module 1	—
Unused	D01156	—	—	Same as Z-TIO-C/D module 1	—
Request item number	D01157	M	R/W	Same as Z-TIO-C/D module 1	0
Request command	D01158	M	R/W	Same as Z-TIO-C/D module 1	0
Setting group communication state	D01159	M	RO	Same as Z-TIO-C/D module 1	—
Measured value (PV)	D01160 to D01163	C	RO	Same as Z-TIO-C/D module 1	—
Comprehensive event state	D01164 to D01167	C	RO	Same as Z-TIO-C/D module 1	—
Operation mode state monitor	D01168 to D01171	C	RO	Same as Z-TIO-C/D module 1	—
Error code	D01172 to D01175	M	RO	Same as Z-TIO-C/D module 1	—
Manipulated output value (MV) monitor [heat-side]	D01176 to D01179	C	RO	Same as Z-TIO-C/D module 1	—
Manipulated output value (MV) monitor [cool-side]	D01180 to D01183	C	RO	Same as Z-TIO-C/D module 1	—
Current transformer (CT) input value monitor	D01184 to D01187	C	RO	Same as Z-TIO-C/D module 1	—
Set value (SV) monitor	D01188 to D01191	C	RO	Same as Z-TIO-C/D module 1	—
Output state monitor	D01192 to D01195	M	RO	Same as Z-TIO-C/D module 1	—
Memory area number monitor	D01196 to D01199	C	RO	Same as Z-TIO-C/D module 1	—
PID/AT transfer	D01200 to D01203	C	R/W	Same as Z-TIO-C/D module 1	0
Auto/Manual transfer	D01204 to D01207	C	R/W	Same as Z-TIO-C/D module 1	0
RUN/STOP transfer	D01208 to D01211	M	R/W	Same as Z-TIO-C/D module 1	0
Memory area transfer	D01212 to D01215	C	R/W	Same as Z-TIO-C/D module 1	1
Event 1 set value (EV1)	D01216 to D01219	C	R/W	Same as Z-TIO-C/D module 1	50
Event 2 set value (EV2)	D01220 to D01223	C	R/W	Same as Z-TIO-C/D module 1	50
Event 3 set value (EV3)	D01224 to D01227	C	R/W	Same as Z-TIO-C/D module 1	50
Event 4 set value (EV4)	D01228 to D01231	C	R/W	Same as Z-TIO-C/D module 1	50
Set value (SV)	D01232 to D01235	C	R/W	Same as Z-TIO-C/D module 1	TC/RTD: 0 V/I: 0.0
Proportional band [heat-side]	D01236 to D01239	C	R/W	Same as Z-TIO-C/D module 1	TC/RTD: 30 (30.0) V/I: 30.0
Integral time [heat-side]	D01240 to D01243	C	R/W	Same as Z-TIO-C/D module 1	240
Derivative time [heat-side]	D01244 to D01247	C	R/W	Same as Z-TIO-C/D module 1	60
Control response parameter	D01248 to D01251	C	R/W	Same as Z-TIO-C/D module 1	PID control, Position proportioning control: 0 Heat/cool PID control: 2
Proportional band [cool-side]	D01252 to D01255	C	R/W	Same as Z-TIO-C/D module 1	TC/RTD: 30 (30.0) V/I: 30.0
Integral time [cool-side]	D01256 to D01259	C	R/W	Same as Z-TIO-C/D module 1	240
Derivative time [cool-side]	D01260 to D01263	C	R/W	Same as Z-TIO-C/D module 1	60
Overlap/Deadband	D01264 to D01267	C	R/W	Same as Z-TIO-C/D module 1	0
Setting change rate limiter (up)	D01268 to D01271	C	R/W	Same as Z-TIO-C/D module 1	0 (0.0)
Setting change rate limiter (down)	D01272 to D01275	C	R/W	Same as Z-TIO-C/D module 1	0 (0.0)
Heater break alarm (HBA) set value	D01276 to D01279	C	R/W	Same as Z-TIO-C/D module 1	0.0
Heater break determination point	D01280 to D01283	C	R/W	Same as Z-TIO-C/D module 1	30.0
Heater melting determination point	D01284 to D01287	C	R/W	Same as Z-TIO-C/D module 1	30.0
PV bias	D01288 to D01291	C	R/W	Same as Z-TIO-C/D module 1	0
Manual manipulated output value	D01292 to D01295	C	R/W	Same as Z-TIO-C/D module 1	0.0
Operation mode	D01296 to D01299	C	R/W	Same as Z-TIO-C/D module 1	3

## 3. COMMUNICATION SPECIFICATIONS

### ■ PLC communication

Interface: Based on RS-485, EIA standard  
Protocol: MITSUBISHI MELSEC series special protocol (type 4)  
— A compatible, 1C frame, ACPU common command (WR/WW) (A series, FX2N/FX2NC series or FX3U/FX3UC series)  
— A compatible, 1C frame, AnA/AnUCPU common command (QR/QW) D register, R register, W register  
QnA compatible, 3C frame, command (0401/1401)  
Only ZR register (AnA/AnU/QnA series, Q series)

Synchronous method: Start/stop synchronous type  
Communication speed: 4800 bps, 9600 bps, 19200 bps, 38400 bps  
Data bit configuration: Start bit: 1  
Data bit: 7 or 8  
Parity bit: Without, Odd or Even  
Stop bit: 1

Maximum connections: 16 Z-TIO-C/D modules per communication port of PLC  
The maximum number of SRZ modules (including other function modules) on the same communication line is 31. However, do not perform PLC communication other than the Z-TIO-C/Z-TIO-D module.

Usable PLC type: MITSUBISHI MELSEC series  
— Computer link unit  
AJ71UC24, A1S71UC24-R4, A1S71C24-R4, etc.  
The unit which AnA/AnUCPU common command (type 4) can use.  
— Serial communication unit  
AJ71QC24N, A1S71QC24N, QJ71C24, etc.  
The unit which AnA/AnUCPU common command (type 4) can use.  
— Adapter  
FX0N-485ADP, FX2NC-485ADP, FX3U-485ADP  
— Expanded function board  
FX2N-485BD, FX3U-485BD  
Interval time: 0 to 250 ms

### ■ Host communication

Interface: Based on RS-485, EIA standard  
Protocol: RKC communication (Based on ANSI X3.28-1976 subcategory 2.5 B1)  
Modbus-RTU (Selectable)

Connection method: 2-wire system, half-duplex multi-drop connection  
Synchronous method: Start/stop synchronous type  
Communication speed: 4800 bps, 9600 bps, 19200 bps, 38400 bps  
Data bit configuration: Start bit: 1  
Data bit: RKC communication: 7 or 8  
Modbus: 8  
Parity bit: RKC communication: Without, Odd or Even  
Modbus: Without  
Stop bit: 1

Error control: RKC communication: Vertical parity, Horizontal parity  
Modbus: CRC-16  
Termination resistor: Externally terminal connected (example: 120 Ω 1/2W)  
Interval time: 0 to 250 ms

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

### ■ Loader communication

Connection method: Connection with a loader communication cable for our USB converter  
COM-K (sold separately).  
Synchronous method: Start/stop synchronous type  
Communication speed: 38400 bps  
Data bit configuration: Start bit: 1  
Data bit: 8  
Parity bit: Without  
Stop bit: 1

Data bit configuration is fixed to the above value.  
Module address is fixed at 0.  
Protocol: ANSI X3.28-1976 subcategory 2.5, B1  
Maximum connections: 1 point

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.

**RKC RKC INSTRUMENT INC.** The first edition: SEP. 2006 [M000]  
The second edition: MAR. 2008 [M000]  
HEADQUARTERS: 16-6, KUGAHARA 5-CHOME, OHTA-KU TOKYO 146-8515 JAPAN  
PHONE: 03-3751-9799 (+81 3 3751 9799) E-mail: info@rkcinstr.co.jp  
FAX: 03-3751-8585 (+81 3 3751 8585) FEB. 2008