Digital Controller

HA400/HA900
HA401/HA901

CC-Link Communication Instruction Manual

RKC® RKC INSTRUMENT INC.

IMR01N20-E2

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- The name of each programmable controller (PLC) means the products of each manufacturer.
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Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.

SYMBOLS

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.

 : 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.

⚠ WARNING

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and 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 can 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.)
- 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 by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- 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.
- To prevent instrument damage or failure, protect the power line and the input/output lines from high currents with a protection device such as fuse, circuit breaker, etc.
- 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 dispensation.
- 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 will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- When high alarm with hold action/re-hold action is used for Event function, alarm does not turn on while hold action is in operation. Take measures to prevent overheating which may occur if the control device fails.

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 purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
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CONTENTS

1. OUTLINE

This manual describes CC-Link specification, wiring, setting, and data instructions for the HA400/900/401/901.

1.1 Product Outline

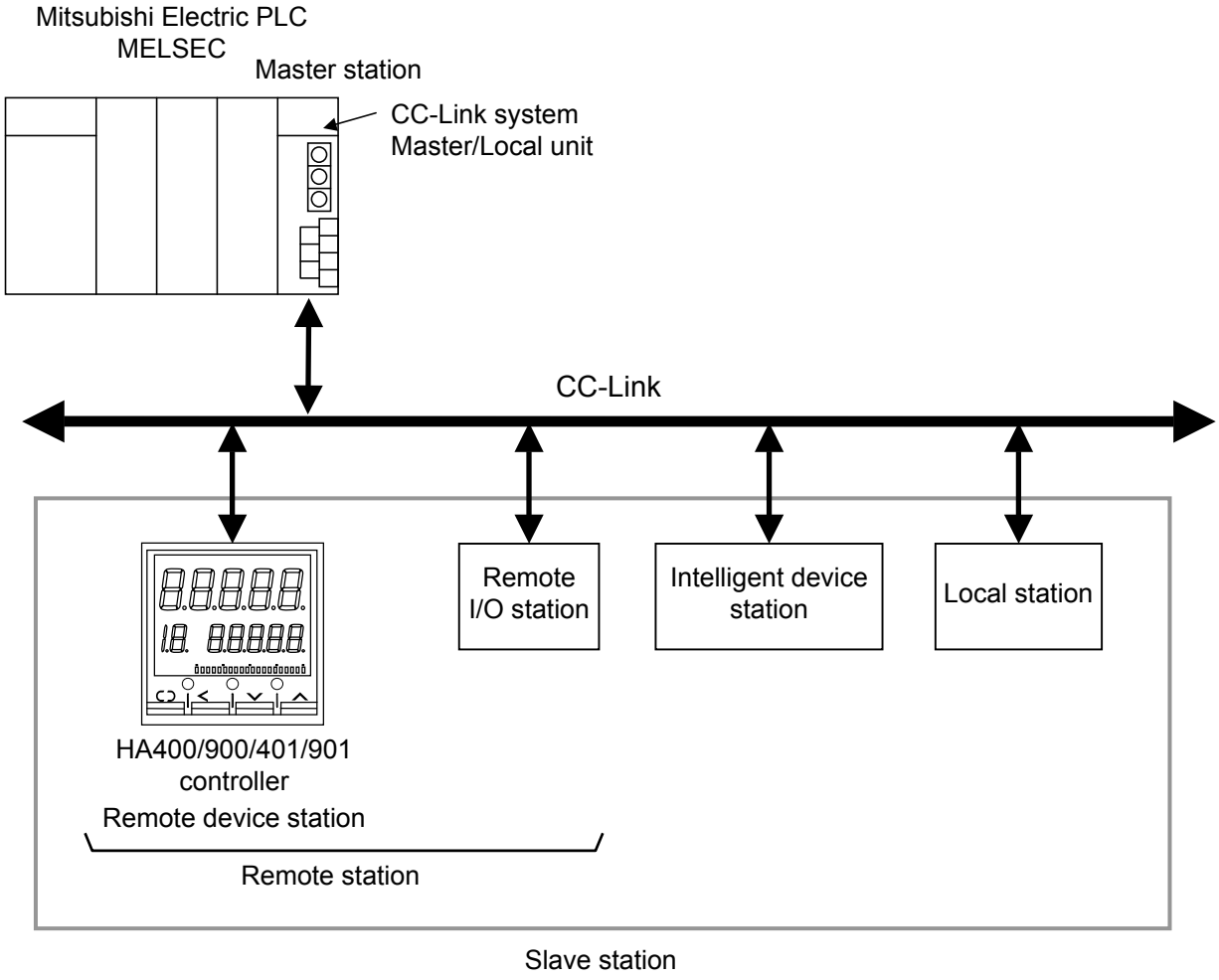
The HA400/900/401/901 digital controllers can send data to and receive data from programmable controllers (Mitsubishi MELSEC series, hereafter called "PLC") via CC-Link (ver.1.10 and ver.2.00). In addition, controllers are connected to CC-Link as the Remote device station.

1.1.1 Communication ports

The controller has a maximum of two communication ports, but CC-Link use only Communication port 2 (terminal No. 25 to 29).

☞ For specification of PLC, refer to the **Instruction manual for PLC**.

☞ For CC-Link, refer to the website of CC-Link Partner Association.
http://www.cc-link.org/



2. SPECIFICATIONS

■ CC-Link communication

Protocol: CC-Link Ver. 2.00/Ver. 1.10

Communication speed: 156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps
Selectable

Communication distance: The maximum communication distance (maximum network length) depends on the communication speed.

Communication speed	Maximum network length (Use the CC-Link dedicated cable Ver. 1.10)
10 Mbps	100 m or less
5 Mbps	160 m or less
2.5 Mbps	400 m or less
625 kbps	900 m or less
156 kbps	1200 m or less

Module type: Remote device station

Number of Occupied station/Extended cyclic:
1 station occupied 1 time
1 station occupied 4 times
1 station occupied 8 times
4 stations occupied 1 time
Selectable

CC-Link version ×: Connectable –: Not connectable

CC-Link version of master station	Number of Occupied station/Extended cyclic			
	1 station occupied 1 time	1 station occupied 4 times	1 station occupied 8 times	4 stations occupied 1 time
CC-Link Ver. 2.00	–	×	×	–
CC-Link Ver. 1.10	×	–	–	×

If a controller set for "1 occupied station and 1 time setting" or "4 occupied stations and 1 time setting" is connected, the CC-Link version on the master station side must be set to 1.10.

Communication data length

Number of Occupied station/Extended cyclic	Remote Input/Output (RX/RY)	Remote register (RWr/RWw)
1 station occupied 1 time	Each 32-bit	Each 4-word
1 station occupied 4 times	Each 64-bit	Each 16-word
1 station occupied 8 times	Each 128-bit	Each 32-word
4 stations occupied 1 time	Each 128-bit	Each 16-word

Station number:	1 station occupied 1 time, 1 station occupied 4 times, and 1 station occupied 8 times: 0 to 64 (0: CC-Link function OFF) 4 stations occupied 1 time: 1 to 61
Connection cable:	CC-Link dedicated cable Ver. 1.10 (Shielded 3-core twisted pair wire)
Connection method:	Terminals
Termination resistor:	110 Ω ± 5 %, 1/2 W (External installation is necessary)

3. CONNECTION TO PLC

⚠ WARNING

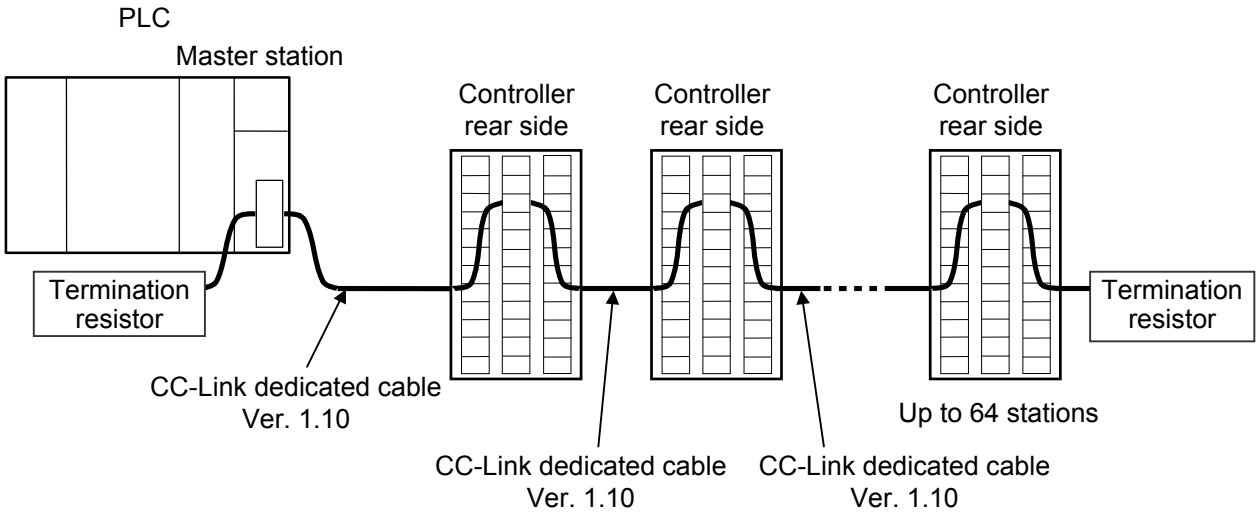
To prevent electric shock or instrument failure, turn off the power before connecting or disconnecting the instrument and peripheral equipment.

☞ For cable specifications, connection method and vendor, refer to the website of CC-Link Partner Association
http://www.cc-link.org/

■ Connection method

The PLC (Master station) and COM-JC make multi-drop connection in CC-Link dedicated cable Ver. 1.10.

📖 The CC-Link dedicated cable Ver. 1.10 is provided by the customer.



Communication speed and maximum transmitter distance
(Use the CC-Link dedicated cable Ver. 1.10)

Communication speed	Station to station cable length	Maximum transmitter distance (maximum length of network)
10 Mbps	20 cm or more	100 m or less
5 Mbps		160 m or less
2.5 Mbps		400 m or less
625 kbps		900 m or less
156 kbps		1200 m or less

☞ For communication speed setting, refer to **4.2 Setting of Station Number and Communication Speed (P. 10)**.

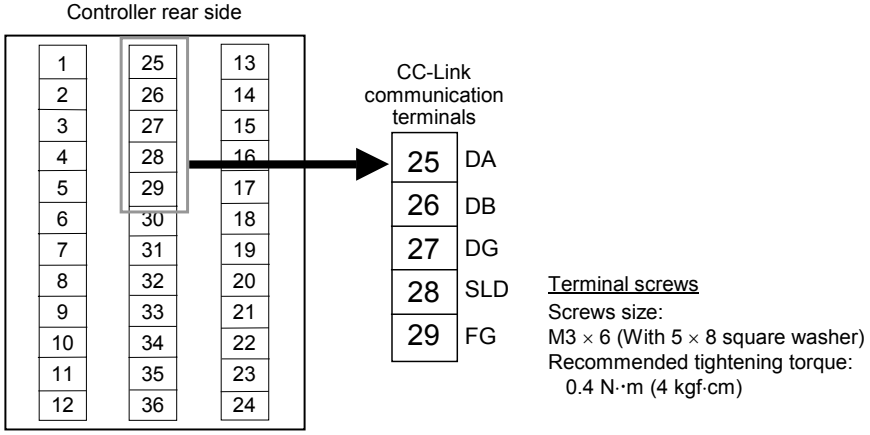
■ Terminal numbers and signal details

The CC-Link connecting terminal of the product is not removable. To replace the instrument, the entire link must be terminated first.
In addition, the FG (frame ground) terminal (terminal number 29) is FG in a CC-Link function, and it is not FG of the instrument all.

Ground both ends of the shielded twisted pair cable via the SLD or FG terminal of each instrument. The SLD terminal is internally connected with the FG terminal.

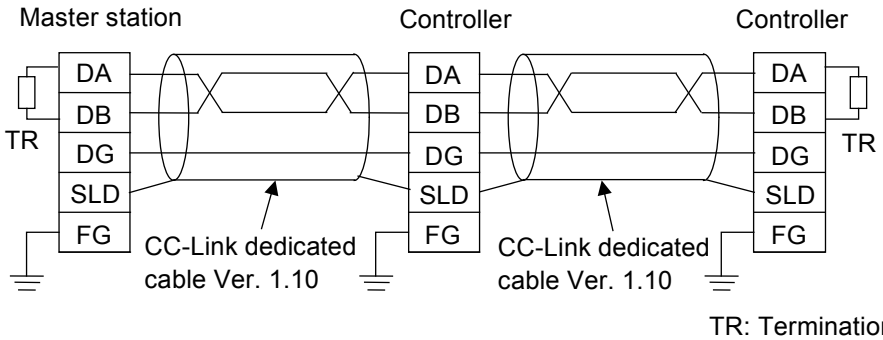
Do not ground the instrument together with other equipment.
In addition, use grounding wires with across section of 2.0 mm^2 or more. (Ground resistance: 100 ohm or less)

Terminal No.	Signal name	Symbol	Cable color
25	Data A	DA	Blue
26	Data B	DB	White
27	Data ground	DG	Yellow
28	Shield	SLD	Grounding wire (Shield)
29	Frame ground	FG	—



■ Connection diagram

Always connect a termination resistor at both ends of the network, between the DA and DB terminals of the instrument.
Termination resistor: 110 Ω ± 5 % 1/2 W

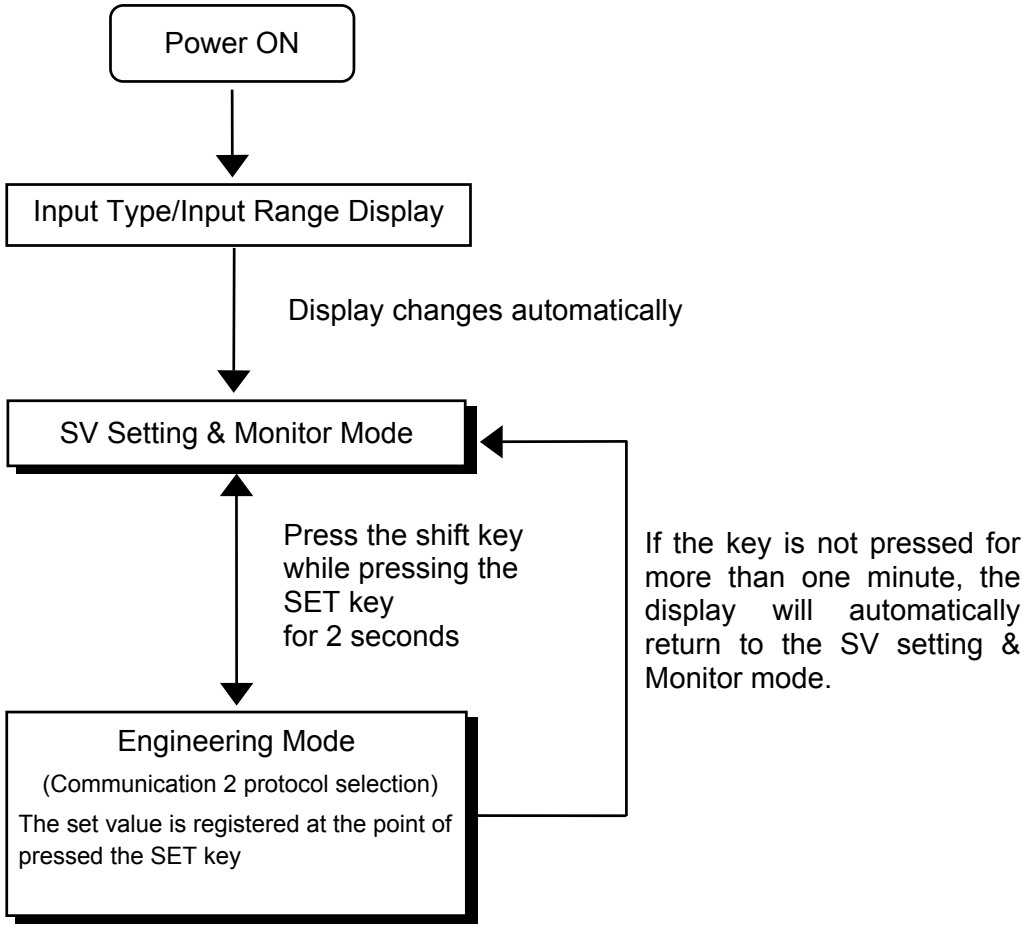


TR: Termination resistor

4. SETTING

4.1 Setting of Number of Occupied Station/Extended Cyclic

The number of occupied stations/extended cyclic of a controller (remote device) can be set here.
Set this parameter on the screen of Communication 2 protocol selection in the Engineering mode.



4.1.1 Transfer to Engineering mode

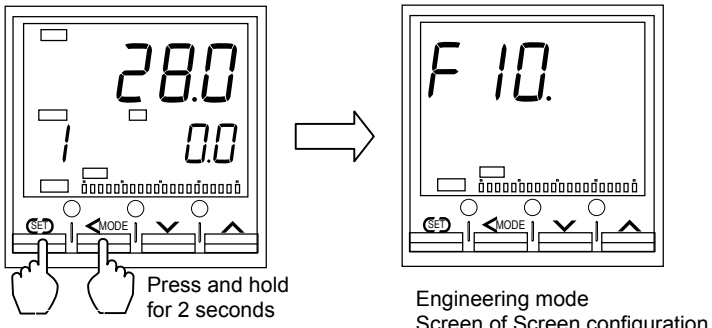
WARNING

Parameters in the Engineering mode should be set according to the application before setting any parameter related to operation. Once the Parameters 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.

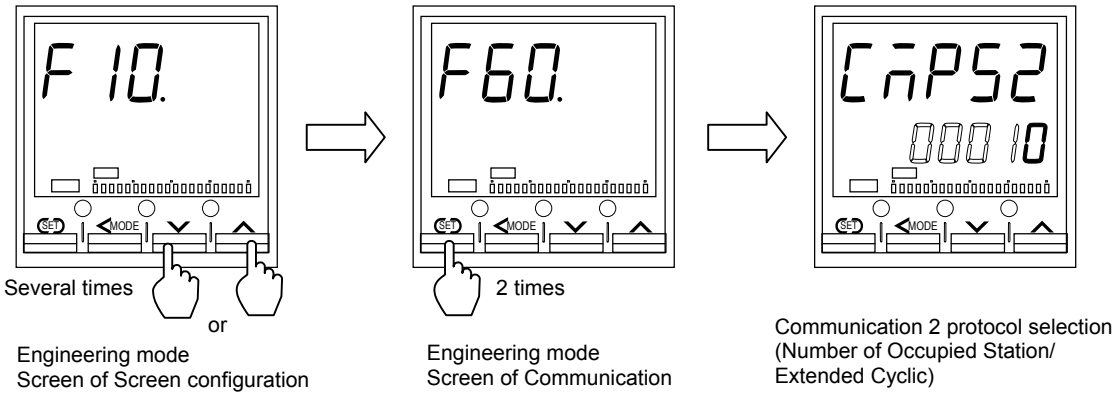
Parameters in Engineering mode are settable only when the controller is in STOP mode.

All parameters of the Engineering mode are displayed regardless of the instrument specification.

1. Press the Shift key while pressing the SET key for 2 seconds at SV setting & Monitor mode until Engineering mode is displayed. Screen configuration "F10." screen is displayed first.



2. Press the UP or DOWN key until Communication "F60." screen is displayed. Press the SET key to change the screen to the Communication 2 protocol selection "CMPS2" screen.

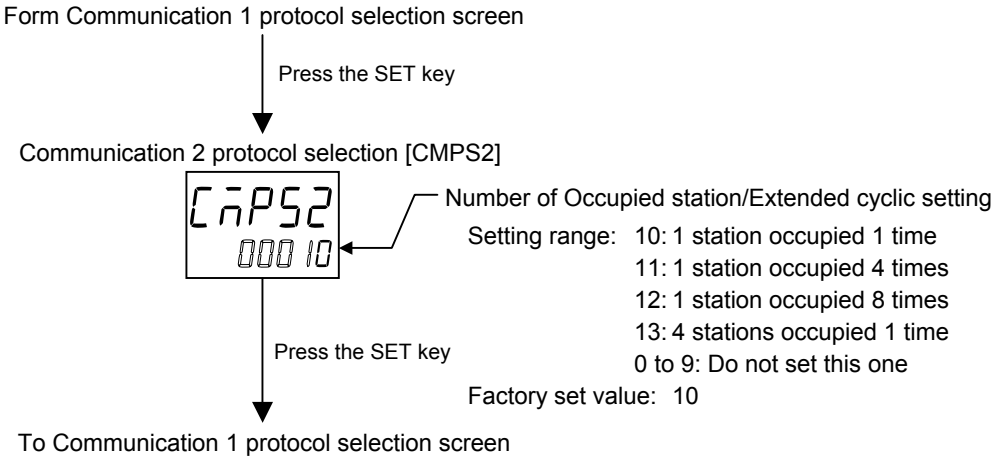


To exit Engineering mode, press the shift key while pressing the SET key. The display changes to the SV setting & Monitor mode.

HA900/901 is used in the above figures for explanation, but the same setting procedures also apply to HA400/401.

4.1.2 Number of Occupied station/Extended cyclic setting (Communication 2 protocol selection)

To select parameters in the Engineering mode, press the SET key.
The parameters relating to CC-Link communication are shown below.



■ Setting procedure

- Communication 2 protocol selection, *CMPS2* (Number of Occupied station/Extended cyclic)
  Enter a desired value with UP, DOWN and shift keys.

■ Store the set value

Press the SET key to store the new value. After all communication parameters are set, and in order to make these values thus set validate, perform any of the following operations.

- The power is turned on again.
- The RUN/STOP mode is changed from STOP mode to RUN mode.

📖 A new value will not be stored without pressing the SET key after the new value is displayed on the display. No communication is performed with the changed values only by pressing the SET key.

📖 When the RUN/STOP mode is changed from STOP mode to RUN mode, the controller performs the same operation as that of Power-on.

📖 After a new value has been changed by using the UP and DOWN keys, the SET key must be pressed within 1 minute, or the new value is not stored and the display will return to the PV1/SV1 monitor screen.

☞ For the RUN/STOP transfer, refer to **HA400/HA900/HA401/HA901 Operation Manual (IMR01N02-E□)**.

■ Description of each parameters

● Communication “F60.”

Symbol	Name	Setting range	Description	Factory set value
CMPS2 (CMPS2)	Communication 2 protocol selection (Number of Occupied station/ Extended cyclic)	10: 1 station occupied 1 time 11: 1 station occupied 4 times 12: 1 station occupied 8 times 13: 4 stations occupied 1 time 0 to 9: Do not set this one	Set this parameter according to the CC-Link master station.	10

CC-Link version ×: Connectable –: Not connectable

CC-Link version of master station	Number of Occupied station/Extended cyclic			
	1 station occupied 1 time	1 station occupied 4 times	1 station occupied 8 times	4 stations occupied 1 time
CC-Link Ver. 2.00	–	×	×	–
CC-Link Ver. 1.10	×	–	–	×

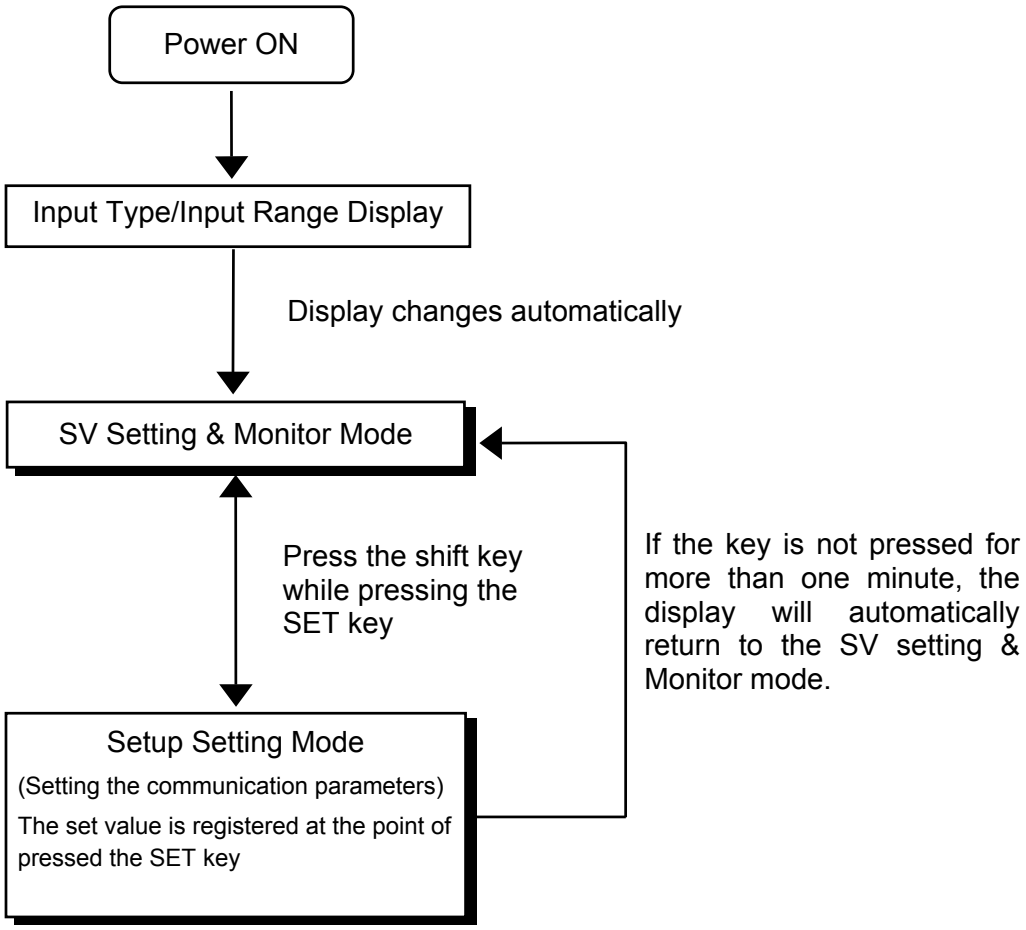
If a controller set for “1 occupied station and 1 time setting” or “4 occupied stations and 1 time setting” is connected, the CC-Link version on the master station side must be set to 1.10.

Communication data length

Number of Occupied station/Extended cyclic	Remote Input/Output (RX/RY)	Remote register (RWr/RWw)
1 station occupied 1 time	Each 32-bit	Each 4-word
1 station occupied 4 times	Each 64-bit	Each 16-word
1 station occupied 8 times	Each 128-bit	Each 32-word
4 stations occupied 1 time	Each 128-bit	Each 16-word

4.2 Setting of Station Number and Communication Speed

To establish communication between a controller (remote device) and a PLC (master station), a station number and a communication speed need to be set.
Set the station number (Device address 2) and the communication speed (Communication speed 2) of the controller in the Setup setting mode.

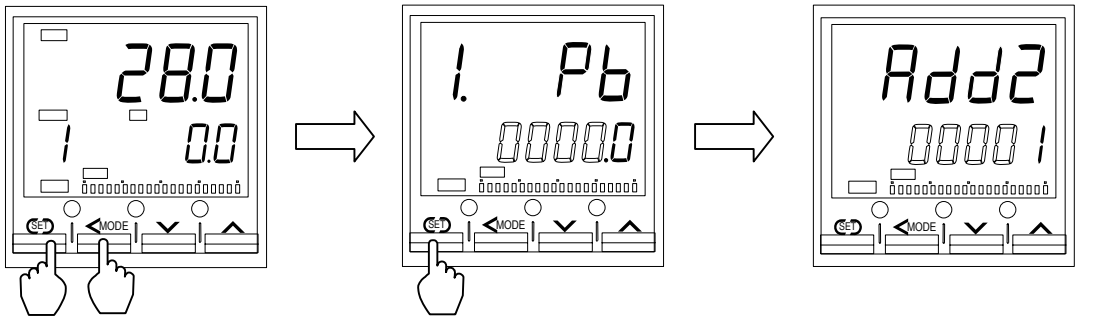


4.2.1 Transfer to setup setting mode

The first displayed parameter in the Setup setting mode varies depending on the instrument specification.

This section provides explanation, assuming that the first parameter in the setup setting mode is PV bias (*Pb*)

To enter the Setup setting mode, you must be in SV setting & Monitor mode. The first parameter to be displayed will be the Input 1_PV bias, *1. Pb*. Press the SET key several times to change to the device address 2, *Add2*.



SV setting & Monitor mode

Setup setting mode
Input1_PV bias setting screen

Device address 2 setting screen
(Slave address 2)

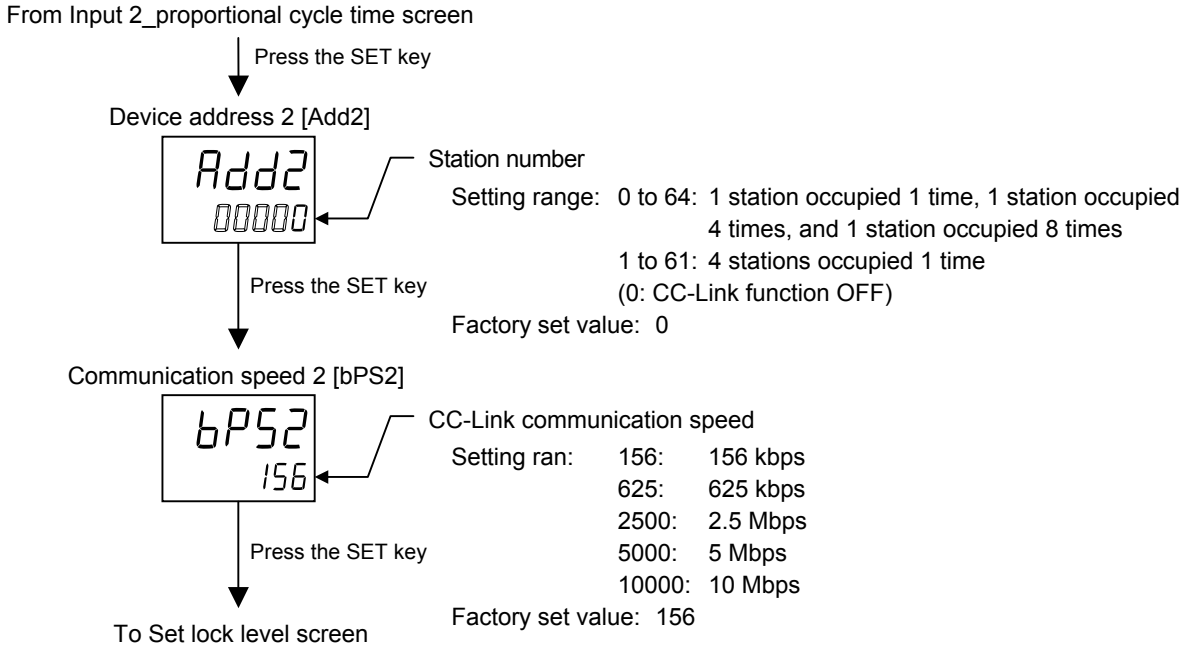
To exit Setup setting mode, press the shift key while pressing the SET key. The display changes to the SV setting & Monitor mode.

HA900/901 is used in the above figures for explanation, but the same setting procedures also apply to HA400/401.

4.2.2 Station number (Device address 2) and Communication speed 2 setting

This item describes when the Communication 2 (CC-Link) is used under the 2-input controller.

To select parameters in the setup setting mode, press the SET key.
The parameters relating to communication are shown below.



■ Setting procedure

Setting procedures vary depending on the communication parameter.

- Device address 2, *Add2* (Station number)
  Enter a desired value with UP, DOWN and shift keys.
- Communication speed, *bPS*
  Operate UP or DOWN key, and choose one among the displayed set values.

■ Store the set value

Press the SET key to store the new value. After all communication parameters are set, in order to make these values thus set validate perform any of the following operations.

- The power is turned on again.
- The RUN/STOP mode is changed from STOP mode to RUN mode.

A new value will not be stored without pressing SET key after the new value is displayed on the display. No communication using the value changed can be performed even with the SET key pressed.

When the RUN/STOP mode is changed from STOP mode to RUN mode, the controller performs the same operation as that of Power-on.

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After a new value has been displayed by using the UP and DOWN keys, the SET key must be pressed within 1 minute, or the new value is not stored and the display will return to the PV1/SV1 monitor screen.

For the RUN/STOP transfer, refer to **HA400/HA900/HA401/HA901 Operation Manual (IMR01N02-E□)**.

■ Description of each parameters

● Communication 2

Symbol	Name	Setting range	Description	Factory set value
Add2 (Add2)	Device address 2 (Station number)	0 to 64: 1 station occupied 1 time, 1 station occupied 4 times, 1 station occupied 8 times 1 to 61: 4 stations occupied 1 time (0: CC-Link function OFF)	Do not use the same device address for more than one controller in multi-drop connection. The "4 stations occupied 1 time setting" needs 4 stations per controller. Specify a station number every 4 stations. [Example] To connect 3 controllers with "4 stations occupied 1 time setting"; For the first controller: set a station number 1 For the second controller: set a station number 5 For the third controller: set a station number 9	0
bPS2 (bPS2)	Communication speed 2 (CC-Link communication speed)	156: 156 kbps 625: 625 kbps 2500: 2.5 Mbps 5000: 5 Mbps 10000: 10 Mbps	The communication speed of all controllers on the same communication line and the master station must be set for the same communication speed. With different communication speed, data link cannot be established properly.	156

Communication speed and maximum transmitter distance (Maximum network length)

Communication speed	Maximum network length (Use the CC-Link dedicated cable Ver. 1.10)
10 Mbps	100 m or less
5 Mbps	160 m or less
2.5 Mbps	400 m or less
625 kbps	900 m or less
156 kbps	1200 m or less

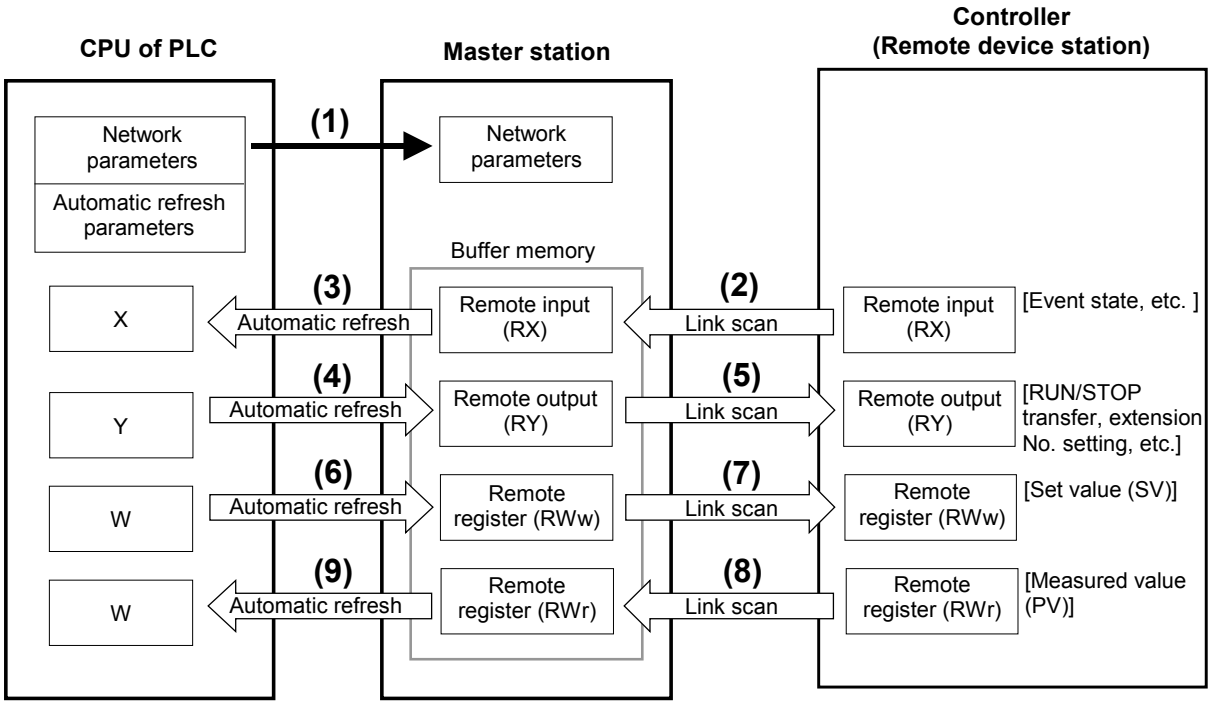
For number of Occupied station/Extended cyclic, refer to **4.1 Setting of Number of Occupied Station/Extended Cyclic (P. 6)**.

5. CC-Link COMMUNICATION

5.1 Communication Between Master Station and Controller (Remote Device Station)

The controller which is a remote device station can process Remote input (RX), Remote output (RY) and Remote registers (RWw and RWr).

■ Outline of communication between master station and controller (Remote device station)



(1) When the PLC system is powered on, the network parameters in the PLC CPU are transferred to the master station, and the CC-Link system automatically starts up. [Data link startup]

(2) The Remote input RX of a controller (Remote device station) is stored automatically (for each link scan) in the master station's Remote input RX buffer memory. [Remote input]

(3) The input status stored in the Remote input RX buffer memory is stored in the CPU device set with the automatic refresh parameters.

(4) The ON/OFF data of the CPU device set with the automatic refresh parameters is stored in the Remote output RY buffer memory. [Remote output]

(5) Remote output RY is automatically set to ON/OFF (for each link scan) according to the output status stored in the Remote output RY buffer memory.

(6) The transmission data of the CPU device set with the automatic refresh parameters is stored in the Remote register RWw buffer memory.

(7) The data stored in the Remote register RWw buffer memory is automatically sent to the Remote register RWw of the controller (Remote device station).

[Writing to the Remote register RWw]

(8) The Remote register RWr data of a controller (Remote device station) is automatically stored in the Remote register RWr buffer memory of the master station.

(9) The Remote register RWr data of a controller (Remote device station) stored in the Remote register RWr buffer memory is stored in the CPU device set with the automatic refresh parameters.

[Reading from the Remote register (RWr)]

With the master station (PLC) set to the STOP state, neither the Remote output (RY) nor data write to the Remote register (RWw) is reflected to the controller.

For details of the communication, refer to the **Instruction manual for PLC**.

■ RUN/STOP for the controller

The controller has no power switch. Immediately upon applying power to the controller, control is started. (Factory set value: RUN mode)
When the controller is needed to suppress the RUN mode during startup or until the master station is in RUN mode, select “STOP start” at Hot/Cold start selection (extension number 230) so that the controller stays in STOP mode when power is back.

For Hot/Cold start selection (extension number 230), refer to **5.7 Extension Number List (P. 46)**.

To stop the control via CC-Link after power has been applied to the controller, set the RUN/STOP transfer (remote output RYnF) to STOP mode.

For RUN/STOP transfer (remote output RYnF), refer to **5.3 Remote Input/Output List (P. 17)**.

Before starting the link scan, set RUN/STOP transfer (remote output RYnF) to STOP mode.

5.2 Processing of Numeric Data Values

(1) 2-word data is read and written in order of low-order word and then high-order word.

(2) The numeric values (remote registers), which are obtained through data send/receive from a controller, may be with/without a decimal point and with/without a negative (minus) sign.

- **For numeric data value without decimal point**

If there is no decimal point, the value is processed as it is.
In parameters which only have ON or OFF status, 1 = ON, 0 = OFF.

[Example]

A signal wire for feedback resistance input is disconnected and the burnout state occurs.

→ Value read from the to extension number 67 [burnout state of feedback resistance input]:
1 (Hexadecimal number: 0001H)

- **For numeric data value with decimal point**

The decimal point is omitted.

[Example]

When the Input 1_Measured value (PV) of controller is 120.5 °C

→ Value read from the Remote register (RWrn, RWrn+1) [Input 1_Measured value (PV1)]:
1205 (Hexadecimal number: 04B5H)

→ Value read from the extension number 0 [Measured value (PV)]:
1205 (Hexadecimal number: 04B5H)

- **For numeric data value with minus sign**

The value is expressed as a 2's complement value which is obtained by subtracting the minus value from the hexadecimal number 100000000H.

[Example]

When the Input 1_Measured value (PV) of controller is –2.5 °C

→ Value read from the Remote register (RWrn, RWrn+1) [Input 1_Measured value (PV1)]:
Hexadecimal number: FFFFFFE7H (100000000H – 25 = 100000000H – 19H = FFFFFFE7H)

→ Value read from the extension number 0 [Measured value (PV)]:
Hexadecimal number: FFFFFFE7H (100000000H – 25 = 100000000H – 19H = FFFFFFE7H)

(3) Read data of unused item becomes 0.

(4) Any attempt to write to an unused item is not processed as an error. Data cannot be written into an unused item.

(5) Communication data includes data that becomes RO (read only) depending on the specification. No error occurs even if data is written when set to RO. However in this case, no data is written.

☞ For details, refer to **5.7 Extension Number List (P. 46)**.

5.3 Remote Input/Output

Remote input (RX) and Remote output (RY) is ON/OFF data.

"n" in the table is the address assigned to the master station by the station number setting.
It can be calculated by the following equation. However, this computing equation applies when a network is configured only by using our controllers and the number of all Occupied stations/Extended cyclic are at the same setting.

Number of Occupied stations/ Extended cyclic setting	Equation
1 station occupied 1 time	n = (Station number – 1) × 2
1 station occupied 4 times	n = (Station number – 1) × 4
1 station occupied 8 times	n = (Station number – 1) × 8
4 stations occupied 1 time	n = (Station number – 1) × 8

As the calculation result is expressed in decimal number it is converted to hexadecimal number before substituted for "n" in the table.

Example:

When the controller is set to 4 stations occupied 1 time and its station number is 5.

n = (5 – 1) × 8 = 32 (Decimal number) → 20 (Hexadecimal number)

For station number 5: Remote inputs RXn0 to RX(n+7)F → RX200 to RX27F
Remote outputs RYn0 to RY(n+7)F → RY200 to RY27F

If the controller is a single input type, communication items for Input 2 are unused.

5.3.1 1 station occupied 1 time

■ Remote input

Data direction: Controller (Remote device station) → Master station (PLC)
Data capacity: 32-bit

Address	Communication item	Data range	Factory set value	Reference page
RXn0	Event 1 state	0: OFF 1: ON	—	P. 144
RXn1	Event 2 state		—	P. 144
RXn2	Input 1_burnout state	0: OFF 1: ON	—	P. 144
RXn3	Heater break alarm 1 (HBA1) state	0: OFF 1: ON	—	P. 145
RXn4	Input 1_PID/AT transfer state	0: PID control 1: Autotuning (AT)	—	P. 145
RXn5	Event 3 state	0: OFF 1: ON	—	P. 144
RXn6	Event 4 state		—	P. 144
RXn7	Input 2_burnout state	0: OFF 1: ON	—	P. 144
RXn8	Heater break alarm 2 (HBA2) state	0: OFF 1: ON	—	P. 145
RXn9	Input 2_PID/AT transfer state	0: PID control 1: Autotuning (AT)	—	P. 145
RXnA	Unused	—	—	—
RXnB	Unused	—	—	—
RXnC	Extended display completion	0: OFF 1: ON	—	P. 44
RXnD	Extended setting completion	0: OFF 1: ON	—	P. 45
RXnE	Unused	—	—	—
RXnF	Hardware error flag	0: OFF 1: ON Turns on when hardware error of the controller occurs.	—	P. 44
RX(n+1)0	Reserved	—	—	—
RX(n+1)1	Reserved	—	—	—
RX(n+1)2	Reserved	—	—	—
RX(n+1)3	Reserved	—	—	—
RX(n+1)4	Reserved	—	—	—
RX(n+1)5	Reserved	—	—	—

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Address	Communication item	Data range	Factory set value	Reference page
RX(n+1)6	Reserved	—	—	—
RX(n+1)7	Reserved	—	—	—
RX(n+1)8	Initialize data processing request flag	0: OFF 1: ON	—	P. 43
RX(n+1)9	Initialize data setting completion flag	0: OFF 1: ON	—	P. 43
RX(n+1)A	Error status flag	0: OFF 1: ON Turns on when self-diagnostics error except watchdog timer abnormality occurs in the controller.	—	P. 44
RX(n+1)B	Remote ready	0: OFF 1: ON	—	P. 43
RX(n+1)C	Reserved	—	—	—
RX(n+1)D	Reserved	—	—	—
RX(n+1)E	Reserved	—	—	—
RX(n+1)F	Reserved	—	—	—

■ Remote output

Data direction: Master station (PLC) → Controller (Remote device station)
Data capacity: 32-bit

Address	Communication item		Data range	Factory set value	Reference page
RYn0	Bit 0	Extension number for display	Display extension number is specified by the ON/OFF states of RYn0 to RYn5. Data 0: OFF 1: ON [Decimal number: 0 to 63]	0	P. 40 P. 46
RYn1	Bit 1				
RYn2	Bit 2				
RYn3	Bit 3				
RYn4	Bit 4				
RYn5	Bit 5				
RYn6	Bit 0	Extension number for setting	Setting extension number is specified by the ON/OFF states of RYn6 to RYnB. Data 0: OFF 1: ON [Decimal number: 0 to 63]	0	P. 41 P. 46
RYn7	Bit 1				
RYn8	Bit 2				
RYn9	Bit 3				
RYnA	Bit 4				
RYnB	Bit 5				
RYnC	Extended display flag		0: OFF 1: ON	0	P. 44

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Address	Communication item	Data range	Factory set value	Reference page
RYnD	Extended setting flag	0: OFF 1: ON	0	P. 45
RYnE	Unused	—	—	—
RYnF	RUN/STOP transfer	0: RUN (Control start) 1: STOP (Control stop)	0	P. 71
RY(n+1)0	Reserved	—	—	—
RY(n+1)1	Reserved	—	—	—
RY(n+1)2	Reserved	—	—	—
RY(n+1)3	Reserved	—	—	—
RY(n+1)4	Reserved	—	—	—
RY(n+1)5	Reserved	—	—	—
RY(n+1)6	Reserved	—	—	—
RY(n+1)7	Reserved	—	—	—
RY(n+1)8	Initialize data processing completion flag	0: OFF 1: ON	0	P. 43
RY(n+1)9	Initialize data setting request flag	0: OFF 1: ON	0	P. 43
RY(n+1)A	Error reset request flag	0: OFF 1: ON	0	P. 44
RY(n+1)B	Reserved	—	—	—
RY(n+1)C	Reserved	—	—	—
RY(n+1)D	Reserved	—	—	—
RY(n+1)E	Reserved	—	—	—
RY(n+1)F	Reserved	—	—	—

5.3.2 1 station occupied 4 times

■ Remote input

Data direction: Controller (Remote device station) → Master station (PLC)
Data capacity: 64-bit

Address	Communication item	Data range	Factory set value	Reference page
RXn0	Event 1 state	0: OFF 1: ON	—	P. 144
RXn1	Event 2 state		—	P. 144
RXn2	Input 1_burnout state	0: OFF 1: ON	—	P. 144
RXn3	Heater break alarm 1 (HBA1) state	0: OFF 1: ON	—	P. 145
RXn4	Input 1_PID/AT transfer state	0: PID control 1: Autotuning (AT)	—	P. 145
RXn5	Event 3 state	0: OFF 1: ON	—	P. 144
RXn6	Event 4 state		—	P. 144
RXn7	Input 2_burnout state	0: OFF 1: ON	—	P. 144
RXn8	Heater break alarm 2 (HBA2) state	0: OFF 1: ON	—	P. 145
RXn9	Input 2_PID/AT transfer state	0: PID control 1: Autotuning (AT)	—	P. 145
RXnA	Unused	—	—	—
RXnB	Unused	—	—	—
RXnC	Extended display completion	0: OFF 1: ON	—	P. 44
RXnD	Extended setting completion	0: OFF 1: ON	—	P. 45
RXnE	Unused	—	—	—
RXnF	Hardware error flag	0: OFF 1: ON Turns on when hardware error of the controller occurs.	—	P. 44
RX(n+1)0 ⋮ RX(n+1)F	Unused	—	—	—

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Address	Communication item	Data range	Factory set value	Reference page
RX(n+2)0 ⋮ RX(n+2)F	Unused	—	—	—
RX(n+3)0	Reserved	—	—	—
RX(n+3)1	Reserved	—	—	—
RX(n+3)2	Reserved	—	—	—
RX(n+3)3	Reserved	—	—	—
RX(n+3)4	Reserved	—	—	—
RX(n+3)5	Reserved	—	—	—
RX(n+3)6	Reserved	—	—	—
RX(n+3)7	Reserved	—	—	—
RX(n+3)8	Initialize data processing request flag	0: OFF 1: ON	—	P. 43
RX(n+3)9	Initialize data setting completion flag	0: OFF 1: ON	—	P. 43
RX(n+3)A	Error status flag	0: OFF 1: ON Turns on when self-diagnostics error except watchdog timer abnormality occurs in the controller.	—	P. 44
RX(n+3)B	Remote ready	0: OFF 1: ON	—	P. 43
RX(n+3)C	Reserved	—	—	—
RX(n+3)D	Reserved	—	—	—
RX(n+3)E	Reserved	—	—	—
RX(n+3)F	Reserved	—	—	—

■ Remote output

Data direction: Master station (PLC) → Controller (Remote device station)
Data capacity: 64-bit

Address	Communication item		Data range	Factory set value	Reference page
RYn0	Bit 0	Extension number for display	Setting extension number is specified by the ON/OFF states of RYn0 to RYn5 and RY(n+1)0 to RY(n+1)2. Data 0: OFF 1: ON [Decimal number: 0 to 511]	0	P. 40 P. 46
RYn1	Bit 1				
RYn2	Bit 2				
RYn3	Bit 3				
RYn4	Bit 4				
RYn5	Bit 5				

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Address	Communication item		Data range	Factory set value	Reference page
RYn6	Bit 0	Extension number for setting	Setting extension number is specified by the ON/OFF states of RYn6 to RynB and RY(n+1)8 to RY(n+1)A. Data 0: OFF 1: ON [Decimal number: 0 to 511]	0	P. 41 P. 46
RYn7	Bit 1				
RYn8	Bit 2				
RYn9	Bit 3				
RYnA	Bit 4				
RYnB	Bit 5				
RYnC	Extended display flag		0: OFF 1: ON	0	P. 44
RYnD	Extended setting flag		0: OFF 1: ON	0	P. 45
RYnE	Unused		—	—	—
RYnF	RUN/STOP transfer		0: RUN (Control start) 1: STOP (Control stop)	0	P. 71
RY(n+1)0	Bit 6	Extension number for display Bit 9 to 13: Unused	Setting extension number is specified by the ON/OFF states of RYn0 to RYn5 and RY(n+1)0 to RY(n+1)2. Data 0: OFF 1: ON [Decimal number: 0 to 511]	0	P. 40 P. 46
RY(n+1)1	Bit 7				
RY(n+1)2	Bit 8				
RY(n+1)3	Bit 9				
RY(n+1)4	Bit 10				
RY(n+1)5	Bit 11				
RY(n+1)6	Bit 12				
RY(n+1)7	Bit 13				
RY(n+1)8	Bit 6	Extension number for setting Bit 9 to 13: Unused	Setting extension number is specified by the ON/OFF states of RYn6 to RynB and RY(n+1)8 to RY(n+1)A. Data 0: OFF 1: ON [Decimal number: 0 to 511]	0	P. 41 P. 46
RY(n+1)9	Bit 7				
RY(n+1)A	Bit 8				
RY(n+1)B	Bit 9				
RY(n+1)C	Bit 10				
RY(n+1)D	Bit 11				
RY(n+1)E	Bit 12				
RY(n+1)F	Bit 13				
RY(n+2)0	Bit 0	Area number for display Bit 5 to 7: Unused	Display area number is specified by the ON/OFF states of RY(n+2)0 to RY(n+2)4. Data 0: OFF 1: ON [Decimal number: 0 to 31] (0, 17 to 31: Control area)	0	P. 40
RY(n+2)1	Bit 1				
RY(n+2)2	Bit 2				
RY(n+2)3	Bit 3				
RY(n+2)4	Bit 4				
RY(n+2)5	Bit 5				
RY(n+2)6	Bit 6				
RY(n+2)7	Bit 7				

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Address	Communication item		Data range	Factory set value	Reference page
RY(n+2)8	Bit 0	Area number for setting Bit 5 to 7: Unused	Setting area number is specified by the ON/OFF states of RY(n+2)8 to RY(n+2)C. Data 0: OFF 1: ON [Decimal number: 0 to 31] (0, 17 to 31: Control area)	0	P. 40
RY(n+2)9	Bit 1				
RY(n+2)A	Bit 2				
RY(n+2)B	Bit 3				
RY(n+2)C	Bit 4				
RY(n+2)D	Bit 5				
RY(n+2)E	Bit 6				
RY(n+2)F	Bit 7				
RY(n+3)0	Reserved		—	—	—
RY(n+3)1	Reserved		—	—	—
RY(n+3)2	Reserved		—	—	—
RY(n+3)3	Reserved		—	—	—
RY(n+3)4	Reserved		—	—	—
RY(n+3)5	Reserved		—	—	—
RY(n+3)6	Reserved		—	—	—
RY(n+3)7	Reserved		—	—	—
RY(n+3)8	Initialize data processing completion flag		0: OFF 1: ON	0	P. 43
RY(n+3)9	Initialize data setting request flag		0: OFF 1: ON	0	P. 43
RY(n+3)A	Error reset request flag		0: OFF 1: ON	0	P. 44
RY(n+3)B	Reserved		—	—	—
RY(n+3)C	Reserved		—	—	—
RY(n+3)D	Reserved		—	—	—
RY(n+3)E	Reserved		—	—	—
RY(n+3)F	Reserved		—	—	—

5.3.3 1 station occupied 8 times or 4 stations occupied 1 time

■ Remote input

Data direction: Controller (Remote device station) → Master station (PLC)
Data capacity: 128-bit

Address	Communication item	Data range	Factory set value	Reference page
RXn0	Event 1 state	0: OFF 1: ON	—	P. 144
RXn1	Event 2 state		—	P. 144
RXn2	Input 1_burnout state	0: OFF 1: ON	—	P. 144
RXn3	Heater break alarm 1 (HBA1) state	0: OFF 1: ON	—	P. 145
RXn4	Input 1_PID/AT transfer state	0: PID control 1: Autotuning (AT)	—	P. 145
RXn5	Event 3 state	0: OFF 1: ON	—	P. 144
RXn6	Event 4 state		—	P. 144
RXn7	Input 2_burnout state	0: OFF 1: ON	—	P. 144
RXn8	Heater break alarm 2 (HBA2) state	0: OFF 1: ON	—	P. 145
RXn9	Input 2_PID/AT transfer state	0: PID control 1: Autotuning (AT)	—	P. 145
RXnA	Unused	—	—	—
RXnB	Unused	—	—	—
RXnC	Extended display completion	0: OFF 1: ON	—	P. 44
RXnD	Extended setting completion	0: OFF 1: ON	—	P. 45
RXnE	Unused	—	—	—
RXnF	Hardware error flag	0: OFF 1: ON Turns on when hardware error of the controller occurs.	—	P. 44
RX(n+1)0 ⋮ RX(n+1)F	Unused	—	—	—

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Address	Communication item	Data range	Factory set value	Reference page
RX(n+2)0 ⋮ RX(n+2)F	Unused	—	—	—
RX(n+3)0 ⋮ RX(n+3)F	Unused	—	—	—
RX(n+4)0 ⋮ RX(n+4)F	Unused	—	—	—
RX(n+5)0 ⋮ RX(n+5)F	Unused	—	—	—
RX(n+6)0 ⋮ RX(n+6)F	Unused	—	—	—
RX(n+7)0	Reserved	—	—	—
RX(n+7)1	Reserved	—	—	—
RX(n+7)2	Reserved	—	—	—
RX(n+7)3	Reserved	—	—	—
RX(n+7)4	Reserved	—	—	—
RX(n+7)5	Reserved	—	—	—
RX(n+7)6	Reserved	—	—	—
RX(n+7)7	Reserved	—	—	—
RX(n+7)8	Initialize data processing request flag	0: OFF 1: ON	—	P. 43
RX(n+7)9	Initialize data setting completion flag	0: OFF 1: ON	—	P. 43
RX(n+7)A	Error status flag	0: OFF 1: ON Turns on when self-diagnostics error except watchdog timer abnormality occurs in the controller.	—	P. 44
RX(n+7)B	Remote ready	0: OFF 1: ON	—	P. 43
RX(n+7)C	Reserved	—	—	—
RX(n+7)D	Reserved	—	—	—
RX(n+7)E	Reserved	—	—	—
RX(n+7)F	Reserved	—	—	—

■ Remote output

Data direction: Master station (PLC) → Controller (Remote device station)
Data capacity: 128-bit

Address	Communication item		Data range	Factory set value	Reference page
RYn0	Bit 0	Extension number for display	Setting extension number is specified by the ON/OFF states of RYn0 to RYn5 and RY(n+1)0 to RY(n+1)2. Data 0: OFF 1: ON [Decimal number: 0 to 511]	0	P. 40 P. 46
RYn1	Bit 1				
RYn2	Bit 2				
RYn3	Bit 3				
RYn4	Bit 4				
RYn5	Bit 5				
RYn6	Bit 0	Extension number for setting	Setting extension number is specified by the ON/OFF states of RYn6 to RynB and RY(n+1)8 to RY(n+1)A. Data 0: OFF 1: ON [Decimal number: 0 to 511]	0	P. 41 P. 46
RYn7	Bit 1				
RYn8	Bit 2				
RYn9	Bit 3				
RYnA	Bit 4				
RYnB	Bit 5				
RYnC	Extended display flag		0: OFF 1: ON	0	P. 44
RYnD	Extended setting flag		0: OFF 1: ON	0	P. 45
RYnE	Unused		—	—	—
RYnF	RUN/STOP transfer		0: RUN (Control start) 1: STOP (Control stop)	0	P. 71
RY(n+1)0	Bit 6	Extension number for display Bit 9 to 13: Unused	Setting extension number is specified by the ON/OFF states of RYn0 to RYn5 and RY(n+1)0 to RY(n+1)2. Data 0: OFF 1: ON [Decimal number: 0 to 511]	0	P. 40 P. 46
RY(n+1)1	Bit 7				
RY(n+1)2	Bit 8				
RY(n+1)3	Bit 9				
RY(n+1)4	Bit 10				
RY(n+1)5	Bit 11				
RY(n+1)6	Bit 12				
RY(n+1)7	Bit 13				
RY(n+1)8	Bit 6	Extension number for setting Bit 9 to 13: Unused	Setting extension number is specified by the ON/OFF states of RYn6 to RynB and RY(n+1)8 to RY(n+1)A. Data 0: OFF 1: ON [Decimal number: 0 to 511]	0	P. 41 P. 46
RY(n+1)9	Bit 7				
RY(n+1)A	Bit 8				
RY(n+1)B	Bit 9				
RY(n+1)C	Bit 10				
RY(n+1)D	Bit 11				
RY(n+1)E	Bit 12				
RY(n+1)F	Bit 13				

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Address	Communication item		Data range	Factory set value	Reference page
RY(n+2)0	Bit 0	Area number for display Bit 5 to 7: Unused	Display area number is specified by the ON/OFF states of RY(n+2)0 to RY(n+2)4. Data 0: OFF 1: ON [Decimal number: 0 to 31] (0, 17 to 31: Control area)	0	P. 40
RY(n+2)1	Bit 1				
RY(n+2)2	Bit 2				
RY(n+2)3	Bit 3				
RY(n+2)4	Bit 4				
RY(n+2)5	Bit 5				
RY(n+2)6	Bit 6				
RY(n+2)7	Bit 7				
RY(n+2)8	Bit 0	Area number for setting Bit 5 to 7: Unused	Setting area number is specified by the ON/OFF states of RY(n+2)8 to RY(n+2)C. Data 0: OFF 1: ON [Decimal number: 0 to 31] (0, 17 to 31: Control area)	0	P. 40
RY(n+2)9	Bit 1				
RY(n+2)A	Bit 2				
RY(n+2)B	Bit 3				
RY(n+2)C	Bit 4				
RY(n+2)D	Bit 5				
RY(n+2)E	Bit 6				
RY(n+2)F	Bit 7				
RY(n+3)0 ⋮ RY(n+3)F	Unused		—	—	—
RY(n+4)0 ⋮ RY(n+4)F	Unused		—	—	—
RY(n+5)0 ⋮ RY(n+5)F	Unused		—	—	—
RY(n+6)0 ⋮ RY(n+6)F	Unused		—	—	—
RY(n+7)0	Reserved		—	—	—
RY(n+7)1	Reserved		—	—	—
RY(n+7)2	Reserved		—	—	—
RY(n+7)3	Reserved		—	—	—
RY(n+7)4	Reserved		—	—	—
RY(n+7)5	Reserved		—	—	—
RY(n+7)6	Reserved		—	—	—
RY(n+7)7	Reserved		—	—	—

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Address	Communication item	Data range	Factory set value	Reference page
RY(n+7)8	Initialize data processing completion flag	0: OFF 1: ON	0	P. 43
RY(n+7)9	Initialize data setting request flag	0: OFF 1: ON	0	P. 43
RY(n+7)A	Error reset request flag	0: OFF 1: ON	0	P. 44
RY(n+7)B	Reserved	—	—	—
RY(n+7)C	Reserved	—	—	—
RY(n+7)D	Reserved	—	—	—
RY(n+7)E	Reserved	—	—	—
RY(n+7)F	Reserved	—	—	—

5.4 Remote Register

Remote registers (RWr, RWw) are numeric data.

"n" in the table is the address assigned to the master station by the station number setting.
It can be calculated by the following equation. However, this computing equation applies when a network is configured only by using our controllers and the number of all Occupied stations/Extended cyclic are at the same setting.

Number of Occupied stations/ Extended cyclic setting	Equation
1 station occupied 1 time	n = (Station number – 1) × 4
1 station occupied 4 times	n = (Station number – 1) ×16
1 station occupied 8 times	n = (Station number – 1) ×32
4 stations occupied 1 time	n = (Station number – 1) ×16

As the calculation result is expressed in decimal number it is converted to hexadecimal number before substituted for "n" in the table.

Example:

When the controller is set to 4 stations occupied 1 time and its station number is 5.

n = (5 – 1) × 16 = 64 (Decimal number) → 40 (Hexadecimal number)

For station number 5: Remote registers RWrn to RWrn+F → RWr40 to RWr4F
RWwn to RWwn+F → RWw40 to RWw4F

To write data into the registers (RWw) for extended area setting, write data in a double word format (32-bit) regardless of the data setting range.

If the communication item has no channel, write a value into the register (RWw) for extended area setting of CH1. The register (RWw) for extended area setting of CH2 is not used.

If the communication item with a channel number is for a single input specification, the register (RWw) for extended area setting of Input 2 (CH 2) is not used.

5.4.1 1 station occupied 1 time

■ Remote register (RWr)

Data direction: Controller (Remote device station) → Master station (PLC)
Data capacity: 4-word

Address	Communication item	Data range	Factory set value	Reference page
RWrn	For extended area display of CH1 [Low-order word]	Data corresponding to the extension number specified by setting the display extension number from RYn0 to RYn5 and from RY(n+1)0 to RY(n+1)2. Data in control area if the communication item supports multi-memory area function.	—	P. 40
RWrn+1	For extended area display of CH1 [High-order word]			
RWrn+2	For extended area display of CH2 [Low-order word]		—	P. 40
RWrn+3	For extended area display of CH2 [High-order word]			

CH1: Extended area of Input 1, CT1, and HBA1.
CH2: Extended area of Input 2, CT2, and HBA2.

■ Remote register (RWw)

Data direction: Master station (PLC) → Controller (Remote device station)
Data capacity: 4-word

Address	Communication item	Data range	Factory set value	Reference page
RWwn	For extended area setting of CH1 [Low-order word]	Data corresponding to the extension number specified by setting the setting extension number from RYn6 to RYnB and from RY(n+1)8 to RY(n+1)A. Data in control area if the communication item supports multi-memory area function.	—	P. 40
RWwn+1	For extended area setting of CH1 [High-order word]			
RWwn+2	For extended area setting of CH2 [Low-order word]		—	P. 40
RWwn+3	For extended area setting of CH2 [High-order word]			

CH1: Extended area of Input 1, CT1, and HBA1.
CH2: Extended area of Input 2, CT2, and HBA2.

5.4.2 1 station occupied 4 times or 4 stations occupied 1 time

■ Remote register (RWr)

Data direction: Controller (Remote device station) → Master station (PLC)
Data capacity: 16-word

Address	Communication item	Data range	Factory set value	Reference page
RWrn	Input 1_measured value (PV1) [Low-order word]	Input 1_input scale low to Input 1_input scale high	—	P. 65
RWrn+1	Input 1_measured value (PV1) [High-order word]			
RWrn+2	Input 2_measured value (PV2) [Low-order word]	Input 2_input scale low to Input 2_input scale high	—	P. 65
RWrn+3	Input 2_measured value (PV2) [High-order word]			
RWrn+4	Input 1_manipulated output value (MV1)	−5.0 to +105.0 %	—	P. 65
RWrn+5	Input 2_manipulated output value (MV2)	−5.0 to +105.0 %	—	P. 65
RWrn+6	Input 1_set value (SV1) monitor [Low-order word]	Input 1_setting limiter low to Input 1_setting limiter high	—	P. 77
RWrn+7	Input 1_set value (SV1) monitor [High-order word]			
RWrn+8	Input 2_set value (SV2) monitor [Low-order word]	Input 2_setting limiter low to Input 2_setting limiter high	—	P. 77
RWrn+9	Input 2_set value (SV2) monitor [High-order word]			
RWrn+A	Error code	Bit data Bit 0: Adjustment data error Bit 1: EEPROM error Bit 2: A/D conversion error Bit 3: RAM check error Bit 4: Hardware configuration error Bit 5: Software configuration error Bit 6: Unused Bit 7: Watchdog timer error Bit 8 to Bit 10: Unused Bit 11: Program busy Bit 12 to Bit 31: Unused Data 0: OFF 1: ON [Decimal number: 0 to 4095]	—	P. 78

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Address	Communication item	Data range	Factory set value	Reference page
RWrn+B	Operation mode state	Bit data Bit 0: Control STOP Bit 1: Control RUN Bit 2: Input 1_Manual mode (Including Input 1_ Remote mode) Bit 3: Input 2_Manual mode (Including Input 2_ Remote mode) Bit 4: Remote mode or Cascade control Bit 5 to Bit 31: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31]	—	P. 95
RWrn+C	For extended area display of CH1 [Low-order word]	Data corresponding to the extension number specified by setting the display extension number from RYn0 to RYn5 and from RY(n+1)0 to RY(n+1)2.	—	P. 40
RWrn+D	For extended area display of CH1 [High-order word]			
RWrn+E	For extended area display of CH2 [Low-order word]	For the communication items supporting multi-memory area function: Data in memory area number specified by display area number setting [RY(n+2)0 to RY(n+2)4].	—	P. 40
RWrn+F	For extended area display of CH2 [High-order word]			

CH1: Extended area of Input 1, CT1, and HBA1.
CH2: Extended area of Input 2, CT2, and HBA2.

■ Remote register (RWw)

Data direction: Master station (PLC) → Controller (Remote device station)
Data capacity: 16-word

Address	Communication item	Data range	Factory set value	Reference page
RWwn	Input 1_set value (SV1) [Low-order word]	Input 1_setting limiter low to Input 1_setting limiter high [Data of control area]	0.0	P. 66
RWwn+1	Input 1_set value (SV1) [High-order word]			
RWwn+2	Input 2_set value (SV2) [Low-order word]	Input 2_setting limiter low to Input 2_setting limiter high [Data of control area]	0.0	P. 66
RWwn+3	Input 2_set value (SV2) [High-order word]			

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Address	Communication item	Data range	Factory set value	Reference page
RWwn+4	Event 1 set value [Low-order word]	Deviation: −Input span to +Input span Process/SV: Input scale low to Input scale high [Data of control area]	50.0	P. 70
RWwn+5	Event 1 set value [High-order word]			
RWwn+6	Event 2 set value [Low-order word]		50.0	P. 70
RWwn+7	Event 2 set value [High-order word]			
RWwn+8	Event 3 set value [Low-order word]		50.0	P. 70
RWwn+9	Event 3 set value [High-order word]			
RWwn+A	Event 4 set value [Low-order word]		50.0	P. 70
RWwn+B	Event 4 set value [High-order word]			
RWwn+C	For extended area setting of CH1 [Low-order word]	Data corresponding to the extension number specified by setting the setting extension number from RYn6 to RYnB and from RY(n+1)8 to RY(n+1)A.	—	P. 40
RWwn+D	For extended area setting of CH1 [High-order word]			
RWwn+E	For extended area setting of CH2 [Low-order word]	For the communication items supporting multi-memory area function: Data in memory area number specified by display area number setting [RY(n+2)8 to RY(n+2)C].	—	P. 40
RWwn+F	For extended area setting of CH2 [High-order word]			

CH1: Extended area of Input 1, CT1, and HBA1.
CH2: Extended area of Input 2, CT2, and HBA2.

5.4.3 1 station occupied 8 times

■ Remote register (RWr)

Data direction: Controller (Remote device station) → Master station (PLC)
Data capacity: 32-word

Address	Communication item	Data range	Factory set value	Reference page
RWrn	Input 1_measured value (PV1) [Low-order word]	Input 1_input scale low to Input 1_input scale high	—	P. 65
RWrn+1	Input 1_measured value (PV1) [High-order word]			
RWrn+2	Input 2_measured value (PV2) [Low-order word]	Input 2_input scale low to Input 2_input scale high	—	P. 65
RWrn+3	Input 2_measured value (PV2) [High-order word]			
RWrn+4	Input 1_manipulated output value (MV1)	−5.0 to +105.0 %	—	P. 65
RWrn+5	Input 2_manipulated output value (MV2)	−5.0 to +105.0 %	—	P. 65
RWrn+6	Input 1_set value (SV1) monitor [Low-order word]	Input 1_setting limiter low to Input 1_setting limiter high	—	P. 77
RWrn+7	Input 1_set value (SV1) monitor [High-order word]			
RWrn+8	Input 2_set value (SV2) monitor [Low-order word]	Input 2_setting limiter low to Input 2_setting limiter high	—	P. 77
RWrn+9	Input 2_set value (SV2) monitor [High-order word]			
RWrn+A	Error code	Bit data Bit 0: Adjustment data error Bit 1: EEPROM error Bit 2: A/D conversion error Bit 3: RAM check error Bit 4: Hardware configuration error Bit 5: Software configuration error Bit 6: Unused Bit 7: Watchdog timer error Bit 8 to Bit 10: Unused Bit 11: Program busy Bit 12 to Bit 31: Unused Data 0: OFF 1: ON [Decimal number: 0 to 4095]	—	P. 78

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Address	Communication item	Data range	Factory set value	Reference page
RWrn+B	Operation mode state	Bit data Bit 0: Control STOP Bit 1: Control RUN Bit 2: Input 1_Manual mode (Including Input 1_ Remote mode) Bit 3: Input 2_Manual mode (Including Input 2_ Remote mode) Bit 4: Remote mode or Cascade control Bit 5 to Bit 31: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31]	—	P. 95
RWrn+C	Current transformer input value 1 (CT1) monitor	0.0 to 30.0 A or 0.0 to 100.0 A	—	P. 66
RWrn+D	Current transformer input value 2 (CT2) monitor		—	P. 66
RWrn+E	Remote input value monitor [Low-order word]	Input 1_setting limiter low to Input 1_setting limiter high	—	P. 91
RWrn+F	Remote input value monitor [High-order word]			
RWrn+10	Cascade monitor [Low-order word]	Input 2_setting limiter low to Input 2_setting limiter high	—	P. 91
RWrn+11	Cascade monitor [High-order word]			
RWrn+12	Memory area soak time monitor [Low-order word]	0 minute 00.00 second to 9 minutes 59.99 seconds or 0 hour 00 minute 00 second to 9 hours 59minutes 59 seconds	—	P. 93
RWrn+13	Memory area soak time monitor [High-order word]			
RWrn+14	Feedback resistance input value monitor	0.0 to 100.0 %	—	P. 92
RWrn+15	Event input state	Bit data Bit 0: DI 1 state Bit 1: DI 2 state Bit 2: DI 3 state Bit 3: DI 4 state Bit 4: DI 5 state Bit 5: DI 6 state Bit 6: DI 7 state Bit 7 to Bit 31: Unused Data 0: Contact open 1: Contact closed [Decimal number: 0 to 127]	—	P. 94
RWrn+16	Unused	—	—	—
RWrn+17	Unused	—	—	—

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Address	Communication item	Data range	Factory set value	Reference page
RWrn+18	Unused	—	—	—
RWrn+19	Unused	—	—	—
RWrn+1A	Unused	—	—	—
RWrn+1B	Unused	—	—	—
RWrn+1C	For extended area display of CH1 [Low-order word]	Data corresponding to the extension number specified by setting the display extension number from RYn0 to RYn5 and from RY(n+1)0 to RY(n+1)2. For the communication items supporting multi-memory area function: Data in memory area number specified by display area number setting [RY(n+2)0 to RY(n+2)4].	—	P. 40
RWrn+1D	For extended area display of CH1 [High-order word]			
RWrn+1E	For extended area display of CH2 [Low-order word]		—	P. 40
RWrn+1F	For extended area display of CH2 [High-order word]			

CH1: Extended area of Input 1, CT1, and HBA1.
CH2: Extended area of Input 2, CT2, and HBA2.

■ Remote register (RWw)

Data direction: Master station (PLC) → Controller (Remote device station)
Data capacity: 32-word

Address	Communication item	Data range	Factory set value	Reference page
RWwn	Input 1_set value (SV1) [Low-order word]	Input 1_setting limiter low to Input 1_setting limiter high [Data of control area]	0.0	P. 66
RWwn+1	Input 1_set value (SV1) [High-order word]			
RWwn+2	Input 2_set value (SV2) [Low-order word]	Input 2_setting limiter low to Input 2_setting limiter high [Data of control area]	0.0	P. 66
RWwn+3	Input 2_set value (SV2) [High-order word]			
RWwn+4	Event 1 set value [Low-order word]	Deviation: –Input span to +Input span Process/SV: Input scale low to Input scale high [Data of control area]	50.0	P. 70
RWwn+5	Event 1 set value [High-order word]			
RWwn+6	Event 2 set value [Low-order word]		50.0	P. 70
RWwn+7	Event 2 set value [High-order word]			

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Address	Communication item	Data range	Factory set value	Reference page
RWwn+8	Event 3 set value [Low-order word]	Deviation: −Input span to +Input span Process/SV: Input scale low to Input scale high [Data of control area]	50.0	P. 70
RWwn+9	Event 3 set value [High-order word]			
RWwn+A	Event 4 set value [Low-order word]		50.0	P. 70
RWwn+B	Event 4 set value [High-order word]			
RWwn+C	Input 1_proportional band [Low-order word]	TC/RTD input: 0 to Input span (Unit: °C [°F]) Voltage/Current input: 0.0 to 1000.0 % of input span (0 or 0.0: ON/OFF action) [Data of control area]	30.0	P. 68
RWwn+D	Input 1_proportional band [High-order word]			
RWwn+E	Input 2_proportional band [Low-order word]		30.0	P. 68
RWwn+F	Input 2_proportional band [High-order word]			
RWwn+10	Input 1_integral time [Low-order word]	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds * (0, 0.0 or 0.00: PD action) * Varies with the setting of the integral/derivative time decimal point position selection. [Data of control area]	240.00	P. 68
RWwn+11	Input 1_integral time [High-order word]			
RWwn+12	Input 2_integral time [Low-order word]		240.00	P. 68
RWwn+13	Input 2_integral time [High-order word]			
RWwn+14	Input 1_derivative time [Low-order word]	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds * (0, 0.0 or 0.00: PI action) * Varies with the setting of the integral/derivative time decimal point position selection. [Data of control area]	60.00	P. 69
RWwn+15	Input 1_derivative time [High-order word]			
RWwn+16	Input 2_derivative time [Low-order word]		60.00	P. 69
RWwn+17	Input 2_derivative time [High-order word]			
RWwn+18	Input 1_control response parameter	0: Slow 1: Medium 2: Fast [Data of control area]	0	P. 79
RWwn+19	Input 2_control response parameter		0	P. 79
RWwn+1A	Unused	—	—	—
RWwn+1B	Unused	—	—	—

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Address	Communication item	Data range	Factory set value	Reference page
RWwn+1C	For extended area setting of CH1 [Low-order word]	Data corresponding to the extension number specified by setting the setting extension number from RYn6 to RYnB and from RY(n+1)8 to RY(n+1)A.	—	P. 40
RWwn+1D	For extended area setting of CH1 [High-order word]			
RWwn+1E	For extended area setting of CH2 [Low-order word]	For the communication items supporting multi-memory area function: Data in memory area number specified by display area number setting [RY(n+2)8 to RY(n+2)C].	—	P. 40
RWwn+1F	For extended area setting of CH2 [High-order word]			

CH1: Extended area of Input 1, CT1, and HBA1.
CH2: Extended area of Input 2, CT2, and HBA2.

5.5 Setting of Extension Number and Memory Area Number

Communication items which are handled in the extension areas of the Remote registers (RWr and RWw) are specified by the extension number. In addition, communication item corresponding to Memory area function specifies memory area number to use in Remote register extension area for area number. Extension numbers and area numbers are set with ON/OFF of remote output.

☞ For Memory area function, refer to **HA400/HA900/HA401/HA901 Operation Manual (IMR01N02-E□)**.
☞ For Remote output, refer to **5.3 Remote Input/Output (P. 17)**.
☞ For Remote register, refer to **5.4 Remote Register (P. 30)**.
☞ For Extension number, refer to **5.7 Extension Number (P. 46)**.

■ When read data

Address for extended area display of remote register (RWr)

Communication item	Number of Occupied station/Extended cyclic		
	1 station occupied 1 time	1 station occupied 4 times/4 stations occupied 1 time	1 station occupied 8 times
For extended area display of CH1 [Low-order word]	RWrn	RWrn+C	RWrn+1C
For extended area display of CH1 [High-order word]	RWrn+1	RWrn+D	RWrn+1D
For extended area display of CH2 [Low-order word]	RWrn+2	RWrn+E	RWrn+1E
For extended area display of CH2 [High-order word]	RWrn+3	RWrn+F	RWrn+1F

CH1: Extended area of Input 1, CT1, and HBA1.
CH2: Extended area of Input 2, CT2, and HBA2.

● Setting of extension number for display

Extension number for display sets it with Remote output RYn0 to RYn5 and RY(n+1)0 to RY(n+1)2.

Bit image

RY(n+1)2	RY(n+1)1	RY(n+1)0	RYn5	RYn4	RYn3	RYn2	RYn1	RYn0
Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit data: 0: OFF 1: ON [Decimal number: 0 to 511]

📖 For the 1station occupied 1 time setting, setting range of extension number is RYn0 to RYn5 [Decimal number: 0 to 63].

● Setting of area number for display

Area number for display sets it with Remote output RY(n+2)0 to RY(n+2)4.

Bit image

RY(n+2)4	RY(n+2)3	RY(n+2)2	RY(n+2)1	RY(n+2)0
Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit data: 0: OFF 1: ON [Decimal number: 0 to 31 (0, 17 to 31: Control area)]

📖 For 1 station occupied 1 time setting, assignment of area number is not possible, as it is a communication item of a control area.

■ When write data

Address for extended area setting of remote register (RWw)

Communication item	Number of Occupied station/Extended cyclic		
	1 station occupied 1 time	1 station occupied 4 times/4 stations occupied 1 time	1 station occupied 8 times
For extended area setting of CH1 [Low-order word]	RWwn	RWwn+C	RWwn+1C
For extended area setting of CH1 [High-order word]	RWwn+1	RWwn+D	RWwn+1D
For extended area setting of CH2 [Low-order word]	RWwn+2	RWwn+E	RWwn+1E
For extended area setting of CH2 [High-order word]	RWwn+3	RWwn+F	RWwn+1F

CH1: Extended area of Input 1, CT1, and HBA1.
CH2: Extended area of Input 2, CT2, and HBA2.

● Setting of extension number for setting

Extension number for setting sets it with Remote output RYn6 to RynB and RY(n+1)8 to RY(n+1)A.

Bit image

RY(n+1)A	RY(n+1)9	RY(n+1)8	RYnB	RYnA	RYn9	RYn8	RYn7	RYn6
Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit data: 0: OFF 1: ON [Decimal number: 0 to 511]

For the 1 station occupied 1 time setting, setting range of extension number is RYn6 to RYnB [Decimal number: 0 to 63].

● Setting of area number for setting

Area number for setting sets it with Remote output RY(n+2)8 to RY(n+2)C.

Bit image

RY(n+2)C	RY(n+2)B	RY(n+2)A	RY(n+2)9	RY(n+2)8
Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit data: 0: OFF 1: ON [Decimal number: 0 to 31 (0, 17 to 31: Control area)]

For 1 station occupied 1 time setting, assignment of area number is not possible, as it is a communication item of a control area.

[Example] When setting extension number for setting to "3: Set value (SV)," and setting area number for setting to "9."
Number of Occupied stations/Extended cyclic setting: 4 stations occupied 1 time

- **Setting of extension number for setting**

Extension number 3: Set value (SV) →

Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	0	1	1

↓

RY(n+1)A	RY(n+1)9	RY(n+1)8	RYnB	RYnA	RYn9	RYn8	RYn7	RYn6
OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON

Bit data: 0: OFF 1: ON

- **Setting of area number for setting**

Memory area number 9 →

Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	0	0	1

↓

RY(n+2)C	RY(n+2)B	RY(n+2)A	RY(n+2)9	RY(n+2)8
OFF	ON	OFF	OFF	ON

Bit data: 0: OFF 1: ON

- **Address for extended area setting of remote register (RWw)**

Communication item	Address	
For extended area setting of CH1 [Low-order word]	RWwn+C	Memory area 9 Input 1_set value (SV1)
For extended area setting of CH1 [High-order word]	RWwn+D	
For extended area setting of CH2 [Low-order word]	RWwn+E	Memory area 9 Input 2_set value (SV2)
For extended area setting of CH2 [High-order word]	RWwn+F	

5.6 CC-Link Flag Operation

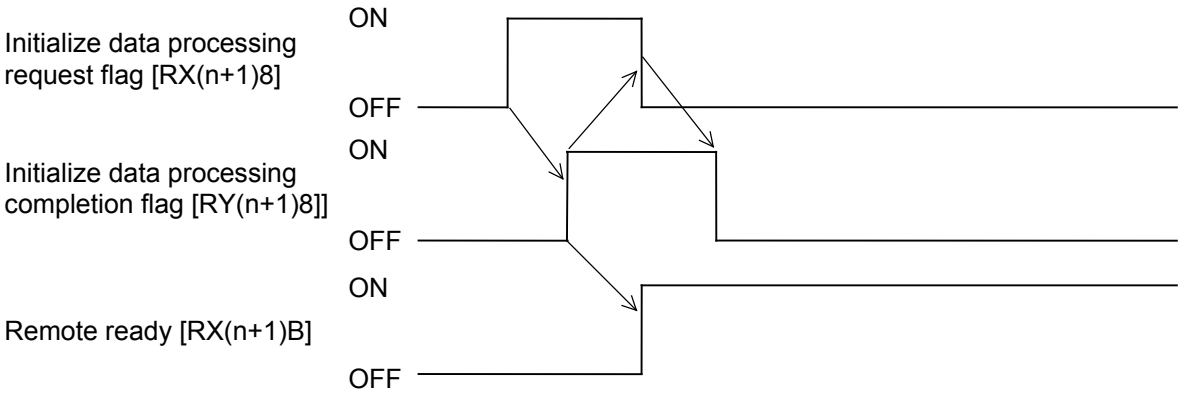
Remote input/output and Remote register flag operations are as follows.

[Example] When the Occupied station/Extended cyclic of controller is set to 1 station occupied 1 time.

■ Initialize request processing at power on

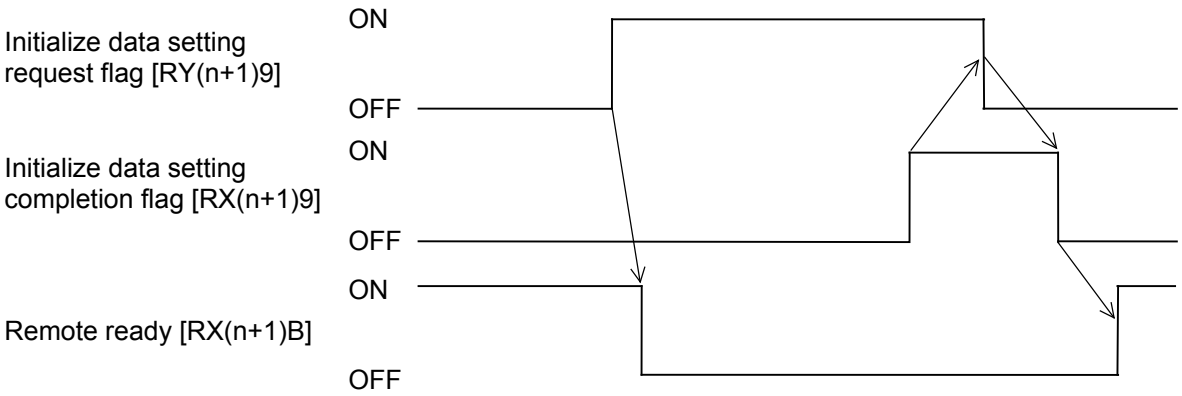
● Initialize processing request from Remote device station (Controller)

If the controller is initialized at power on, the Initialize data processing request flag [RX(n+1)8] is turned on. Thus, turn on the Initialize data processing completion flag [RY(n+1)8].
When controller becomes a ready state, a Remote ready [RX(n+1)B] is turned on.



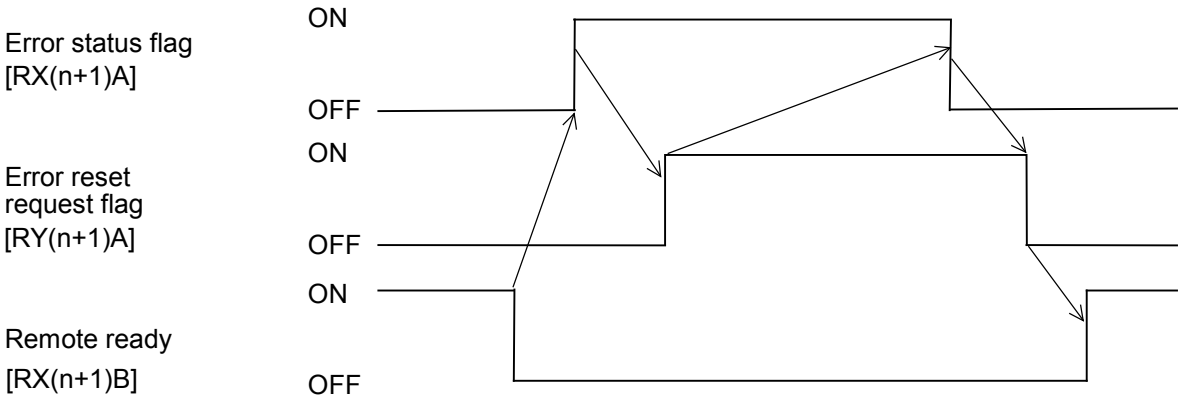
● Initialize processing request from Master station (PLC)

This is a controller initialize setting request. As there is no initialize data specifically, no processing is required.



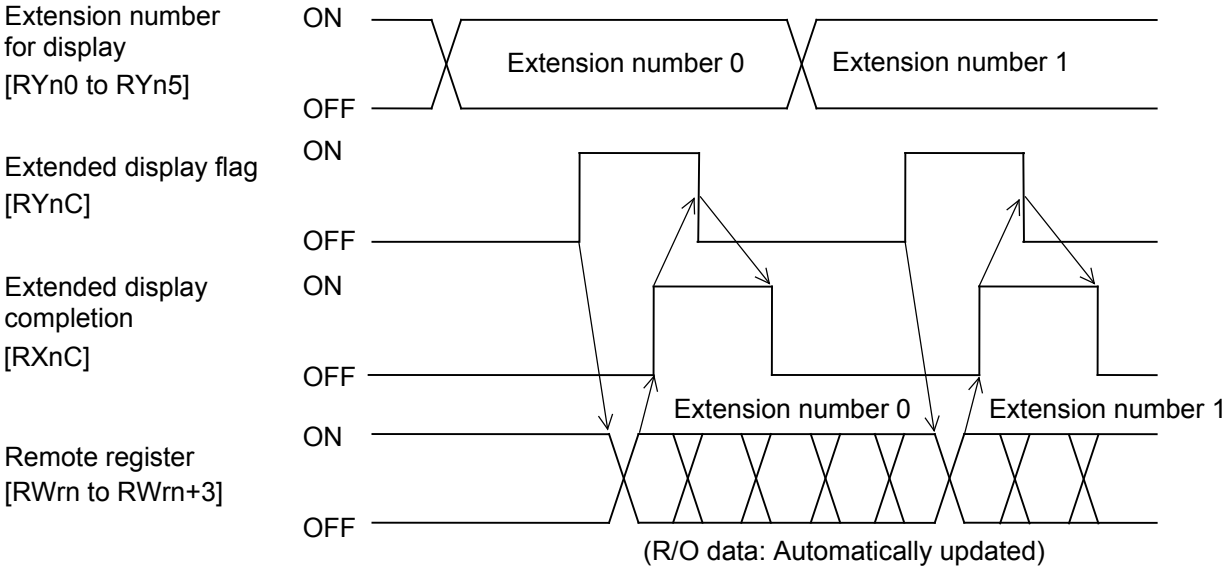
■ Error flag/Error reset processing

When the Error status flag [RX(n+1)A] is turned on, the error code is stored in the remote register.
If the Error reset request flag [RY(n+1)A] is turned on when an error occurs, [RX(n+1)A] is turned off to clear the error code.



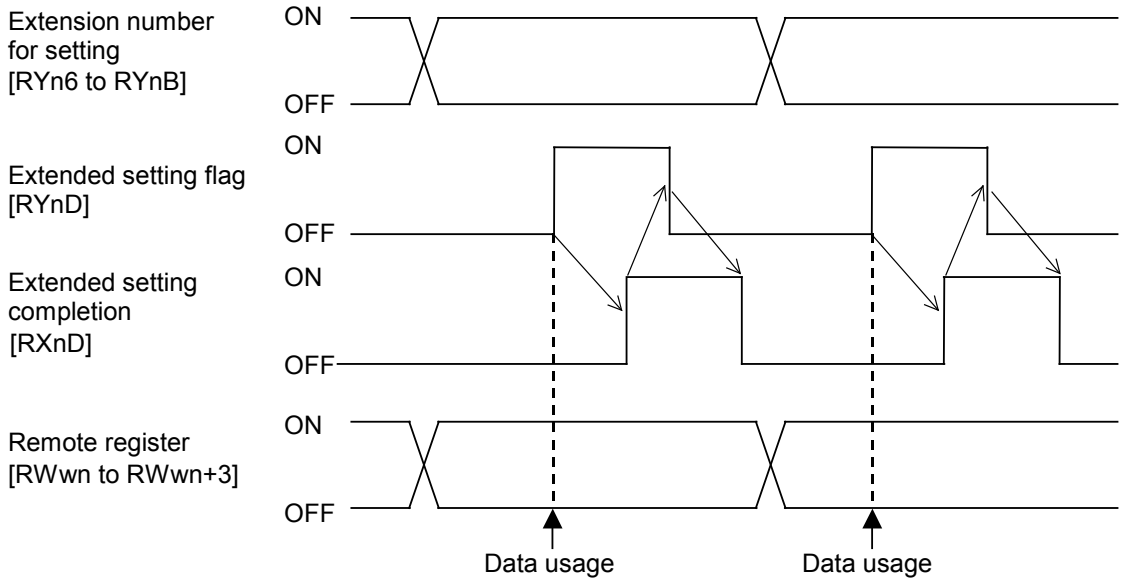
■ Extension number for display selection processing

The content of the extended display remote register is selected.
After the Extension number for display [RYn0 to RYn5] is set, turn on the Extended display flag [RYnC]. After the data in the Remote register [RWrn to RWrn+3] is displayed, check that Extended display completion [RXnC] has been turned on and then turn off the Extended display flag [RYnC]. If the extended display flag is turned off, the extended display completion is turned off.



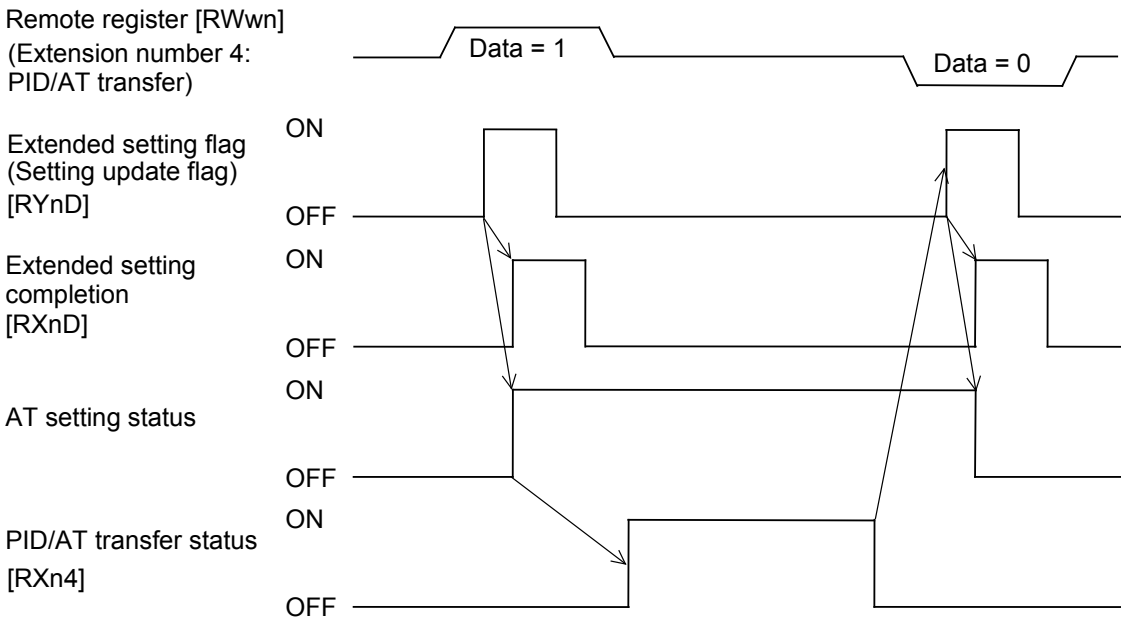
■ Extension number for setting selection processing

The content of the extended setting remote register is selected and the set value is changed.
After the Extension number for setting [RYn6 to RYnB] is set, turn on the Extended setting flag [RYnD]. After the content of the Remote register [RWwn to RWwn+3] is set, check that Extended setting completion [RXnD] is turned on and then turn off the Extended setting flag [RYnD]. If the Extended setting flag [RYnD] is turned off, the Extended setting completion [RXnD] is turned off.



■ AT start procedure

Instructs AT execution.



5.7 Extension Number

The extension number is the number that is specified in the remote output to handle the data in remote registers.
If the necessary data is selected from a list of extension numbers and that extension number is set by remote output, the data can be handled in the Remote registers (RWr and RWw).

Remote output of extension number for display:
RYn0 to RYn5 and RY(n+1)0 to RY(n+1)7 [Decimal number: 0 to 511]
Remote output of extension number for setting:
RYn6 to RynB and RY(n+1)8 to RY(n+1)A [Decimal number: 0 to 511]


For the 1 station occupied 1 time setting, setting range of extension number becomes RYn0 to RYn5 [Decimal number: 0 to 63] and RYn6 to RYnB [Decimal number: 0 to 63].

■ Extension number list


Attribute
RO: Read only data
Remote device station (Controller) → Master station (PLC)
WO: Write only data
Remote device station (Controller) ← Master station (PLC)
R/W: Read and Write data
Remote device station (Controller) ↔ Master station (PLC)


CH
○: Communication item with channel numbers.
Data handled by the unit of channel.
×: Communication item without channel numbers.
Data handled by the unit of controller.


For the R/W (read and write) communication item with a channel number, in case of a single input type, the Input 2 (CH 2) is RO (read only).

: Data related to multi-memory area function

Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
0	Measured value (PV)	RO	Input scale low to Input scale high	—	○	P. 65
1	Manipulated output value (MV)	RO	−5.0 to +105.0 %	—	○	P. 65
2	Current transformer input value (CT) monitor	RO	0.0 to 30.0 A or 0.0 to 100.0 A	—	○	P. 66
3	Set value (SV)	R/W	Setting limiter low to Setting limiter high	0.0	○	P. 66
4	PID/AT transfer	R/W	0: PID control 1: Autotuning (AT)	0	○	P. 67
5	Proportional band	R/W	TC/RTD input: 0 (0.0, 0.00) to Input span (Unit: °C [°F]) Voltage/Current input: 0.0 to 1000.0 % of input span (0, 0.0 or 0.00: ON/OFF action)	30.0	○	P. 68
6	Integral time	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds * (0, 0.0 or 0.00: PD action) * Varies with the setting of the integral/derivative time decimal point position selection.	240.00	○	P. 68
7	Derivative time	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds * (0, 0.0 or 0.00: PI action) * Varies with the setting of the integral/derivative time decimal point position selection.	60.00	○	P. 69
8	PV bias	R/W	−Input span to +Input span	0	○	P. 69
9	Event 1 set value	R/W	Deviation: −Input span to +Input span Process/SV: Input scale low to Input scale high:	50.0	×	P. 70
10	Event 2 set value	R/W		50.0	×	P. 70
11	Reserved	—	—	—	—	—
12	Reserved	—	—	—	—	—
13	Reserved	—	—	—	—	—
14	Reserved	—	—	—	—	—
15	Reserved	—	—	—	—	—
16	Unused	—	—	—	—	—
17	RUN/STOP transfer	R/W	0: Control RUN 1: Control STOP	0	×	P. 71

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Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
18	Proportional cycle time	R/W	0.1 to 100.0 seconds	Relay contact output: 20.0 seconds Voltage pulse output and Triac output: 2.0 seconds	○	P. 71
19	Auto/Manual transfer	R/W	0: Auto mode 1: Manual mode	0	○	P. 72
20	Manual output value	R/W	Output limiter low to Output limiter high	0.0	○	P. 72
21	Setting limiter high	R/W	Setting limiter low to Input scale high	Input scale high	○	P. 73
22	Setting limiter low	R/W	Input scale low to Setting limiter high	Input scale low	○	P. 73
23	PV digital filter	R/W	0.00 to 10.00 seconds (0.00: Unused)	HA400/900: 0.00 HA401/901: 1.00	○	P. 74
24	Heater break alarm (HBA) set value	R/W	0.0 to 30.0 A or 0.0 to 100.0 A 0.0: Unused	0.0	○	P. 75
25	Decimal point position	R/W	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	1	○	P. 77
26 • • • 30	Unused	—	—	—	—	—
31	Set value (SV) monitor	RO	Setting limiter low to Setting limiter high	—	○	P. 77
32	Error code	RO	Bit data Bit 0: Adjustment data error Bit 1: EEPROM error Bit 2: A/D conversion error Bit 3: RAM check error Bit 4: Hardware configuration error Bit 5: Software configuration error Bit 6: Unused Bit 7: Watchdog timer error Bit 8 to Bit 10: Unused Bit 11: Program busy Bit 12 to Bit 31: Unused Data 0: OFF 1: ON [Decimal number: 0 to 4095]	—	×	P. 78

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: Data related to multi-memory area function

Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
33	Memory area transfer	R/W	1 to 16	1	×	P. 79
34	Control response parameter	R/W	0: Slow 1: Medium 2: Fast	0	○	P. 79
35	Unused	—	—	—	—	—
36	Input type selection	R/W	Input 1: 0 to 9, 12 to 23 Input 2: 0 to 9, 12 to 21 TC input 0: K −200 to +1372 °C −328.0 to +2501.6 °F 1: J −200 to +1200 °C −328.0 to +2192.0 °F 2: R −50 to +1768 °C −58.0 to +3214.4 °F 3: S −50 to +1768 °C −58.0 to +3214.4 °F 4: B 0 to 1800 °C 32.0 to 3272.0 °F 5: E −200 to +1000 °C −328.0 to +1832.0 °F 6: N 0 to 1300 °C 32.0 to 2372.0 °F 7: T −200 to +400 °C −328.0 to +752.0 °F 8: W5Re/W26Re 0 to 2300 °C 32.0 to 4172.0 °F 9: PLII 0 to 1390 °C 32.0 to 2534.0 °F RTD input (3-wire system) 12: Pt100 −200 to +850 °C −328.0 to +1562.0 °F 13: JPt100 −200 to +600 °C −328.0 to +1112.0 °F (Continued on the next page.)	Based on model code When not specified: Type K	○	P. 80

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: Data related to multi-memory area function

Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
36	Input type selection	R/W	Voltage (V)/Current (I) inputs −19999 to +99999 14: 0 to 20 mA DC 15: 4 to 20 mA DC 16: 0 to 10 V DC 17: 0 to 5 V DC 18: 1 to 5 V DC 19: 0 to 1 V DC 20: 0 to 100 mV DC 21: 0 to 10 mV DC RTD input (4-wire system) 22: Pt100 −200 to +850 °C −328.0 to +1562.0 °F 23: JPt100 −200 to +600 °C −328.0 to +1112.0 °F	Based on model code When not specified: Type K	○	P. 80
37	Setting change rate limiter (up)	R/W	0 to Input span/unit time * (0: Unused) (Varies with the setting of the Decimal point position) * Unit time: 60 seconds (Factory set value)	0.0	○	P. 81
38	Control action	R/W	0: Direct action 1: Reverse action	1	○	P. 82
39	Event 1 type selection	R/W	0: None 1: Deviation high 2: Deviation low 3: Deviation high/low 4: Band 5: Process high 6: Process low 7: SV high 8: SV low	0	×	P. 83
40	Event 2 type selection	R/W		0	×	P. 83
41	Event 1 differential gap	R/W	0 to Input span (Varies with the setting of the Decimal point position)	TC/RTD input: 2.0 °C [°F] V/I input: 0.2 % of input span	×	P. 85
42	Event 2 differential gap	R/W	0 to Input span (Varies with the setting of the Decimal point position)	TC/RTD input: 2.0 °C [°F] V/I input: 0.2 % of input span	×	P. 85
43	Event 1 hold action	R/W	0: OFF 1: Hold action ON 2: Re-hold action ON	0	×	P. 86

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: Data related to multi-memory area function

Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
44	Event 2 hold action	R/W	0: OFF 1: Hold action ON 2: Re-hold action ON	0	×	P. 86
45	Unused	—	—	—	—	—
46	Output limiter high	R/W	Output limiter low to 105.0 %	105.0	○	P. 88
47	Output limiter low	R/W	−5.0 % to Output limiter high	−5.0	○	P. 88
48	Unused	—	—	—	—	—
49	Unused	—	—	—	—	—
50	Control loop break alarm 1 (LBA1) time	R/W	0 to 7200 seconds (0: Unused)	480	×	P. 89
51	LBA1 deadband	R/W	0.0 to Input span (Varies with the setting of the Decimal point position)	0.0	×	P. 89
52	Control loop break alarm 2 (LBA2) time	R/W	0 to 7200 seconds (0: Unused)	480	×	P. 89
53	LBA2 deadband	R/W	0.0 to Input span (Varies with the setting of the Decimal point position)	0.0	×	P. 89
54	Event 3 set value	R/W	Deviation: −Input span to +Input span Process/SV: Input scale low to Input scale high	50.0	×	P. 70
55	Event 4 set value	R/W		50.0	×	P. 70
56	Event 3 type selection	R/W	0: None 1: Deviation high 2: Deviation low 3: Deviation high/low 4: Band 5: Process high 6: Process low 7: SV high 8: SV low 9: Control loop break alarm (LBA)	0	×	P. 83
57	Event 4 type selection	R/W	0: None 1: Deviation high 2: Deviation low 3: Deviation high/low 4: Band 5: Process high 6: Process low 7: SV high 8: SV low 9: Control loop break alarm (LBA)	0	×	P. 83
58	Event 3 differential gap	R/W	0 to Input span (Varies with the setting of the Decimal point position)	TC/RTD input: 2.0 °C [°F] V/I input: 0.2 % of input span	×	P. 85

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: Data related to multi-memory area function

Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
59	Event 4 differential gap	R/W	0 to Input span (Varies with the setting of the Decimal point position)	TC/RTD input: 2.0 °C [°F] V/I input: 0.2 % of input span	×	P. 85
60	Event 3 hold action	R/W	0: OFF 1: Hold action ON 2: Re-hold action ON	0	×	P. 86
61	Event 4 hold action	R/W	0: OFF 1: Hold action ON 2: Re-hold action ON	0	×	P. 86
62	Setting change rate limiter (down)	R/W	0 to Input span/unit time * (0: Unused) (Varies with the setting of the Decimal point position) * Unit time: 60 seconds (Factory set value)	0.0	○	P. 82
63	Unused	—	—	—	—	—
64	Remote input value monitor	RO	Input 1_setting limiter low to Input 1_setting limiter high	—	×	P. 91
65	Cascade monitor	RO	Input 2_setting limiter low to Input 2_setting limiter high	—	×	P. 91
66	Feedback resistance input value monitor	RO	0.0 to 100.0 %	—	×	P. 92
67	Feedback resistance input burnout state	RO	0: OFF 1: ON	—	×	P. 92
68	Memory area soak time monitor	RO	0 minute 00.00 second to 9 minutes 59.99 seconds or 0 hour 00 minute 00 second to 9 hours 59minutes 59 seconds The memory area soak time is counted and displayed in seconds in the communication regardless of the setting option. 0 minute 00.00 second to 9 minutes 59.99 seconds: 0 to 599.99 seconds 0 hour 00 minute 00 second to 9 hours 59minutes 59 seconds: 0 to 35999 seconds	—	×	P. 93

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: Data related to multi-memory area function

Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
69	Event input (DI) state	RO	Bit data Bit 0: DI 1 state Bit 1: DI 2 state Bit 2: DI 3 state Bit 3: DI 4 state Bit 4: DI 5 state Bit 5: DI 6 state Bit 6: DI 7 state Bit 7 to Bit 31: Unused Data 0: Contact open 1: Contact closed [Decimal number: 0 to 127]	—	×	P. 94
70	Operation mode state	RO	Bit data Bit 0: Control STOP Bit 1: Control RUN Bit 2: Input 1_Manual mode (Including Input 1_ Remote mode) Bit 3: Input 2_Manual mode (Including Input 2_ Remote mode) Bit 4: Remote mode or Cascade control Bit 5 to Bit 31: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31]	—	×	P. 95
71 • • • 89	Unused	—	—	—	—	—
90	Remote/Local transfer	R/W	0: Local mode 1: Remote mode or Cascade control	0	×	P. 96
91 • • • 109	Unused	—	—	—	—	—
110	Link area number	R/W	0 to 16 (0: No link)	0	×	P. 96
111	Area soak time	R/W	0 minute 00.00 second to 9 minutes 59.99 seconds or 0 hour 00 minute 00 second to 9 hours 59minutes 59 seconds	0.00.00	×	P. 97
112 • • • 139	Unused	—	—	—	—	—

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Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
140	Heater break determination point	R/W	0.0 to 100.0 % of Heater break alarm (HBA) set value (0.0: Heater break determination is invalidated)	30.0	○	P. 98
141	Heater melting determination point	R/W	0.0 to 100.0 % of Heater break alarm (HBA) set value (0.0: Heater melting determination is invalidated)	30.0	○	P. 99
142	PV ratio	R/W	0.500 to 1.500	1.000	○	P. 99
143	PV low input cut-off	R/W	0.00 to 25.00 % of input span	0.00	○	P. 100
144	Set lock level	R/W	Bit data Bit 0: Lock only setting items other than SV and Event set value (EV1 to EV4). Bit 1: Lock only Event set value (EV1 to EV4) Bit 2: Lock only Set value (SV) Bit 3 to Bit 15: Unused Data 0: Unlock 1: Lock [Decimal number: 0 to 7]	0	×	P. 101
145	Unused	—	—	—	—	—
146	EEPROM storage state	RO	0: The content of the EEPROM does not match that of the RAM. 1: The content of the EEPROM matches that of the RAM.	—	×	P. 102
147	EEPROM storage mode	R/W	0: Set values are store to the EEPROM when set values are changed. 1: Not set values are store to the EEPROM when set values are changed.	0	×	P. 102
148 • • • 159	Unused	—	—	—	—	—
160	Display unit selection	R/W	0: °C 1: °F	0	○	P. 103
161	Input scale high	R/W	TC/RTD inputs: Input scale low to Maximum value of the selected input range Voltage (V)/Current (I) inputs: –19999 to +19999 (Varies with the setting of the Decimal point position)	TC/RTD: Maximum value of the selected input range V/I: 100.0	○	P. 104

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Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
162	Input scale low	R/W	TC/RTD inputs: Minimum value of the selected input range to Input scale high Voltage (V)/Current (I) inputs: –19999 to +19999 (Varies with the setting of the Decimal point position)	TC/RTD: Minimum value of the selected input range V/I: 0.0	○	P. 104
163	Input error determination point (high)	R/W	Input scale low – (5 % of input span) to Input scale high + (5 % of input span)	TC/RTD: Input scale high + (5 % of input span) V/I: 105.0	○	P. 105
164	Input error determination point (low)	R/W		TC/RTD: Input scale low – (5 % of input span) V/I: –5.0	○	P. 105
165	Burnout direction	R/W	0: Upscale 1: Downscale	0	○	P. 106
166	Square root extraction	R/W	0: Unused 1: Used	0	○	P. 106
167	Power supply frequency	R/W	0: 50 Hz 1: 60 Hz	0	×	P. 107
168	Unused	—	—	—	—	—
169	Unused	—	—	—	—	—
170	Event input logic selection	R/W	0 to 6	1	×	P. 107
171 • • • 179	Unused	—	—	—	—	—
180	Output logic selection	R/W	1 to 11	1-input controller: 1 2-input controller: 5	×	P. 110
181	Output 1 timer setting	R/W	0.0 to 600.0 seconds	0.0	×	P. 112
182	Output 2 timer setting	R/W		0.0	×	P. 112
183	Output 3 timer setting	R/W		0.0	×	P. 112
184	Output 4 timer setting	R/W		0.0	×	P. 112
185	Output 5 timer setting	R/W		0.0	×	P. 112

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Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
186	Alarm lamp lighting condition setting 1	R/W	Bit data Bit 0: Event 1 Bit 1: Event 2 Bit 2: Event 3 Bit 3: Event 4 Bit 4 to Bit 31: Unused Data 0: ALM lamp is not lit 1: ALM lamp is lit [Decimal number: 0 to 15]	15	×	P. 113
187	Alarm lamp lighting condition 2	R/W	Bit data Bit 0: HBA1 Bit 1: HBA2 Bit 2 to Bit 31: Unused Data 0: ALM lamp is not lit 1: ALM lamp is lit [Decimal number: 0 to 3]	3	×	P. 114
188	Unused	—	—	—	—	—
189	Unused	—	—	—	—	—
190	Transmission output 1_ type selection	R/W	0: None 1: Input 1_measured value (PV) 2: Input 1_set value (SV) 3: Input 1_deviation value 4: Input 1_manipulated output value (MV) 5: Input 2_measured value (PV) 6: Input 2_set value (SV) 7: Input 2_deviation value 8: Input 2_manipulated output value (MV) 9: Feedback resistance input value (POS)	0	×	P. 115
191	Transmission output 1_ scale high	R/W	Measured value (PV) and set value (SV): Input scale low to Input scale high Manipulated output value (MV) and Feedback resistance input value (POS): –5.0 to +105.0 % Deviation: –Input span to +Input span	PV/SV: Input scale high MV/POS: 100.0 Deviation: +Input span	×	P. 116
192	Transmission output 1_ scale low	R/W		PV/SV: Input scale low MV/POS: 0.0 Deviation: –Input span	×	P. 116

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Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
193	Transmission output 2_ type selection	R/W	0: None 1: Input 1_measured value (PV) 2: Input 1_set value (SV) 3: Input 1_deviation value 4: Input 1_manipulated output value (MV) 5: Input 2_measured value (PV) 6: Input 2_set value (SV) 7: Input 2_deviation value 8: Input 2_manipulated output value (MV) 9: Feedback resistance input value (POS)	0	×	P. 115
194	Transmission output 2_ scale high	R/W	Measured value (PV) and set value (SV): Input scale low to Input scale high Manipulated output value (MV) and Feedback resistance input value (POS): –5.0 to +105.0 % Deviation: –Input span to +Input span	PV/SV: Input scale high MV/POS: 100.0 Deviation: +Input span	×	P. 116
195	Transmission output 2_ scale low	R/W		PV/SV: Input scale low MV/POS: 0.0 Deviation: –Input span	×	P. 116
196	Transmission output 3_ type selection	R/W	0: None 1: Input 1_measured value (PV) 2: Input 1_set value (SV) 3: Input 1_deviation value 4: Input 1_manipulated output value (MV) 5: Input 2_measured value (PV) 6: Input 2_set value (SV) 7: Input 2_deviation value 8: Input 2_manipulated output value (MV) 9: Feedback resistance input value (POS)	0	×	P. 115

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Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
197	Transmission output 3_ scale high	R/W	Measured value (PV) and set value (SV): Input scale low to Input scale high Manipulated output value (MV) and Feedback resistance input value (POS): –5.0 to +105.0 % Deviation: –Input span to +Input span	PV/SV: Input scale high MV/POS: 100.0 Deviation: +Input span	×	P. 116
198	Transmission output 3_ scale low	R/W		PV/SV: Input scale low MV/POS: 0.0 Deviation: –Input span	×	P. 116
199	Unused	—	—	—	—	—
200	Event 1 action at input error	R/W	0: Normal processing 1: Turn the event output ON	0	×	P. 117
201	Event 1 assignment	R/W	1: For input 1 2: For input 2	1	×	P. 118
202	Unused	—	—	—	—	—
203	Unused	—	—	—	—	—
204	Event 2 action at input error	R/W	0: Normal processing 1: Turn the event output ON	0	×	P. 117
205	Event 2 assignment	R/W	1: For input 1 2: For input 2	1	×	P. 118
206	Unused	—	—	—	—	—
207	Unused	—	—	—	—	—
208	Event 3 action at input error	R/W	0: Normal processing 1: Turn the event output ON	0	×	P. 117
209	Event 3 assignment	R/W	1: For input 1 2: For input 2	1	×	P. 118
210	Unused	—	—	—	—	—
211	Unused	—	—	—	—	—
212	Event 4 action at input error	R/W	0: Normal processing 1: Turn the event output ON	0	×	P. 117
213	Event 4 assignment	R/W	1: For input 1 2: For input 2	1	×	P. 118
214 ⋮ 219	Unused	—	—	—	—	—

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Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
220	CT1 ratio	R/W	0 to 9999	Based on model code	○	P. 118
221	Heater break alarm (HBA) type selection	R/W	0: Heater break alarm (HBA) type A (Time-proportional control output) 1: Heater break alarm (HBA) type B (Continuous control output)	1	○	P. 119
222	Number of heater break alarm (HBA) delay times	R/W	0 to 255 times	5	○	P. 120
223	CT assignment	R/W	0: None 1: OUT1 2: OUT2 3: OUT3 4: OUT4 5: OUT5	CT provided: 1 (When HBA1 is specified) CT not provided: 0	○	P. 120
224 • • • 229	Unused	—	—	—	—	—
230	Hot/Cold start	R/W	Power failure less than 3 seconds: 0: Hot start 1 5: Cold start 1: Hot start 1 6: Hot start 1 2: Hot start 1 7: Hot start 2 3: Hot start 2 8: Stop start 4: Hot start 2 Power failure 3 seconds or more: 0: Hot start 1 5: Cold start 1: Hot start 2 6: Stop start 2: Cold start 7: Stop start 3: Hot start 2 8: Stop start 4: Cold start	0	×	P. 121
231	Input 2_use selection	R/W	0: Single loop control 1: Remote input 2: Cascade control (slave)	0	×	P. 121
232	Cascade ratio	R/W	0.0000 to 1.5000	1.0000	×	P. 122
233	Cascade bias	R/W	–Input span to +Input span	0.0	×	P. 122
234	SV tracking	R/W	0: Unused 1: Used	1	×	P. 124
235 • • • 239	Unused	—	—	—	—	—

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Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
240	Integral/Derivative time decimal point position selection	R/W	0: No decimal place 1: One decimal place 2: Two decimal places	2	○	P. 125
241	Derivative gain	R/W	0.1 to 10.0	6.0	○	P. 125
242	ON/OFF action differential gap (upper)	R/W	0 to Input span (Varies with the setting of the Decimal point position)	TC/RTD: 1.0 °C [°F] V/I: 0.1 % of input span	○	P. 125
243	ON/OFF action differential gap (lower)	R/W		TC/RTD: 1.0 °C [°F] V/I: 0.1 % of input span	○	P. 126
244	Action at input error (high)	R/W	0: Normal control 1: Manipulated output value at input error	0	○	P. 127
245	Action at input error (low)	R/W		0	○	P. 128
246	Manipulated output value at input error	R/W	−5.0 to +105.0 %	−5.0	○	P. 128
247	Output change rate limiter (up)	R/W	0.0 to 1000.0 %/seconds of manipulated output (0.0: OFF)	0.0	○	P. 129
248	Output change rate limiter (down)	R/W		0.0	○	P. 130
249	Power feed forward selection	R/W	0: Unused 1: Used	Based on model code	○	P. 131
250	Power feed forward gain	R/W	0.01 to 5.00	1.00	○	P. 132
251 • • • 259	Unused	—	—	—	—	—
260	Action at feedback resistance (FBR) input error	R/W	0: Close-side output ON, Open-side output OFF 1: Close-side output OFF, Open-side output OFF 2: Close-side output OFF, Open-side output ON	0	×	P. 132
261	Feedback resistance (FBR) input assignment	R/W	1: Input 1 2: Input 2	1	×	P. 132
262	Open/Close output neutral zone	R/W	0.1 to 10.0 % of output	10.0	×	P. 133
263	Open/Close output differential gap	R/W	0.1 to 5.0 % of output	0.2	×	P. 134
264	Feedback adjustment	R/W	0: Adjustment end 1: During the open-side adjusting 2: During the close-side adjusting	—	×	P. 135

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Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
265 ⋮ 269	Unused	—	—	—	—	—
270	AT bias	R/W	–Input span to +Input span	0	○	P. 136
271	AT cycles	R/W	0: 1.5 cycles 1: 2.0 cycles 2: 2.5 cycles 3: 3.0 cycles	1	○	P. 137
272	AT differential gap time	R/W	0.00 to 50.00 seconds	HA400/900: 0.10 HA401/901: 10.00	○	P. 138
273 ⋮ 299	Unused	—	—	—	—	—
300	Setting change rate limiter unit time	R/W	1 to 3600 seconds	60	×	P. 139
301	Soak time unit selection	R/W	0: 0 hour 00 minutes 00 second to 9 hours 59 minutes 59 seconds 2: 0 minutes 00.00 seconds to 9 minutes 59.99 seconds	2	×	P. 139
302 ⋮ 319	Unused	—	—	—	—	—
320	STOP display selection	R/W	0: Displays on the measured value (PV1/PV2) unit 1: Displays on the set value (SV) unit	0	×	P. 140
321	Bar graph display selection	R/W	0: No display 1: Input 1_manipulated output value (MV) 2: Input 1_measured value (PV) 3: Input 1_set value (SV) 4: Input 1_deviation value 5: Feedback resistance input value (POS) 6: Input 2_manipulated output value (MV) 7: Input 2_measured value (PV) 8: Input 2_set value (SV) 9: Input 2_deviation value	0	×	P. 140
322	Bar graph resolution setting	R/W	1 to 100 digit/dot	100	×	P. 141

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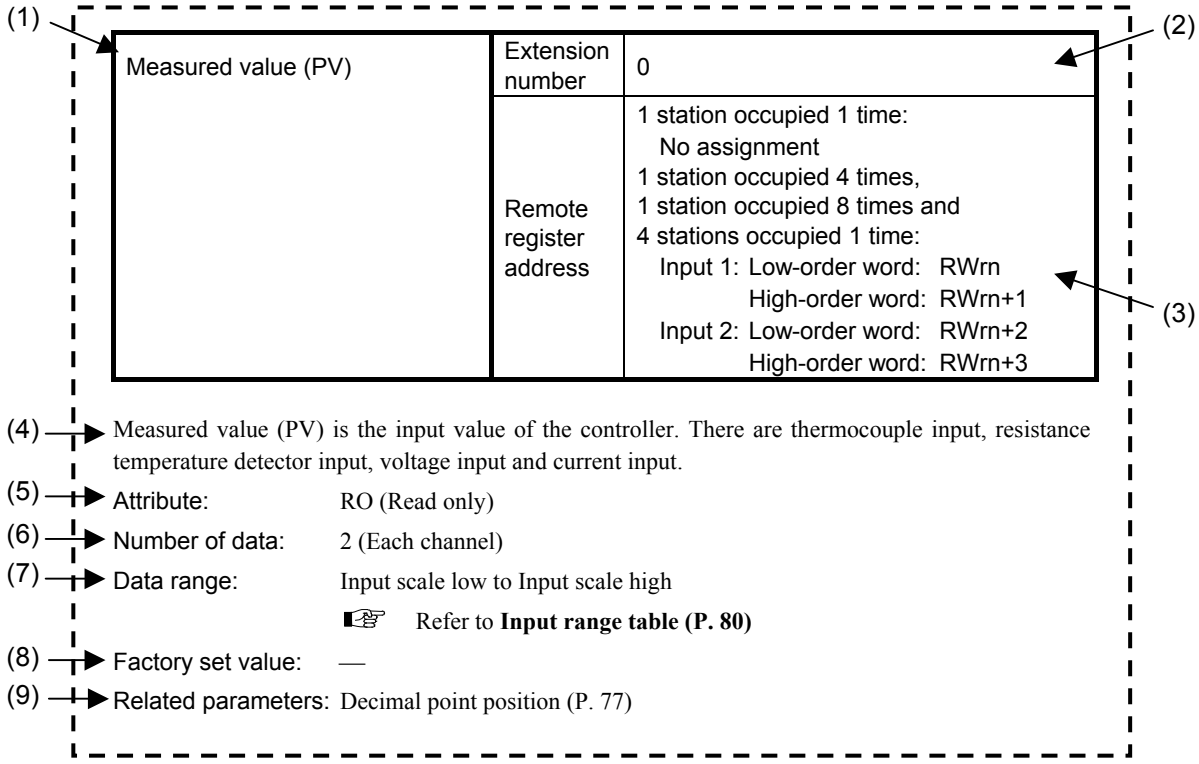
Extension number	Communication item	Attribute	Data range	Factory set value	CH	Reference page
323	Auto/Manual transfer key operation selection	R/W	0: Unused 1: Auto/Manual transfer for input 1 2: Auto/Manual transfer for input 2 3: Auto/Manual transfer for input 1 and input 2	3	×	P. 142
324	Remote/Local transfer key operation selection	R/W	0: Unused 1: Remote/Local transfer	1	×	P. 142
325	RUN/STOP transfer key operation selection	R/W	0: Unused 1: RUN/STOP transfer	1	×	P. 142
326 • • • 339	Unused	—	—	—	—	—
340	ROM version display	RO	Display the version of loading software.	—	×	P. 143
341	Integrated operating time monitor	RO	0 to 99999 hours	—	×	P. 143
342	Holding peak value ambient temperature monitor	RO	−10.0 to +100.0 °C	—	×	P. 143
343	Power feed transformer input value monitor	RO	0.0 to 160.0 % (Display in the engineering unit of % corresponding to the rated value.)	—	×	P. 143
344 • • • 511	Unused	—	—	—	—	—

6. COMMUNICATION DATA DESCRIPTION

■ Reference to communication data contents



(1) Name: Communication data name is written.

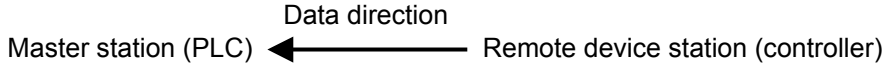
(2) Extension number: Explains the extension number of communication items.
The extension number can be handled with remote registers (RWr, RWw) when specified by the remote output (RY).

(3) Address: Displays the address of the following communication data; remote register address, remote input address, and remote output address.
Shows the address of communication items which are assigned.

(4) Description: A short description of the communication data item is written.

(5) Attribute: Shows the access direction of the communication data seen from the master station (PLC).

RO: Only reading data is possible.



WO: Only writing data is possible.

R/W: Reading and writing data is possible.

(6) Number of data: Shows the number of the communication data.
In case of communication data per channel: 2
In case of communication data per controller: 1

(7) Data range: The reading range or the writing range of communication data is written.

(8) Factory set value: The factory set value of communication data is written.

(9) Related parameters: A name and a page of related parameters are written.

 There is item including the functional description.

Measured value (PV)	Extension number	0
	Remote register address	1 station occupied 1 time: No assignment 1 station occupied 4 times, 1 station occupied 8 times and 4 stations occupied 1 time: Input 1: Low-order word: RWrn High-order word: RWrn+1 Input 2: Low-order word: RWrn+2 High-order word: RWrn+3

Measured value (PV) is the input value of the controller. There are thermocouple input, resistance temperature detector input, voltage input and current input.

Attribute: RO (Read only)
Number of data: 2 (Each channel)
Data range: Input scale low to Input scale high

☞ Refer to **Input range table (P. 80)**

Factory set value: —
Related parameters: Decimal point position (P. 77)

Manipulated output value (MV)	Extension number	1
	Remote register address	1 station occupied 1 time: No assignment 1 station occupied 4 times, 1 station occupied 8 times and 4 stations occupied 1 time: Input 1: RWrn+4 Input 2: RWrn+5

This value is an output value of the controller.

Attribute: RO (Read only)
Number of data: 2 (Each channel)
Number of data: −5.0 to +105.0 %
Factory set value: —
Related parameters: Manual output value (P. 72), Output logic selection (P. 110),
Output change rate limiter (up) (P. 129),
Output change rate limiter (down) (P. 130),
Output limiter high/low (P. 88)

Current transformer input value (CT) monitor	Extension number	2
	Remote register address	1 station occupied 1 time, 1 station occupied 4 times and 4 stations occupied 1 time: No assignment 1 station occupied 8 times: Input 1: RWrn+C Input 2: RWrn+D

This value is a current transformer input value that is used for heater break alarm function.

Attribute: RO (Read only)
Number of data: 2 (Each channel)
Data range: When the CT type is CTL-6-P-N: 0.0 to 30.0 A
When the CT type is CTL-12-S56-10L-N: 0.0 to 100.0 A
📖 **The CT input cannot measure less than 0.4 A.**
Factory set value: —
Related parameters: Heater break alarm (HBA) state (P. 145), Heater break alarm (HBA) set value (P. 75), CT ratio (P. 118), CT assignment (P. 120)

Set value (SV)	Extension number	3
	Remote register address	1 station occupied 1 time: No assignment 1 station occupied 4 times, 1 station occupied 8 times and 4 stations occupied 1 time: Input 1: Low-order word: RWwn High-order word: RWwn+1 Input 2: Low-order word: RWwn+2 High-order word: RWwn+3

The Set value (SV) is a desired value of the control.

Attribute: R/W (Read and Write)

📖 **The Input 2_set value (SV2) becomes RO (Read only) for the 1-input controller.**

Number of data: 2 (Each channel)
Data range: Setting limiter low to Setting limiter high

☞ Refer to **Input range table (P. 80)**

Factory set value: Input 1_set value (SV1): 0
Input 2_set value (SV2): 0
Related parameters: Setting limiter high/low (P. 73)

PID/AT transfer	Extension number	4

This item transfers PID control and Autotuning (AT).

Attribute: R/W (Read and Write)

📖 **Input 2_PID/AT transfer becomes RO (Read only) for 1-input controller.**

Number of data: 2 (Each channel)

Data range: 0: PID control
1: Autotuning (AT)

Factory set value: Input 1_PID/AT transfer: 0
Input 2_PID/AT transfer: 0

Related parameters: AT bias (P. 136), AT cycle (P. 137), AT differential gap time (P. 138)

Autotuning (AT): Autotuning (AT) function automatically measures, calculates and sets the optimum PID constants. The followings are the conditions necessary to carry out Autotuning and the conditions which will cause the Autotuning to stop.

[Requirements for AT start]

Start the Autotuning when all following conditions are satisfied:

- Operation mode conditions are as follows:
  – Auto/Manual transfer → Auto mode
  – Remote/Local transfer → Local mode
  – PID/AT transfer → PID control
  – RUN/STOP transfer → Control RUN
- The Measured value (PV) is without input error range [Input error determination point (high) > Measured value (PV) > Input error determination point (low)].
- The output limiter high is 0.1 % or higher and the output limiter low is 99.9 % or less.

📖 When the Autotuning is finished, the controller will automatically returns to PID control.

📖 When the cascade control is activated, the AT function cannot be turned on.

[Requirement for AT cancellation]

- When the temperature Set value (SV) is changed.
- When the output limiter high or the output limiter low is changed.
- When the PV bias, the PV digital filter, or the PV ratio is changed.
- When the Auto/Manual mode is changed to the Manual mode.
- When the Remote/Local mode is changed to the Remote mode.
- When the Measured value (PV) goes to input error range [Measured value (PV) ≥ Input error determination point (high) or Input error determination point (low) ≥ Measured value (PV)].
- When the power failure occurs.
- When the instrument is in the FAIL state.
- When the PID/AT transfer is changed to the PID control.
- When the RUN/STOP mode is changed to the control STOP.

📖 **If the AT is canceled, the controller immediately changes to PID control. The PID values will be the same as before AT was activated.**

Proportional band	Extension number	5
	Remote register address	1 station occupied 1 time, 1 station occupied 4 times and 4 stations occupied 1 time: No assignment 1 station occupied 8 times: Input 1: Low-order word: RWwn+C High-order word: RWwn+D Input 2: Low-order word: RWwn+E High-order word: RWwn+F

This value expresses a proportional band of the PI and PID control.

Attribute: R/W (Read and Write)

The Input 2_proportional band becomes RO (Read only) for the 1-input controller.

Number of data: 2 (Each channel)

Data range: Thermocouple (TC)/RTD inputs: 0 (0.0, 0.00) to Input span
Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of input span
0 (0.0, 0.00): ON/OFF action

Factory set value: Input 1_proportional band: 30.0
Input 2_proportional band: 30.0

Related parameters: ON/OFF action differential gap (upper) (P. 125),
ON/OFF action differential gap (lower) (P. 126)

Integral time	Extension number	6
	Remote register address	1 station occupied 1 time, 1 station occupied 4 times and 4 stations occupied 1 time: No assignment 1 station occupied 8 times: Input 1: Low-order word: RWwn+10 High-order word: RWwn+11 Input 2: Low-order word: RWwn+12 High-order word: RWwn+13

Integral action is to eliminate offset between SV and PV by proportional action.

Attribute: R/W (Read and Write)

The Input 2_integral time becomes RO (Read only) for the 1-input controller.

Number of data: 2 (Each channel)

Data range: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds
(0, 0.0 or 0.00: PD action)

Factory set value: Input 1_integral time: 240.00
Input 2_integral time: 240.00

Related parameters: Integral/Derivative time decimal point position selection (P. 125)

Derivative time	Extension number	7
	Remote register address	1 station occupied 1 time, 1 station occupied 4 times and 4 stations occupied 1 time: No assignment 1 station occupied 8 times: Input 1: Low-order word: RWwn+14 High-order word: RWwn+15 Input 2: Low-order word: RWwn+16 High-order word: RWwn+17

Derivative action is to prevent rippling and make control stable by monitoring output change.

Attribute: R/W (Read and Write)

The Input 2_derivative time becomes RO (Read only) for the 1-input controller.

Number of data: 2 (Each channel)

Data range: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds
(0, 0.0 or 0.00: PI action)

Factory set value: Input 1_derivative time: 60.00
Input 2_derivative time: 60.00

Related parameters: Integral/Derivative time decimal point position selection (P. 125)

PV bias	Extension number	8

PV bias adds bias to the Measured value (PV). The PV bias is used to compensate the individual variations of the sensors or correct the difference between the Measured value (PV) of other instruments.

Attribute: R/W (Read and Write)

The Input 2_PV bias becomes RO (Read only) for the 1-input controller.

Number of data: 2 (Each channel)

Data range: –Input span to +Input span

Factory set value: Input 1_PV bias: 0
Input 2_PV bias: 0

Event 1 set value	Extension number	9
	Remote register address	1 station occupied 1 time: No assignment 1 station occupied 4 times, 1 station occupied 8 times and 4 stations occupied 1 time: Low-order word: RWwn+4 High-order word: RWwn+5
Event 2 set value	Extension number	10
	Remote register address	1 station occupied 1 time: No assignment 1 station occupied 4 times, 1 station occupied 8 times and 4 stations occupied 1 time: Low-order word: RWwn+6 High-order word: RWwn+7
Event 3 set value	Extension number	54
	Remote register address	1 station occupied 1 time: No assignment 1 station occupied 4 times, 1 station occupied 8 times and 4 stations occupied 1 time: Low-order word: RWwn+8 High-order word: RWwn+9
Event 4 set value	Extension number	55
	Remote register address	1 station occupied 1 time: No assignment 1 station occupied 4 times, 1 station occupied 8 times and 4 stations occupied 1 time: Low-order word: RWwn+A High-order word: RWwn+B

Event 1 through Event 4 are set values of the event action.

Attribute: R/W (Read and Write)

The Event 3 set value becomes RO (Read only) when it was selected "9: Control loop break alarm (LBA)" from the Event 3 type selection.

The Event 4 set value becomes RO (Read only) when it was selected "9: Control loop break alarm (LBA)" from the Event 3 type selection.

Number of data: 1 (Each controller)

Data range: Deviation: –Input span to +Input span
Process: Input scale low to Input scale high
SV: Input scale low to Input scale high

Factory set value: 50.0

Related parameters: Event state (P. 144), Event type selection (P. 83), Event hold action (P. 86), Event differential gap (P. 85), Event action at input error (P. 117), Event assignment (P. 118)

RUN/STOP transfer	Extension number	17
	Remote output address	RYnF

This item transfers Control RUN and Control STOP.

Attribute: R/W (Read and Write)
Number of data: 1 (Each controller)
Data range: 0: Control RUN
1: Control STOP
Factory set value: 0
Related parameters: Operation mode state (P. 95)

- The controller status at STOP mode is the same as that of Power-off. However for the specification with current output (other than 0 to 20 mA) or voltage output, an output of –5 % is fed when at STOP.
- If the instrument is transferred to RUN mode from STOP mode, it performs the same operation (control RUN, Event determination start-up) as the power-on.
- The RUN/STOP transfer of the remote output (RYnF) is enabled by detecting the edge of the bit status change.

Proportional cycle time	Extension number	18

Proportional cycle time is to set control cycle time for time based control output such as voltage pulse for SSR, triac and relay output.

Attribute: R/W (Read and Write)

- **This item becomes RO (Read only) for the Voltage/Current output specification.**

Number of data: 2 (Each channel)
Data range: 0.1 to 100.0 seconds
Factory set value: Input 1_proportional cycle time:
Relay contact output: 20.0 seconds
Voltage pulse output and triac output: 2.0 seconds
Input 2_proportional cycle time:
Relay contact output: 20.0 seconds
Voltage pulse output and triac output: 2.0 seconds

- The proportional cycle time becomes invalidated when the Voltage/Current output is selected as control output type.

Auto/Manual transfer	Extension number	19

This item transfers the Automatic (AUTO) control and the Manual (MAN) control.

Attribute: R/W (Read and Write)

The Input 2_Auto/Manual transfer becomes RO (Read only) for the 1-input controller.

Number of data: 2 (Each channel)
Data range: 0: Auto mode
1: Manual mode
Factory set value: Input 1_Auto/Manual transfer: 0
Input 2_Auto/Manual transfer: 0
Related parameters: Operation mode state (P. 95)

Manual output value	Extension number	20

This item is the output value in the manual (MAN) control.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) for the automatic (AUTO) control.

Number of data: 2 (Each channel)
Data range: Output limiter low to Output limiter high
Factory set value: Input 1_manual output value: 0.0
Input 2_manual output value: 0.0
Related parameters: Output limiter high/low (P. 88)

Setting limiter high	Extension number	21

Use to set a high limit of the set value.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

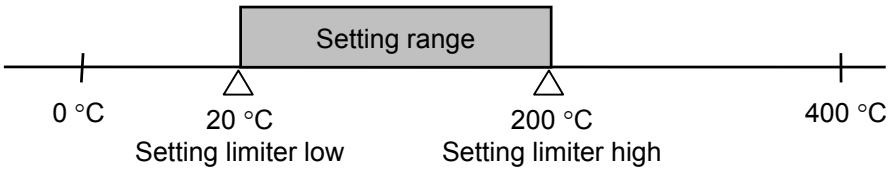
Data range: Setting limiter low to Input scale high

Factory set value: Input 1_setting limiter high: Input 1_input scale high
Input 2_setting limiter high: Input 2_input scale high

Related parameters: Decimal point position (P. 77), Input scale high (P. 104),
Setting limiter low (P. 73)

Setting Limiter: Setting Limiter is to set the range of the Set value (SV).

Example: The input range (input scale range) is from 0 to 400 °C, the setting limiter high is 200 °C, and the setting limiter low is 20 °C.



Setting limiter low	Extension number	22

Use to set a low limit of the set value.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: Input scale low to Setting limiter high

Factory set value: Input 1_setting limiter low: Input 1_input scale low
Input 2_setting limiter low: Input 2_input scale low

Related parameters: Decimal point position (P. 77), Input scale low (P. 104),
Setting limiter high (P. 73)

Functional description:

Refer to the setting limiter high.

PV digital filter	Extension number	23

This item is the time of the first-order lag filter eliminate noise against the measured input.

Attribute: R/W (Read and Write)

The Input 2_PV digital filter becomes RO (Read only) for the 1-input controller.

Number of data: 2 (Each channel)

Data range: 0.00 to 10.00 seconds
0.00: OFF (Unused)

Factory set value: HA400/900: Input 1_PV digital filter: 0.00
Input 2_PV digital filter: 0.00
HA401/901: Input 1_PV digital filter: 1.00
Input 2_PV digital filter: 1.00

Heater break alarm (HBA) set value	Extension number	24

HBA1 and HBA2 are to set the set values for the heater break alarm (HBA) function. The HBA function detects a fault in the heating circuit by monitoring the current flowing through the load by a dedicated current transformer (CT).

Up to two heater break alarms are available with the controller. CT input 1 is for HBA1, and CT input 2 for HBA2. CT inputs can be assigned to one output from OUT1 to OUT5. To use HBA for a three-phase load, both CT inputs can be assigned to the same output.

Two types of heater break alarms, TYPE "A" and TYPE "B" (factory set value: TYPE "B"), are available. An appropriate type should be selected depending on the application. (Please refer to "Heater break alarm function" below.)

These parameters, HBA set values are used for both types. However, each type has different function and care must be used to set an appropriate set value.

For type "A" HBA,
- Set the set value to approximately 85 % of the maximum reading of the CT input.
- Set the set value to a slightly smaller value to prevent a false alarm depending on the stability of the power supply.
- When more than one heater is connected in parallel, it may be necessary to increase the HBA set value to detect a single heater failure.

For type "B" HBA,
- Set the set value to the maximum CT input value. This will be the current when the control is at 100 % control output. The set value is used to calculate the width of a non-alarm range.

Attribute: R/W (Read and Write)

Heater break alarm 1 (HBA1) set value becomes RO (Read only) for no current transformer input 1 (CT1) specification.

Heater break alarm 2 (HBA2) set value becomes RO (Read only) for no current transformer input 2 (CT2) specification.

Number of data: 2 (Each channel)

Data range: With CTL-6-P-N: 0.0 to 30.0 A (0.0: Not used)
With CTL-12-S56-10L-N: 0.0 to 100.0 A (0.0: Not used)

Factory set value: Heater break alarm 1 (HBA1) set value: 0.0
Heater break alarm 2 (HBA2) set value: 0.0

Related parameters: Heater break determination point (P. 98),
Heater melting determination point (P. 99),
Heater break alarm (HBA) type selection (P. 119),
Number of heater break alarm (HBA) delay times (P. 120)

Heater break alarm function:

■ Heater break alarm (HBA) type A

Heater break alarm (HBA) type A can only be used with time-proportional control output (relay, voltage pulse, or triac output). The HBA function monitors the current flowing through the load by a dedicated current transformer (CT), compares the measured value with the HBA set values, and detects a fault in the heating circuit.

Low or No current flow (Heater break, malfunction of the control device, etc.):
When the control output is ON and the CT input value is equal to or less than the heater break determination point for the preset number of consecutive sampling cycles, an alarm is activated.

Over current or short-circuit:
When the control output is OFF and the CT input value is equal to or greater than the heater break determination point for the preset number of consecutive sampling cycles, an alarm is activated.

Continued on the next page.

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■ Heater break alarm (HBA) type B

Heater Break Alarm (HBA) type B can be used with both continuous control output (current/voltage continuous output) and time-proportional control output (relay, voltage pulse output, or triac). The HBA function assumes that the heater current value is proportional* to the control output value of the controller, otherwise viewed as the manipulated variable (MV), and compare it with the CT input value to detect a fault in the heating or cooling circuit.

* It is assumed that the current value flowing through the load is at maximum when the control output from the controller is 100 %, and the minimum current value flowing through the load is zero (0) when the control output from the controller is 0 %.

Low or No current flow (Heater break, malfunction of the control device, etc.)

The alarm determination point (Low) is calculated as follows:

[Non-alarm range (Low) width] = (HbL1 or HbL2) × (HbA1 or HbA2)

[Alarm determination point (Low)] = [(HbA1 or HbA2) × (MV1 or MV2)] − [Non-alarm range (Low) width]

When the CT input value is equal to or less than the heater break determination point for the preset number of consecutive sampling cycles, an alarm status is produced.

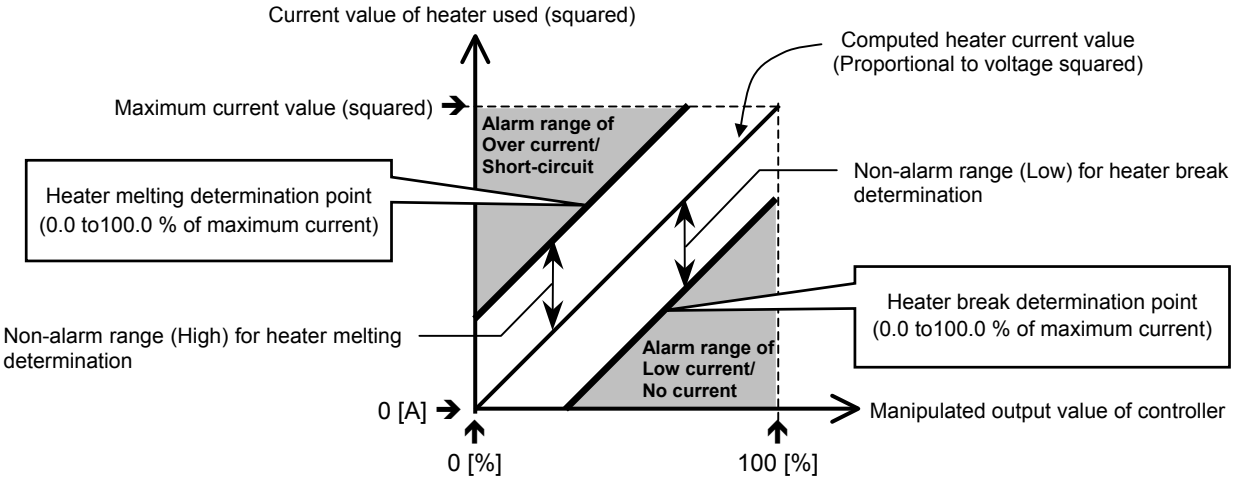
Over current or short-circuit

The alarm determination point (High) is calculated as follows:

[Non-alarm range (High) width] = (HbH1 or HbH2) × (HbA1 or HbA2)

[Alarm determination point (High)] = [(HbA1 or HbA2) × (MV1 or MV2)] + [Non-alarm range (High) width]

When the CT input value is equal to or greater than the heater melting determination point for the preset number of consecutive sampling cycles, an alarm status is produced.



The current factory set values of HbLs (Heater break determination point) and HbHs (Heater melting determination point) are set to 30.0 %. If any of the following conditions exists, set them to a slightly larger value to prevent a false alarm.

- **Heater current values is not proportional to the control output in Phase control.**
- **There is difference on control output accuracy between the controller and the operating unit (scr Power Controller).**
- **There is a delay on control output between the controller and the operating unit (scr Power Controller).**

The factory set value of the HBA type is heater break alarm (HBA) type B.

Decimal point position	Extension number	25

Use to select the decimal point position of the input range.

Attribute: R/W (Read and Write)
📖 **This item becomes RO (Read only) during control RUN.**

Number of data: 2 (Each channel)

Data range:
Thermocouple (TC) inputs:
0: No decimal place
1: One decimal place

RTD inputs:
0: No decimal place
1: One decimal place
2: Two decimal places

Voltage (V)/Current (I) inputs:
0: No decimal place
1: One decimal place
2: Two decimal places
3: Three decimal places
4: Four decimal places

Factory set value: Input 1_decimal point position: 1
Input 2_decimal point position: 1

Related parameters: Input type selection (P. 80), Input scale high (P. 104), Input scale low (P. 104)

Set value (SV1) monitor	Extension number	31
	Remote register address	1 station occupied 1 time: No assignment 1 station occupied 4 times, 1 station occupied 8 times and 4 stations occupied 1 time: Input 1: Low-order word: RWrn+6 High-order word: RWrn+7 Input 2: Low-order word: RWrn+8 High-order word: RWrn+9

This value is a monitor of the Set value (SV) that is a desired value for control.

Attribute: RO (Read only)

Number of data: 2 (Each channel)

Data range: Setting limiter low to Setting limiter high
☞ Refer to **Input range table (P. 80)**

Factory set value: —

Related parameters: Decimal point position (P. 77)

Error code	Extension number	32
	Remote register address	1 station occupied 1 time: No assignment 1 station occupied 4 times, 1 station occupied 8 times and 4 stations occupied 1 time: RWrn+A

Each error state of the controller is expressed in bit data items.

Attribute: RO (Read only)

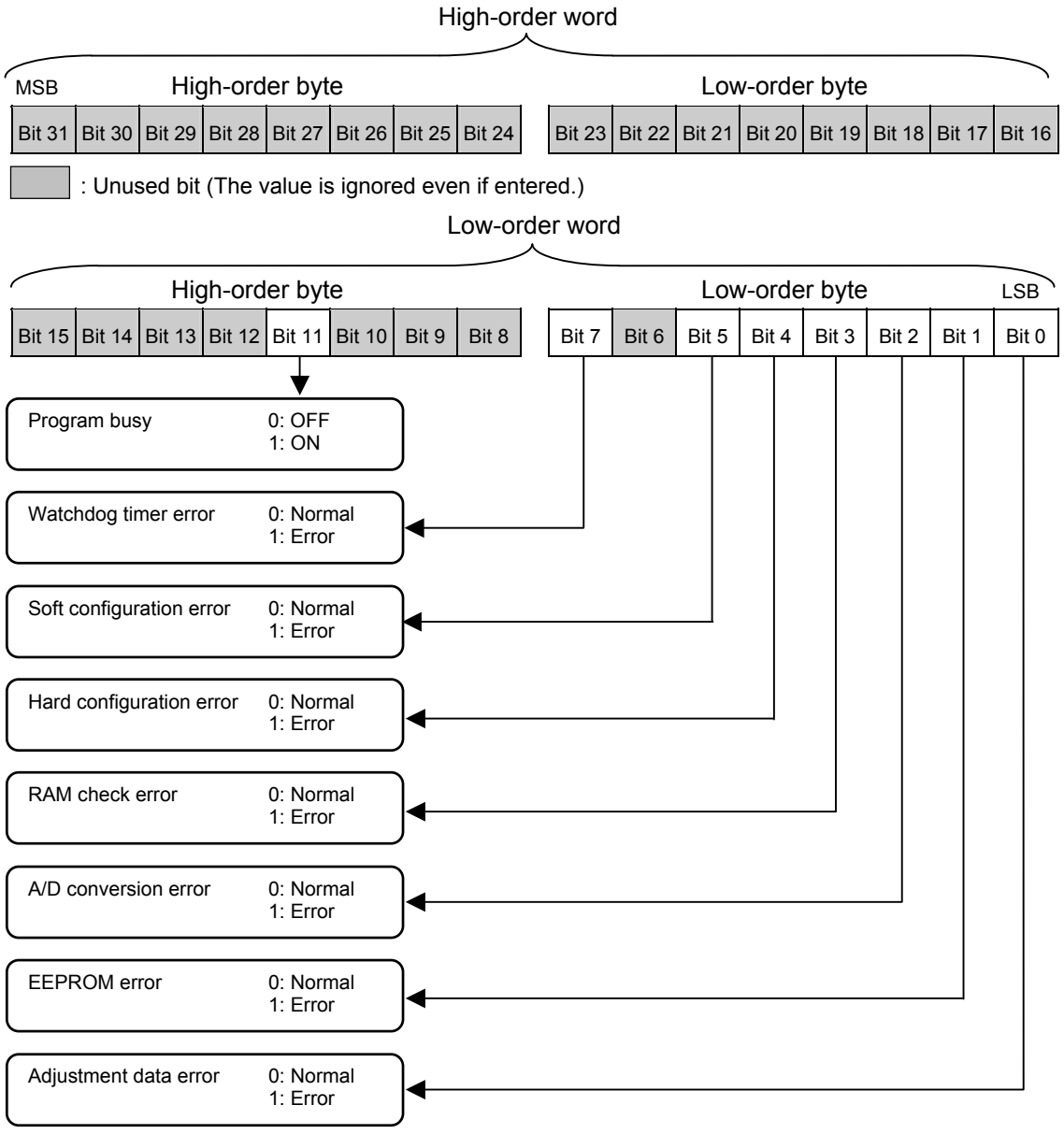
Number of data: 1 (Each controller)

Data range: 0 to 4095 (Bit data)

Bit 0 to Bit 5, Bit 7 and Bit 11 are used.

(Bit 6,Bit 8 to Bit 10, Bit 12 to Bit 31: Unused)

Each error state is assigned as a bit image in binary numbers.



Factory set value: —

Memory area selection	Extension number	33

Selects the memory area (control area) used for control.

Attribute: R/W (Read and Write)
Number of data: 1 (Each controller)
Data range: 1 to 16
Factory set value: 1

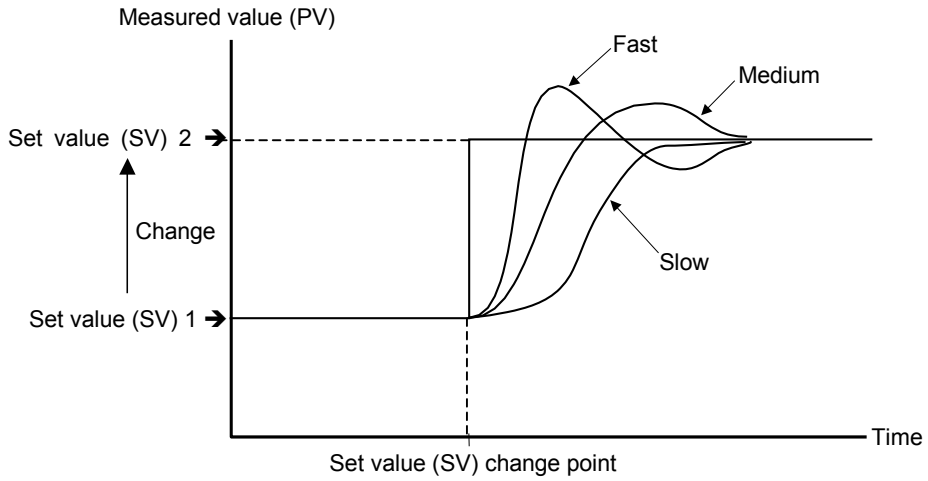
Control response parameter	Extension number	34
	Remote register address	1 station occupied 1 time, 1 station occupied 4 times and 4 stations occupied 1 time: No assignment 1 station occupied 8 times: Input 1: RWwn+18 Input 2: RWwn+19

The control response for the Set value (SV) change can be selected among Slow, Medium, and Fast.

Attribute: R/W (Read and Write)

The Input 2_control response parameter becomes RO (Read only) for the 1-input controller.

Number of data: 2 (Each channel)
Data range: 0: Slow
1: Medium
2: Fast
Factory set value: Input 1_control response parameter: 0
Input 2_control response parameter: 0
Control Response: The control response for the Set value (SV) change can be selected among Slow, Medium, and Fast. If a fast response is required, Fast is chosen. Fast may cause overshoot. If overshoot is critical, Slow is chosen.



Input type selection	Extension number	36

Number of data: 2 (Each channel)
Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Data range: 0 to 23 (refer to the following table)

[Input range table]

Set value	Input type		Input range	Hardware
0	TC input	K	–200 to +1372 °C or –328.0 to +2501.6 °F	Voltage (Low) input group
1		J	–200 to +1200 °C or –328.0 to +2192.0 °F	
2		R	–50 to +1768 °C or –58.0 to +3214.4 °F	
3		S	–50 to +1768 °C or –58.0 to +3214.4 °F	
4		B	0 to 1800 °C or 32.0 to 3272.0 °F	
5		E	–200 to +1000 °C or –328.0 to +1832.0 °F	
6		N	0 to 1300 °C or 32.0 to 2372.0 °F	
7		T	–200 to +400 °C or –328.0 to +752.0 °F	
8		W5Re/W26Re	0 to 2300 °C or 32.0 to 4172.0 °F	
9		PLII	0 to 1390 °C or 32.0 to 2534.0 °F	
19	Voltage (Low) input	0 to 1 V	Programmable range (–19999 to +99999)	
20		0 to 100 mV		
21		0 to 10 mV		
12	RTD input	3-wire system Pt100	–200 to +850 °C or –328.0 to +1562.0 °F	
13		3-wire system JPt100	–200 to +600 °C or –328.0 to +1112.0 °F	
22		4-wire system Pt100	–200 to +850 °C or –328.0 to +1562.0 °F	
23		4-wire system JPt100	–200 to +600 °C or –328.0 to +1112.0 °F	
14	Current input	0 to 20 mA	Programmable range (–19999 to +99999)	
15		4 to 20 mA		
16	Voltage (High) input	0 to 10 V	Programmable range (–19999 to +99999)	Voltage (High) input group
17		0 to 5 V		
18		1 to 5 V		

An input type change may only be made within the hardware groups as shown above.

Do not set to any number (including 10 and 11) which is not described in the input range table above. This may cause malfunctioning.

4-wire RTD input type (22 and 23) can not be selected for Input type selection of Input 2 (2.InP).

Refer to the above input range table to select input type of the remote input. Input range 0 through 13, 22 or 23 can not be selected for.

Factory set value: Input 1_input type selection: Based on model code. (when not specifying: Type K)
Input 2_input type selection: Based on model code. (when not specifying: Type K)
Related parameters: Display unit selection (P. 103), Decimal point position (P. 77),
Input scale high (P. 104), Input scale low (P. 104)

Setting change rate limiter (up)	Extension number	37

This function is to allow the Set value (SV) to be automatically changed at specific rates when a new Set value (SV).

Attribute: R/W (Read and Write)

The Input 2_setting change rate limiter (up) becomes RO (Read only) for the 1-input controller.

Number of data: 2 (Each channel)

Data range: 0 to Input span/unit time * * Unit time: 60 seconds (factory set value)
0: OFF (Unused)
(Varies with the setting of the Decimal point position)

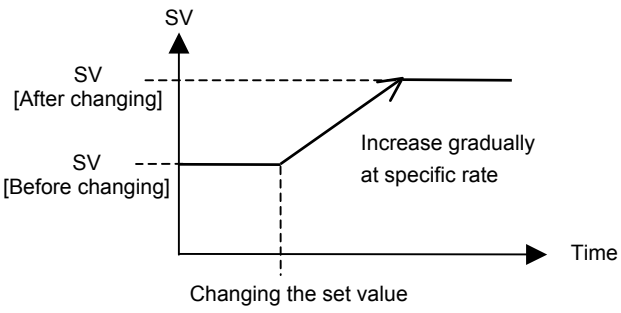
Factory set value: Input 1_setting change rate limiter (up): 0.0
Input 2_setting change rate limiter (up): 0.0

Related parameters: Setting change rate limiter unit time (P. 139)

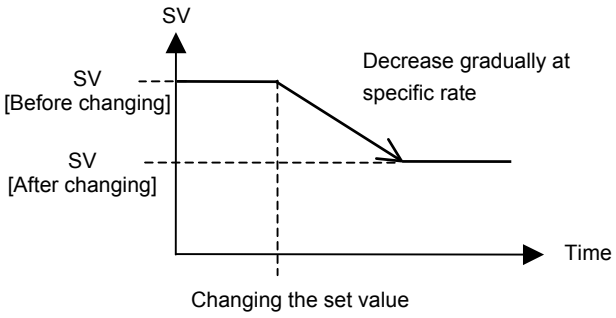
■ Setting change rate limiter

Application examples of Setting change rate limiter:

- **Increasing the SV to a higher value**



- **Decreasing the SV to a lower value**



When the Setting change rate limiter is used, the SV will also ramp up or ramp down by the function at power-on and operation mode change from STOP to RUN.

If the Autotuning (AT) function is activated while the SV is ramping up or ramping down by the Setting change rate limiter, AT will starts after the SV finishes ramp-up or ramp-down by the limiter, and the controller is in PID control mode until AT starts.

When the value of Setting change rate limiter is changed during normal operation, the ramp-up or ramp-down rate will be changed unless the SV already has finished ramp-up or ramp-down by the function.

If the rate of Setting change limiter is set to any value other than "0.0: OFF (Unused)," the event re-hold action to be taken by a Set value (SV) change becomes invalidated.

Setting change rate limiter (down)	Extension number	62

This function is to allow the Set value (SV) to be automatically changed at specific rates when a new Set value (SV).

Attribute: R/W (Read and Write)

The Input 2_setting change rate limiter (down) becomes RO (Read only) for the 1-input controller.

Number of data: 2 (Each channel)

Data range: 0 to Input span/unit time * * Unit time: 60 seconds (factory set value)
0: OFF (Unused)
(Varies with the setting of the Decimal point position)

Factory set value: Input 1_setting change rate limiter (down): 0.0
Input 2_setting change rate limiter (down): 0.0

Related parameters: Setting change rate limiter unit time (P. 139)

Functional description:
Refer to the Setting change rate limiter (up).

Control action type selection	Extension number	38

Use to select direct action/reverse action.

Attribute: R/W (Read and Write)

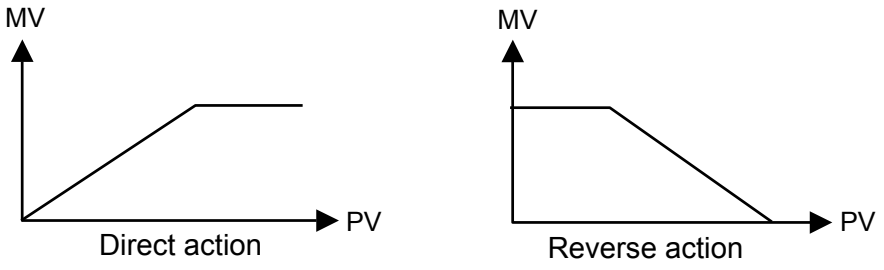
This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0: Direct action
1: Reverse action

Factory set value: Input 1_control action type selection: 1
Input 2_control action type selection: 1

Control action type: Direct action: The Manipulated output value (MV) increases as the Measured value (PV) increases. This action is used generally for cool control.
Reverse action: The Manipulated output value (MV) decreases as the Measured value (PV) increases. This action is used generally for heat control.



Event 1 type selection	Extension number	39
Event 2 type selection	Extension number	40
Event 3 type selection	Extension number	56
Event 4 type selection	Extension number	57

Use to select a type of the Event 1, 2, 3 and 4.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range:
0: None
1: Deviation high [1]
2: Deviation low [1]
3: Deviation high/low [1]
4: Band [1]
5: Process high [1]
6: Process low [1]
7: SV high
8: SV low
9: Control loop break alarm (LBA) [2]

[1] Event hold action is available.

[2] The "9: Control loop break alarm (LBA)" can be selected only for Event 3 and Event 4.

Factory set value: 0

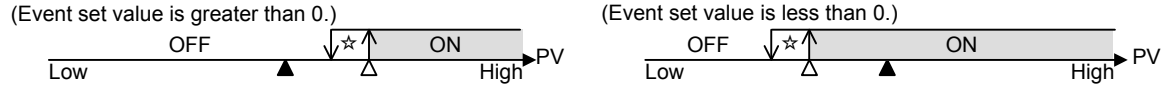
Related parameters: Event set value (P. 70), Control loop break alarm (LBA) time (P. 89), LBA deadband (P. 89), Output logic selection (P. 110), Output timer setting (P. 112), Event hold action (P. 86), Event differential gap (P. 85), Event action at input error (P. 117), Event assignment (P. 118), Alarm lamp lighting condition setting (P. 113, P. 114)

Functional description:

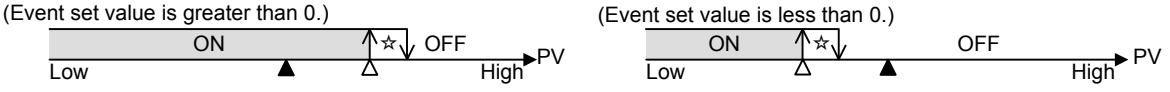
- **Event action type**

(▲: Set value (SV) △: Event set value ☆: Event differential gap)

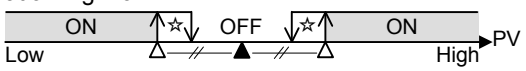
Deviation high:



Deviation low:



Deviation high/low:



Band:

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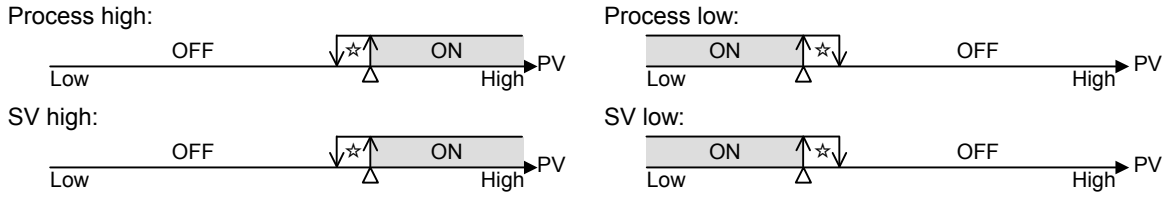


● Control loop break alarm (LBA)

The control loop break alarm (LBA) function is used to detect a load (heater) break or a failure in the external actuator (power controller, magnet relay, etc.), or a failure in the control loop caused by an input (sensor) break. The LBA function is activated when control output reaches 0 % (low limit with output limit function) or 100 % (high limit with output limit function). LBA monitors variation of the Measured value (PV) for the length of LBA time. When the LBA time has elapsed and the PV is still within the alarm determination range, the LBA will be ON.

[Alarm action]

The LBA function produces the alarm when any of the following conditions occurs.

LBA determination range: Temperature input: 2 °C [2 °F] (fixed)
Voltage/Current input: 0.2 % of span (fixed)

- **When the control output reaches 0 % (low limit with output limit function)**

For direct action: When the LBA time has passed and the PV has not risen beyond the alarm determination range, the alarm will be turned on.

For reverse action: When the LBA time has passed and the PV has not fallen below the alarm determination range, the alarm will be turned on.

- **When the output exceeds 100 % (low limit with output high function)**

For direct action: When the LBA time has passed and the PV has not fallen below the alarm determination range, the alarm will be turned on.

For reverse action: When the LBA time has passed and the PV has not risen beyond the alarm determination range, the alarm will be turned on.

If the Autotuning function is used, the LBA time is automatically set twice as large as the integral time. The LBA setting time will not be changed even if the integral time is changed.

LBA function is not operative when:
- AT function is activated.
- The controller is in STOP mode.
- LBA function is set to "0."
- LBA function is not assigned to Event 3 or Event 4.

The LBA function does not detect a location which causes alarm status. If LBA alarm is ON, check each device or wiring of the control loop.

While the LBA is ON (under alarm status), the following conditions cancel the alarm status and LBA will be OFF:
- The Measured value (PV) rises beyond (or falls below) the LBA determination range within the LBA time.
- The Measured value (PV) enters within the LBA deadband.

Event 1 differential gap	Extension number	41
Event 2 differential gap	Extension number	42
Event 3 differential gap	Extension number	58
Event 4 differential gap	Extension number	59

Use to set a differential gap of the Event 1, 2, 3 or 4.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0 to Input span
(Varies with the setting of the Decimal point position)

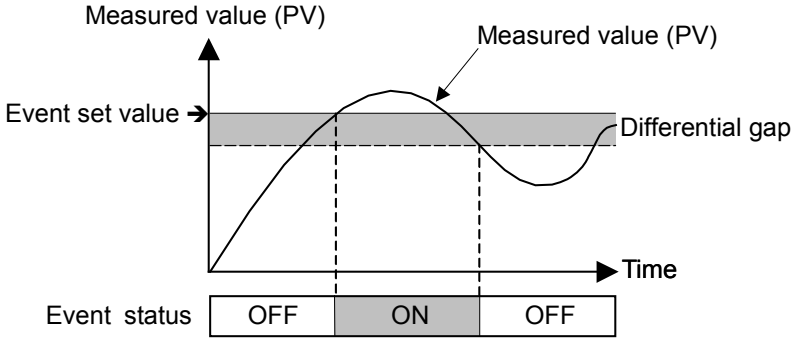
Factory set value: Thermocouple (TC) /RTD inputs: 2.0 °C [°F]
Voltage (V)/Current (I) inputs: 0.2 % of input span

Related parameters: Event set value (P. 70), Event type selection (P. 83), Event hold action (P. 86), Event action at input error (P. 117), Event assignment (P. 118)

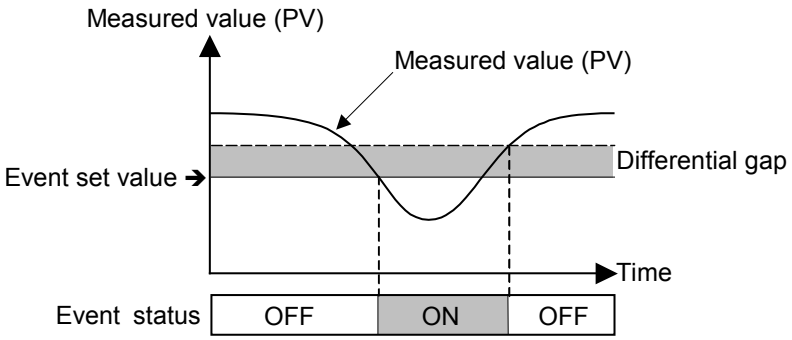
Event differential gap function:

It prevents chattering of event output due to the measured value fluctuation around the event set value.

[Event high]



[Event low]



Event 1 hold action	Extension number	43
Event 2 hold action	Extension number	44
Event 3 hold action	Extension number	60
Event 4 hold action	Extension number	61

Use to set an event hold action for the Event 1, 2, 3 or 4.

When high alarm with Hold/Re-hold action is used for Event function, alarm does not turn on while Hold action is in operation. Use in combination with a high alarm without Hold action in order to prevent overheating which may occur by failure of control devices, such as welding of relays.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0: OFF
1: ON
2: Re-hold action ON

Factory set value: 0

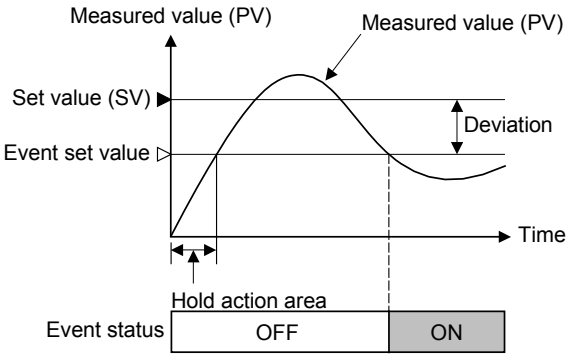
Related parameters: Event set value (P. 70), Event type selection (P. 83), Event differential gap (P. 85), Event action at input error (P. 117), Event assignment (P. 118)

Functional description:

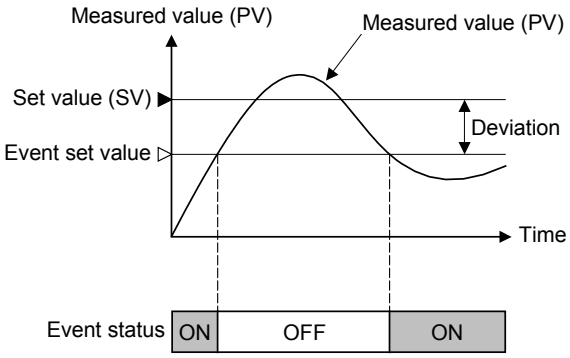
- **Hold action**

When Hold action is ON, the event action is suppressed at start-up or STOP to RUN until the measured value has entered the non-event range.

[With hold action]



[Without hold action]



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● Re-hold action

When Re-hold action is ON, the event action is also suppressed at the control set value change until the measured value has entered the non-event range.

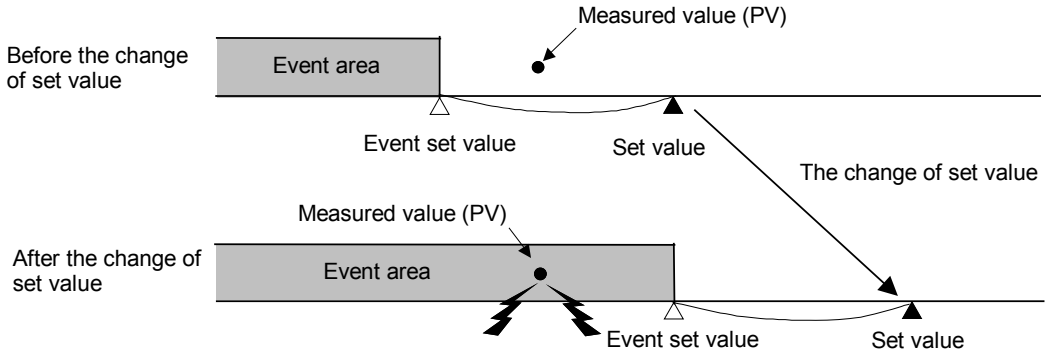
Action condition	1: Hold action ON (Only Hold action)	2: Re-hold action ON (Hold and Re-hold actions)
When the power is turned on	Hold action	Hold action
When transferred from STOP (control STOP) to RUN (control RUN)	Hold action	Hold action
When the Set value (SV) is changed	Without Hold and Re-hold actions	Re-hold action

The Re-hold action is invalidated for any of the following. However, the Hold action is validated.

- **When Setting change rate limiter other than "OFF (Unused)" are set**
- **When Remote/Local transfer is the remote mode**

[Example] When Event 1 type is the deviation low:

When Re-hold action is OFF and event output type is deviation, the event output is produced due to the Set value change. The Re-hold action suppresses the alarm output until the measured value has entered the non-event range again.



Output limiter high	Extension number	46

Use to set the high limit value of manipulated output.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)
Data range: Output limiter low to 105.0 %
Factory set value: Input 1_output limiter high: 105.0
Input 2_output limiter high: 105.0
Related parameters: Output change rate limiter (up) (P. 129),
Output change rate limiter (down) (P. 130),
Output limiter low (P. 88)

Output limiter low	Extension number	47

Use to set the low limit value of manipulated output.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)
Data range: −5.0 % to Output limiter high
Factory set value: Input 1_output limiter low: −5.0
Input 2_output limiter low: −5.0
Related parameters: Output change rate limiter (up) (P. 129),
Output change rate limiter (down) (P. 130),
Output limiter high (P. 88)

Control loop break alarm 1 (LBA1) time	Extension number	50
Control loop break alarm 2 (LBA2) time	Extension number	52

The LBA time sets the time required for the LBA function to determine there is a loop failure. When the LBA is output (under alarm status), the LBA function still monitors the Measured value (PV) variation at an interval of the LBA time.

Attribute: R/W (Read and Write)

📖 **The control loop break alarm 1 (LBA1) time becomes RO (Read only) when it was selected "1 to 8" from the Event 3 type selection.**

📖 **The control loop break alarm 2 (LBA2) time becomes RO (Read only) when it was selected "1 to 8" from the Event 4 type selection.**

Number of data: 1 (Each controller)
Data range: 0 to 7200 seconds (0: Unused)
Factory set value: 480
Related parameters: Event state (P. 144), Event assignment (P. 118), LBA deadband (P. 89)

LBA1 deadband	Extension number	51
LBA2 deadband	Extension number	53

The LBA deadband gives a neutral zone to prevent the control loop break alarm (LBA) from malfunctioning caused by disturbance.

Attribute: R/W (Read and Write)

📖 **The LBA1 deadband becomes RO (Read only) when it was selected "1 to 8" from the Event 3 type selection.**

📖 **The LBA2 deadband becomes RO (Read only) when it was selected "1 to 8" from the Event 4 type selection.**

Number of data: 1 (Each controller)
Data range: 0 to Input span
(Varies with the setting of the Decimal point position)
Factory set value: 0.0
Related parameters: Event state (P. 114), Event assignment (P. 118),
Control loop break alarm (LBA) time (P. 89)

Functional description:

■ LBA Function

Control loop break alarm (LBA):
The control loop break alarm (LBA) function is used to detect a load (heater) break or a failure in the external actuator (power controller, magnet relay, etc.), or a failure in the control loop caused by an input (sensor) break. The LBA function is activated when control output reaches 0 % (low limit with output limit function) or 100 % (high limit with output limit function). LBA monitors variation of the Measured value (PV) for the length of LBA time. When the LBA time has elapsed and the PV is still within the alarm determination range, the LBA will be ON.

[Alarm action]

LBA determination range: Temperature input: 2 °C [2 °F] (fixed)
Voltage/Current input: 0.2 % of span (fixed)

- **When the output reaches 0 % (low limit with output limit function)**

For direct action: When the LBA time has passed and the PV has not risen beyond the alarm determination range, the alarm will be turned on.
For reverse action: When the LBA time has passed and the PV has not fallen below the alarm determination range, the alarm will be turned on.

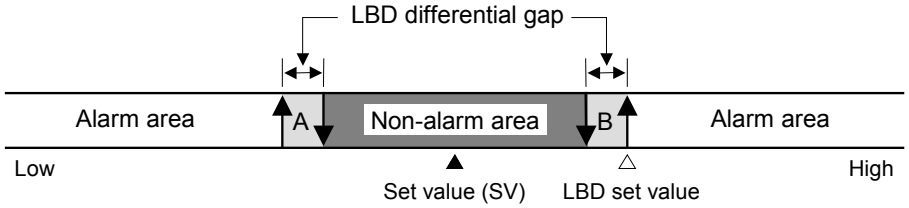
- **When the output exceeds 100 % (high limit with output limit function)**

For direct action: When the LBA time has passed and the PV has not fallen below the alarm determination range, the alarm will be turned on.
For reverse action: When the LBA time has passed and the PV has not risen beyond the alarm determination range, the alarm will be turned on.

If the autotuning function is used, the LBA time is automatically set twice as large as the integral time. The LBA setting time will not be changed even if the integral time is changed.

LBA Deadband function:

The LBA may malfunction due to external disturbances. To prevent malfunctioning due to external disturbance, LBA deadband (LBD) sets a neutral zone in which LBA is not activated. When the Measured value (PV) is within the LBD area, LBA will not be activated. If the LBD setting is not correct, the LBA will not work correctly.



A: During temperature rise: Alarm area B: During temperature rise: Non-alarm area
During temperature fall: Non-alarm area During temperature fall: Alarm area

LBD differential gap: TC/RTD input: 0.8 °C [°F] (Fixed)
Voltage/Current input: 0.8 % of input span (Fixed)

If the LBA function detects an error occurring in the control loop, but cannot specify the location, a check of the control loop in order. The LBA function does not detect a location which causes alarm status. If LBA alarm is ON, check each device or wiring of the control loop.

LBA function is not operative when:
- AT function is activated.
- The controller is in STOP mode.
- LBA function is set to "0."
- LBA function is not assigned to Event 3 or Event 4.

If the LBA time is too short or does not match the controlled object requirements, LBA may turn ON or OFF at inappropriate time or remain OFF. Change the LBA time based on the malfunction.

While the LBA is ON (under alarm status), the following conditions cancel the alarm status and LBA will be OFF:
- The Measured value (PV) rises beyond (or falls below) the LBA determination range within the LBA time.
- The Measured value (PV) enters within the LBA deadband.

Remote input value monitor	Extension number	64
	Remote register address	1 station occupied 1 time, 1 station occupied 4 times and 4 stations occupied 1 time: No assignment 1 station occupied 8 times: Low-order word: RWrn+E High-order word: RWrn+F

This value is an input value that is used for remote input function.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: Input 1_setting limiter low to Input 1_setting limiter high

☞ Refer to **Input range table (P. 80)**

Factory set value: —

Cascade monitor	Extension number	65
	Remote register address	1 station occupied 1 time, 1 station occupied 4 times and 4 stations occupied 1 time: No assignment 1 station occupied 8 times: Low-order word: RWrn+10 High-order word: RWrn+11

This value is an input value (a commanding value from the master) that is used for cascade control function.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: Input 2_setting limiter low to Input 2_setting limiter high

☞ Refer to **Input range table (P. 80)**

Factory set value: —
Related parameters: Input 2_use selection (P. 121)

Feedback resistance input value monitor	Extension number	66
	Remote register address	1 station occupied 1 time, 1 station occupied 4 times and 4 stations occupied 1 time: No assignment 1 station occupied 8 times: RWrn+14

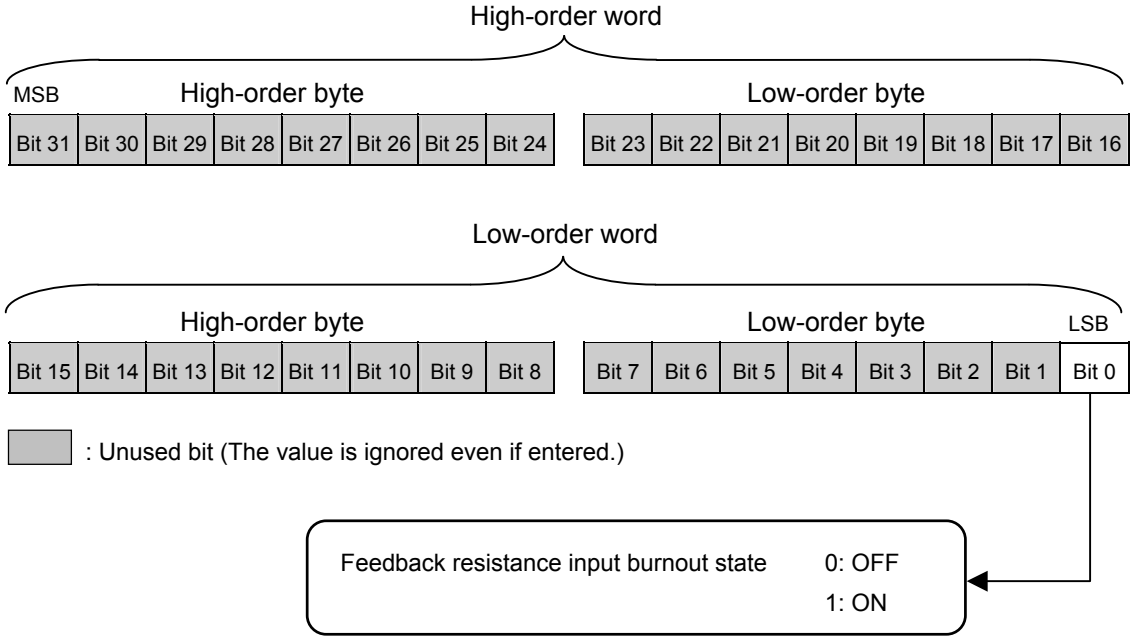
This value is a feedback resistance (FBR) input value of the controller.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: 0.0 to 100.0 %
Factory set value: —
Related parameters: Open/Close output neutral zone (P. 133),
Open/Close output differential gap (P. 134)

Feedback resistance input burnout state	Extension number	67

This value expresses a state in feedback resistance input break.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: Uses Bit 0 only.



Factory set value: —
Related parameters: Action at feedback resistance (FBR) input error (P. 132)

Memory area soak time monitor	Extension number	68
	Remote register address	1 station occupied 1 time, 1 station occupied 4 times and 4 stations occupied 1 time: No assignment 1 station occupied 8 times: Low-order word: RWrn+12 High-order word: RWrn+13

Monitors the time elapsed for memory area operation (soak time) when Ramp/Soak control by using multi-memory area is performed.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: 0 minute 00.00 second to 9 minutes 59.99 seconds or
0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds

Memory area soak time monitor is expressed in second unit for the communication.
0 minute 00.00 second to 9 minutes 59.99 seconds: 0 to 59999 seconds
0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds: 0 to 35999 seconds

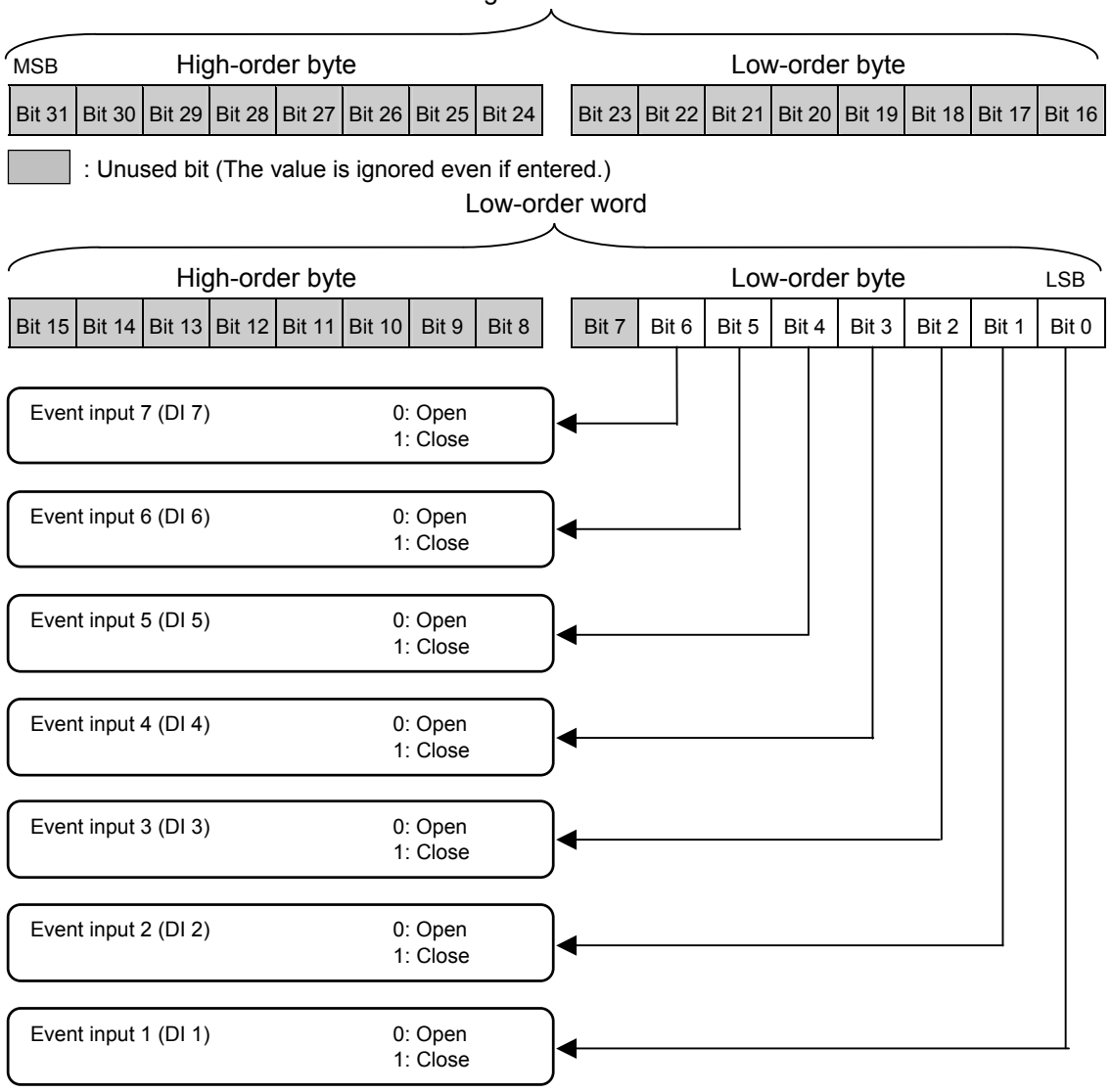
Factory set value: —
Related parameters: Area soak time (P. 97), Soak time unit selection (P. 139)

As the area soak time for the memory area linked last becomes invalidated, no area soak time is monitored.

Event input (DI) state	Extension number	69
	Remote register address	1 station occupied 1 time, 1 station occupied 4 times and 4 stations occupied 1 time: No assignment 1 station occupied 8 times: RWrn+15

Each event input state of the controller is expressed in bit data items.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: 0 to 127 (Bit data)
Bit 0 to Bit 6 are used. (Bit 7 to Bit 31: Unused)
Event input (DI) state is assigned as a bit image in binary numbers.

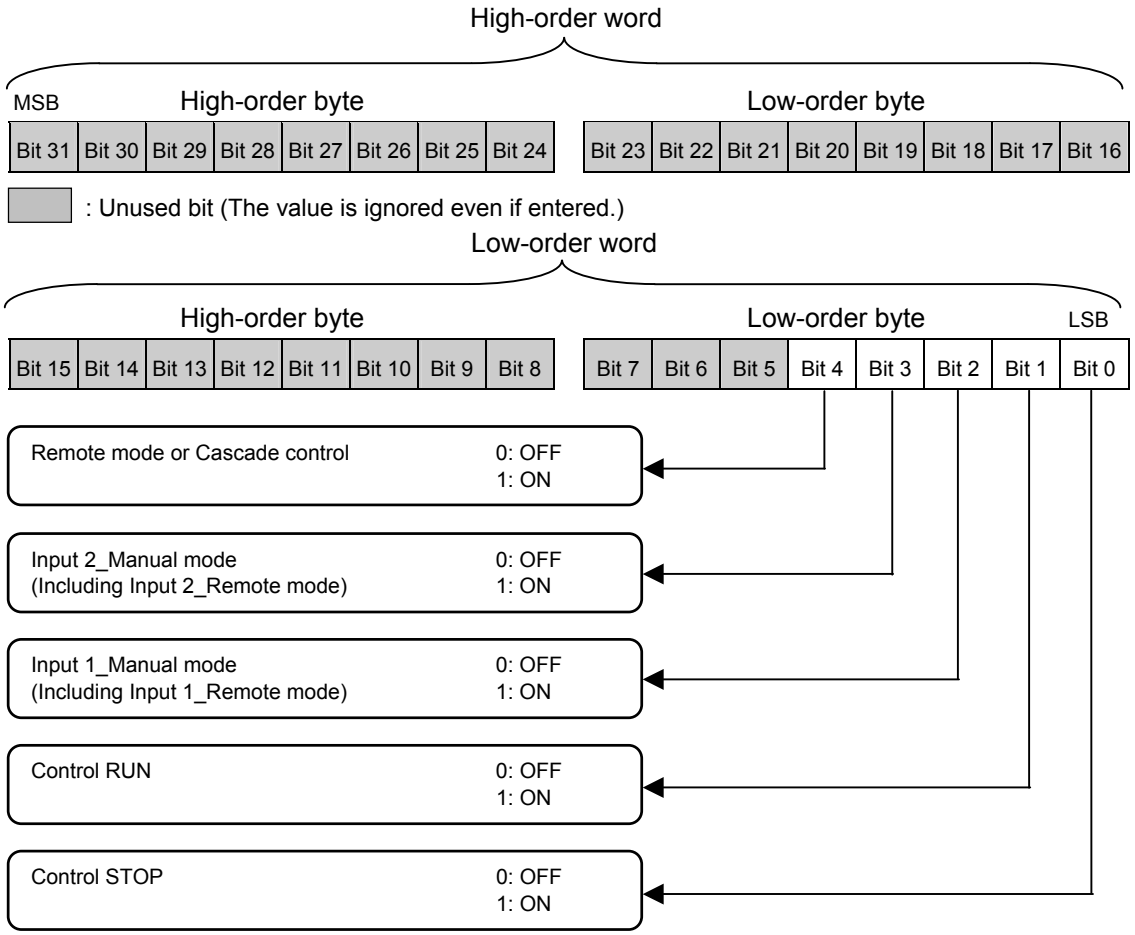


Factory set value: —
Related parameters: Event input logic selection (P. 107)

Operation mode state	Extension number	70
	Remote register address	1 station occupied 1 time: No assignment 1 station occupied 4 times, 1 station occupied 8 times and 4 stations occupied 1 time: RWrn+B

Each operation mode state of the controller is expressed in bit data items.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: 0 to 31 (Bit data)
Bit 0 to Bit 4 are used. (Bit 5 to Bit 31: Unused)
Each operation mode state is assigned as a bit image in binary numbers.



Factory set value: —
Related parameters: Auto/Manual transfer (P. 72), Remote/Local transfer (P. 96), RUN/STOP transfer (P. 71), Input 2_use selection (P. 121)

Remote/Local transfer	Extension number	90

This item selects to use the set value of local or remote input.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) besides the remote input specification or the cascade control specification.

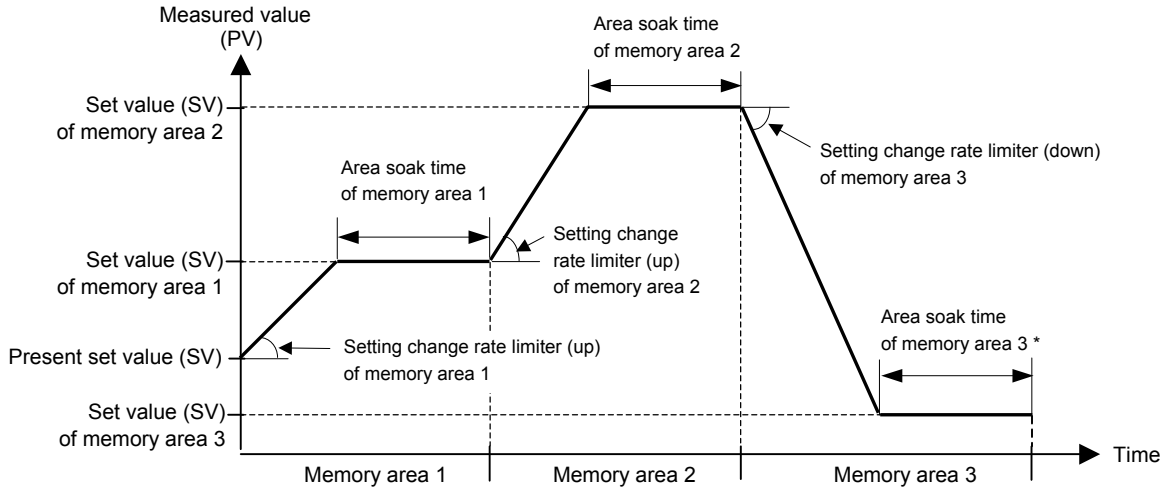
Number of data: 1 (Each controller)
Data range: 0: Local mode
1: Remote mode or Cascade control (Slave)
Factory set value: 0
Related parameters: Operation mode state (P. 95)

Link area number	Extension number	110

Link area number is used for Ramp/Soak control function in conjunction with Area soak time and Setting change rate limiter (up/down).

Attribute: R/W (Read and Write)
Number of data: 1 (Each controller)
Data range: 0 to 16
0: OFF (No link)
Factory set value: 0
Ramp/Soak control function:
Ramp/Soak control is possible by using Area soak time, Link area number and Setting change rate limiter (up/down) in Parameter setting mode.

[Usage example]



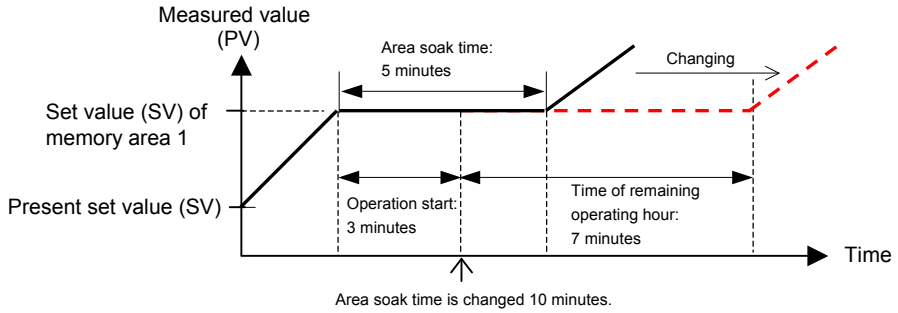
* The Area soak time for the memory area linked last becomes invalidated to continue the state of the Set value (SV) reached.

Area soak time	Extension number	111

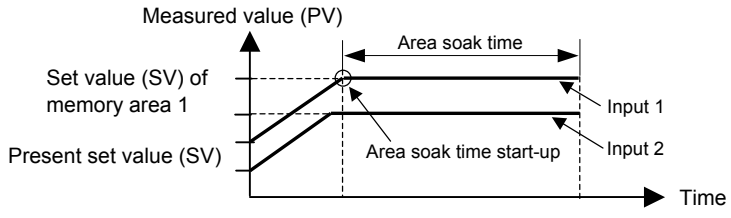
Area soak time is used for Ramp/Soak control function in conjunction with Link area number and Setting change rate limiter (up/down). (refer to P. 96)

Attribute: R/W (Read and Write)
Number of data: 1 (Each controller)
Data range: 0 minute 00.00 second to 9 minutes 59.99 seconds or
0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds
Factory set value: 0.00.00 (0 minute 00.00 second to 9 minute 59.99 seconds)
Related parameters: Soak time unit selection (P. 139)

The Area soak time can be changed during normal operation with Ramp/Soak control function, but Read the following example carefully how the time change affects Ramp/Soak control time. For example, the Memory area which has 5-minute soak time is executed. When 3 minutes passed, the Area soak time is changed from 5 minutes to 10 minutes. The remaining time of the currently executed Memory area is calculated as follows.
(The new soak time 10 minutes) – (lapsed time 3 minutes) = (remaining time 7 minutes)
The old soak time does not have any effect on remaining time.



For the instrument with the 2-input specification, its area soaking starts based on the arrival at the memory area set value of Input 1 or that of Input 2, whichever later.



Heater break determination point	Extension number	140

Set the heater break determination point for the heater break alarm (HBA) type B.

Attribute: R/W (Read and Write)

Heater break determination point 1 set value becomes RO (Read only) for no current transformer input 1 (CT1) specification and heater break alarm (HBA) type A.

Heater break determination point 2 set value becomes RO (Read only) for no current transformer input 2 (CT2) specification and heater break alarm (HBA) type A.

Number of data: 2 (Each channel)

Data range: Heater break determination point 1:
0.0 to 100.0 % of heater break alarm 1 (HBA1) set value
(0.0: Heater break determination is invalidated)
Heater break determination point 2:
0.0 to 100.0 % of heater break alarm 2 (HBA2) set value
(0.0: Heater break determination is invalidated)

Factory set value: Heater break determination point 1: 30.0
Heater break determination point 2: 30.0

Related parameters: Heater break alarm (HBA) set value (P. 75),
Heater melting determination point (P. 99),
Heater break alarm (HBA) type selection (P. 119),
Number of heater break alarm (HBA) delay times (P. 120)

Functional description:
Refer to Heater break alarm (HBA) set value (P. 75)

Heater melting determination point	Extension number	141

Set the heater melting determination point for the heater break alarm (HBA) type B.

Attribute: R/W (Read and Write)

📖 **Heater melting determination point 1 set value becomes RO (Read only) for no current transformer input 1 (CT1) specification and heater break alarm (HBA) type A.**

📖 **Heater melting determination point 2 set value becomes RO (Read only) for no current transformer input 2 (CT2) specification and heater break alarm (HBA) type A.**

Number of data: 2 (Each channel)

Data range: Heater melting determination point 1:
0.0 to 100.0 % of heater break alarm 1 (HBA1) set value
(0.0: Heater melting determination is invalidated)
Heater melting determination point 2:
0.0 to 100.0 % of heater break alarm 2 (HBA2) set value
(0.0: Heater melting determination is invalidated)

Factory set value: Heater melting determination point 1: 30.0
Heater melting determination point 2: 30.0

Related parameters: Heater break alarm (HBA) set value (P. 75),
Heater break determination point (P. 98),
Heater break alarm (HBA) type selection (P. 119),
Number of heater break alarm (HBA) delay times (P. 120)

Functional description:
Refer to Heater break alarm (HBA) set value (P. 75)

PV ratio	Extension number	142

PV ratio is a multiplier to be applied to the Measured value (PV). The PV bias is used to compensate the individual variations of the sensors or correct the difference between the Measured value (PV) of other instruments.

Attribute: R/W (Read and Write)

📖 **The Input 2_PV ratio becomes RO (Read only) for the 1-input controller.**

Number of data: 2 (Each channel)

Data range: 0.500 to 1.500

Factory set value: Input 1_PV ratio: 1.000
Input 2_PV ratio: 1.000

PV low input cut-off	Extension number	143

PV low input cut-off is used with Square root extraction function. The measured value less than the PV low input cut-off is ignored to prevent control disturbance caused by input variation at low measured value range.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

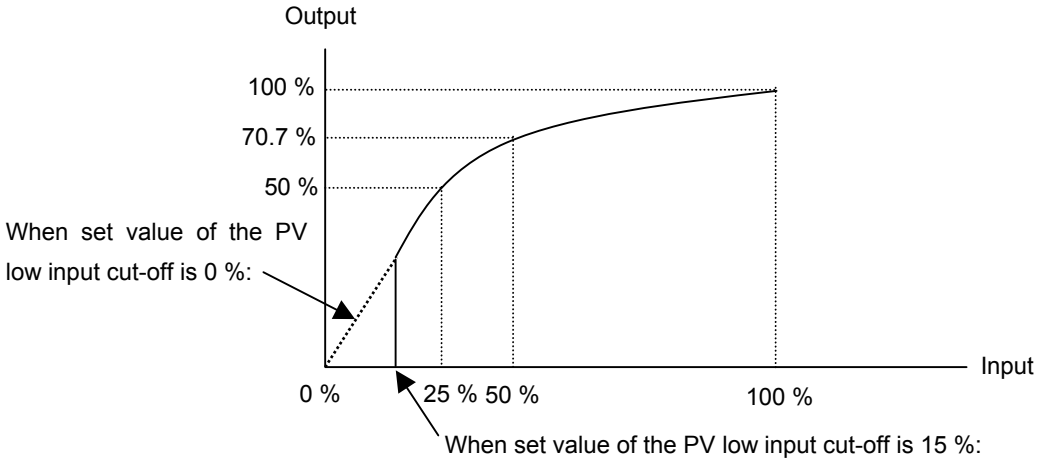
Number of data: 2 (Each channel)

Data range: 0.00 to 25.00 % of input span

Factory set value: Input 1_PV low input cut-off: 0.00
Input 2_PV low input cut-off: 0.00

PV low input cut-off function:

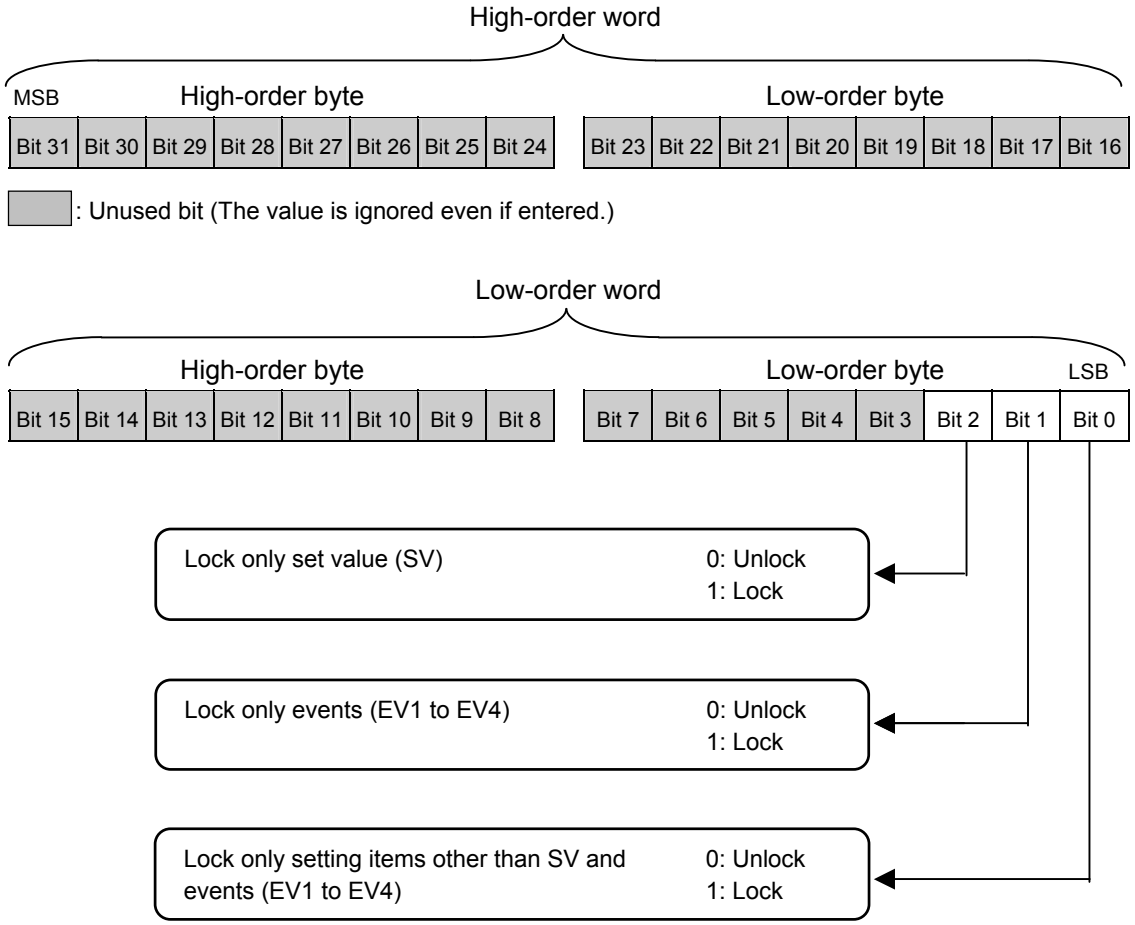
When input signal square root extraction is used for flow control, etc., the square root extraction result varies widely at the low measured value range. The measured value less than the PV low input cut-off is ignored to calculate control output in order to prevent control disturbance caused by input variation at low measured value range.



Set lock level	Extension number	144

The set lock level restricts parameter setting changes by key operation (Set data lock function).
This function prevents the operator from making errors during operation.

Attribute: R/W (Read and Write)
Number of data: 1 (Each controller)
Data range: 0 to 7 (Bit data)
Bit 0 to Bit 2 are used. (Bit 3 to Bit 31: Unused)
The set lock level is assigned as a bit image in binary numbers.



Factory set value: 0

EEPROM storage state	Extension number	146

The contents of the RAM and those of the EEPROM can be checked.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: 0: The content of the EEPROM does not coincide with that of the RAM.
- As data is being written to the EEPROM when the EEPROM storage mode is selected "0: Set values are store to the EEPROM when set values are changed," do not turn the power off. If turned off, no set values are stored.
- If the EEPROM storage mode is changed after "0: Set values are store to the EEPROM when set values are changed" is changed to "1: Not set values are store to the EEPROM when set values are changed," *0* is set (mismatch). As the set value changed is not backup, select the backup mode if necessary.

1: The content of the EEPROM coincides with that of the RAM.
The contents of the RAM match with those of the EEPROM.
(Data write to the EEPROM is completed.)

Factory set value: —

EEPROM storage mode	Extension number	147

It is set whether the data storage in the non-volatile memory (EEPROM) is executed or not.

Attribute: R/W (Read and Write)
Number of data: 1 (Each controller)
Data range: 0: Set values are store to the EEPROM when set values are changed.
1: Not set values are store to the EEPROM when set values are changed.
Factory set value: 0

When the memory is used to frequently change the set value via communication, select "1: Not set values are store to the EEPROM when set values are changed."

For the following case, data is stored into the EEPROM regardless of the EEPROM mode setting.
- **When the data is changed through key operation**
- **Data written into the controller by specifying the memory area number**

The non-volatile memory (EEPROM) has limitations on the number of memory rewrite times. If "1: Not set values are store to the EEPROM when set values are changed" is selected as the EEPROM storage mode, all of the set values changed are not written to the EEPROM and thus a problem of limitations on the number of memory rewrite times can be solved.

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When selecting any EEPROM storage mode, take notice of the following.

- If power failure occurs while "1: Not set values are store to the EEPROM when set values are changed" is selected, the set value returns to the value before the storage mode is selected.
- If "1: Not set values are store to the EEPROM when set values are changed" is changed to "0: Set values are store to the EEPROM when set values are changed," all of the set values at that time are stored to the EEPROM. If necessary to backup the final value of each set item, select "0: Set values are store to the EEPROM when set values are changed."
- When the power is turned on, "0: Set values are store to the EEPROM when set values are changed" is always set.

Display unit selection	Extension number	160

Use to select the temperature unit for thermocouple (TC) and RTD inputs.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0: °C
1: °F

Factory set value: Input 1_display unit selection: 0
Input 2_display unit selection: 0

Input scale high	Extension number	161

This value is high limit of the input scale range.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: Thermocouple (TC)/RTD inputs:
Input scale low to Maximum value of the selected input range
Voltage (V)/Current (I) inputs:
–19999 to +99999
(Varies with the setting of the decimal point position)

Factory set value: Input 1_input scale high:
Thermocouple (TC)/RTD inputs: Maximum value of the selected input range
Voltage (V)/Current (I) inputs: 100.0
Input 2_input scale high:
Thermocouple (TC)/RTD inputs: Maximum value of the selected input range
Voltage (V)/Current (I) inputs: 100.0

Related parameters: Input type selection (P. 80), Decimal point position (P. 77),
Input scale low (P. 104)

Input Scale High function:
The input scale range can be easily set by setting the input scale high limit/low limit.

When a Voltage/Current input type is selected, the Input scale high can be set lower than the Input scale low. (Input scale high < Input scale low)

Input scale low	Extension number	162

This value is to set the low limit of the input scale range.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: Thermocouple (TC)/RTD inputs:
Minimum value of the selected input range to Input scale high
Voltage (V)/Current (I) inputs:
–19999 to +99999
(Varies with the setting of the decimal point position)

Factory set value: Input 1_input scale low:
Thermocouple (TC)/RTD inputs: Minimum value of the selected input range
Voltage (V)/Current (I) inputs: 0.0
Input 2_input scale low:
Thermocouple (TC)/RTD inputs: Minimum value of the selected input range
Voltage (V)/Current (I) inputs: 0.0

Related parameters: Input type selection (P. 80), Decimal point position (P. 77),
Input scale high (P. 104)

Input Scale Low function:
Refer to the input scale high.

Input error determination point (high)	Extension number	163

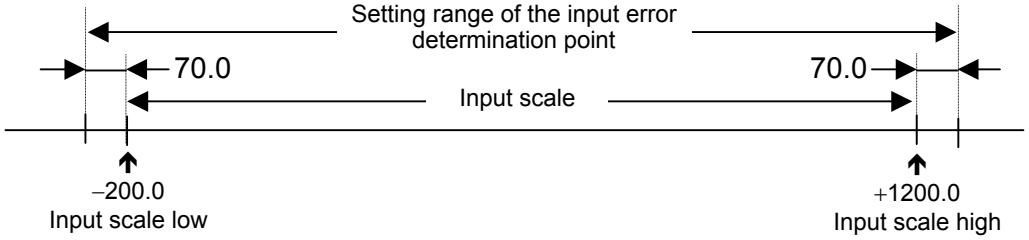
Use to set Input error determination point (high). Input error determination function is activated when a measured value reaches the limit, and control output value selected by Action at input error will be output.

Attribute: R/W (Read and Write)
This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: Input scale low – (5 % of input span) to Input scale high + (5 % of input span)

[Example] When the input scale is –200.0 to +1200.0:
Input span: 1400.0
5 % of input span: 70.0
Setting range: –270.0 to +1270.0



Factory set value: Input 1_input error determination point (high):
Thermocouple (TC)/RTD inputs: Input scale high + (5 % of input span)
Voltage (V)/Current (I) inputs: 105.0
Input 2_input error determination point (high):
Thermocouple (TC)/RTD inputs: Input scale high + (5 % of input span)
Voltage (V)/Current (I) inputs: 105.0

Related parameters: Input error determination point (low) (P. 105),
Action at input error (high) (P. 127), Action at input error (low) (P. 128),
Manipulated output value at input error (P. 128)

Input error determination point (low)	Extension number	164

Use to set Input error determination point (low). Input error determination function is activated when a measured value reaches the limit, and control output value selected by Action at input error will be output.

Attribute: R/W (Read and Write)
This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: Input scale low – (5 % of input span) to Input scale high + (5 % of input span)

Factory set value: Input 1_input error determination point (low):
Thermocouple (TC)/RTD inputs: Input scale low – (5 % of input span)
Voltage (V)/Current (I) inputs: –5.0
Input 2_input error determination point (low):
Thermocouple (TC)/RTD inputs: Input scale low – (5 % of input span)
Voltage (V)/Current (I) inputs: –5.0

Related parameters: Input error determination point (high) (P. 105),
Action at input error (high) (P. 127), Action at input error (low) (P. 128),
Manipulated output value at input error (P. 128)

Burnout direction	Extension number	165

Use to select Burnout direction in input break. When input break is detected by the controller, the measured value go either Upscale or Downscale according to the Burnout Direction setting.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0: Upscale
1: Downscale

Factory set value: Input 1_burnout direction: 0
Input 2_burnout direction: 0

The action in the input breaks fix regardless of setting a burnout direction about the following input.

- **RTD inputs: Upscale**
- **Voltage (High) inputs: Downscale (Indicates value near 0 V.)**
- **Current (I) inputs: Downscale (Indicates value near 0 mA.)**

Square root extraction selection	Extension number	166

Use to select Use/Unused of the square root extraction for the measured value.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0: Unused
1: Use

Factory set value: Input 1_square root extraction selection: 0
Input 2_square root extraction selection: 0

Related parameters: PV low input cut-off (P. 100)

Square root extraction function:

The controller can receive the input signal directly from a differential pressure type flow transmitter by using Square root extraction function without using a square root extractor.

Power supply frequency selection	Extension number	167

Use to select the power supply frequency of the controller suited to the application.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0: 50 Hz
1: 60 Hz

Factory set value: 0

Event input logic selection	Extension number	170

Use to assign the function (memory area, operation mode) for the event inputs (DI 1 to DI 7).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0 to 6 (refer to the following table)

[Function Assignment Table]

Set value	DI 1	DI 2	DI 3	DI 4	DI 5	DI 6	DI 7
	Terminal No. 30-31	Terminal No. 30-32	Terminal No. 30-33	Terminal No. 30-34	Terminal No. 35-36	Terminal No. 13-14	Terminal No. 13-15
0	Unused (No function assignment)						
1	Memory area number selection (1 to 16)				Memory area set	RUN/STOP transfer	Auto/Manual transfer
2	Memory area number selection (1 to 16)				Memory area set	RUN/STOP transfer	Remote/Local transfer
3	Memory area number selection (1 to 16)				Memory area set	Remote/Local transfer	Auto/Manual transfer
4	Memory area number selection (1 to 8)			Memory area set	RUN/STOP transfer	Remote/Local transfer	Auto/Manual transfer
5	Memory area number selection (1 to 8)			Memory area set	Remote/Local transfer	Unused	Unused
6	Memory area number selection (1 to 8)			Memory area set	Auto/Manual transfer	Unused	Unused

In case of CC-Link communication, event inputs DI 1 to DI 5 are not available.

DI 6 and DI 7 cannot be used when the Communication 1 function is specified.

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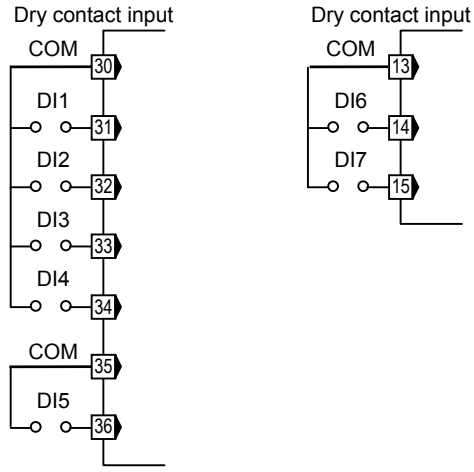
Event input terminals



Contact input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specification below.
Contact resistance: At OFF (contact open) 500 kΩ or more
At ON (contact closed) 10 Ω or less

Factory set value: 1
Event input function: Refer to the blow.

- Contact status of memory area number selection

To store a new Memory Area number as the Control Area, close the DI for Memory Area Set.

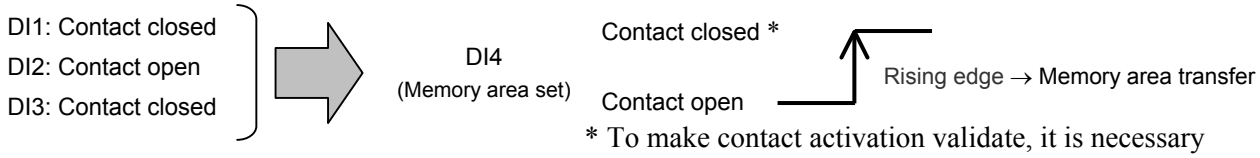
Event input	Memory area number															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DI 1	×	–	×	–	×	–	×	–	×	–	×	–	×	–	×	–
DI 2	×	×	–	–	×	×	–	–	×	×	–	–	×	×	–	–
DI 3	×	×	×	×	–	–	–	–	×	×	×	×	–	–	–	–
DI 4	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–

×: Contact open –: Contact closed

Transfer timing of memory area number:

[Example] Change the memory area number to 6
(when “4” is selected in “Event input logic selection”)

First, close the contacts between DI1 and DI3 and the common terminal. Next, open the contact between DI2 and the common. Then, close the contact between DI4 and the common from open status, the memory area in the controller will change to “6.”



* To make contact activation validate, it is necessary to maintain the same contact state (contact closed) for more than 200 ms.

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- **DI Status for mode transfer**

	Contact closed	Contact open	No event input or not selected
RUN/STOP transfer	RUN (Control RUN)	STOP (Control STOP)	RUN (Control RUN)
Auto/Manual transfer	Auto	Manual	Auto
Remote/Local transfer *	Remote or cascade control	Local	Local

* If "Input 2_use selection" is changed to "2: Cascade control (Slave)," "Remote/Local" needs to be changed to "Cascade/Local."

- **RUN/STOP transfer**

Mode select from front key or communication	Status of event input (DI)	Actual operation mode
RUN (Control RUN)	Contact closed	RUN (Control RUN)
	Contact open	STOP (Control STOP)
STOP (Control STOP)	Contact closed	
	Contact open	

- **Auto/Manual transfer**

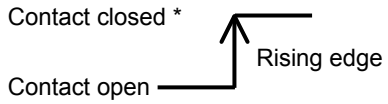
Mode select from front key or communication	Status of event input (DI)	Actual operation mode
Auto	Contact closed	Auto
	Contact open	Manual
Manual	Contact closed	
	Contact open	

- **Remote/Local transfer**

Mode select from front key or communication	Status of event input (DI)	Actual operation mode
Remote	Contact closed	Remote
	Contact open	Local
Local	Contact closed	
	Contact open	

Transfer timing of RUN/STOP, Auto/Manual, and Remote/Local:

The selection operation is taken when DI contact is closed from the open condition (Rising edge).



* To make contact activation validate, it is necessary to maintain the same contact state (contact closed) for more than 200 ms.

Output logic selection	Extension number	180

This is used to assign the output function (control output, event, etc.) for the output (OUT1 to OUT5).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 1 to 11 (refer to the following table)

(M: Relay contact output, V: Voltage pulse output, R: Current output, E: Voltage, T: Triac output)

Set value	OUT1 (M/ V / R/ E/ T)	OUT2 (M/ V/ R/ E/ T)	OUT3 (M/ V/ R/ E/ T)	OUT4 (M)	OUT5 (M)	Remarks
1	MV 1	HBA 1 (Energized) or HBA 2 (Energized)	EV 3 (Energized) or EV 4 (Energized)	EV 2 (Energized)	EV 1 (Energized)	—
2	MV 1	HBA 1 (De-energized) or HBA 2 (De-energized)	EV 3 (De-energized) or EV 4 (De-energized)	EV 2 (De-energized)	EV 1 (De-energized)	—
3	MV 1	EV 3 (Energized), EV 4 (Energized), HBA 1 (Energized) or HBA 2 (Energized)	EV 2 (Energized)	EV 1 (Energized)	FAIL (De-energized)	Energized alarm corresponding to FAIL output
4	MV 1	EV 3 (De-energized), EV 4 (De-energized), HBA 1 (De-energized) or HBA 2 (De-energized)	EV 2 (De-energized)	EV 1 (De-energized)	FAIL (De-energized)	De-energized alarm corresponding to FAIL output
5	MV 1	MV 2	EV 4 (Energized) or HBA 2 (Energized)	EV 3 (Energized) or HBA 1 (Energized)	EV 1 (Energized) or EV2 (Energized)	Energized alarm corresponding to two loops control
6	MV 1	MV 2	EV 4 (De-energized) or HBA 2 (De-energized)	EV 3 (De-energized) or HBA 1 (De-energized)	EV 1 (De-energized) or EV 2 (De-energized)	De-energized alarm corresponding to two loops control
7	MV 1	MV 2	EV 3 (Energized), EV 4 (Energized), HBA 1 (Energized) or HBA 2 (Energized)	EV 2 (Energized)	EV 1 (Energized)	Energized alarm corresponding to two loops control
8	MV 1	MV 2	EV 3 (De-energized), EV 4 (De-energized), HBA 1 (De-energized) or HBA 2 (De-energized)	EV 2 (De-energized)	EV 1 (De-energized)	De-energized alarm corresponding to two loops control
9	MV 1 (OPEN)	MV 1 (CLOSE)	EV 3 (Energized), EV 4 (Energized), HBA 1 (Energized) or HBA 2 (Energized)	EV 2 (Energized)	EV 1 (Energized)	Energized alarm corresponding to position proportioning PID control
10	MV 1 (OPEN)	MV 1 (CLOSE)	EV 3 (De-energized), EV 4 (De-energized), HBA 1 (De-energized) or HBA 2 (De-energized)	EV 2 (De-energized)	EV 1 (De-energized)	De-energized alarm corresponding to position proportioning PID control
11	MV 1	EV 4 (Energized) or HBA 2 (Energized)	EV 3 (Energized) or HBA 1 (Energized)	EV 2 (Energized)	EV 1 (Energized)	Energized alarm

MV 1 = Manipulated output value of Input 1,
MV 2 = Manipulated output value of Input 2,
MV 1 (OPEN) = Open-side control output of Position proportioning PID control,
MV 1 (CLOSE) = Close-side control output of Position proportioning PID control,
HBA 1 = Output of Heater break alarm 1,
HBA 2 = Output of Heater break alarm 2,
EV 1 = Output of Event 1, EV 2 = Output of Event 2, EV 3 = Output of Event 3, EV 4 = Output of Event 4, FAIL = FAIL output

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An output logic becomes *OR* output when two or more output functions are assigned to one output.

When three transmission outputs are selected, the transmission outputs are automatically assigned to OUT1 through OUT3 and it has priority over the Output logic selection.
To select Manipulated output value of Input 1 or Input 2 as output type of OUT1, OUT2 or OUT3, select "4: Input 1_manipulated output value (MV)" or "8: Input 2_manipulated output value (MV)" at the parameters of Transmission output type selection.

Transmission output type	Assign location of output
Transmission output 1	Output 1 (OUT1)
Transmission output 2	Output 2 (OUT2)
Transmission output 3	Output 3 (OUT3)

Factory set value: For 1-input controller: 1
For 2-input controller: 5

Related parameters: Output timer setting (P. 112), Transmission output type selection (P. 115), Event type selection (P. 83), CT assignment (P. 120), Heater break alarm (HBA) type selection (P. 119), Alarm lamp lighting condition setting (P. 113, P. 114)

Output 1 timer setting	Extension number	181
Output 2 timer setting	Extension number	182
Output 3 timer setting	Extension number	183
Output 4 timer setting	Extension number	184
Output 5 timer setting	Extension number	185

Output timer setting is to set an output delay time for event outputs.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0.0 to 600.0 seconds

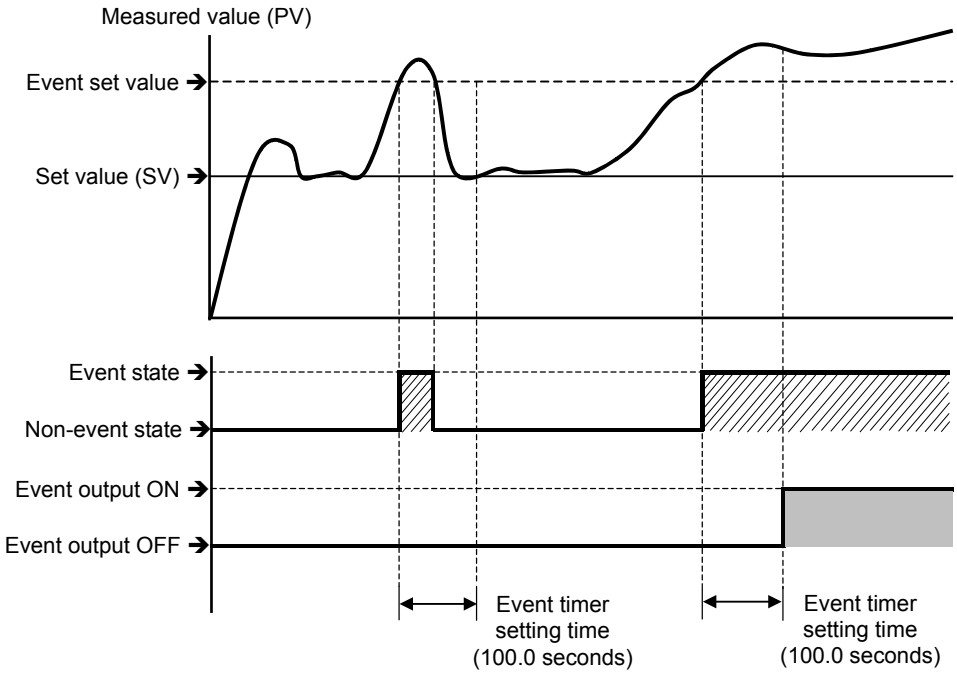
Factory set value: 0.0

Related parameters: Output logic selection (P. 110), Event type selection (P. 83), Alarm lamp lighting condition setting (P. 113, P. 114)

Output timer setting function:

When an event condition becomes On status, the output is suppressed until the Output Timer set time elapses. After the time is up, if the event output is still ON status, the output will be produced.

Example: When set the event timer to 100.0 seconds.



Alarm lamp lighting condition setting 1	Extension number	186

Use to set an alarm (ALM) lamp lighting conditions to Event 1 to Event 4.

Attribute: R/W (Read and Write)

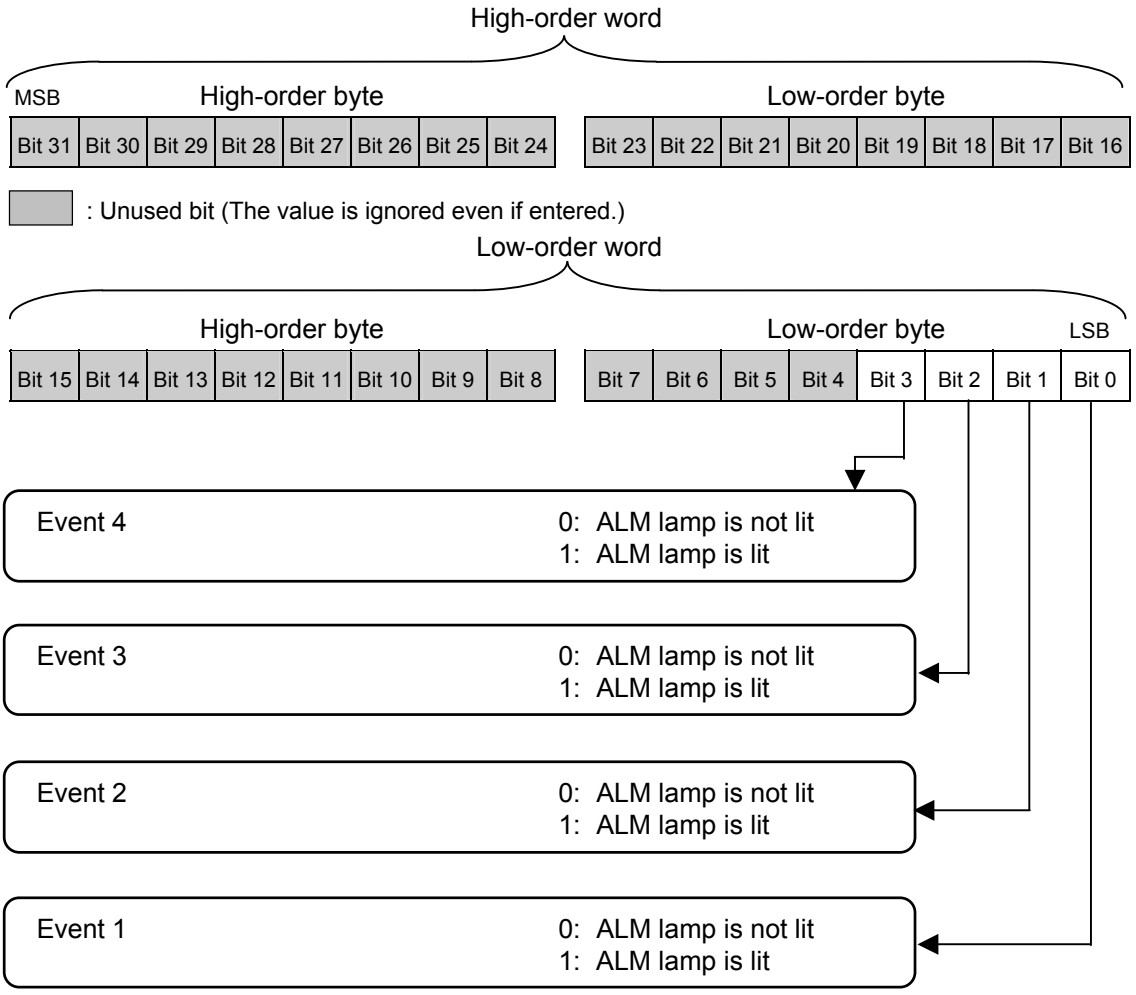
This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0 to 15 (Bit data)

Bit 0 to Bit 3 are used. (Bit 4 to Bit 31: Unused)

The alarm lamp lighting condition setting 1 is assigned as a bit image in binary numbers.



Factory set value: 15

The alarm lamp is lit through the *OR* operation of Event 1 to Event 4, HBA1 and HBA2 each of which is set to "1: ALM lamp is lit."

Alarm lamp lighting condition setting 2	Extension number	187

Use to set an alarm (ALM) lamp lighting conditions to HBA1 and HBA2.

Attribute: R/W (Read and Write)

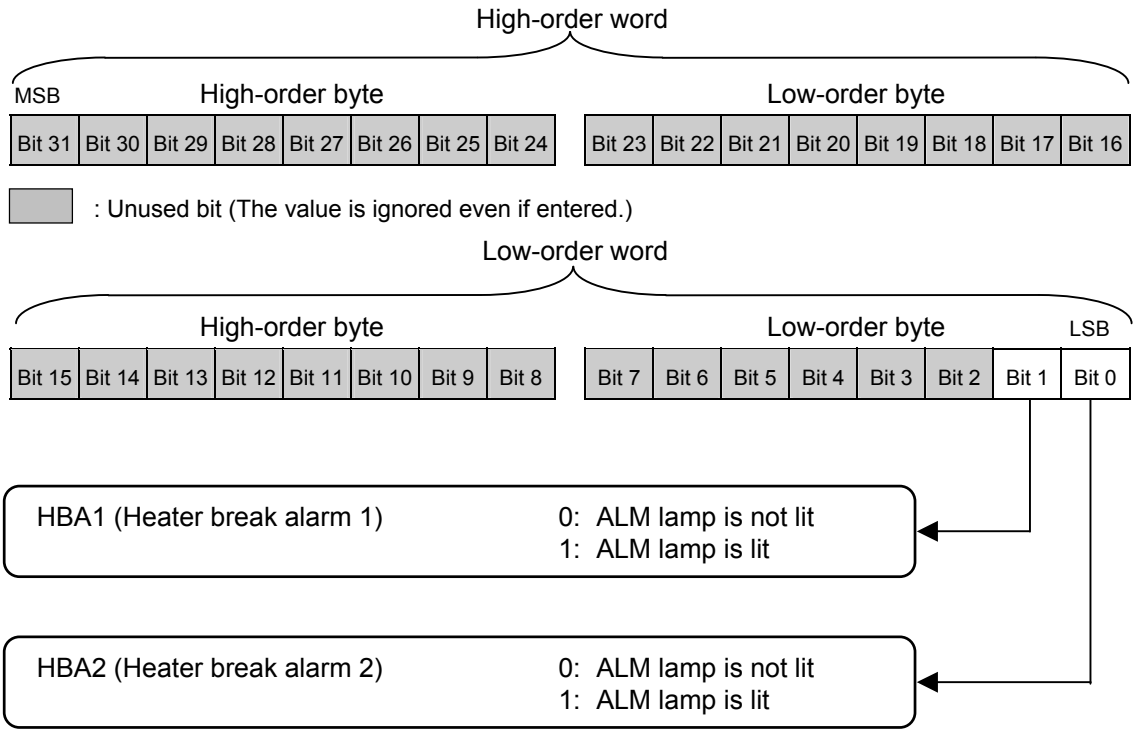
This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0 to 3 (Bit data)

Bit 0 and Bit 1 are used. (Bit 2 to Bit 31: Unused)

The alarm lamp lighting condition setting 2 is assigned as a bit image in binary numbers.



Factory set value: 3

The alarm lamp is lit through the *OR* operation of Event 1 to Event 4, HBA1 and HBA2 each of which is set to "1: ALM lamp is lit."

Transmission output 1_ type selection	Extension number	190
Transmission output 2_ type selection	Extension number	193
Transmission output 3_ type selection	Extension number	196

Use to select the transmission output type.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range:
0: None
1: Input 1_measured value (PV)
2: Input 1_set value (SV)
3: Input 1_deviation value
4: Input 1_manipulated output value (MV)
5: Input 2_measured value (PV)
6: Input 2_set value (SV)
7: Input 2_deviation value
8: Input 2_manipulated output value (MV)
9: Feedback resistance input value (POS)

Factory set value: 0

Related parameters: Transmission output scale high (P. 116),
Transmission output scale low (P. 116)

Specify the output type of the transmission output when ordering.

When transmission outputs are selected and used, the outputs are allocated as follows.
- Transmission output 1: Output 1 (OUT1)
- Transmission output 2: Output 2 (OUT2)
- Transmission output 3: Output 3 (OUT3)

The transmission has priority over the Output logic selection.

Transmission output 1_scale high	Extension number	191
Transmission output 2_scale high	Extension number	194
Transmission output 3_scale high	Extension number	197

Use to set a scale high limit value of the transmission output.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: Measured value (PV) and Set value (SV): Input scale low to Input scale high
Manipulated output value (MV) and Feedback resistance input value (POS): –5.0 to +105.0 %
Deviation value: –Input span to +Input span

Factory set value: Measured value (PV) and Set value (SV): Input scale high
Manipulated output value (MV) and Feedback resistance input value (POS): 100.0
Deviation value: + Input span

Related parameters: Transmission output type selection (P. 115),
Transmission output scale low (P. 116)

Transmission output 1_scale low	Extension number	192
Transmission output 2_scale low	Extension number	195
Transmission output 3_scale low	Extension number	198

Use to set a scale low limit value of the transmission output.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: Measured value (PV) and Set value (SV): Input scale low to Input scale high
Manipulated output value (MV) and Feedback resistance input value (POS): –5.0 to +105.0 %
Deviation value: –Input span to +Input span

Factory set value: Measured value (PV) and Set value (SV): Input scale low
Manipulated output value (MV) and Feedback resistance input value (POS): 0.0
Deviation value: –Input span

Related parameters: Transmission output type selection (P. 115),
Transmission output scale high (P. 116)

Event 1 action at input error	Extension number	200
Event 2 action at input error	Extension number	204
Event 3 action at input error	Extension number	208
Event 4 action at input error	Extension number	212

Event action at input error is to select the event action when the measured value reaches the input error determination point (high or low limit).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

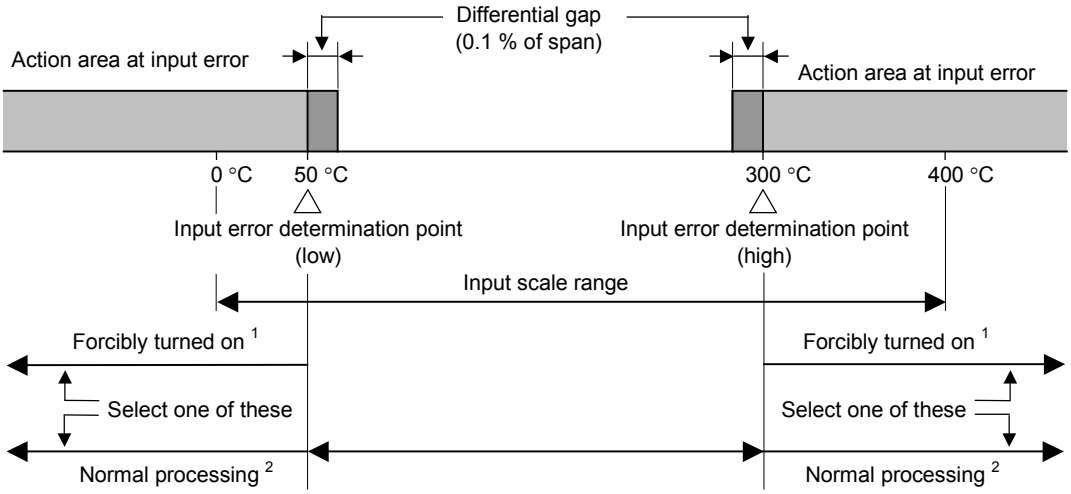
Data range: 0: Normal processing
1: Turn the event output ON

Factory set value: 0

Related parameters: Input error determination point (high) (P. 105),
Input error determination point (low) (P. 105)

Event action at input error:

Example: Input range: 0 to 400 °C
Input error determination point (high): 300 °C
Input error determination point (low): 50 °C



[1] The event output is forcibly turned on regardless of the selected event action status when the input is abnormal.

[2] The event output is produced depending on the selected event action status even if the input is abnormal.

Event 1 assignment	Extension number	201
Event 2 assignment	Extension number	205
Event 3 assignment	Extension number	209
Event 4 assignment	Extension number	213

Use to assign event outputs to either Input 1 or Input 2.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 1: For input 1
2: For input 2

Factory set value: 1

Related parameters: Event set value (P. 70), Event type selection (P. 83),
Event hold action (P. 86), Event differential gap (P. 85),
Event action at input error (P. 117)

CT ratio	Extension number	220

Use to set the number of turns in the current transformer which is used to monitor the current flowing through the load. There are two types of dedicated current transformers.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0 to 9999

Factory set value: When the CT type is CTL-6-P-N: 800
When the CT type is CTL-12-S56-10L-N: 1000

Related parameters: Heater break alarm (HBA) set value (P. 75), CT assignment (P. 120)
Heater break determination point (P. 98),
Heater melting determination point (P. 99)

Heater break alarm (HBA) type selection	Extension number	221

Use to select the heater break alarm type.

Attribute: R/W (Read and Write)

HBA1 type selection becomes RO (Read only) for no current transformer input 1 (CT1) specification.

HBA2 type selection becomes RO (Read only) for no current transformer input 2 (CT2) specification.

Number of data: 2 (Each channel)

Data range: 0: Heater break alarm (HBA) type A
1: Heater break alarm (HBA) type B

Factory set value: Heater break alarm 1 (HBA1) type selection: 1
Heater break alarm 2 (HBA1) type selection: 1

Related parameters: Heater break alarm (HBA) state (P. 145),
Heater break alarm (HBA) set value (P. 75),
Heater break determination point (P. 98),
Heater melting determination point (P. 99),
Output logic selection (P. 110), CT ratio (P. 118), CT assignment (P. 120),
Number of heater break alarm (HBA) delay times (P. 120)

Heater break alarm function:

■ Heater break alarm (HBA) type A

- Heater break alarm (HBA) type A can only be used with time-proportional control output (relay, voltage pulse, or triac output).
- The HBA function monitors the current flowing through the load by a dedicated current transformer (CT), compares the measured value with the HBA set values, and detects a fault in the heating circuit.
- Set the HBA set value to approximately 85 % of the maximum reading of the CT input.
- Set the HBA set value to a slightly smaller value to prevent a false alarm depending on the stability of the power supply. When more than one heater is connected in parallel, it may be necessary to increase the HBA set value to detect a single heater failure.

■ Heater break alarm (HBA) type B

- Heater break alarm (HBA) type B can be used with both continuous control output (current/voltage continuous output) and time-proportional control output (relay, voltage pulse output, or triac).
- The HBA function assumes that the heater current value is proportional* to the control output value of the controller, otherwise viewed as the Manipulated variable (MV), and compare it with the CT input value to detect a fault in the heating or cooling circuit.

  * It is assumed that the current value flowing through the load is at maximum when the control output from the controller is 100 %, and the minimum current value flowing through the load is zero (0) when the control output from the controller is 0 %.
- Set the HBA set value to the maximum CT input value. This will be the current when the control is at 100 % control output.

Number of heater break alarm (HBA) delay times	Extension number	222

To prevent producing a false alarm, the alarm function waits to produce an alarm status until the measured CT input value is in an alarm range for the preset number of consecutive sampling cycles (HBA sampling cycle time: 500 ms).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)
Data range: 0 to 255
Factory set value: Number of heater break alarm 1 (HBA1) delay times: 5
Number of heater break alarm 2 (HBA2) delay times: 5
Related parameters: Heater break alarm (HBA) state (P. 145),
Heater break alarm (HBA) set value (P. 75),
Heater break determination point (P. 98),
Heater melting determination point (P. 99),
Output logic selection (P. 110), CT ratio (P. 118), CT assignment (P. 120),
Heater break alarm (HBA) type selection (P. 119)

CT assignment	Extension number	223

Use to assign the current transformer input to an output from OUT1 to OUT5. The CT input 1 is tied to HBA1, and the CT input 2 tied to HBA2, so when CT1 is assigned to OUT1, HBA1 is also automatically assigned to OUT1.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)
Data range: 0: None
1: Output 1 (OUT1)
2: Output 2 (OUT2)
3: Output 3 (OUT3)
4: Output 4 (OUT4)
5: Output 5 (OUT5)
Factory set value: **CT1 for:**
Current transformer 1 (CT1) input not provided: 0
Current transformer 1 (CT1) input provided: 1 (When HBA1 is specified)
CT2 for:
Current transformer 2 (CT2) input not provided: 0
Current transformer 2 (CT2) input provided: 2 (When HBA2 is specified)
Related parameters: Heater break alarm (HBA) set value (P. 75), Output logic selection (P. 110), CT ratio (P. 118)

The current transformer 1 (CT1) is for the heater break alarm 1 (HBA1). The current transformer 2 (CT2) is for the heater break alarm 2 (HBA2). Select an appropriate output number by checking the Output Logic Selection or Transmission Output Type.

To use HBA for a three-phase load, both CT inputs can be assigned to the same output.

Hot/Cold start selection	Extension number	230

Use to select the start mode at power recovery.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0 to 5 (refer to the following table)

Set value	Power failure less than 3 seconds	Power failure 3 seconds or more
0	Hot start 1	Hot start 1
1	Hot start 1	Hot start 2
2	Hot start 1	Cold start
3	Hot start 2	Hot start 2
4	Hot start 2	Cold start
5	Cold start	Cold start
6	Hot start 1	Stop start
7	Hot start 2	Stop start
8	Stop start	Stop start

Factory set value: 0

Hot/Cold start function:

After the power failure, when power is back to the controller,

Hot start 1: the controller will return to the same operation mode and the same manipulated value which were used or calculated by the controller before power failure.

Hot start 2: the controller will return to the same operation mode which was used by the controller before power failure.

- In the Manual mode, the output value will be at the low output limit value.
- In the Auto mode, the controller will calculate the manipulated output value regardless that before power failure. So, the manipulated output varies.

Cold start: the controller will automatically go to Manual mode and output the low output limit value.

Stop start: Started in the control stop (STOP) state regardless of the RUN mode (Auto/Manual) before power failure. Set to the RUN mode before power failure when changed to RUN from STOP by RUN/STOP selection.

Input 2_use selection	Extension number	231

Use to select the usage of Input 2. Cascade control can be selected by this parameter.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0: Single loop control
1: Remote input
2: Cascade control (Slave)

Factory set value: 0

Cascade ratio	Extension number	232

Cascade ratio is a multiplier which is used to convert the manipulated output (%) to cascade signal (°C or °F) at the cascade master.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)
Data range: 0.0000 to 1.5000
Factory set value: 1.0000
Related parameters: Cascade bias (P. 122)

Cascade bias	Extension number	233

The cascade bias is applied to the input value on the slave side in the cascade control.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)
Data range: –Input span to +Input span
Factory set value: 0

The functional description of relative items to the cascade control is shown in the following.

- **Cascade control**

Cascade control monitors the controlled object temperature in the master unit and then corrects the set value in the slave unit depending on the deviation between the target value (set value) and actual temperature. The slave unit controls the non-controlled object (heater, refrigeration device, etc). As a result, the controlled object temperature can be reached and controlled at the target value. Cascade control is suitable for an application which has a large time lag between the heat/refrigeration source and section whose temperature is necessary to be controlled.

- **Cascade ratio**

The conversion rate when the manipulated output (%) in the cascade master is converted to the relevant cascade signal (°C or °F) can by changed from 0.0000 to 1.5000 by the cascade ratio.

- **Cascade bias**

The cascade bias is a bias added to the input value on the slave side.

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Example: Relationship between the manipulated output (%) in the cascade master and relevant cascade signal (°C)

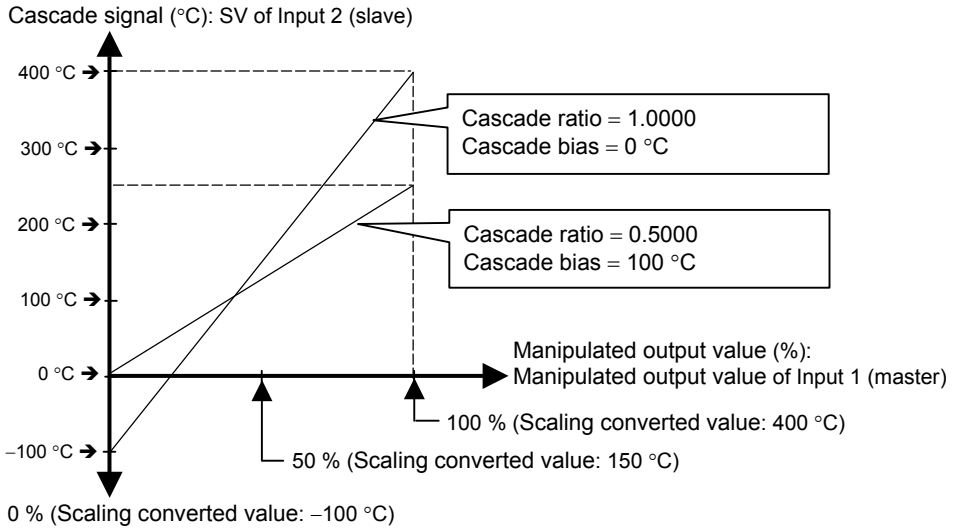
Output scale in the input 1 (master): 0 to 100 %
Input scale in the input 2: −100 to +400 °C

Manipulated output of Input1 (master) = 0 %
Cascade ratio = 1.0000
Cascade bias = 0 °C
↓
Cascade signal (Input2: slave set value) = −100 °C

Manipulated output of Input1 (master) = 0 %
Cascade ratio = 0.5000
Cascade bias = 100 °C
↓
Cascade signal (Input2: slave set value) = 0 °C

Manipulated output of Input1 (master) = 100 %
Cascade ratio = 1.0000
Cascade bias = 0 °C
↓
Cascade signal (Input2: slave set value) = 400 °C

Manipulated output of Input1 (master) = 100 %
Cascade ratio = 0.5000
Cascade bias = 100 °C
↓
Cascade signal (Input2: slave set value) = 250 °C



SV tracking	Extension number	234

To select Use/Unused of SV tracking.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

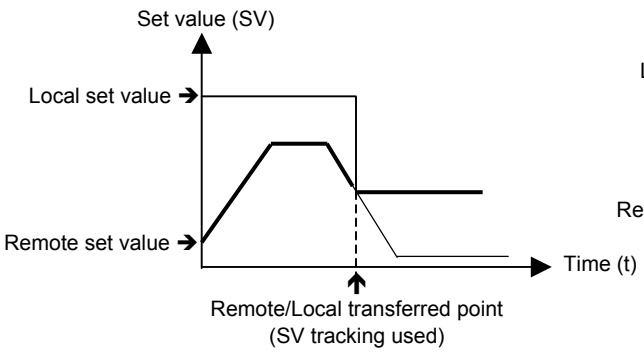
Data range: 0: Unused
1: Use

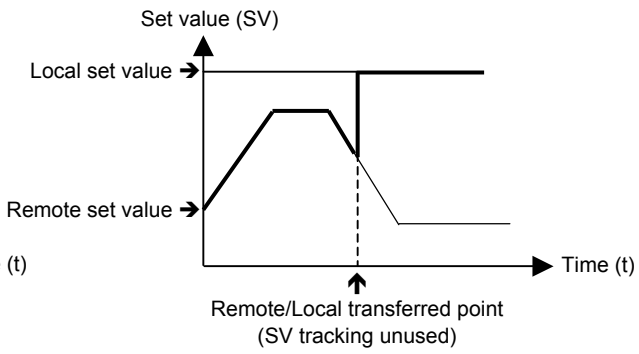
Factory set value: 1

SV tracking function:

With SV Tracking function, when Remote/Local mode is transferred from Remote to Local, the set value used in Remote mode before the mode transfer will be kept using in Local mode to prevent rapid set value change.

Operation mode:	Local →	Remote →	Local
Set value used	Local set value	Remote set value	Local set value
SV tracking used	Local set value ≠ Remote set value	Local set value = Remote set value	Local set value = Remote set value
SV tracking unused	Local set value ≠ Remote set value	Local set value ≠ Remote set value	Local set value ≠ Remote set value





Integral/Derivative time decimal point position selection	Extension number	240

Use to select a decimal point position of integral time and derivative time in PID control.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0: No decimal place
1: One decimal place
2: Two decimal places

Factory set value: Input 1_integral/derivative time decimal point position selection: 2
Input 2_integral/derivative time decimal point position selection: 2

Related parameters: Integral time (P. 68), Derivative time (P. 69)

Derivative gain	Extension number	241

Use to set a gain used for derivative action in PID control. Derivative gain should not be changed under ordinary operation.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0.1 to 10.0

Factory set value: Input 1_derivative gain: 6.0
Input 2_derivative gain: 6.0

Under ordinary operation, it is not necessary to change Derivative gain set value.

ON/OFF action differential gap (upper)	Extension number	242

Use to set the ON/OFF control differential gap (upper).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0 to Input span
(Varies with the setting of the Decimal point position)

Factory set value: Input 1_ON/OFF action differential gap (upper):
Thermocouple (TC) /RTD inputs: 1.0 °C [°F]
Voltage (V)/Current (I) inputs: 0.1 % of input span
Input 2_ON/OFF action differential gap (upper):
Thermocouple (TC) /RTD inputs: 1.0 °C [°F]
Voltage (V)/Current (I) inputs: 0.1 % of input span

Related parameters: ON/OFF action differential gap (lower) (P. 126)

ON/OFF action differential gap:
Refer to the ON/OFF action differential gap (lower).

ON/OFF action differential gap (lower)	Extension number	243

Use to set the ON/OFF control differential gap (lower).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0 to Input span

(Varies with the setting of the Decimal point position)

Factory set value: Input 1_ON/OFF action differential gap (lower):

Thermocouple (TC) /RTD inputs: 1.0 °C [°F]

Voltage (V)/Current (I) inputs: 0.1 % of input span

Input 2_ON/OFF action differential gap (lower):

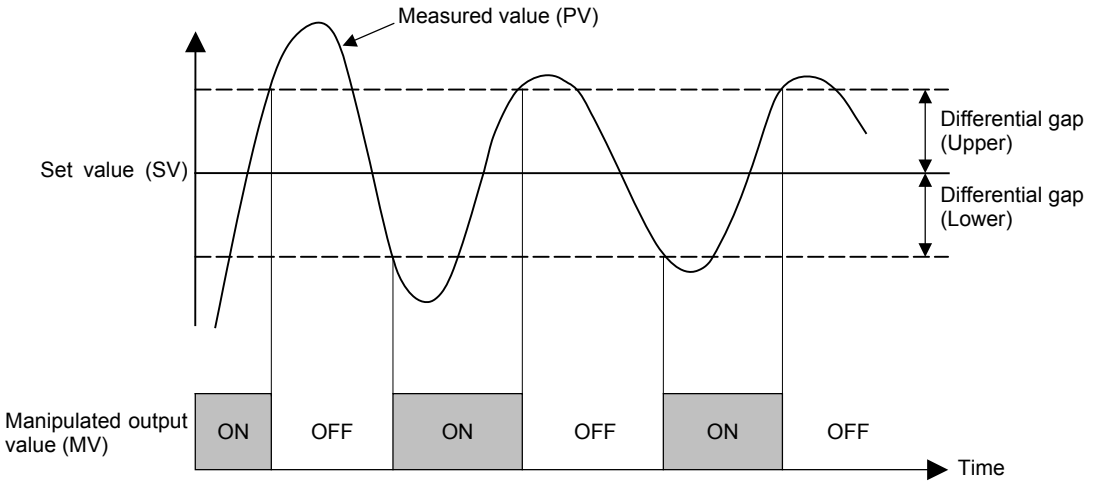
Thermocouple (TC) /RTD inputs: 1.0 °C [°F]

Voltage (V)/Current (I) inputs: 0.1 % of input span

Related parameters: ON/OFF action differential gap (upper) (P. 125)

ON/OFF action differential gap:

ON/OFF control is possible when the proportional band is set to "0" or "0.0." In ON/OFF control with Reverse action, when the Measured value (PV) is smaller than the Set value (SV), the Manipulated output (MV) is 100 % or ON. When the PV is higher than the SV, the MV is 0 % or OFF. Differential gap setting prevents control output from repeating ON and OFF too frequently.



Action at input error (high)	Extension number	244

Use to select the action when the measured value reaches the Input error determination point (high) or more.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

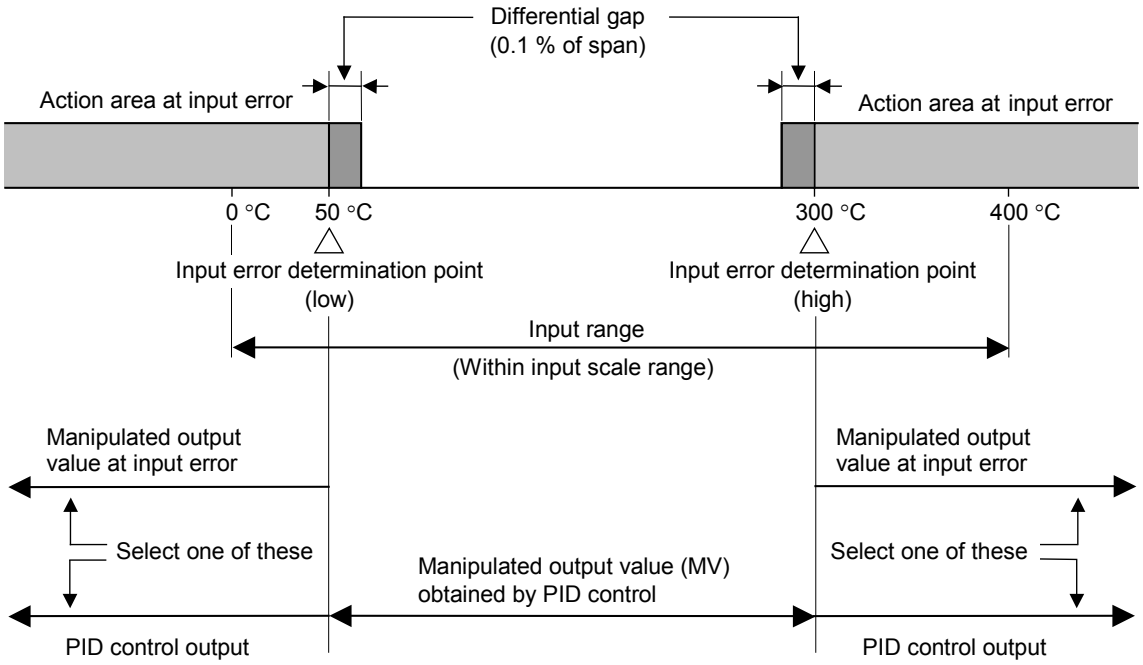
Data range: 0: Normal control
1: Manipulated output value at input error

Factory set value: Input 1_action at input error (high): 0
Input 2_action at input error (high): 0

Related parameters: Input error determination point (high) (P. 105),
Manipulated output value at input error (P. 128)

Action at input error:

Example: Input range: 0 to 400 °C
Input error determination point (high): 300 °C
Input error determination point (low): 50 °C



Action at input error (low)	Extension number	245

Use to select the action when the measured value reaches the Input error determination point (low).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0: Normal control
1: Manipulated output value at input error

Factory set value: Input 1_action at input error (low): 0
Input 2_action at input error (low): 0

Related parameters: Input error determination point (low) (P. 105),
Manipulated output value at input error (P. 128)

Action at input error: Refer to the action at input error (high).

Manipulated output value at input error	Extension number	246

When the measured value reaches Input error determination point and Action at input error is set to "1," this manipulated value is output.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: −5.0 to +105.0 %

Factory set value: Input 1_manipulated output value at input error: −5.0
Input 2_manipulated output value at input error: −5.0

Related parameters: Input error determination point (high) (P. 105),
Input error determination point (low) (P. 105),
Action at input error (high) (P. 127),
Action at input error (low) (P. 128)

Output change rate limiter (up)	Extension number	247

Use to set the output change rate limiter (upward side) to limit of the variation of output is set.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0.0 to 1000.0 %/second of manipulated output
0.0: OFF (Unused)

Factory set value: Input 1_output change rate limiter (up): 0.0
Input 2_output change rate limiter (up): 0.0

Related parameters: Output change rate limiter (down) (P. 130),
Output limiter high (P. 88), Output limiter low (P. 88)

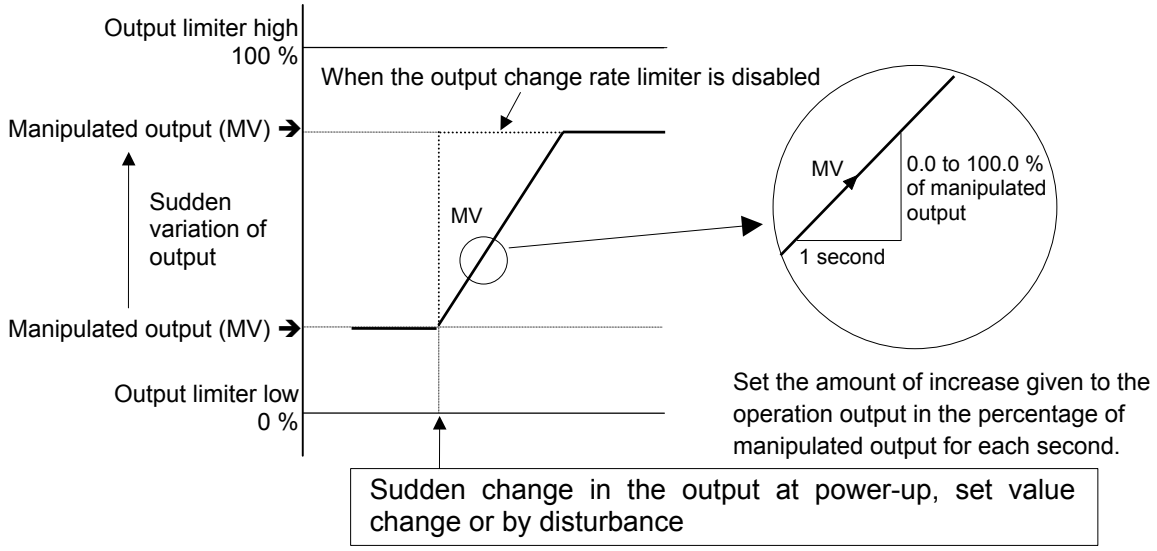
Output change rate limiter:

The Output change rate limiter limits the variation of Manipulated output (MV) per second. This function is suitable for an application in which a sudden MV change is not acceptable.

[Example]

The output change rate limiter is effective

- The MV reaches 100 % when the power is turned on to the controller and such a sudden output change is not acceptable in the application.
- A sudden output change occurs at the SV change and it is not acceptable in the application.



The output changes at specific rates set by Output change rate limiter (up) even under the situations where a sudden output change would occur without output change rate limiter function. There is also independent Output change rate limiter (down).

- If the output change rate is set smaller, it will cause slow control response and affect Derivative action.
- When the Output change rate limiter is used, you may not be able to obtain appropriate PID constants by Autotuning.
- The Output change rate limiter is particularly effective when a sudden MV change may create uncontrollable situation cause a large current flow. Also, it is very effective current output or voltage output is used as control output.

Output change rate limiter (down)	Extension number	248

Use to set the output change rate limiter (down).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0.0 to 1000.0 %/second of manipulated output
0.0: OFF (Unused)

Factory set value: Input 1_output change rate limiter (down): 0.0
Input 2_output change rate limiter (down): 0.0

Related parameters: Output change rate limiter (up) (P. 129),
Output limiter high (P. 88), Output limiter low (P. 88)

Output Change Rate Limiter:
Refer to the Output change rate limiter (up).

Power feed forward selection	Extension number	249

Use to select Use/Unused of the power feed forward (PFF) function.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

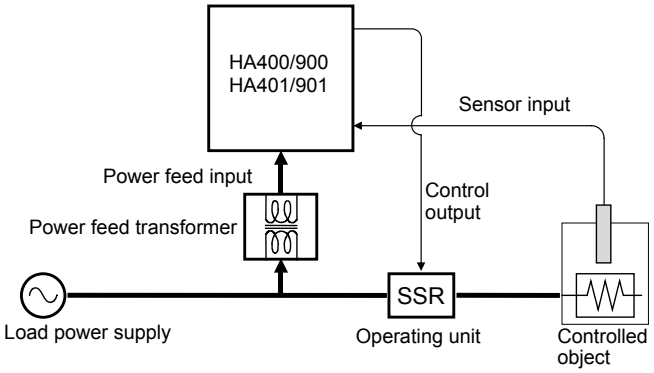
Data range: 0: Unused
1: Used

Factory set value: Input 1_power feed forward selection:
Based on the model code specified when ordered.
Input 2_power feed forward selection:
Based on the model code specified when ordered.

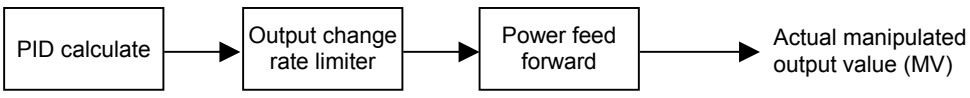
Related parameters: Power feed forward gain (P. 132)

Power feed forward function:

The power feed forward function monitors the electrical load through a dedicated transformer, and adjusts manipulated output to compensate power supply fluctuation. If the function detects approximately 30 % voltage drop, the controller automatically stops PID control.



The power feed forward function is used together with the output change rate limiter function, the manipulated output value may exceed the limit of the output change rate limiter.



Relationship between the power feed forward and output change rate limiter

The controller with power feed forward function (optional) must be used with the dedicated power feed transformer. The controller will not output the Manipulated value (MV), if the transformer is not connected to the controller.

This parameter applies only to instruments specified with the power feed forward function (optional) when ordered.

When the power feed forward function is used for two-loop control, the power supply for controlled objects of both loops is required to be common.

Always use the dedicated power feed transformer included.

Power feed forward gain	Extension number	250

Use to set a gain used for the power feed forward (PFF) function. Power Feed Forward gain should not be changed under ordinary operation.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)
Data range: 0.01 to 5.00
Factory set value: Input 1_power feed forward gain: 1.00
Input 2_power feed forward gain: 1.00
Related parameters: Power feed forward selection (P. 131)
Functional description:

Power supply voltage variations may give disturbances to the controlled temperature as they make an effect on external devices other than heaters. If in such a case, control stability can be maintained by adjusting the power feed forward gain. Usually, the instrument is used at a gain of 1.00.

Under ordinary operation, it is not necessary to change Power feed forward gain set value.

Action at feedback resistance (FBR) input error	Extension number	260

Use to select an action at the feedback resistance (FBR) input break.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)
Data range: 0: Close-side output ON, Open-side output OFF
1: Close-side output OFF, Open-side output OFF
2: Close-side output OFF, Open-side output ON
Factory set value: 0
Related parameters: Open/Close output neutral zone (P. 133),
Open/Close output differential gap (P. 134), Feedback adjustment (P. 135)

Feedback resistance (FBR) input assignment	Extension number	261

Use to assign the feedback resistance (FBR) input to an input.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)
Data range: 1: Input 1
2: Input 2
Factory set value: 1
Related parameters: Open/Close output differential gap (P. 134),
Action at feedback resistance (FBR) input error (P. 132),
Feedback adjustment (P. 135)

Open/Close output neutral zone	Extension number	262

Use to set Open/Close output neutral zone in position proportioning PID control.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

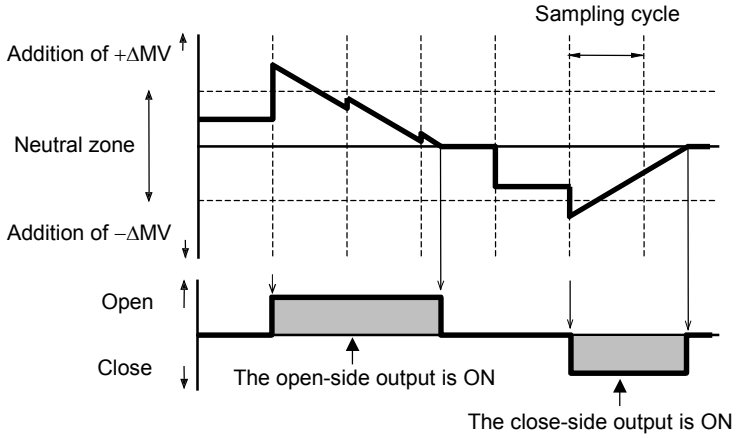
Data range: 0.1 to 10.0 % of output

Factory set value: 10.0

Related parameters: Open/Close output differential gap (P. 134),
Action at feedback resistance (FBR) input error (P. 132),
Feedback adjustment (P. 135)

Open/Close output neutral zone:

The neutral zone is used to prevent a control motor from repeating ON/OFF too frequently. When the PID calculated output value is within the neutral zone, the controller will not output the MV to a control motor.



The controller does not output the MV to a control motor when the PID calculated output value is within the neutral zone.

Open/Close output differential gap	Extension number	263

Use to set a differential gap of Open/Close output used in the position proportioning PID control.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

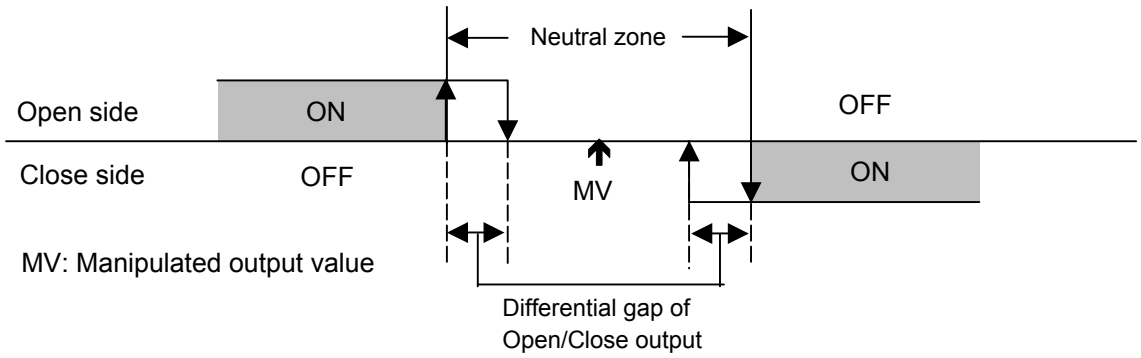
Data range: 0.1 to 5.0 % of output

Factory set value: 0.2

Related parameters: Open/Close output neutral zone (P. 133),
Action at feedback resistance (FBR) input error (P. 132),
Feedback adjustment (P. 135)

Open/Close output differential gap:

The Open/Close output differential gap prevents output ON/OFF chattering caused by fluctuation of feedback resistance input.



Feedback adjustment	Extension number	264

Feedback Adjustment function is to adjust controller's output value to match the feedback resistance (FBR) of the control motor. After the adjustment, the manipulated output value of 0 to 100 % obtained after PID computation matches the valve position signal of the fully closed position to the fully opened position [feedback resistance (FBR) input] sent from the control motor. The adjustment have to be completed before starting operation. Always make sure that the wiring is correct and the control motor operates normally before the adjustment.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

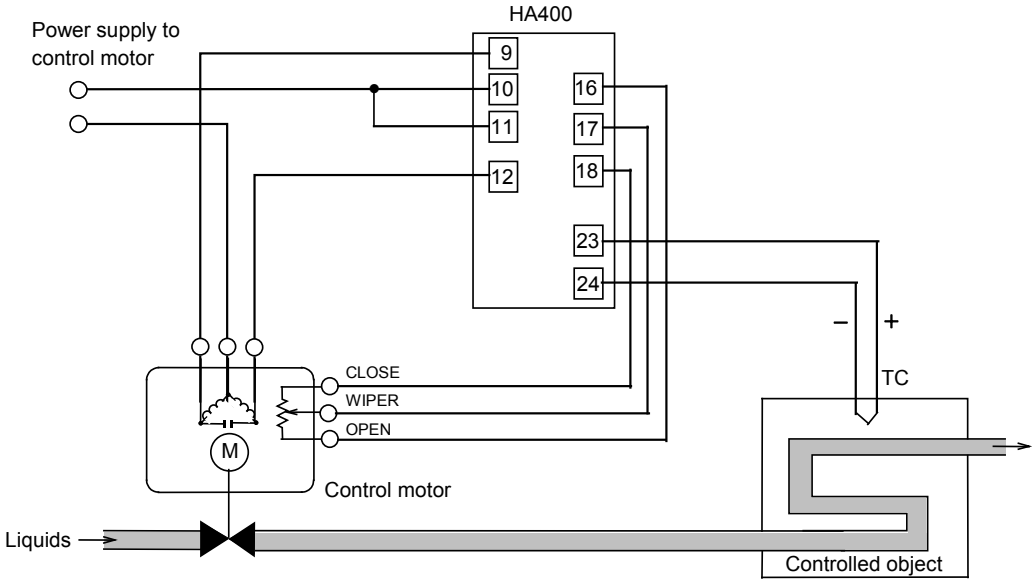
Data range: 0: Adjustment end
1: During the Open-side adjusting
2: During the Close-side adjusting

Factory set value: —

Functional description:

The position proportioning PID control is performed by feeding back both the valve opening (feedback resistance input) from the control motor and Measured value (PV) from the controlled object in the flow control.

[Wiring Example]



AT bias	Extension number	270

Use to set a bias to move the set value only when Autotuning is activated.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: –Input span to +Input span

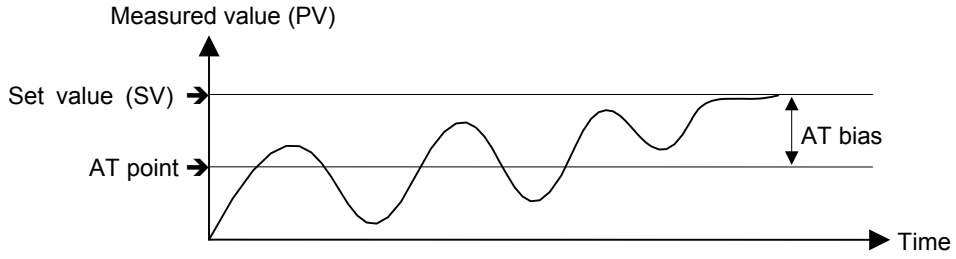
Factory set value: Input 1_AT bias: 0
Input 2_AT bias: 0

Related parameters: PID/AT transfer (P. 67)

Functional description:

The AT bias is used to prevent overshoot during Autotuning in the application which does not allow overshoot even during Autotuning. RKC Autotuning method uses ON/OFF control at the set value to calculate the PID values. However, if overshoot is a concern during Autotuning, the desired AT bias should be set to lower the set point during Autotuning so that overshoot is prevented.

Example: When AT bias is set to the minus (–) side



AT cycle	Extension number	271

Use to select the number of ON/OFF cycles used to calculate PID values during Autotuning.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

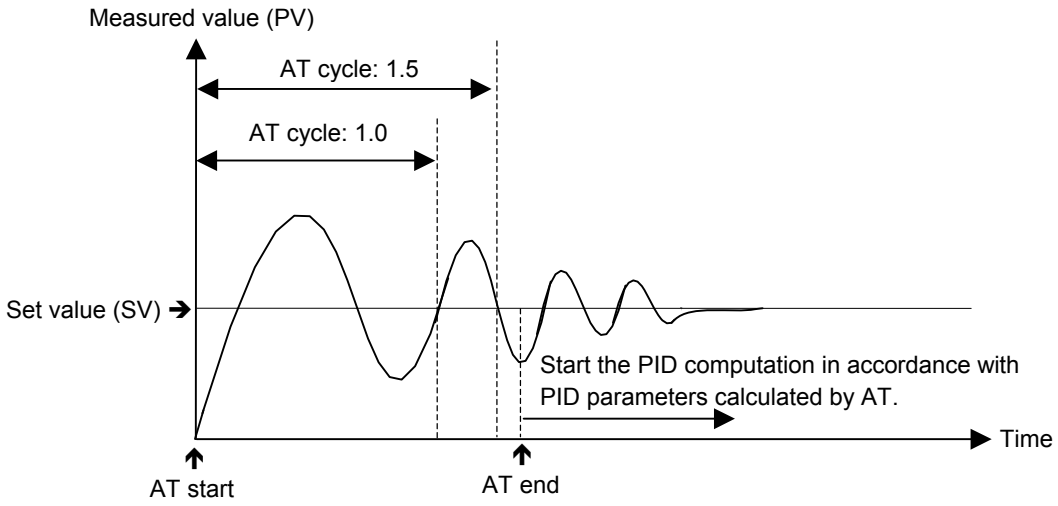
Number of data: 2 (Each channel)

Data range: 0: 1.5 cycles
1: 2.0 cycles
2: 2.5 cycles
3: 3.0 cycles

Factory set value: Input 1_AT cycle: 1
Input 2_AT cycle: 1

Related parameters: PID/AT transfer (P. 67)

Example: When the AT cycle is set to 1.5 cycle and the Autotuning (AT) function is executed just after the power is turned on.



AT differential gap time	Extension number	272

Use to set an ON/OFF action differential gap time for Autotuning. This function prevents the AT function from malfunctioning caused by noise.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 2 (Each channel)

Data range: 0.00 to 50.00 seconds

Factory set value: HA400/900: Input 1_AT differential gap time: 0.10
Input 2_AT differential gap time: 0.10
HA401/901: Input 1_AT differential gap time: 10.00
Input 2_AT differential gap time: 10.00

Related parameters: PID/AT transfer (P. 67)

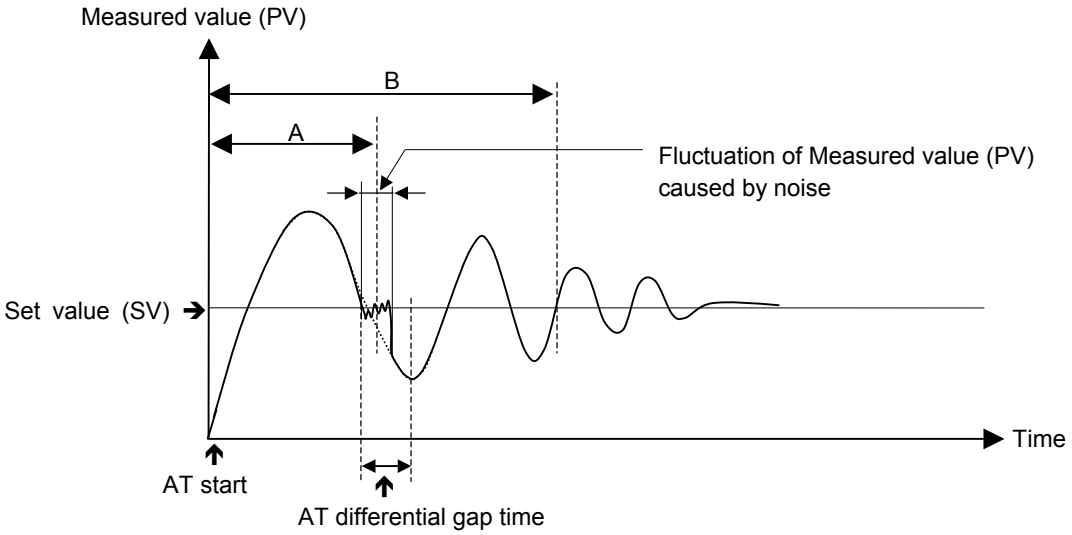
Functional description:

In order to prevent the output from chattering due to the fluctuation of a Measured value (PV) caused by noise during Autotuning, the output on or off state is held until "AT differential gap time" has passed after the output on/off state is changed to the other. Set "AT differential gap time" to "1/100 × Time required for temperature rise."

Example:

A: AT cycle time when the AT differential gap time is set to 0.00 second.
The output chatters due to the fluctuation of the Measured value (PV) caused by noise, and Autotuning function is not able to monitor appropriate cycles to calculate suitable PID values.

B: AT cycle time when the AT differential gap time is set to "Time corresponding to 0.25 cycles."
The fluctuation of a Measured value (PV) caused by noise is ignored and as a result Autotuning function is able to monitor appropriate cycles to calculate suitable PID values.



The factory set value of the AT cycle is 2 cycles.

Setting change rate limiter unit time	Extension number	300

Set the time unit for Setting change rate limiter (up/down).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 1 to 3600 seconds

Factory set value: 60

Related parameters: Setting change rate limiter (up) (P. 81)
Setting change rate limiter (down) (P. 82)

Soak time unit selection	Extension number	301

Use to select the time unit for Area soak time.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0: 0 hour 00 minutes 00 second to 9 hours 59 minutes 59 seconds
2: 0 minutes 00.00 seconds to 9 minutes 59.99 seconds

Factory set value: 2

Related parameters: Area soak time (P. 97)

STOP display selection	Extension number	320

STOP message for control STOP mode can be displayed either on the upper display or the lower display. This item is to select the display to show the STOP message.

Attribute: R/W (Read and Write)

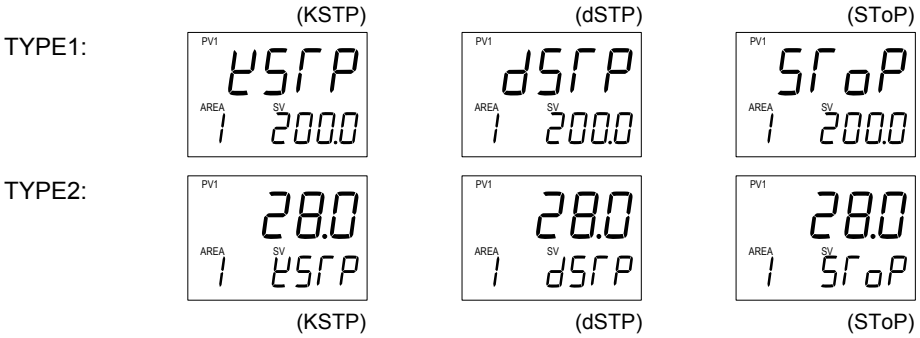
This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0: Displays on the measured value (PV1/PV2) unit (TYPE 1)
1: Displays on the set value (SV) unit (TYPE 2)

Factory set value: 0

There are three different Characters for STOP mode depending on how to be transferred from RUN to STOP.



Bar graph display selection	Extension number	321

Use to select the contents of the bar graph display.

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0: No display
1: Input 1_manipulated output value (MV)
2: Input 1_measured value (PV)
3: Input 1_set value (SV)
4: Input 1_deviation value
5: Feedback resistance input value (POS)
6: Input 2_manipulated output value (MV)
7: Input 2_measured value (PV)
8: Input 2_set value (SV)
9: Input 2_deviation value

Factory set value: 0

Related parameters: Bar graph resolution setting (P. 141)

Continued on the next page.

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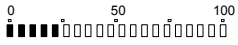
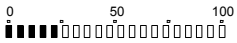
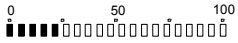
Bar graph display explanation:

Manipulated output value (MV) display	Displays the Manipulated output value (MV). When Manipulated output value (MV) is at 0 % or less, the left-end dot of the bar-graph flashes. When MV exceeds 100 %, the right-end dot flashes. [Display example] 
Measured value (PV) display	Scaling is available within the input range. [Display example] 
Set value (SV) display	Displays the Set value (SV). Scaling is available within the input range. [Display example] 
Deviation value display	Displays the deviation between the Measured value (PV) and the Set value (SV). When the Deviation display is selected, the dots at both ends of bar-graph light. A display resolution per dot is settable from 1 to 100. [Display example] 
Feedback resistance input value (POS) display	Displays the Feedback resistance input value (POS). It is available only with position proportioning PID control. [Display example] 

The number of dot points: 10 dots (HA400/401) 20 dots (HA900/901)

Bar graph resolution setting	Extension number	322

Use to set the bar graph display resolution for the deviation display. However, this set value becomes validated only when the bar graph display selection is “4: Input 1_deviation value” or “9: Input 2_deviation value.”

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 1 to 100 digit/dot

Sets several digit per 1 dots of the bar graph.

Factory set value: 100

Related parameters: Bar graph display selection (P. 140)

Auto/Manual transfer key operation selection	Extension number	323

Use to select Use/Unused of Auto/Manual transfer key (A/M).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0: Unused
1: Auto/Manual transfer for input 1
2: Auto/Manual transfer for input 2
3: Common Auto/Manual transfer for input 1 and input 2

Factory set value: 3

Remote/Local transfer key operation selection	Extension number	324

Use to select Use/Unused of Remote/Local transfer key (R/L).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0: Unused
1: Remote/Local transfer

Factory set value: 1

RUN/STOP transfer key operation selection	Extension number	325

Use to select Use/Unused of RUN/STOP transfer key (R/S).

Attribute: R/W (Read and Write)

This item becomes RO (Read only) during control RUN.

Number of data: 1 (Each controller)

Data range: 0: Unused
1: RUN/STOP transfer

Factory set value: 1

ROM version display	Extension number	340

This value is a version of the ROM loaded on the controller.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: Displays the version of loading software.
Factory set value: —

Integrated operating time monitor	Extension number	341

This value is an integrated operating time of the controller.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: 0 to 99999 hours
Factory set value: —

Holding peak value ambient temperature monitor	Extension number	342

This value is a maximum ambient temperature of the instrument.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: −10.0 to +100.0 °C
Factory set value: —

Power feed transformer input value monitor	Extension number	343

This value is the input value of a power feed forward transformer.

Attribute: RO (Read only)
Number of data: 1 (Each controller)
Data range: 0.0 to 160.0 %
Displays in the percentage of the rated value.
Factory set value: —

Event 1 state	Extension number	No assignment
	Remote input address	RXn0
Event 2 state	Extension number	No assignment
	Remote input address	RXn1
Event 3 state	Extension number	No assignment
	Remote input address	RXn5
Event 4 state	Extension number	No assignment
	Remote input address	RXn6

This value expresses a state of the event ON/OFF.

Attribute: RO (Read only)
Number of data: 1
Data range: 0: OFF
1: ON
Factory set value: —
Related parameters: Event set value (P. 70), Output logic selection (P. 110), Event type selection (P. 83), Event hold action (P. 86), Event differential gap (P. 85), Event action at input error (P. 117), Event assignment (P. 118)

Input 1_burnout state	Extension number	No assignment
	Remote input address	RXn2
Input 2_burnout state	Extension number	No assignment
	Remote input address	RXn7

This value expresses a state in input break.

Attribute: RO (Read only)
Number of data: 1
Data range: 0: OFF
1: ON
Factory set value: —
Related parameters: Burnout direction (P. 106)

Heater break alarm 1 (HBA1) state	Extension number	No assignment
	Remote input address	RXn3
Heater break alarm 2 (HBA2) state	Extension number	No assignment
	Remote input address	RXn8

This value expresses a state of the heater break alarm ON/OFF.

Attribute: RO (Read only)
Number of data: 1
Data range: 0: OFF
1: ON
Factory set value: —
Related parameters: Current transformer input value (CT) monitor (P. 66),
Heater break alarm (HBA) set value (P. 75),
CT ratio (P. 118), CT assignment (P. 120)

Input 1_PID/AT transfer state	Extension number	No assignment
	Remote input address	RXn4
Input 2_PID/AT transfer state	Extension number	No assignment
	Remote input address	RXn9

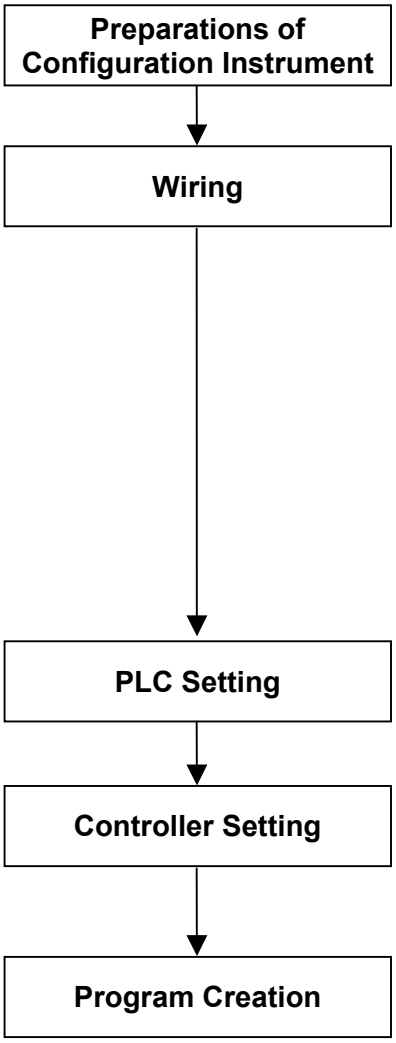
Monitors the transfer status of the PID control and the Autotuning (AT).

Attribute: RO (Read only)
Number of data: 1
Data range: 0: PID control
1: Autotuning (AT)
Factory set value: —
Related parameters: PID/AT transfer (P. 67)

7. USAGE EXAMPLE

This chapter describes a usage example of CC-Link communication.

7.1 Handling Procedures



☞ Refer to **7.2 System Configuration (P. 147)**.

☞
- For wiring of the controller, refer to **3. CONNECTION TO PLC (P. 4)**.
- For mounting and wiring of PLC, refer to **PLC Instruction Manual**.

☞ For cable wiring of CC-Link network system, see Instruction Manual of master instrument or website of CC-Link Partner Association.
http://www.cc-link.org/

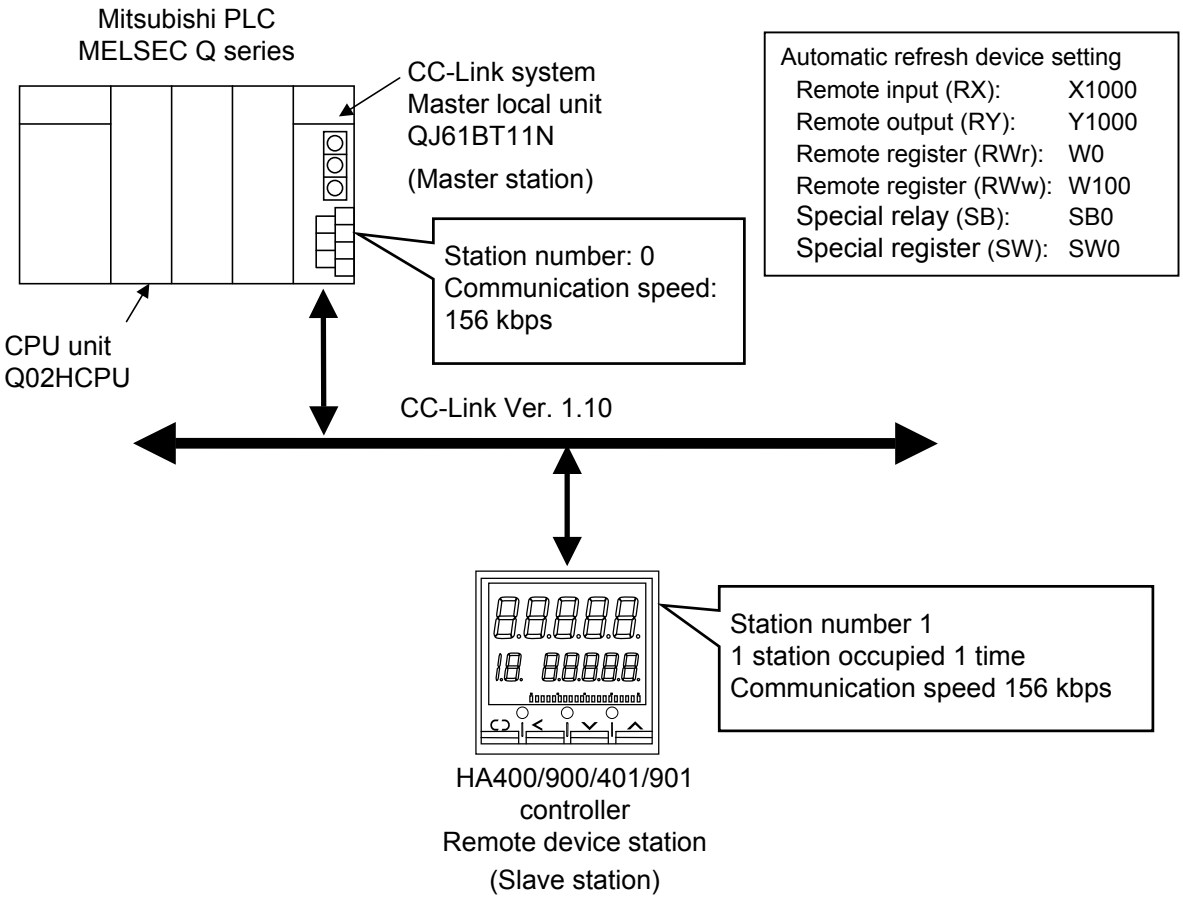
☞ Refer to **7.3 CC-Link Communication Setting (P. 148)** and **PLC Instruction Manual**.

☞ Refer to **4. SETTING (P. 6)** and **7.3 CC-Link Communication Setting (P. 148)**.

☞ Refer to **7.4 Device Assignments Example (P. 150)**, **7.5 Sample Program (P. 153)** and **PLC Instruction Manual**.

7.2 System Configuration

This usage example is explained using the following system configuration.



System configuration example

■ Instruments used in this configuration

- CC-Link controller
  HA400, HA900, HA401, and HA901
- Mitsubishi Electric PLC MELSEC Q series
  - CPU unit: Q02HCPU
  - CC-Link system master local unit: QJ61BT11N
- CC-Link dedicated cable Ver. 1.10

7.3 CC-Link Communication Setting

Set the PLC and controller as following.

■ PLC setting

☞ For operating of CC-Link system master local unit QJ61BT11N and MELSEC sequencer programming software GX Developer, refer to **PLC Instruction Manual**.

[CC-Link system master local unit QJ61BT11N setting]

Setting item	Content
Station number	0
CC-Link communication speed	156 kbps

[Master station network parameter setting by GX Developer]

Setting item	Content
Number of boards in module	1
Start I/O number	0000
Operational settings	Parameter name: None Data link disorder station setting: Clear Case of CPU STOP setting: Refresh
Type	Master station
CC-Link mode setting	Remote net (Ver. 1 mode)
Total number of connected modules	1
Number of retries	5
Number of automatic return modules	1
Standby master station number	Blank
Operation specification when CPU is down	Stop
Scan mode specification	Asynchronous
Delay time setting	10 (500 μs)
Station information [Number of controller connection: 1 (Station number: 1)]	Station type: Remote device station Expanded cyclic setting: Single Number of occupied stations: Occupies 1 station Remote station points: 32 points Reserved/Invalid station select: No setting Intelligent buffer select (word): No setting

📖 CC-Link version varies according to the specification of Occupied station/Extended cyclic of the controller. Select CC-Link version of PLC by setting the following CC-Link specifications:

- 1 station occupied 1 time/4 stations occupied 1 time: CC-Link Ver. 1.10
- 1 station occupied 4 times/1 station occupied 8 times: CC-Link Ver. 2.00

[Automatic refresh parameter setting by GX Developer]

Setting item	Content
Remote input (RX) refresh device	X1000
Remote output (RY) refresh device	Y1000
Remote register (RWr) refresh device	W0
Remote register (RWw) refresh device	W100
Special relay (SB) refresh device	SB0
Special register (SW) refresh device	SW0

■ Controller setting

[CC-Link communication conditions]

- Number of occupied station/extended cyclic (Communication 2 protocol): 1 station occupied 1 time
- Station number (Device address 2): 1
- CC-Link communication speed (Communication speed 2): 156 kbps

☞ For setting procedure, refer to **4. SETTING (P. 6)**.

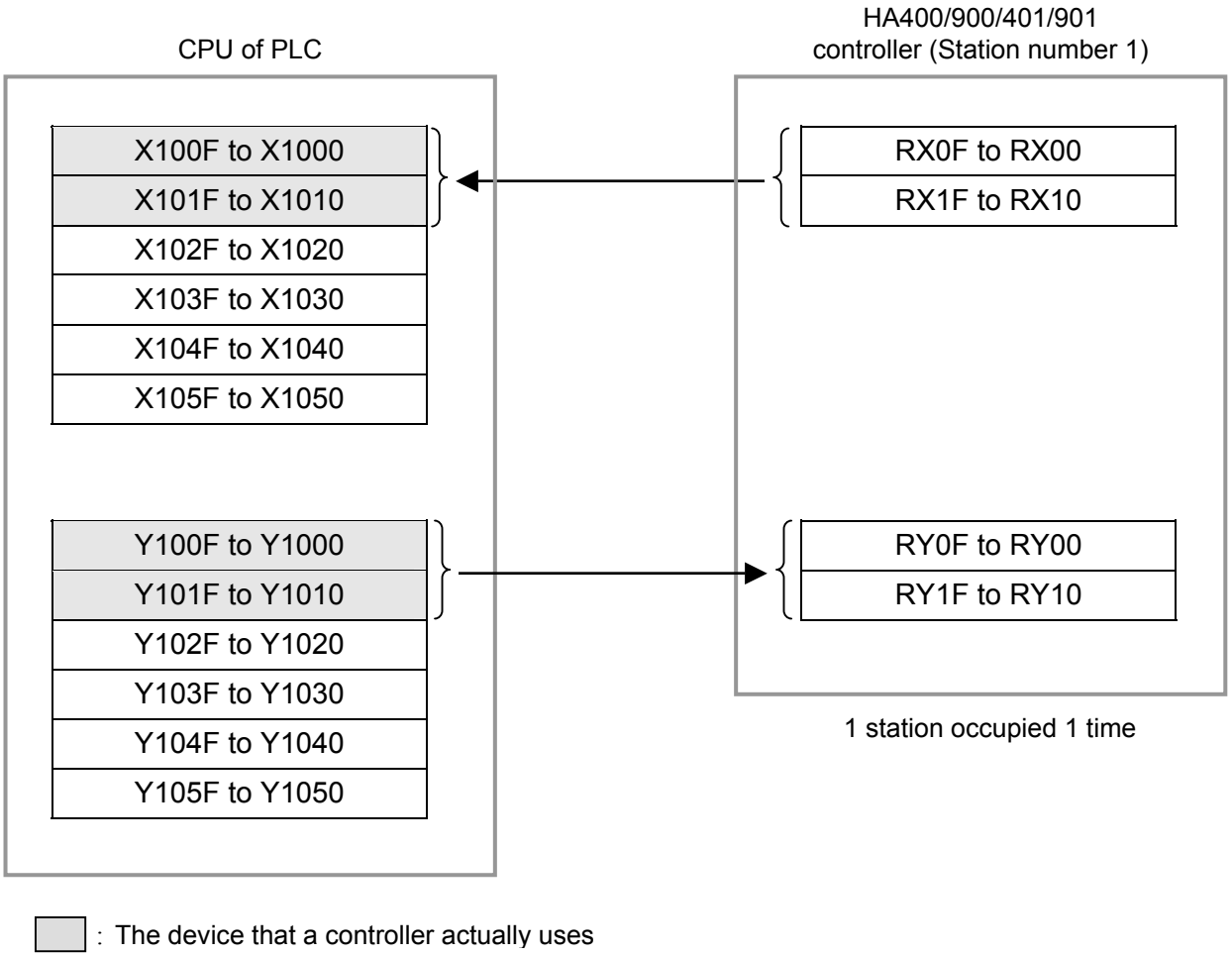
7.4 Device Assignments Example

According to the contents set by **7.3 CC-Link Communication Setting (P. 148)**, each device is assigned.

■ Assignment conditions

Station number of controller:	1
Number of occupied station/extended cyclic:	1 station occupied 1 time
Remote input (RX) refresh device:	X1000
Remote output (RY) refresh device:	Y1000
Remote register (RWr) refresh device:	W0
Remote register (RWw) refresh device:	W100
Special relay (SB) refresh device:	SB0
Special register (SW) refresh device:	SW0

■ Remote input (RX) and Remote output (RY)



: The device that a controller actually uses

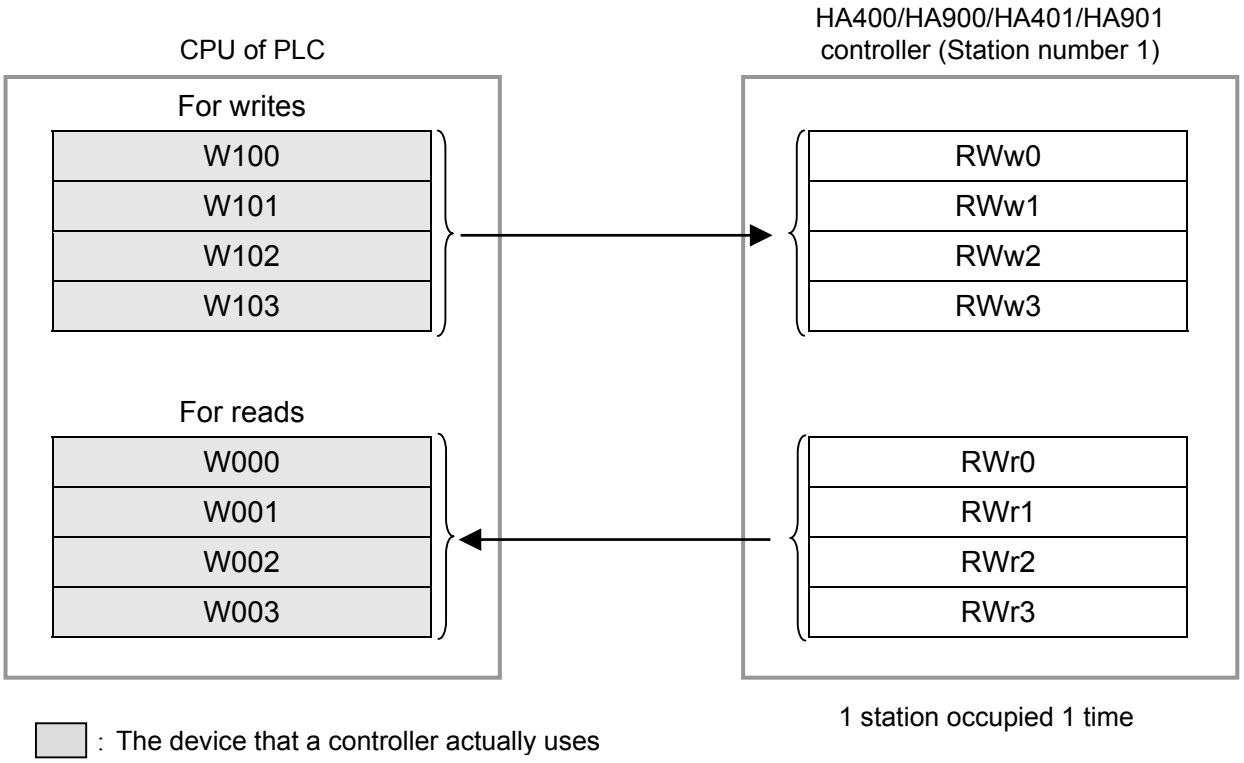
- **Device assignment table of Remote input (RX)**

CPU device number	Communication item	Remote input (RX) address
X1000	Event 1 state	RX00
X1001	Event 2 state	RX01
X1002	Input 1_Burnout state	RX02
X1003	Heater break alarm 1 (HBA1) state	RX03
X1004	Input 1_PID/AT transfer	RX04
X1005	Event 3 state	RX05
X1006	Event 4 state	RX06
X1007	Input 2_Burnout state	RX07
X1008	Heater break alarm 2 (HBA2) state	RX08
X1009	Input 2_PID/AT transfer	RX09
X100A	Unused	RX0A
X100B	Unused	RX0B
X100C	Extended display completion	RX0C
X100D	Extended display completion	RX0D
X100E	Unused	RX0E
X100F	Hardware error flag	RX0F
X1010	Reserved	RX10
X1011	Reserved	RX11
X1012	Reserved	RX12
X1013	Reserved	RX13
X1014	Reserved	RX14
X1015	Reserved	RX15
X1016	Reserved	RX16
X1017	Reserved	RX17
X1018	Initialize data processing request flag	RX18
X1019	Initialize data setting completion flag	RX19
X101A	Error status flag	RX1A
X101B	Remote ready	RX1B
X101C	Reserved	RX1C
X101D	Reserved	RX1D
X101E	Reserved	RX1E
X101F	Reserved	RX1F

- **Device assignment table of Remote output (RY)**

CPU device number	Communication item		Remote output (RY) address
Y1000	Bit 0	Extension number for display	RY00
Y1001	Bit 1		RY01
Y1002	Bit 2		RY02
Y1003	Bit 3		RY03
Y1004	Bit 4		RY04
Y1005	Bit 5		RY05
Y1006	Bit 0	Extension number for setting	RY06
Y1007	Bit 1		RY07
Y1008	Bit 2		RY08
Y1009	Bit 3		RY09
Y100A	Bit 4		RY0A
Y100B	Bit 5		RY0B
Y100C	Extended display flag		RY0C
Y100D	Extended setting flag		RY0D
Y100E	Unused		RY0E
Y100F	RUN/STOP transfer		RY0F
Y1010	Reserved		RY10
Y1011	Reserved		RY11
Y1012	Reserved		RY12
Y1013	Reserved		RY13
Y1014	Reserved		RY14
Y1015	Reserved		RY15
Y1016	Reserved		RY16
Y1017	Reserved		RY17
Y1018	Initialize data processing completion flag		RY18
Y1019	Initialize data setting request flag		RY19
Y101A	Error reset request flag		RY1A
Y101B	Reserved		RY1B
Y101C	Reserved		RY1C
Y101D	Reserved		RY1D
Y101E	Reserved		RY1E
Y101F	Reserved		RY1F

■ Remote register (RWr, RWw)



● Device assignment table of Remote register (RWw)

CPU device number	Communication item	Remote register (RWw) address
W100	For extended area setting of CH1 [Low-order word]	RWw0
W101	For extended area setting of CH1 [High-order word]	RWw1
W102	For extended area setting of CH2 [Low-order word]	RWw2
W103	For extended area setting of CH2 [High-order word]	RWw3

CH1: Extended area of Input 1, CT1, and HBA1.
CH2: Extended area of Input 2, CT2, and HBA2.

● Device assignment table of Remote register (RWr)

CPU device address	Communication item	Remote register (RWr) address
W000	For extended area display of CH1 [Low-order word]	RWr0
W001	For extended area display of CH1 [High-order word]	RWr1
W002	For extended area display of CH2 [Low-order word]	RWr2
W003	For extended area display of CH2 [High-order word]	RWr3

CH1: Extended area of Input 1, CT1, and HBA1.
CH2: Extended area of Input 2, CT2, and HBA2.

7.5 Sample Program

■ Program conditions

Station number of controller: 1

Number of Occupied station/Extended cyclic:
1 station occupied 1 time

Automatic refresh device assignment: Refer to **7.4 Device Assignments Example (P. 150)**.

Special relay (M) assignment:
M0: Extension number setting flag for display
M1: Measured value (PV)/Manipulated output value (MV) transfer
M2: Extension number setting flag for setting

Data register (D) assignment:
D0: Measured value (PV) [Low-order word] store of CH1
D1: Measured value (PV) [High-order word] store of CH1
D2: Measured value (PV) [Low-order word] store of CH2
D3: Measured value (PV) [High-order word] store of CH2
D4: Manipulated output value (MV) [Low-order word] store of CH1
D5: Manipulated output value (MV) [High-order word] store of CH1
D6: Manipulated output value (MV) [Low-order word] store of CH2
D7: Manipulated output value (MV) [High-order word] store of CH2

Memory aera number: Control area

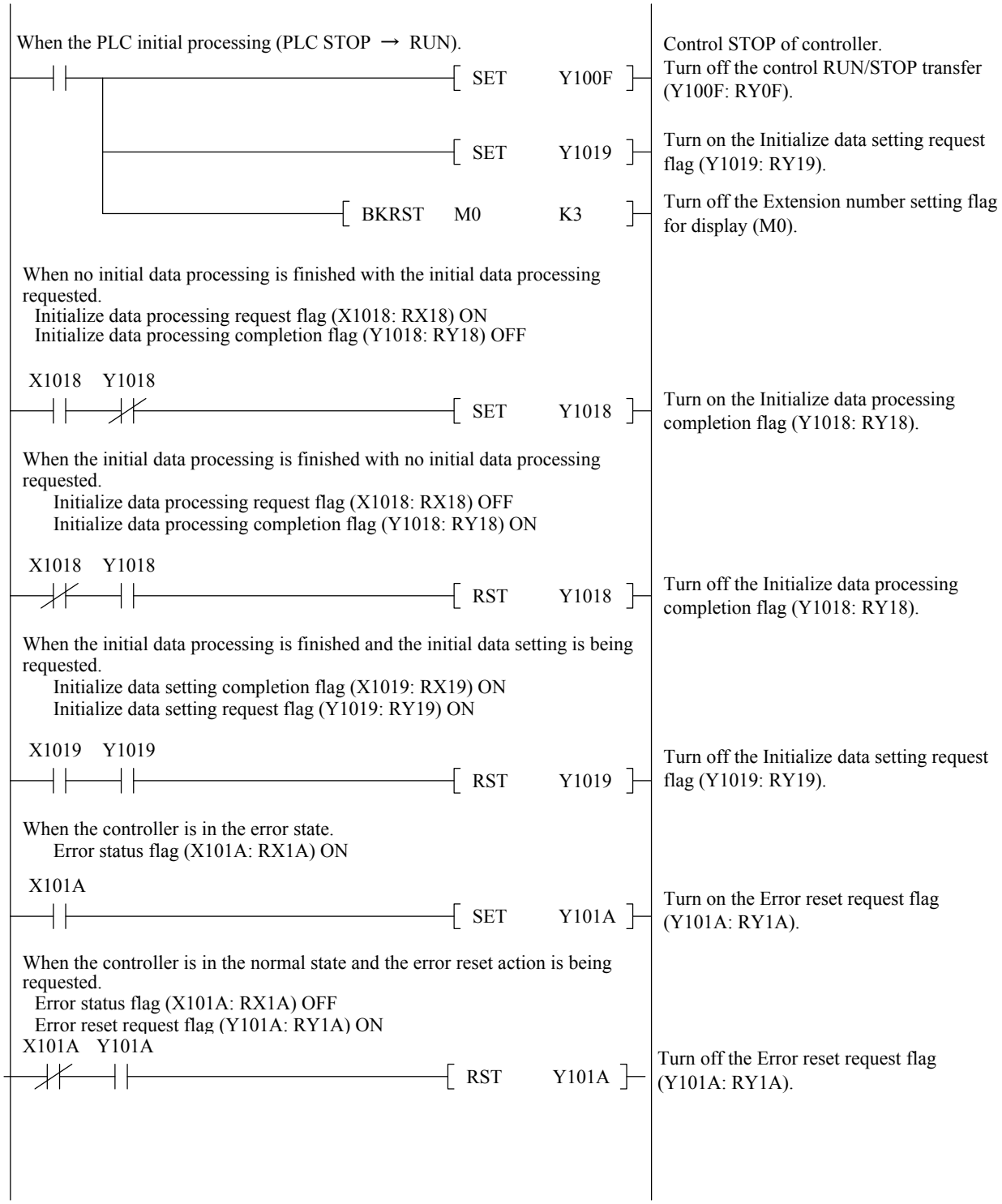
■ Program operation

1. Store Measured value (PV) and Manipulated output value (MV) to a data register.

2. Write in Set value (SV) of CH1 (Input 1) and CH2 (Input 2) in control area.
CH1 set value (SV): 200.0 °C
CH2 set value (SV): 300.0 °C

3. Change the controller to the control RUN.

■ Sample program



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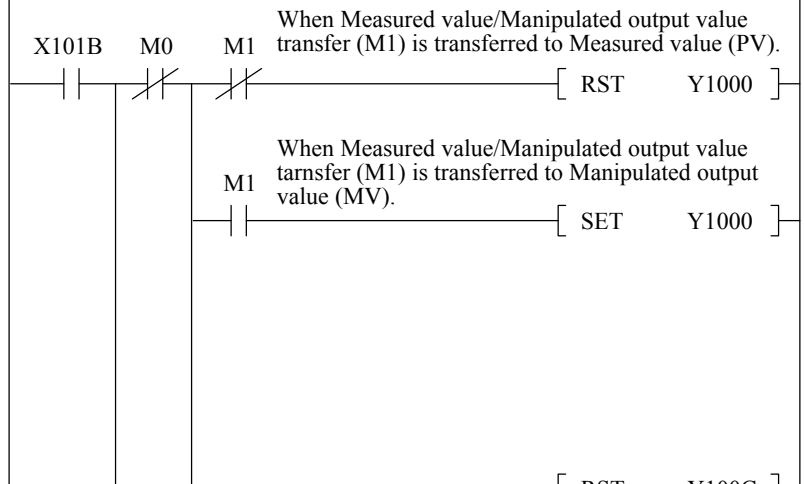
When the controller is in the remote ready state and no display extension number setting is processed yet.
Remote ready (X101B: RX1B) ON
Extension number setting flag for display (M0) OFF



Set the extension number for display.
Extension number 0: Turn off the extension number setting Bit 0 (Y1000: RY00) for Measured value (PV) display.

Set the extension number for display.
Extension number 1: Turn on the extension number setting bit 0 (Y1000: RY00) for Manipulated output value (MV) display.

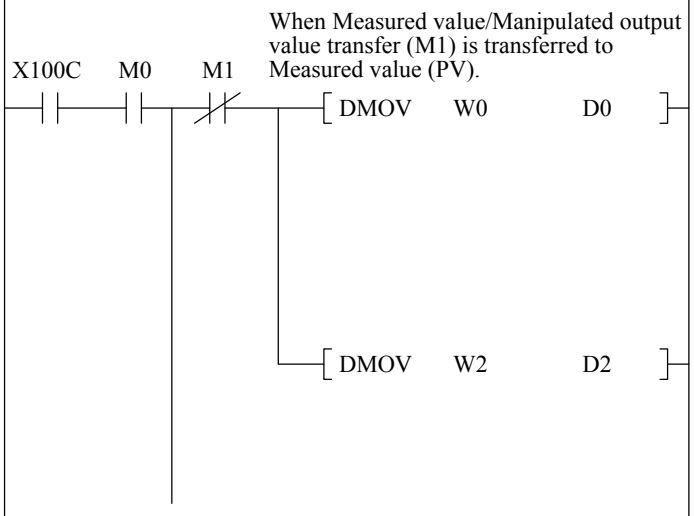
Only the bit (Bit 0) necessary for setting display extension number 0 or 1 is specified. Any unspecified bit is assumed to be the register initial value, 0.

Turn off the Extended display flag (Y100C: RY0C).

Turn on the Extended display flag (Y100C: RY0C).

Extension number setting end for display.
Turn on the Extension number setting flag for display (M0).

When the extension display is finished and the display extension number has been set.
Extended display completion flag (X100C: RX0C) ON
Extension number setting flag for display (M0) ON



Store the Measured value (PV) of CH1 into the data register D0 and D1.
Store the Extension area for display [Low-order word](W000: RWr0) of CH1 into the data register D0.
Store the Extension area for display [High-order word](W001: RWr1) of CH1 into the data register D1.

Store the Measured value (PV) of CH2 into the data register D2 and D3.
Store the Extension area for display [Low-order word](W002: RWr2) of CH2 into the data register D2.
Store the Extension area for display [High-order word](W003: RWr3) of CH2 into the data register D3.

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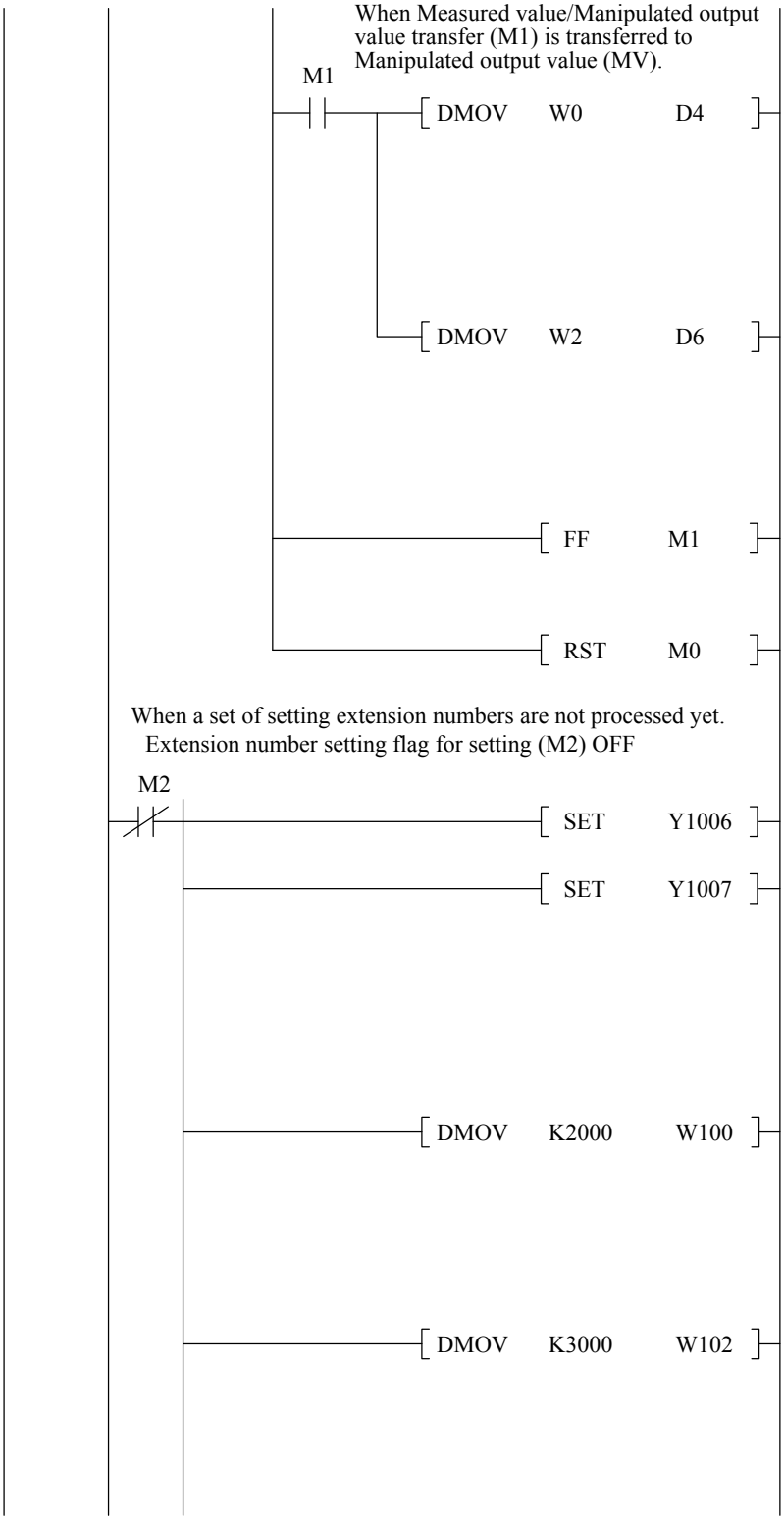

Store the Manipulated output value (MV) of CH1 into the data register D4 and D5.
Store the Extension area for display [Low-order word](W000: RWr0) of CH1 into the data register D4.
Store the Extension area for display [High-order word](W001: RWr1) of CH1 into the data register D5.

Store the Manipulated output value (MV) of CH2 into the data register D6 and D7.
Store the Extension area for display [Low-order word](W002: RWr2) of CH2 into the data register D6.
Store the Extension area for display [High-order word](W003: RWr3) of CH2 into the data register D7.

Measured value/Manipulated output value transfer (M1) is inversely transferred.
Variables to be read are alternately selected.

Turn off the Extension number setting flag for display (M0).

Set the extension number for setting.
Extension number 3:
Turn on the Extension number setting Bit 0 (Y1006: RY06) for Set value (SV) setting.
Turn on the Extension number setting Bit 1 (Y1007: RY07) for Set value (SV) setting.

Only the bits (Bit 0 and Bit 1) necessary forsetting extension number 3 are specified. Any unspecified bit is assumed to be the register initial value, 0.

Set “200.0 °C” to Set value (SV) of CH1.
Write “2000” for Extension area setting [Low-order word] (W100: RWw0) of CH1.
Write “0” for Extension area setting [High-order word] (W101: RWw1) of CH1.

Set “300.0 °C” to Set value (SV) of CH2.
Write “3000” for Extension area setting [Low-order word] (W102: RWw2) of CH2.
Write “0” for Extension area setting [High-order word] (W103: RWw3) of CH2.

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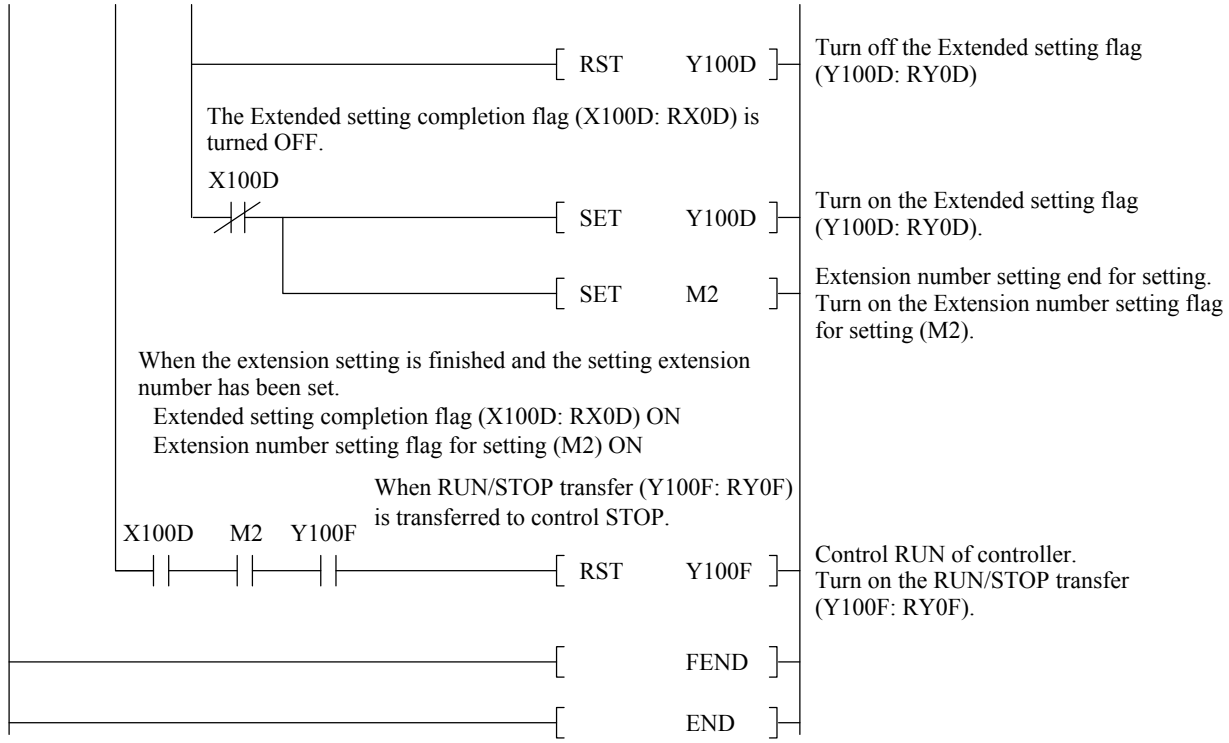


8. TROUBLESHOOTING

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

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

⚠ WARNING

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

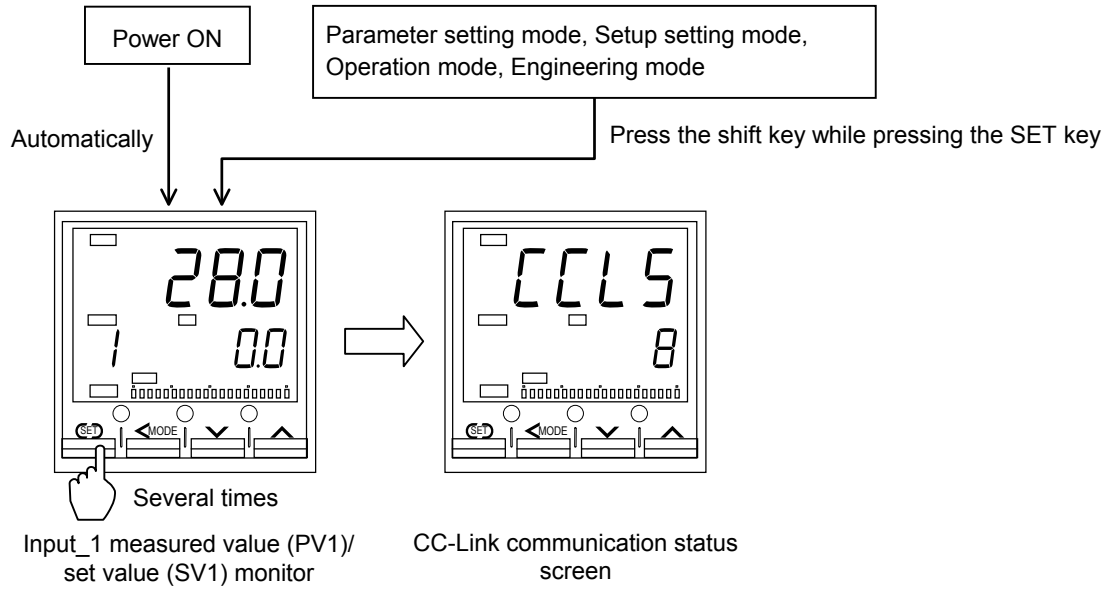
All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action. The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.

8.1 CC-Link Communication Status Display

The communication status of CC-Link can be monitored on the CC-Link communication status display.

■ Display procedure

Press the SET key at "Input 1_measured value (PV1)/set value (SV1) monitor" screen until "CC-Link communication status" screen is displayed.



HA900/901 is used in the above figures for explanation, but the same setting procedures also apply to HA400/401.

■ Status contents list

Below is the CC-Link status display screen and its contents.
The CC-Link status display shows "CCLS" on the upper part of the display and the status number (in hexadecimal) on the lower part of the display. If two or more statuses have been generated, the display shows the sum of the status numbers.

Status number (Hexadecimal)	Contents	Possible cause	Solution
1 (1)	CC-Link hardware error	CC-Link hardware is defective.	Disconnect power from the instrument once, and connect power again. If error repeats, please contact RKC sales office or the agent about the error status number.
2 (2)	CC-Link software error	CC-Link software is defective.	
4 (4)	CC-Link internal communication error	CC-Link internal communication is defective.	

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Status number (Hexadecimal)	Contents	Possible cause	Solution
8 (8)	CC-Link versions do not match	CC-Link versions do not match between the PLC and the controller.	Match the CC-Link version between the PLC and the controller.
10 (10)	Abnormal setting range of station number, communication speed, number of occupied stations, or extended cyclic	CC-Link hardware may be defective.	Disconnect power from the instrument once, and connect power again. If error repeats, please inform RKC sales office or the agent about the error status number.
20 (20)	Setting of station number, communication speed, number of occupied stations, or extended cyclic may have been changed.	Setting of station number, communication speed, number of occupied stations, or extended cyclic may have been changed by someone intentionally or unintentionally.	• Restore the changed values to the original values. • Power the controller again (modified setting becomes effective). • Change the operation mode to RUN from STOP. (modified setting becomes effective).
40 (40)	Communication offline	Setting of station number, communication speed, number of occupied stations, or extended cyclic may differ between the PLC and the controller.	Match the setting between the PLC and the controller.
80 (80)	PLC error	PLC may be defective.	Refer to the PLC instruction manual.
100 (100)	SQ value error	Extended cyclic setting is different between PLC and controller.	Match the setting between the PLC and the controller.
200 (200)	Setting range error of registers RY, RWw at the time of writing	Data written into register is out of setting range. If any one of registers has an out-of-range set value, this error is caused.	Error status flag is “1: ON.” Write “1: ON” to the error reset request flag. When the error status flag becomes “0: OFF,” write “0:OFF” to the error reset request flag.

8.2 Solutions for Problems

This section describes possible causes of communication errors and remedies.

Problem	Possible cause	Solution
No response	Wrong connection, no connection or disconnection of the CC-Link dedicated cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the CC-Link dedicated cable	Confirm the wiring or connector and repair or replace the wrong one
	Communication speed setting of PLC and controllers is mismatch	Confirm the communication speed setting and set that correctly
	Wrong station number setting	Confirm the station number setting and set that correctly

MEMO

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