



Ramp/Soak Controller

PZ400/PZ900
PZ401/PZ901

Host Communication
Instruction Manual

NOTICE

This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.

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

- Windows is a trademark of Microsoft Corporation.
- Modbus is a registered trademark of Schneider Electric.
- 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.
- To avoid damage to the instrument display, do not rub with an abrasive material or push the front panel with a hard object.

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.

■ Character Symbols

11-segment character

0	1	2	3	4	5	6	7	8	9	Minus	Period
0	1	2	3	4	5	6	7	8	9	-	.
A	B (b)	C	c	D (d)	E	F	G	H	I	J	K
A	b	C	c	d	E	F	G	H	I	J	K
L	M	N	n	O (o)	P	Q	R	S	T	t	U
L	M	N	n	o	P	Q	R	S	T	t	U
u	V	W	X	Y	Z	Degree	/	Prime	* (Asterisk)	→	
u	V	W	X	Y	Z	°	/	'	*	→	

7-segment character

0	1	2	3	4	5	6	7	8	9	Minus	Period
0	1	2	3	4	5	6	7	8	9	-	.
A	B (b)	C	c	D (d)	E	F	G	H	I	J	K
A	b	C	c	d	E	F	G	H	I	J	K
L	M	N (n)	O (o)	P	Q	R	S	T	t	U	u
L	M	N	O	P	Q	R	S	T	t	U	u
V	W	X	Y	Z	Degree	/	Prime	* (Asterisk)			
V	W	X	Y	Z	°	/	'	*			

■ 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 (1, 2)	Heater break alarm (1, 2)
OUT (1 to 3)	Output (1 to 3)	CT (1, 2)	Current transformer (1, 2)
DI (1 to 6)	Digital input (1 to 6)	LBA	Control loop break alarm
DO (1 to 4)	Digital output (1 to 4)	LBD	LBA deadband
FBR	Feedback resistance		

Document Configuration

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

The following manuals can be downloaded from the official RKC website:

<https://www.rkcinst.co.jp/english/download-center/>

Manual	Manual Number	Remarks
PZ400/PZ900/PZ401/PZ901 Installation Manual	IMR03B01-E□	This manual is enclosed with instrument. This manual explains the mounting and wiring.
PZ400/PZ900/PZ401/PZ901 Quick Operation Manual	IMR03B02-E□	This manual is enclosed with instrument. This manual explains the basic key operation, mode menu, and data setting.
PZ400/PZ900/PZ401/PZ901 Parameter List	IMR03B03-E□	This manual is enclosed with instrument. This list is a compilation of the parameter data of each mode.
PZ400/PZ900/PZ401/PZ901 Instruction Manual	IMR03B05-E□	This manual describes installation, wiring, operation of each function, and troubleshooting.
PZ400/PZ900/PZ401/PZ901 Host Communication Instruction Manual	IMR03B06-E3	This manual you are reading now. This manual explains RKC communication protocol (ANSI X3.28-1976) and Modbus relating to communication parameters setting.
PZ400/PZ900/PZ401/PZ901 PLC Communication Instruction Manual	IMR03B07-E□	This manual describes how to set up the instrument for communication with a programmable controller (PLC).



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

About This Manual

This manual consists of 8 chapters and an appendix. If you are looking for topics concerning the host communication, you may be able to find one in the following table.

	What do you want to do?	See the following section for more details
☐	I want to know the features of the host communication	1 OUTLINE
☐	I want to know how to connect to the host computer	2. WIRING
☐	I want to know how to connect to the loader communication device	2. WIRING
☐	I want to know how to set up the communication parameters	3. PARAMETER SETTING
☐	I want to know the content of RKC communication protocol	4. RKC COMMUNICATION PROTOCOL
☐	I want to know the content of Modbus protocol	5. MODBUS PROTOCOL
☐	I want to know how to use Modbus data mapping	5. MODBUS PROTOCOL
☐	I want to check the data map structure	6. COMMUNICATION DATA LIST
☐	I want to know how to read the table	6. COMMUNICATION DATA LIST
☐	I want to check RKC communication/Modbus (double word) [identifier, data register address, data attribute, data range and factory set values]	6. COMMUNICATION DATA LIST
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☐	I want to know how to cope with errors	7. TROUBLESHOOTING
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MEMO

OUTLINE

1

This chapter describes the host communication of PZ400/900/401/901.

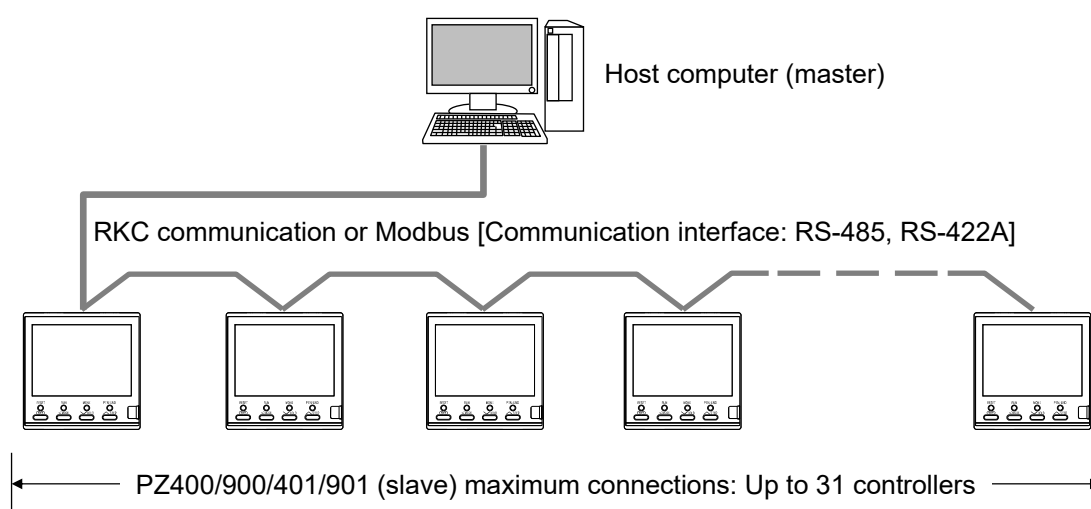
The communication function makes it possible to monitor and set the data of the Temperature Controller PZ400/900/401/901 from a host computer. The PZ400/900/401/901 interfaces with the host computer via Modbus or RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4) protocols. Communication function is available only when optional communication function has been specified at the time of ordering. In addition, the controller PZ400/900/401/901 is equipped standard with a loader communication connector. Therefore, loader communication is possible. For reference purposes, the Modbus protocol identifies the host computer as master, the controller as slave.

■ Host communication (RKC communication, Modbus) [Optional]

Communication interface: RS-485, RS-422A

● Multi-drop connection

One host computer (master) can communicate with up to 31 PZ400/900/401/901s.



● Communication data type

There are such data as shown below for the communication with the computer.

Communication data type can be selected at Input data type (*Input Data Type*).

☞ For the Input data type, refer to **3.2 Selection of Communication Data Type (P. 3-5)**.

RKC communication

- 7 digits data
- 6 digits data

Modbus

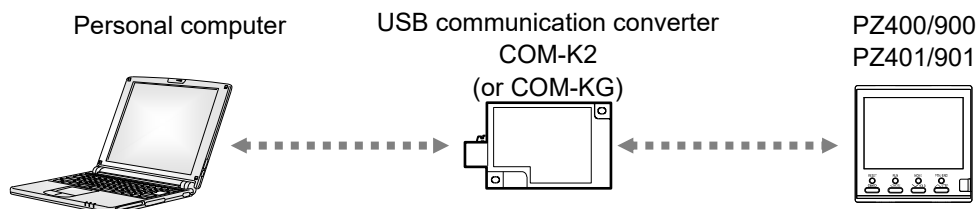
- Double word
- Single word

■ Loader communication

Loader communication allows PZ400/900/401/901 data to be set from a personal computer.

By saving the data that was set using our Communication Tool PROTEM2 to a computer, the data can be transferred to other PZ400/900/401/901s, allowing setup to be accomplished much more quickly than when the data is set in each PZ400/900/401/901 using the front panel keys.

RKC USB communication converter COM-K2 or COM-KG (sold separately) is required for the loader communication.



Maximum connections: 1 controller

NOTE

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



Loader communication can be used on a PZ400/900/401/901 even when the Communication function (optional) is not installed.



The loader communication corresponds to the RKC communication protocol “Based on ANSI X3.28-1976 subcategories 2.5 and A4.”

■ Communication Tool PROTEM2

PROTEM2 is an integrated configuration support software to manage parameter setting and measured values of our controllers (including PZ400/900/401/901).

The PROTEM2 can be downloaded from the official RKC website.

Check our website for more details and operating environment of the PROTEM2.



PROTEM2 requires Microsoft .NET Framework 4.5 or later to be installed on the computer.



PROTEM2 can be used with RKC communication protocol and Modbus protocol.
PROTEM2 can also be used for loader communication and a host communication.

MEMO

WIRING

2

This chapter describes how to connect to the host computer.

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⚠ WARNING

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

2.1 Wiring Cautions

- To avoid noise induction, keep communication wire away from instrument power line, load lines and power lines of other electric equipment.
- Use the solderless terminal appropriate to the screw size.
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 mm²

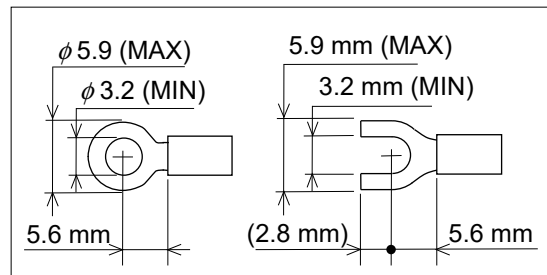
Specified dimension:

Refer to Fig. at the right

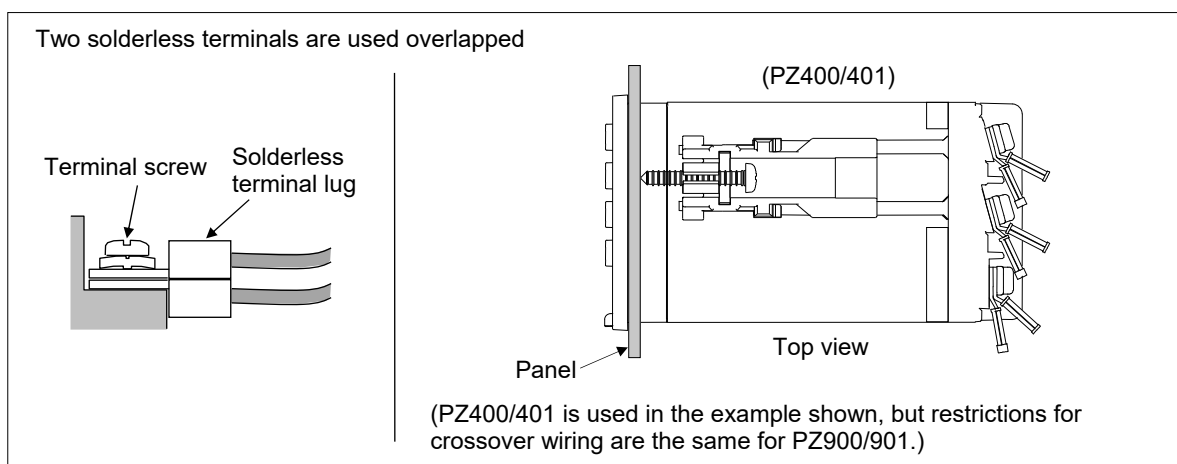
Specified solderless terminal:

Manufactured by J.S.T MFG CO., LTD.

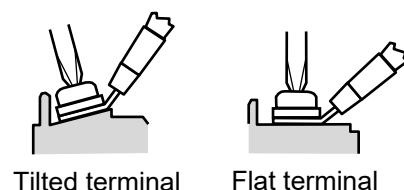
Circular terminal with isolation V1.25-MS3



- Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.
- If solderless terminal lugs other than the recommended dimensions are used, terminal screws may not be tightened. In that case, bend each solderless terminal lug before wiring. If the terminal screw is forcibly tightened, it may be damaged.
- Up to two solderless terminal lugs can be connected to one terminal screw. **The requirements of reinforced insulation can be still complied with in this condition.** When actually doing this, place one solderless terminal lug over the other as illustrated below.



- 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.

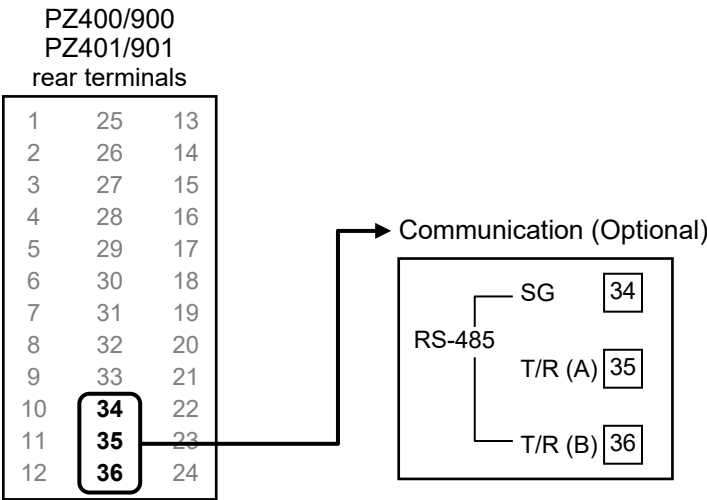


2.2 Wiring for Host Communication

Host communication is used for a connection to a host computer via RS-485 or RS-422A.

2.2.1 Connection to the RS-485 port of PZ400/900/401/901

■ Communication terminal number and signal details

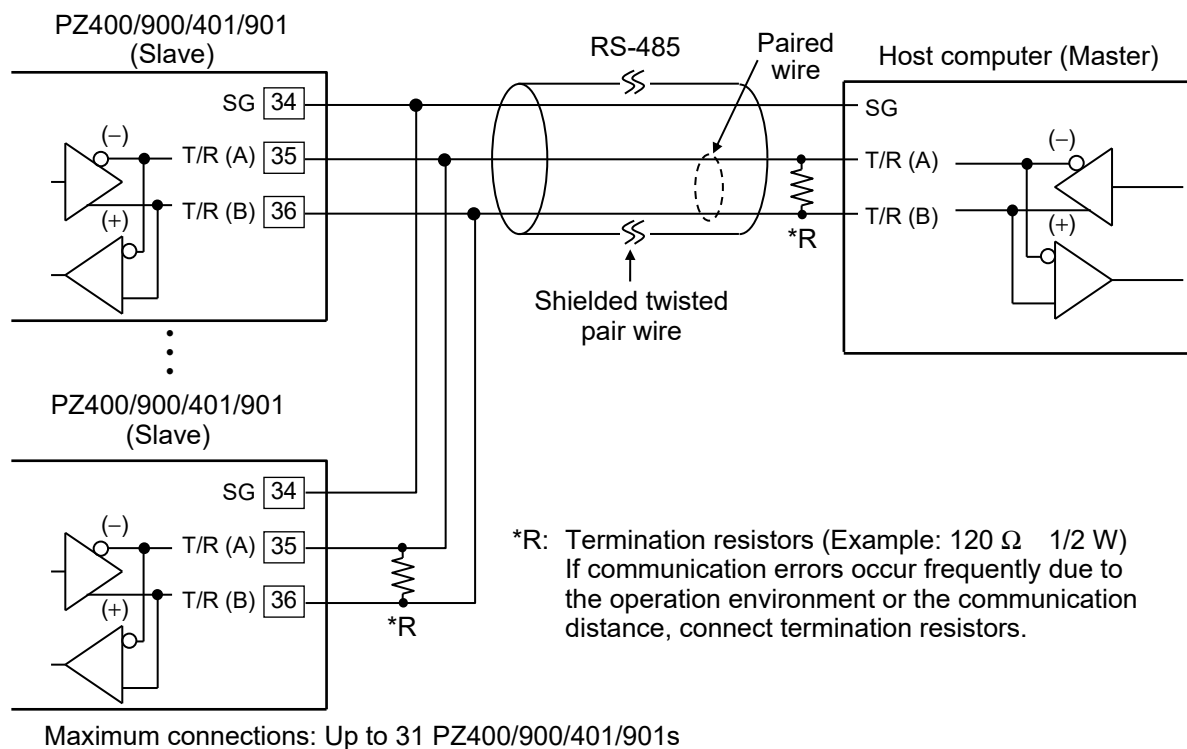


RS-485

PZ400/900/401/901 terminal No.	Symbol	Signal name
34	SG	Signal ground
35	T/R (A)	Send data/Receive data
36	T/R (B)	Send data/Receive data

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

● Wiring example

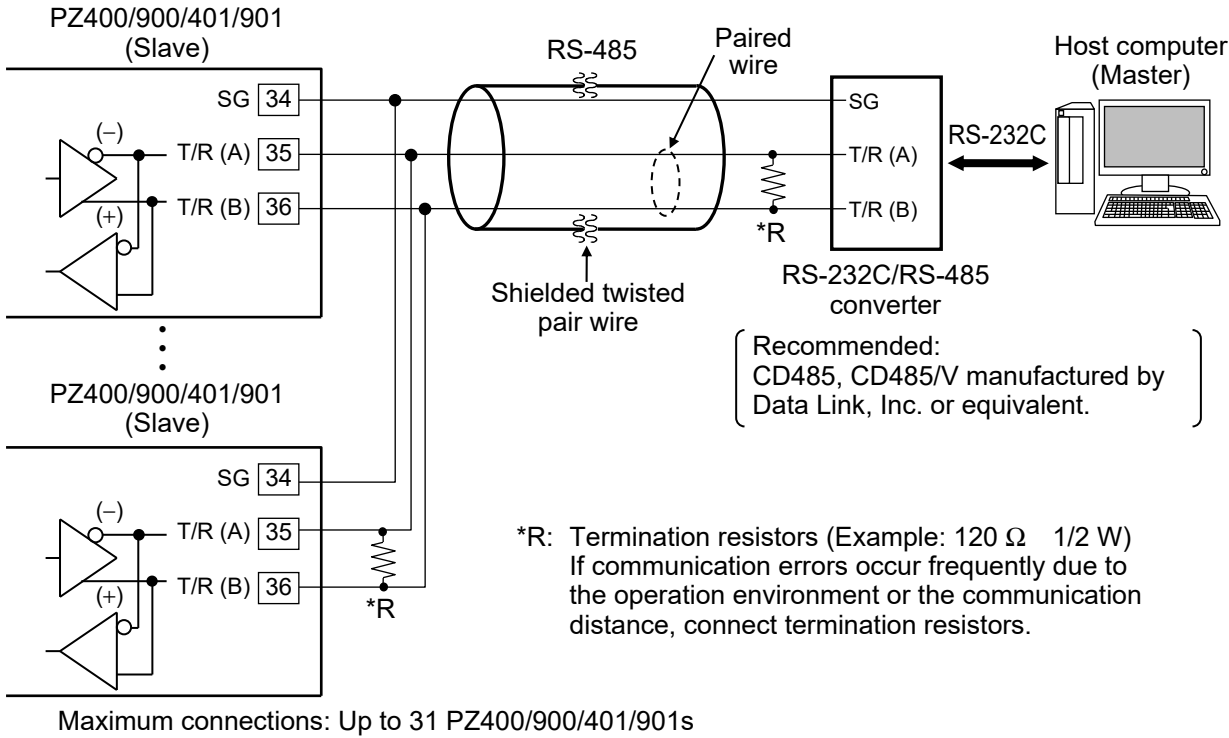


The communication cable and termination resistor(s) must be provided by the customer.

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

Use a RS-232C/RS-485 converter with an automatic send/receive transfer function.

● Wiring example

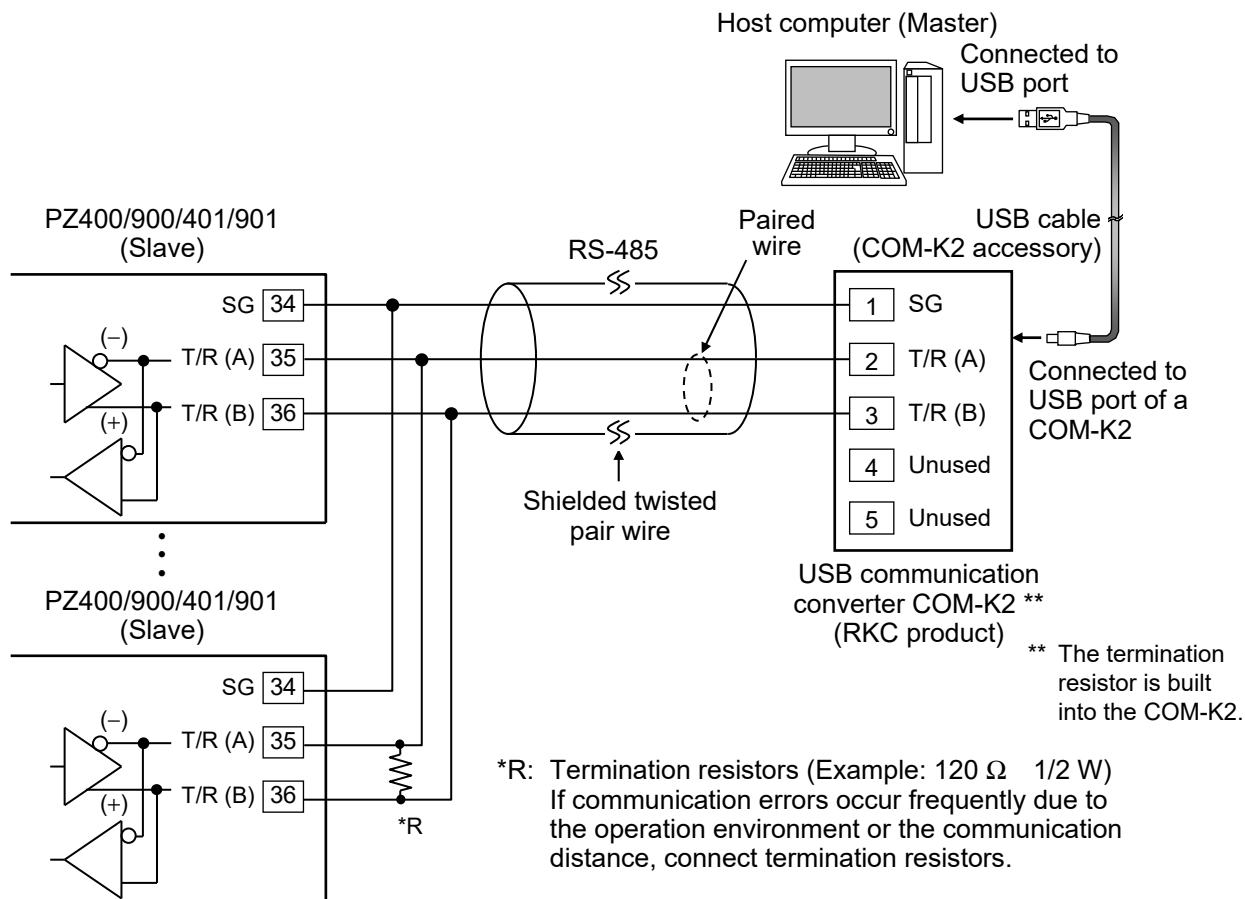


The communication cable and termination resistor(s) must be provided by the customer.

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

Connect the USB communication converter between the host computer and the PZ400/900/401/901.

● Wiring example



Maximum connections: Up to 31 PZ400/900/401/901s



The communication cable and termination resistor(s) must be provided by the customer.



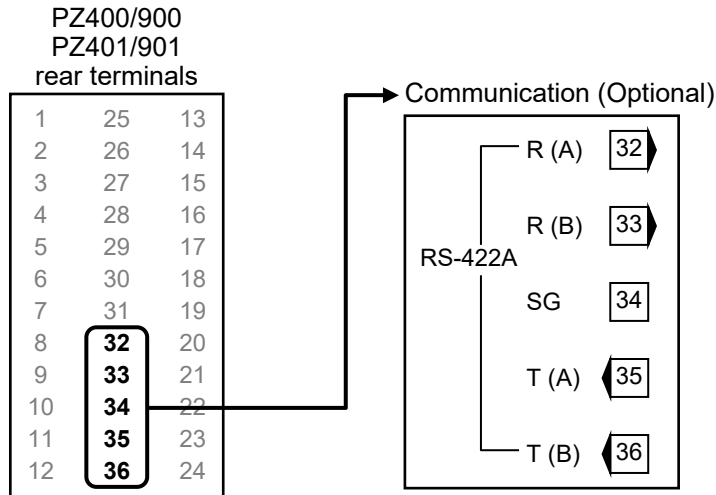
Recommended USB communication converter: **COM-K2** or **COM-KG (RKC product)**

For the COM-K2, refer to the **COM-K2 Instruction Manual**.

For the COM-KG, refer to the **COM-KG Instruction Manual**.

2.2.2 Connection to the RS-422A port of PZ400/900/401/901

■ Communication terminal number and signal details

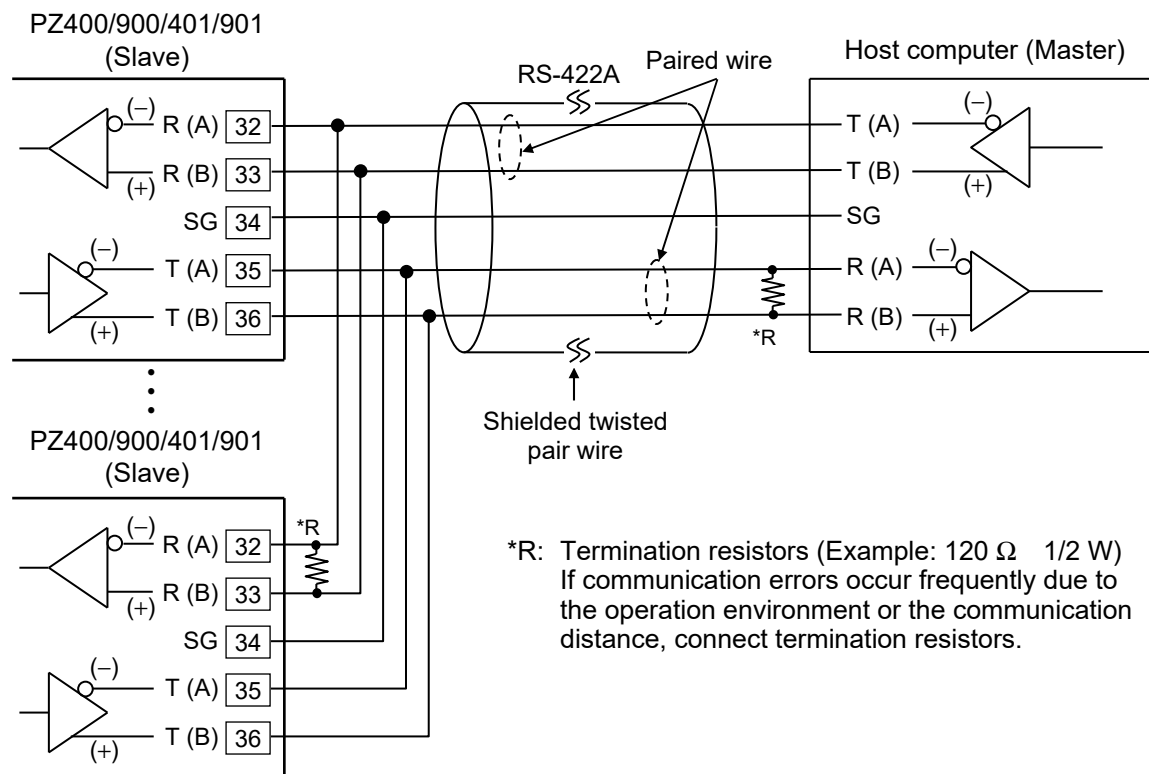


RS-422A

PZ400/900/401/901 terminal No.	Symbol	Signal name
32	R (A)	Receive data
33	R (B)	Receive data
34	SG	Signal ground
35	T (A)	Send data
36	T (B)	Send data

■ Connection to the RS-422A port of the host computer (master)

● Wiring example



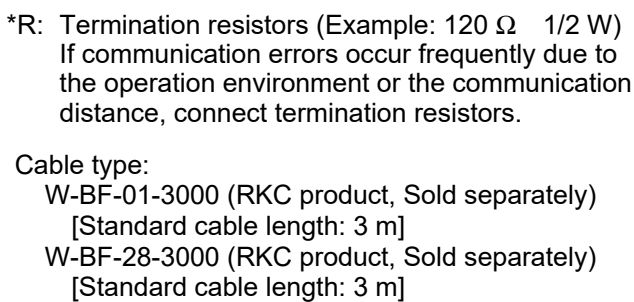
Maximum connections: Up to 31 PZ400/900/401/901s



The cable and termination resistor(s) must be provided by the customer.

- **Wiring example**

1. *Journal of the American Medical Association*, 1997; 278: 1039-1044.

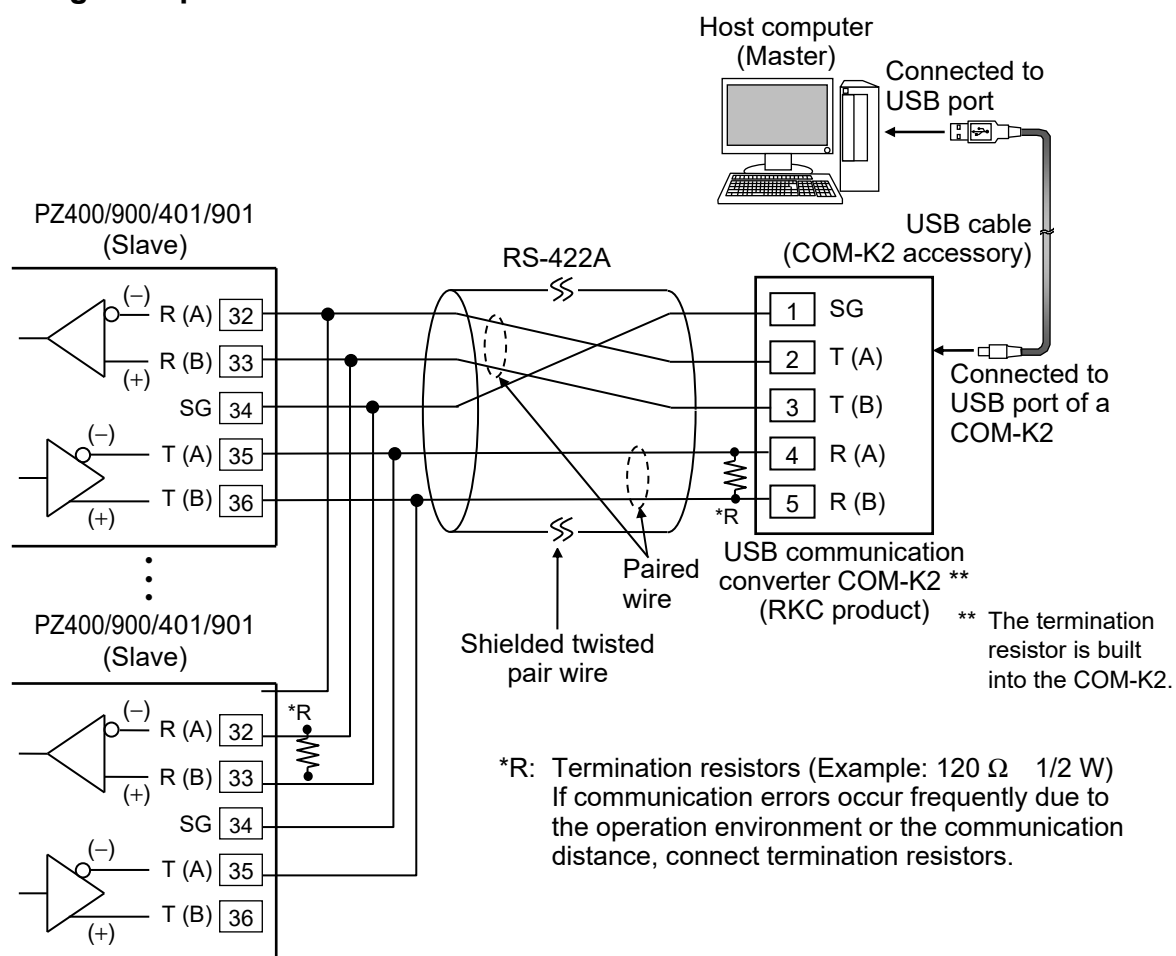


-  The cable and termination resistor(s) must be provided by the customer.
-  W-BF-01 or W-BF-28 communication cable (RKC product) can be used as communication cable (sold separately). If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.
-  Recommended RS-232C/RS-422A converter: **COM-A** (RKC product)
For the COM-A, refer to the **COM-A/COM-B Instruction Manual**.

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

Connect the USB communication converter between the host computer and the PZ400/900/401/901.

● Wiring example



Maximum connections: Up to 31 PZ400/900/401/901s



The communication cable and termination resistor(s) must be provided by the customer.



Recommended USB communication converter: **COM-K2** or **COM-KG (RKC product)**

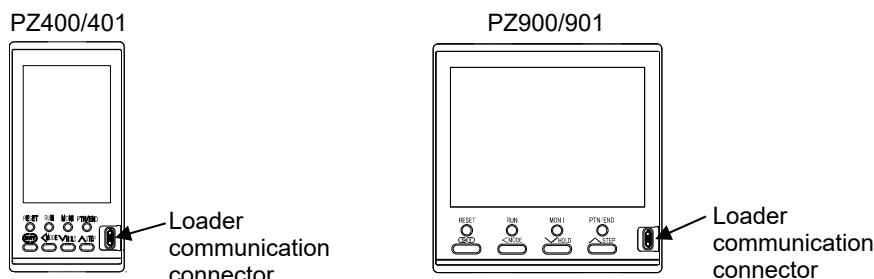
For the COM-K2, refer to the **COM-K2 Instruction Manual**.

For the COM-KG, refer to the **COM-KG Instruction Manual**.

2.3 Connections for Loader Communication

■ Position of loader communication connector

The loader communication connector can be found on the front of the instrument. In the following picture the connector cover is open.



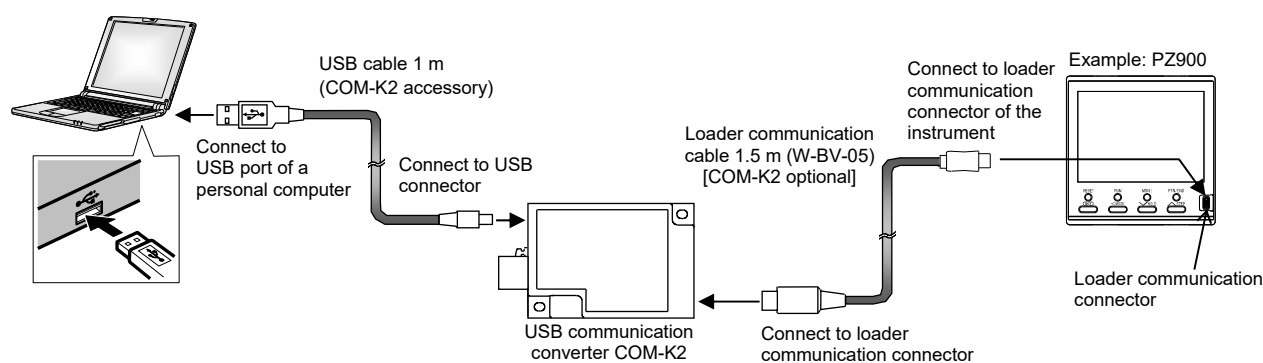
■ Wiring method

Connect the PZ400/900/401/901, COM-K2 (or COM-KG), and personal computer using a USB cable and a loader communication cable. Make sure the connectors are oriented correctly when connecting.



NOTE

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



Connection example of loader communication

- Communication Tool
PROTEM2
Software operation environment:
Consult the manual that you downloaded
- Communication settings on the computer
(The following values are all fixed)
Communication speed: 38400 bps
Start bit: 1
Data bit: 8
Parity bit: None
Stop bit: 1
- Communication port of host computer
USB port: Based on USB Ver. 2.0



- The device address of the loader communication is fixed at "0." The setting of the device address is disregarded.
- The loader communication corresponds to the RKC communication protocol "Based on ANSI X3.28-1976 subcategories 2.5 and A4."
- Loader communication can be used on a PZ400/900/401/901 even when the Communication function (optional) is not installed.



Recommended USB communication converter:
COM-K2 or COM-KG (RKC product)
For the COM-K2, refer to the **COM-K2 Instruction Manual**.
For the COM-KG, refer to the **COM-KG Instruction Manual**.



When using the loader communication, USB driver for COM-K2 must be installed on the personal computer. The USB driver can be downloaded the official RKC website. Installation of the USB driver is not necessary when the COM-KG is used on Windows 10.



When the instrument is powered off, power can be supplied to the instrument from COM-K2 (or COM-KG). This function is exclusive for parameter setting, and the instrument functions as follows.

- Control is stopped (Output is off, relay remains open).
- Host communication is stopped.
- The PV/SV monitor shows “LoAd” for the PV display and “----” for the SV display. The LCD backlight is partially turned off.



While the instrument is powered by COM-K2 (or COM-KG), if power is applied to the instrument, the instrument will be reset and starts for normal operation.



When the instrument is normally powered, the host communication can be used simultaneously.

PARAMETER SETTING

3

This chapter describes how to set up parameters necessary for the host communication.

3.1 Setting of Communication Parameter	3-2
3.1.1 Description of each parameter	3-2
3.1.2 Setting procedure	3-4
3.2 Selection of Communication Data Type	3-5
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3.1 Setting of Communication Parameter

3.1.1 Description of each parameter

To establish communication between host computer (master) and PZ400/900/401/901 (slave), it is necessary to set the following parameters. The communication related parameters can be found in the Function block No. 60: communication (SC1) of Engineering mode.

The communication status can be monitored at “Communication response monitor.”

■ Function block No. 60: Communication (SC1)

No.	Symbol	Name	Data range	Description	Factory set value
—	<i>F_n60</i>	Function block No. 60	This is the first parameter symbol of Function block No. 60.		—
236	<i>CMPS</i>	Communication protocol	0: RKC communication 1: Modbus (Order of data transfer: high-order word to low-order word) 2: Modbus (Order of data a transfer: low-order word to high-order word) 3: PLC communication * (MITSUBISHI MELSEC series special protocol QnA-compatible 3C frame [format 4]) * Do not set for the host communication.	Select the communication protocol type.	When the communication protocol is specified at the time of order, the specified communication protocol will be the factory set value. With communication, communication protocol not specified: 0
237	<i>Add</i>	Device address	RKC communication: 0 to 99 Modbus: 1 to 99 PLC communication: 0 to 30	Do not use the same device address for more than one PZ400/900/401/901 in multi-drop connection. Each PZ400/900/401/901 must have a unique address in multi-drop connection.	RKC communication: 0 Modbus: 1 PLC communication: 0
238	<i>bPS</i>	Communication speed	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps	Set the same communication speed for both the PZ400/900/401/901 (slave) and the host computer (master).	3
239	<i>blf</i>	Data bit configuration	0 to 11 Refer to Data bit configuration table (P. 3-3)	Set the same data bit configuration for both the PZ400/900/401/901 (slave) and the host computer (master).	0
240	<i>INT</i>	Interval time	0 to 250 ms	The Interval time is the waiting time between the receipt of the message from the host computer and the transmission of the reply message from PZ400/900/401/901. Adjust the interval time when the switchover between send and receive is not appropriate.	10
241	<i>CMRM</i>	Communication response monitor	Refer to ● Communication response monitor (P. 3-3)	Displays the communication state.	—

Data bit configuration table

Set value	Data bit	Parity bit	Stop bit
0	8	None	1
1	8	None	2
2	8	Even	1
3	8	Even	2
4	8	Odd	1
5	8	Odd	2

Set value	Data bit	Parity bit	Stop bit
6	7	None	1
7	7	None	2
8	7	Even	1
9	7	Even	2
10	7	Odd	1
11	7	Odd	2

■ : Not settable for Modbus



Interval time:

The interval time for the PZ400/900/401/901 should be set to provide a time for host computer to finish sending all data including stop bit and to switch the line to receive status for the host. If the interval time between the two is too short, the PZ400/900/401/901 may send data before the host computer is ready to receive it. In this case, communication transmission cannot be conducted correctly.



The communication protocol, device address (slave address), communication speed, data bit configuration, and interval time can also be set by loader communication using PROTEM2. It can also be set by host communication.

● Communication response monitor

Communication
response monitor



SV display unit

Communication response monitor

0: Normal response

1: Overrun error

2: Parity error

4: Framing error

8: Receive buffer overflow

If two or more errors occur, the error values are summed up.

Errors are displayed in the hexadecimal format (0 to F).

0 (fixed)

Reception status monitor

Each time signal is received, 0 and 1 are displayed in turns.

Transmission status monitor

Each time signal is sent, 0 and 1 are displayed in turns.

Lights off

3.1.2 Setting procedure

The communication related parameters can be found in the Function block No. 60: Communication (SCI) of Engineering mode.



NOTE

After all the communications parameters are set, perform one of the following steps to make settings valid:

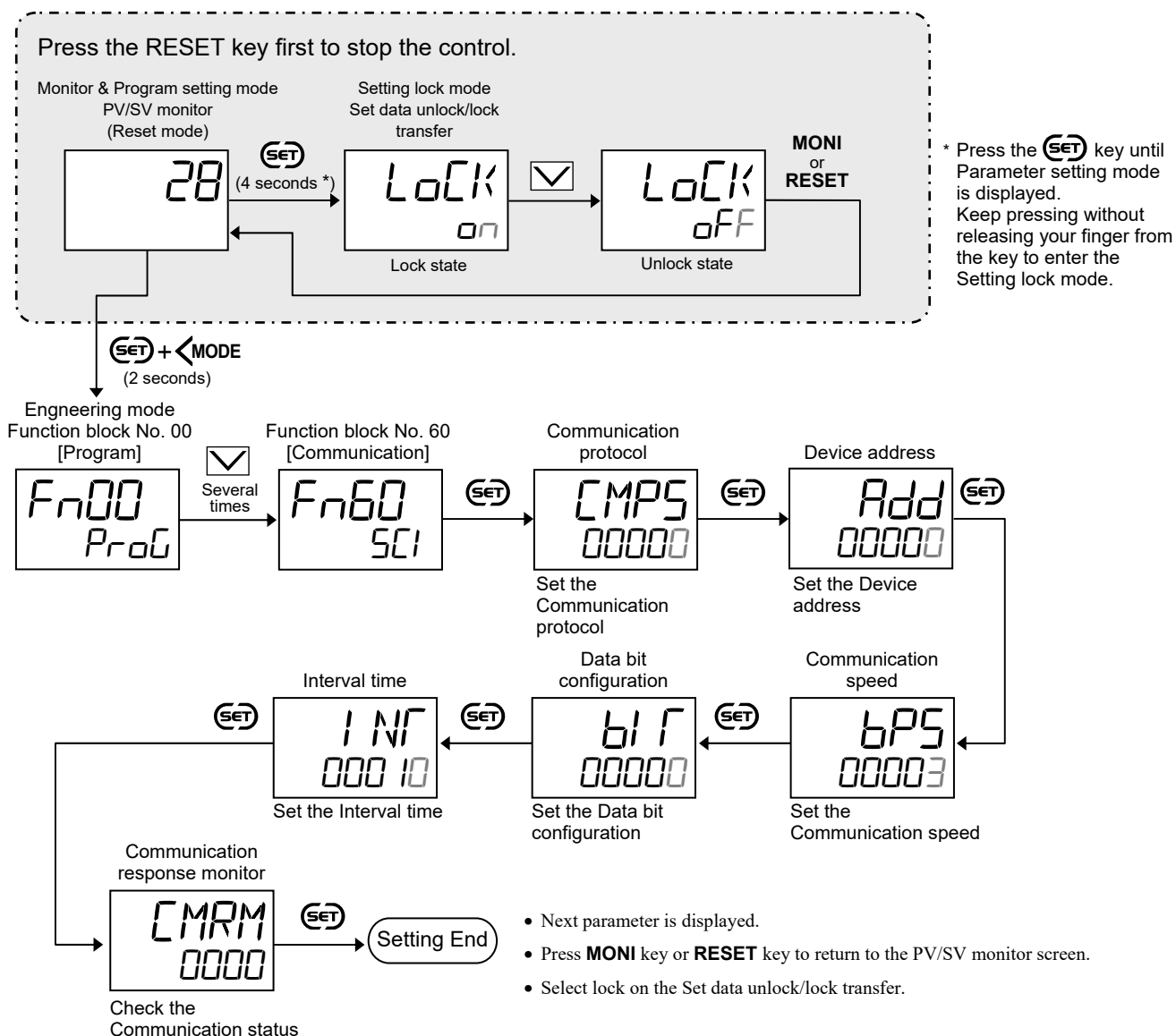
- The power is turned on again after turning it off once.
- The Operation mode is changed to Program control mode (RUN), the Fixed set point control mode (FIX) or the Manual control mode (MAN) from Reset mode (RESET) again after changing it to Reset mode (RESET) once.

Set value change and registration

- The flashing digit indicates which digit can be set. Press **<MODE>** key to go to a different digit.
- To store a new value for the parameter, always press the **(SET)** key. The display changes to the next parameter and the new value will be stored. The modified data will not be stored only by operating the **▲** and **▼** keys.
- In case no operation is performed within 60 seconds after the change of the setting, the mode will return to the PV/SV monitor. The modified data will not be registered in this case.

■ Setting procedure

To enter the Engineering mode



3.2 Selection of Communication Data Type

3.2.1 Communication data type

There are such data as shown below for the communication with the computer. Communication data type can be selected at Input data type (I Ndf).

 For the Input data type, refer to the **3.2.2 Description of each parameter (P. 3-6)**.

■ RKC communication

Communication data type	Set value of Input data type
7 digits data	0
6 digits data	1

 For the data map of RKC communication, **6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-8)**.

■ Modbus

Communication data type	Set value of Input data type
Double word  For details, refer to the 6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-8) .	0
Single word  For details, refer to the 6.4.1 Communication data [Modbus single word] (P. 6-86) .	1

3.2.2 Description of each parameter

Communication data type can be selected at Input data type (*I Ndf*). The Input data type can be found in the Function block No. 21: Input (*I nP*) of Engineering mode.

■ Function block No. 21: Input (*I nP*)

No.	Symbol	Name	Data range	Description	Factory set value
—	<i>F n2 I</i>	Function block No. 21	This is the first parameter symbol of Function block No. 21		—
⋮	⋮	⋮	⋮	⋮	⋮
145	<i>I Ndf</i>	Input data type	0: Number of measured value digits: 5 Number of RKC communication data digits: 7 Modbus data: Double word PLC communication data: Double word (System data: Single word) 1: Number of measured value digits: 4 Number of RKC communication data digits: 6 Modbus data: Single word PLC communication data: Single word When changing the Input data type from 0 to 1 and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand.	Select the input data type.	Depends on the input range code specified at the time of order.



The communication data type can be checked at Input data type of the host communication.

Input data type

RKC communication identifier: SE (Refer to P. 6-35)

Modbus Double word: 013EH, 013FH (Refer to P. 6-35)

Modbus Single word: 009FH (Refer to P. 6-89)

3.2.3 Setting procedure

The Input data type can be found in the Function block No. 21: Input (I nP) of Engineering mode.



NOTE

After all the communications parameters are set, perform one of the following steps to make settings valid:

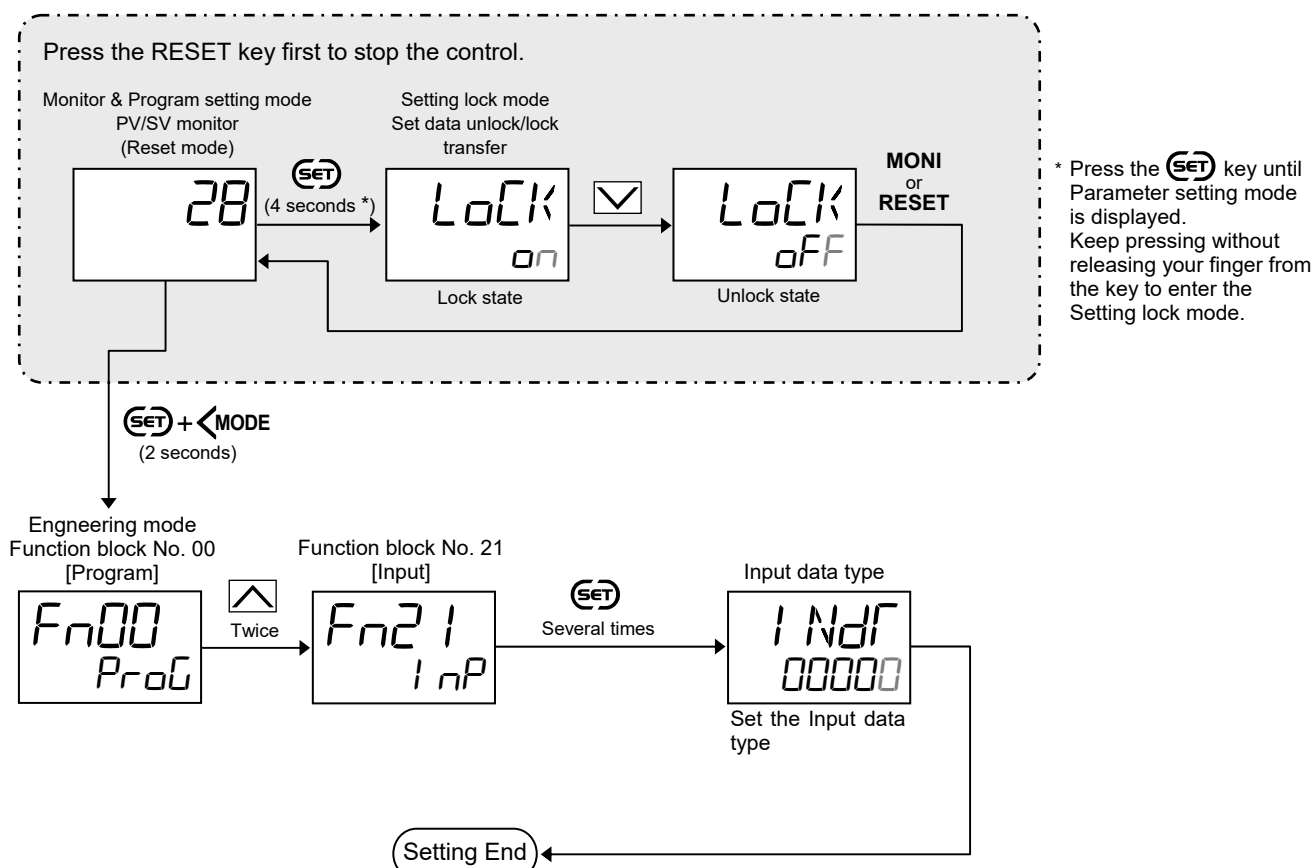
- The power is turned on again after turning it off once.
- The Operation mode is changed to Program control mode (RUN), the Fixed set point control mode (FIX) or the Manual control mode (MAN) from Reset mode (RESET) again after changing it to Reset mode (RESET) once.

Set value change and registration

- The flashing digit indicates which digit can be set. Press **◀MODE** key to go to a different digit.
- To store a new value for the parameter, always press the **(SET)** key. The display changes to the next parameter and the new value will be stored. The modified data will not be stored only by operating the **▲** and **▼** keys.
- In case no operation is performed within 60 seconds after the change of the setting, the mode will return to the PV/SV monitor. The modified data will not be registered in this case.

■ Setting procedure

To enter the Engineering mode



- Next parameter is displayed.
- Press **MONI** key or **RESET** key to return to the PV/SV monitor screen.
- Select lock on the Set data unlock/lock transfer

3.3 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 PZ400/900/401/901 to send data:

- Response wait time after PZ400/900/401/901 sends BCC in polling procedure
- Response wait time after PZ400/900/401/901 sends ACK or NAK in selecting procedure



Response send time is time when interval time is set at 0 ms.

RKC communication (Polling procedure) processing times

Procedure details	Time
Response send time after PZ400/900/401/901 receives ENQ	4.48 ms max.
Response send time after PZ400/900/401/901 receives ACK	4.64 ms max.
Response send time after PZ400/900/401/901 receives NAK	4.64 ms max.
Response send time after PZ400/900/401/901 sends BCC	304 μ s max.

RKC communication (Selecting procedure) processing times

Procedure details	Time
Response send time after PZ400/900/401/901 receives BCC	318 ms max.
Response wait time after PZ400/900/401/901 sends ACK	276 μ s max.
Response wait time after PZ400/900/401/901 sends NAK	276 μ s max.

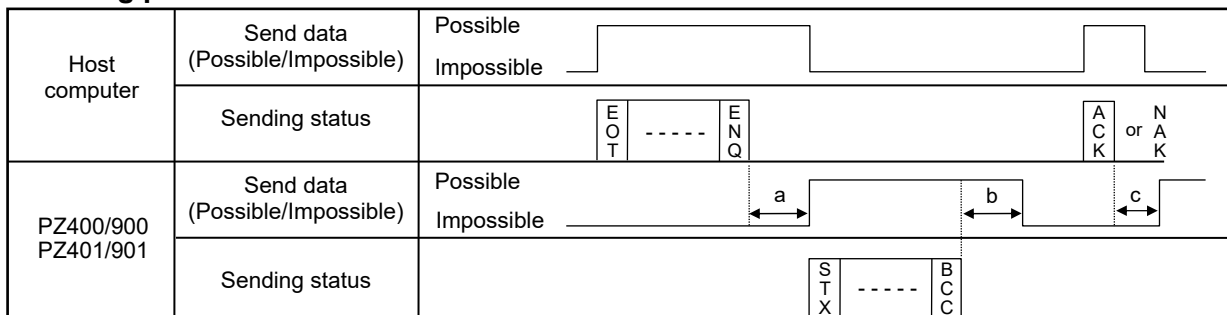
Modbus processing times

Procedure details	Time
Read holding registers [03H] Response send time after the slave receives the query message	19.5 ms max.
Preset single register [06H] Response send time after the slave receives the query message	160 ms max.
Diagnostics (loopback test) [08H] Response send time after the slave receives the query message	14.8 ms max.
Preset multiple registers (Write multiple registers) [10H] Response send time after the slave receives the query message	312 ms max.

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

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

● Polling procedure

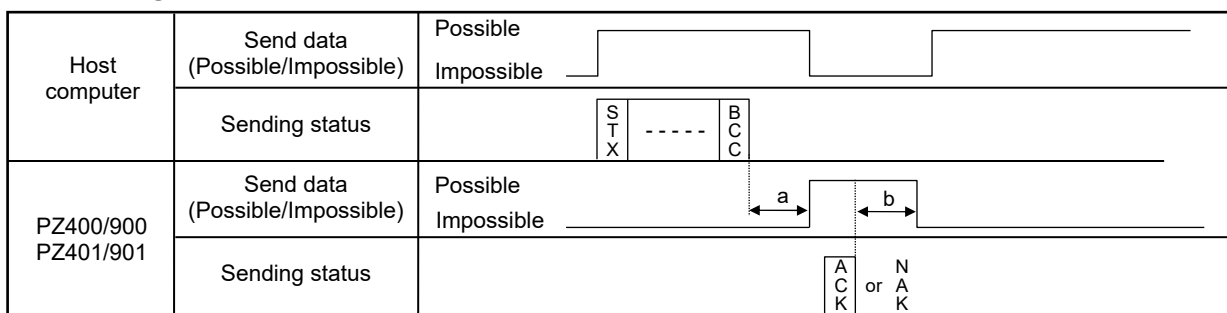


a: Response send time after the PZ400/900/401/901 receives [ENQ] + Interval time

b: Response send time after the PZ400/900/401/901 sends BCC

c: Response send time after the PZ400/900/401/901 receives [ACK] + Interval time or
Response send time after the PZ400/900/401/901 receives [NAK] + Interval time

● Selecting procedure



a: Response send time after the PZ400/900/401/901 receives BCC + Interval time

b: Response wait time after the PZ400/900/401/901 sends ACK or Response wait time after the
PZ400/900/401/901 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 PZ400/900/401/901 to process data:

- In polling procedure, Response wait time after the PZ400/900/401/901 sends BCC
- In selecting procedure, Response wait time after the PZ400/900/401/901 sends ACK or NAK

■ Fail-safe

A transmission error may occur if the transmission line is 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.

MEMO

RKC COMMUNICATION PROTOCOL

4

This chapter describes the RKC communication protocol.

4.1 Polling	4-2
4.1.1 Polling procedures	4-3
4.1.2 Polling procedure example	4-9
4.2 Selecting	4-11
4.2.1 Selecting procedures	4-11
4.2.2 Selecting procedure example	4-15

The RKC communication uses the Polling/Selecting method to establish a data link. The basic procedure follows ANSI X3.28-1976 subcategories 2.5 and A4 basic mode data transmission control procedure (Fast selecting is the selecting method used in this controller).

In this chapter PZ400/900/401/901 are called controllers.

- 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 controller responds according to queries and commands from the host.
- The code used in communication is 7-bit ASCII code including transmission control characters. The transmission control characters are EOT (04H), ENQ (05H), ACK (06H), NAK (15H), STX (02H) and ETX (03H). The figures in the parentheses indicate the corresponding hexadecimal number.



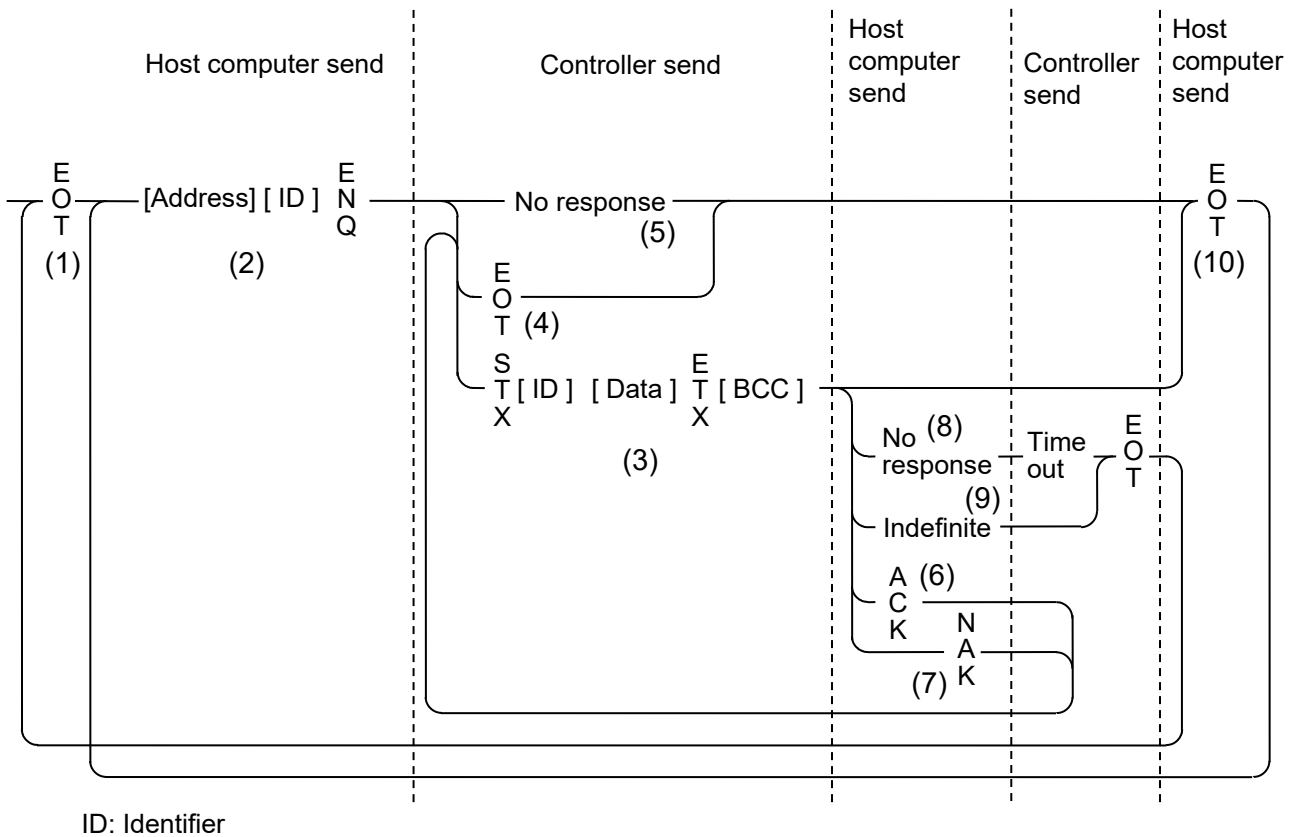
Data send/receive state (communication data monitoring and setting) of RKC communication can be checked by using the following software:

Communication Tool “PROTEM2”

The software can be downloaded from the official RKC website.

4.1 Polling

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



4.1.1 Polling procedures

(1) Data link initialization

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

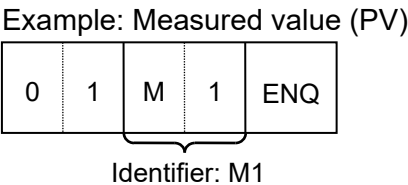
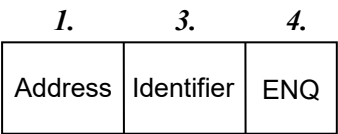
(2) Data sent from host computer - Polling sequence

The host computer sends the polling sequence in the following two types of formats:

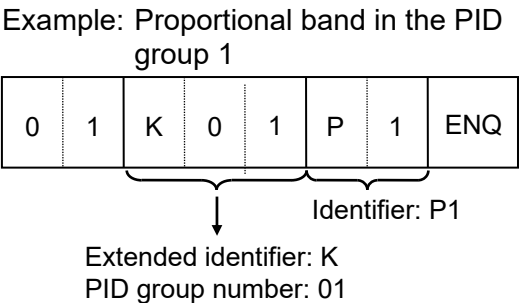
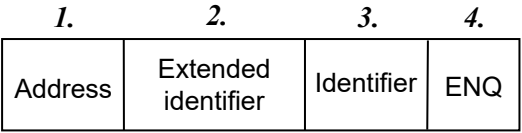
- Format when Extended identifier is not required.
- Format when Extended identifier is required.

Extended identifiers are used when a parameter requires “Pattern & Segment group,” “Pattern group,” “PID group” or “PLC item group.”

■ When Extended identifier is not required



■ When Extended identifier is required



1. Address (2 digits)

The device address specifies the controller to be polled and each controller must have its own unique device address.

This data is a device address of the controller to be selected and must be the same as the device address set value in item 3.1 Setting of Communication Parameter (P. 3-2).

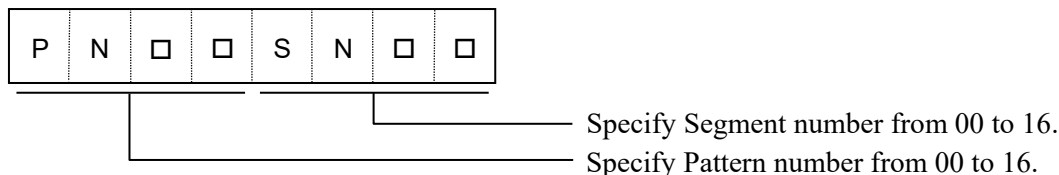


The polling address which transmitted a message once becomes effective so long as data link is not initialized by transmit and receive of EOT.

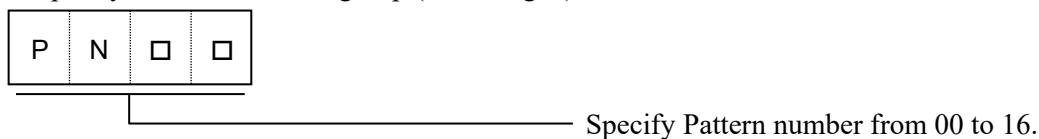
2. Extended identifier

Extended identifiers are used when a parameter requires “Pattern & Segment group,” “Pattern group,” “PID group” or “PLC item group.” There are 4 types of Extended identifiers.

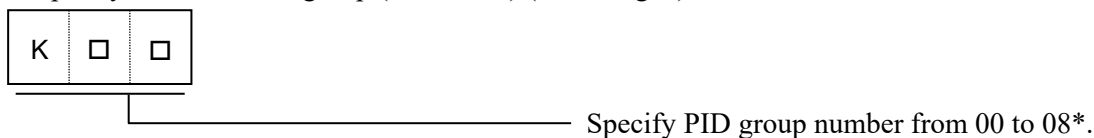
- To specify data with Pattern & Segment group (6 to 8 digits)



- To specify data with Pattern group (3 or 4 digits)



- To specify data with PID group (Level PID) (2 or 3 digits)



* When the Level PID action selection is “0: No Level PID”, PID group numbers 02 to 08 are invalid and the response is NAK (Negative Acknowledge).

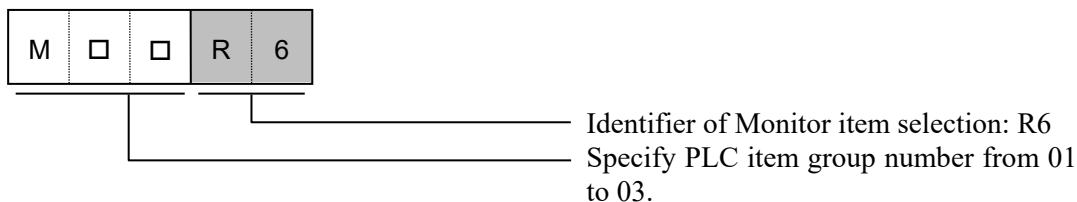
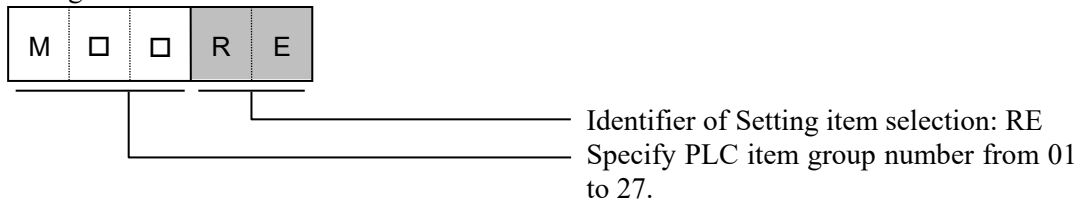
Level PID action selection

7RKC communication identifier: PP (Refer to P. 6-47)

Modbus Double word: 01D6H, 01D7H (Refer to P. 6-47)

Modbus Single word: 00EBH (Refer to P. 6-91)

- To specify data with PLC item group (2 or 3 digits)

Monitor item selection**Setting item selection**

The data being used is specified upon when setting “00” for group number.



The upper digits of the display can be zero-suppressed.



When specifying a parameter which does not have Extended identifier, the specified Extended identifier is ignored.

3. Identifier (2 digits)

The identifier specifies the type of data that is requested from the controller. Always attach the ENQ code to the end of the identifier.

■  For details, refer to **6.3 RKC Communication/Modbus (Double Word) Data (P. 6-8)**.

4. ENQ

The ENQ is the transmission control character that indicates the end of the polling sequence.

The ENQ must be attached to the end of the identifier.

The host computer then must wait for a response from the controller.

(3) Data sent from the controller

If the polling sequence is received correctly, the controller sends data in the following two types of formats:

- Format when Extended identifier is not required.
- Format when Extended identifier is required.

Extended identifiers are used when a parameter requires “Pattern & Segment group,” “Pattern group,” “PID group” or “PLC item group.”

■ When Extended identifier is not required

1.	3.	4.	5.	6.
STX	Identifier	Data	ETX	BCC

■ When Extended identifier is required

1.	2.	3.	4.	5.	6.
STX	Extended identifier	Identifier	Data	ETX	BCC



When specifying the data belonging to “Pattern & Segment group,” “Pattern group,” “PID group” and “PLC item group,” if you have omitted extended identifier(s), the data used at that moment will be specified, and Pattern No., Segment No., and Group No. will be “00.”

Example: Segment level in the Pattern & Segment group

STX	P	N	0	0	S	N	0	0	L	E	Data	ETX	BCC
Extended identifier: PN Pattern number: 00					Extended identifier: SN Segment number: 00				Identifier: LE				

Example: Proportional band in the PID group

STX	K	0	0	P	1	Data	ETX	BCC
Extended identifier: K PID group number: 00				Identifier: P1				

1. STX

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

2. Extended identifier

Extended identifiers are used when a parameter requires “Pattern & Segment group,” “Pattern group,” “PID group” or “PLC item group.”



For details, refer to **(2) Data sent from host computer - Polling sequence, 2. Extended identifier (P. 4-4).**



When specifying a parameter which does not have Extended identifier, the specified Extended identifier is ignored.

3. Identifier (2 digits)

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



For details, refer to **6.3 RKC Communication/Modbus (Double Word) Data (P. 6-8).**

4. Data (7 or 6 digits)

Data which is indicated by an identifier of the controller. It is expressed in decimal ASCII code including a minus sign (–) and a decimal point. Data is not zero-suppressed.



The following items have the data length (in digits) as follows.

- Instrument serial number monitor (Identifier RX): 10 digits
- Model code monitor (Identifier ID): 32 digits



The time data is described as shown below:

- Segment remaining time, Segment time, Pattern end output time, Time signal start/end time and Segment time in progress

When data range is 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds:

Data range is 0:00 to 199:59, punctuation of time unit is expressed in colon “: (3AH).”

- Pattern remaining time monitor

When data range is 0 hours 00 minutes to 999 hours 59 minutes or 0 minutes 00 seconds to 999 minutes 59 seconds:

Data range is 0:00 to 999:59, punctuation of time unit is expressed in colon “: (3AH).”

- AT remaining time monitor

When data range is 0 hours 00 minutes to 48 hours 00 minutes:

Data range is 0:00 to 48:00, punctuation of time unit is expressed in colon “: (3AH).”



The data length in RKC communication (7 or 6 digits) can be set at Input data type.

For the Input data type, refer to **3.2 Selection of Communication Data Type (P. 3-5)**.

5. ETX

ETX is a transmission control character used to indicate the end of text transmission.

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 ETX, not including STX.

Example:

STX	M	1	0	0	1	0	0	.	0	ETX	BCC
-----	---	---	---	---	---	---	---	---	---	-----	-----

4DH 31H 30H 30H 31H 30H 30H 2EH 30H 03H ← Hexadecimal numbers

$$\text{BCC} = 4\text{DH} \oplus 31\text{H} \oplus 30\text{H} \oplus 30\text{H} \oplus 31\text{H} \oplus 30\text{H} \oplus 30\text{H} \oplus 2\text{EH} \oplus 30\text{H} \oplus 03\text{H} = 50\text{H}$$

($\oplus$: *Exclusive OR*)

Value of BCC becomes 50H.

(4) EOT sent from the controller (Ending data transmission from the controller)

In the following cases, the controller sends EOT to terminate the data link:

- When the specified identifier (Extended identifier) is invalid
- When there is an error in the data type
- When data is not sent from the host computer even if the data link is initialized
- When all the data has been sent

(5) No response from the controller

The controller 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 controller receives ACK from the host computer, the controller will send any remaining data of the next identifier without additional action from the host computer.

 For the identifier, refer to **6.3 RKC Communication/Modbus (Double Word) Data (P. 6-8)**.

When the host computer determines to terminate the data link, EOT is sent from the host computer.

(7) NAK (Negative acknowledge)

If the host computer does not receive correct data from the controller, it sends a negative acknowledgment NAK to the controller. The controller 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.

(8) No response from host computer

When the host computer does not respond within approximately three seconds after the controller sends data, the controller sends EOT to terminate the data link. (Time out: 3 seconds)

(9) Indefinite response from host computer

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

(10) EOT (Data link termination)

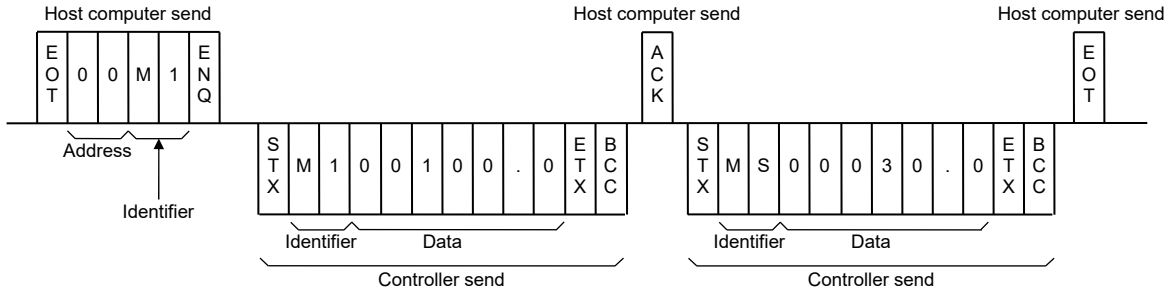
The host computer sends EOT message when it is necessary to suspend communication with the controller or to terminate the data link due to lack of response from the controller.

4.1.2 Polling procedure example

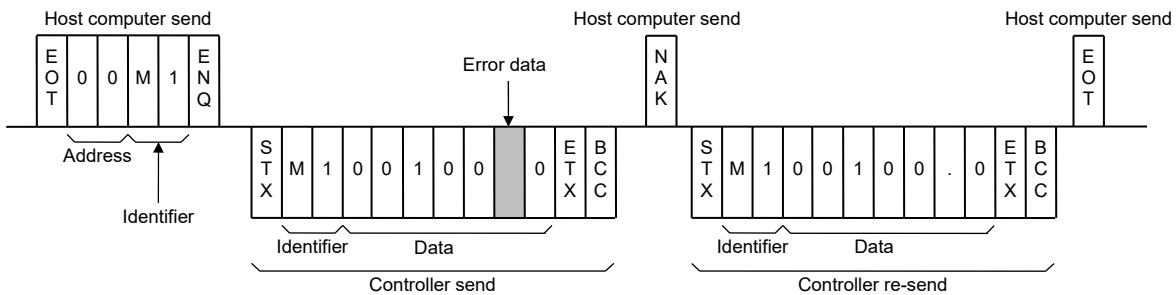
(1) When polling items which does not have Extended identifier

Example: Read Measured value (PV) from the controller

■ Normal transmission



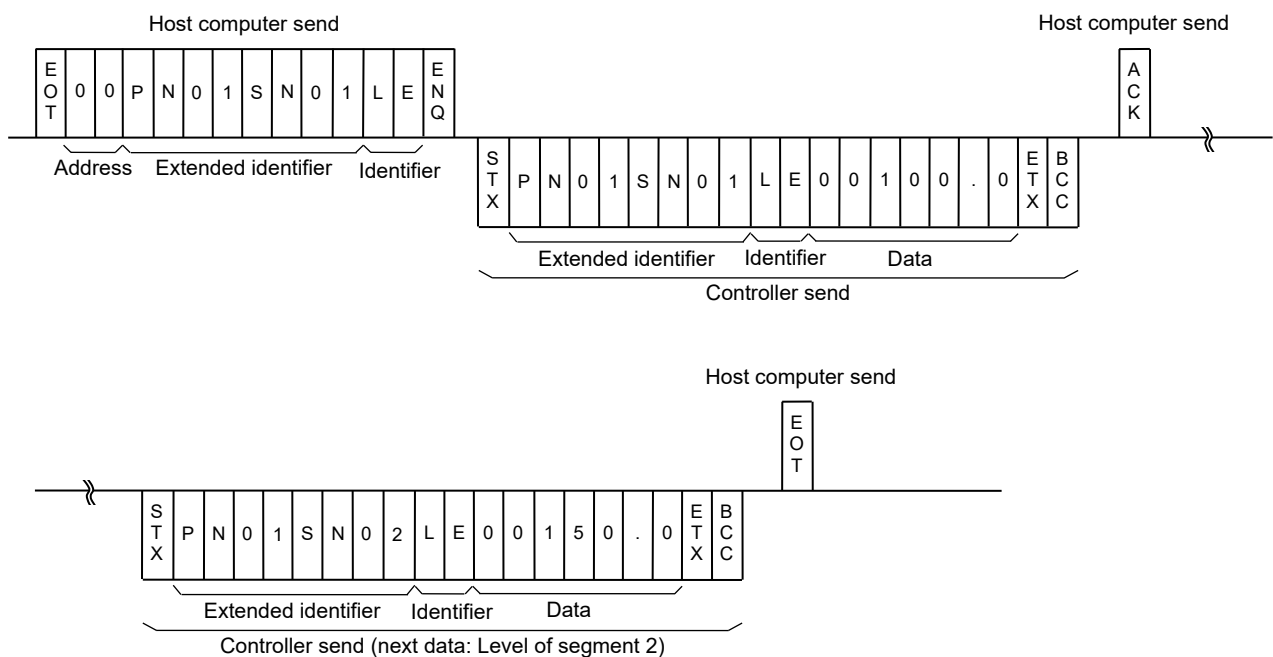
■ Error transmission



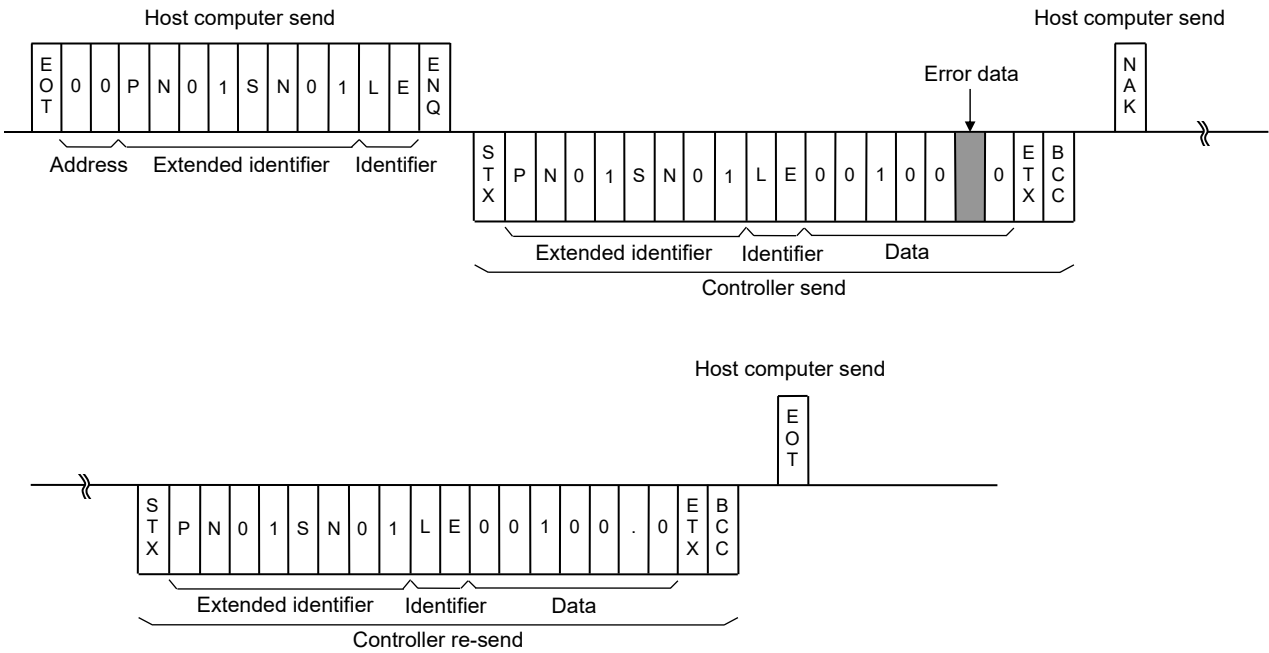
(2) When polling items which requires Extended identifier

Example: Read data of Segment 1 level of Pattern 1 from controller

■ Normal transmission

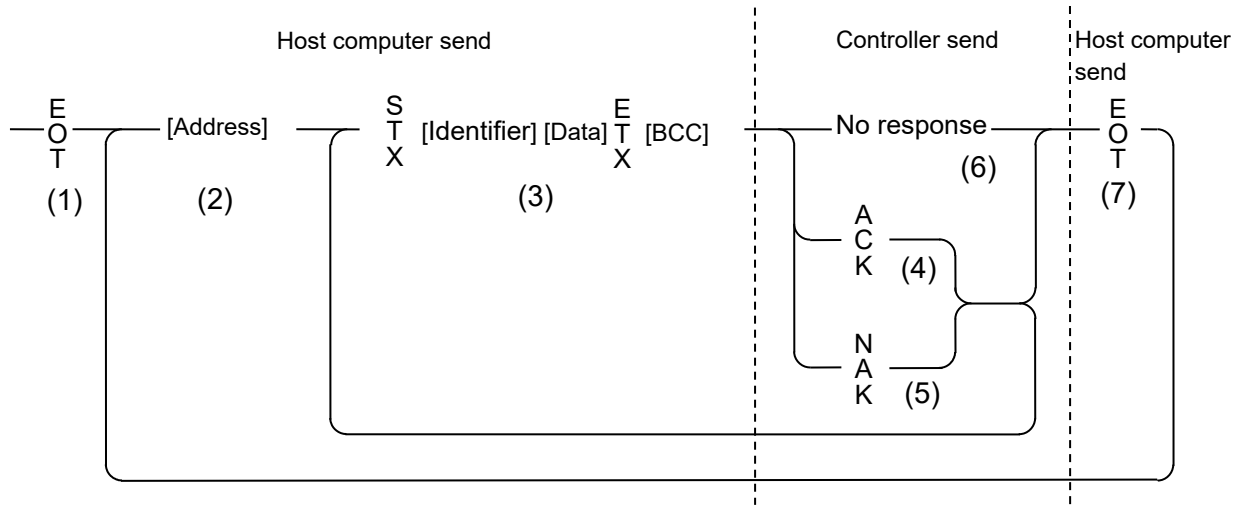


■ Error transmission



4.2 Selecting

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



4.2.1 Selecting procedures

(1) Data link initialization

Host computer sends EOT to the controllers 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 device address of the controller to be selected and must be the same as the device address set value in item **3.1 Setting of Communication Parameter (P. 3-2)**.



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 Extended identifier is not required

	2.	3.		
STX	Identifier	Data	ETX	BCC

■ When Extended identifier is required

	1.	2.	3.		
STX	Extended identifier	Identifier	Data	ETX	BCC

 For the STX, ETX and BCC, refer to **4.1 Polling (P. 4-2)**.

1. Extended identifier

Extended identifiers are used when a parameter requires “Pattern & Segment group,” “Pattern group,” “PID group” or “PLC item group.”

 For details, refer to **(2) Data sent from host computer - Polling sequence, 2. Extended identifier (P. 4-4)**.

 When specifying a parameter which does not have Extended identifier, the specified Extended identifier is ignored.

2. Identifier (2 digits)

The identifier specifies the type of data that is requested from the controller, such as set value.

 For details, refer to **6.3 RKC Communication/Modbus (Double Word) Data (P. 6-8)**.

3. Data

Data which is indicated by an identifier of the controller is expressed in decimal ASCII code including a minus sign (–) and a decimal point. The channel number can be zero-suppressed.

The number of digits varies depending on the type of identifier. (7 or 6 digits)

 The time data is described as shown below:

- Segment remaining time, Segment time, Pattern end output time, Time signal start/end time and Segment time in progress:
When data range is 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds:
Data range is 0:00 to 199:59, punctuation of time unit is expressed in colon “: (3AH).”
- Pattern remaining time monitor:
When data range is 0 hours 00 minutes to 999 hours 59 minutes or 0 minutes 00 seconds to 999 minutes 59 seconds:
Data range is 0:00 to 999:59, punctuation of time unit is expressed in colon “: (3AH).”
- AT remaining time monitor:
When data range is 0 hours 00 minutes to 48 hours 00 minutes:
Data range is 0:00 to 48:00, 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)

 The data length in RKC communication (7 or 6 digits) can be set at Input data type.
For the Input data type, refer to **3.2 Selection of Communication Data Type (P. 3-5)**.

● About numerical data

Receivable data

The controller can receive zero-suppressed data and whole number data (data without decimal fraction).

<Example> For example, even if the data -1.5 is sent by the host as -001.5 , -01.5 , -1.5 , -1.50 , -1.500 , the controller receives the data as -1.5 .

- When the host computer sends data containing a decimal point to the item without a decimal point, the controller receives a message with the value that is cut off below the decimal point.

<Example> When setting range is 0 to 200, the controller will receive as follows:

Send data	0.5	100.5
Receive data	0	100

- The controller receives a value truncated to a specified number of decimal places. The digits smaller than that will be cut off.

<Example> When setting range is -10.00 to $+10.00$, the controller will receives as follows:

Send data	-0.5	-0.058	$.05$	-0
Receive data	-0.50	-0.05	0.05	0.00

Unreceivable data

The controller sends NAK when received a following data.

+	Plus sign and data with a plus sign
-	Only minus sign (without a number)
.	Only decimal point (period)
-.	Only minus sign and a decimal point

(4) ACK (Acknowledgment)

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

(5) NAK (Negative acknowledge)

If the controller 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 controller will send NAK in the following cases:

- When an error occurs on communication the line (parity, framing error, etc.)
- When a BCC check error occurs
- When the specified identifier (Extended identifier) is invalid
- When receive data exceeds the setting range
- When receive data is the identifier of RO (read only)

(6) No response from controller

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

(7) EOT (Data link termination)

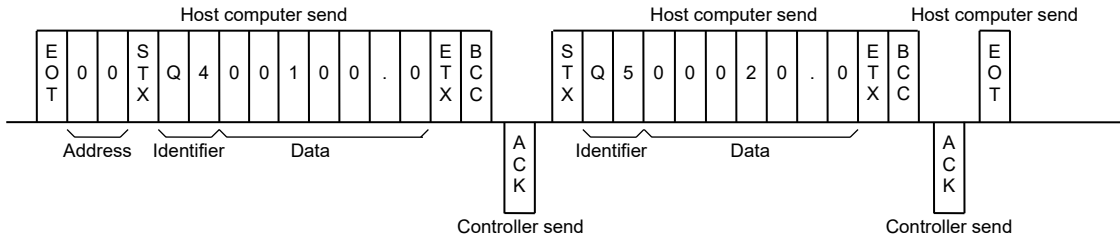
The host computer sends EOT when there is no more data to be sent from the host computer or there is no response from the controller.

4.2.2 Selecting procedure example

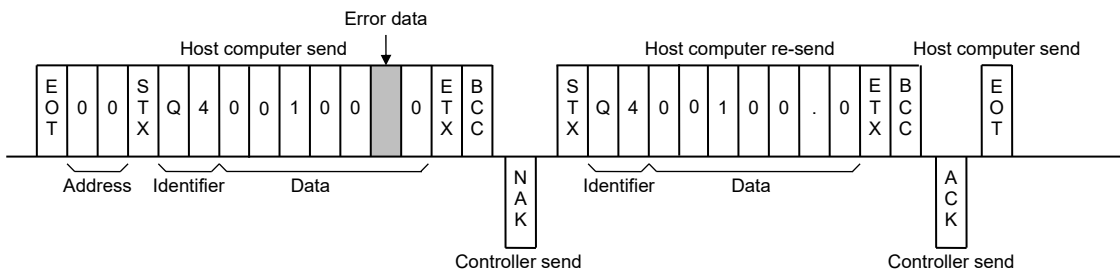
(1) When selecting items which does not have Extended identifier

Example: Write Level PID setting 1 to the controller

■ Normal transmission



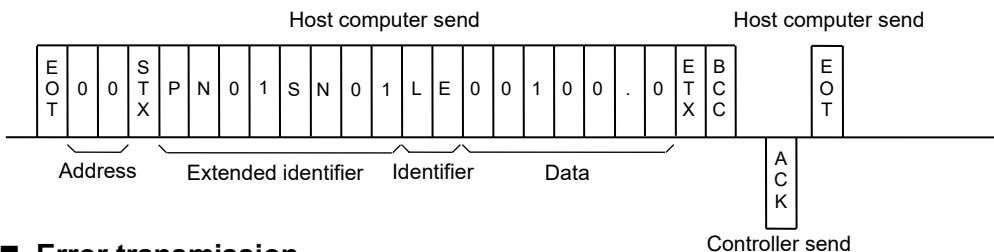
■ Error transmission



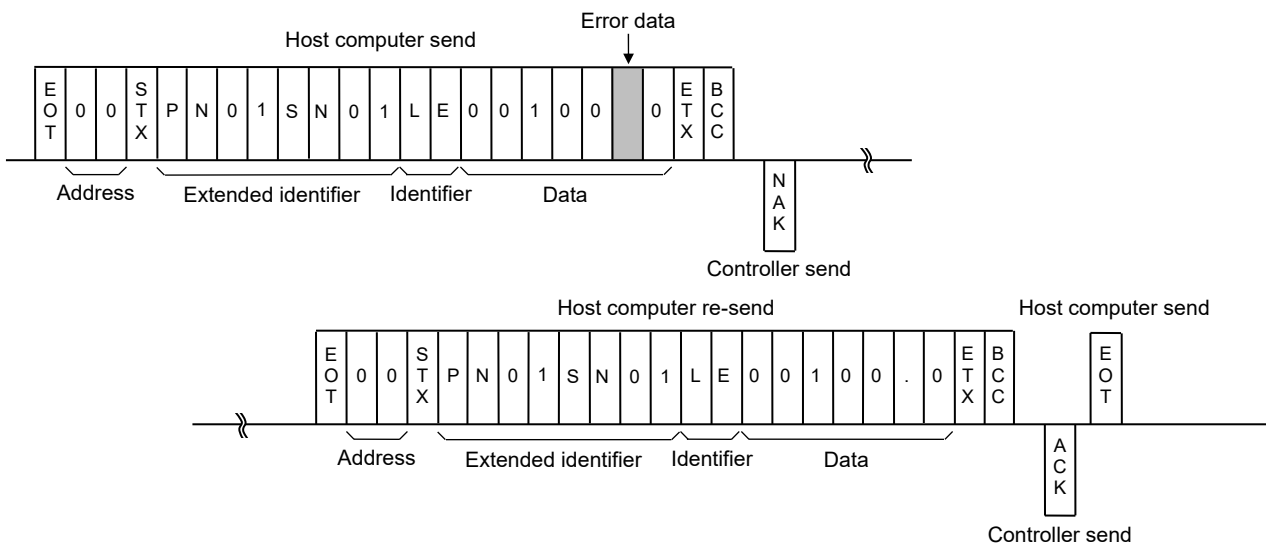
(2) When selecting items which requires Extended identifier

Example: Write data of Segment 1 level of Pattern 1 to controller

■ Normal transmission



■ Error transmission



MEMO

MODBUS PROTOCOL

5

This chapter describes the Modbus protocol.

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In this chapter a host computer is called Master and PZ400/900/401/901 is called Slave.

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. When master begins data transmission, a set of data is sent to the slave in a fixed sequence. When it is received, the slave decodes it, takes the necessary action, and returns data to the master.



Data send/receive state (communication data setting) of Modbus can be checked by using the following software:

Communication Tool “PROTEM2”

The software can be downloaded from the official RKC website.

5.1 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.

Slave address
Function code
Data
Error check (CRC-16)

Message format

■ Slave address

The slave address is a number from 1 to 99 manually set at the front key panel of the PZ400/900/401/901.



Master does not communicate with the slave when the address is set to “0.”



For details, refer to **3.1 Setting of Communication Parameter (P. 3-2)**.

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

■ Function code

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



For details, refer to **5.2 Function Code (P. 5-3)**.

■ Data

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



For details, refer to **5.6 Register Read and Write (P. 5-8)** and **6. COMMUNICATION DATA LIST (P. 6-1)**.

■ Error check

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



For details, refer to **5.5 Calculating CRC-16 (P. 5-5)**.

5.2 Function Code

Function code contents

Function code (Hexadecimal)	Function	Contents
03H	Read holding registers	Measured (PV) value monitor, Event state monitor, etc.
06H	Preset single register	Set value (SV), Event set value, PID constants, PV bias, etc. (Write single data)
08H	Diagnostics (loopback test)	loopback test
10H	Preset multiple registers (Write multiple registers)	Set value (SV), Event set value, PID constants, PV bias, etc. (Write multiple consecutive data)

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	5	255
06H	Preset single register	8	8	5	8
08H	Diagnostics (loopback test)	8	8	5	8
10H	Preset multiple registers (Write multiple registers)	11	255	5	8

5.3 Communication Mode

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

Items	Contents
Data bit length	8-bit (Binary)
Start mark of message	Unused
End mark of message	Unused
Message length	Refer to 5.2 Function Code
Data time interval	Less than 24-bit 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-bit time. If time intervals become time longer than the 24-bit time the relevant slave assumes that message sending from the master is terminated and there is no response.

5.4 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 (Write 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 returns the error response message without any action.

Slave address
Function code
Error code
Error check (CRC-16)

Error response message

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

Error code	Contents
1	Function code error (An unsupported function code was specified)
2	When the mismatched address is specified.
3	• The maximum number (Read from a read holding register or write to Preset multiple registers [Write multiple registers]) has been exceeded. • The setting of the number of data (the number of requested byte) is not set to a double of the requested number of data at the time of "Preset multiple registers (Write multiple registers)"
4	Self-diagnostic error response

- Order of determination of error
Error code 1 > Error code 3 > Error code 2 > Error code 4

(3) No response

The slave 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 etc., is found in the query message.
- Data time interval in the query message from the master exceeds 24-bit time.

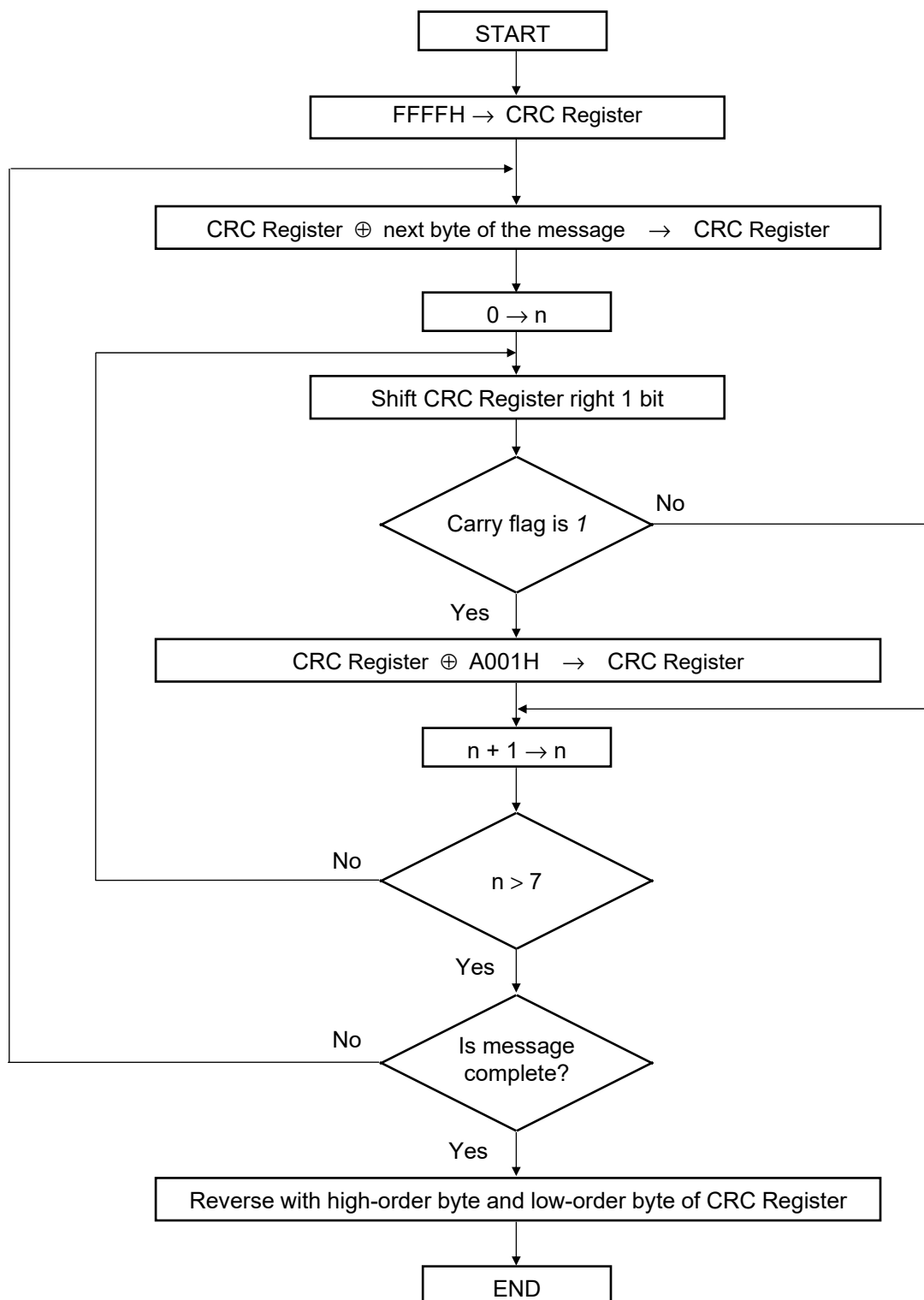
5.5 Calculating CRC-16

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 coincide, 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* ($\oplus$) 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 hexadecimal 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 $\oplus$ 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' exist. These 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_message_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, uint16 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_message_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_message_length++] = crcl;
    z_p [z_message_length] = crch;
    return CRC;
}
```

5.6 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 0000H to 0003H are the read out from slave address 2.

● Double word

Query message

Slave address		02H	} First holding register address } The setting must be between 1 (0001H) and 62 (003EH).
Function code		03H	
Starting number	High	00H	
	Low	00H	
Quantity	High	00H	
	Low	04H	
CRC-16	High	44H	
	Low	3AH	

Normal response message

Slave address		02H	→ Number of holding registers × 2
Function code		03H	
Number of data		08H	
First holding register contents (Low-order word of the first data)	High	00H	
	Low	62H	
Next holding register contents (High-order word of the first data)	High	00H	
	Low	00H	
Next holding register contents (Low-order word of the next data)	High	00H	
	Low	14H	
Next holding register contents (High-order word of the next data)	High	00H	
	Low	00H	
CRC-16	High	99H	
	Low	51H	

Error response message

Slave address		02H
80H + Function code (+ denotes a logical add)		83H
Error code		03H
CRC-16	High	F1H
	Low	31H

● Single word

Query message

Slave address		02H	} First holding register address
Function code		03H	
Starting number	High	00H	
	Low	00H	
Quantity	High	00H	} The setting must be between 1(0001H) and 125 (007DH).
	Low	04H	
CRC-16	High	44H	
	Low	3AH	

Normal response message

Slave address		02H	→ Number of holding registers × 2
Function code		03H	
Number of data		08H	
First holding register contents (First data)	High	00H	
	Low	62H	
Next holding register contents (Next data)	High	00H	
	Low	14H	
Next holding register contents (Next data)	High	00H	
	Low	00H	
Next holding register contents (Next data)	High	00H	
	Low	00H	
CRC-16	High	E9H	
	Low	56H	

Error response message

Slave address		02H
80H + Function code (+ denotes a logical add)		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 0072H of slave address 1.

Query message

Slave address		01H
Function code		06H
Holding register number	High	00H
	Low	72H
Write data	High	00H
	Low	01H
CRC-16	High	E8H
	Low	11H

} Any data within the range

Normal response message

Slave address		01H
Function code		06H
Holding register number	High	00H
	Low	72H
Write data	High	00H
	Low	01H
CRC-16	High	E8H
	Low	11H

} Contents will be the same as query message data.

Error response message

Slave address		01H
80H + Function code (+ denotes a logical add)		86H
Error code		02H
CRC-16	High	C3H
	Low	A1H



In the case of double word, writing to high-order word register only is not possible. The attempt ends with a normal message, but the write will not be done.

■ Diagnostics (Loopback test) [08H]

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

Example: Loopback test for slave address 1

Query message

Slave address		01H	} Test code must be set to "00."
Function code		08H	
Test code	High	00H	
	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 (+ denotes a logical add)		88H
Error code		03H
CRC-16	High	06H
	Low	01H

■ Preset multiple registers (Write 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 0070H to 0071H of slave address 1.

Query message

Slave address		01H	
Function code		10H	
Starting number	High	00H	} First holding register address
	Low	70H	
Quantity	High	00H	} Set a register address within the following range. Double word: 1 to 61 (0001H to 003DH) Single word: 1 to 123 (0001H to 007BH)
	Low	02H	
Number of data		04H	→ Number of holding registers × 2
Data to first register	High	00H	} Any pertinent data
	Low	01H	
Data to next register	High	00H	
	Low	00H	
CRC-16	High	A5H	
	Low	4BH	

Normal response message

Slave address		01H
Function code		10H
Starting number	High	00H
	Low	70H
Quantity	High	00H
	Low	02H
CRC-16	High	40H
	Low	13H

Error response message

Slave address		01H
80H + Function code (+ denotes a logical add)		90H
Error code		02H
CRC-16	High	CDH
	Low	C1H

5.7 Caution for Handling Communication Data

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



FFFFH represents -1.

- The Modbus protocol processes the data with a decimal point as the data without a decimal point during the communication.

Example 1: When Manipulated output value monitor [heat-side] is 5.0 %, 5.0 is processed as 50,
50 = 0032H.

Manipulated output value monitor [heat-side]	High	00H
	Low	32H

Example 2: When Set value (SV) in Fixed set point control mode is -20.0 °C, -20.0 is processed as -200,
-200 = 0000H - 00C8H = FF38H.

Set value (SV) in Fixed set point control mode	High	FFH
	Low	38H

- In our communication a variable is handled as a double word or a single word.



Switchover between the single word and the double word can be done at Input data type.
For the Input data type, refer to **3.2 Selection of Communication Data Type (P. 3-5)**.

[Double word]

- The variable is handled as 4 bytes data.
- One variable use two register addresses (Address of high-order word, Address of low-order word).
- To Read/Write two-word data is implemented from the low-order word to the high-order word or from the high-order word to the low-order word.



The data transfer sequence is selectable at "Communication protocol" in the Engineering mode.
For the Communication protocol, refer to **3.1 Setting of Communication Parameter (P. 3-2)**.

- There is the following constraint in writing data in order to treat the variable as 4 bytes data.
 - It is not possible to write only of high-order word. The communication response becomes normal response, but do not writing.
 - A writing only of low-order word does sign extend and does it.

Example 1: When did a writing only of "0020H" in low-order word.

The controller interprets high-order word as "0000H."

Example 2: When did a writing only of "FFFFH (-1)" in low-order word.

The controller interprets high-order word as "FFFFH."

[Single word]

- A variable is handled as a two-byte data.
- Each variable occupies one register address.

- If data range error occurs during data writing (Write Action), it is not processed as an error. Normal data is written in data register but data with error is not written; therefore, it is recommended to confirm data of changed items after the data setting.
- Commands should be sent at time intervals of 24 bits after the master receives the response message.
- Definitions of registers
 - ① Illegal register
Register outside of the data map range defined in Specification.
 - ② Unused register
Register that can be used/unused depending on the selected function and that is set to unused.
Or registers of undisclosed items.

- Register handling

- (1) Reading register

Register types contained in communication data	Action at the time of reading
① Illegal register	Error code 2 * is returned if illegal register is included.
② Unused register	Return 0000h only for unused register.
③ Registers except the above	Register can be read.

- (2) Preset single register

Register types contained in communication data	Action at the time of writing
① Illegal register	Return error code 2 * and destroy write data.
② Unused register	Destroy write data.
③ Write-protected register (Read-only register)	
④ Write a value outside the setting range	
⑤ High word register of double word data	Capable of writing into register.
⑥ Registers except the above	

- (3) Preset multiple registers

Register types contained in communication data	Action at the time of writing
① Illegal register	Error code 2 * is returned if illegal register is included, and all the written data will be destroyed.
② Unused register	Destroy write data of unused registers.
③ Write-protected register (Read-only register)	Destroy write data to write-protected register.
④ Write a value outside the setting range	Destroy write data outside the setting range.
⑤ Register last written into is a high word register	Destroy data of the last written register.
⑥ Registers except the above	Capable of writing into register.

* When an error with higher error code determination is active, priority is given to it.

5.8 How to Use Modbus Data Mapping

Data mapping function is a function that enables the data that needs to be constantly monitored to be mapped into the specified address area.

Up to 32 communication data can be assigned to the register address in the following table used to actually read the data from/write the data to.

Communication data allocation can be performed in “Register address specifying the mapping data.”

(HEX: Hexadecimal number DEC: Decimal number)

	Double word	Single word
Register address specifying the mapping data	HEX: 0500H to 053FH DEC: 1280 to 1343	HEX: 0500H to 051FH DEC: 1280 to 1311
Register address actually read from/write to	HEX: 1000H to 103FH DEC: 4096 to 4159	HEX: 1000H to 101FH DEC: 4096 to 4127
Register address of the mappable data	Refer to 6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-8).	Refer to 6.4.1 Communication data [Modbus single word] (P. 6-86).



For the data mapping address list, refer to the **6.3.2 Data mapping address [Modbus double word]** (P. 6-56), **6.4.2 Data mapping address [Modbus single word]** (P. 6-93).

Example 1: When the data is read in double-word

Data to be mapped: Measured value (PV), Manipulated output value monitor [heat-side],
Event 1 state monitor, Event 2 state monitor

- I. Write 0000H to the low-order word of Register address setting 1 to 4 (see table of “Register address for data designation”). Write register address of the data to be mapped (either low-order word or high-order word) to the high-order word.

Data to be mapped

Name	Register address			
	HEX		DEC	
	Low-order	High-order	Low-order	High-order
Measured value (PV)	0000	0001	0	1
Manipulated output value monitor [heat-side]	0004	0005	4	5
Event 1 state monitor	0022	0023	34	35
Event 2 state monitor	0024	0025	36	37

Write 0000H to the low-order word of Register address for data designation, or
Write register address of the data to be mapped (either low-order word or high-order word) to the high-order word.*
* There is no difference whichever data is written.

Register address for data designation

Name	Register address				Setting data
	HEX		DEC		
	Low-order	High-order	Low-order	High-order	
Register address setting 1 [Read/write address: Low-order word 1000H, high-order word 1001H]	0500	0501	1280	1201	Low-order word: 0000H High-order word: 0000H or 0001H
Register address setting 2 [Read/write address: Low-order word 1002H, high-order word 1003H]	0502	0503	1202	1203	Low-order word: 0000H High-order word: 0004H or 0005H
Register address setting 3 [Read/write address: Low-order word 1004H, high-order word 1005H]	0504	0505	1204	1205	Low-order word: 0000H High-order word: 0022H or 0023H
Register address setting 4 [Read/write address: Low-order word 1006H, high-order word 1007H]	0506	0207	1206	1207	Low-order word: 0000H High-order word: 0024H or 0025H

The table below shows the assignment of read/write register addresses 1000H to 1007H by the above mapping.

Register address				Name
HEX		DEC		
Low-order	High-order	Low-order	High-order	
1000	1001	4096	4097	Measured value (PV)
1002	1003	4098	4099	Manipulated output value monitor [heat-side]
1004	1005	4100	4101	Event 1 state monitor
1006	1007	4102	4104	Event 2 state monitor

2. Reads out the mapping data by following order message.

Slave address		02H	} First holding register address (1000H)
Function code		03H	
Starting number	High	10H	
	Low	00H	
Quantity	High	00H	} Number of data (4)
	Low	04H	
CRC-16	High	40H	
	Low	FAH	

Example 2: When the data is read in a single word of data mapped.

Data to be mapped: Measured value (PV), Manipulated output value monitor [heat-side],
Event 1 state monitor, Event 2 state monitor

1. Write register addresses of mapping data to register address setting from 1 to 4 (Register address for data designation).

Data to be mapped

Name	Register address	
	HEX	DEC
Measured value (PV)	0000	0
Manipulated output value monitor [heat-side]	0002	2
Event 1 state monitor	0011	17
Event 2 state monitor	0012	18

Write register address to be mapped to the register address for the designation of data

Register address for data designation

Name	Register address		Setting data
	HEX	DEC	
Register address setting 1 [Read/write address: 1000H]	0500	1280	0000
Register address setting 2 [Read/write address: 1001H]	0501	1281	0002
Register address setting 3 [Read/write address: 1002H]	0502	1282	0011
Register address setting 4 [Read/write address: 1003H]	0503	1283	0012

The table below shows the assignment of read/write register addresses 1000H to 1003H by the above mapping.

Register address		Name
HEX	DEC	
1000	4096	Measured value (PV)
1001	4097	Manipulated output value monitor [heat-side]
1002	4098	Event 1 state monitor
1003	4099	Event 2 state monitor

2. Reads out the mapping data by following order message.

Slave address		02H	
Function code		03H	
Starting number	High	10H	} First holding register address (1000H)
	Low	00H	
Quantity	High	00H	} Number of data (4)
	Low	04H	
CRC-16	High	40H	
	Low	FAH	

MEMO

COMMUNICATION DATA LIST

6

This chapter describes communication data.

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6.1 Data Map Structure

This chapter contains two types of data maps.

- **RKC Communication/Modbus (Double Word) data map**
- **Modbus (Single word) data map**

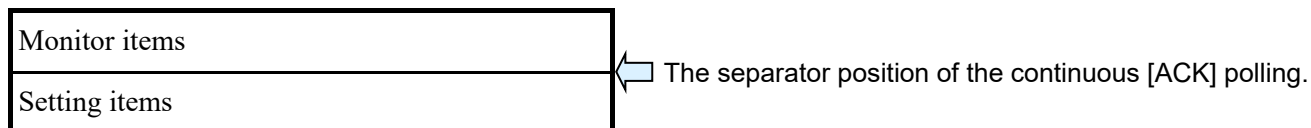
The data length in RKC communication (7 or 6 digits) or the communication data type in Modbus (single word/double word) can be set at Input data type (*Input*).

 For the Input data type, refer to the **3.2 Selection of Communication Data Type (P. 3-5)**.

6.1.1 Structure of RKC Communication/Modbus (Double Word) data map

This part describes identifiers in RKC communication and register addresses in Modbus data (double word). The structure of RKC communication/Modbus (double word) is as follows.

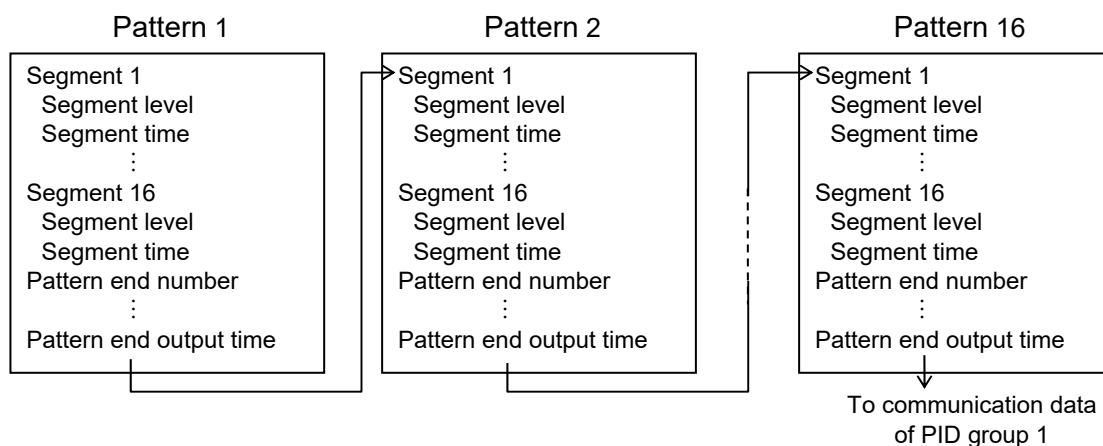
■ RKC communication



● Continuous [ACK (Acknowledgment)] polling

- Continuous [ACK (Acknowledgment)] polling stops between the monitor item and the set item.
- In the case of groups (Pattern & Segment group, Pattern group, PID group, and PLC items group), communication data of the group is sent sequentially, and after completion of this, communication data in the next group is transmitted.

Example: Pattern & Segment group and Pattern group



- When Group zero is specified or when there is no specification of the group, communication data is sent from all groups starting with group 1 after sending communication data of groups now in operation.

■ Modbus (Double word)

HEX: Hexadecimal number DEC: Decimal number

Register address				Contents
HEX		DEC		
Low-order	High-order	Low-order	High-order	
0000 ⋮ 0118	0001 ⋮ 0119	0 ⋮ 280	1 ⋮ 281	Normal setting data Refer to 6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-8).
011A ⋮ 027E	011B ⋮ 027F	282 ⋮ 638	283 ⋮ 639	Data in the Engineering mode Refer to 6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-8).
0280 ⋮ 04FE	0281 ⋮ 04FF	640 ⋮ 1278	641 ⋮ 1279	Illegal register
0500 ⋮ 053E	0501 ⋮ 053F	1280 ⋮ 1342	1281 ⋮ 1343	Mapping setting (32) Refer to ■ Register address for data designation of 6.3.2 Data mapping address [Modbus double word] (P. 6-56).
0540 ⋮ 0FFE	0541 ⋮ 0FFF	1344 ⋮ 4094	1345 ⋮ 4095	Illegal register
1000 ⋮ 103E	1001 ⋮ 103F	4096 ⋮ 4158	4097 ⋮ 4159	Mapping data (32) Refer to ■ Register address for data read/write of 6.3.2 Data mapping address [Modbus double word] (P. 6-59).
1040 ⋮ 14FE	1041 ⋮ 14FF	4160 ⋮ 5374	4161 ⋮ 5375	Illegal register
1500 ⋮ 161E	1501 ⋮ 161F	5376 ⋮ 5562	5377 ⋮ 5563	PID group (Level PID) data Refer to 6.3.3 PID group (Level PID) data [Modbus double word] (P. 6-61).
1620 ⋮ 2FFE	1621 ⋮ 2FFF	5564 ⋮ 12286	5565 ⋮ 12287	Illegal register
3000 ⋮ 35FE	3001 ⋮ 35FF	12288 ⋮ 13822	12289 ⋮ 13823	Pattern & Segment group data Refer to 6.3.4 Pattern & Segment group data [Modbus double word] (P. 6-65).
3600 ⋮ 4FFE	3601 ⋮ 4FFF	13824 ⋮ 20478	13825 ⋮ 20479	Illegal register
5000 ⋮ 537E	5001 ⋮ 537F	20480 ⋮ 21374	20481 ⋮ 21375	Pattern group data Refer to 6.3.5 Pattern group data [Modbus double word] (P. 6-75).
5380 ⋮ 7FFE	5381 ⋮ 7FFF	21376 ⋮ 32766	21377 ⋮ 32767	Illegal register

☞ For the illegal register, refer to the **5.7 Caution for Handling Communication Data (P. 5-13).**

☞ For the Data mapping, refer to the **5.8 How to Use Modbus Data Mapping (P. 5-15).**

6.1.2 Structure of Modbus (Single Word) data map

This part describes register addresses of Modbus data (single word). The structure of the data map of Modbus (single word) is as follows.

HEX: Hexadecimal number DEC: Decimal number

Register address		Contents
HEX	DEC	
0000 ⋮ 008C	0 ⋮ 140	Normal setting data items Refer to 6.4.1 Communication data [Modbus single word] (P. 6-86) .
008D ⋮ 013F	141 ⋮ 319	Data in the Engineering mode Refer to 6.4.1 Communication data [Modbus single word] (P. 6-86) .
0140 ⋮ 04FF	320 ⋮ 1279	Illegal register
0500 ⋮ 051F	1280 ⋮ 1311	Mapping setting (32) Refer to ■ Register address for data designation of 6.4.2 Data mapping address [Modbus single word] (P. 6-93) .
0520 ⋮ 0FFF	1312 ⋮ 4095	Illegal register
1000 ⋮ 101F	4096 ⋮ 4127	Mapping data (32) Refer to ■ Register address for data read/write of 6.4.2 Data mapping address [Modbus single word] (P. 6-95) .
1020 ⋮ 14FF	4128 ⋮ 5375	Illegal register
1500 ⋮ 158F	5376 ⋮ 5519	PID group (Level PID) data Refer to 6.4.3 PID group (Level PID) data [Modbus single word] (P. 6-97) .
1590 ⋮ 2FFF	5520 ⋮ 12287	Illegal register
3000 ⋮ 32FF	12288 ⋮ 13055	Pattern & Segment group data Refer to 6.4.4 Pattern & Segment group data [Modbus single word] (P. 6-99) .
3300 ⋮ 4FFF	13056 ⋮ 20479	Illegal register
5000 ⋮ 51BF	20480 ⋮ 20927	Pattern group data Refer to 6.4.5 Pattern group data [Modbus single word] (P. 6-105) .
51C0 ⋮ 7FFF	20928 ⋮ 32767	Illegal register

 For the illegal register, refer to the **5.7 Caution for Handling Communication Data (P. 5-13)**.

 For the Data mapping, refer to the **5.8 How to Use Modbus Data Mapping (P. 5-15)**.

6.2 How to Read the Table

■ Data map of RKC communication identifiers/Modbus double word

This part describes how to read the data map of **6.3.1 Communication data [RKC communication identifier/Modbus double word]** (P. 6-8).

(1) ↓	(2) ↓	(3) ↓	(4) ↓	(5) ↓	(6) ↓	(7) ↓	(8) ↓			
No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
1	Measured value (PV)	M1	7 or 6	0000	0001	0	1	RO	Input range low – (Input 1_5 % of input span or more) to Input range high + (Input 1_5 % of input span or more) [Varies with the setting of the Decimal point position.]	—
2	Set value (SV) monitor	MS	7 or 6	0002	0003	2	3	RO	Setting limiter low to Setting limiter high [Varies with the setting of the Decimal point position.]	—

(1) **No.:** Communication data number

(2) **Name:** Communication data name

☞ For the unused register, refer to the **5.7 Caution for Handling Communication Data** (P. 5-13).

(3) **Identifier:** Identifier for RKC communication

(4) **Digits:** Number of digits for RKC communication

(5) **Register address:** Register address for Modbus communication
(HEX: Hexadecimal number DEC: Decimal number)

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

RO: Read only data

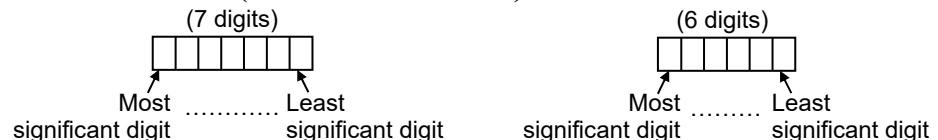
Host computer ← Data direction PZ400/900/401/901

R/W: Read and Write data

Host computer ↔ Data direction PZ400/900/401/901

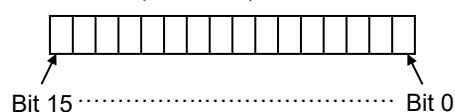
(7) **Data range:** Read or write range of communication data

• ASCII code data (RKC communication)



☞ The data length in RKC communication (7 or 6 digits) can be set at **Input data type (I Ndt)** (P. 3-6).

• 16-bit data (Modbus)



(8) **Factory set value:** Factory set value of communication data



The communication data include “Normal setting data” and “Data in the Engineering mode.”

Normal setting data: No. 1 to 144

Data in the Engineering mode: No. 145 to 326



The attributes of parameters in the Engineering mode are RO (Read only) in the Program control mode (RUN), the Fixed set point control mode (FIX) or the Manual control mode (MAN).

WARNING

Communication data in the Engineering mode 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

Make sure to be in the Reset mode (RESET) before conducting parameter setting in the Engineering mode. However, only checking can be made even in the Program control mode (RUN), the Fixed set point control mode (FIX) and the Manual control mode (MAN).

■ Data map of Modbus single word

This part describes how to read the data map of **6.4.1 Communication data [Modbus single word]** (P. 6-86).

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
1	Measured value (PV)	0000	0	1
2	Set value (SV) monito	0001	1	2

(1) No.: Communication data number

(2) Name: Communication data name

(3) Register address: Register address for Modbus communication
(HEX: Hexadecimal number DEC: Decimal number)

(4) 6.3.1 Reference No.: Refer to **6.3.1 Communication data [RKC communication identifier/Modbus double word]** (P. 6-8) for communication data numbers.

Find the same number in the data map **6.3.1 Communication data [RKC communication identifier/Modbus double word]**, and use the attribute, the data range and the factory set value obtained there.

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
1	Measured value (PV)	M1	7 or 6	0000	0001	0	1	RO	Input range low – (Input 1_5 % of input span or more) to Input range high + (Input 1_5 % of input span or more) [Varies with the setting of the Decimal point position.]	—
2	Set value (SV) monitor	MS	7 or 6	0002	0003	2	3	RO	Setting limiter low to Setting limiter high [Varies with the setting of the Decimal point position.]	—



The communication data include “Normal setting data” and “Data in the Engineering mode.”

Normal setting data: No. 1 to 141

Data in the Engineering mode: No. 142 to 321



The attributes of parameters in the Engineering mode are RO (Read only) in the Program control mode (RUN), the Fixed set point control mode (FIX) or the Manual control mode (MAN).

WARNING

Communication data in the Engineering mode 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

Make sure to be in the Reset mode (RESET) before conducting parameter setting in the Engineering mode. However, only checking can be made even in the Program control mode (RUN), the Fixed set point control mode (FIX) and the Manual control mode (MAN).

6.3 RKC Communication/Modbus (Double Word) Data

The following table shows communication identifiers of RKC communication and double word register address of Modbus.



In case of Input data type “0,” Modbus double word.



Switchover between the single word and the double word can be done at Input data type.

For the Input data type, refer to the **3.2 Selection of Communication Data Type (P. 3-5)**.

6.3.1 Communication data [RKC communication identifier/Modbus double word]

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
1	Measured value (PV)	M1	7 or 6	0000	0001	0	1	RO	Input range low – (5 % of input span or more) to Input range high + (5 % of input span or more) [Varies with the setting of the Decimal point position.]	—
2	Set value (SV) monitor	MS	7 or 6	0002	0003	2	3	RO	Setting limiter low to Setting limiter high [Varies with the setting of the Decimal point position.]	—
3	Manipulated output value monitor [heat-side]	O1	7 or 6	0004	0005	4	5	RO	–5.0 to +105.0 %	—
4	Manipulated output value monitor [cool-side]	O2	7 or 6	0006	0007	6	7	RO	–5.0 to +105.0 %	—
5	Current transformer 1 (CT1) input value monitor	M3	7 or 6	0008	0009	8	9		0.0 to 100.0 A	—
6	Current transformer 2 (CT2) input value monitor	M4	7 or 6	000A	000B	10	11		0.0 to 100.0 A	—
7	Feedback resistance (FBR) input value	M2	7 or 6	000C	000D	12	13		0.0 to 100.0 %	—
8	Pattern number monitor	—	7 or 6	000E	000F	14	15	RO	1 to 16	—

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
9	Segment number monitor	SN	7 or 6	0010	0011	16	17	RO	1 to 16	—
10	Segment remaining time monitor	TR	7 or 6	0012	0013	18	19	RO	RKC communication 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds 200:00: Continuous When the Pattern end signal is valid in the Pattern end mode, the remaining time of the Pattern end output will be displayed. [Time unit depends on the time unit of the setting]	—
									Modbus 0 to 11999 minutes 0 to 11999 seconds 12000: Continuous When the Pattern end signal is valid in the Pattern end mode, the remaining time of the Pattern end output will be displayed. [Time unit depends on the time unit of the setting]	
11	Pattern remaining time monitor	MW	7 or 6	0014	0015	20	21	RO	RKC communication 0 hours 00 minutes to 999 hours 59 minutes or 0 minutes 00 seconds to 999 minutes 59 seconds [Time unit depends on the time unit of the setting]	—
									Modbus 0 to 59999 minutes 0 to 59999 seconds [Time unit depends on the time unit of the setting]	
12	Number of repeating patterns monitor	MY	7 or 6	0016	0017	22	23	RO	1 to 1000 times 1000: Continuous operation	—

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
13	Time signal state	ED	7 or 6	0018	0019	24	25	RO	RKC communication The Time signal state is assigned as a bit image in binary numbers. Bit 0: Time signal 1 Bit 1: Time signal 2 Bit 2: Time signal 3 Bit 3: Time signal 4 Bit 4 to Bit 7: Unused Data 0: OFF 1: ON Modbus 0 to 15 0: OFF +1: Time signal 1 ON +2: Time signal 2 ON +4: Time signal 3 ON +8: Time signal 4 ON When multiple items are applicable, they are summed up.	—
14	Pattern end state	EN	7 or 6	001A	001B	26	27	RO	0: OFF 1: ON (Pattern end state)	—
15	Wait state	WT	7 or 6	001C	001D	28	29	RO	0: OFF 1: ON (Wait state)	—
16	Hold state *	HO	7 or 6	001E	001F	30	31	RW	0: OFF 1: ON (Hold state)	0

* When the Digital input (DI) for the Reset mode (RESET) setting, or the Hold function is closed, this setting is invalid and response is NAK.

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
17	Overall operation status	L0	7 or 6	0020	0021	32	33	RO	0 to 63 0: OFF +1: Program control mode (RUN) state, Fixed set point control mode (FIX) state or Manual control mode (MAN) state +2: Hold state +4: Wait state +8: Pattern end state +16: Autotuning (AT) state or Overall level autotuning (AT) state +32: Communication monitoring result When multiple items are applicable, they are summed up.	—
18	Event 1 state monitor	AA	7 or 6	0022	0023	34	35	RO	0: OFF 1: ON	—
19	Event 2 state monitor	AB	7 or 6	0024	0025	36	37	RO	0: OFF 1: ON	—
20	Event 3 state monitor	AG	7 or 6	0026	0027	38	39	RO	0: OFF 1: ON	—
21	Event 4 state monitor	AH	7 or 6	0028	0029	40	41	RO	0: OFF 1: ON	—
22	Heater break alarm 1 (HBA1) state monitor	AC	7 or 6	002A	002B	42	43	RO	0: OFF 1: ON	—
23	Heater break alarm 2 (HBA2) state monitor	AD	7 or 6	002C	002D	44	45	RO	0: OFF 1: ON	—
24	Control loop break alarm (LBA) state monitor	AE	7 or 6	002E	002F	46	47	RO	0: OFF 1: ON	—

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
25	Comprehensive event state	AJ	7 or 6	0030	0031	48	49	RO	0 to 511 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm (LBA) +128: Input error high +256: Input error low When multiple items are applicable, they are summed up.	—
26	Burnout state monitor	B1	7 or 6	0032	0033	50	51	RO	0: OFF 1: ON	—
27	Feedback resistance (FBR) break monitor	B2	7 or 6	0034	0035	52	53	RO	0: OFF 1: ON	—
28	DI state monitor	L1	7 or 6	0036	0037	54	55	RO	RKC communication The DI state is assigned as a bit image in binary numbers. Bit 0: DI1 Bit 1: DI2 Bit 2: DI3 Bit 3: DI4 Bit 4: DI5 Bit 5: DI6 Bit 6 to Bit 7: Unused Data 0: Open 1: Closed	—

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
28	DI state monitor (Continued from the previous page)	L1	7 or 6	0036	0037	54	55	RO	Modbus 0 to 63 0: Open +1: DI1 Closed +2: DI2 Closed +4: DI3 Closed +8: DI4 Closed +16: DI5 Closed +32: DI6 Closed When multiple items are applicable, they are summed up.	—
29	OUT state monitor	Q1	7 or 6	0038	0039	56	57	RO	RKC communication The OUT state is assigned as a bit image in binary numbers. Bit 0: OUT1 Bit 1: OUT2 Bit 2: OUT3 Bit 3 to Bit 7: Unused Data 0: OFF 1: ON Modbus 0 to 7 0: OFF +1: OUT1 ON +2: OUT2 ON +4: OUT3 ON When multiple items are applicable, they are summed up.	—

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
30	DO state monitor	Q2	7 or 6	003A	003B	58	59	RO	RKC communication The DO state is assigned as a bit image in binary numbers. Bit 0: DO1 Bit 1: DO2 Bit 2: DO3 Bit 3 DO4 Bit 4 to Bit 7: Unused Data 0: OFF 1: ON	—
								Modbus 0 to 15 0: OFF +1: DO1 ON +2: DO2 ON +4: DO3 ON +8: DO4 ON When multiple items are applicable, they are summed up.		
31	PID group	PC	7 or 6	003C	003D	60	61	RO	Switching by Set value (SV): 1 to 8 Switching by Measured value (PV): 1 to 8 [Which PID group can be used depends on the setting of the Level PID action selection.]	—
32	Peak hold monitor	HQ	7 or 6	003E	003F	62	63	RO	Input range low – (5 % of input span) to Input range high + (5 % of input span) [Varies with the setting of the Decimal point position.]	—
33	Bottom hold monitor	FQ	7 or 6	0040	0041	64	65	RO	Input range low – (5 % of input span) to Input range high + (5 % of input span) [Varies with the setting of the Decimal point position.]	—
34	AT remaining time monitor	AN	7 or 6	0042	0043	66	67	RO	RKC communication 0 hours 00 minutes to 48 hours 00 minutes	—
									Modbus 0 to 2880 minutes	

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
35	AT/ST status monitor	AP	7 or 6	0044	0045	68	69	RO	−4 to +2 0: AT/ST complete +1: AT running now +2: ST running now −1: Aborted. Setting changed. −2: Aborted. Abnormal input. −3: Aborted. Timeout. −4: Aborted. Abnormal calculated values.	—
36	Error code	ER	7 or 6	0046	0047	70	71	RO	0 to 71 0: Normal +1: Adjustment data error +2: Data back-up error +4: A/D conversion error (Temperature compensation error included) +64: Display units error When multiple items are applicable, they are summed up.	—
37	Integrated operating time	UT	7 or 6	0048	0049	72	73	RO	0 to 65535 hours	—
38	Peak hold monitor of ambient temperature	HP	7 or 6	004A	004B	74	75	RO	−120 to +120 °C	—
39	ROM version	VR	7 or 6	—	—	—	—	RO	Version of ROM built in the instrument	—
40	Model code monitor	ID	32	—	—	—	—	RO	Model code	—
41	Instrument number monitor	RX	10	—	—	—	—	RO	Instrument serial number	—

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
42	Retransmission output 1 decimal point position	—	—	004C	004D	76	77	RO	0: No decimal place 3: Three decimal places 1: One decimal place 4: Four decimal places 2: Two decimal places When the type of retransmission output is as follows: Varies with the setting of the Decimal point position.	—
43	Retransmission output 2 decimal point position	—	—	004E	004F	78	79	RO	No retransmission output Measured value (PV) Segment level or Set value (SV) in Fixed set point control mode SV monitor value Deviation	—
44	Retransmission output 3 decimal point position	—	—	0050	0051	80	81	RO	When the type of retransmission output is as follows: 1 (One decimal place) Manipulated output value [heat-side] Manipulated output value [cool-side] Current transformer 1 (CT1) input value Current transformer 2 (CT2) input value	—
45	Event 1 decimal point position	—	—	0052	0053	82	83	RO	0: No decimal place 3: Three decimal places 1: One decimal place 4: Four decimal places	—
46	Event 2 decimal point position	—	—	0054	0055	84	85	RO	2: Two decimal places	—
47	Event 3 decimal point position	—	—	0056	0057	86	87	RO	When the event type is No event, Deviation, Process, or SV: Varies with the setting of the Decimal point position.	—
48	Event 4 decimal point position	—	—	0058	0059	88	89	RO	When the Event type is Manipulated output value: 1 (One decimal place)	—
49	Execution pattern selection	ZA	7 or 6	005A	005B	90	91	R/W	RKC communication 0 to 16 Settable only in the RESET mode (RESET) In Program control mode (RUN), Fixed set point control mode (FIX), and Manual control mode (MAN), the Pattern number now in execution will be displayed. Modbus 0 to 16 Settable only in the RESET mode (RESET)	1

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
50	Peak/Bottom hold reset	CQ	7 or 6	005C	005D	92	93	R/W	0: Hold 1: Reset Returns to Hold state automatically after reset.	0
51	Bottom suppression start signal	S8	7 or 6	005E	005F	94	95	R/W	0 to 1 0: No forced ON +1: Bottom suppression action Forced ON	0
52	Operation mode transfer ¹	XM	7 or 6	0060	0061	96	97	R/W	0: Reset mode (RESET) 1: Program control mode (RUN) 2: Fixed set point control mode (FIX) 3: Manual control mode (MAN)	0
53	Step function ²	SK	7 or 6	0062	0063	98	99	R/W	0: Normal state 1: Step	0
54	Autotuning (AT)	G1	7 or 6	0064	0065	100	101	R/W	0: PID control 1: Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to “0.”	0
55	Overall level autotuning (AT)	TT	7 or 6	0066	0067	102	103	R/W	0: Overall level autotuning (AT) OFF 1: Overall level autotuning (AT) ON When the Overall level autotuning (AT) is finished, the control will automatically return to “0.”	0
56	Startup tuning (ST)	ST	7 or 6	0068	0069	104	105	R/W	0: ST unused 1: Execute once * 2: Execute always * When the ST is finished, the control will automatically return to “0.”	0
57	Interlock release	IL	7 or 6	006A	006B	106	107	R/W	0: Interlock release 1: Interlock state “1: Interlock state” is for monitoring the interlocked state. Do not write “1.”	0
58	Set value (SV) in Fixed set point control mode	S1	7 or 6	006C	006D	108	109	R/W	Setting limiter low to Setting limiter high [Varies with the setting of the Decimal point position.]	0

¹ When the Digital input (DI) for the Reset mode (RESET) setting is closed, this setting is invalid and the response is NAK [Negative Acknowledge].

² When the Digital input (DI) for the Reset mode (RESET) setting, or the Hold function is closed, this setting is invalid and response is NAK [Negative Acknowledge].

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
59	Segment level [PN, SN]	LE	7 or 6	006E	006F	110	111	R/W	Setting limiter low to Setting limiter high [Varies with the setting of the Decimal point position.]	0
60	Segment time [PN, SN]	TM	7 or 6	0070	0071	112	113	R/W	RKC communication 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds 200:00: Continuous (Settable only in Soak segments * of segment 2 to 16) * When the segment that is set to continuous becomes no longer a soak segment, the Segment time is automatically set to 199 hours 59 minutes or 199 minutes 59 seconds. [Time unit depends on the time unit of the setting] Modbus 0 to 11999 minutes 0 to 11999 seconds 12000: Continuous (Settable only in Soak segments * of segment 2 to 16) * When the segment that is set to continuous becomes no longer a soak segment, the Segment time is automatically set to 11999 minutes or 11999 seconds. [Time unit depends on the time unit of the setting]	RKC communication: 0:00 (0 hour 00 minutes) Modbus: 0
61	Pattern end number [PN]	PE	7 or 6	0072	0073	114	115	R/W	1 to 16 (Segment number)	16
62	Number of repeating patterns [PN]	RR	7 or 6	0074	0075	116	117	R/W	1 to 1000 times 1000: Continuous operation	1
63	Pattern link number [PN]	LP	7 or 6	0076	0077	118	119	R/W	0 to 16 0: No link	0

Data belonging to [PN, SN]: Pattern & Segment group [Extended identifier: PN (Pattern), SN (Segment) Number of patterns: 16, Number of segments: 16]

Data belonging to [PN]: Pattern group [Extended identifier: PN Number of patterns: 16]

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
64	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high] [PN]	A1	7 or 6	0078	0079	120	121	R/W	Deviation: – Input span to + Input span [Varies with the setting of the Decimal point position.] Input value or Set value: Input range low to Input range high [Varies with the setting of the Decimal point position.] Manipulated output value: –5.0 to +105.0 %	TC/RTD inputs: 10 V/I inputs: 5 % of input span Manipulated output value: 50.0
65	Event 1 set value (EV1') [low] [PN]	BT	7 or 6	007A	007B	122	123	R/W	Deviation: – Input span to + Input span [Varies with the setting of the Decimal point position.] Input value: Input range low to Input range high [Varies with the setting of the Decimal point position.]	TC/RTD inputs: –10 V/I inputs: –5 % of input span
66	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high] [PN]	A2	7 or 6	007C	007D	124	125	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
67	Event 2 set value (EV2') [low] [PN]	BU	7 or 6	007E	007F	126	127	R/W	Same as Event 1 set value (EV1') [low]	
68	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high] [PN]	A7	7 or 6	0080	0081	128	129	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
69	Event 3 set value (EV3') [low] [PN]	BV	7 or 6	0082	0083	130	131	R/W	Same as Event 1 set value (EV1') [low]	

Data belonging to [PN]: Pattern group [Extended identifier: PN Number of patterns: 16]

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
70	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high] [PN]	A8	7 or 6	0084	0085	132	133	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
71	Event 4 set value (EV4') [low] [PN]	BW	7 or 6	0086	0087	134	135	R/W	Same as Event 1 set value (EV1') [low]	
72	Time signal 1 start segment number [PN]	SA	7 or 6	0088	0089	136	137	R/W	1 to 16	1
73	Time signal 1 start time [PN]	T5	7 or 6	008A	008B	138	139	R/W	RKC communication 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds [Time unit depends on the time unit of the setting]	RKC communication: 0:00 (0 hour 00 minutes) Modbus: 0
									Modbus 0 to 11999 minues 0 to 11999 seconds [Time unit depends on the time unit of the setting]	
74	Time signal 1 end segment number [PN]	SO	7 or 6	008C	008D	140	141	R/W	1 to 16	1
75	Time signal 1 end time [PN]	T9	7 or 6	008E	008F	142	143	R/W	RKC communication 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds [Time unit depends on the time unit of the setting]	RKC communication: 0:00 (0 hour 00 minutes) Modbus: 0
									Modbus 0 to 11999 minutes 0 to 11999 seconds [Time unit depends on the time unit of the setting]	

Data belonging to [PN]: Pattern group [Extended identifier: PN Number of patterns: 16]

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
76	Time signal 2 start segment number [PN]	SB	7 or 6	0090	0091	144	145	R/W	Same as Time signal 1 start segment number	
77	Time signal 2 start time [PN]	T6	7 or 6	0092	0093	146	147	R/W	Same as Time signal 1 start time	
78	Time signal 2 end segment number [PN]	SP	7 or 6	0094	0095	148	149	R/W	Same as Time signal 1 end segment number	
79	Time signal 2 end time [PN]	TA	7 or 6	0096	0097	150	151	R/W	Same as Time signal 1 end time	
80	Time signal 3 start segment number [PN]	SC	7 or 6	0098	0099	152	153	R/W	Same as Time signal 1 start segment number	
81	Time signal 3 start time [PN]	T7	7 or 6	009A	009B	154	155	R/W	Same as Time signal 1 start time	
82	Time signal 3 end segment number [PN]	SQ	7 or 6	009C	009D	156	157	R/W	Same as Time signal 1 end segment number	
83	Time signal 3 end time [PN]	TB	7 or 6	009E	009F	158	159	R/W	Same as Time signal 1 end time	
84	Time signal 4 start segment number [PN]	SD	7 or 6	00A0	00A1	160	161	R/W	Same as Time signal 1 start segment number	
85	Time signal 4 start time [PN]	T8	7 or 6	00A2	00A3	162	163	R/W	Same as Time signal 1 start time	

Data belonging to [PN]: Pattern group [Extended identifier: PN Number of patterns: 16]

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
86	Time signal 4 end segment number [PN]	SR	7 or 6	00A4	00A5	164	165	R/W	Same as Time signal 1 end segment number	
87	Time signal 4 end time [PN]	TC	7 or 6	00A6	00A7	166	167	R/W	Same as Time signal 1 end time	
88	Pattern end output time [PN]	ET	7 or 6	00A8	00A9	168	169	R/W	RKC communication 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds 0:00: Output remains on [Time unit depends on the time unit of the setting]	RKC communication: 0:00 (0 hour 00 minute) Modbus: 0
									Modbus 0 to 11999 minutes 0 to 11999 seconds 0: Output remains on [Time unit depends on the time unit of the setting]	
89	Proportional band [heat-side] [K]	P1	7 or 6	00AA	00AB	170	171	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 1000.0 % of Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0
90	Integral time [heat-side] [K]	I1	7 or 6	00AC	00AD	172	173	R/W	PID control or Heat/Cool PID control 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240

Data belonging to [PN]: Pattern group [Extended identifier: PN Number of patterns: 16]

Data belonging to [K]: PID group (Level PID) [Extended identifier: K Number of groups: 8]

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
91	Derivative time [heat-side] [K]	D1	7 or 6	00AE	00AF	174	175	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
92	Control response parameter [K]	CA	7 or 6	00B0	00B1	176	177	R/W	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	2
93	Proactive intensity [K]	ZP	7 or 6	00B2	00B3	178	179	R/W	0 to 4 0: No function	2
94	Manual reset [K]	MR	7 or 6	00B4	00B5	180	181	R/W	−100.0 to +100.0 %	0.0
95	FF amount [K]	F3	7 or 6	00B6	00B7	182	183	R/W	−100.0 to +100.0 %	0.0
96	Output limiter high [heat-side] [K]	OH	7 or 6	00B8	00B9	184	185	R/W	Output limiter low [heat-side] to 105.0 %	105.0
97	Output limiter low [heat-side] [K]	OX	7 or 6	00BA	00BB	186	187	R/W	−5.0 % to Output limiter high [heat-side]	−5.0
98	Control loop break alarm (LBA) time [K]	A5	7 or 6	00BC	00BD	188	189	R/W	0 to 7200 seconds 0: No function	LBA function is specified: 480 LBA function is not specified: 0
99	LBA deadband (LBD) [K]	A6	7 or 6	00BE	00BF	190	191	R/W	0 to Input span [Varies with the setting of the Decimal point position.]	0
100	Unused register	—	—	00C0	00C1	192	193	—	—	—

Data belonging to [K]: PID group (Level PID) [Extended identifier: K Number of groups: 8]

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
101	Proportional band [cool-side] [K]	P2	7 or 6	00C2	00C3	194	195	R/W	TC/RTD inputs 1 (0.1, 0.01) to Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.1 to 1000.0 % of Input span	TC/RTD inputs: 30 V/I inputs: 3.0
102	Integral time [cool-side] [K]	I2	7 or 6	00C4	00C5	196	197	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
103	Derivative time [cool-side] [K]	D2	7 or 6	00C6	00C7	198	199	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
104	Overlap/Deadband [K]	V1	7 or 6	00C8	00C9	200	201	R/W	TC/RTD inputs – Input span to + Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs –100.0 to +100.0 % of Input span Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0
105	Output limiter high [cool-side] [K]	OL	7 or 6	00CA	00CB	202	203	R/W	Heat/Cool PID control Output limiter low [cool-side] to 105.0 %	105.0
	Output limiter low [heat-side] [K]								PID control or Position proportioning PID control –5.0 % to Output limiter high [heat-side] Same data as RKC communication identifier OX	–5.0
106	Output limiter low [cool-side] [K]	OY	7 or 6	00CC	00CD	204	205	R/W	–5.0 % to Output limiter high [cool-side]	–5.0

Data belonging to [K]: PID group (Level PID) [Extended identifier: K Number of groups: 8]

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
107	Automatic level PID setting	LV	7 or 6	00CE	00CF	206	207	R/W	–1: Restore setting before change 0: Automatic setting OFF 1: Automatic setting ON	0
108	Level PID setting 1 *	Q4	7 or 6	00D0	00D1	208	209	R/W	Input range low to Input range high [Varies with the setting of the Decimal point position.]	Input range high
109	Level PID setting 2 *	Q5	7 or 6	00D2	00D3	210	211	R/W	Same as Level PID setting 1	
110	Level PID setting 3 *	Q6	7 or 6	00D4	00D5	212	213	R/W	Same as Level PID setting 1	
111	Level PID setting 4 *	Q7	7 or 6	00D6	00D7	214	215	R/W	Same as Level PID setting 1	
112	Level PID setting 5 *	Q8	7 or 6	00D8	00D9	216	217	R/W	Same as Level PID setting 1	
113	Level PID setting 6 *	Q9	7 or 6	00DA	00DB	218	219	R/W	Same as Level PID setting 1	
114	Level PID setting 7 *	QA		00DC	00DD	220	221	R/W	Same as Level PID setting 1	
115	Wait zone high	ZW	7 or 6	00DE	00DF	222	223	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 100.0 % of Input span 0 (0.0, 0.00): Wait zone high OFF	0

* Level PID settings 1 to 7 of Input 1 always maintain the following relation.

(Level PID setting 1) ≤ (Level PID setting 2) ≤ (Level PID setting 3) ≤ (Level PID setting 4) ≤ (Level PID setting 5) ≤ (Level PID setting 6) ≤ (Level PID setting 7)

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
116	Wait zone low	ZX	7 or 6	00E0	00E1	224	225	R/W	TC/RTD inputs – Input span to 0 (0.0, 0.00) (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs –100.0 to 0.0 % of Input span 0 (0.0, 0.00): Wait zone low OFF	0
117	SV selection at program start	SV	7 or 6	00E2	00E3	226	227	R/W	0: Zero start 1: PV start 2: PV start (time saving)	0
118	Hot/Cold start	XN	7 or 6	00E4	00E5	228	229	R/W	0: Hot start 1 1: Hot start 2 2: Cold start 3: Reset start	0
119	Control action at pattern end	X1	7 or 6	00E6	00E7	230	231	R/W	PID control, Heat/Cool PID control or Position proportioning PID control (With FBR input): 0: Control continued 1: Control stop Position proportioning PID control (When there is no FBR input or the FBR input is break): 0: Control continued 1: Open-side output OFF, Close-side output OFF 2: Open-side output OFF, Close-side output ON 3: Open-side output ON, Close-side output OFF	0
120	Output action at pattern end	X2	7 or 6	00E8	00E9	232	233	R/W	0 to 7 0: OFF +1: Logic calculation output: Action continues +2: Retransmission output: Action continues +4: Instrument status output: Action continues To select two or more functions, sum each value.	7
121	Display update cycle	HE	7 or 6	00EA	00EB	234	235	R/W	1: 50 ms 6: 300 ms 2: 100 ms 7: 350 ms 3: 150 ms 8: 400 ms 4: 200 ms 9: 450 ms 5: 250 ms 10: 500 ms	1

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
122	PV bias	PB	7 or 6	00EC	00ED	236	237	R/W	– Input span to + Input span [Varies with the setting of the Decimal point position.]	0
123	PV digital filter	F1	7 or 6	00EE	00EF	238	239	R/W	0.0 to 100.0 seconds 0.0: Filter OFF	0.0
124	PV ratio	PR	7 or 6	00F0	00F1	240	241	R/W	0.500 to 1.500	1.000
125	PV low input cut-off	DP	7 or 6	00F2	00F3	242	243	R/W	0.00 to 25.00 % of Input span	0.00
126	OUT1 proportional cycle time	T0	7 or 6	00F4	00F5	244	245	R/W	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note1
127	OUT2 proportional cycle time	T1	7 or 6	00F6	00F7	246	247	R/W	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note2
128	OUT3 proportional cycle time	T2	7 or 6	00F8	00F9	248	249	R/W	0.1 to 100.0 seconds	Voltage pulse output: Note3

Note1: In case OUT1 function selection is “Control output [cool-side]” and Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

Note2: In case OUT2 function selection is “Control output [cool-side]” and Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

Note3: In case OUT3 function selection is “Control output [cool-side]” and Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
129	OUT1 minimum ON/OFF time of proportional cycle	OP	7 or 6	00FA	00FB	250	251	R/W	0 to 1000 ms	0
130	OUT2 minimum ON/OFF time of proportional cycle	OQ	7 or 6	00FC	00FD	252	253	R/W	0 to 1000 ms	0
131	OUT3 minimum ON/OFF time of proportional cycle	OR	7 or 6	00FE	00FF	254	255	R/W	0 to 1000 ms	0
132	Heater break alarm 1 (HBA1) set value	A3	7 or 6	0100	0101	256	257	R/W	0.0 to 100.0 A 0.0: HBA function OFF	0.0
133	Number of heater break alarm 1 (HBA1) delay times	TH	7 or 6	0102	0103	258	259	R/W	0 to 255 times	5
134	Heater break alarm 2 (HBA2) set value	A4	7 or 6	0104	0105	260	261	R/W	0.0 to 100.0 A 0.0: HBA function OFF	0.0
135	Number of heater break alarm 2 (HBA2) delay times	TI	7 or 6	0106	0107	262	263	R/W	0 to 255 times	5

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
137	Event selection of the Segment [PN, SN]	AS	7 or 6	0108	0109	264	265	R/W	RKC communication The Event selection of the Segment is assigned as a bit image in binary numbers. Bit 0: Event 1 Bit 1: Event 2 Bit 2: Event 3 Bit 3: Event 4 Bit 4 to Bit 7: Unused Data 0: Unused 1: Used	1111
									Modbus 0 to 15 0: OFF +1: Event 1 is enabled +2: Event 2 is enabled +4: Event 3 is enabled +8: Event 4 is enabled To select two or more functions, sum each value.	15
136	Manual manipulated output value	ON	7 or 6	010A	010B	266	267	R/W	PID control, Position proportioning PID control Output limiter low [heat-side] to Output limiter high [heat-side] Heat/Cool PID control * −(Output limiter high [cool-side]) to +(Output limiter high [heat-side])	PID control, Position proportioning PID control: −5.0 Heat/Cool PID control: 0.0

Data belonging to [PN, SN]: Pattern & Segment group [Extended identifier: PN (Pattern), SN (Segment) Number of patterns: 16, Number of segments: 16]

* In case of Heat/Cool PID control, the data range has such exceptional conditions as shown below.

- (1) Output limiter high [cool-side] is ≤ 0.0 %
 - Output limiter low [heat-side] is ≤ 0.0 %: 0.0 % to +(Output limiter high [heat-side])
 - Output limiter low [heat-side] is > 0.0 %: Output limiter low [heat-side] to Output limiter high [heat-side]
- (2) Output limiter high [heat-side] is ≤ 0.0 %
 - Output limiter low [cool-side] is ≤ 0.0 %: -(Output limiter high [cool-side]) to 0.0 %
 - Output limiter low [cool-side] is > 0.0 %: -(Output limiter high [cool-side]) to -(Output limiter low [cool-side])
- (3) Fixed at 0.0 % in the following cases: Output limiter high [cool-side] ≤ 0.0 %, and Output limiter high [heat-side] ≤ 0.0 %

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
138	ON/OFF action differential gap (upper)	IV	7 or 6	010C	010D	268	269	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 100.0 % of Input span	TC/RTD inputs: 1 V/I inputs: 0.1
139	ON/OFF action differential gap (lower)	IW	7 or 6	010E	010F	270	271	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 100.0 % of Input span	TC/RTD inputs: 1 V/I inputs: 0.1
140	AT bias	GB	7 or 6	0110	0111	272	273	R/W	– Input span to + Input span [Varies with the setting of the Decimal point position.]	0
141	Open/Close output neutral zone	V2	7 or 6	0112	0113	274	275	R/W	0.1 to 10.0 % of output	2.0
142	Open/Close output differential gap	VH	7 or 6	0114	0115	276	277	R/W	0.1 to 5.0 % of output	1.0
143	FF amount learning	G7	7 or 6	0116	0117	278	279	R/W	0 to 1 0: No learning +1: Learn Input	0
144	Determination point of external disturbance	G8	7 or 6	0118	0119	280	281	R/W	– Input span to + Input span [Varies with the setting of the Decimal point position.]	–1

Items 145o 326 are data in the Engineering mode.

WARNING

Communication data the Engineering mode 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

Make sure to be in the **RESET** mode before conducting parameter setting in the Engineering mode. However, only checking can be made even in the **Program control mode (RUN)**, the **Fixed set point control mode (FIX)** and the **Manual control mode (MAN)**.

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
145	Time unit of the setting	X0	7 or 6	011A	011B	282	283	R/W	RKC communication 0: Hour : Minute 1: Minute : Second	0
									Modbus 0: Minute 1: Second	
146	Segment setting change type	SG	7 or 6	011C	011D	284	285	R/W	0: Change type 1 1: Change type 2	0
147	Store segment setting change	SJ	7 or 6	011E	011F	286	287	R/W	0: Store setting 1: Do not store setting	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
148	ALM lamp lighting condition	LY	7 or 6	0120	0121	288	289	R/W	0 to 511 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm (LBA) +128: Input error high +256: Input error low To select two or more functions, sum each value.	127
149	PV flashing display at input error	DU	7 or 6	0122	0123	290	291	R/W	0: Flashing display 1: Non-flashing display	0
150	Select hide items in Monitor mode	LN	7 or 6	0124	0125	292	293	R/W	0 to 31 0: Show all +1: Number of repeating patterns monitor +2: Pattern remaining time monitor +4: Manipulated output value (MV) monitor +8: Current transformer (CT) input value monitor +16: Comprehensive event state To select two or more functions, sum each value.	0
151	Select hide items in Operation transfer mode	LM	7 or 6	0126	0127	294	295	R/W	0 to 31 0: Show all +1: Operation mode transfer +2: Step function +4: Autotuning (AT) +8: Overall level autotuning (AT) +16: Startup tuning (ST) To select two or more functions, sum each value.	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
152	Input type	XI	7 or 6	0128	0129	296	297	R/W	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 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input –10 to +10 V DC 22: Voltage input –5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC	Same as the input type of the input range code specified at the time of order.
153	Display unit	PU	7 or 6	012A	012B	298	299	R/W	0: °C 1: °F	Same as the display unit of the input range code specified at the time of order.
154	Decimal point position	XU	7 or 6	012C	012D	300	301	R/W	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC inputs: W5Re/W26Re, PR40-20: 0 (fixed) Thermocouples other than those shown above: 0 or 1 RTD inputs: 0 to 2 Voltage (V)/Current (I) inputs: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3	Same as the decimal point position of the input range code specified at the time of order. For V/I inputs: 1
155	Input range high	XV	7 or 6	012E	012F	302	303	R/W	(Input range low + 1 digit) to Maximum value of input range [Varies with the setting of the Decimal point position.]	High limit value of the input range code specified at the time of order. For V/I inputs: 100.0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
156	Input range low	XW	7 or 6	0130	0131	304	305	R/W	Minimum value of input range to (Input range high – 1 digit) [Varies with the setting of the Decimal point position.]	Low limit value of the input range code specified at the time of order. For V/I inputs: 0.0
157	Input error determination point (high)	AV	7 or 6	0132	0133	306	307	R/W	Input error determination point (low) to Input range high + (5 % of input span) [Varies with the setting of the Decimal point position.]	Input range high + (5 % of input span)
158	Input error determination point (low)	AW	7 or 6	0134	0135	308	309	R/W	Input range low – (5 % of input span) * to Input error determination point (high) [Varies with the setting of the Decimal point position.] * When Input type of Input 1 is RTD, low limit value is about 2 Ohms. (Pt100: –245.5 °C [–409.8 °F], JPt100: –237.6 °C [–395.7 °F])	Input range low – (5 % of input span)
159	Temperature compensation calculation	R0	7 or 6	0136	0137	310	311	R/W	0: No temperature compensation calculation 1: With temperature compensation calculation	1
160	Burnout direction	BS	7 or 6	0138	0139	312	313	R/W	0: Upscale 1: Downscale	0
161	Square root extraction	XH	7 or 6	013A	013B	314	315	R/W	0: Unused 1: Used	0
162	Inverting input	IB	7 or 6	013C	013D	316	317	R/W	0: Unused 1: Used	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
163	Input data type	SE	7 or 6	013E	013F	318	319	R/W	0: Number of measured value digits: 5 Number of RKC communication data digits: 7 Modbus data: Double word PLC communication data: Double word (System data: Single word) 1: Number of measured value digits: 4 Number of RKC communication data digits: 6 Modbus data: Single word PLC communication data: Single word When changing the Input data type from 0 to 1 (or 2) and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand.	Depends on the input range code specified at the time of order.
164	DI1 function selection	H2	7 or 6	0140	0141	320	321	R/W	0: No function 1: Reset mode (RESET) setting 2: Program control mode (RUN) setting 3: Step function 4: Hold function 5: Interlock release 6: Peak/Bottom hold reset 7: Autotuning (AT) 8: Set data unlock/lock transfer 9: Direct/Reverse action transfer 10: Program pattern No. switching (2 patterns without SET) 11: Program pattern No. switching (8 patterns without SET) 12: Program pattern No. switching (8 patterns with SET) 13: Program pattern No. switching (16 patterns without SET) 14: Program pattern No. switching (16 patterns with SET)	1
165	DI2 function selection	H3	7 or 6	0142	0143	322	323	R/W	0 to 9 Same as DI1 function selection (0 to 9)	2
166	DI3 function selection	H4	7 or 6	0144	0145	324	325	R/W	0 to 9 Same as DI1 function selection (0 to 9)	3
167	DI4 function selection	H5	7 or 6	0146	0147	326	327	R/W	0 to 9 Same as DI1 function selection (0 to 9)	4
168	DI5 function selection	H6	7 or 6	0148	0149	328	329	R/W	0 to 9 Same as DI1 function selection (0 to 9)	5

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
169	DI6 function selection	H7	7 or 6	014A	014B	330	331	R/W	0 to 9 Same as DI1 function selection (0 to 9)	8
170	DI logic invert	D0	7 or 6	014C	014D	332	333	R/W	0 to 3 0: No logic invert +1: Set data unlock/lock transfer +2: Direct/Reverse action transfer To select two or more functions, sum each value.	0
171	OUT1 function selection	E0	7 or 6	014E	014F	334	335	R/W	0: No assignment 1: Control output [heat-side] or [open-side] 2: Control output [cool-side] or [close-side] 3: Retransmission output 4: Logic calculation output (Event, HBA, LBA, Input error) 5: Output of Program control mode (RUN) state 6: Output of Manual control mode (MAN) state 7: Autotuning (AT) state output 8: Output of the communication monitoring result 9: FAIL output (Permanently configured to be de-energized)	Based on Model code
172	OUT2 function selection	E2	7 or 6	0150	0151	336	337	R/W	Same as OUT1 function selection	Based on Model code
173	OUT3 function selection	E3	7 or 6	0152	0153	338	339	R/W	Same as OUT1 function selection	3
174	OUT1 logic calculation selection	W0	7 or 6	0154	0155	340	341	R/W	0 to 511 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm (LBA) +128: Input error high +256: Input error low To select two or more functions, sum each value.	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
175	OUT2 logic calculation selection	W2	7 or 6	0156	0157	342	343	R/W	Same as OUT1 logic calculation selection	0
176	OUT3 logic calculation selection	W3	7 or 6	0158	0159	344	345	R/W	Same as OUT1 logic calculation selection	0
177	Energized/De-energized selection	NA	7 or 6	015A	015B	346	347	R/W	0 to 127 0: All outputs are energized +1: OUT1 de-energized +2: OUT2 de-energized +4: OUT3 de-energized +8: DO1 de-energized +16: DO2 de-energized +32: DO3 de-energized +64: DO4 de-energized To select two or more functions, sum each value.	0
178	Interlock selection	LF	7 or 6	015C	015D	348	349	R/W	0 to 511 0: Unused +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm (LBA) +128: Input error high +256: Input error low To select two or more functions, sum each value.	0
179	Output action in Reset mode	SS	7 or 6	015E	015F	350	351	R/W	0 to 7 0: OFF +1: Logic calculation output: Action continues +2: Retransmission output: Action continues +4: Instrument status output: Action continues To select two or more functions, sum each value.	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
180	Universal output type selection (OUT3)	XO	7 or 6	0160	0161	352	353	R/W	0: Voltage pulse output 1: Current output (4 to 20 mA DC) 2: Current output (0 to 20 mA DC)	1
181	Retransmission output 1 type	LA	7 or 6	0162	0163	354	355	R/W	0: No retransmission output 1: Measured value (PV) 2: Segment level or Set value (SV) in Fixed set point control mode 3: SV monitor value 4: Deviation 5: Manipulated output value [heat-side] 6: Manipulated output value [cool-side] 7: Current transformer 1 (CT1) input value * 8: Current transformer 2 (CT2) input value * * Setting will be ignored if Current transformer (CT) input is not specified at the time of order.	0
182	Retransmission output 1 scale high	HV	7 or 6	0164	0165	356	357	R/W	No retransmission output, Measured value (PV), Segment level, Set value (SV) in Fixed set point control mode and SV monitor value Input range low to Input range high [Varies with the setting of the Decimal point position.] Deviation – Input span to + Input span [Varies with the setting of the Decimal point position.] Manipulated output value –5.0 to +105.0 % Current transformer (CT) input value 0.0 to 100.0 %	No retransmission output, Measured value (PV), Segment level, Set value (SV) in Fixed set point control mode and SV monitor value: Input range high Deviation: + Input span Manipulated output value, and Current transformer (CT) input value: 100.0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
183	Retransmission output 1 scale low	HW	7 or 6	0166	0167	358	359	R/W	No retransmission output, Measured value (PV), Segment level, Set value (SV) in Fixed set point control mode and SV monitor value Input range low to Input range high [Varies with the setting of the Decimal point position.] Deviation – Input span to + Input span [Varies with the setting of the Decimal point position.] Manipulated output value –5.0 to +105.0 % Current transformer (CT) input value 0.0 to 100.0 %	No retransmission output, Measured value (PV), Segment level, Set value (SV) in Fixed set point control mode and SV monitor value: Input range low Deviation: – Input span Manipulated output value, and Current transformer (CT) input value: 0.0
184	Retransmission output 2 type	LB	7 or 6	0168	0169	360	361	R/W	Same as Retransmission output 1 type	Based on Model code
185	Retransmission output 2 scale high	CV	7 or 6	016A	016B	362	363	R/W	Same as Retransmission output 1 scale high	
186	Retransmission output 2 scale low	CW	7 or 6	016C	016D	364	365	R/W	Same as Retransmission output 1 scale low	
187	Retransmission output 3 type	LC	7 or 6	016E	016F	366	367	R/W	Same as Retransmission output 1 type	Based on Model code
188	Retransmission output 3 scale high	EV	7 or 6	0170	0171	368	369	R/W	Same as Retransmission output 1 scale high	
189	Retransmission output 3 scale low	EW	7 or 6	0172	0173	370	371	R/W	Same as Retransmission output 1 scale low	

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
190	DO1 function selection	E4	7 or 6	0174	0175	372	373	R/W	0: No assignment 1: Logic calculation output (Event, HBA, LBA, Input error) 2: Output of Program control mode (RUN) state 3: Output of Manual control mode (MAN) state 4: Autotuning (AT) state output 5: Output of the communication monitoring result 6: FAIL output (Permanently configured to be deenergized) 7: Time signal 8: Pattern end signal	Based on Model code
191	DO2 function selection	E5	7 or 6	0176	0177	374	375	R/W	Same as DO1 function selection	Based on Model code
192	DO3 function selection	E6	7 or 6	0178	0179	376	377	R/W	Same as DO1 function selection	Based on Model code
193	DO4 function selection	E7	7 or 6	017A	017B	378	379	R/W	Same as DO1 function selection	Based on Model code
194	DO1 logic calculation selection	W4	7 or 6	017C	017D	380	381	R/W	0 to 511 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm (LBA) +128: Input error high +256: Input error low To select two or more functions, sum each value.	Based on Model code
195	DO2 logic calculation selection	W5	7 or 6	017E	017F	382	383	R/W	Same as DO1 logic calculation selection	Based on Model code

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
196	DO3 logic calculation selection	W6	7 or 6	0180	0181	384	385	R/W	Same as DO1 logic calculation selection	Based on Model code
197	DO4 logic calculation selection	W7	7 or 6	0182	0183	386	387	R/W	Same as DO1 logic calculation selection	Based on Model code
198	DO1 time signal selection	DJ	7 or 6	0184	0185	388	389	R/W	RKC communication The DO1 time signal selection is assigned as a bit image in binary numbers. Bit 0: Time signal 1 Bit 1: Time signal 2 Bit 2: Time signal 3 Bit 3: Time signal 4 Bit 4 to Bit 7: Unused Data 0: Unused 1: Used	0000
									Modbus 0 to 15 0: OFF +1: Time signal 1 is enabled +2: Time signal 2 is enabled +4: Time signal 3 is enabled +8: Time signal 4 is enabled To select two or more functions, sum each value.	0
199	DO2 time signal selection	DK	7 or 6	0186	0187	390	391	R/W	Same as DO1 time signal selection	
200	DO3 time signal selection	DL	7 or 6	0188	0189	392	393	R/W	Same as DO1 time signal selection	
201	DO4 time signal selection	DM	7 or 6	018A	018B	394	395	R/W	Same as DO1 time signal selection	

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
202	Event 1 type	XA	7 or 6	018C	018D	396	397	R/W	0: None 1: Deviation high (Using SV monitor value) ^a 2: Deviation low (Using SV monitor value) ^a 3: Deviation high/low (Using SV monitor value) ^a 4: Band (Using SV monitor value) ^a 5: Deviation high/low (Using SV monitor value) [High/Low individual setting] ^a 6: Band (Using SV monitor value) [High/Low individual setting] ^a 7: SV high (Using SV monitor value) 8: SV low (Using SV monitor value) 9: Process high ^b 10: Process low ^b 11: Deviation high (Using segment level) ^a 12: Deviation low (Using segment level) ^a 13: Deviation high/low (Using segment level) ^a 14: Band (Using segment level) ^a 15: Deviation high/low (Using segment level) [High/Low individual setting] ^a 16: Band (Using segment level) [High/Low individual setting] ^a 17: SV high (Using segment level) 18: SV low (Using segment level) 19: MV high [heat-side] ^{b, c} 20: MV low [heat-side] ^{b, c} 21: MV high [cool-side] ^b 22: MV low [cool-side] ^b 23: Process high/low [High/Low individual setting] ^b 24: Process band [High/Low individual setting] ^b ^a Event hold and re-hold action is available. ^b Event hold action is available. ^c When the instrument is specified as position proportioning PID control with feedback resistance, this item becomes Feedback resistance (FBR) input.	If the Event type is specified by the Digital output function selection of initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified by the Digital output function selection of initial setting code: 1

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
203	Event 1 hold action	WA	7 or 6	018E	018F	398	399	R/W	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the Digital output function selection of initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified by the Digital output function selection of initial setting code: 0
204	Event 1 differential gap	HA	7 or 6	0190	0191	400	401	R/W	Deviation, Process and SV: 0 to Input span [Varies with the setting of the Decimal point position.] MV: 0.0 to 110.0 %	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 % of Input span MV: 0.2
205	Event 1 timer	TD	7 or 6	0192	0193	402	403	R/W	0.0 to 600.0 seconds	0.0
206	Event 2 type	XB	7 or 6	0194	0195	404	405	R/W	Same as Event 1 type	Same as Event 1 type If the Event type is not specified by the Digital output function selection of initial setting code: 2
207	Event 2 hold action	WB	7 or 6	0196	0197	406	407	R/W	Same as Event 1 hold action	
208	Event 2 differential gap	HB	7 or 6	0198	0199	408	409	R/W	Same as Event 1 differential gap	
209	Event 2 timer	TG	7 or 6	019A	019B	410	411	R/W	Same as Event 1 timer	
210	Event 3 type	XC	7 or 6	019C	019D	412	413	R/W	Same as Event 1 type	Same as Event 1 type If the Event type is not specified by the Digital output function selection of initial setting code: 0

No.	Name	Identifier	Digits	Register address				Attribute	Data range		Factory set value
				HEX		DEC					
				Low-order	High-order	Low-order	High-order				
211	Event 3 hold action	WC	7 or 6	019E	019F	414	415	R/W	Same as Event 1 hold action		
212	Event 3 differential gap	HC	7 or 6	01A0	01A1	416	417	R/W	Same as Event 1 differential gap		
213	Event 3 timer	TE	7 or 6	01A2	01A3	418	419	R/W	Same as Event 1 timer		
214	Event 4 type	XD	7 or 6	01A4	01A5	420	421	R/W	Same as Event 1 type	Same as Event 1 type If the Event type is not specified by the Digital output function selection of initial setting code: 0	
215	Event 4 hold action	WD	7 or 6	01A6	01A7	422	423	R/W	Same as Event 1 hold action		
216	Event 4 differential gap	HD	7 or 6	01A8	01A9	424	425	R/W	Same as Event 1 differential gap		
217	Event 4 timer	TF	7 or 6	01AA	01AB	426	427	R/W	Same as Event 1 timer		
218	CT1 assignment	ZF	7 or 6	01AC	01AD	428	429	R/W	0: None 1: OUT1 2: OUT2 3: OUT3	If the Current transformer (CT) input is specified by the Option 1 type when ordering: 1 If the Current transformer (CT) input is not specified: 0	
219	CT1 type	YE	7 or 6	01AE	01AF	430	431	R/W	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code	
220	CT1 ratio	XS	7 or 6	01B0	01B1	432	433	R/W	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000	

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
221	CT1 low input cut-off	M5	7 or 6	01B2	01B3	434	435	R/W	0.0 to 1.0 A	0.0
222	CT2 assignment	ZG	7 or 6	01B4	01B5	436	437	R/W	0: None 1: OUT1 2: OUT2 3: OUT3	If the Current transformer (CT) input is specified by the Option 1 type when ordering: 1 If the Current transformer (CT) input is not specified: 0
223	CT2 type	YF	7 or 6	01B6	01B7	438	439	R/W	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code
224	CT2 ratio	XT	7 or 6	01B8	01B9	440	441	R/W	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000
225	CT2 low input cut-off	M7	7 or 6	01BA	01BB	442	443	R/W	0.0 to 1.0 A	0.0
226	Manual manipulated output value selection	OT	7 or 6	01BC	01BD	444	445	R/W	0: The last manipulated output value (Balanceless-bumpless function) 1: Manual manipulated output value	0
227	Integral/Derivative time decimal point position	PK	7 or 6	01BE	01BF	446	447	R/W	0: No decimal place 1: One decimal place 2: Two decimal places	0
228	ST start condition	SU	7 or 6	01C0	01C1	448	449	R/W	0: Activate the Startup tuning (ST) function when the power is turned on; when transferred from RESET to RUN/FIX; or when the Set value (SV) is changed. 1: Activate the Startup tuning (ST) function when the power is turned on; when transferred from RESET to RUN/FIX 2: Activate the Startup tuning (ST) function when the Set value (SV) is changed.	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
229	Time signal selection	TS	7 or 6	01C2	01C3	450	451	R/W	RKC communication The time signal selection is assigned as a bit image in binary numbers. Bit 0: Time signal 1 Bit 1: Time signal 2 Bit 2: Time signal 3 Bit 3: Time signal 4 Bit 4 to Bit 7: Unused Data 0: Unused 1: Used Modbus 0 to 15 0: OFF +1: Time signal 1 is enabled +2: Time signal 2 is enabled +4: Time signal 3 is enabled +8: Time signal 4 is enabled To select two or more functions, sum each value.	Based on Model code
230	Pattern end signal selection	EP	7 or 6	01C4	01C5	452	453	R/W	0: Unused 1: Used	Based on Model code
231	Control action	XE	7 or 6	01C6	01C7	454	455	R/W	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling linear type] 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action)	Control action specified at the time of order.

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
232	Output change rate limiter (up) [heat-side]	PH	7 or 6	01C8	01C9	456	457	R/W	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0
233	Output change rate limiter (down) [heat-side]	PL	7 or 6	01CA	01CB	458	459	R/W	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0
234	Action (high) input error	WH	7 or 6	01CC	01CD	460	461	R/W	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual control mode) 2: Manipulated output value at input error (Program control mode, Fixed set point control mode)	2
235	Action (low) input error	WL	7 or 6	01CE	01CF	462	463	R/W	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual control mode) 2: Manipulated output value at input error (Program control mode, Fixed set point control mode)	2
236	Manipulated output value at input error	OE	7 or 6	01D0	01D1	464	465	R/W	PID control, Position proportioning PID control –5.0 to +105.0 % Heat/Cool PID control –105.0 to +105.0 %	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0
237	Manipulated output value in Reset mode [heat-side]	OF	7 or 6	01D2	01D3	466	467	R/W	–5.0 to +105.0 %	–5.0
238	Start determination point	SX	7 or 6	01D4	01D5	468	469	R/W	0 to Input span 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of input span
239	Level PID action selection	PP	7 or 6	01D6	01D7	470	471	R/W	0: No Level PID* 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action) * When the setting is "No Level PID", the setting of PID group numbers 02 to 08 are invalid.	0
240	Level PID differential gap	L5	7 or 6	01D8	01D9	472	473	R/W	0 to Input span [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2
241	Unused register	—	—	01DA	01DB	474	475	—	—	—

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
242	Action at feedback resistance (FBR) input error	SY	7 or 6	01DC	01DD	476	477	R/W	0: Action depending on the Valve action in Reset mode 1: Control action continued	0
243	Feedback adjustment	FV	7 or 6	01DE	01DF	478	479	R/W	0: Adjustment end 1: During adjustment on the open-side 2: During adjustment on the close-side 3: Adjustment error	0
244	Control motor time	TN	7 or 6	01E0	01E1	480	481	R/W	5 to 1000 seconds	10
245	Integrated output limiter	OK	7 or 6	01E2	01E3	482	483	R/W	0.0 to 200.0 % of control motor time 0.0: No function	150.0
246	Valve action in Reset mode	VS	7 or 6	01E4	01E5	484	485	R/W	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
247	Action at saturated output	UZ	7 or 6	01E6	01E7	486	487	R/W	0: Invalid (The close-side [or open-side] output turns to OFF when the valve position is fully closed [or opened]). 1: Valid (The close-side [or open-side] output remains ON state when the valve position is fully closed [or opened]).	0
248	Output change rate limiter (up) [cool-side]	PM	7 or 6	01E8	01E9	488	489	R/W	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0
249	Output change rate limiter (down) [cool-side]	PN	7 or 6	01EA	01EB	490	491	R/W	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0
250	Manipulated output value in Reset mode [cool-side]	OG	7 or 6	01EC	01ED	492	493	R/W	−5.0 to +105.0 %	−5.0
251	Undershoot suppression factor	KB	7 or 6	01EE	01EF	494	495	R/W	0.000 to 1.000	Water cooling: 0.100 Air cooling: 0.250 Cooling linear: 1.000
252	Overlap/Deadband reference point	UY	7 or 6	01F0	01F1	496	497	R/W	0.0 to 1.0	0.0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value																																																				
				HEX		DEC																																																								
				Low-order	High-order	Low-order	High-order																																																							
253	Bottom suppression function	G6	7 or 6	01F2	01F3	498	499	R/W	0: No function 1: FF amount is added by level 2: FF amount is forcibly added	0																																																				
254	Communication protocol	IS	7 or 6	01F4	01F5	500	501	R/W	0: RKC communication 1: Modbus (Order of data transfer: high-order word to low-order word) 2: Modbus (Order of data transfer: low-order word to high-order word) 3: PLC communication (MITSUBISHI MELSEC series special protocol QnA compatible 3C frame [Format 4])	When the communication protocol is specified at the time of order, the specified communication protocol will be the factory set value. With communication, communication protocol not specified: 0																																																				
255	Device address	IP	7 or 6	01F6	01F7	502	503	R/W	RKC communication: 0 to 99 Modbus: 1 to 99 PLC communication: 0 to 30	RKC communication: 0 Modbus: 1 PLC communication: 0																																																				
256	Communication speed	IR	7 or 6	01F8	01F9	504	505	R/W	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps	3																																																				
257	Data bit configuration	IQ	7 or 6	01FA	01FB	506	507	R/W	Data bit configuration table<table><tr><th>Set value</th><th>Data bit</th><th>Parity bit</th><th>Stop bit</th></tr><tr><td>0</td><td>8</td><td>None</td><td>1</td></tr><tr><td>1</td><td>8</td><td>None</td><td>2</td></tr><tr><td>2</td><td>8</td><td>Even</td><td>1</td></tr><tr><td>3</td><td>8</td><td>Even</td><td>2</td></tr><tr><td>4</td><td>8</td><td>Odd</td><td>1</td></tr><tr><td>5</td><td>8</td><td>Odd</td><td>2</td></tr><tr><td>6</td><td>7</td><td>None</td><td>1</td></tr><tr><td>7</td><td>7</td><td>None</td><td>2</td></tr><tr><td>8</td><td>7</td><td>Even</td><td>1</td></tr><tr><td>9</td><td>7</td><td>Even</td><td>2</td></tr><tr><td>10</td><td>7</td><td>Odd</td><td>1</td></tr><tr><td>11</td><td>7</td><td>Odd</td><td>2</td></tr></table> RKC communication: 0 to 11 Modbus: 0 to 5	Set value	Data bit	Parity bit	Stop bit	0	8	None	1	1	8	None	2	2	8	Even	1	3	8	Even	2	4	8	Odd	1	5	8	Odd	2	6	7	None	1	7	7	None	2	8	7	Even	1	9	7	Even	2	10	7	Odd	1	11	7	Odd	2	0
Set value	Data bit	Parity bit	Stop bit																																																											
0	8	None	1																																																											
1	8	None	2																																																											
2	8	Even	1																																																											
3	8	Even	2																																																											
4	8	Odd	1																																																											
5	8	Odd	2																																																											
6	7	None	1																																																											
7	7	None	2																																																											
8	7	Even	1																																																											
9	7	Even	2																																																											
10	7	Odd	1																																																											
11	7	Odd	2																																																											

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
258	Interval time	IT	7 or 6	01FC	01FD	508	509	R/W	0 to 250 ms	10
259	Register type	QZ	7 or 6	01FE	01FF	510	511	R/W	MITSUBISHI PLC 0: D register (data register) 1: R register (file register) 2: W register (link register) 3: ZR register (Method of specifying consecutive numbers when 32767 of R register is exceeded.)	0
260	Register start number (High-order 4-bit)	QS	7 or 6	0200	0201	512	513	R/W	0 to 15	0
261	Register start number (Low-order 16-bit)	QX	7 or 6	0202	0203	514	515	R/W	0 to 65535	1000
262	Monitor item register bias	R3	7 or 6	0204	0205	516	517	R/W	12 to 65535	12
263	Setting item register bias	R4	7 or 6	0206	0207	518	519	R/W	0 to 65535	0
264	Instrument link recognition time	QT	7 or 6	0208	0209	520	521	R/W	0 to 255 seconds	5
265	PLC response waiting time	VT	7 or 6	020A	020B	522	523	R/W	0 to 3000 ms	255
266	PLC communication start time	R5	7 or 6	020C	020D	524	525	R/W	1 to 255 seconds	5
267	Slave register bias	R8	7 or 6	020E	020F	526	527	R/W	0 to 65535	140

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
268	Number of recognizable devices	QU	7 or 6	0210	0211	528	529	R/W	0 to 30	8
269	Station number	QV	7 or 6	0212	0213	530	531	R/W	0 to 31	0
270	PC number	QW	7 or 6	0214	0215	532	533	R/W	0 to 255	255
271	Monitor item selection [M]	R6	7 or 6	—	—	—	—	R/W	0 to 65535 For details, refer to PLC communication manual.	—
272	Setting item selection [M]	RE	7 or 6	—	—	—	—	R/W	0 to 65535 For details, refer to PLC communication manual.	—
273	Monitor item selection 1	—	—	0216	0217	534	535	R/W	0 to 65535 For details, refer to PLC communication manual.	4031
274	Monitor item selection 2	—	—	0218	0219	536	537	R/W		1028
275	Monitor item selection 3	—	—	021A	021B	538	539	R/W		32
276	Setting item selection 1	—	—	021C	021D	540	541	R/W	0 to 65535 For details, refer to PLC communication manual.	121
277	Setting item selection 2	—	—	021E	021F	542	543	R/W		0
278	Setting item selection 3	—	—	0220	0221	544	545	R/W		40
279	Setting item selection 4	—	—	0222	0223	546	547	R/W		7183
280	Setting item selection 5	—	—	0224	0225	548	549	R/W		0
281	Setting item selection 6	—	—	0226	0227	550	551	R/W		0
282	Setting item selection 7	—	—	0228	0229	552	553	R/W		0
283	Setting item selection 8	—	—	022A	022B	554	555	R/W		0
284	Setting item selection 9	—	—	022C	022D	556	557	R/W		0

Data belonging to [M]: PLC item group [Extended identifier: M Number of groups of Monitor item selection: 3 Number of groups of Setting item selection: 27]

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
285	Setting item selection 10	—	—	022E	022F	558	559	R/W	0 to 65535 For details, refer to PLC communication manual.	0
286	Setting item selection 11	—	—	0230	0231	560	561	R/W		0
287	Setting item selection 12	—	—	0232	0233	562	563	R/W		3
288	Setting item selection 13	—	—	0234	0235	564	565	R/W		0
289	Setting item selection 14	—	—	0236	0237	566	567	R/W		0
290	Setting item selection 15	—	—	0238	0239	568	569	R/W		0
291	Setting item selection 16	—	—	023A	023B	570	571	R/W		0
292	Setting item selection 17	—	—	023C	023D	572	573	R/W		0
293	Setting item selection 18	—	—	023E	023F	574	575	R/W		0
294	Setting item selection 19	—	—	0240	0241	576	577	R/W		0
295	Setting item selection 20	—	—	0242	0243	578	579	R/W		0
296	Setting item selection 21	—	—	0244	0245	580	581	R/W		0
297	Setting item selection 22	—	—	0246	0247	582	583	R/W		0
298	Setting item selection 23	—	—	0248	0249	584	585	R/W		0
299	Setting item selection 24	—	—	024A	024B	586	587	R/W		0
300	Setting item selection 25	—	—	024C	024D	588	589	R/W		0
301	Setting item selection 26	—	—	024E	024F	590	591	R/W		0
302	Setting item selection 27	—	—	0250	0251	592	593	R/W		0
303	Setting limiter high	SH	7 or 6	0252	0253	594	595	R/W	Setting limiter low to Input range high [Varies with the setting of the Decimal point position.]	Input range high
304	Setting limiter low	SL	7 or 6	0254	0255	596	597	R/W	Setting limiter low to Input range high [Varies with the setting of the Decimal point position.]	Input range low

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
305	Initialization	DC	7 or 6	0256	0257	598	599	R/W	1225: Start initialization Other values: Set values are maintained After the initialization, this instrument is restarted. This setting will automatically go back to zero.	0
306	Set data unlock/lock transfer	LU	7 or 6	0258	0259	600	601	R/W	0: Unlock state 1: Lock state	0
307	Set lock level	LK	7 or 6	025A	025B	602	603	R/W	RKC communication The Set lock level is assigned as a bit image in binary numbers. Bit 0: Program setting mode + Parameter select mode Bit 1: Operation transfer mode Bit 2: Parameter setting mode Bit 3 Setup setting mode Bit 4 Engineering mode Bit 5 to Bit 7: Unused Data 0: Unlock 1: Lock	00000
									Modbus 0 to 31 0: Unlock + 1: Program setting mode + Parameter select mode + 2: Operation transfer mode + 4: Parameter setting mode + 8: Setup setting mode +16: Engineering mode To select two or more functions, sum each value.	0
308	Select Blind function	BQ	7 or 6	025C	025D	604	605	R/W	0: Blind function: OFF 1: Blind function: ON	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
309	Parameter select direct registration	LD	7 or 6	025E	025F	606	607	R/W	0: Direct registration: OFF 1: Direct registration: ON	0
310	Parameter select setting 1	BA	7 or 6	0260	0261	608	609	R/W	0 to 254 (Screen No.) 0: No registration	0
311	Parameter select setting 2	BB	7 or 6	0262	0263	610	611	R/W	0 to 254 (Screen No.) 0: No registration	0
312	Parameter select setting 3	BC	7 or 6	0264	0265	612	613	R/W	0 to 254 (Screen No.) 0: No registration	0
313	Parameter select setting 4	BD	7 or 6	0266	0267	614	615	R/W	0 to 254 (Screen No.) 0: No registration	0
314	Parameter select setting 5	BE	7 or 6	0268	0269	616	617	R/W	0 to 254 (Screen No.) 0: No registration	0
315	Parameter select setting 6	BF	7 or 6	026A	026B	618	619	R/W	0 to 254 (Screen No.) 0: No registration	0
316	Parameter select setting 7	BG	7 or 6	026C	026D	620	621	R/W	0 to 254 (Screen No.) 0: No registration	0
317	Parameter select setting 8	BH	7 or 6	026E	026F	622	623	R/W	0 to 254 (Screen No.) 0: No registration	0
318	Parameter select setting 9	BI	7 or 6	0270	0271	624	625	R/W	0 to 254 (Screen No.) 0: No registration	0
319	Parameter select setting 10	BJ	7 or 6	0272	0273	626	627	R/W	0 to 254 (Screen No.) 0: No registration	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
320	Parameter select setting 11	BK	7 or 6	0274	0275	628	629	R/W	0 to 254 (Screen No.) 0: No registration	0
321	Parameter select setting 12	BL	7 or 6	0276	0277	630	631	R/W	0 to 254 (Screen No.) 0: No registration	0
322	Parameter select setting 13	BM	7 or 6	0278	0279	632	633	R/W	0 to 254 (Screen No.) 0: No registration	0
323	Parameter select setting 14	BN	7 or 6	027A	027B	634	635	R/W	0 to 254 (Screen No.) 0: No registration	0
324	Parameter select setting 15	BO	7 or 6	027C	027D	636	637	R/W	0 to 254 (Screen No.) 0: No registration	0
325	Parameter select setting 16	BP	7 or 6	027E	027F	638	639	R/W	0 to 254 (Screen No.) 0: No registration	0
326	Select hide items in Program setting mode	LQ	7 or 6	0280	0281	640	641	R/W	0 to 31 0: Show all +1: Segment setting +2: Pattern end output time +4: Time signal setting +8: Event setting +16: Repeat and link setting To select two or more functions, sum each value.	0

6.3.2 Data mapping address [Modbus double word]

Necessary data can be read/written at one time by assigning any desired data (max. 32) continuously.

 For the Data mapping, refer to the **5.8 How to Use Modbus Data Mapping (P. 5-15)**.

■ Register address for data designation

No.	Name	Registeraddress				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
1	Register address setting 1 [Read/write address: Low-order word 1000H, high-order word 1001H]	0500	0501	1280	1281	R/W	Set the register address of data to be assigned to 1000H to 103FH Decimal number: -1 to 32767 (-1: Without mapping) Hexadecimal numeral: FFFFH to 7FFFH (FFFFH: Without mapping) The register addresses for data designation (0500H to 053FH) and read/write (1000H to 103FH) will be invalid (without mapping), even if set.	-1
2	Register address setting 2 [Read/write address: Low-order word 1002H, high-order word 1003H]	0502	0503	1282	1283	R/W		-1
3	Register address setting 3 [Read/write address: Low-order word 1004H, high-order word 1005H]	0504	0505	1284	1285	R/W		-1
4	Register address setting 4 [Read/write address: Low-order word 1006H, high-order word 1007H]	0506	0507	1286	1287	R/W		-1
5	Register address setting 5 [Read/write address: Low-order word 1008H, high-order word 1009H]	0508	0509	1288	1289	R/W		-1
6	Register address setting 6 [Read/write address: Low-order word 100AH, high-order word 100BH]	050A	050B	1290	1291	R/W		-1
7	Register address setting 7 [Read/write address: Low-order word 100CH, high-order word 100DH]	050C	050D	1292	1293	R/W		-1
8	Register address setting 8 [Read/write address: Low-order word 100EH, high-order word 100FH]	050E	050F	1294	1295	R/W		-1
9	Register address setting 9 [Read/write address: Low-order word 1010H, high-order word 1011H]	0510	0511	1296	1297	R/W		-1
10	Register address setting 10 [Read/write address: Low-order word 1012H, high-order word 1013H]	0512	0513	1298	1299	R/W		-1
11	Register address setting 11 [Read/write address: Low-order word 1014H, high-order word 1015H]	0514	0515	1300	1301	R/W		-1
12	Register address setting 12 [Read/write address: Low-order word 1016H, high-order word 1017H]	0516	0517	1302	1303	R/W		-1

No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
13	Register address setting 13 [Read/write address: Low-order word 1018H, high-order word 1019H]	0518	0519	1304	1305	R/W	Set the register address of data to be assigned to 1000H to 103FH Decimal number: –1 to 32767 (–1: Without mapping) Hexadecimal numeral: FFFFH to 7FFFH (FFFFH: Without mapping) The register addresses for data designation (0500H to 053FH) and read/write (1000H to 103FH) will be invalid (without mapping), even if set.	–1
14	Register address setting 14 [Read/write address: Low-order word 101AH, high-order word 101BH]	051A	051B	1306	1307	R/W		–1
15	Register address setting 15 [Read/write address: Low-order word 101CH, high-order word 101DH]	051C	051D	1308	1309	R/W		–1
16	Register address setting 16 [Read/write address: Low-order word 101EH, high-order word 101FH]	051E	051F	1310	1311	R/W		–1
17	Register address setting 17 [Read/write address: Low-order word 1020H, high-order word 1021H]	0520	0521	1312	1313	R/W		–1
18	Register address setting 18 [Read/write address: Low-order word 1022H, high-order word 1023H]	0522	0523	1314	1315	R/W		–1
19	Register address setting 19 [Read/write address: Low-order word 1024H, high-order word 1025H]	0524	0525	1316	1317	R/W		–1
20	Register address setting 20 [Read/write address: Low-order word 1026H, high-order word 1027H]	0526	0527	1318	1319	R/W		–1
21	Register address setting 21 [Read/write address: Low-order word 1028H, high-order word 1029H]	0528	0529	1320	1321	R/W		–1
22	Register address setting 22 [Read/write address: Low-order word 102AH, high-order word 102BH]	052A	052B	1322	1323	R/W		–1
23	Register address setting 23 [Read/write address: Low-order word 102CH, high-order word 102DH]	052C	052D	1324	1325	R/W		–1
24	Register address setting 24 [Read/write address: Low-order word 102EH, high-order word 102FH]	052E	052F	1326	1327	R/W		–1
25	Register address setting 25 [Read/write address: Low-order word 1030H, high-order word 1031H]	0530	0531	1328	1329	R/W		–1
26	Register address setting 26 [Read/write address: Low-order word 1032H, high-order word 1033H]	0532	0533	1330	1331	R/W		–1
27	Register address setting 27 [Read/write address: Low-order word 1034H, high-order word 1035H]	0534	0535	1332	1333	R/W		–1

No.	Name	Registeraddress				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
28	Register address setting 28 [Read/write address: Low-order word 1036H, high-order word 1037H]	0536	0537	1334	1335	R/W	Set the register address of data to be assigned to 1000H to 103FH Decimal number: -1 to 32767 (-1: Without mapping) Hexadecimal numeral: FFFFH to 7FFFH (FFFFH: Without mapping) The register addresses for data designation (0500H to 053FH) and read/write (1000H to 103FH) will be invalid (without mapping), even if set.	-1
29	Register address setting 29 [Read/write address: Low-order word 1038H, high-order word 1039H]	0538	0539	1336	1337	R/W		-1
30	Register address setting 30 [Read/write address: Low-order word 103AH, high-order word 103BH]	053A	053B	1338	1339	R/W		-1
31	Register address setting 31 [Read/write address: Low-order word 103CH, high-order word 103DH]	053C	053D	1340	1341	R/W		-1
32	Register address setting 32 [Read/write address: Low-order word 103EH, high-order word 103FH]	053E	053F	1342	1343	R/W		-1

■ Register address for data read/write

No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
1	Data specified Register address setting 1 (Low-order word 0500H, high-order word 0501H)	1000	1001	4096	4097	Based on the data specified at 0500H to 053FH.		
2	Data specified Register address setting 2 (Low-order word 0502H, high-order word 0503H)	1002	1003	4098	4099			
3	Data specified Register address setting 3 (Low-order word 0504H, high-order word 0505H)	1004	1005	4100	4101			
4	Data specified Register address setting 4 (Low-order word 0506H, high-order word 0507H)	1006	1007	4102	4103			
5	Data specified Register address setting 5 (Low-order word 0508H, high-order word 0509H)	1008	1009	4104	4105			
6	Data specified Register address setting 6 (Low-order word 050AH, high-order word 050BH)	100A	100B	4106	4107			
7	Data specified Register address setting 7 (Low-order word 050CH, high-order word 050DH)	100C	100D	4108	4109			
8	Data specified Register address setting 8 (Low-order word 050EH, high-order word 050FH)	100E	100F	4110	4111			
9	Data specified Register address setting 9 (Low-order word 0510H, high-order word 0511H)	1010	1011	4112	4113			
10	Data specified Register address setting 10 (Low-order word 0512H, high-order word 0513H)	1012	1013	4114	4115			
11	Data specified Register address setting 11 (Low-order word 0514H, high-order word 0515H)	1014	1015	4116	4117			
12	Data specified Register address setting 12 (Low-order word 0516H, high-order word 0517H)	1016	1017	4118	4119			
13	Data specified Register address setting 13 (Low-order word 0518H, high-order word 0519H)	1018	1019	4120	4121			
14	Data specified Register address setting 14 (Low-order word 051AH, high-order word 051BH)	101A	101B	4122	4123			
15	Data specified Register address setting 15 (Low-order word 051CH, high-order word 051DH)	101C	101D	4124	4125			
16	Data specified Register address setting 16 (Low-order word 051EH, high-order word 051FH)	101E	101F	4126	4127			

No.	Name	Registeraddress				Attri- bute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
17	Data specified Register address setting 17 (Low-order word 0520H, high-order word 0521H)	1020	1021	4128	4129	Based on the data specified at 0500H to 053FH.		
18	Data specified Register address setting 18 (Low-order word 0522H, high-order word 0523H)	1022	1023	4130	4131			
19	Data specified Register address setting 19 (Low-order word 0524H, high-order word 0525H)	1024	1025	4132	4133			
20	Data specified Register address setting 20 (Low-order word 0526H, high-order word 0527H)	1026	1027	4134	4135			
21	Data specified Register address setting 21 (Low-order word 0528H, high-order word 0529H)	1028	1029	4136	4137			
22	Data specified Register address setting 22 (Low-order word 052AH, high-order word 052BH)	102A	102B	4138	4139			
23	Data specified Register address setting 23 (Low-order word 052CH, high-order word 052DH)	102C	102D	4140	4141			
24	Data specified Register address setting 24 (Low-order word 052EH, high-order word 052FH)	102E	102F	4142	4143			
25	Data specified Register address setting 25 (Low-order word 0530H, high-order word 0531H)	1030	1031	4144	4145			
26	Data specified Register address setting 26 (Low-order word 0532H, high-order word 0533H)	1032	1033	4146	4147			
27	Data specified Register address setting 27 (Low-order word 0534H, high-order word 0535H)	1034	1035	4148	4149			
28	Data specified Register address setting 28 (Low-order word 0536H, high-order word 0537H)	1036	1037	4150	4151			
29	Data specified Register address setting 29 (Low-order word 0538H, high-order word 0539H)	1038	1039	4152	4153			
30	Data specified Register address setting 30 (Low-order word 053AH, high-order word 053BH)	103A	103B	4154	4155			
31	Data specified Register address setting 31 (Low-order word 053CH, high-order word 053DH)	103C	103D	4156	4157			
32	Data specified Register address setting 32 (Low-order word 053EH, high-order word 053FH)	103E	103F	4158	4159			

6.3.3 PID group (Level PID) data [Modbus double word]

Register addresses 1500H to 161FH are used to check and change set values belonging to the PID group (Level PID).

■ PID group 1 data

No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
1	Proportional band [heat-side]	1500	1501	5376	5377	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 1000.0 % of Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0
2	Integral time [heat-side]	1502	1503	5378	5379	R/W	PID control or Heat/Cool PID control 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240
3	Derivative time [heat-side]	1504	1505	5380	5381	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
4	Control response parameter	1506	1507	5382	5383	R/W	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	2
5	Proactive intensity	1508	1509	5384	5385	R/W	0 to 4 0: No function	2
6	Manual reset	150A	150B	5386	5387	R/W	−100.0 to +100.0 %	0.0
7	FF amount	150C	150D	5388	5389	R/W	−100.0 to +100.0 %	0.0
8	Output limiter high [heat-side]	150E	150F	5390	5391	R/W	Output limiter low [heat-side] to 105.0 %	105.0
9	Output limiter low [heat-side]	1510	1511	5392	5393	R/W	−5.0 % to Output limiter high [heat-side]	−5.0

No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
10	Control loop break alarm (LBA) time	1512	1513	5394	5395	R/W	0 to 7200 seconds 0: No function	LBA function is specified: 480 LBA function is not specified: 0
11	LBA deadband (LBD)	1514	1515	5396	5397	R/W	0 to Input span [Varies with the setting of the Decimal point position.]	0
12	Unused register	1516	1517	5398	5399	—	—	—
13	Proportional band [cool-side]	1518	1519	5400	5401	R/W	TC/RTD inputs 1 (0.1, 0.01) to Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.1 to 1000.0 % of Input span	TC/RTD inputs: 30 V/I inputs: 3.0
14	Integral time [cool-side]	151A	151B	5402	5403	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
15	Derivative time [cool-side]	151C	151D	5404	5405	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
16	Overlap/Deadband	151E	151F	5406	5407	R/W	TC/RTD inputs – Input span to + Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs –100.0 to +100.0 % of Input span Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0
17	Output limiter high [cool-side]	1520	1521	5408	5409	R/W	Heat/Cool PID control Output limiter low [cool-side] to 105.0 %	105.0
	Output limiter low [heat-side]						PID control or Position proportioning PID control –5.0 % to Output limiter high [heat-side] Same data as RKC communication identifier OX	–5.0
18	Output limiter low [cool-side]	1522	1523	5410	5411	R/W	–5.0 % to Output limiter high [cool-side]	–5.0

■ PID group 2 to 5 data

Register address for PID group 2 to 5.

For details of attribute, data range and factory set values, refer to the same line No. in ■ PID group 1 data (P.6-61).



When the Level PID action selection is “0: No Level PID”, PID group numbers 02 to 08 are invalid and the response is NAK (Negative Acknowledge).

Low: Low-order High: High-order

No.	Name	PID group 2				PID group 3				PID group 4				PID group 5			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Proportional band [heat-side]	1524	1525	5412	5413	1548	1549	5448	5449	156C	156D	5484	5485	1590	1591	5520	5521
2	Integral time [heat-side]	1526	1527	5414	5415	154A	154B	5450	5451	156E	156F	5486	5487	1592	1593	5522	5523
3	Derivative time [heat-side]	1528	1529	5416	5417	154C	154D	5452	5453	1570	1571	5488	5489	1594	1595	5524	5525
4	Control response parameter	152A	152B	5418	5419	154E	154F	5454	5455	1572	1573	5490	5491	1596	1597	5526	5527
5	Proactive intensity	152C	152D	5420	5421	1550	1551	5456	5457	1574	1575	5492	5493	1598	1599	5528	5529
6	Manual reset	152E	152F	5422	5423	1552	1553	5458	5459	1576	1577	5494	5495	159A	159B	5530	5531
7	FF amount	1530	1531	5424	5425	1554	1555	5460	5461	1578	1579	5496	5497	159C	159D	5532	5533
8	Output limiter high [heat-side]	1532	1533	5426	5427	1556	1557	5462	5463	157A	157B	5498	5499	159E	159F	5534	5535
9	Output limiter low [heat-side]	1534	1535	5428	5429	1558	1559	5464	5465	157C	157D	5500	5501	15A0	15A1	5536	5537
10	Control loop break alarm (LBA) time	1536	1537	5430	5431	155A	155B	5466	5467	157E	157F	5502	5503	15A2	15A3	5538	5539
11	LBA deadband (LBD)	1538	1539	5432	5433	155C	155D	5468	5469	1580	1581	5504	5505	15A4	15A5	5540	5541
12	Unused register	153A	153B	5434	5435	155E	155F	5470	5471	1582	1583	5506	5507	15A6	15A7	5542	5543
13	Proportional band [cool-side]	153C	153D	5436	5437	1560	1561	5472	5473	1584	1585	5508	5509	15A8	15A9	5544	5545
14	Integral time [cool-side]	153E	153F	5438	5439	1562	1563	5474	5475	1586	1587	5510	5511	15AA	15AB	5546	5547
15	Derivative time [cool-side]	1540	1541	5440	5441	1564	1565	5476	5477	1588	1589	5512	5513	15AC	15AD	5548	5549
16	Overlap/Deadband	1542	1543	5442	5443	1566	1567	5478	5479	158A	158B	5514	5515	15AE	15AF	5550	5551
17	Output limiter high [cool-side] Output limiter low [heat-side]	1544	1545	5444	5445	1568	1569	5480	5481	158C	158D	5516	5517	15B0	15B1	5552	5553
18	Output limiter low [cool-side]	1546	1547	5446	5447	156A	156B	5482	5483	158E	158F	5518	5519	15B2	15B3	5554	5555

■ PID group 6 to 8 data

Register address for PID group 6 to 8.

For details of attribute, data range and factory set values, refer to the same line No. in ■ **PID group 1 data (P.6-61)**.



When the Level PID action selection is “0: No Level PID”, PID group numbers 02 to 08 are invalid and the response is NAK (Negative Acknowledge).

Low: Low-order High: High-order

No.	Name	PID group 6				PID group 7				PID group 8			
		Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Proportional band [heat-side]	15B4	15B5	5556	5557	15D8	15D9	5592	5593	15FC	15FD	5628	5629
2	Integral time [heat-side]	15B6	15B7	5558	5559	15DA	15DB	5594	5595	15FE	15FF	5630	5631
3	Derivative time [heat-side]	15B8	15B9	5560	5561	15DC	15DD	5596	5597	1600	1601	5632	5633
4	Control response parameter	15BA	15BB	5562	5563	15DE	15DF	5598	5599	1602	1603	5634	5635
5	Proactive intensity	15BC	15BD	5564	5565	15E0	15E1	5600	5601	1604	1605	5636	5637
6	Manual reset	15BE	15BF	5566	5567	15E2	15E3	5602	5603	1606	1607	5638	5639
7	FF amount	15C0	15C1	5568	5569	15E4	15E5	5604	5605	1608	1609	5640	5641
8	Output limiter high [heat-side]	15C2	15C3	5570	5571	15E6	15E7	5606	5607	160A	160B	5642	5643
9	Output limiter low [heat-side]	15C4	15C5	5572	5573	15E8	15E9	5608	5609	160C	160D	5644	5645
10	Control loop break alarm (LBA) time	15C6	15C7	5574	5575	15EA	15EB	5610	5611	160E	160F	5646	5647
11	LBA deadband (LBD)	15C8	15C9	5576	5577	15EC	15ED	5612	5613	1610	1611	5648	5649
12	Unused register	15CA	15CB	5578	5579	15EE	15EF	5614	5615	1612	1613	5650	5651
13	Proportional band [cool-side]	15CC	15CD	5580	5581	15F0	15F1	5616	5617	1614	1615	5652	5653
14	Integral time [cool-side]	15CE	15CF	5582	5583	15F2	15F3	5618	5619	1616	1617	5654	5655
15	Derivative time [cool-side]	15D0	15D1	5584	5585	15F4	15F5	5620	5621	1618	1619	5656	5657
16	Overlap/Deadband	15D2	15D3	5586	5587	15F6	15F7	5622	5623	161A	161B	5658	5659
17	Output limiter high [cool-side] Output limiter low [heat-side]	15D4	15D5	5588	5589	15F8	15F9	5624	5625	161C	161D	5660	5661
18	Output limiter low [cool-side]	15D6	15D7	5590	5591	15FA	15FB	5626	5627	161E	161F	5662	5663

6.3.4 Pattern & Segment group data [Modbus double word]

Register addresses 3000H to 35FFH are used to check and change set values belonging to the Pattern & Segment group.

■ Data description (Name, Attribute, Data range, Factory set value)

No.	Name	Attribute	Data range	Factory set value
1	Segment level	R/W	Setting limiter low to Setting limiter high [Varies with the setting of the Decimal point position.]	0
2	Segment time	R/W	RKC communication 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds 200:00: Continuous (Settable only in Soak segments * of segment 2 to 16) * When the segment that is set to continuous becomes no longer a soak segment, the Segment time is automatically set to 199 hours 59 minutes or 199 minutes 59 seconds. [Time unit depends on the time unit of the setting] Modbus 0 to 11999 minutes 0 to 11999 seconds 12000: Continuous (Settable only in Soak segments * of segment 2 to 16) * When the segment that is set to continuous becomes no longer a soak segment, the Segment time is automatically set to 11999 minutes or 11999 seconds. [Time unit depends on the time unit of the setting]	RKC communication: 0:00 (0 hour 00 minutes) Modbus: 0

No.	Name	Attribute	Data range	Factory set value
3	Event selection of the Segment	R/W	RKC communication The Event selection of the Segment is assigned as a bit image in binary numbers. Bit 0: Event 1 Bit 1: Event 2 Bit 2: Event 3 Bit 3: Event 4 Bit 4 to Bit 7: Unused Data 0: Unused 1: Used	1111
			Modbus 0 to 15 0: OFF +1: Event 1 is enabled +2: Event 2 is enabled +4: Event 3 is enabled +8: Event 4 is enabled To select two or more functions, sum each value.	15

■ Register address for Segment 1 to 16 of Pattern 1 to 4

Register address for Segment 1 to 16 of Pattern 1 to 4. For details of attribute, data range and factory set values, refer to the same line No. in ■ **Data description (Name, Attribute, Data range, Factory set value) (P.6-65).**

Low: Low-order High: High-order

Segment No.	Name	Pattern 1				Pattern 2				Pattern 3				Pattern 4			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Segment level	3000	3001	12288	12289	3060	3061	12384	12385	30C0	30C1	12480	12481	3120	3121	12576	12577
	Segment time	3002	3003	12290	12291	3062	3063	12386	12387	30C2	30C3	12482	12483	3122	3123	12578	12579
	Event selection of the Segment	3004	3005	12292	12293	3064	3065	12388	12389	30C4	30C5	12484	12485	3124	3125	12580	12581
2	Segment level	3006	3007	12294	12295	3066	3067	12390	12391	30C6	30C7	12486	12487	3126	3127	12582	12583
	Segment time	3008	3009	12296	12297	3068	3069	12392	12393	30C8	30C9	12488	12489	3128	3129	12584	12585
	Event selection of the Segment	300A	300B	12298	12299	306A	306B	12394	12395	30CA	30CB	12490	12491	312A	312B	12586	12587
3	Segment level	300C	300D	12300	12301	306C	306D	12396	12397	30CC	30CD	12492	12493	312C	312D	12588	12589
	Segment time	300E	300F	12302	12303	306E	306F	12398	12399	30CE	30CF	12494	12495	312E	312F	12590	12591
	Event selection of the Segment	3010	3011	12304	12305	3070	3071	12400	12401	30D0	30D1	12496	12497	3130	3131	12592	12593
4	Segment level	3012	3013	12306	12307	3072	3073	12402	12403	30D2	30D3	12498	12499	3132	3133	12594	12595
	Segment time	3014	3015	12308	12309	3074	3075	12404	12405	30D4	30D5	12500	12501	3134	3135	12596	12597
	Event selection of the Segment	3016	3017	12310	12311	3076	3077	12406	12407	30D6	30D7	12502	12503	3136	3137	12598	12599
5	Segment level	3018	3019	12312	12313	3078	3079	12408	12409	30D8	30D9	12504	12505	3138	3139	12600	12601
	Segment time	301A	301B	12314	12315	307A	307B	12410	12411	30DA	30DB	12506	12507	313A	313B	12602	12603
	Event selection of the Segment	301C	301D	12316	12317	307C	307D	12412	12413	30DC	30DD	12508	12509	313C	313D	12604	12605
6	Segment level	301E	301F	12318	12319	307E	307F	12414	12415	30DE	30DF	12510	12511	313E	313F	12606	12607
	Segment time	3020	3021	12320	12321	3080	3081	12416	12417	30E0	30E1	12512	12513	3140	3141	12608	12609
	Event selection of the Segment	3022	3023	12322	12323	3082	3083	12418	12419	30E2	30E3	12514	12515	3142	3143	12610	12611
7	Segment level	3024	3025	12324	12325	3084	3085	12420	12421	30E4	30E5	12516	12517	3144	3145	12612	12613
	Segment time	3026	3027	12326	12327	3086	3087	12422	12423	30E6	30E7	12518	12519	3146	3147	12614	12615
	Event selection of the Segment	3028	3029	12328	12329	3088	3089	12424	12425	30E8	30E9	12520	12521	3148	3149	12616	12617
8	Segment level	302A	302B	12330	12331	308A	308B	12426	12427	30EA	30EB	12522	12523	314A	314B	12618	12619
	Segment time	302C	302D	12332	12333	308C	308D	12428	12429	30EC	30ED	12524	12525	314C	314D	12620	12621
	Event selection of the Segment	302E	302F	12334	12335	308E	308F	12430	12431	30EE	30EF	12526	12527	314E	314F	12622	12623

Low: Low-order High: High-order

Segment No.	Name	Pattern 1				Pattern 2				Pattern 3				Pattern 4			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
9	Segment level	3030	3031	12336	12337	3090	3091	12432	12433	30F0	30F1	12528	12529	3150	3151	12624	12625
	Segment time	3032	3033	12338	12339	3092	3093	12434	12435	30F2	30F3	12530	12531	3152	3153	12626	12627
	Event selection of the Segment	3034	3035	12340	12341	3094	3095	12436	12437	30F4	30F5	12532	12533	3154	3155	12628	12629
10	Segment level	3036	3037	12342	12343	3096	3097	12438	12439	30F6	30F7	12534	12535	3156	3157	12630	12631
	Segment time	3038	3039	12344	12345	3098	3099	12440	12441	30F8	30F9	12536	12537	3158	3159	12632	12633
	Event selection of the Segment	303A	303B	12346	12347	309A	309B	12442	12443	30FA	30FB	12538	12539	315A	315B	12634	12635
11	Segment level	303C	303D	12348	12349	309C	309D	12444	12445	30FC	30FD	12540	12541	315C	315D	12636	12637
	Segment time	303E	303F	12350	12351	309E	309F	12446	12447	30FE	30FF	12542	12543	315E	315F	12638	12639
	Event selection of the Segment	3040	3041	12352	12353	30A0	30A1	12448	12449	3100	3101	12544	12545	3160	3161	12640	12641
12	Segment level	3042	3043	12354	12355	30A2	30A3	12450	12451	3102	3103	12546	12547	3162	3163	12642	12643
	Segment time	3044	3045	12356	12357	30A4	30A5	12452	12453	3104	3105	12548	12549	3164	3165	12644	12645
	Event selection of the Segment	3046	3047	12358	12359	30A6	30A7	12454	12455	3106	3107	12550	12551	3166	3167	12646	12647
13	Segment level	3048	3049	12360	12361	30A8	30A9	12456	12457	3108	3109	12552	12553	3168	3169	12648	12649
	Segment time	304A	304B	12362	12363	30AA	30AB	12458	12459	310A	310B	12554	12555	316A	316B	12650	12651
	Event selection of the Segment	304C	304D	12364	12365	30AC	30AD	12460	12461	310C	310D	12556	12557	316C	316D	12652	12653
14	Segment level	304E	304F	12366	12367	30AE	30AF	12462	12463	310E	310F	12558	12559	316E	316F	12654	12655
	Segment time	3050	3051	12368	12369	30B0	30B1	12464	12465	3110	3111	12560	12561	3170	3171	12656	12657
	Event selection of the Segment	3052	3053	12370	12371	30B2	30B3	12466	12467	3112	3113	12562	12563	3172	3173	12658	12659
15	Segment level	3054	3055	12372	12373	30B4	30B5	12468	12469	3114	3115	12564	12565	3174	3175	12660	12661
	Segment time	3056	3057	12374	12375	30B6	30B7	12470	12471	3116	3117	12566	12567	3176	3177	12662	12663
	Event selection of the Segment	3058	3059	12376	12377	30B8	30B9	12472	12473	3118	3119	12568	12569	3178	3179	12664	12665
16	Segment level	305A	305B	12378	12379	30BA	30BB	12474	12475	311A	311B	12570	12571	317A	317B	12666	12667
	Segment time	305C	305D	12380	12381	30BC	30BD	12476	12477	311C	311D	12572	12573	317C	317D	12668	12669
	Event selection of the Segment	305E	305F	12382	12383	30BE	30BF	12478	12479	311E	311F	12574	12575	317E	317F	12670	12671

■ Register address for Segment 1 to 16 of Pattern 5 to 8

Register address for Segment 1 to 16 of Pattern 5 to 8. For details of attribute, data range and factory set values, refer to the same line No. in ■ **Data description (Name, Attribute, Data range, Factory set value) (P.6-65).**

Low: Low-order High: High-order

Segment No.	Name	Pattern 5				Pattern 6				Pattern 7				Pattern 8			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Segment level	3180	3181	12672	12673	31E0	31E1	12768	12769	3240	3241	12864	12865	32A0	32A1	12960	12961
	Segment time	3182	3183	12674	12675	31E2	31E3	12770	12771	3242	3243	12866	12867	32A2	32A3	12962	12963
	Event selection of the Segment	3184	3185	12676	12677	31E4	31E5	12772	12773	3244	3245	12868	12869	32A4	32A5	12964	12965
2	Segment level	3186	3187	12678	12679	31E6	31E7	12774	12775	3246	3247	12870	12871	32A6	32A7	12966	12967
	Segment time	3188	3189	12680	12681	31E8	31E9	12776	12777	3248	3249	12872	12873	32A8	32A9	12968	12969
	Event selection of the Segment	318A	318B	12682	12683	31EA	31EB	12778	12779	324A	324B	12874	12875	32AA	32AB	12970	12971
3	Segment level	318C	318D	12684	12685	31EC	31ED	12780	12781	324C	324D	12876	12877	32AC	32AD	12972	12973
	Segment time	318E	318F	12686	12687	31EE	31EF	12782	12783	324E	324F	12878	12879	32AE	32AF	12974	12975
	Event selection of the Segment	3190	3191	12688	12689	31F0	31F1	12784	12785	3250	3251	12880	12881	32B0	32B1	12976	12977
4	Segment level	3192	3193	12690	12691	31F2	31F3	12786	12787	3252	3253	12882	12883	32B2	32B3	12978	12979
	Segment time	3194	3195	12692	12693	31F4	31F5	12788	12789	3254	3255	12884	12885	32B4	32B5	12980	12981
	Event selection of the Segment	3196	3197	12694	12695	31F6	31F7	12790	12791	3256	3257	12886	12887	32B6	32B7	12982	12983
5	Segment level	3198	3199	12696	12697	31F8	31F9	12792	12793	3258	3259	12888	12889	32B8	32B9	12984	12985
	Segment time	319A	319B	12698	12699	31FA	31FB	12794	12795	325A	325B	12890	12891	32BA	32BB	12986	12987
	Event selection of the Segment	319C	319D	12700	12701	31FC	31FD	12796	12797	325C	325D	12892	12893	32BC	32BD	12988	12989
6	Segment level	319E	319F	12702	12703	31FE	31FF	12798	12799	325E	325F	12894	12895	32BE	32BF	12990	12991
	Segment time	31A0	31A1	12704	12705	3200	3201	12800	12801	3260	3261	12896	12897	32C0	32C1	12992	12993
	Event selection of the Segment	31A2	31A3	12706	12707	3202	3203	12802	12803	3262	3263	12898	12899	32C2	32C3	12994	12995
7	Segment level	31A4	31A5	12708	12709	3204	3205	12804	12805	3264	3265	12900	12901	32C4	32C5	12996	12997
	Segment time	31A6	31A7	12710	12711	3206	3207	12806	12807	3266	3267	12902	12903	32C6	32C7	12998	12999
	Event selection of the Segment	31A8	31A9	12712	12713	3208	3209	12808	12809	3268	3269	12904	12905	32C8	32C9	13000	13001
8	Segment level	31AA	31AB	12714	12715	320A	320B	12810	12811	326A	326B	12906	12907	32CA	32CB	13002	13003
	Segment time	31AC	31AD	12716	12717	320C	320D	12812	12813	326C	326D	12908	12909	32CC	32CD	13004	13005
	Event selection of the Segment	31AE	31AF	12718	12719	320E	320F	12814	12815	326E	326F	12910	12911	32CE	32CF	13006	13007

Segment No.	Name	Pattern 5				Pattern 6				Pattern 7				Pattern 8			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
9	Segment level	31B0	31B1	12720	12721	3210	3211	12816	12817	3270	3271	12912	12913	32D0	32D1	13008	13009
	Segment time	31B2	31B3	12722	12723	3212	3213	12818	12819	3272	3273	12914	12915	32D2	32D3	13010	13011
	Event selection of the Segment	31B4	31B5	12724	12725	3214	3215	12820	12821	3274	3275	12916	12917	32D4	32D5	13012	13013
10	Segment level	31B6	31B7	12726	12727	3216	3217	12822	12823	3276	3277	12918	12919	32D6	32D7	13014	13015
	Segment time	31B8	31B9	12728	12729	3218	3219	12824	12825	3278	3279	12920	12921	32D8	32D9	13016	13017
	Event selection of the Segment	31BA	31BB	12730	12731	321A	321B	12826	12827	327A	327B	12922	12923	32DA	32DB	13018	13019
11	Segment level	31BC	31BD	12732	12733	321C	321D	12828	12829	327C	327D	12924	12925	32DC	32DD	13020	13021
	Segment time	31BE	31BF	12734	12735	321E	321F	12830	12831	327E	327F	12926	12927	32DE	32DF	13022	13023
	Event selection of the Segment	31C0	31C1	12736	12737	3220	3221	12832	12833	3280	3281	12928	12929	32E0	32E1	13024	13025
12	Segment level	31C2	31C3	12738	12739	3222	3223	12834	12835	3282	3283	12930	12931	32E2	32E3	13026	13027
	Segment time	31C4	31C5	12740	12741	3224	3225	12836	12837	3284	3285	12932	12933	32E4	32E5	13028	13029
	Event selection of the Segment	31C6	31C7	12742	12743	3226	3227	12838	12839	3286	3287	12934	12935	32E6	32E7	13030	13031
13	Segment level	31C8	31C9	12744	12745	3228	3229	12840	12841	3288	3289	12936	12937	32E8	32E9	13032	13033
	Segment time	31CA	31CB	12746	12747	322A	322B	12842	12843	328A	328B	12938	12939	32EA	32EB	13034	13035
	Event selection of the Segment	31CC	31CD	12748	12749	322C	322D	12844	12845	328C	328D	12940	12941	32EC	32ED	13036	13037
14	Segment level	31CE	31CF	12750	12751	322E	322F	12846	12847	328E	328F	12942	12943	32EE	32EF	13038	13039
	Segment time	31D0	31D1	12752	12753	3230	3231	12848	12849	3290	3291	12944	12945	32F0	32F1	13040	13041
	Event selection of the Segment	31D2	31D3	12754	12755	3232	3233	12850	12851	3292	3293	12946	12947	32F2	32F3	13042	13043
15	Segment level	31D4	31D5	12756	12757	3234	3235	12852	12853	3294	3295	12948	12949	32F4	32F5	13044	13045
	Segment time	31D6	31D7	12758	12759	3236	3237	12854	12855	3296	3297	12950	12951	32F6	32F7	13046	13047
	Event selection of the Segment	31D8	31D9	12760	12761	3238	3239	12856	12857	3298	3299	12952	12953	32F8	32F9	13048	13049
16	Segment level	31DA	31DB	12762	12763	323A	323B	12858	12859	329A	329B	12954	12955	32FA	32FB	13050	13051
	Segment time	31DC	31DD	12764	12765	323C	323D	12860	12861	329C	329D	12956	12957	32FC	32FD	13052	13053
	Event selection of the Segment	31DE	31DF	12766	12767	323E	323F	12862	12863	329E	329F	12958	12959	32FE	32FF	13054	13055

Low: Low-order High: High-order

■ Register address for Segment 1 to 16 of Pattern 9 to 12

Register address for Segment 1 to 16 of Pattern 9 to 12. For details of attribute, data range and factory set values, refer to the same line No. in ■ **Data description (Name, Attribute, Data range, Factory set value) (P.6-65).**

Low: Low-order High: High-order

Segment No.	Name	Pattern 9				Pattern 10				Pattern 11				Pattern 12			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Segment level	3300	3301	13056	13057	3360	3361	13152	13153	33C0	33C1	13248	13249	3420	3421	13344	13345
	Segment time	3302	3303	13058	13059	3362	3363	13154	13155	33C2	33C3	13250	13251	3422	3423	13346	13347
	Event selection of the Segment	3304	3305	13060	13061	3364	3365	13156	13157	33C4	33C5	13252	13253	3424	3425	13348	13349
2	Segment level	3306	3307	13062	13063	3366	3367	13158	13159	33C6	33C7	13254	13255	3426	3427	13350	13351
	Segment time	3308	3309	13064	13065	3368	3369	13160	13161	33C8	33C9	13256	13257	3428	3429	13352	13353
	Event selection of the Segment	330A	330B	13066	13067	336A	336B	13162	13163	33CA	33CB	13258	13259	342A	342B	13354	13355
3	Segment level	330C	330D	13068	13069	336C	336D	13164	13165	33CC	33CD	13260	13261	342C	342D	13356	13357
	Segment time	330E	330F	13070	13071	336E	336F	13166	13167	33CE	33CF	13262	13263	342E	342F	13358	13359
	Event selection of the Segment	3310	3311	13072	13073	3370	3371	13168	13169	33D0	33D1	13264	13265	3430	3431	13360	13361
4	Segment level	3312	3313	13074	13075	3372	3373	13170	13171	33D2	33D3	13266	13267	3432	3433	13362	13363
	Segment time	3314	3315	13076	13077	3374	3375	13172	13173	33D4	33D5	13268	13269	3434	3435	13364	13365
	Event selection of the Segment	3316	3317	13078	13079	3376	3377	13174	13175	33D6	33D7	13270	13271	3436	3437	13366	13367
5	Segment level	3318	3319	13080	13081	3378	3379	13176	13177	33D8	33D9	13272	13273	3438	3439	13368	13369
	Segment time	331A	331B	13082	13083	337A	337B	13178	13179	33DA	33DB	13274	13275	343A	343B	13370	13371
	Event selection of the Segment	331C	331D	13084	13085	337C	337D	13180	13181	33DC	33DD	13276	13277	343C	343D	13372	13373
6	Segment level	331E	331F	13086	13087	337E	337F	13182	13183	33DE	33DF	13278	13279	343E	343F	13374	13375
	Segment time	3320	3321	13088	13089	3380	3381	13184	13185	33E0	33E1	13280	13281	3440	3441	13376	13377
	Event selection of the Segment	3322	3323	13090	13091	3382	3383	13186	13187	33E2	33E3	13282	13283	3442	3443	13378	13379
7	Segment level	3324	3325	13092	13093	3384	3385	13188	13189	33E4	33E5	13284	13285	3444	3445	13380	13381
	Segment time	3326	3327	13094	13095	3386	3387	13190	13191	33E6	33E7	13286	13287	3446	3447	13382	13383
	Event selection of the Segment	3328	3329	13096	13097	3388	3389	13192	13193	33E8	33E9	13288	13289	3448	3449	13384	13385
8	Segment level	332A	332B	13098	13099	338A	338B	13194	13195	33EA	33EB	13290	13291	344A	344B	13386	13387
	Segment time	332C	332D	13100	13101	338C	338D	13196	13197	33EC	33ED	13292	13293	344C	344D	13388	13389
	Event selection of the Segment	332E	332F	13102	13103	338E	338F	13198	13199	33EE	33EF	13294	13295	344E	344F	13390	13391

Low: Low-order High: High-order

Segment No.	Name	Pattern 9				Pattern 10				Pattern 11				Pattern 12			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
9	Segment level	3330	3331	13104	13105	3390	3391	13200	13201	33F0	33F1	13296	13297	3450	3451	13392	13393
	Segment time	3332	3333	13106	13107	3392	3393	13202	13203	33F2	33F3	13298	13299	3452	3453	13394	13395
	Event selection of the Segment	3334	3335	13108	13109	3394	3395	13204	13205	33F4	33F5	13300	13301	3454	3455	13396	13397
10	Segment level	3336	3337	13110	13111	3396	3397	13206	13207	33F6	33F7	13302	13303	3456	3457	13398	13399
	Segment time	3338	3339	13112	13113	3398	3399	13208	13209	33F8	33F9	13304	13305	3458	3459	13400	13401
	Event selection of the Segment	333A	333B	13114	13115	339A	339B	13210	13211	33FA	33FB	13306	13307	345A	345B	13402	13403
11	Segment level	333C	333D	13116	13117	339C	339D	13212	13213	33FC	33FD	13308	13309	345C	345D	13404	13405
	Segment time	333E	333F	13118	13119	339E	339F	13214	13215	33FE	33FF	13310	13311	345E	345F	13406	13407
	Event selection of the Segment	3340	3341	13120	13121	33A0	33A1	13216	13217	3400	3401	13312	13313	3460	3461	13408	13409
12	Segment level	3342	3343	13122	13123	33A2	33A3	13218	13219	3402	3403	13314	13315	3462	3463	13410	13411
	Segment time	3344	3345	13124	13125	33A4	33A5	13220	13221	3404	3405	13316	13317	3464	3465	13412	13413
	Event selection of the Segment	3346	3347	13126	13127	33A6	33A7	13222	13223	3406	3407	13318	13319	3466	3467	13414	13415
13	Segment level	3348	3349	13128	13129	33A8	33A9	13224	13225	3408	3409	13320	13321	3468	3469	13416	13417
	Segment time	334A	334B	13130	13131	33AA	33AB	13226	13227	340A	340B	13322	13323	346A	346B	13418	13419
	Event selection of the Segment	334C	334D	13132	13133	33AC	33AD	13228	13229	340C	340D	13324	13325	346C	346D	13420	13421
14	Segment level	334E	334F	13134	13135	33AE	33AF	13230	13231	340E	340F	13326	13327	346E	346F	13422	13423
	Segment time	3350	3351	13136	13137	33B0	33B1	13232	13233	3410	3411	13328	13329	3470	3471	13424	13425
	Event selection of the Segment	3352	3353	13138	13139	33B2	33B3	13234	13235	3412	3413	13330	13331	3472	3473	13426	13427
15	Segment level	3354	3355	13140	13141	33B4	33B5	13236	13237	3414	3415	13332	13333	3474	3475	13428	13429
	Segment time	3356	3357	13142	13143	33B6	33B7	13238	13239	3416	3417	13334	13335	3476	3477	13430	13431
	Event selection of the Segment	3358	3359	13144	13145	33B8	33B9	13240	13241	3418	3419	13336	13337	3478	3479	13432	13433
16	Segment level	335A	335B	13146	13147	33BA	33BB	13242	13243	341A	341B	13338	13339	347A	347B	13434	13435
	Segment time	335C	335D	13148	13149	33BC	33BD	13244	13245	341C	341D	13340	13341	347C	347D	13436	13437
	Event selection of the Segment	335E	335F	13150	13151	33BE	33BF	13246	13247	341E	341F	13342	13343	347E	347F	13438	13439

■ Register address for Segment 1 to 16 of Pattern 13 to 16

Register address for Segment 1 to 16 of Pattern 13 to 16. For details of attribute, data range and factory set values, refer to the same line No. in ■ **Data description (Name, Attribute, Data range, Factory set value) (P.6-65).**

Low: Low-order High: High-order

Segment No.	Name	Pattern 13				Pattern 14				Pattern 15				Pattern 16			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Segment level	3480	3481	13440	13441	34E0	34E1	13536	13537	3540	3541	13632	13633	35A0	35A1	13728	13729
	Segment time	3482	3483	13442	13443	34E2	34E3	13538	13539	3542	3543	13634	13635	35A2	35A3	13730	13731
	Event selection of the Segment	3484	3485	13444	13445	34E4	34E5	13540	13541	3544	3545	13636	13637	35A4	35A5	13732	13733
2	Segment level	3486	3487	13446	13447	34E6	34E7	13542	13543	3546	3547	13638	13639	35A6	35A7	13734	13735
	Segment time	3488	3489	13448	13449	34E8	34E9	13544	13545	3548	3549	13640	13641	35A8	35A9	13736	13737
	Event selection of the Segment	348A	348B	13450	13451	34EA	34EB	13546	13547	354A	354B	13642	13643	35AA	35AB	13738	13739
3	Segment level	348C	348D	13452	13453	34EC	34ED	13548	13549	354C	354D	13644	13645	35AC	35AD	13740	13741
	Segment time	348E	348F	13454	13455	34EE	34EF	13550	13551	354E	354F	13646	13647	35AE	35AF	13742	13743
	Event selection of the Segment	3490	3491	13456	13457	34F0	34F1	13552	13553	3550	3551	13648	13649	35B0	35B1	13744	13745
4	Segment level	3492	3493	13458	13459	34F2	34F3	13554	13555	3552	3553	13650	13651	35B2	35B3	13746	13747
	Segment time	3494	3495	13460	13461	34F4	34F5	13556	13557	3554	3555	13652	13653	35B4	35B5	13748	13749
	Event selection of the Segment	3496	3497	13462	13463	34F6	34F7	13558	13559	3556	3557	13654	13655	35B6	35B7	13750	13751
5	Segment level	3498	3499	13464	13465	34F8	34F9	13560	13561	3558	3559	13656	13657	35B8	35B9	13752	13753
	Segment time	349A	349B	13466	13467	34FA	34FB	13562	13563	355A	355B	13658	13659	35BA	35BB	13754	13755
	Event selection of the Segment	349C	349D	13468	13469	34FC	34FD	13564	13565	355C	355D	13660	13661	35BC	35BD	13756	13757
6	Segment level	349E	349F	13470	13471	34FE	34FF	13566	13567	355E	355F	13662	13663	35BE	35BF	13758	13759
	Segment time	34A0	34A1	13472	13473	3500	3501	13568	13569	3560	3561	13664	13665	35C0	35C1	13760	13761
	Event selection of the Segment	34A2	34A3	13474	13475	3502	3503	13570	13571	3562	3563	13666	13667	35C2	35C3	13762	13763
7	Segment level	34A4	34A5	13476	13477	3504	3505	13572	13573	3564	3565	13668	13669	35C4	35C5	13764	13765
	Segment time	34A6	34A7	13478	13479	3506	3507	13574	13575	3566	3567	13670	13671	35C6	35C7	13766	13767
	Event selection of the Segment	34A8	34A9	13480	13481	3508	3509	13576	13577	3568	3569	13672	13673	35C8	35C9	13768	13769
8	Segment level	34AA	34AB	13482	13483	350A	350B	13578	13579	356A	356B	13674	13675	35CA	35CB	13770	13771
	Segment time	34AC	34AD	13484	13485	350C	350D	13580	13581	356C	356D	13676	13677	35CC	35CD	13772	13773
	Event selection of the Segment	34AE	34AF	13486	13487	350E	350F	13582	13583	356E	356F	13678	13679	35CE	35CF	13774	13775

Low: Low-order High: High-order

Segment No.	Name	Pattern 13				Pattern 14				Pattern 15				Pattern 16			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
9	Segment level	34B0	34B1	13488	13489	3510	3511	13584	13585	3570	3571	13680	13681	35D0	35D1	13776	13777
	Segment time	34B2	34B3	13490	13491	3512	3513	13586	13587	3572	3573	13682	13683	35D2	35D3	13778	13779
	Event selection of the Segment	34B4	34B5	13492	13493	3514	3515	13588	13589	3574	3575	13684	13685	35D4	35D5	13780	13781
10	Segment level	34B6	34B7	13494	13495	3516	3517	13590	13591	3576	3577	13686	13687	35D6	35D7	13782	13783
	Segment time	34B8	34B9	13496	13497	3518	3519	13592	13593	3578	3579	13688	13689	35D8	35D9	13784	13785
	Event selection of the Segment	34BA	34BB	13498	13499	351A	351B	13594	13595	357A	357B	13690	13691	35DA	35DB	13786	13787
11	Segment level	34BC	34BD	13500	13501	351C	351D	13596	13597	357C	357D	13692	13693	35DC	35DD	13788	13789
	Segment time	34BE	34BF	13502	13503	351E	351F	13598	13599	357E	357F	13694	13695	35DE	35DF	13790	13791
	Event selection of the Segment	34C0	34C1	13504	13505	3520	3521	13600	13601	3580	3581	13696	13697	35E0	35E1	13792	13793
12	Segment level	34C2	34C3	13506	13507	3522	3523	13602	13603	3582	3583	13698	13699	35E2	35E3	13794	13795
	Segment time	34C4	34C5	13508	13509	3524	3525	13604	13605	3584	3585	13700	13701	35E4	35E5	13796	13797
	Event selection of the Segment	34C6	34C7	13510	13511	3526	3527	13606	13607	3586	3587	13702	13703	35E6	35E7	13798	13799
13	Segment level	34C8	34C9	13512	13513	3528	3529	13608	13609	3588	3589	13704	13705	35E8	35E9	13800	13801
	Segment time	34CA	34CB	13514	13515	352A	352B	13610	13611	358A	358B	13706	13707	35EA	35EB	13802	13803
	Event selection of the Segment	34CC	34CD	13516	13517	352C	352D	13612	13613	358C	358D	13708	13709	35EC	35ED	13804	13805
14	Segment level	34CE	34CF	13518	13519	352E	352F	13614	13615	358E	358F	13710	13711	35EE	35EF	13806	13807
	Segment time	34D0	34D1	13520	13521	3530	3531	13616	13617	3590	3591	13712	13713	35F0	35F1	13808	13809
	Event selection of the Segment	34D2	34D3	13522	13523	3532	3533	13618	13619	3592	3593	13714	13715	35F2	35F3	13810	13811
15	Segment level	34D4	34D5	13524	13525	3534	3535	13620	13621	3594	3595	13716	13717	35F4	35F5	13812	13813
	Segment time	34D6	34D7	13526	13527	3536	3537	13622	13623	3596	3597	13718	13719	35F6	35F7	13814	13815
	Event selection of the Segment	34D8	34D9	13528	13529	3538	3539	13624	13625	3598	3599	13720	13721	35F8	35F9	13816	13817
16	Segment level	34DA	34DB	13530	13531	353A	353B	13626	13627	359A	359B	13722	13723	35FA	35FB	13818	13819
	Segment time	34DC	34DD	13532	13533	353C	353D	13628	13629	359C	359D	13724	13725	35FC	35FD	13820	13821
	Event selection of the Segment	34DE	34DF	13534	13535	353E	353F	13630	13631	359E	359F	13726	13727	35FE	35FF	13822	13823

6.3.5 Pattern group data [Modbus double word]

Register addresses 5000H to 537FH are used to check and change set values belonging to the Pattern group.

■ Pattern 1 data

No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
1	Pattern end number	5000	5001	20480	20481	R/W	1 to 16 (Segment number)	16
2	Number of repeating patterns	5002	5003	20482	20483	R/W	1 to 1000 times 1000: Continuous operation	1
3	Pattern link number	5004	5005	20484	20485	R/W	0 to 16 0: No link	0
4	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high]	5006	5007	20486	20487	R/W	Deviation: – Input span to + Input span [Varies with the setting of the Decimal point position.] Input value or Set value: Input range low to Input range high [Varies with the setting of the Decimal point position.] Manipulated output value: –5.0 to +105.0 %	TC/RTD inputs: 10 V/I inputs: 5 % of input span Manipulated output value: 50.0
5	Event 1 set value (EV1') [low]	5008	5009	20488	20489	R/W	Deviation: – Input span to + Input span [Varies with the setting of the Decimal point position.] Input value: Input range low to Input range high [Varies with the setting of the Decimal point position.]	TC/RTD inputs: –10 V/I inputs: –5 % of input span
6	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high]	500A	500B	20490	20491	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
7	Event 2 set value (EV2') [low]	500C	500D	20492	20493	R/W	Same as Event 1 set value (EV1') [low]	

No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
8	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high]	500E	500F	20494	20495	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
9	Event 3 set value (EV3') [low]	5010	5011	20496	20497	R/W	Same as Event 1 set value (EV1') [low]	
10	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high]	5012	5013	20498	20499	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
11	Event 4 set value (EV4') [low]	5014	5015	20500	20501	R/W	Same as Event 1 set value (EV1') [low]	
12	Time signal 1 start segment number	5016	5017	20502	20503	R/W	1 to 16	1
13	Time signal 1 start time	5018	5019	20504	20505	R/W	RKC communication 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds [Time unit depends on the time unit of the setting]	RKC communication: 0:00 (0 hour 00 minutes) Modbus: 0
							Modbus 0 to 11999 minues 0 to 11999 seconds [Time unit depends on the time unit of the setting]	
14	Time signal 1 end segment number	501A	501B	20506	20507	R/W	1 to 16	1
15	Time signal 1 end time	501C	501D	20508	20509	R/W	RKC communication 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds [Time unit depends on the time unit of the setting]	RKC communication: 0:00 (0 hour 00 minutes) Modbus: 0
							Modbus 0 to 11999 minutes 0 to 11999 seconds [Time unit depends on the time unit of the setting]	
16	Time signal 2 start segment number	501E	501F	20510	20511	R/W	Same as Time signal 1 start segment number	

No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
17	Time signal 2 start time	5020	5021	20512	20513	R/W	Same as Time signal 1 start time	
18	Time signal 2 end segment number	5022	5023	20514	20515	R/W	Same as Time signal 1 end segment number	
19	Time signal 2 end time	5024	5025	20516	20517	R/W	Same as Time signal 1 end time	
20	Time signal 3 start segment number	5026	5027	20518	20519	R/W	Same as Time signal 1 start segment number	
21	Time signal 3 start time	5028	5029	20520	20521	R/W	Same as Time signal 1 start time	
22	Time signal 3 end segment number	502A	502B	20522	20523	R/W	Same as Time signal 1 end segment number	
23	Time signal 3 end time	502C	502D	20524	20525	R/W	Same as Time signal 1 end time	
24	Time signal 4 start segment number	502E	502F	20526	20527	R/W	Same as Time signal 1 start segment number	
25	Time signal 4 start time	5030	5031	20528	20529	R/W	Same as Time signal 1 start time	
26	Time signal 4 end segment number	5032	5033	20530	20531	R/W	Same as Time signal 1 end segment number	
27	Time signal 4 end time	5034	5035	20532	20533	R/W	Same as Time signal 1 end time	
28	Pattern end output time	5036	5037	20534	20535	R/W	RKC communication 0 hours 00 minutes to 199 hours 59 minutes or 0 minutes 00 seconds to 199 minutes 59 seconds 0:00: Output remains on [Time unit depends on the time unit of the setting]	RKC communication: 0:00 (0 hour 00 minute) Modbus: 0
							Modbus 0 to 11999 minutes 0 to 11999 seconds 0: Output remains on [Time unit depends on the time unit of the setting]	

■ Pattern 2 to 5 data

Register address for Pattern 2 to 5.

For details of attribute, data range and factory set values, refer to the same line No. in ■ Pattern 1 data (P.6-75).

Low: Low-order High: High-order

No.	Name	PID group 2				PID group 3				PID group 4				PID group 5			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Pattern end number	5038	5039	20536	20537	5070	5071	20592	20593	50A8	50A9	20648	20649	50E0	50E1	20704	20705
2	Number of repeating patterns	503A	503B	20538	20539	5072	5073	20594	20595	50AA	50AB	20650	20651	50E2	50E3	20706	20707
3	Pattern link number	503C	503D	20540	20541	5074	5075	20596	20597	50AC	50AD	20652	20653	50E4	50E5	20708	20709
4	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high]	503E	503F	20542	20543	5076	5077	20598	20599	50AE	50AF	20654	20655	50E6	50E7	20710	20711
5	Event 1 set value (EV1') [low]	5040	5041	20544	20545	5078	5079	20600	20601	50B0	50B1	20656	20657	50E8	50E9	20712	20713
6	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high]	5042	5043	20546	20547	507A	507B	20602	20603	50B2	50B3	20658	20659	50EA	50EB	20714	20715
7	Event 2 set value (EV2') [low]	5044	5045	20548	20549	507C	507D	20604	20605	50B4	50B5	20660	20661	50EC	50ED	20716	20717
8	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high]	5046	5047	20550	20551	507E	507F	20606	20607	50B6	50B7	20662	20663	50EE	50EF	20718	20719
9	Event 3 set value (EV3') [low]	5048	5049	20552	20553	5080	5081	20608	20609	50B8	50B9	20664	20665	50F0	50F1	20720	20721
10	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high]	504A	504B	20554	20555	5082	5083	20610	20611	50BA	50BB	20666	20667	50F2	50F3	20722	20723
11	Event 4 set value (EV4') [low]	504C	504D	20556	20557	5084	5085	20612	20613	50BC	50BD	20668	20669	50F4	50F5	20724	20725
12	Time signal 1 start segment number	504E	504F	20558	20559	5086	5087	20614	20615	50BE	50BF	20670	20671	50F6	50F7	20726	20727
13	Time signal 1 start time	5050	5051	20560	20561	5088	5089	20616	20617	50C0	50C1	20672	20673	50F8	50F9	20728	20729

Low: Low-order High: High-order

No.	Name	PID group 2				PID group 3				PID group 4				PID group 5			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
14	Time signal 1 end segment number	5052	5053	20562	20563	508A	508B	20618	20619	50C2	50C3	20674	20675	50FA	50FB	20730	20731
15	Time signal 1 end time	5054	5055	20564	20565	508C	508D	20620	20621	50C4	50C5	20676	20677	50FC	50FD	20732	20733
16	Time signal 2 start segment number	5056	5057	20566	20567	508E	508F	20622	20623	50C6	50C7	20678	20679	50FE	50FF	20734	20735
17	Time signal 2 start time	5058	5059	20568	20569	5090	5091	20624	20625	50C8	50C9	20680	20681	5100	5101	20736	20737
18	Time signal 2 end segment number	505A	505B	20570	20571	5092	5093	20626	20627	50CA	50CB	20682	20683	5102	5103	20738	20739
19	Time signal 2 end time	505C	505D	20572	20573	5094	5095	20628	20629	50CC	50CD	20684	20685	5104	5105	20740	20741
20	Time signal 3 start segment number	505E	505F	20574	20575	5096	5097	20630	20631	50CE	50CF	20686	20687	5106	5107	20742	20743
21	Time signal 3 start time	5060	5061	20576	20577	5098	5099	20632	20633	50D0	50D1	20688	20689	5108	5109	20744	20745
22	Time signal 3 end segment number	5062	5063	20578	20579	509A	509B	20634	20635	50D2	50D3	20690	20691	510A	510B	20746	20747
23	Time signal 3 end time	5064	5065	20580	20581	509C	509D	20636	20637	50D4	50D5	20692	20693	510C	510D	20748	20749
24	Time signal 4 start segment number	5066	5067	20582	20583	509E	509F	20638	20639	50D6	50D7	20694	20695	510E	510F	20750	20751
25	Time signal 4 start time	5068	5069	20584	20585	50A0	50A1	20640	20641	50D8	50D9	20696	20697	5110	5111	20752	20753
26	Time signal 4 end segment number	506A	506B	20586	20587	50A2	50A3	20642	20643	50DA	50DB	20698	20699	5112	5113	20754	20755
27	Time signal 4 end time	506C	506D	20588	20589	50A4	50A5	20644	20645	50DC	50DD	20700	20701	5114	5115	20756	20757
28	Pattern end output time	506E	506F	20590	20591	50A6	50A7	20646	20647	50DE	50DF	20702	20703	5116	5117	20758	20759

■ Pattern 6 to 9 data

Register address for Pattern 6 to 9.

For details of attribute, data range and factory set values, refer to the same line No. in ■ Pattern 1 data (P.6-75).

Low: Low-order High: High-order

No.	Name	PID group 6				PID group 7				PID group 8				PID group 9			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Pattern end number	5118	5119	20760	20761	5150	5151	20816	20817	5188	5189	20872	20873	51C0	51C1	20928	20929
2	Number of repeating patterns	511A	511B	20762	20763	5152	5153	20818	20819	518A	518B	20874	20875	51C2	51C3	20930	20931
3	Pattern link number	511C	511D	20764	20765	5154	5155	20820	20821	518C	518D	20876	20877	51C4	51C5	20932	20933
4	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high]	511E	511F	20766	20767	5156	5157	20822	20823	518E	518F	20878	20879	51C6	51C7	20934	20935
5	Event 1 set value (EV1') [low]	5120	5121	20768	20769	5158	5159	20824	20825	5190	5191	20880	20881	51C8	51C9	20936	20937
6	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high]	5122	5123	20770	20771	515A	515B	20826	20827	5192	5193	20882	20883	51CA	51CB	20938	20939
7	Event 2 set value (EV2') [low]	5124	5125	20772	20773	515C	515D	20828	20829	5194	5195	20884	20885	51CC	51CD	20940	20941
8	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high]	5126	5127	20774	20775	515E	515F	20830	20831	5196	5197	20886	20887	51CE	51CF	20942	20943
9	Event 3 set value (EV3') [low]	5128	5129	20776	20777	5160	5161	20832	20833	5198	5199	20888	20889	51D0	51D1	20944	20945
10	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high]	512A	512B	20778	20779	5162	5163	20834	20835	519A	519B	20890	20891	51D2	51D3	20946	20947
11	Event 4 set value (EV4') [low]	512C	512D	20780	20781	5164	5165	20836	20837	519C	519D	20892	20893	51D4	51D5	20948	20949
12	Time signal 1 start segment number	512E	512F	20782	20783	5166	5167	20838	20839	519E	519F	20894	20895	51D6	51D7	20950	20951
13	Time signal 1 start time	5130	5131	20784	20785	5168	5169	20840	20841	51A0	51A1	20896	20897	51D8	51D9	20952	20953

Low: Low-order High: High-order

No.	Name	PID group 6				PID group 7				PID group 8				PID group 9			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
14	Time signal 1 end segment number	5132	5133	20786	20787	516A	516B	20842	20843	51A2	51A3	20898	20899	51DA	51DB	20954	20955
15	Time signal 1 end time	5134	5135	20788	20789	516C	516D	20844	20845	51A4	51A5	20900	20901	51DC	51DD	20956	20957
16	Time signal 2 start segment number	5136	5137	20790	20791	516E	516F	20846	20847	51A6	51A7	20902	20903	51DE	51DF	20958	20959
17	Time signal 2 start time	5138	5139	20792	20793	5170	5171	20848	20849	51A8	51A9	20904	20905	51E0	51E1	20960	20961
18	Time signal 2 end segment number	513A	513B	20794	20795	5172	5173	20850	20851	51AA	51AB	20906	20907	51E2	51E3	20962	20963
19	Time signal 2 end time	513C	513D	20796	20797	5174	5175	20852	20853	51AC	51AD	20908	20909	51E4	51E5	20964	20965
20	Time signal 3 start segment number	513E	513F	20798	20799	5176	5177	20854	20855	51AE	51AF	20910	20911	51E6	51E7	20966	20967
21	Time signal 3 start time	5140	5141	20800	20801	5178	5179	20856	20857	51B0	51B1	20912	20913	51E8	51E9	20968	20969
22	Time signal 3 end segment number	5142	5143	20802	20803	517A	517B	20858	20859	51B2	51B3	20914	20915	51EA	51EB	20970	20971
23	Time signal 3 end time	5144	5145	20804	20805	517C	517D	20860	20861	51B4	51B5	20916	20917	51EC	51ED	20972	20973
24	Time signal 4 start segment number	5146	5147	20806	20807	517E	517F	20862	20863	51B6	51B7	20918	20919	51EE	51EF	20974	20975
25	Time signal 4 start time	5148	5149	20808	20809	5180	5181	20864	20865	51B8	51B9	20920	20921	51F0	51F1	20976	20977
26	Time signal 4 end segment number	514A	514B	20810	20811	5182	5183	20866	20867	51BA	51BB	20922	20923	51F2	51F3	20978	20979
27	Time signal 4 end time	514C	514D	20812	20813	5184	5185	20868	20869	51BC	51BD	20924	20925	51F4	51F5	20980	20981
28	Pattern end output time	514E	514F	20814	20815	5186	5187	20870	20871	51BE	51BF	20926	20927	51F6	51F7	20982	20983

■ Pattern 10 to 13 data

Register address for Pattern 10 to 13.

For details of attribute, data range and factory set values, refer to the same line No. in ■ Pattern 1 data (P.6-75).

Low: Low-order High: High-order

No.	Name	PID group 10				PID group 11				PID group 12				PID group 13			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Pattern end number	51F8	51F9	20984	20985	5230	5231	21040	21041	5268	5269	21096	21097	52A0	52A1	21152	21153
2	Number of repeating patterns	51FA	51FB	20986	20987	5232	5233	21042	21043	526A	526B	21098	21099	52A2	52A3	21154	21155
3	Pattern link number	51FC	51FD	20988	20989	5234	5235	21044	21045	526C	526D	21100	21101	52A4	52A5	21156	21157
4	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high]	51FE	51FF	20990	20991	5236	5237	21046	21047	526E	526F	21102	21103	52A6	52A7	21158	21159
5	Event 1 set value (EV1') [low]	5200	5201	20992	20993	5238	5239	21048	21049	5270	5271	21104	21105	52A8	52A9	21160	21161
6	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high]	5202	5203	20994	20995	523A	523B	21050	21051	5272	5273	21106	21107	52AA	52AB	21162	21163
7	Event 2 set value (EV2') [low]	5204	5205	20996	20997	523C	523D	21052	21053	5274	5275	21108	21109	52AC	52AD	21164	21165
8	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high]	5206	5207	20998	20999	523E	523F	21054	21055	5276	5277	21110	21111	52AE	52AF	21166	21167
9	Event 3 set value (EV3') [low]	5208	5209	21000	21001	5240	5241	21056	21057	5278	5279	21112	21113	52B0	52B1	21168	21169
10	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high]	520A	520B	21002	21003	5242	5243	21058	21059	527A	527B	21114	21115	52B2	52B3	21170	21171
11	Event 4 set value (EV4') [low]	520C	520D	21004	21005	5244	5245	21060	21061	527C	527D	21116	21117	52B4	52B5	21172	21173
12	Time signal 1 start segment number	520E	520F	21006	21007	5246	5247	21062	21063	527E	527F	21118	21119	52B6	52B7	21174	21175
13	Time signal 1 start time	5210	5211	21008	21009	5248	5249	21064	21065	5280	5281	21120	21121	52B8	52B9	21176	21177

Low: Low-order High: High-order

No.	Name	PID group 10				PID group 11				PID group 12				PID group 13			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
14	Time signal 1 end segment number	5212	5213	21010	21011	524A	524B	21066	21067	5282	5283	21122	21123	52BA	52BB	21178	21179
15	Time signal 1 end time	5214	5215	21012	21013	524C	524D	21068	21069	5284	5285	21124	21125	52BC	52BD	21180	21181
16	Time signal 2 start segment number	5216	5217	21014	21015	524E	524F	21070	21071	5286	5287	21126	21127	52BE	52BF	21182	21183
17	Time signal 2 start time	5218	5219	21016	21017	5250	5251	21072	21073	5288	5289	21128	21129	52C0	52C1	21184	21185
18	Time signal 2 end segment number	521A	521B	21018	21019	5252	5253	21074	21075	528A	528B	21130	21131	52C2	52C3	21186	21187
19	Time signal 2 end time	521C	521D	21020	21021	5254	5255	21076	21077	528C	528D	21132	21133	52C4	52C5	21188	21189
20	Time signal 3 start segment number	521E	521F	21022	21023	5256	5257	21078	21079	528E	528F	21134	21135	52C6	52C7	21190	21191
21	Time signal 3 start time	5220	5221	21024	21025	5258	5259	21080	21081	5290	5291	21136	21137	52C8	52C9	21192	21193
22	Time signal 3 end segment number	5222	5223	21026	21027	525A	525B	21082	21083	5292	5293	21138	21139	52CA	52CB	21194	21195
23	Time signal 3 end time	5224	5225	21028	21029	525C	525D	21084	21085	5294	5295	21140	21141	52CC	52CD	21196	21197
24	Time signal 4 start segment number	5226	5227	21030	21031	525E	525F	21086	21087	5296	5297	21142	21143	52CE	52CF	21198	21199
25	Time signal 4 start time	5228	5229	21032	21033	5260	5261	21088	21089	5298	5299	21144	21145	52D0	52D1	21200	21201
26	Time signal 4 end segment number	522A	522B	21034	21035	5262	5263	21090	21091	529A	529B	21146	21147	52D2	52D3	21202	21203
27	Time signal 4 end time	522C	522D	21036	21037	5264	5265	21092	21093	529C	529D	21148	21149	52D4	52D5	21204	21205
28	Pattern end output time	522E	522F	21038	21039	5266	5267	21094	21095	529E	529F	21150	21151	52D6	52D7	21206	21207

■ Pattern 14 to 16 data

Register address for Pattern 14 to 16

For details of attribute, data range and factory set values, refer to the same line No. in ■ Pattern 1 data (P.6-75).

Low: Low-order High: High-order

No.	Name	PID group 14				PID group 15				PID group 16			
		Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Pattern end number	52D8	52D9	21208	21209	5310	5311	21264	21265	5348	5349	21320	21321
2	Number of repeating patterns	52DA	52DB	21210	21211	5312	5313	21266	21267	534A	534B	21322	21323
3	Pattern link number	52DC	52DD	21212	21213	5314	5315	21268	21269	534C	534D	21324	21325
4	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high]	52DE	52DF	21214	21215	5316	5317	21270	21271	534E	534F	21326	21327
5	Event 1 set value (EV1') [low]	52E0	52E1	21216	21217	5318	5319	21272	21273	5350	5351	21328	21329
6	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high]	52E2	52E3	21218	21219	531A	531B	21274	21275	5352	5353	21330	21331
7	Event 2 set value (EV2') [low]	52E4	52E5	21220	21221	531C	531D	21276	21277	5354	5355	21332	21333
8	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high]	52E6	52E7	21222	21223	531E	531F	21278	21279	5356	5357	21334	21335
9	Event 3 set value (EV3') [low]	52E8	52E9	21224	21225	5320	5321	21280	21281	5358	5359	21336	21337
10	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high]	52EA	52EB	21226	21227	5322	5323	21282	21283	535A	535B	21338	21339
11	Event 4 set value (EV4') [low]	52EC	52ED	21228	21229	5324	5325	21284	21285	535C	535D	21340	21341
12	Time signal 1 start segment number	52EE	52EF	21230	21231	5326	5327	21286	21287	535E	535F	21342	21343
13	Time signal 1 start time	52F0	52F1	21232	21233	5328	5329	21288	21289	5360	5361	21344	21345

Low: Low-order High: High-order

No.	Name	PID group 14				PID group 15				PID group 16			
		Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
14	Time signal 1 end segment number	52F2	52F3	21234	21235	532A	532B	21290	21291	5362	5363	21346	21347
15	Time signal 1 end time	52F4	52F5	21236	21237	532C	532D	21292	21293	5364	5365	21348	21349
16	Time signal 2 start segment number	52F6	52F7	21238	21239	532E	532F	21294	21295	5366	5367	21350	21351
17	Time signal 2 start time	52F8	52F9	21240	21241	5330	5331	21296	21297	5368	5369	21352	21353
18	Time signal 2 end segment number	52FA	52FB	21242	21243	5332	5333	21298	21299	536A	536B	21354	21355
19	Time signal 2 end time	52FC	52FD	21244	21245	5334	5335	21300	21301	536C	536D	21356	21357
20	Time signal 3 start segment number	52FE	52FF	21246	21247	5336	5337	21302	21303	536E	536F	21358	21359
21	Time signal 3 start time	5300	5301	21248	21249	5338	5339	21304	21305	5370	5371	21360	21361
22	Time signal 3 end segment number	5302	5303	21250	21251	533A	533B	21306	21307	5372	5373	21362	21363
23	Time signal 3 end time	5304	5305	21252	21253	533C	533D	21308	21309	5374	5375	21364	21365
24	Time signal 4 start segment number	5306	5307	21254	21255	533E	533F	21310	21311	5376	5377	21366	21367
25	Time signal 4 start time	5308	5309	21256	21257	5340	5341	21312	21313	5378	5379	21368	21369
26	Time signal 4 end segment number	530A	530B	21258	21259	5342	5343	21314	21315	537A	537B	21370	21371
27	Time signal 4 end time	530C	530D	21260	21261	5344	5345	21316	21317	537C	537D	21372	21373
28	Pattern end output time	530E	530F	21262	21263	5346	5347	21318	21319	537E	537F	21374	21375

6.4 Modbus (Single Word) Data

6.4.1 Communication data [Modbus single word]

The following table shows single word register address of Modbus.

For attribute, data range, and factory set values, refer to **6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-8)**.



When Input data type is set to “1,” the communication data will be Modbus single word.



Switchover between the single word and the double word can be done at Input data type.

For the Input data type, refer to the **3.2 Selection of Communication Data Type (P. 3-5)**.

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
1	Measured value (PV)	0000	0	1
2	Set value (SV) monitor	0001	1	2
3	Manipulated output value monitor [heat-side]	0002	2	3
4	Manipulated output value monitor [cool-side]	0003	3	4
5	Current transformer 1 (CT1) input value monitor	0004	4	5
6	Current transformer 2 (CT2) input value monitor	0005	5	6
7	Feedback resistance (FBR) input value	0006	6	7
8	Pattern number monitor	0007	7	8
9	Segment number monitor	0008	8	9
10	Segment remaining time monitor	0009	9	10
11	Pattern remaining time monitor	000A	10	11
12	Number of repeating patterns monitor	000B	11	12
13	Time signal state	000C	12	13
14	Pattern end state	000D	13	14
15	Wait state	000E	14	15
16	Hold state	000F	15	16
17	Overall operation status	0010	16	17
18	Event 1 state monitor	0011	17	18
19	Event 2 state monitor	0012	18	19
20	Event 3 state monitor	0013	19	20

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
21	Event 4 state monitor	0014	20	21
22	Heater break alarm 1 (HBA1) state monitor	0015	21	22
23	Heater break alarm 2 (HBA2) state monitor	0016	22	23
24	Control loop break alarm (LBA) state monitor	0017	23	24
25	Comprehensive event state	0018	24	25
26	Burnout state monitor	0019	25	26
27	Feedback resistance (FBR) break monitor	001A	26	27
28	DI state monitor	001B	27	28
29	OUT state monitor	001C	28	29
30	DO state monitor	001D	29	30
31	PID group	001E	30	31
32	Peak hold monitor	001F	31	32
33	Bottom hold monitor	0020	32	33
34	AT remaining time monitor	0021	33	34
35	AT/ST status monitor	0022	34	35
36	Error code	0023	35	36
37	Integrated operating time	0024	36	37
38	Peak hold monitor of ambient temperature	0025	37	38
39	Retransmission output 1 decimal point position	0026	38	42
40	Retransmission output 2 decimal point position	0027	39	43
41	Retransmission output 3 decimal point position	0028	40	44
42	Event 1 decimal point position	0029	41	45

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
43	Event 2 decimal point position	002A	42	46
44	Event 3 decimal point position	002B	43	47
45	Event 4 decimal point position	002C	44	48
46	Execution pattern selection	002D	45	49
47	Peak/Bottom hold reset	002E	46	50
48	Bottom suppression start signal	002F	47	51
49	Operation mode transfer	0030	48	52
50	Step function	0031	49	53
51	Autotuning (AT)	0032	50	54
52	Overall level autotuning (AT)	0033	51	55
53	Startup tuning (ST)	0034	52	56
54	Interlock release	0035	53	57
55	Set value (SV) in Fixed set point control mode	0036	54	58
56	Segment level	0037	55	59
57	Segment time	0038	56	60
58	Pattern end number	0039	57	61
59	Number of repeating patterns	003A	58	62
60	Pattern link number	003B	59	63
61	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high]	003C	60	64
62	Event 1 set value (EV1') [low]	003D	61	65
63	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high]	003E	62	66
64	Event 2 set value (EV2') [low]	003F	63	67
65	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high]	0040	64	68

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
66	Event 3 set value (EV3') [low]	0041	65	69
67	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high]	0042	66	70
68	Event 4 set value (EV4') [low]	0043	67	71
69	Time signal 1 start segment number	0044	68	72
70	Time signal 1 start time	0045	69	73
71	Time signal 1 end segment number	0046	70	74
72	Time signal 1 end time	0047	71	75
73	Time signal 2 start segment number	0048	72	76
74	Time signal 2 start time	0049	73	77
75	Time signal 2 end segment number	004A	74	78
76	Time signal 2 end time	004B	75	79
77	Time signal 3 start segment number	004C	76	80
78	Time signal 3 start time	004D	77	81
79	Time signal 3 end segment number	004E	78	82
80	Time signal 3 end time	004F	79	83
81	Time signal 4 start segment number	0050	80	84
82	Time signal 4 start time	0051	81	85
83	Time signal 4 end segment number	0052	82	86
84	Time signal 4 end time	0053	83	87
85	Pattern end output time	0054	84	88
86	Proportional band [heat-side]	0055	85	89
87	Integral time [heat-side]	0056	86	90
88	Derivative time [heat-side]	0057	87	91
89	Control response parameter	0058	88	92
90	Proactive intensity	0059	89	93
91	Manual reset	005A	90	94
92	FF amount	005B	91	95

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
93	Output limiter high [heat-side]	005C	92	96
94	Output limiter low [heat-side]	005D	93	97
95	Control loop break alarm (LBA) time	005E	94	98
96	LBA deadband (LBD)	005F	95	99
97	Unused register	0060	96	—
98	Proportional band [cool-side]	0061	97	101
99	Integral time [cool-side]	0062	98	102
100	Derivative time [cool-side]	0063	99	103
101	Overlap/Deadband	0064	100	104
102	Output limiter high [cool-side]	0065	101	105
	Output limiter low [heat-side]			
103	Output limiter low [cool-side]	0066	102	106
104	Automatic level PID setting	0067	103	107
105	Level PID setting 1	0068	104	108
106	Level PID setting 2	0069	105	109
107	Level PID setting 3	006A	106	110
108	Level PID setting 4	006B	107	111
109	Level PID setting 5	006C	108	112
110	Level PID setting 6	006D	109	113
111	Level PID setting 7	006E	110	114
112	Wait zone high	006F	111	115
113	Wait zone low	0070	112	116
114	SV selection at program start	0071	113	117
115	Hot/Cold start	0072	114	118
116	Control action at pattern end	0073	115	119
117	Output action at pattern end	0074	116	120
118	Display update cycle	0075	117	121
119	PV bias	0076	118	122
120	PV digital filter	0077	119	123
121	PV ratio	0078	120	124
122	PV low input cut-off	0079	121	125

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
123	OUT1 proportional cycle time	007A	122	126
124	OUT2 proportional cycle time	007B	123	127
125	OUT3 proportional cycle time	007C	124	128
126	OUT1 minimum ON/OFF time of proportional cycle	007D	125	129
127	OUT2 minimum ON/OFF time of proportional cycle	007E	126	130
128	OUT3 minimum ON/OFF time of proportional cycle	007F	127	131
129	Heater break alarm 1 (HBA1) set value	0080	128	132
130	Number of heater break alarm 1 (HBA1) delay times	0081	129	133
131	Heater break alarm 2 (HBA2) set value	0082	130	134
132	Number of heater break alarm 2 (HBA2) delay times	0083	131	135
133	Event selection of the Segment	0084	132	136
134	Manual manipulated output value	0085	133	137
135	ON/OFF action differential gap (upper)	0086	134	138
136	ON/OFF action differential gap (lower)	0087	135	139
137	AT bias	0088	136	140
138	Open/Close output neutral zone	0089	137	141
139	Open/Close output differential gap	008A	138	142
140	FF amount learning	008B	139	143
141	Determination point of external disturbance	008C	140	144

Items 142 to 321 are data in the Engineering mode.

WARNING

Communication data the Engineering mode 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

Make sure to be in the Reset mode (RESET) before conducting parameter setting in the Engineering mode. However, only checking can be made even in the Program control mode (RUN), the Fixed set point control mode (FIX) and the Manual control mode (MAN).

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
142	Time unit of the setting	008D	141	145
143	Segment setting change type	008E	142	146
144	Store segment setting change	008F	143	147
145	ALM lamp lighting condition	0090	144	148
146	PV flashing display at input error	0091	145	149
147	Select hide items in Monitor mode	0092	146	150
148	Select hide items in Operation transfer mode	0093	147	151
149	Input type	0094	148	152
150	Display unit	0095	149	153
151	Decimal point position	0096	150	154
152	Input range high	0097	151	155
153	Input range low	0098	152	156
154	Input error determination point (high)	0099	153	157
155	Input error determination point (low)	009A	154	158
156	Temperature compensation calculation	009B	155	159
157	Burnout direction	009C	156	160

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
158	Square root extraction	009D	157	161
159	Inverting input	009E	158	162
160	Input data type	009F	159	163
161	DI1 function selection	00A0	160	164
162	DI2 function selection	00A1	161	165
163	DI3 function selection	00A2	162	166
164	DI4 function selection	00A3	163	167
165	DI5 function selection	00A4	164	168
166	DI6 function selection	00A5	165	169
167	DI logic invert	00A6	166	170
168	OUT1 function selection	00A7	167	171
169	OUT2 function selection	00A8	168	172
170	OUT3 function selection	00A9	169	173
171	OUT1 logic calculation selection	00AA	170	174
172	OUT2 logic calculation selection	00AB	171	175
173	OUT3 logic calculation selection	00AC	172	176

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
174	Energized/De-energized selection	00AD	173	177
175	Interlock selection	00AE	174	178
176	Output action in Reset mode	00AF	175	179
177	Universal output type selection (OUT3)	00B0	176	180
178	Retransmission output 1 type	00B1	177	181
179	Retransmission output 1 scale high	00B2	178	182
180	Retransmission output 1 scale low	00B3	179	183
181	Retransmission output 2 type	00B4	180	184
182	Retransmission output 2 scale high	00B5	181	185
183	Retransmission output 2 scale low	00B6	182	186
184	Retransmission output 3 type	00B7	183	187
185	Retransmission output 3 scale high	00B8	184	188
186	Retransmission output 3 scale low	00B9	185	189
187	DO1 function selection	00BA	186	190
188	DO2 function selection	00BB	187	191
189	DO3 function selection	00BC	188	192
190	DO4 function selection	00BD	189	193
191	DO1 logic calculation selection	00BE	190	194
192	DO2 logic calculation selection	00BF	191	195
193	DO3 logic calculation selection	00C0	192	196
194	DO4 logic calculation selection	00C1	193	197
195	DO1 time signal selection	00C2	194	198
196	DO2 time signal selection	00C3	195	199
197	DO3 time signal selection	00C4	196	200
198	DO4 time signal selection	00C5	197	201
199	Event 1 type	00C6	198	202
200	Event 1 hold action	00C7	199	203
201	Event 1 differential gap	00C8	200	204
202	Event 1 timer	00C9	201	205
203	Event 2 type	00CA	202	206
204	Event 2 hold action	00CB	203	207

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
205	Event 2 differential gap	00CC	204	208
206	Event 2 timer	00CD	205	209
207	Event 3 type	00CE	206	210
208	Event 3 hold action	00CF	207	211
209	Event 3 differential gap	00D0	208	212
210	Event 3 timer	00D1	209	213
211	Event 4 type	00D2	210	214
212	Event 4 hold action	00D3	211	215
213	Event 4 differential gap	00D4	212	216
214	Event 4 timer	00D5	213	217
215	CT1 assignment	00D6	214	218
216	CT1 type	00D7	215	219
217	CT1 ratio	00D8	216	220
218	CT1 low input cut-off	00D9	217	221
219	CT2 assignment	00DA	218	222
220	CT2 type	00DB	219	223
221	CT2 ratio	00DC	220	224
222	CT2 low input cut-off	00DD	221	225
223	Manual manipulated output value selection	00DE	222	226
224	Integral/Derivative time decimal point position	00DF	223	227
225	ST start condition	00E0	224	228
226	Time signal selection	00E1	225	229
227	Pattern end signal selection	00E2	226	230
228	Control action	00E3	227	231
229	Output change rate limiter (up) [heat-side]	00E4	228	232
230	Output change rate limiter (down) [heat-side]	00E5	229	233
231	Action (high) input error	00E6	230	234
232	Action (low) input error	00E7	231	235
233	Manipulated output value at input error	00E8	232	236
234	Manipulated output value in Reset mode [heat-side]	00E9	233	237

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
235	Start determination point	00EA	234	238
236	Level PID action selection	00EB	235	239
237	Level PID differential gap	00EC	236	240
238	Unused register	00ED	237	—
239	Action at feedback resistance (FBR) input error	00EE	238	242
240	Feedback adjustment	00EF	239	243
241	Control motor time	00F0	240	244
242	Integrated output limiter	00F1	241	245
243	Valve action in Reset mode	00F2	242	246
244	Action at saturated output	00F3	243	247
245	Output change rate limiter (up) [cool-side]	00F4	244	248
246	Output change rate limiter (down) [cool-side]	00F5	245	249
247	Manipulated output value in Reset mode [cool-side]	00F6	246	250
248	Undershoot suppression factor	00F7	247	251
249	Overlap/Deadband reference point	00F8	248	252
250	Bottom suppression function	00F9	249	253
251	Communication protocol	00FA	250	254
252	Device address	00FB	251	255
253	Communication speed	00FC	252	256
254	Data bit configuration	00FD	253	257
255	Interval time	00FE	254	258
256	Register type	00FF	255	259
257	Register start number (High-order 4-bit)	0100	256	260
258	Register start number (Low-order 16-bit)	0101	257	261
259	Monitor item register bias	0102	258	262
260	Setting item register bias	0103	259	263
261	Instrument link recognition time	0104	260	264
262	PLC response waiting time	0105	261	265
263	PLC communication start time	0106	262	266
264	Slave register bias	0107	263	267

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
265	Number of recognizable devices	0108	264	268
266	Station number	0109	265	269
267	PC number	010A	266	270
268	Monitor item selection 1	010B	267	273
269	Monitor item selection 2	010C	268	274
270	Monitor item selection 3	010D	269	275
271	Setting item selection 1	010E	270	276
272	Setting item selection 2	010F	271	277
273	Setting item selection 3	0110	272	278
274	Setting item selection 4	0111	273	279
275	Setting item selection 5	0112	274	280
276	Setting item selection 6	0113	275	281
277	Setting item selection 7	0114	276	282
278	Setting item selection 8	0115	277	283
279	Setting item selection 9	0116	278	284
280	Setting item selection 10	0117	279	285
281	Setting item selection 11	0118	280	286
282	Setting item selection 12	0119	281	287
283	Setting item selection 13	011A	282	288
284	Setting item selection 14	011B	283	289
285	Setting item selection 15	011C	284	290
286	Setting item selection 16	011D	285	291
287	Setting item selection 17	011E	286	292
288	Setting item selection 18	011F	287	293
289	Setting item selection 19	0120	288	294
290	Setting item selection 20	0121	289	295
291	Setting item selection 21	0122	290	296
292	Setting item selection 22	0123	291	297
293	Setting item selection 23	0124	292	298
294	Setting item selection 24	0125	293	299
295	Setting item selection 25	0126	294	300

No.	Name	Register address		6.3.1
		HEX	DEC	Reference No.
296	Setting item selection 26	0127	295	301
297	Setting item selection 27	0128	296	302
298	Setting limiter high	0129	297	303
299	Setting limiter low	012A	298	304
300	Initialization	012B	299	305
301	Set data unlock/lock transfer	012C	300	306
302	Set lock level	012D	301	307
303	Select Blind function	012E	302	308
304	Parameter select direct registration	012F	303	309
305	Parameter select setting 1	0130	304	310
306	Parameter select setting 2	0131	305	311
307	Parameter select setting 3	0132	306	312
308	Parameter select setting 4	0133	307	313
309	Parameter select setting 5	0134	308	314
310	Parameter select setting 6	0135	309	315
311	Parameter select setting 7	0136	310	316
312	Parameter select setting 8	0137	311	317
313	Parameter select setting 9	0138	312	318
314	Parameter select setting 10	0139	313	319
315	Parameter select setting 11	013A	314	320
316	Parameter select setting 12	013B	315	321
317	Parameter select setting 13	013C	316	322
318	Parameter select setting 14	013D	317	323
319	Parameter select setting 15	013E	318	324
320	Parameter select setting 16	013F	319	325
321	Select hide items in Program setting mode	0140	320	326

6.4.2 Data mapping address [Modbus single word]

Necessary data can be read/written at one time by assigning any desired data (max. 32) continuously.



For the Data mapping, refer to the **5.8 How to Use Modbus Data Mapping (P. 5-15)**.

■ Register address for data designation

No.	Name	Register address		Attribute	Data range	Factory set value
		HEX	DEC			
1	Register address setting 1 [Read/write address: 1000H]	0500	1280	R/W	Set the register address of data to be assigned to 1000H to 101FH Decimal number: –1 to 32767 (–1: Without mapping) Hexadecimal numeral: FFFFH to 7FFFH (FFFFH: Without mapping) The register addresses for data designation (0500H to 051FH) and read/write (1000H to 101FH) will be invalid (without mapping), even if set.	–1
2	Register address setting 2 [Read/write address: 1001H]	0501	1281	R/W		–1
3	Register address setting 3 [Read/write address: 1002H]	0502	1282	R/W		–1
4	Register address setting 4 [Read/write address: 1003H]	0503	1283	R/W		–1
5	Register address setting 5 [Read/write address: 1004H]	0504	1284	R/W		–1
6	Register address setting 6 [Read/write address: 1005H]	0505	1285	R/W		–1
7	Register address setting 7 [Read/write address: 1006H]	0506	1286	R/W		–1
8	Register address setting 8 [Read/write address: 1007H]	0507	1287	R/W		–1
9	Register address setting 9 [Read/write address: 1008H]	0508	1288	R/W		–1
10	Register address setting 10 [Read/write address: 1009H]	0509	1289	R/W		–1
11	Register address setting 11 [Read/write address: 100AH]	050A	1290	R/W		–1
12	Register address setting 12 [Read/write address: 100BH]	050B	1291	R/W		–1
13	Register address setting 13 [Read/write address: 100CH]	050C	1292	R/W		–1
14	Register address setting 14 [Read/write address: 100DH]	050D	1293	R/W		–1
15	Register address setting 15 [Read/write address: 100EH]	050E	1294	R/W		–1
16	Register address setting 16 [Read/write address: 100FH]	050F	1295	R/W		–1

No.	Name	Register address		Attribute	Data range	Factory set value
		HEX	DEC			
17	Register address setting 17 [Read/write address: 1010H]	0510	1296	R/W	Set the register address of data to be assigned to 1000H to 101FH Decimal number: -1 to 32767 (-1: Without mapping) Hexadecimal numeral: FFFFH to 7FFFH (FFFFH: Without mapping) The register addresses for data designation (0500H to 051FH) and read/write (1000H to 101FH) will be invalid (without mapping), even if set.	-1
18	Register address setting 18 [Read/write address: 1011H]	0511	1297	R/W		-1
19	Register address setting 19 [Read/write address: 1012H]	0512	1298	R/W		-1
20	Register address setting 20 [Read/write address: 1013H]	0513	1299	R/W		-1
21	Register address setting 21 [Read/write address: 1014H]	0514	1300	R/W		-1
22	Register address setting 22 [Read/write address: 1015H]	0515	1301	R/W		-1
23	Register address setting 23 [Read/write address: 1016H]	0516	1302	R/W		-1
24	Register address setting 24 [Read/write address: 1017H]	0517	1303	R/W		-1
25	Register address setting 25 [Read/write address: 1018H]	0518	1304	R/W		-1
26	Register address setting 26 [Read/write address: 1019H]	0519	1305	R/W		-1
27	Register address setting 27 [Read/write address: 101AH]	051A	1306	R/W		-1
28	Register address setting 28 [Read/write address: 101BH]	051B	1307	R/W		-1
29	Register address setting 29 [Read/write address: 101CH]	051C	1308	R/W		-1
30	Register address setting 30 [Read/write address: 101DH]	051D	1309	R/W		-1
31	Register address setting 31 [Read/write address: 101EH]	051E	1310	R/W		-1
32	Register address setting 32 [Read/write address: 101FH]	051F	1311	R/W		-1

■ Register address for data read/write

No.	Name	Register address		Attribute	Data range	Factory set value
		HEX	DEC			
1	Data specified Register address setting 1 (0500H)	1000	4096	Based on the data specified at 0500H to 051FH.		
2	Data specified Register address setting 2 (0501H)	1001	4097			
3	Data specified Register address setting 3 (0502H)	1002	4098			
4	Data specified Register address setting 4 (0503H)	1003	4099			
5	Data specified Register address setting 5 (0504H)	1004	4100			
6	Data specified Register address setting 6 (0505H)	1005	4101			
7	Data specified Register address setting 7 (0506H)	1006	4102			
8	Data specified Register address setting 8 (0507H)	1007	4103			
9	Data specified Register address setting 9 (0508H)	1008	4104			
10	Data specified Register address setting 10 (0509H)	1009	4105			
11	Data specified Register address setting 11 (050AH)	100A	4106			
12	Data specified Register address setting 12 (050BH)	100B	4107			
13	Data specified Register address setting 13 (050CH)	100C	4108			
14	Data specified Register address setting 14 (050DH)	100D	4109			
15	Data specified Register address setting 15 (050EH)	100E	4110			
16	Data specified Register address setting 16 (050FH)	100F	4111			
17	Data specified Register address setting 17 (0510H)	1010	4112			
18	Data specified Register address setting 18 (0511H)	1011	4113			
19	Data specified Register address setting 19 (0512H)	1012	4114			
20	Data specified Register address setting 20 (0513H)	1013	4115			
21	Data specified Register address setting 21 (0514H)	1014	4116			
22	Data specified Register address setting 22 (0515H)	1015	4117			

No.	Name	Register address		Attribute	Data range	Factory set value
		HEX	DEC			
23	Data specified Register address setting 23 (0516H)	1016	4118	Based on the data specified at 0500H to 051FH.		
24	Data specified Register address setting 24 (0517H)	1017	4119			
25	Data specified Register address setting 25 (0518H)	1018	4120			
26	Data specified Register address setting 26 (0519H)	1019	4121			
27	Data specified Register address setting 27 (051AH)	101A	4122			
28	Data specified Register address setting 28 (051BH)	101B	4123			
29	Data specified Register address setting 29 (051CH)	101C	4124			
30	Data specified Register address setting 30 (051DH)	101D	4125			
31	Data specified Register address setting 31 (051EH)	101E	4126			
32	Data specified Register address setting 32 (051FH)	101F	4127			

6.4.3 PID group (Level PID) data [Modbus single word]

Register addresses 1500H to 158FH are used to check and change set values belonging to the PID group (Level PID).

For the details of attribute, data range and factory set values, refer to ■ PID group 1 data (P.6-61), 6.3.3 PID group (Level PID) data [Modbus double word].



When the Level PID action selection is “0: No Level PID”, PID group numbers 02 to 08 are invalid and the response is NAK (Negative Acknowledge).

■ PID group 1 to 6 data

No.	Name	PID group 1		PID group 2		PID group 3		PID group 4		PID group 5		PID group 6		6.3.3 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
1	Proportional band [heat-side]	1500	5376	1512	5394	1524	5412	1536	5430	1548	5448	155A	5466	1
2	Integral time [heat-side]	1501	5377	1513	5395	1525	5413	1537	5431	1549	5449	155B	5467	2
3	Derivative time [heat-side]	1502	5378	1514	5396	1526	5414	1538	5432	154A	5450	155C	5468	3
4	Control response parameter	1503	5379	1515	5397	1527	5415	1539	5433	154B	5451	155D	5469	4
5	Proactive intensity	1504	5380	1516	5398	1528	5416	153A	5434	154C	5452	155E	5470	5
6	Manual reset	1505	5381	1517	5399	1529	5417	153B	5435	154D	5453	155F	5471	6
7	FF amount	1506	5382	1518	5400	152A	5418	153C	5436	154E	5454	1560	5472	7
8	Output limiter high [heat-side]	1507	5383	1519	5401	152B	5419	153D	5437	154F	5455	1561	5473	8
9	Output limiter low [heat-side]	1508	5384	151A	5402	152C	5420	153E	5438	1550	5456	1562	5474	9
10	Control loop break alarm (LBA) time	1509	5385	151B	5403	152D	5421	153F	5439	1551	5457	1563	5475	10
11	LBA deadband (LBD)	150A	5386	151C	5404	152E	5422	1540	5440	1552	5458	1564	5476	11
12	Unused register	150B	5387	151D	5405	152F	5423	1541	5441	1553	5459	1565	5477	—
13	Proportional band [cool-side]	150C	5388	151E	5406	1530	5424	1542	5442	1554	5460	1566	5478	13
14	Integral time [cool-side]	150D	5389	151F	5407	1531	5425	1543	5443	1555	5461	1567	5479	14
15	Derivative time [cool-side]	150E	5390	1520	5408	1532	5426	1544	5444	1556	5462	1568	5480	15
16	Overlap/Deadband	150F	5391	1521	5409	1533	5427	1545	5445	1557	5463	1569	5481	16
17	Output limiter high [cool-side] Output limiter low [heat-side]	1510	5392	1522	5410	1534	5428	1546	5446	1558	5464	156A	5482	17
18	Output limiter low [cool-side]	1511	5393	1523	5411	1535	5429	1547	5447	1559	5465	156B	5483	18

■ PID group 7 to 8 data

No.	Name	PID group 7		PID group 8		6.3.3 Reference No.
		Register address		Register address		
		HEX	DEC	HEX	DEC	
1	Proportional band [heat-side]	156C	5484	157E	5502	1
2	Integral time [heat-side]	156D	5485	157F	5503	2
3	Derivative time [heat-side]	156E	5486	1580	5504	3
4	Control response parameter	156F	5487	1581	5505	4
5	Proactive intensity	1570	5488	1582	5506	5
6	Manual reset	1571	5489	1583	5507	6
7	FF amount	1572	5490	1584	5508	7
8	Output limiter high [heat-side]	1573	5491	1585	5509	8
9	Output limiter low [heat-side]	1574	5492	1586	5510	9
10	Control loop break alarm (LBA) time	1575	5493	1587	5511	10
11	LBA deadband (LBD)	1576	5494	1588	5512	11
12	Unused register	1577	5495	1589	5513	—
13	Proportional band [cool-side]	1578	5496	158A	5514	13
14	Integral time [cool-side]	1579	5497	158B	5515	14
15	Derivative time [cool-side]	157A	5498	158C	5516	15
16	Overlap/Deadband	157B	5499	158D	5517	16
17	Output limiter high [cool-side] Output limiter low [heat-side]	157C	5500	158E	5518	17
18	Output limiter low [cool-side]	157D	5501	158F	5519	18

6.4.4 Pattern & Segment group data [Modbus single word]

Register addresses 3000H to 31FFH are used to check and change set values belonging to the Pattern & Segment group.

For the details of attribute, data range and factory set values, refer to ■ Data description (Name, Attribute, Data range, Factory set value) (P.6-65), 6.3.4 Pattern & Segment group data [Modbus double word].

■ Register address for Segment 1 to 16 of Pattern 1 to 6

Segment No.	Name	Pattern 1		Pattern 2		Pattern 3		Pattern 4		Pattern 5		Pattern 6		6.3.4 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
1	Segment level	3000	12288	3030	12336	3060	12384	3090	12432	30C0	12480	30F0	12528	1
	Segment time	3001	12289	3031	12337	3061	12385	3091	12433	30C1	12481	30F1	12529	2
	Event selection of the Segment	3002	12290	3032	12338	3062	12386	3092	12434	30C2	12482	30F2	12530	3
2	Segment level	3003	12291	3033	12339	3063	12387	3093	12435	30C3	12483	30F3	12531	1
	Segment time	3004	12292	3034	12340	3064	12388	3094	12436	30C4	12484	30F4	12532	2
	Event selection of the Segment	3005	12293	3035	12341	3065	12389	3095	12437	30C5	12485	30F5	12533	3
3	Segment level	3006	12294	3036	12342	3066	12390	3096	12438	30C6	12486	30F6	12534	1
	Segment time	3007	12295	3037	12343	3067	12391	3097	12439	30C7	12487	30F7	12535	2
	Event selection of the Segment	3008	12296	3038	12344	3068	12392	3098	12440	30C8	12488	30F8	12536	3
4	Segment level	3009	12297	3039	12345	3069	12393	3099	12441	30C9	12489	30F9	12537	1
	Segment time	300A	12298	303A	12346	306A	12394	309A	12442	30CA	12490	30FA	12538	2
	Event selection of the Segment	300B	12299	303B	12347	306B	12395	309B	12443	30CB	12491	30FB	12539	3
5	Segment level	300C	12300	303C	12348	306C	12396	309C	12444	30CC	12492	30FC	12540	1
	Segment time	300D	12301	303D	12349	306D	12397	309D	12445	30CD	12493	30FD	12541	2
	Event selection of the Segment	300E	12302	303E	12350	306E	12398	309E	12446	30CE	12494	30FE	12542	3
6	Segment level	300F	12303	303F	12351	306F	12399	309F	12447	30CF	12495	30FF	12543	1
	Segment time	3010	12304	3040	12352	3070	12400	30A0	12448	30D0	12496	3100	12544	2
	Event selection of the Segment	3011	12305	3041	12353	3071	12401	30A1	12449	30D1	12497	3101	12545	3
7	Segment level	3012	12306	3042	12354	3072	12402	30A2	12450	30D2	12498	3102	12546	1
	Segment time	3013	12307	3043	12355	3073	12403	30A3	12451	30D3	12499	3103	12547	2
	Event selection of the Segment	3014	12308	3044	12356	3074	12404	30A4	12452	30D4	12500	3104	12548	3
8	Segment level	3015	12309	3045	12357	3075	12405	30A5	12453	30D5	12501	3105	12549	1
	Segment time	3016	12310	3046	12358	3076	12406	30A6	12454	30D6	12502	3106	12550	2
	Event selection of the Segment	3017	12311	3047	12359	3077	12407	30A7	12455	30D7	12503	3107	12551	3

Segment No.	Name	Pattern 1		Pattern 2		Pattern 3		Pattern 4		Pattern 5		Pattern 6		6.3.4 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
9	Segment level	3018	12312	3048	12360	3078	12408	30A8	12456	30D8	12504	3108	12552	1
	Segment time	3019	12313	3049	12361	3079	12409	30A9	12457	30D9	12505	3109	12553	2
	Event selection of the Segment	301A	12314	304A	12362	307A	12410	30AA	12458	30DA	12506	310A	12554	3
10	Segment level	301B	12315	304B	12363	307B	12411	30AB	12459	30DB	12507	310B	12555	1
	Segment time	301C	12316	304C	12364	307C	12412	30AC	12460	30DC	12508	310C	12556	2
	Event selection of the Segment	301D	12317	304D	12365	307D	12413	30AD	12461	30DD	12509	310D	12557	3
11	Segment level	301E	12318	304E	12366	307E	12414	30AE	12462	30DE	12510	310E	12558	1
	Segment time	301F	12319	304F	12367	307F	12415	30AF	12463	30DF	12511	310F	12559	2
	Event selection of the Segment	3020	12320	3050	12368	3080	12416	30B0	12464	30E0	12512	3110	12560	3
12	Segment level	3021	12321	3051	12369	3081	12417	30B1	12465	30E1	12513	3111	12561	1
	Segment time	3022	12322	3052	12370	3082	12418	30B2	12466	30E2	12514	3112	12562	2
	Event selection of the Segment	3023	12323	3053	12371	3083	12419	30B3	12467	30E3	12515	3113	12563	3
13	Segment level	3024	12324	3054	12372	3084	12420	30B4	12468	30E4	12516	3114	12564	1
	Segment time	3025	12325	3055	12373	3085	12421	30B5	12469	30E5	12517	3115	12565	2
	Event selection of the Segment	3026	12326	3056	12374	3086	12422	30B6	12470	30E6	12518	3116	12566	3
14	Segment level	3027	12327	3057	12375	3087	12423	30B7	12471	30E7	12519	3117	12567	1
	Segment time	3028	12328	3058	12376	3088	12424	30B8	12472	30E8	12520	3118	12568	2
	Event selection of the Segment	3029	12329	3059	12377	3089	12425	30B9	12473	30E9	12521	3119	12569	3
15	Segment level	302A	12330	305A	12378	308A	12426	30BA	12474	30EA	12522	311A	12570	1
	Segment time	302B	12331	305B	12379	308B	12427	30BB	12475	30EB	12523	311B	12571	2
	Event selection of the Segment	302C	12332	305C	12380	308C	12428	30BC	12476	30EC	12524	311C	12572	3
16	Segment level	302D	12333	305D	12381	308D	12429	30BD	12477	30ED	12525	311D	12573	1
	Segment time	302E	12334	305E	12382	308E	12430	30BE	12478	30EE	12526	311E	12574	2
	Event selection of the Segment	302F	12335	305F	12383	308F	12431	30BF	12479	30EF	12527	311F	12575	3

■ Register address for Segment 1 to 16 of Pattern 7 to 12

Segment No.	Name	Pattern 7		Pattern 8		Pattern 9		Pattern 10		Pattern 11		Pattern 12		6.3.4 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
1	Segment level	3120	12576	3150	12624	3180	12672	31B0	12720	31E0	12768	3210	12816	1
	Segment time	3121	12577	3151	12625	3181	12673	31B1	12721	31E1	12769	3211	12817	2
	Event selection of the Segment	3122	12578	3152	12626	3182	12674	31B2	12722	31E2	12770	3212	12818	3
2	Segment level	3123	12579	3153	12627	3183	12675	31B3	12723	31E3	12771	3213	12819	1
	Segment time	3124	12580	3154	12628	3184	12676	31B4	12724	31E4	12772	3214	12820	2
	Event selection of the Segment	3125	12581	3155	12629	3185	12677	31B5	12725	31E5	12773	3215	12821	3
3	Segment level	3126	12582	3156	12630	3186	12678	31B6	12726	31E6	12774	3216	12822	1
	Segment time	3127	12583	3157	12631	3187	12679	31B7	12727	31E7	12775	3217	12823	2
	Event selection of the Segment	3128	12584	3158	12632	3188	12680	31B8	12728	31E8	12776	3218	12824	3
4	Segment level	3129	12585	3159	12633	3189	12681	31B9	12729	31E9	12777	3219	12825	1
	Segment time	312A	12586	315A	12634	318A	12682	31BA	12730	31EA	12778	321A	12826	2
	Event selection of the Segment	312B	12587	315B	12635	318B	12683	31BB	12731	31EB	12779	321B	12827	3
5	Segment level	312C	12588	315C	12636	318C	12684	31BC	12732	31EC	12780	321C	12828	1
	Segment time	312D	12589	315D	12637	318D	12685	31BD	12733	31ED	12781	321D	12829	2
	Event selection of the Segment	312E	12590	315E	12638	318E	12686	31BE	12734	31EE	12782	321E	12830	3
6	Segment level	312F	12591	315F	12639	318F	12687	31BF	12735	31EF	12783	321F	12831	1
	Segment time	3130	12592	3160	12640	3190	12688	31C0	12736	31F0	12784	3220	12832	2
	Event selection of the Segment	3131	12593	3161	12641	3191	12689	31C1	12737	31F1	12785	3221	12833	3
7	Segment level	3132	12594	3162	12642	3192	12690	31C2	12738	31F2	12786	3222	12834	1
	Segment time	3133	12595	3163	12643	3193	12691	31C3	12739	31F3	12787	3223	12835	2
	Event selection of the Segment	3134	12596	3164	12644	3194	12692	31C4	12740	31F4	12788	3224	12836	3
8	Segment level	3135	12597	3165	12645	3195	12693	31C5	12741	31F5	12789	3225	12837	1
	Segment time	3136	12598	3166	12646	3196	12694	31C6	12742	31F6	12790	3226	12838	2
	Event selection of the Segment	3137	12599	3167	12647	3197	12695	31C7	12743	31F7	12791	3227	12839	3
9	Segment level	3138	12600	3168	12648	3198	12696	31C8	12744	31F8	12792	3228	12840	1
	Segment time	3139	12601	3169	12649	3199	12697	31C9	12745	31F9	12793	3229	12841	2
	Event selection of the Segment	313A	12602	316A	12650	319A	12698	31CA	12746	31FA	12794	322A	12842	3

Segment No.	Name	Pattern 7		Pattern 8		Pattern 9		Pattern 10		Pattern 11		Pattern 12		6.3.4 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
10	Segment level	313B	12603	316B	12651	319B	12699	31CB	12747	31FB	12795	322B	12843	1
	Segment time	313C	12604	316C	12652	319C	12700	31CC	12748	31FC	12796	322C	12844	2
	Event selection of the Segment	313D	12605	316D	12653	319D	12701	31CD	12749	31FD	12797	322D	12845	3
11	Segment level	313E	12606	316E	12654	319E	12702	31CE	12750	31FE	12798	322E	12846	1
	Segment time	313F	12607	316F	12655	319F	12703	31CF	12751	31FF	12799	322F	12847	2
	Event selection of the Segment	3140	12608	3170	12656	31A0	12704	31D0	12752	3200	12800	3230	12848	3
12	Segment level	3141	12609	3171	12657	31A1	12705	31D1	12753	3201	12801	3231	12849	1
	Segment time	3142	12610	3172	12658	31A2	12706	31D2	12754	3202	12802	3232	12850	2
	Event selection of the Segment	3143	12611	3173	12659	31A3	12707	31D3	12755	3203	12803	3233	12851	3
13	Segment level	3144	12612	3174	12660	31A4	12708	31D4	12756	3204	12804	3234	12852	1
	Segment time	3145	12613	3175	12661	31A5	12709	31D5	12757	3205	12805	3235	12853	2
	Event selection of the Segment	3146	12614	3176	12662	31A6	12710	31D6	12758	3206	12806	3236	12854	3
14	Segment level	3147	12615	3177	12663	31A7	12711	31D7	12759	3207	12807	3237	12855	1
	Segment time	3148	12616	3178	12664	31A8	12712	31D8	12760	3208	12808	3238	12856	2
	Event selection of the Segment	3149	12617	3179	12665	31A9	12713	31D9	12761	3209	12809	3239	12857	3
15	Segment level	314A	12618	317A	12666	31AA	12714	31DA	12762	320A	12810	323A	12858	1
	Segment time	314B	12619	317B	12667	31AB	12715	31DB	12763	320B	12811	323B	12859	2
	Event selection of the Segment	314C	12620	317C	12668	31AC	12716	31DC	12764	320C	12812	323C	12860	3
16	Segment level	314D	12621	317D	12669	31AD	12717	31DD	12765	320D	12813	323D	12861	1
	Segment time	314E	12622	317E	12670	31AE	12718	31DE	12766	320E	12814	323E	12862	2
	Event selection of the Segment	314F	12623	317F	12671	31AF	12719	31DF	12767	320F	12815	323F	12863	3

■ Register address for Segment 1 to 16 of Pattern 13 to 16

No.	Name	Pattern 13		Pattern 14		Pattern 15		Pattern 16		6.3.4 Reference No.
		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
1	Segment level	3240	12864	3270	12912	32A0	12960	32D0	13008	1
	Segment time	3241	12865	3271	12913	32A1	12961	32D1	13009	2
	Event selection of the Segment	3242	12866	3272	12914	32A2	12962	32D2	13010	3
2	Segment level	3243	12867	3273	12915	32A3	12963	32D3	13011	1
	Segment time	3244	12868	3274	12916	32A4	12964	32D4	13012	2
	Event selection of the Segment	3245	12869	3275	12917	32A5	12965	32D5	13013	3
3	Segment level	3246	12870	3276	12918	32A6	12966	32D6	13014	1
	Segment time	3247	12871	3277	12919	32A7	12967	32D7	13015	2
	Event selection of the Segment	3248	12872	3278	12920	32A8	12968	32D8	13016	3
4	Segment level	3249	12873	3279	12921	32A9	12969	32D9	13017	1
	Segment time	324A	12874	327A	12922	32AA	12970	32DA	13018	2
	Event selection of the Segment	324B	12875	327B	12923	32AB	12971	32DB	13019	3
5	Segment level	324C	12876	327C	12924	32AC	12972	32DC	13020	1
	Segment time	324D	12877	327D	12925	32AD	12973	32DD	13021	2
	Event selection of the Segment	324E	12878	327E	12926	32AE	12974	32DE	13022	3
6	Segment level	324F	12879	327F	12927	32AF	12975	32DF	13023	1
	Segment time	3250	12880	3280	12928	32B0	12976	32E0	13024	2
	Event selection of the Segment	3251	12881	3281	12929	32B1	12977	32E1	13025	3
7	Segment level	3252	12882	3282	12930	32B2	12978	32E2	13026	1
	Segment time	3253	12883	3283	12931	32B3	12979	32E3	13027	2
	Event selection of the Segment	3254	12884	3284	12932	32B4	12980	32E4	13028	3
8	Segment level	3255	12885	3285	12933	32B5	12981	32E5	13029	1
	Segment time	3256	12886	3286	12934	32B6	12982	32E6	13030	2
	Event selection of the Segment	3257	12887	3287	12935	32B7	12983	32E7	13031	3
9	Segment level	3258	12888	3288	12936	32B8	12984	32E8	13032	1
	Segment time	3259	12889	3289	12937	32B9	12985	32E9	13033	2
	Event selection of the Segment	325A	12890	328A	12938	32BA	12986	32EA	13034	3

No.	Name	Pattern 13		Pattern 14		Pattern 15		Pattern 16		6.3.4 Reference No.
		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
10	Segment level	325B	12891	328B	12939	32BB	12987	32EB	13035	1
	Segment time	325C	12892	328C	12940	32BC	12988	32EC	13036	2
	Event selection of the Segment	325D	12893	328D	12941	32BD	12989	32ED	13037	3
11	Segment level	325E	12894	328E	12942	32BE	12990	32EE	13038	1
	Segment time	325F	12895	328F	12943	32BF	12991	32EF	13039	2
	Event selection of the Segment	3260	12896	3290	12944	32C0	12992	32F0	13040	3
12	Segment level	3261	12897	3291	12945	32C1	12993	32F1	13041	1
	Segment time	3262	12898	3292	12946	32C2	12994	32F2	13042	2
	Event selection of the Segment	3263	12899	3293	12947	32C3	12995	32F3	13043	3
13	Segment level	3264	12900	3294	12948	32C4	12996	32F4	13044	1
	Segment time	3265	12901	3295	12949	32C5	12997	32F5	13045	2
	Event selection of the Segment	3266	12902	3296	12950	32C6	12998	32F6	13046	3
14	Segment level	3267	12903	3297	12951	32C7	12999	32F7	13047	1
	Segment time	3268	12904	3298	12952	32C8	13000	32F8	13048	2
	Event selection of the Segment	3269	12905	3299	12953	32C9	13001	32F9	13049	3
15	Segment level	326A	12906	329A	12954	32CA	13002	32FA	13050	1
	Segment time	326B	12907	329B	12955	32CB	13003	32FB	13051	2
	Event selection of the Segment	326C	12908	329C	12956	32CC	13004	32FC	13052	3
16	Segment level	326D	12909	329D	12957	32CD	13005	32FD	13053	1
	Segment time	326E	12910	329E	12958	32CE	13006	32FE	13054	2
	Event selection of the Segment	326F	12911	329F	12959	32CF	13007	32FF	13055	3

6.4.5 Pattern group data [Modbus single word]

Register addresses 5000H to 51BFH are used to check and change set values belonging to the Pattern group.

For the details of attribute, data range and factory set values, refer to ■ Pattern 1 data (P.6-75), 6.3.5 Pattern group data [Modbus double word].

■ Pattern 1 to 6 data

No.	Name	Pattern 1		Pattern 2		Pattern 3		Pattern 4		Pattern 5		Pattern 6		6.3.5 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
1	Pattern end number	5000	20480	501C	20508	5038	20536	5054	20564	5070	20592	508C	20620	1
2	Number of repeating patterns	5001	20481	501D	20509	5039	20537	5055	20565	5071	20593	508D	20621	2
3	Pattern link number	5002	20482	501E	20510	503A	20538	5056	20566	5072	20594	508E	20622	3
4	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high]	5003	20483	501F	20511	503B	20539	5057	20567	5073	20595	508F	20623	4
5	Event 1 set value (EV1') [low]	5004	20484	5020	20512	503C	20540	5058	20568	5074	20596	5090	20624	5
6	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high]	5005	20485	5021	20513	503D	20541	5059	20569	5075	20597	5091	20625	6
7	Event 2 set value (EV2') [low]	5006	20486	5022	20514	503E	20542	505A	20570	5076	20598	5092	20626	7
8	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high]	5007	20487	5023	20515	503F	20543	505B	20571	5077	20599	5093	20627	8
9	Event 3 set value (EV3') [low]	5008	20488	5024	20516	5040	20544	505C	20572	5078	20600	5094	20628	9
10	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high]	5009	20489	5025	20517	5041	20545	505D	20573	5079	20601	5095	20629	10
11	Event 4 set value (EV4') [low]	500A	20490	5026	20518	5042	20546	505E	20574	507A	20602	5096	20630	11

No.	Name	Pattern 1		Pattern 2		Pattern 3		Pattern 4		Pattern 5		Pattern 6		6.3.5 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
12	Time signal 1 start segment number	500B	20491	5027	20519	5043	20547	505F	20575	507B	20603	5097	20631	12
13	Time signal 1 start time	500C	20492	5028	20520	5044	20548	5060	20576	507C	20604	5098	20632	13
14	Time signal 1 end segment number	500D	20493	5029	20521	5045	20549	5061	20577	507D	20605	5099	20633	14
15	Time signal 1 end time	500E	20494	502A	20522	5046	20550	5062	20578	507E	20606	509A	20634	15
16	Time signal 2 start segment number	500F	20495	502B	20523	5047	20551	5063	20579	507F	20607	509B	20635	16
17	Time signal 2 start time	5010	20496	502C	20524	5048	20552	5064	20580	5080	20608	509C	20636	17
18	Time signal 2 end segment number	5011	20497	502D	20525	5049	20553	5065	20581	5081	20609	509D	20637	18
19	Time signal 2 end time	5012	20498	502E	20526	504A	20554	5066	20582	5082	20610	509E	20638	19
20	Time signal 3 start segment number	5013	20499	502F	20527	504B	20555	5067	20583	5083	20611	509F	20639	20
21	Time signal 3 start time	5014	20500	5030	20528	504C	20556	5068	20584	5084	20612	50A0	20640	21
22	Time signal 3 end segment number	5015	20501	5031	20529	504D	20557	5069	20585	5085	20613	50A1	20641	22
23	Time signal 3 end time	5016	20502	5032	20530	504E	20558	506A	20586	5086	20614	50A2	20642	23
24	Time signal 4 start segment number	5017	20503	5033	20531	504F	20559	506B	20587	5087	20615	50A3	20643	24
25	Time signal 4 start time	5018	20504	5034	20532	5050	20560	506C	20588	5088	20616	50A4	20644	25
26	Time signal 4 end segment number	5019	20505	5035	20533	5051	20561	506D	20589	5089	20617	50A5	20645	26
27	Time signal 4 end time	501A	20506	5036	20534	5052	20562	506E	20590	508A	20618	50A6	20646	27
28	Pattern end output time	501B	20507	5037	20535	5053	20563	506F	20591	508B	20619	50A7	20647	28

■ Pattern 7 to 12 data

No.	Name	Pattern 7		Pattern 8		Pattern 9		Pattern 10		Pattern 11		Pattern 12		6.3.5 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
1	Pattern end number	50A8	20648	50C4	20676	50E0	20704	50FC	20732	5118	20760	5134	20788	1
2	Number of repeating patterns	50A9	20649	50C5	20677	50E1	20705	50FD	20733	5119	20761	5135	20789	2
3	Pattern link number	50AA	20650	50C6	20678	50E2	20706	50FE	20734	511A	20762	5136	20790	3
4	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high]	50AB	20651	50C7	20679	50E3	20707	50FF	20735	511B	20763	5137	20791	4
5	Event 1 set value (EV1') [low]	50AC	20652	50C8	20680	50E4	20708	5100	20736	511C	20764	5138	20792	5
6	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high]	50AD	20653	50C9	20681	50E5	20709	5101	20737	511D	20765	5139	20793	6
7	Event 2 set value (EV2') [low]	50AE	20654	50CA	20682	50E6	20710	5102	20738	511E	20766	513A	20794	7
8	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high]	50AF	20655	50CB	20683	50E7	20711	5103	20739	511F	20767	513B	20795	8
9	Event 3 set value (EV3') [low]	50B0	20656	50CC	20684	50E8	20712	5104	20740	5120	20768	513C	20796	9
10	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high]	50B1	20657	50CD	20685	50E9	20713	5105	20741	5121	20769	513D	20797	10
11	Event 4 set value (EV4') [low]	50B2	20658	50CE	20686	50EA	20714	5106	20742	5122	20770	513E	20798	11
12	Time signal 1 start segment number	50B3	20659	50CF	20687	50EB	20715	5107	20743	5123	20771	513F	20799	12
13	Time signal 1 start time	50B4	20660	50D0	20688	50EC	20716	5108	20744	5124	20772	5140	20800	13
14	Time signal 1 end segment number	50B5	20661	50D1	20689	50ED	20717	5109	20745	5125	20773	5141	20801	14
15	Time signal 1 end time	50B6	20662	50D2	20690	50EE	20718	510A	20746	5126	20774	5142	20802	15
16	Time signal 2 start segment number	50B7	20663	50D3	20691	50EF	20719	510B	20747	5127	20775	5143	20803	16

No.	Name	Pattern 7		Pattern 8		Pattern 9		Pattern 10		Pattern 11		Pattern 12		6.3.5 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
17	Time signal 2 start time	50B8	20664	50D4	20692	50F0	20720	510C	20748	5128	20776	5144	20804	17
18	Time signal 2 end segment number	50B9	20665	50D5	20693	50F1	20721	510D	20749	5129	20777	5145	20805	18
19	Time signal 2 end time	50BA	20666	50D6	20694	50F2	20722	510E	20750	512A	20778	5146	20806	19
20	Time signal 3 start segment number	50BB	20667	50D7	20695	50F3	20723	510F	20751	512B	20779	5147	20807	20
21	Time signal 3 start time	50BC	20668	50D8	20696	50F4	20724	5110	20752	512C	20780	5148	20808	21
22	Time signal 3 end segment number	50BD	20669	50D9	20697	50F5	20725	5111	20753	512D	20781	5149	20809	22
23	Time signal 3 end time	50BE	20670	50DA	20698	50F6	20726	5112	20754	512E	20782	514A	20810	23
24	Time signal 4 start segment number	50BF	20671	50DB	20699	50F7	20727	5113	20755	512F	20783	514B	20811	24
25	Time signal 4 start time	50C0	20672	50DC	20700	50F8	20728	5114	20756	5130	20784	514C	20812	25
26	Time signal 4 end segment number	50C1	20673	50DD	20701	50F9	20729	5115	20757	5131	20785	514D	20813	26
27	Time signal 4 end time	50C2	20674	50DE	20702	50FA	20730	5116	20758	5132	20786	514E	20814	27
28	Pattern end output time	50C3	20675	50DF	20703	50FB	20731	5117	20759	5133	20787	514F	20815	28

■ Pattern 13 to 16 data

No.	Name	Pattern 13		Pattern 14		Pattern 15		Pattern 16		6.3.5 Reference No.
		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
1	Pattern end number	5150	20816	516C	20844	5188	20872	51A4	20900	1
2	Number of repeating patterns	5151	20817	516D	20845	5189	20873	51A5	20901	2
3	Pattern link number	5152	20818	516E	20846	518A	20874	51A6	20902	3
4	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high]	5153	20819	516F	20847	518B	20875	51A7	20903	4
5	Event 1 set value (EV1') [low]	5154	20820	5170	20848	518C	20876	51A8	20904	5
6	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high]	5155	20821	5171	20849	518D	20877	51A9	20905	6
7	Event 2 set value (EV2') [low]	5156	20822	5172	20850	518E	20878	51AA	20906	7
8	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high]	5157	20823	5173	20851	518F	20879	51AB	20907	8
9	Event 3 set value (EV3') [low]	5158	20824	5174	20852	5190	20880	51AC	20908	9
10	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high]	5159	20825	5175	20853	5191	20881	51AD	20909	10
11	Event 4 set value (EV4') [low]	515A	20826	5176	20854	5192	20882	51AE	20910	11
12	Time signal 1 start segment number	515B	20827	5177	20855	5193	20883	51AF	20911	12
13	Time signal 1 start time	515C	20828	5178	20856	5194	20884	51B0	20912	13
14	Time signal 1 end segment number	515D	20829	5179	20857	5195	20885	51B1	20913	14
15	Time signal 1 end time	515E	20830	517A	20858	5196	20886	51B2	20914	15
16	Time signal 2 start segment number	515F	20831	517B	20859	5197	20887	51B3	20915	16

No.	Name	Pattern 13		Pattern 14		Pattern 15		Pattern 16		6.3.5 Reference No.
		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
17	Time signal 2 start time	5160	20832	517C	20860	5198	20888	51B4	20916	17
18	Time signal 2 end segment number	5161	20833	517D	20861	5199	20889	51B5	20917	18
19	Time signal 2 end time	5162	20834	517E	20862	519A	20890	51B6	20918	19
20	Time signal 3 start segment number	5163	20835	517F	20863	519B	20891	51B7	20919	20
21	Time signal 3 start time	5164	20836	5180	20864	519C	20892	51B8	20920	21
22	Time signal 3 end segment number	5165	20837	5181	20865	519D	20893	51B9	20921	22
23	Time signal 3 end time	5166	20838	5182	20866	519E	20894	51BA	20922	23
24	Time signal 4 start segment number	5167	20839	5183	20867	519F	20895	51BB	20923	24
25	Time signal 4 start time	5168	20840	5184	20868	51A0	20896	51BC	20924	25
26	Time signal 4 end segment number	5169	20841	5185	20869	51A1	20897	51BD	20925	26
27	Time signal 4 end time	516A	20842	5186	20870	51A2	20898	51BE	20926	27
28	Pattern end output time	516B	20843	5187	20871	51A3	20899	51BF	20927	28

TROUBLE SHOOTING

7

This chapter describes how to cope with errors during the communication.

7.1 RKC Communication.....	7-3
7.2 Modbus	7-4

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 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. The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.

This section lists some of the main causes and solutions for communication problems.

If you cannot solve a problem, please contact RKC sales office or the agent, on confirming the type name and specifications of the product.

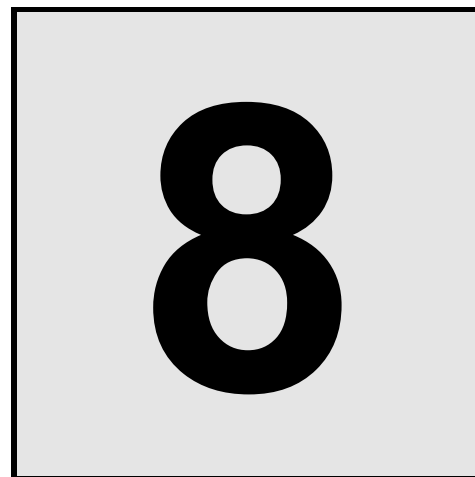
7.1 RKC Communication

Problem	Possible 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	Re-examine the communication program
	Transmission line is not set to the receive state after data send (for RS-485)	
	Communication protocol setting is wrong	Set "0: RKC communication" at Communication protocol referring to 3.1 Setting of Communication Parameter (P. 3-2) .
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 specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it

7.2 Modbus

Problem	Possible 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	
	A transmission error (overrun error, framing error, parity error or CRC-16 error) is found in the query message	Re-transmit after time-out occurs or verify communication program
	The time interval between adjacent data in the query message is too long, exceeding 24-bit time	
	Communication protocol setting is wrong	Set "1" or "2" at Communication protocol referring to 3.1 Setting of Communication Parameter (P. 3-2) . 1: Modbus (Order of data transfer: high-order word to low-order word) 2: Modbus (Order of data a transfer: low-order word to high-order word)
Error code 1	Function code 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	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.

SPECIFICATIONS



This chapter describes the specification of the host communication.

8.1 RKC Communication.....	8-2
8.2 Modbus	8-3
8.3 Loader Communication	8-4

8.1 RKC Communication

Interface:	Based on RS-485, EIA standard Based on RS-422A, EIA standard
Connection method:	2-wire system, half-duplex multi-drop connection
Synchronous method:	Start/Stop synchronous type
Communication speed:	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps
Protocol:	ANSI X3.28-1976 subcategories 2.5 and A4 Polling/Selecting type
Data bit configuration:	Start bit: 1 Data bit: 7 or 8 Parity bit: None, Odd or Even Stop bit: 1 or 2
Error control:	Vertical parity (With parity bit selected) Horizontal parity (BCC check)
Communication code:	ASCII 7-bit code
Termination resistor:	Externally terminal connected ($120\ \Omega$ 1/2 W)
Xon/Xoff control:	None
Maximum connections:	Up to 31 controllers
Signal logic:	RS-485/RS-422A

Signal logic	Logic
$V(A) - V(B) \geq 1.5\text{ V}$	0 (SPACE)
$V(A) - V(B) \leq -1.5\text{ V}$	1 (MARK)

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

Maximum transmission distance:	1.2 km (This is the maximum value specified in the standard and actual value depends on the product specification.)
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8.2 Modbus

Interface:	Based on RS-485, EIA standard Based on RS-422A, EIA standard
Connection method:	2-wire system, half-duplex multi-drop connection
Synchronous method:	Start/Stop synchronous type
Communication speed:	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps
Data bit configuration:	Start bit: 1 Data bit: 8 Parity bit: None, Odd or Even Stop bit: 1 or 2
Protocol:	Modbus
Signal transmission mode:	Remote Terminal Unit (RTU) mode
Function code:	03H (Read holding registers) 06H (Preset single register) 08H (Diagnostics: loopback test) 10H (Preset multiple registers [Write multiple registers])
Error check method:	CRC-16
Error code:	1: Function code error 2: When the mismatched address is specified. 3: • The maximum number (Read from a read holding resistor or write to Preset multiple resistors [Write multiple registers]) has been exceeded. • The setting of the number of data (the number of requested byte) is not set to a double of the requested number of data at the time of “Preset multiple registers (Write multiple registers)” 4: Self-diagnostic error response
Termination resistor:	Externally terminal connected (Example: 120 Ω 1/2 W)
Maximum connections:	Up to 31 controllers
Signal logic:	RS-485/RS-422A

Signal logic	Logic
$V(A) - V(B) \geq 1.5 \text{ V}$	0 (SPACE)
$V(A) - V(B) \leq -1.5 \text{ V}$	1 (MARK)

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

Maximum transmission distance:	1.2 km (This is the maximum value specified in the standard and actual value depends on the product specification.)
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8.3 Loader Communication

Protocol:	For RKC communication protocol only (ANSI X3.28-1976 subcategories 2.5 and A4)
Synchronous method:	Start/Stop synchronous type
Communication speed:	38400 bps
Data bit configuration:	Start bit: 1 Data bit: 8 Parity bit: None Stop bit: 1 Number of communication data digits: 7(fixed)
Maximum connections:	1 point
Connection method:	Exclusive cable (W-BV-05)
Interval time:	10 ms



When the instrument is powered off, power can be supplied to the instrument from COM-K2 or COM-KG. This function is exclusive for parameter setting, and the instrument functions as follows.

- Control is stopped (Output is off, relay remains open).
- Host communication is stopped.
- The PV/SV monitor shows “Load” for the PV display and “----” for the SV display. The LCD backlight is partially turned off.

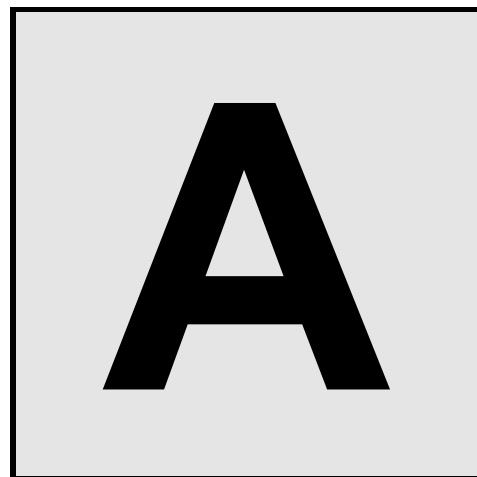


While the instrument is powered by COM-K2 or COM-KG, if power is applied to the instrument, the instrument will be reset and starts for normal operation.



When the instrument is normally powered, the host communication can be used simultaneously.

APPENDIX



A.1 ASCII 7-Bit Code Table	A-2
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A.1 ASCII 7-Bit Code Table

This table is only for use with RKC communication.

					b7	0	0	0	0	1	1	1	1
					b6	0	0	1	1	0	0	1	1
					b5	0	1	0	1	0	1	0	1
b5 to b7	b4	b3	b2	b1		0	1	2	3	4	5	6	7
	0	0	0	0	0	NUL	DLE	SP	0	@	P	'	p
	0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
	0	0	1	0	2	STX	DC2	”	2	B	R	b	r
	0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
	0	1	0	0	4	EOT	DC4	\$	4	D	T	d	t
	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
	0	1	1	0	6	ACK	SYM	&	6	F	V	f	v
	0	1	1	1	7	BEL	ETB	,	7	G	W	g	w
	1	0	0	0	8	BS	CAN	(	8	H	X	h	x
	1	0	0	1	9	HT	EM	)	9	I	Y	i	y
	1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
	1	0	1	1	B	VT	ESC	+	;	K	[	k	{
	1	1	0	0	C	FF	FS	,	<	L	¥	l	
	1	1	0	1	D	CR	GS	-	=	M	]	m	}
	1	1	1	0	E	SO	RS	.	>	N	^	n	~
	1	1	1	1	F	SI	US	/	?	O	_	o	DEL



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