



Temperature Controller

FZ110/FZ400/FZ900

Instruction Manual
[Part1: Hardware]



NOTICE

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

~ : Alternating current

== : Direct current

 : Reinforced insulation

 : Safety precaution

This symbol is used where the instruction manual needs to be consulted for the safety of both the operator and the equipment. Carefully read the cautions in this manual before using the instrument.

- Windows is a trademark of Microsoft Corporation.
- Modbus is a registered trademark of Schneider Electric.
- Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.



Safety Precautions

■ Pictorial Symbols (safety symbols)

Various pictorial symbols are used in this manual to ensure safe use of the product, to protect you and other people from harm, and to prevent damage to property. The symbols are described below.

Be sure you thoroughly understand the meaning of the symbols before reading this manual.

 **WARNING** : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

 **CAUTION** : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

 : This mark indicates that all precautions should be taken for safe usage.

WARNING

- To prevent injury to persons, damage to the instrument and equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to the instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to the 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 may occur and warranty is void under these conditions.



CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy plant.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
 - If input/output or signal lines within the building are longer than 30 meters.
 - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock to operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- All wiring must be in accordance with local codes and regulations.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as a fuse, circuit breaker, etc.
- A malfunction in this product may occasionally make control operations impossible or prevent alarm outputs, resulting in a possible hazard. Take appropriate measures in the end use to prevent hazards in the event of malfunction.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dissipation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to the instrument display, do not rub with an abrasive material or push the front panel with a hard object.

For Proper Disposal

When disposing of each part used for this instrument, always follows the procedure for disposing of industrial wastes stipulated by the respective local community.



Symbols

■ Pictorial Symbols (safety symbols)



NOTE : This mark indicates important information on installation, handling and operating procedures.



: This mark indicates supplemental information on installation, handling and operating procedures.



: This mark indicates where additional information may be located.

■ Character Symbols

11-segment character

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

7-segment character

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

■ Abbreviation symbols

These abbreviations are used in this manual:

Abbreviation symbols	Name	Abbreviation symbols	Name
PV	Measured value	TC (input)	Thermocouple (input)
SV	Set value	RTD (input)	Resistance temperature detector (input)
MV	Manipulated output value	V (input)	Voltage (input)
AT	Autotuning	I (input)	Current (input)
ST	Startup tuning	HBA (1, 2)	Heater break alarm (1, 2)
OUT (1 to 3)	Output (1 to 3)	CT (1, 2)	Current transformer (1, 2)
DI (1 to 6)	Digital input (1 to 6)	LBA	Control loop break alarm
DO (1 to 4)	Digital output (1 to 4)	LBD	LBA deadband
FBR	Feedback resistance		

■ Screens used in this manual

It should be noted that this manual describes various screens of FZ110/400/900 according to the following rules.

FZ110/400/900 are available in two types: single input type and dual input type.

The dual input type is further categorized into two types: Dual PV type (for FZ400/900) and PV + Remote setting type (for FZ110/400/900). For a dual input model, the same parameter may exist in both Input 1 and Input 2. “1.” or “2.” is added to the top of the parameters for identification. “1.” is not added to the top of the parameters list for the single input type.

[Display example of the dual input type]

Input 1_Set value (SV)

1. 5V

Input 2_Set value (SV)

2. 5V

[Display example of a single input type]

Set value (SV)

5V

This manual uses the dual inputs for explanation. For other types such as a single input type, ignore the first character “1.” at the top of the parameter.

The parameters used only on FZ400 and FZ900 (including parameters used only on the dual input type) are displayed in the colored background ().

[Notation in this manual]

This part is not displayed on the single input type. →

Input 1_Set value (SV)

1. 5V

Parameter shown only on the dual input type

Input 2_Set value (SV)

2. 5V

FUNC key assignment

Parameters used only on FZ400/900 regardless of the number of inputs.

FNK4



Document Configuration

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

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

http://www.rkcinst.com/english/manual_load.htm.

Manual	Manual Number	Remarks
FZ110/FZ400/FZ900 Installation Manual	IMR03A01-E□	This manual is enclosed with instrument. This manual explains the mounting and wiring.
FZ110/FZ400/FZ900 Quick Operation Manual	IMR03A02-E□	This manual is enclosed with instrument. This manual explains the basic key operation, mode menu, and data setting.
FZ110/FZ400/FZ900 Parameter List	IMR03A03-E□	This manual is enclosed with instrument. This list is a compilation of the parameter data of each mode.
FZ110/FZ400/FZ900 Instruction Manual [Part 1: Hardware]	IMR03A04-E3	This manual you are reading now. This manual describes installation, wiring, troubleshooting and product specification.
FZ110/FZ400/FZ900 Instruction Manual [Part 2: Parameters/Functions]	IMR03A05-E□	Parameters: This manual describes how to switch the operation modes and parameters, the range of parameters, and initialization/automatic conversion associated with the change of settings. Functions: This manual describes how to set up and each function.
FZ110/FZ400/FZ900 Instruction Manual [Host Communication]	IMR03A07-E□	This manual explains RKC communication protocol (ANSI X3.28-1976) and Modbus relating to communication parameters setting.
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]	IMR03A08-E□	This manual describes how to set up the instrument for communication with a programmable controller (PLC).



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



About This Manual

This manual consists of the following 7 chapters and index; Parts description, Model code, Mounting, Wiring and other basic handling of the instrument. If you are looking for basic handling information, you may be able to find one in the following table of contents.

[This manual (Part1: Hardware)]

	What do you want to do?	See the following section for more details
☐	I want to check the features, the instrument, and the model code.	1. OUTLINE
☐	I want to check the mounting caution and how to mount and remove.	2. MOUNTING *
☐	I want to check the external dimensions and the panel cutout details	2. MOUNTING *
☐	I want to check wiring caution, terminal layout, wiring to each terminal, etc.	3. WIRING *
☐	I want to check the connection information of the loader communication.	3. WIRING *
☐	I want to check how to use terminal covers (optional).	3. WIRING
☐	I want to check the front appearance.	4. PARTS DESCRIPTION AND BASIC OPERATION *
☐	I want to check the modes available.	
☐	I want to know the basic operation such as setting a set value.	
☐	I want to know what to do when I use the instrument for the first time.	5. OPERATION *
☐	I want to know the error indications and the error codes.	6. TROUBLESHOOTING *
☐	I want to know what actions I should take in case of errors.	6. TROUBLESHOOTING
☐	I want to check the instrument information (ROM version, model code, instrument number).	6. TROUBLESHOOTING
☐	I want to know the specification of the instrument.	7. SPECIFICATIONS *
☐	I want to know how to replace a waterproof/dustproof gasket (optional)	A. APPENDIX
☐	I want to know the external dimension of the current transformer (CT).	A. APPENDIX

* Checking is possible using a concise manual supplied with the product.

[Major topics contained in other manuals]

	What do you want to do?	See the following section for more details
☐	I want to know the functions and how to use them.	[Part 2: Parameters/Functions]
☐	I want to check the parameter names and their setting range.	[Part 2: Parameters/Functions] Parameter List (This manual is enclosed with instrument.)
☐	I want to know how to connect this instrument to a host computer.	[Host Communication]
☐	I want to know how to connect this instrument to a programmable logic controller (PLC).	[PLC Communication]

Contents

	Page
NOTICE	
Safety Precautions	i-1
■ Pictorial Symbols (safety symbols)	i-1
WARNING	i-1
CAUTION	i-2
For Proper Disposal	i-2
Symbols	i-3
■ Pictorial Symbols (safety symbols)	i-3
■ Character Symbols	i-3
■ Abbreviation symbols	i-4
■ Screens used in this manual	i-4
Document Configuration	i-5
About This Manual	i-6

1. OUTLINE.....1-1

Chapter 1 describes features, package contents, model code, etc.

1.1 Features	1-2
1.2 Checking the Product	1-3
1.3 Model Code	1-4
1.3.1 Suffix code	1-4
■ FZ110	1-4
■ FZ400/900	1-6
1.3.2 Quick start code (Initial setting code)	1-8
1.3.3 Range Code Table	1-10

2. MOUNTING.....2-1

Chapter 2 describes mounting cautions, dimensions and mounting procedures.

2.1 Mounting Cautions	2-2
2.2 Dimensions	2-3
2.3 Procedures of Mounting and Removing	2-5
■ The mounting position of the mounting brackets	2-5
■ Mounting procedures (Standard type)	2-6
■ Mounting procedures (Waterproof/Dustproof type)	2-7
■ Removal procedures	2-8



3. WIRING 3-1

Chapter 3 describes wiring cautions, wiring layout and wiring of terminals.

3.1 Wiring Cautions	3-2
3.2 Terminal Layout.....	3-5
■ FZ110	3-5
■ FZ400	3-6
■ FZ900	3-7
■ Isolations of input and output.....	3-8
3.3 Wiring of Each Terminal [FZ110]	3-9
3.3.1 Power supply.....	3-9
3.3.2 Measured input (Thermocouple/RTD/Voltage/Current)	3-10
3.3.3 Output 1 (OUT1)/Output 2 (OUT2).....	3-11
3.3.4 Digital output (DO1/DO2)	3-13
3.3.5 Option 1.....	3-14
■ Option 1: A [Digital input 1 (DI1), Remote setting input].....	3-14
■ Option 1: B [Digital input 1 (DI1), Output 3 (OUT3)]	3-15
■ Option 1: C, D, E [Digital input 1 (DI1), Current transformer input 1 (CT1)]	3-17
■ Option 1: F [Digital input 1 to 3 (DI1 to DI3)].....	3-19
3.3.6 Option 2.....	3-20
■ Option 2: A [Communication (RS-485)]	3-20
3.4 Wiring of Each Terminal [FZ400/900]	3-24
3.4.1 Power supply.....	3-24
3.4.2 Measured input 1 (Thermocouple/RTD/Voltage/Current)	3-25
3.4.3 Output 1 (OUT1)/Output 2 (OUT2).....	3-26
3.4.4 Digital output (DO1/DO2/DO3/DO4)	3-28
3.4.5 Option 1.....	3-30
■ Option 1: T, U, V [Current transformer input 1 (CT1), Current transformer input 2 (CT2)].....	3-30
■ Option 1: W [Feedback resistance (FBR) input]	3-32
3.4.6 Option 2.....	3-33
■ Option 2: A [Output 3 (OUT3)]	3-33
■ Option 2: B [Digital input 1 to 6 (DI1 to DI6)]	3-35
■ Option 2: C [Communication (RS-422A)].....	3-36
■ Option 2: D [Communication (RS-485)]	3-40
■ Option 2: E [Output 3 (OUT3), Digital input 1 to 6 (DI1 to DI6)]	3-44
■ Option 2: F [Output 3 (OUT3), Communication (RS-422A)]	3-46
■ Option 2: G [Output 3 (OUT3), Communication (RS-485)].....	3-48
■ Option 2: H [Output 3 (OUT3), Digital input 1 to 4 (DI1 to DI4), Communication (RS-422A)]	3-50
■ Option 2: J [Output 3 (OUT3), Digital input 1 to 6 (DI1 to DI6), Communication (RS-485)].....	3-53



	Page
3.4.7 Option 3.....	3-56
■ Option 3: 1 [Remote setting input]	3-56
■ Option 3: 2 [Measured input 2].....	3-57
3.5 Connections for Loader Communication	3-59
3.6 Handling of the Terminal Cover [Optional].....	3-61
■ Mounting procedures	3-61
■ Removing procedures.....	3-62

4. PARTS DESCRIPTION AND BASIC OPERATION 4-1

Chapter 4 describes name of parts, switching modes, setting and modifying values and other basic operations.

4.1 Parts Description	4-2
4.2 Mode Switching	4-5
4.3 Changing Set Value.....	4-6
4.4 Operation of the Direct Key (FUNC key) [FZ400/900]	4-7
4.5 Protecting Setting Data.....	4-8

5. OPERATION 5-1

Chapter 5 describes caution for first time use, parameter setting required before operation, and others.

5.1 Operating Precautions.....	5-2
5.2 Setup Procedures.....	5-3
5.3 Initial Setup Before Operation.....	5-4
5.3.1 Initial setting of setup example 1 (Setting parameters related to the event).....	5-5
5.3.2 Initial setting of setup example 2 (Setting parameters related to the input, control, output and event)	5-7
5.4 Setting the Control Set Value [Set value (SV)]	5-10
5.5 Setting the Event Set Value.....	5-11
5.6 Tuning the PID Parameters (Execution of AT).....	5-13

6. TROUBLESHOOTING 6-1

Chapter 6 describes Error displays and countermeasures for errors.

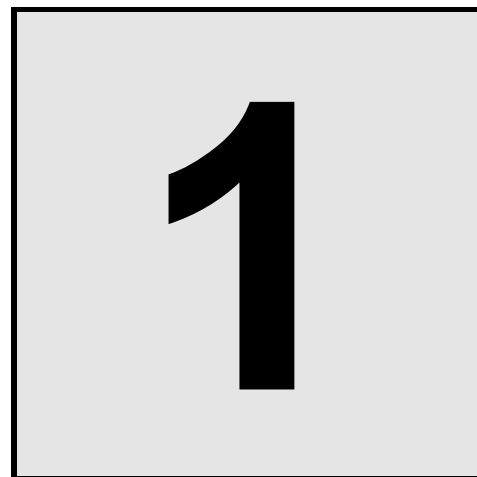
6.1 Error Displays	6-2
■ Input error displays.....	6-2
■ Self-diagnostic error	6-4



	Page
6.2 Solutions for Problems	6-5
■ Display related errors	6-6
■ Control related errors	6-7
■ Operation related errors	6-9
■ Event related errors	6-10
■ Control loop break alarm (LBA) related errors.....	6-10
■ Heater break alarm (HBA) related errors.....	6-11
■ Communication related errors.....	6-12
6.3 Verifying Instrument Information.....	6-14
■ How to display the information.....	6-14
■ How to check.....	6-15
 7. SPECIFICATIONS	 7-1
 A. APPENDIX.....	 A-1
A.1 Replacing the Waterproof/Dustproof Gasket [Optional]	A-2
A.2 Current Transformer (CT) Dimensions [Optional]	A-5



OUTLINE



This chapter describes features, package contents, model code, etc.

1.1 Features.....	1-2
1.2 Checking the Product.....	1-3
1.3 Model Code.....	1-4
1.3.1 Suffix code	1-4
■ FZ110.....	1-4
■ FZ400/900.....	1-6
1.3.2 Quick start code (Initial setting code).....	1-8
1.3.3 Range Code Table	1-10



1.1 Features

This high performance digital controller has the following features:

Cope with various control applications

- PID control (Reverse action)¹
- PID control (Direct action)¹
- Heat/Cool PID control (for Extruder [air cooling])¹
- Heat/Cool PID control (for Extruder [water cooling])¹
- Heat/Cool PID control (Cooling linear type)¹
- Position proportioning PID control (Reverse action)¹
- Position proportioning PID control (Direct action)¹
- ON/OFF action²
- Manual control³

¹ Specify when ordering

² Proportional band [heat-side] must be set to zero.

³ Switch the mode to Manual mode using Auto/Manual transfer

Dual loop control is available (optional)

The following control types are available.

- Remote setting input¹
- 2-loop control^{1,2}
- Differential temperature control^{1,2}
- Control with PV select^{1,2}
- Cascade control^{1,2}

¹ For details, refer to the separate manual [Part 2].

² FZ400/900 only

Can handle various external disturbances

- Suppresses overshoot at startup (at power on, STOP to RUN), set value (SV) change, and occurrence of external disturbances*
- Suppresses overshoot during the transition from ramp to soak when Setting change rate limiter is used*
- Suppresses the bottom at the occurrence of external disturbances caused by Feedforward*

* For details, refer to the separate manual [Part 2].

Freely assignable outputs

Output signal (control output, retransmission output, logic calculation output, and instrument status output) is freely assignable to each output of FZ110 (OUT: max. 3, DO: max. 2) and FZ400/900 (OUT: max. 3, DO: max. 4).*

* For details, refer to the separate manual [Part 2].

Versatile memory area function

Main settings such as PID, event, and control related settings can be stored in up to 16 areas (Memory area function).

The use of this function offers:

- Simple ramp/soak control*
- Simple sequence operation*
- Control using Level PID*

* For details, refer to the separate manual [Part 2].

Improved operatability

Function assignable key (FUNC key)*

FZ400/900 are supplied with a FUNC key to which a specific function can be assigned. Assigning a function to the FUNC key realizes a direct access.

Desired screens can be grouped for easy access*

Up to 16 desired screens can be registered as one mode (Parameter select function).

* For details, refer to the separate manual [Part 2].

Communication

- Loader communication connector is supplied as standard on the front panel (FZ110/400/900). Using our USB communication converter (COM-K2) and our communication tool (PROTEM2)*, the loader communication is possible to easily store and copy the set values.

* Download the software from the official RKC website:
<http://www.rkcinst.com>

- When Communication interface¹ and communication protocol² are specified at the time of order, any one of the following communication functions is possible.
 - Host communication to an upper system³
 - PLC communication to MITSUBISHI MELSEC series⁴

¹ RS-485 (FZ110/400/900), RS-422A (FZ400/900)

² RKC communication (ANSI X3.28-1976), Modbus-RTU, MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4)

³ For details, refer to the separate manual [Host Communication].

⁴ For details, refer to the separate manual [PLC Communication].

1.2 Checking the Product

Before using this product, check each of the following:

- Model code
- Check that there are no scratches or breakage in external appearance (case, front panel, or terminal, etc.)
- Check that all of the items delivered are complete. (Refer to below)

Accessories	Q'TY	Remarks	
☐ Instrument	1	_____	
☐ Mounting bracket (with screw)	2	FZ900 Waterproof/Dustproof type: 4	
☐ FZ110/FZ400/FZ900 Installation Manual (IMR03A01-E□)	1	Enclosed with instrument	
☐ FZ110/FZ400/FZ900 Quick Operation Manual (IMR03A02-E□)	1	Enclosed with instrument	
☐ FZ110/FZ400/FZ900 Parameter List (IMR03A03-E□)	1	Enclosed with instrument	
☐ FZ110/FZ400/FZ900 Instruction Manual [Part 1: Hardware] (IMR03A04-E3)	1	This manual (sold separately)	This manual can be downloaded from the official RKC website: http://www.rkcinst.com/english/manual_load.htm
☐ FZ110/FZ400/FZ900 Instruction Manual [Part 2: Parameters/Functions] (IMR03A05-E□)	1	Sold separately	
☐ FZ110/FZ400/FZ900 Instruction Manual [Host Communication] (IMR03A07-E□)	1	Sold separately	
☐ FZ110/FZ400/FZ900 Instruction Manual [PLC Communication] (IMR03A08-E□)	1	Sold separately	
☐ Gasket KFZ100-317 (FZ110) KFZ400-317 (FZ400) KFZ900-317 (FZ900)	1	Optional (Waterproof/Dustproof type)	
☐ Terminal cover KCA100-517 (FZ110) KFB400-58 (FZ400/900)	Depending on the order quantity	Optional (sold separately)	
☐ Front cover KFZ100-314 (FZ110) KRB400-36 (FZ400) KRB900-36 (FZ900)	Depending on the order quantity	Optional (sold separately)	
☐ CT (Current transformer for heater break alarm) CTL-6-P-Z [for 0.0 to 10.0 A] CTL-6-P-N [for 0.0 to 30.0 A] CTL-12-S56-10L-N [for 0.0 to 100.0 A]	Depending on the order quantity	Optional (sold separately)	



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



1. OUTLINE

1.3 Model Code

Check that the product received is correctly specified by referring to the following model code list:

If the product is not identical to the specifications, please contact RKC sales office or the agent.

1.3.1 Suffix code

■ FZ110

FZ110 □ □ □ □ — □ □ □ * □ □ □ □ □ / □
 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

Specification		Suffix code										
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Control method	PID control with AT (Reverse action)	F										
	PID control with AT (Direct action)	D										
	Heat/Cool PID control with AT	G										
	Heat/Cool PID control with AT (for Extruder [air cooling])	A										
	Heat/Cool PID control with AT (for Extruder [water cooling])	W										
	Position proportioning PID control (Reverse action)	Z										
	Position proportioning PID control (Direct action)	C										
Measured input and Range	Refer to Range Code Table (P. 1-10)	□□□										
Output 1 (OUT1) ¹	None				N							
	Relay contact output				M							
	Voltage pulse output (0/12 V DC)				V							
	Continuous voltage output (0 to 5 V DC)				4							
	Continuous voltage output (0 to 10 V DC)				5							
	Continuous voltage output (1 to 5 V DC)				6							
	Current output (0 to 20 mA DC)				7							
	Current output (4 to 20 mA DC)				8							
	Transistor output				B							
Output 2 (OUT2) ¹	None				N							
	Relay contact output				M							
	Voltage pulse output (0/12 V DC)				V							
	Continuous voltage output (0 to 5 V DC)				4							
	Continuous voltage output (0 to 10 V DC)				5							
	Continuous voltage output (1 to 5 V DC)				6							
	Current output (0 to 20 mA DC)				7							
	Current output (4 to 20 mA DC)				8							
	Transistor output				B							
Power supply voltage	24 V AC/DC				3							
	100 to 240 V AC				4							
Digital output (DO) ¹	None						N					
	Digital output [1 point] (DO1)						1					
	Digital output [2 points] (DO1, DO2)						2					
Option 1 ²	None							N				
	Digital input [1 point] (DI1) + Remote setting input							A				
	Digital input [1 point] (DI1) + Output 3 (OUT3)							B				
	Digital input [1 point] (DI1) + CT input [CTL-6-P-N]							C				
	Digital input [1 point] (DI1) + CT input [CTL-12-S56-10L-N]							D				
	Digital input [1 point] (DI1) + CT input [CTL-6-P-Z]							E				
	Digital input [3 points] (DI1 to DI3)							F				
Option 2 ³	None								N			
	Communication (RS-485)								A			
Display color	Standard									N		
Waterproof/ Dustproof (optional)	None										N	
	Waterproof/Dustproof (IP65)										1	
Quick start code ¹	Quick start code not specified											N
	Specify quick start code											1



- ¹ The factory set values of Output 1 (OUT1), Output 2 (OUT2), and Digital output will be as follows depending on the suffix code and the initial setting code.

(3) Output 1 (OUT1)	(11) Quick start code	Factory set value	Remarks
Suffix code	Suffix code		
N: None	N: Quick start code not specified 1: Specify quick start code	No output assignment to OUT1	—
			—
Other than N	N: Quick start code not specified	Input 1_Control output (Heat/Cool PID control: Heat-side, Position proportioning PID control: Open-side)	To be shipped with the output assignment code "1" in the Initial setting code (P. 1-8)
	1: Specify quick start code		Depends on the output assignment code in the Initial setting code (P. 1-8)

(4) Output 2 (OUT2)	(11) Quick start code	Factory set value	Remarks
Suffix code	Suffix code		
N: None	N: Quick start code not specified 1: Specify quick start code	No output assignment to OUT2	—
			—
Other than N	N: Quick start code not specified	Heater break alarm 1 (HBA1) output Heater break alarm 2 (HBA2) output (*)	To be shipped with the output assignment code "1" in the Initial setting code (P. 1-8)
	1: Specify quick start code		Depends on the output assignment code in the Initial setting code (P. 1-8)

(*) For Heat/Cool PID control: Input 1_Control output (cool-side) For Position proportioning PID control: Input 1_Control output (close-side)

(6) Digital output (DO)	(11) Quick start code	Factory set value	Remarks
Suffix code	Suffix code		
N: None	N: Quick start code not specified 1: Specify quick start code	DO1: No assignment DO2: No assignment	—
			—
1: Digital output [1 point] (DO1)	N: Quick start code not specified	DO1: Event 1 DO2: No assignment	To be shipped with the output assignment code "1" in the Initial setting code (P. 1-8)
	1: Specify quick start code		Depends on the output assignment code in the Initial setting code (P. 1-8)
2: Digital output [2 points] (DO1, DO2)	N: Quick start code not specified	DO1: Event 1 DO2: Event 2	To be shipped with the output assignment code "1" in the Initial setting code (P. 1-8)
	1: Specify quick start code		Depends on the output assignment code in the Initial setting code (P. 1-8)

- ² Depending on the designation of the suffix code, the factory set values of Digital input, Remote setting input, Output 3 (OUT3), and Current transformer (CT) input in Option 1 will be as follows.

(7) Option 1	Factory set value					
Suffix code	Digital input DI1	Digital input DI2	Digital input DI3	Remote setting input	Output 3 (OUT3)	CT input
N: None	—	—	—	—	—	—
A: Digital input [1 point] (DI1) + Remote setting input	Remote/Local transfer	—	—	(NOTE 1)	—	—
B: Digital input [1 point] (DI1) + Output 3 (OUT3)	RUN/STOP transfer	—	—	—	(NOTE 2)	—
C: Digital input [1 point] (DI1) + CT input [CTL-6-P-N]	RUN/STOP transfer	—	—	—	—	Output 1 (OUT1) [CT1 assignment]
D: Digital input [1 point] (DI1) + CT input [CTL-12-S56-10L-N]	RUN/STOP transfer	—	—	—	—	Output 1 (OUT1) [CT1 assignment]
E: Digital input [1 point] (DI1) + CT input [CTL-6-P-Z]	RUN/STOP transfer	—	—	—	—	Output 1 (OUT1) [CT1 assignment]
F: Digital input [3 points] (DI1 to DI3)	RUN/STOP transfer	Auto/Manual transfer	Interlock release	—	—	—

(NOTE 1) The factory set value of the Remote setting input depends on the designation at "Remote setting input type" in the Initial setting code.

When "N: Quick start code not specified" is specified in the Initial setting code, the Remote setting input type will be factory preset to "0 to 10V DC" (Input range is the same as Measured input 1).

(NOTE 2) Output 3 (OUT3) will be factory preset as follows.

Universal output type selection (OUT3) (UN o): Current output (4 to 20 mA DC)

OUT3 function selection (o5L 3): Retransmission output

Retransmission output 3 type (Ro 3): Input 1_Measured value (PV)

- ³ When "N: Quick start code not specified" is specified in the Initial setting code, the protocol of "Communication (RS-485)" at Option 2 type will be factory preset to RKC communication (ANSI X3.28-1976). The digit of the communication data depends on the Input range code.

■ FZ400/900

FZ400

FZ900

$$\begin{array}{cccccccccccc} \square & \square & \square & \square & \square & \square & \square & \square & \square & \square & \square & \square \\ (1) & (2) & (3) & (4) & (5) & (6) & (7) & (8) & (9) & (10) & (11) & (12) \end{array}$$
[illegible]



- ¹ The factory set values of Output 1 (OUT1), Output 2 (OUT2), and Digital output will be as follows depending on the suffix code and the initial setting code.

(3) Output 1 (OUT1)	(12) Quick start code	Factory set value	Remarks
Suffix code	Suffix code		
N: None	N: Quick start code not specified 1: Specify quick start code	No output assignment to OUT1	—
			—
Other than N	N: Quick start code not specified	Input 1_Control output (Heat/Cool PID control: Heat-side, Position proportioning PID control: Open-side)	To be shipped with the output assignment code "1" in the Initial setting code (P. 1-8)
	1: Specify quick start code		Depends on the output assignment code in the Initial setting code (P. 1-8)

(4) Output 2 (OUT2)	(12) Quick start code	Factory set value	Remarks
Suffix code	Suffix code		
N: None	N: Quick start code not specified 1: Specify quick start code	No output assignment to OUT2	—
			—
Other than N	N: Quick start code not specified	Heater break alarm 1 (HBA1) output Heater break alarm 2 (HBA2) output (*)	To be shipped with the output assignment code "1" in the Initial setting code (P. 1-8)
	1: Specify quick start code		Depends on the output assignment code in the Initial setting code (P. 1-8)

(*) The content of the assignment depends on the control action and the selection of Option 3. (Refer to P. 1-9)

(6) Digital output (DO)	(12) Quick start code	Factory set value	Remarks
Suffix code	Suffix code		
1: Digital output [1 point] (DO1)	N: Quick start code not specified	DO1: Event 1 DO2 to DO4: No assignment	To be shipped with the output assignment code "1" in the Initial setting code (P. 1-8)
	1: Specify quick start code		Depends on the output assignment code in the Initial setting code (P. 1-8)
4: Digital output [4 points] (DO1 to DO4)	N: Quick start code not specified	DO1: Event 1 DO2: Event 2 DO3: Event 3 DO4: Event 4	To be shipped with the output assignment code "1" in the Initial setting code (P. 1-8)
	1: Specify quick start code		Depends on the output assignment code in the Initial setting code (P. 1-8)

- ² When "CT input [2 points] (CT1, CT2)" is specified at Option 1, the instrument will be shipped configured as follows.
 CT1 assignment: Output 1 (OUT1)
 CT2 assignment: Depends on the control action type.
 PID control (without Measured input 2): Output 1 (OUT1) Heat/Cool PID control: Output 2 (OUT2)
 PID control (with Measured input 2): Output 2 (OUT2) Position proportioning PID control: Output 2 (OUT2)
- ³ Depending on the designation of the suffix code, the factory set values of Output3 (OUT3), Digital input, and Communication in Option 2 will be as follows.

(8) Option 2	Factory set value							
Suffix code	DI1	DI2	DI3	DI4	DI5	DI6	OUT3	Communication
N: None	—	—	—	—	—	—	—	—
A: Output 3 (OUT3)	—	—	—	—	—	—	(NOTE 1)	—
B: Digital input [6 inputs] (DI1 to DI6)	Area 8 points (**)	Area 8 points (**)	Area 8 points (**)	RUN/STOP transfer *	Auto/Manual transfer **	Interlock release	—	—
C: Communication (RS-422A)	—	—	—	—	—	—	—	(NOTE 2)
D: Communication (RS-485)	—	—	—	—	—	—	—	(NOTE 2)
E: Output 3 (OUT3) + Digital input [6 inputs] (DI1 to DI6)	Area 8 points (**)	Area 8 points (**)	Area 8 points (**)	RUN/STOP transfer *	Auto/Manual transfer **	Interlock release	(NOTE 1)	—
F: Output 3 (OUT3) + Communication (RS-422A)	—	—	—	—	—	—	(NOTE 1)	(NOTE 2)
G: Output 3 (OUT3) + Communication (RS-485)	—	—	—	—	—	—	(NOTE 1)	(NOTE 2)
H: Output 3 (OUT3) + Digital input [4 inputs] (DI1 to DI4) + Communication (RS-422A)	Area 8 points (**)	Area 8 points (**)	Area 8 points (**)	RUN/STOP transfer *	—	—	(NOTE 1)	(NOTE 2)
J: Output 3 (OUT3) + Digital input [6 inputs] (DI1 to DI6) + Communication (RS-485)	Area 8 points (**)	Area 8 points (**)	Area 8 points (**)	RUN/STOP transfer *	Auto/Manual transfer **	Interlock release	(NOTE 1)	(NOTE 2)

(**): Without area set signal

* When "1: Remote setting input" is specified at Option 3, this will be configured to "Remote/Local transfer".

** When "2: Measured input 2" is specified at Option 3, "Auto/Manual transfer" will be assigned to Input 1 and Input 2.

(NOTE 1) Output 3 (OUT3) will be factory preset as follows.

Universal output type selection (OUT3) (U₁ o): Current output (4 to 20 mA DC)
 OUT3 function selection (oSL3): Retransmission output
 Retransmission output 3 type (R_{o3}): Input 1_Measured value (PV)

(NOTE 2) When "N: Quick start code not specified" is specified in the Initial setting code, the protocol of "Communication (RS-422A)" and "Communication (RS-485)" at Option 2 type will be factory preset to RKC communication (ANSI X3.28-1976). The digit of the communication data depends on the Input range code.

- ⁴ When Heat/Cool PID control or position proportioning PID control is specified at Control action, "3: Measured input 2" in the Specification code is not selectable.
- ⁵ When "Remote setting input" or "Measured input 2" is specified at OUT3 the instrument will be shipped configured as follows.
 Remote setting input: The factory set value of the Remote setting input depends on the designation at "Remote setting input type" in the Initial setting code. When "N: Quick start code not specified" is specified in the Initial setting code, the Remote setting input type will be factory preset to "0 to 10V DC" (Input range is the same as Measured input 1).
 Measured input 2: Select function for input 2 (2P_r) will be shipped configured as "2-loop control."
 The default value of the Input range and the Control action will be the same as Measured input 1.



1.3.2 Quick start code (Initial setting code)

Quick start code tells the factory to ship with each parameter preset to the values detailed as specified by the customer. Quick start code is not necessarily specified when ordering, unless the preset is requested.

These parameters are software selectable items and can be re-programmed in the field following procedures found in the manual.

□ □ — □ □ □ □ — □
(1) (2) (3) (4) (5) (6) (7)

Specification		Initial setting code						
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Output assignment	OUT1, OUT2, DO1 to DO4 [Refer to Output Assignment Code Table (P. 1-9)]	□						
Remote setting input type ^a	None		N					
	Voltage input (0 to 1 V DC)		3					
	Voltage input (0 to 5 V DC)		4					
	Voltage input (0 to 10 V DC)		5					
	Voltage input (1 to 5 V DC)		6					
	Current input (0 to 20 mA DC)		7					
	Current input (4 to 20 mA DC)		8					
	Voltage input (–5 to +5 V DC)		9					
	Voltage input (–10 to +10 V DC)		A					
Event 1 type ^{b, c}	None			N				
	Deviation high			A				
	Deviation low			B				
	Deviation high/low			C				
	Band			D				
	Deviation high with hold action			E				
	Deviation low with hold action			F				
	Deviation high/low with hold action			G				
	Process high			H				
	Process low			J				
	Process high with hold action			K				
	Process low with hold action			L				
	Deviation high with re-hold action			Q				
	Deviation low with re-hold action			R				
	Deviation high/low with re-hold action			T				
	Band (High/low individual setting)			U				
	SV high			V				
	SV low			W				
	Deviation high/low (High/low individual setting)			X				
	Deviation high/low with hold action (High/low individual setting)			Y				
	Deviation high/low with re-hold action (High/low individual setting)			Z				
	MV high			1				
	MV low			2				
	MV high (Cool-side)			3				
	MV low (Cool-side)			4				
Event 2 type ^{b, c}	None				N			
	Event 2 type (The code is same as Event 1 type)				□			
Event 3 type ^{b, c}	None					N		
	Event 3 type (The code is same as Event 1 type)					□		
Event 4 type ^{b, c}	None						N	
	Event 4 type (The code is same as Event 1 type)						□	
Communication protocol ^d	None							N
	RKC communication (ANSI X3.28-1976)							1
	Modbus							2
	PLC communication: MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4)							3

^a When "Remote setting input" is not specified as an option, only "N: None" is selectable.

^b When the designation in the Initial setting code is "N: Quick start code not specified," the instrument will be shipped with the configuration of "A: Deviation high."

^c The input assignment of the event will be configured as "Input 1."

^d When "Communication" is not specified as an option, only "N: None" is selectable as the communication protocol.

Output Assignment Code Table

Code	OUT1	OUT2 *	DO1	DO2	DO3	DO4
1	MV1	HBA1/HBA2	EV1	EV2	EV3	EV4
2	MV1	HBA1/HBA2	EV1	LBA1/LBA2	EV3	EV4
3	MV1	FAIL	EV1	HBA1/HBA2	EV3	LBA1/LBA2
4	MV1	HBA1/HBA2	EV1	FAIL	EV3	EV4
5	MV1	EV1	LBA1/LBA2	HBA1/HBA2	EV3	EV4
6	MV1	HBA1/HBA2	LBA1/LBA2	FAIL	EV3	EV4
7	MV1	EV1	HBA1/HBA2	FAIL	EV3	EV4
8	MV1	EV2/EV4	EV1/EV3	HBA1/HBA2	LBA1/LBA2	FAIL

MV1: Input 1_Control output (Heat/Cool PID control: Heat-side, Position proportioning PID control: Open-side)

HBA1: Heater break alarm 1 (HBA1) output EV1: Event 1 output

HBA2: Heater break alarm 2 (HBA2) output EV2: Event 2 output

LBA1: Control loop break alarm 1 (LBA1) output EV3: Event 3 output

LBA2: Control loop break alarm 2 (LBA2) output EV4: Event 4 output

FAIL: FAIL output

If two or more items are assigned to the same output, the resultant output is OR.

* OUT2 assignment

The output assignment depends on the Control action and the selection of Option 3.

Control action	Option 3 (FZ400/900)	OUT2 assignment
PID control	Option 3: None or Remote setting input	One item from the above Output Assignment Code Table.
	Measured input 2	Input 2_Control output
Heat/Cool PID control or Position proportioning PID control	Option 3: None or Remote setting input	Input 1_Control output (Heat/Cool PID control: Cool-side Position proportioning PID control: Close-side)

 : FZ400/900 only



1.3.3 Range Code Table



The input range can be changed later within the range of the input range table * even if the input range is specified at the time of order.

* Refer to the separate manual [Part 2: Parameters/Functions].

● Thermocouple (TC) input

Input type	Code	Range	Note
K	K01	0 to 200 °C	4
	K02	0 to 400 °C	4
	K03	0 to 600 °C	4
	K04	0 to 800 °C	4
	K06	0 to 1200 °C	4
	K07	0 to 1372 °C	4
	K08	−199.9 to +300.0 °C	4
	K09	0.0 to 400.0 °C	4
	K10	0.0 to 800.0 °C	4
	K14	0 to 300 °C	4
	K41	−200 to +1372 °C	4
	K42	−200.0 to +1372.0 °C	5
	KA1	0 to 800 °F	4
	KA2	0 to 1600 °F	4
	KA3	0 to 2502 °F	4
J	J01	0 to 200 °C	4
	J02	0 to 400 °C	4
	J03	0 to 600 °C	4
	J04	0 to 800 °C	4
	J08	0.0 to 400.0 °C	4
	J29	−200.0 to +1200.0 °C	5

Input type	Code	Range	Note
J	JA1	0 to 800 °F	4
	JA3	0 to 2192 °F	4
	JA6	0 to 400 °F	4
T	T01	−199.9 to +400.0 °C	4
	T02	−199.9 to +100.0 °C	4
	T03	−100.0 to +200.0 °C	4
	T19	−200.0 to +400.0 °C	5
R	R01	0 to 1600 °C	4
	R07	−50 to +1768 °C	4
S	S06	−50 to +1768 °C	4
B	B03	0 to 1800 °C	4
E	E01	0 to 800 °C	4
N	N02	0 to 1300 °C	4
W5Re/ W26Re	W03	0 to 2300 °C	4
PL II	A01	0 to 1300 °C	4
U	U01	−199.9 to +600.0 °C	4
L	L04	0.0 to 900.0 °C	4
PR40-20	F02	0 to 1800 °C	5
	FA2	0 to 3200 °F	5

● RTD input

Input type	Code	Range	Note
Pt100	D01	−199.9 to +649.0 °C	4
	D04	−100.0 to +100.0 °C	4
	D05	−100.0 to +200.0 °C	4
	D06	0.0 to 50.0 °C	4
	D07	0.0 to 100.0 °C	4
	D08	0.0 to 200.0 °C	4
	D09	0.0 to 300.0 °C	4
	D10	0.0 to 500.0 °C	4
	D12	−199.9 to +600.0 °C	4

Input type	Code	Range	Note
Pt100	D21	−200.0 to +200.0 °C	5
	D27	0.00 to 50.00 °C	4
	D34	−100.00 to +100.00 °C	5
	D35	−200.0 to +850.0 °C	5
	DA1	−199.9 to +999.9 °F	4
	DA9	0.0 to 500.0 °F	4
	JPt100	0.0 to 200.0 °C	4
JPt100	P29	−100.00 to +100.00 °C	5
	P30	−200.0 to +640.0 °C	5

● Voltage/Current input

Input type	Code	Range	Note
0 to 10 mV DC	101	Programmable range −19999 to +99999 (Factory set value 0.0 to 100.0)	5
0 to 100 mV DC	201		5
0 to 1 V DC	301		5
0 to 5 V DC	401		5
0 to 10 V DC	501		5

Input type	Code	Range	Note
1 to 5 V DC	601	Programmable range −19999 to +99999 (Factory set value 0.0 to 100.0)	5
0 to 20 mA DC	701		5
4 to 20 mA DC	801		5
−10 to +10 V DC	904		5
−5 to +5 V DC	905		5

Note The number of displayed digits of the measured value.

In case of RKC communication, if the displayed data is 4 digits, it is handled as 6-digit data. If the displayed data is 5 digits, it is handled as 7-digit data. In case of Modbus communication, the 4-digit display is handled as a “single word” and the 5-digit display is handled as a “double word”.

* Order of data transfer: upper word to lower word



MOUNTING

2

This chapter describes mounting cautions, dimensions and mounting procedures.

2.1 Mounting Cautions	2-2
2.2 Dimensions	2-3
2.3 Procedures of Mounting and Removing	2-5
■ The mounting position of the mounting brackets	2-5
■ Mounting procedures (Standard type).....	2-6
■ Mounting procedures (Waterproof/Dustproof type).....	2-7
■ Removal procedures	2-8

2.1 Mounting Cautions

WARNING

To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

- (1) This instrument is intended to be used under the following environmental conditions. **(IEC61010-1)**
[OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]
- (2) Use this instrument within the following environment conditions:
 - Allowable ambient temperature: -10 to $+55$ °C
 - Allowable ambient humidity: 5 to 95 %RH
(Absolute humidity: MAX.W.C 29 g/m³ dry air at 101.3 kPa)
 - Installation environment conditions: Indoor use
Altitude up to 2000 m
Short-term temporary overvoltage: 1440 V
Long-term temporary overvoltage: 490 V
- (3) Avoid the following conditions when selecting the mounting location:
 - Rapid changes in ambient temperature which may cause condensation.
 - Corrosive or inflammable gases.
 - Direct vibration or shock to the mainframe.
 - Water, oil, chemicals, vapor or steam splashes.
 - Excessive dust, salt or iron particles.
 - Excessive induction noise, static electricity, magnetic fields or noise.
 - Direct air flow from an air conditioner.
 - Exposure to direct sunlight.
 - Excessive heat accumulation.
- (4) Mount this instrument in the panel considering the following conditions:
 - Provide adequate ventilation space so that heat does not build up.
 - Ensure at least 50 mm space on top and bottom of the instrument for maintenance and environmental reasons.
 - Do not mount this instrument directly above equipment that generates large amount of heat (heaters, transformers, thyristor units, large-wattage resistors.)
 - If the ambient temperature rises above 55 °C, cool this instrument with a forced air cooling fan, cooling unit, etc. Cooled air should not blow directly on this instrument.
 - In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
 - High voltage equipment: Do not mount within the same panel.
 - Power lines: Separate at least 200 mm.
 - Rotating machinery: Separate as far as possible.
 - For correct functioning mount this instrument in a horizontal position.
- (5) In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.

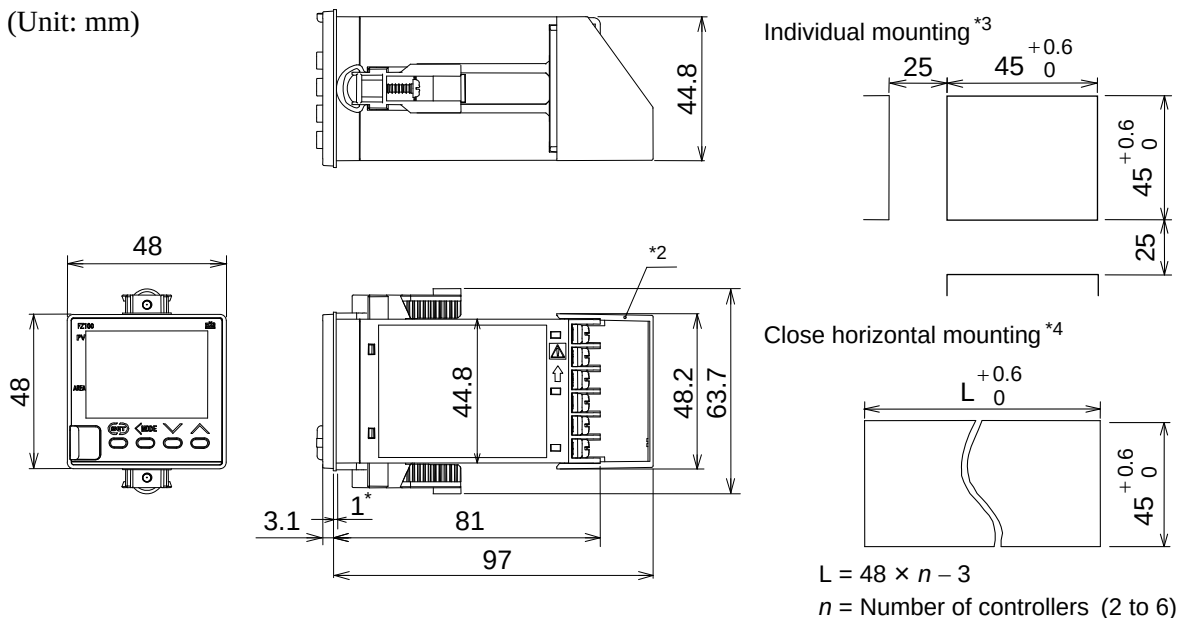
2.2 Dimensions

Panel thickness: 1 to 10 mm

(When mounting multiple FZ110/400/900 controllers close together, the panel strength should be checked to ensure proper support.)

■ FZ110

(Unit: mm)



*1 Gasket (optional)

*2 Terminal cover (optional) [sold separately]

*3 To keep the instrument as waterproof as possible, make sure that the panel surface has no burr or distortion where the hole is to be cut out.

*4 Remove the gasket. When the FZ110/400 is mounted closely protection will be compromised and they will not meet IP65 standards.

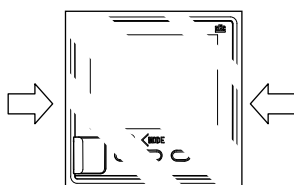
Handling precautions for front cover for the FZ110 (sold separately)

■ Mounting

When installing a front cover for the FZ110 (P/N: KFZ100-314, sold separately), hold the cover horizontally against the installation panel, place it over the instrument, and push it until it is fixed. Make sure the front cover is firmly fixed in place.

■ Removal

To remove the front cover, hold the both sides of the cover and pull the cover toward you pressing it inward.



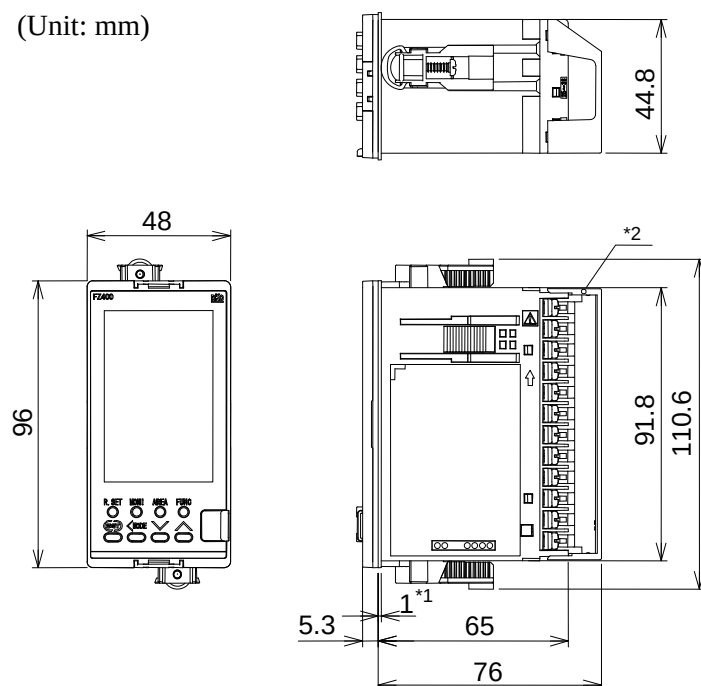
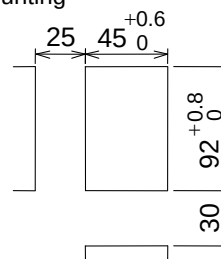
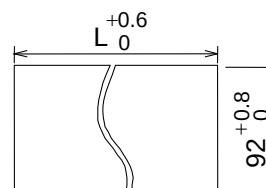
To remove the cover, hold the both sides of the cover (as shown with arrows).

An image of the front cover for the FZ110 (KFZ100-314) which is placed over the instrument.



■ FZ400

(Unit: mm)

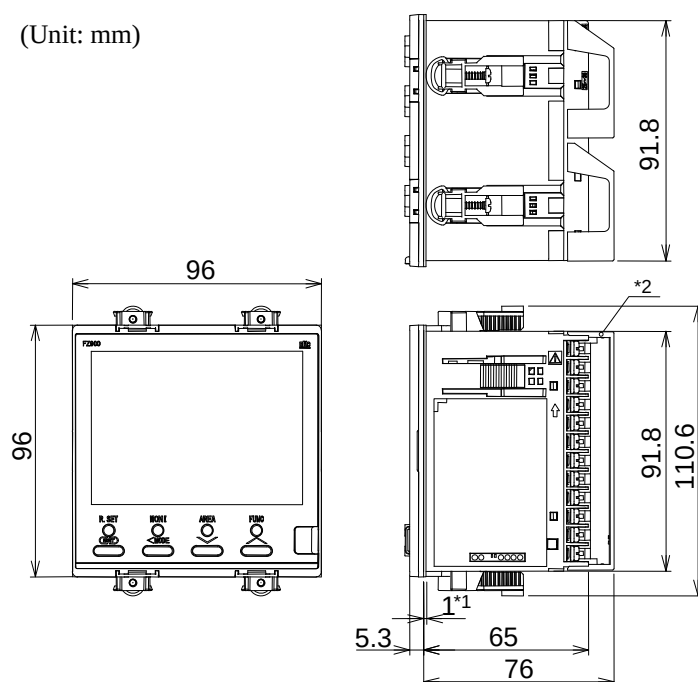
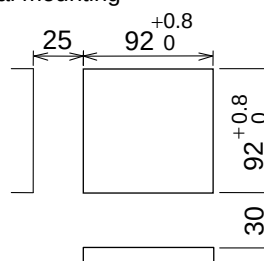
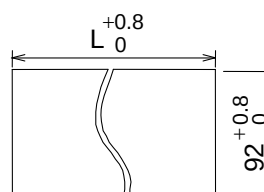
Individual mounting ^{*3}Close horizontal mounting ^{*4}

$$L = 48 \times n - 3$$

 n = Number of controllers (2 to 6)

■ FZ900

(Unit: mm)

Individual mounting ^{*3}Close horizontal mounting ^{*4}

$$L = 96 \times n - 4$$

 n = Number of controllers (2 to 6)

*1 Gasket (optional)

*2 Terminal cover (optional) [sold separately]

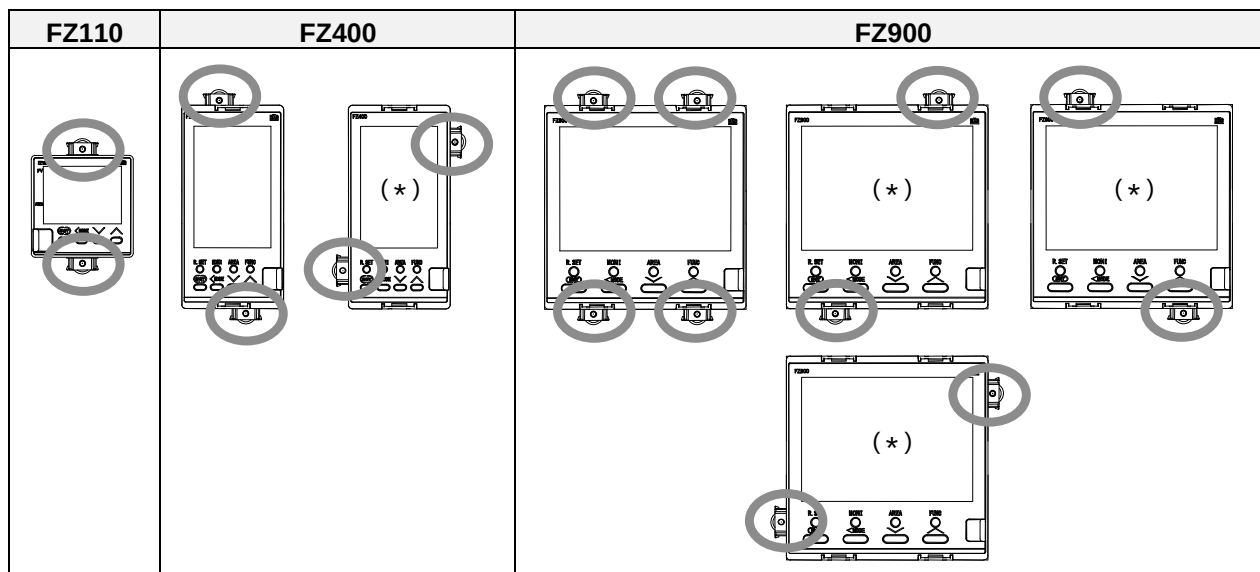
*3 To keep the instrument as waterproof as possible, make sure that the panel surface has no burr or distortion where the hole is to be cut out.

*4 Remove the gasket. When the FZ900 is mounted closely protection will be compromised and they will not meet IP65 standards.

2.3 Procedures of Mounting and Removing

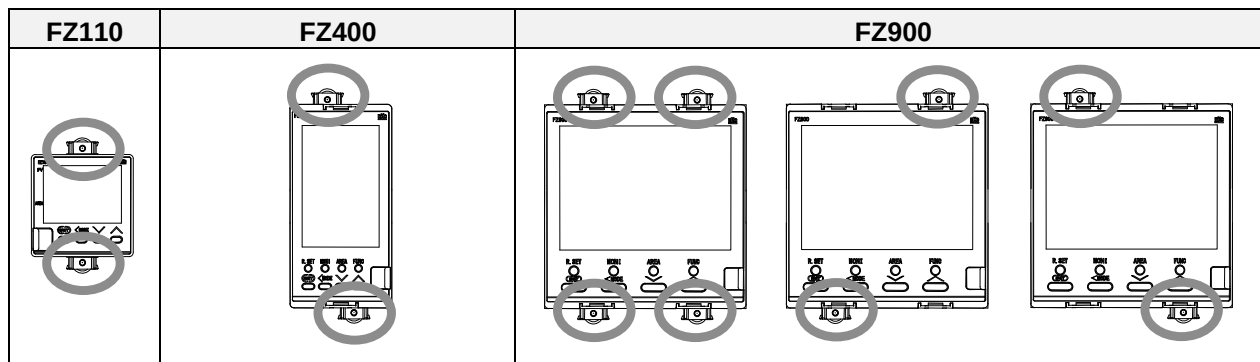
■ The mounting position of the mounting brackets

● Mounting positions for a single controller



(*) FZ400 with mounting brackets attached on the side and FZ900 mounted with two mounting brackets do not provide water and dustproof protection.

● Mounting positions for close mounting

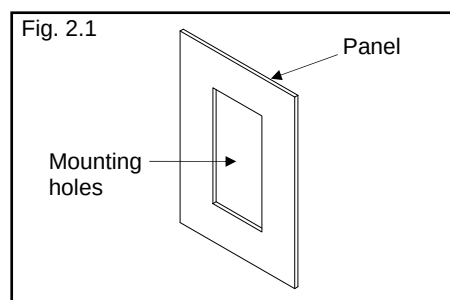


When mounted closely, the controllers are not waterproof or dustproof.

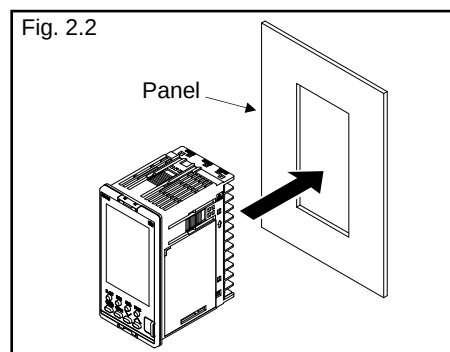
■ Mounting procedures (Standard type)

1. Prepare the panel cutout as specified in Fig. 2.1.
(Panel thickness: 1 to 10 mm)

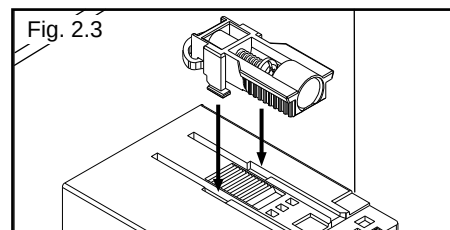
Refer to **2.2 Dimensions (P. 2-3)**.



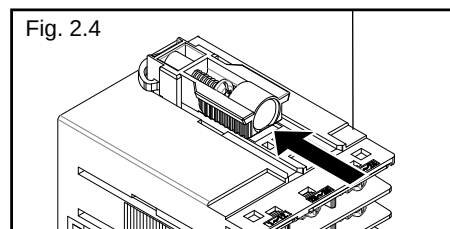
2. Insert the instrument through the panel cutout. (Fig. 2.2)



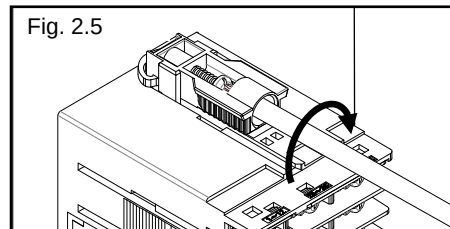
3. Insert the mounting bracket into the mounting groove of the instrument. (Fig. 2.3)



4. Push the mounting bracket forward until the bracket is firmly secured to the panel. (Fig. 2.4)



5. Tighten the screw for the mounting bracket with a Phillips screwdriver.
Do not overtighten the screw. (Fig. 2.5)
Recommended tightening torque: 0.15 N·m [1.5 kgf·cm]



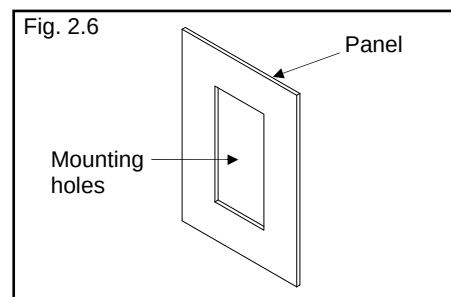
6. The other mounting bracket(s) should be installed in the same way as described in 3 to 5.

■ Mounting procedures (Waterproof/Dustproof type)

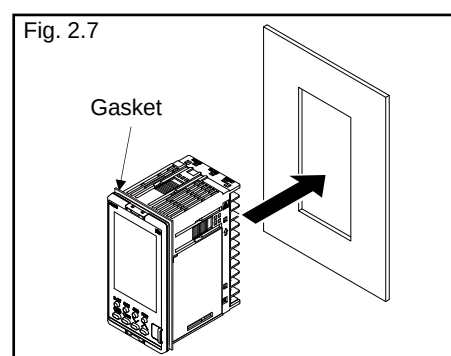
The front of the instrument conforms to **IP65** [Specify when ordering] when mounted on the panel. For effective Waterproof/Dustproof, the gasket must be securely placed between the instrument and the panel without any gap. If a gasket is damaged, please contact RKC sales office or the agent.

1. Prepare the panel cutout as specified in Fig. 2.6.
(Panel thickness: 1 to 10 mm)

Refer to **2.2 Dimensions (P. 2-3)**.



2. Set the waterproof/dustproof gasket (optional) on the case from the back side of the instrument as shown in Fig. 2.7. Insert the instrument through the panel cutout.

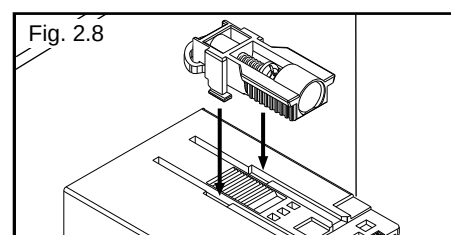


3. Insert the mounting bracket into the mounting groove of the instrument. (Fig. 2.8)

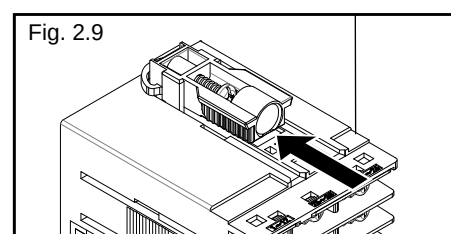


NOTE

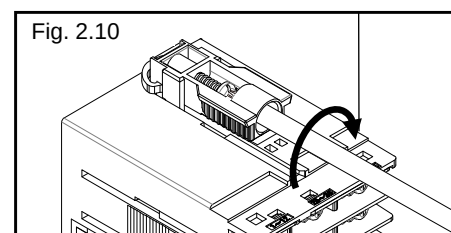
For waterproof and dustproof protection, two mounting brackets (P. 2-5) must be placed on the top and the bottom side of the instrument. If the mounting brackets are placed on the sides of the controller, waterproof and dustproof protection will not be guaranteed.



4. Push the mounting bracket forward until the bracket is firmly secured to the panel. (Fig. 2.9)



5. Tighten the screw for the mounting bracket with a Phillips screwdriver. Do not overtighten the screw. (Fig. 2.10)
Recommended tightening torque: 0.15 N·m [1.5 kgf·cm]



6. The other mounting bracket(s) should be installed in the same way as described in 3 to 5.



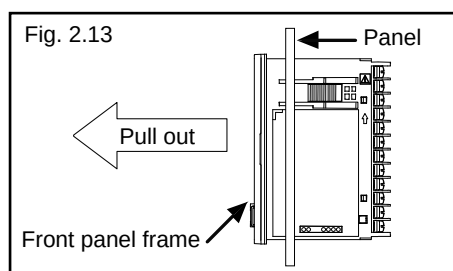
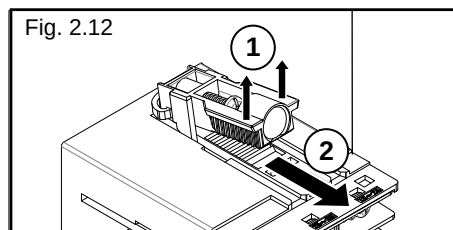
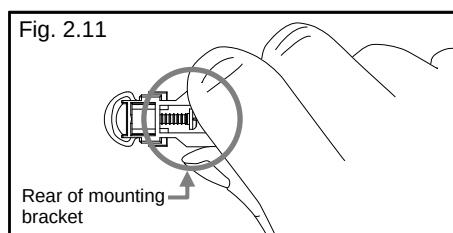
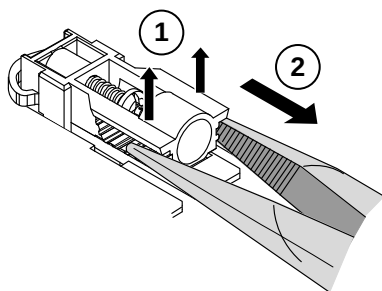
For replacing of the gasket, refer to **APPENDIX A.1 Replacing the Waterproof/Dustproof Gasket (P. A-2)**.

■ Removal procedures

1. Turn the power OFF.
2. Remove the wiring.
3. Loosen the screw of the mounting bracket.
4. Remove the mounting bracket by pulling it up (Fig. 2.12 ①) and forward (Fig. 2.12 ②) while holding the rear (Fig. 2.11).
5. The other mounting bracket(s) should be removed in the same way as described in 3 and 4.
6. Pull out the instrument from the mounting cutout while holding the front panel frame of this instrument. (Fig. 2.13)



Use long-nose pliers to remove the mounting brackets from the instrument that is installed in a narrow space or installed closely to each other in a vertical position.





WIRING

3

This chapter describes wiring cautions, wiring layout and wiring of terminals.

3.1 Wiring Cautions.....	3-2
3.2 Terminal Layout	3-5
3.3 Wiring of Each Terminal [FZ110]	3-9
3.3.1 Power supply	3-9
3.3.2 Measured input (Thermocouple/RTD/Voltage/Current).....	3-10
3.3.3 Output 1 (OUT1)/Output 2 (OUT2)	3-11
3.3.4 Digital output (DO1/DO2).....	3-13
3.3.5 Option 1	3-14
3.3.6 Option 2	3-20
3.4 Wiring of Each Terminal [FZ400/900]	3-24
3.4.1 Power supply	3-24
3.4.2 Measured input 1 (Thermocouple/RTD/Voltage/Current).....	3-25
3.4.3 Output 1 (OUT1)/Output 2 (OUT2)	3-26
3.4.4 Digital output (DO1/DO2/DO3/DO4).....	3-28
3.4.5 Option 1	3-30
3.4.6 Option 2	3-33
3.4.7 Option 3	3-56
3.5 Connections for Loader Communication	3-59
3.6 Handling of the Terminal Cover [Optional]	3-61

3.1 Wiring Cautions

WARNING

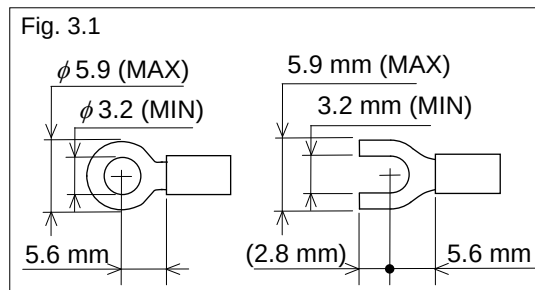
To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- Signal connected to Voltage input and Current input shall be low voltage defined as “SELV” circuit per IEC 60950-1.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
 - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
 - Always install the noise filter on a grounded panel. Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
 - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.
- Allow approximately 5 seconds for contact output when the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply input, supply power from “SELV” circuit defined as IEC 60950-1.
- This instrument is not provided with an overcurrent protection device. For safety install an overcurrent protection device (such as a fuse) with adequate breaking close to the instrument.

Fuse type:	Time-lag fuse (IEC60127-2, UL248-14)
Fuse rating:	Rated voltage 250 V AC
	Rated current 0.5 A (24 V AC/DC type)
	1 A (100 to 240 V AC type)

- Use the solderless terminal appropriate to the screw size.

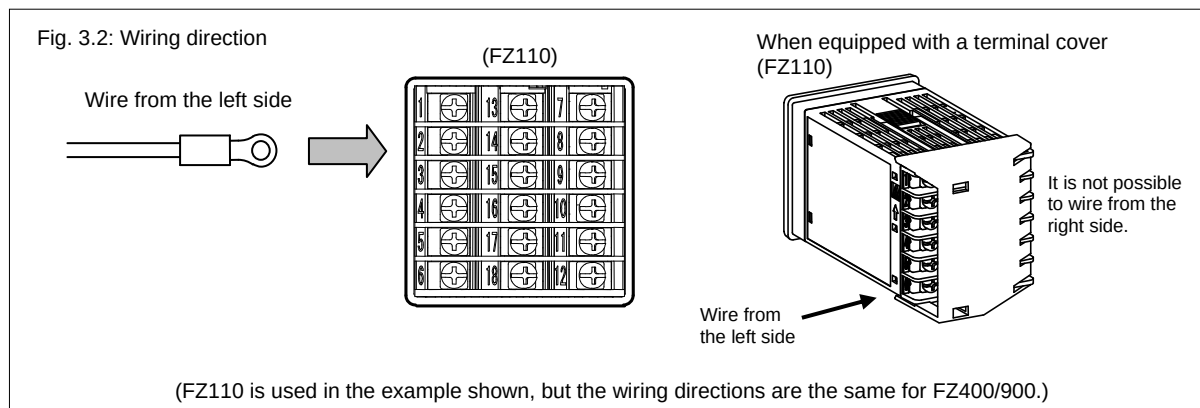
Screw size:	M3 × 7 (with 5.8 × 5.8 square washer)
Recommended tightening torque:	0.4 N·m (4 kgf·cm)
Applicable wire:	Solid/twisted wire of 0.25 to 1.65 mm ²
Specified dimension:	Refer to Fig. 3.1
Specified solderless terminal:	Circular terminal with isolation
	V1.25–MS3
	Manufactured by J.S.T MFG CO., LTD.



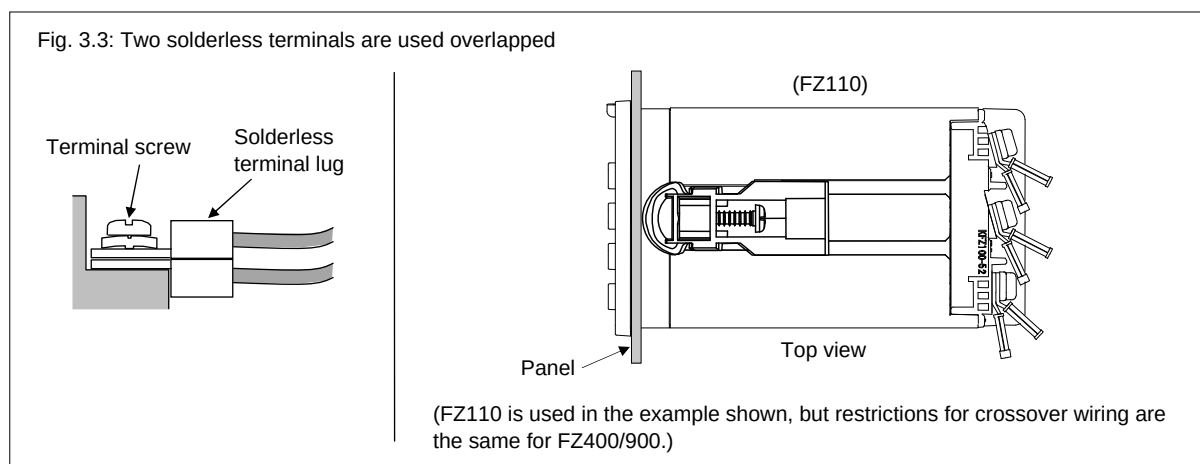
- Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.

- When wiring FZ110/400/900, wire from the left direction toward the backside terminals as shown in Fig. 3.2. For FZ110, the wiring surfaces of the central and the right side lines of terminals are inclined to make it easier to wire from the left side.

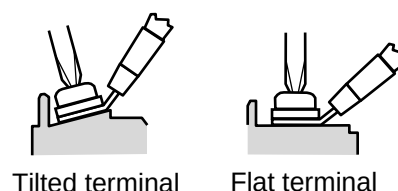
When using the terminal cover (Figs. 3.2, 3.4), it is not possible to wire from the right side. When wiring from the left and right with a close mounting, there are cases where adjacent instruments cannot be wired.



- Up to two solderless terminal lugs can be connected to one terminal screw. **The requirements of reinforced insulation can be still complied with in this condition.** When actually doing this, place one solderless terminal lug over the other as illustrated below.

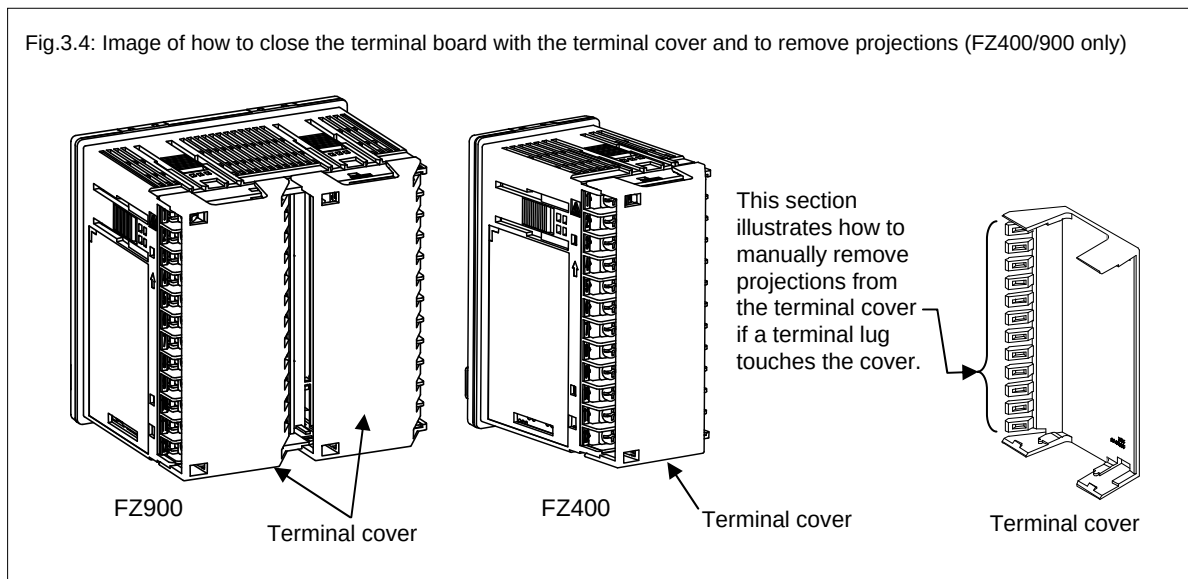


- If solderless terminal lugs other than the recommended dimensions are used, terminal screws may not be tightened. In that case, bend each solderless terminal lug before wiring. If the terminal screw is forcibly tightened, it may be damaged.
- In case of FZ110, if two solderless terminal lugs are connected to one terminal screw, a terminal cover cannot be used.
- When tightening a screw of the instrument, make sure to fit the screwdriver properly into the screw head mounted tilted or flat as shown in the right figure. Tightening the screw with excessive torque may damage the screw thread.



- Caution for using the terminal cover:
 - To prevent electric shock or instrument failure, always turn off the power before mounting or removing the terminal cover.
 - When mounting and removing the terminal cover, apply pressure very carefully to avoid damage to the terminal cover.
 - If a solderless terminal lug touches the FZ400/900 common terminal cover, remove the projection from the terminal cover by manually bending it back and forth until it breaks off. (Fig. 3.4)

Fig.3.4: Image of how to close the terminal board with the terminal cover and to remove projections (FZ400/900 only)



For the mounting and removing of the terminal cover, refer to **3.6 Handling of the Terminal Cover [Optional]** (P. 3-61).

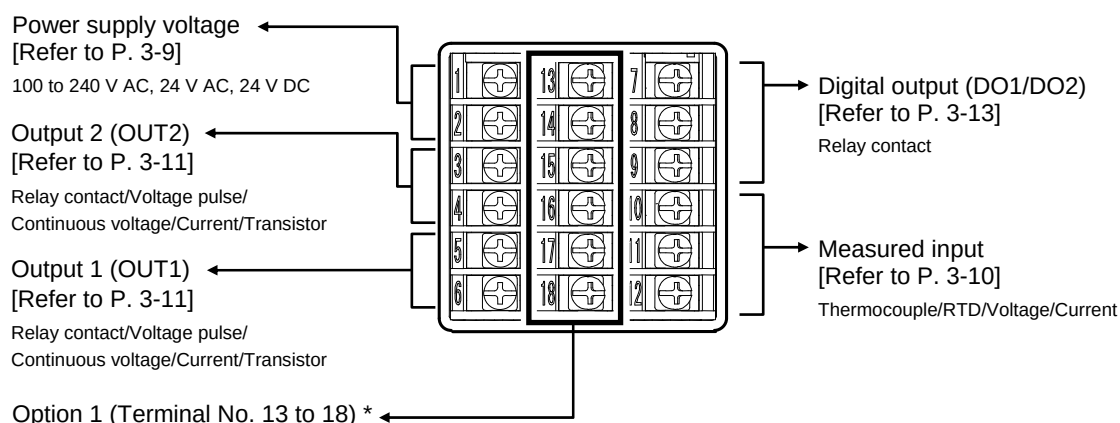
3.2 Terminal Layout

The terminal layout is as follows.



To prevent malfunctioning, do not connect wires to unused terminals.

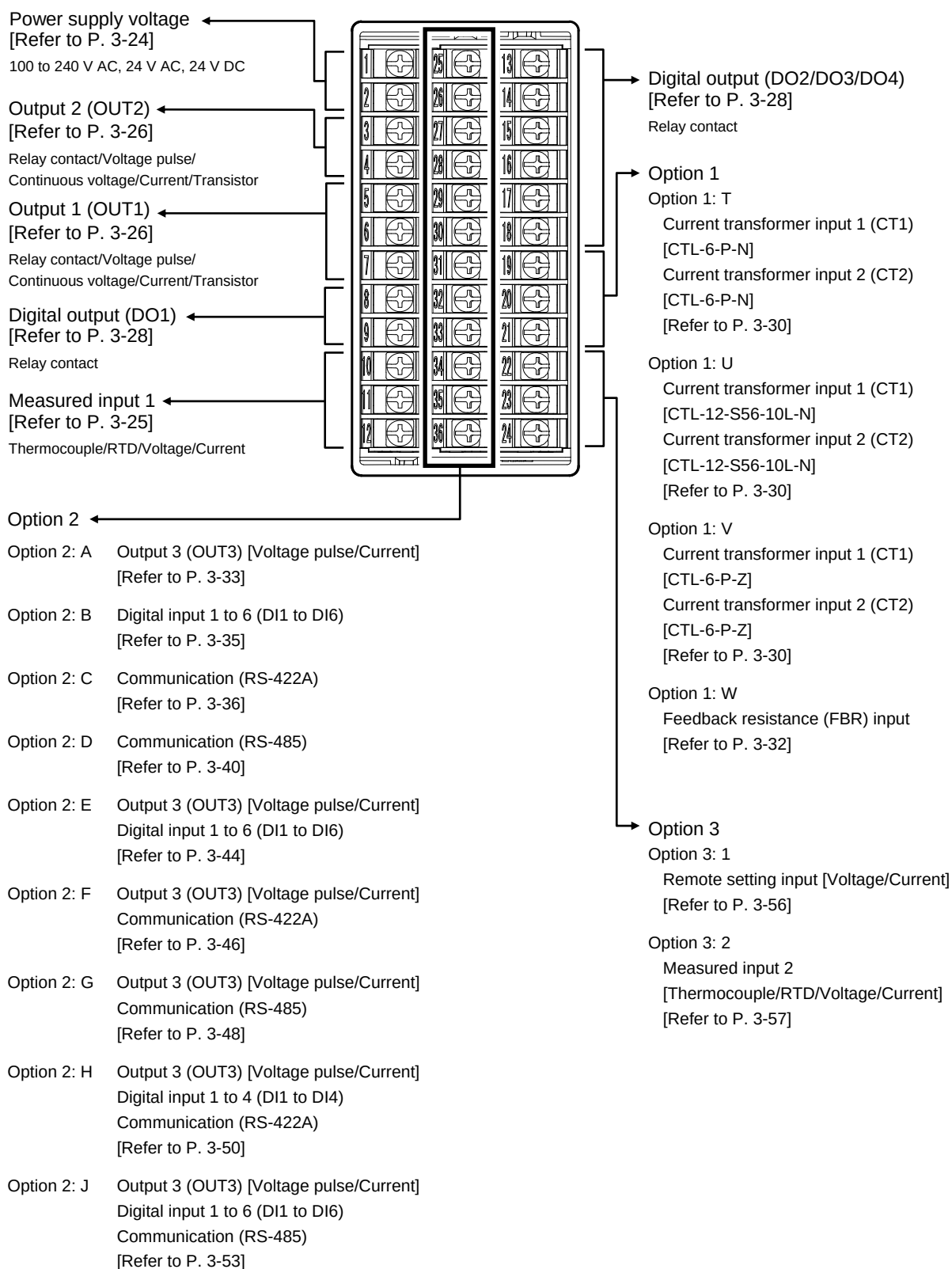
■ FZ110



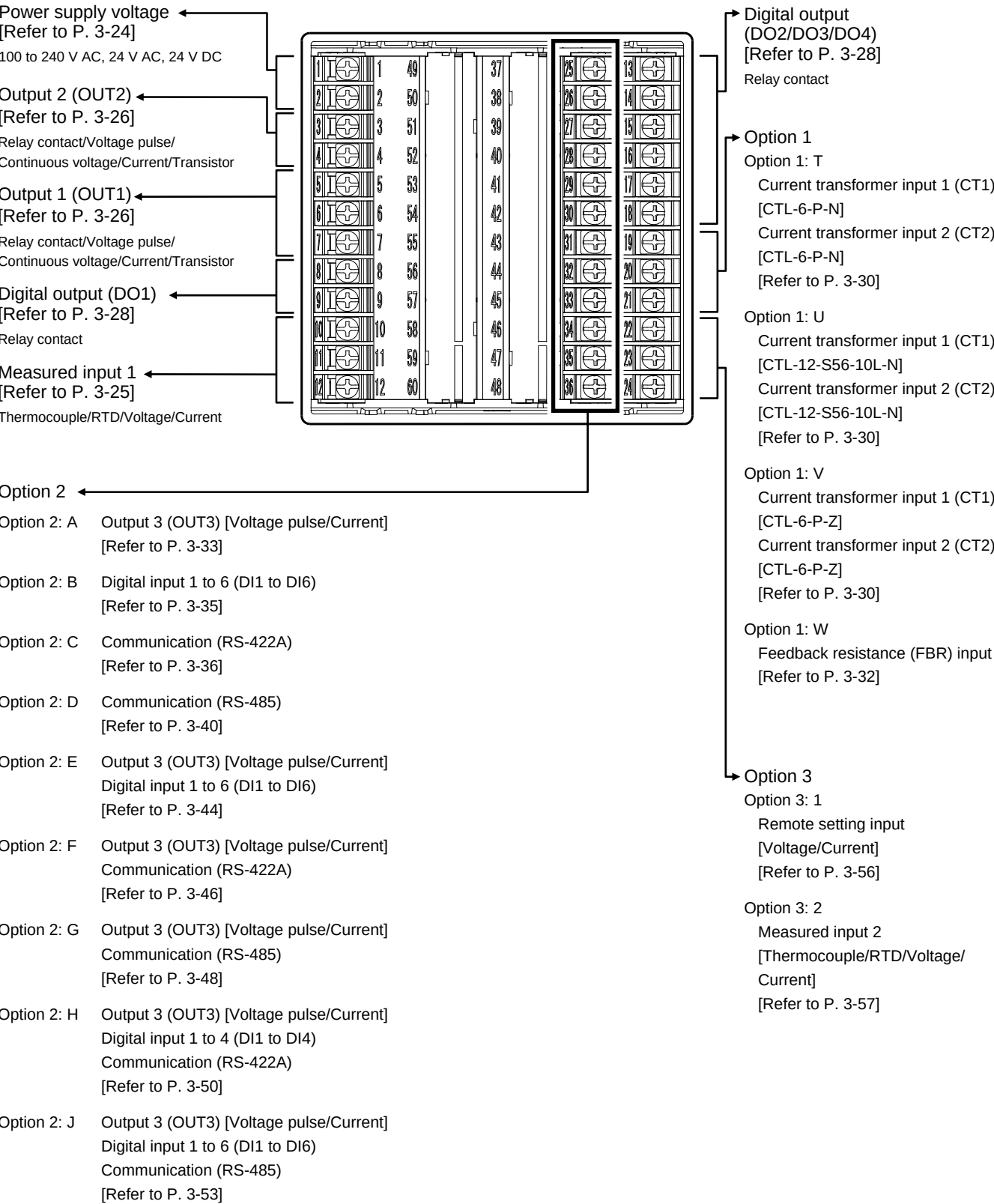
- Option 1: A Digital input 1 (DI1)
Remote setting input [Voltage/Current]
[Refer to P. 3-14]
- Option 1: B Digital input 1 (DI1)
Output 3 (OUT3) [Voltage pulse/Current]
[Refer to P. 3-15]
- Option 1: C Digital input 1 (DI1)
Current transformer input 1 (CT1) [CTL-6-P-N]
[Refer to P. 3-17]
- Option 1: D Digital input 1 (DI1)
Current transformer input 1 (CT1) [CTL-12-S56-10L-N]
[Refer to P. 3-17]
- Option 1: E Digital input 1 (DI1)
Current transformer input 1 (CT1) [CTL-6-P-Z]
[Refer to P. 3-17]
- Option 1: F Digital input 1 to 3 (DI1 to DI3)
[Refer to P. 3-19]
- Option 2 (Terminal No. 16 to 18) *
- Option 2: A Communication (RS-485)
[Refer to P. 3-20]

* Terminal No.16 is a common terminal for COM (–) of the Digital input and the SG of the Communication.

■ FZ400

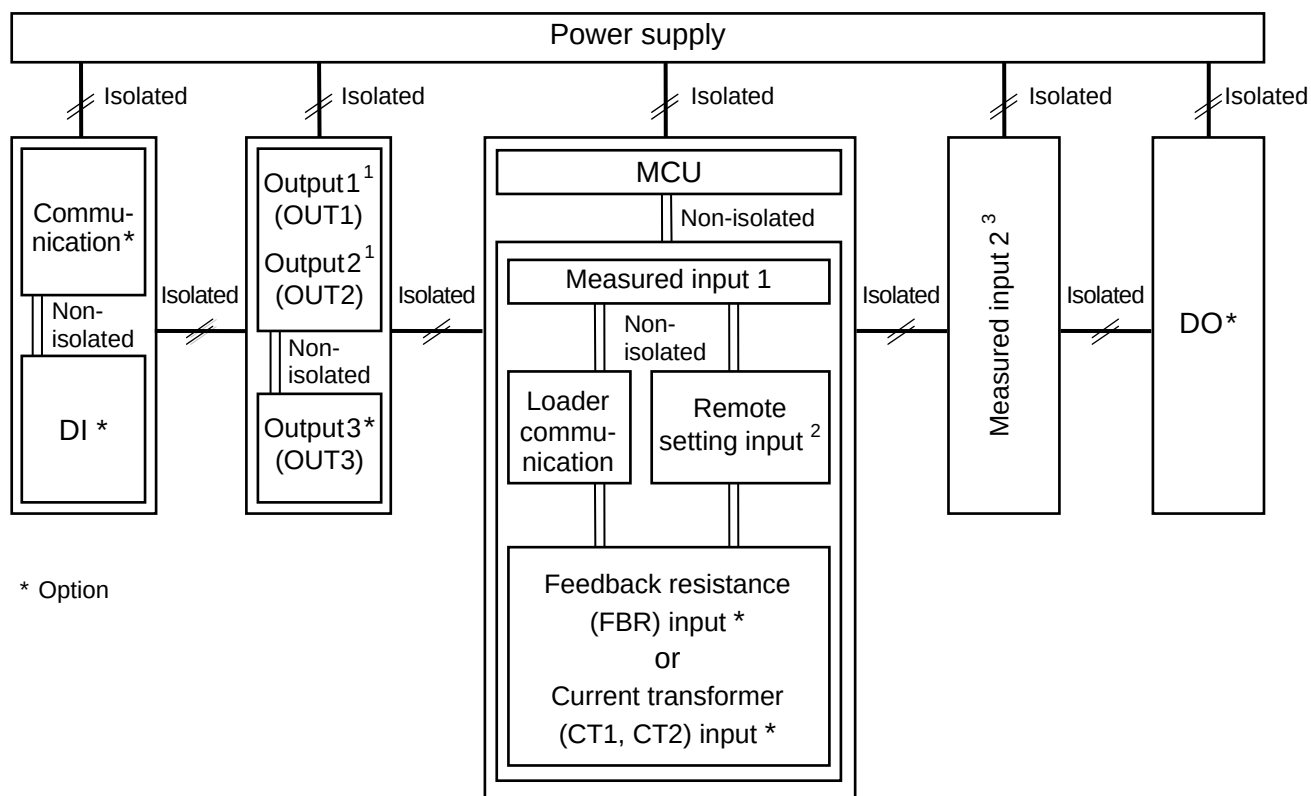


■ FZ900



■ Isolations of input and output

For the Input/Output isolation block of this instrument, refer to the following:



¹ Outputs are isolated if either OUT1 or OUT2 is "relay contact output." If both outputs are not "relay contact output," outputs are not isolated.

² For FZ110 (optional)

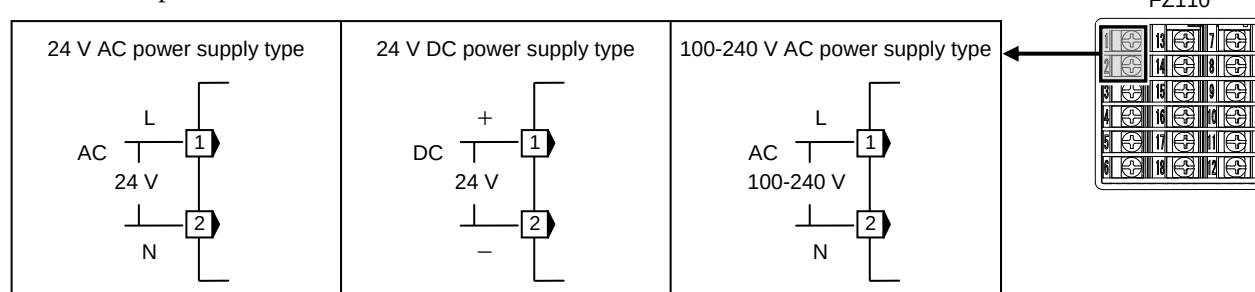
³ For FZ400/900 (optional)

3.3 Wiring of Each Terminal [FZ110]

Always check the polarity of each terminal prior to wiring.

3.3.1 Power supply

- Connect the power to terminal numbers 1 and 2.



- Power supply voltage for the controller must be within the range shown below.

FZ110 - * /

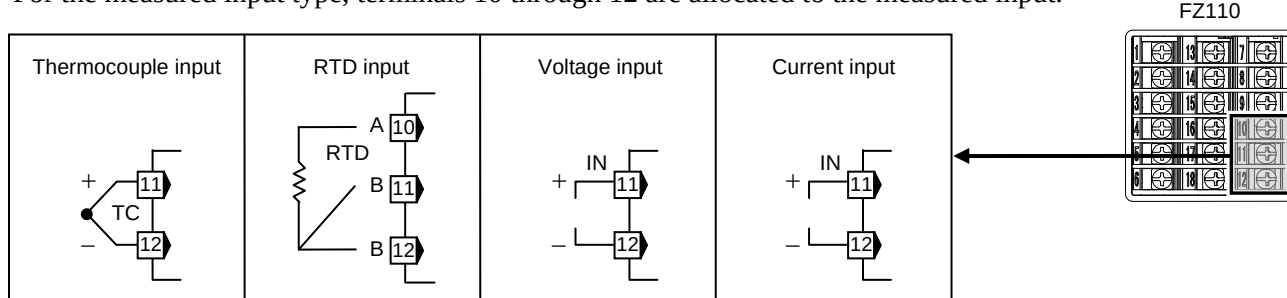
(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

Suffix code	Power supply type	Power consumption	Rush current
3	20.4 to 26.4 V AC [Including power supply voltage variation] (Rated: 24 V AC) Power supply frequency: 50/60 Hz Frequency variation: 50 Hz (−10 to +5 %) 60 Hz (−10 to +5 %)	5.2 VA max. (at 24 V AC)	16.3 A or less (at 24 V AC)
3	20.4 to 26.4 V DC [Including power supply voltage variation] (Rated: 24 V DC)	126 mA max. (at 24 V DC)	11.5 A or less (at 24 V DC)
4	85 to 264 V AC [Including power supply voltage variation] (Rated: 100 to 240 V DC) Power supply frequency: 50/60 Hz Frequency variation: 50 Hz (−10 to +5 %) 60 Hz (−10 to +5 %)	5.2 VA max. (at 100 V AC) 8.1 VA max. (at 240 V AC)	5.6 A or less (at 100 V AC) 13.3 A or less (at 240 V AC)

- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply input, supply power from “SELV” circuit defined as IEC 60950-1.
- This instrument is not provided with an overcurrent protection device. For safety install an overcurrent protection device (such as a fuse) with adequate breaking close to the instrument.
 - Fuse type: Time-lag fuse (IEC60127-2, UL248-14)
 - Fuse rating: Rated voltage 250 V AC
 - Rated current 0.5 A (24 V AC/DC type)
 - 1 A (100 to 240 V AC type)

3.3.2 Measured input (Thermocouple/RTD/Voltage/Current)

- For the measured input type, terminals 10 through 12 are allocated to the measured input.



- The input types (input group) are as follows.

FZ110 * /

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

Suffix code	Input group	Input type
Refer to Range Code Table (P. 1-10)	Thermocouple (TC) input	K, J, T, S, R, E, B, N (JIS C1602-1995), PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002]), U, L (DIN43710-1985), PR40-20 (ASTM-E1751-00)
	RTD input	Pt100 (JIS C1604-1997), JPt100 (JIS C1604-1997, Pt100 of JIS C1604-1981)
	Low voltage input	0 to 10 mV DC, 0 to 100 mV DC
	High voltage input	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, -5 to +5 V DC, -10 to +10 V DC
	Current input	0 to 20 mA DC, 4 to 20 mA DC

 NOTE

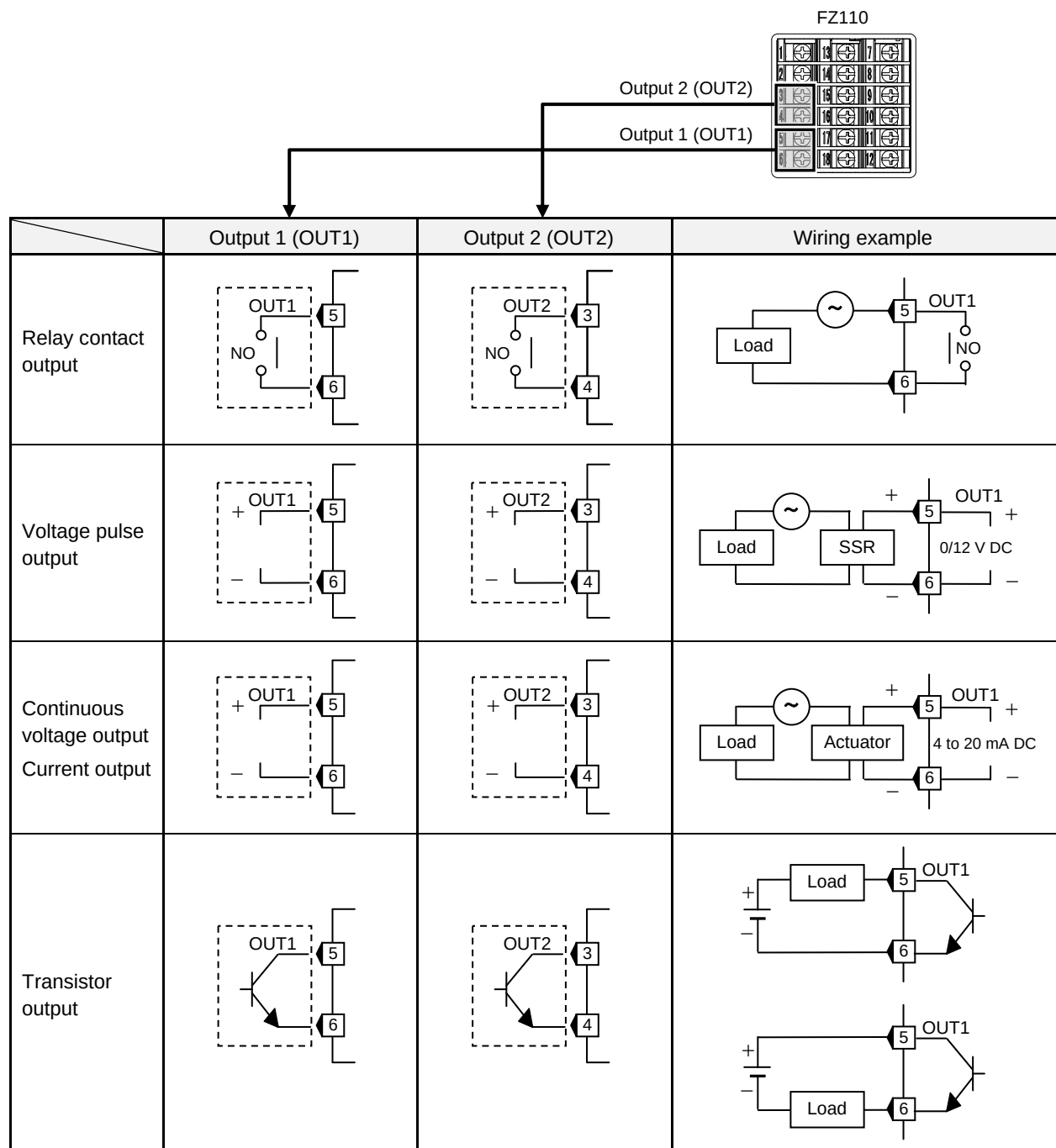
When the input type is changed from current or high voltage input to TC, RTD or low voltage input, remove the wirings of the measured input before attempting the input change. Changing the input type with the signal applied to the instrument may lead to a failure of the instrument.

 For details on changing the Input type, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- Signal connected to Voltage input and Current input shall be low voltage defined as “SELV” circuit per IEC 60950-1.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.

3.3.3 Output 1 (OUT1)/Output 2 (OUT2)

- Terminal 5 and 6 are used for Output 1 (OUT1); and Terminal 3 and 4 are used for Output 2 (OUT2).
- Connect an appropriate load according to the output type of Output 1 (OUT1) and Output 2 (OUT2). (Specify when ordering)



NO: Normal open

: The dotted box diagram describes the output state inside the instrument.

- Outputs are isolated if Output 1 (OUT1) or Output 2 (OUT2) is relay contact output. If both outputs are not relay contact output, outputs are not isolated.

Continued on the next page.

- Number of outputs and output types must be specified when ordering. The specifications of each output are as follows.

FZ110 ☐ ☐☐☐-☐☐☐*☐☐☐☐☐☐/☐
(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

Suffix code		Output type	Specifications
Output 1 (OUT1)	Output 2 (OUT2)		
N	N	None	
M	M	Relay contact output	Contact type: a contact Contact rating (Resistive load): 250 V AC 3 A, 30 V DC 1 A Electrical life: 100,000 times or more (Rated load) Mechanical life: 20 million times or more (Switching: 300 times/min)
V	V	Voltage pulse output	0/12 V DC (Allowable load resistance: 500 Ω or more)
4	4	Continuous voltage output	0 to 5 V DC (Allowable load resistance: 1 kΩ or more)
5	5		0 to 10 V DC (Allowable load resistance: 1 kΩ or more)
6	6		1 to 5 V DC (Allowable load resistance: 1 kΩ or more)
7	7	Current output	0 to 20 mA DC (Allowable load resistance: 500 Ω or less)
8	8		4 to 20 mA DC (Allowable load resistance: 500 Ω or less)
B	B	Transistor output	Allowable load current: 100 mA Load voltage: 30 V DC or less Voltage drop at ON: 2 V or less (at allowable load current) Leakage current at OFF: 0.1 mA or less

- Output signals (function) can be assigned to each output (OUT, OUT2). Output signal (function) assignment is available either Initial setting code at the time of order or reconfiguration in the Engineering mode.

 For the details of Output signals (function) assignment, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Outputs (OUT1, OUT2) and Output signals (function)

(✓: Assignable)

Output signal (function)	OUT1 ¹					OUT2 ¹				
	Relay contact	Voltage pulse	Current	Continuous voltage	Transistor	Relay contact	Voltage pulse	Current	Continuous voltage	Transistor
Input 1_Control output (Heat-side) ²	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Input 1_Control output (Cool-side) ²	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Input 1_Control output (Position proportioning) ²	✓	✓	—	—	✓	✓	✓	—	—	✓
Logic calculation output (Event output) ^{2,4}	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Logic calculation output (Control loop break alarm (LBA) output) ^{2,4}	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Logic calculation output (Heater break alarm (HBA) output) ^{2,4}	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
RUN state output ³	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Output of the communication monitoring result ³	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manual mode state output ³	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Remote mode state output ³	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
AT state output ³	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Output while Set value (SV) is changing ³	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FAIL output ²	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Retransmission output ³	—	—	✓	✓	—	—	—	✓	✓	—

¹ The following table shows factory set values of Output signals (function) which are assigned to OUT1 and OUT2 when the suffix code other than "N" is specified.

Control action	Factory set value	
PID control	OUT1: Input 1_Control output	OUT2: Heater break alarm 1 (HBA1) output Heater break alarm 2 (HBA2) output
Heat/Cool PID control	OUT1: Input 1_Control output (Heat-side)	OUT1: Input 1_Control output (Cool-side)
Position proportioning PID control	OUT1: Input 1_Control output (Open-side)	OUT1: Input 1_Control output (Close-side)

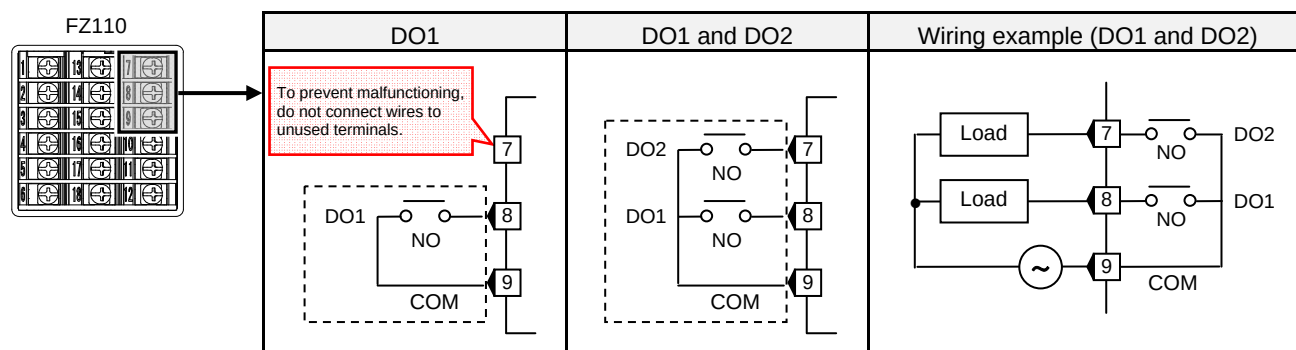
² Factory preset is available by specifying the Initial setting code at the time of order. [1.3.2 Quick start code (Initial setting code) (P. 1-8)]

³ Configurable at "OUT1 function selection" and "OUT2 function selection" in the Engineering mode.

⁴ Multiple functions can be specified for "OUT1 logic calculation selection" and "OUT2 logic calculation selection" in the Engineering mode. (OR-output)

3.3.4 Digital output (DO1/DO2)

- Terminals 7 through 9 are used for Digital outputs (DO1, DO2). (specify when ordering)
- Connect the load(s) according to the number of output (specify when ordering) of Digital outputs (DO1 and DO2).



NO: Normally open

⋯ : The dotted box diagram describes the output state inside the instrument.

- Output type is only relay contact output.

FZ110 □ □ □ □ — □ □ □ * □ □ □ □ □ / □
 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

Suffix code	Number of output	Specifications
N	None	
1	Digital output [1 point] (DO1)	Contact type: a contact Contact rating (Resistive load): 250 V AC 1 A, 30 V DC 0.5 A
2	Digital output [2 points] (DO1, DO2)	Electrical life: 150,000 times or more (Rated load) Mechanical life: 20 million times or more (Switching: 300 times/min)

- Output signals (function) can be assigned to each Digital output (DO1, DO2). Output signal (function) assignment is available either Initial setting code at the time of order or reconfiguration in the Engineering mode.

For the details of Output signals (function) assignment, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Digital outputs (DO1, DO2) and Output signals (function)

(✓: Assignable)

Output signals (function)	DO1 ¹	DO2 ¹	Remarks
Logic calculation output (Event output) ^{2,4}	✓	✓	¹ The following table shows factory set values of Output signals (function) which are assigned to DO1 and DO2 when the suffix code other than "N" is specified. Digital output 1point (DO1): DO1: Event 1, DO2: No assignment Digital output 2points (DO1, DO2): DO1: Event 1, DO2: Event 2
Logic calculation output (Control loop break alarm (LBA) output) ^{2,4}	✓	✓	
Logic calculation output (Heater break alarm (HBA) output) ^{2,4}	✓	✓	
RUN state output ³	✓	✓	
Output of the communication monitoring result ³	✓	✓	² Factory preset is available by specifying the Initial setting code at the time of order. [1.3.2 Quick start code (Initial setting code) (P. 1-8)]
Manual mode state output ³	✓	✓	
Remote mode state output ³	✓	✓	³ Configurable at "DO1 function selection" and "DO2 function selection" in the Engineering mode.
AT state output ³	✓	✓	
Output while Set value (SV) is changing ³	✓	✓	
FAIL output ²	✓	✓	⁴ Multiple functions can be specified for "DO1 logic calculation selection" and "DO2 logic calculation selection" in the Engineering mode. (OR-output)

3.3.5 Option 1

- Terminal Nos. 13 to 16 are for Option 1.
- The Option 1 types are as follows.

FZ110 ☐ ☐☐☐-☐ ☐ ☐ * ☐ ☐ ☐ ☐ / ☐

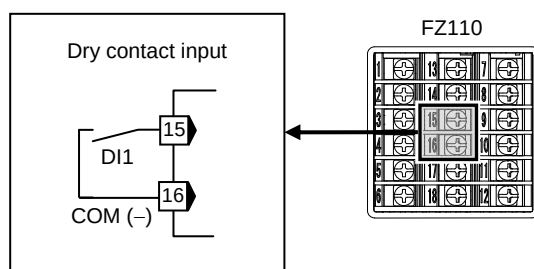
(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

Suffix code	Contents of Option 1	See page
N	None	
A	Digital input [1 point] (DI1)+Remote setting input	P. 3-14 to 3-15
B	Digital input [1 point] (DI1)+Output 3 (OUT3)	P. 3-15 to 3-16
C	Digital input [1 point] (DI1)+CT input [CTL-6-P-N]	P. 3-17
D	Digital input [1 point] (DI1)+CT input [CTL-12-S56-10L-N]	P. 3-17
E	Digital input [1 point] (DI1)+CT input [CTL-6-P-Z]	P. 3-17
F	Digital input [3 points] (DI1 to DI3)	P. 3-19

■ **Option 1: A [Digital input 1 (DI1), Remote setting input]**

Digital input 1 (DI1):

- Terminal 15 and 16 are used for Digital input 1 (DI1).



Option 1 function: In the case of “A,” the SG of the communication (Option 2) and the COM (–) of Digital input use terminal No. 16 in common.

- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

Contact specifications:

At OFF (contact open): 50 kΩ or more

At ON (contact closed): 1 k Ω or less

Contact current: 3.3 mA DC or less

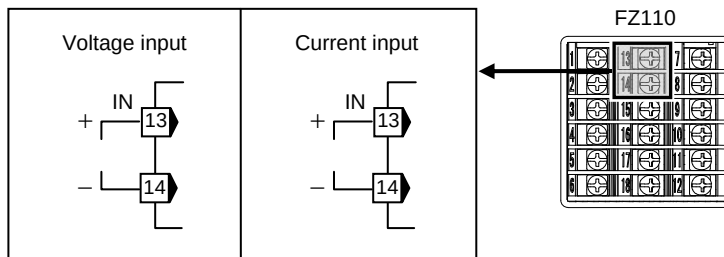
Capture judgment time: Within 200 ms

- The following functions can be assigned to Digital input 1 (DI1). Function assignment for Digital input 1 (DI1) can be done in the Engineering mode.
 - RUN/STOP transfer
 - Auto/Manual transfer
 - Remote/Local transfer
 - Interlock release
 - Peak/Bottom holds release
 - Autotuning (AT) ON/OFF
 - Set data Unlock/Lock
 - Direct/Reverse action transfer
 - Memory area transfer 2 points (Without area set signal) *
 - Area jump *

* Settable only at DI1 function selection in the Engineering mode

 To assign functions to Digital input 1 (DI1), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

- Terminal 13 and 14 are used for Remote setting input.
- Connect an appropriate input to terminals 13 and 14 according to the specification of the Remote setting input.



- Remote setting input type must be specified when ordering.

FZ110 ☐ ☐☐☐ ☐ ☐ ☐ * ☐ **A** ☐ ☐ ☐ / **1**

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

The designation of the initial setting code must be "1: Specify quick start code."

[Quick start code (Initial setting code)]

□ □ — □ □ □ □ — □
(1) (2) (3) (4) (5) (6) (7)

Code	Input type	Code	Input type
N	None	7	Current input (0 to 20 mA DC)
3	Voltage input (0 to 1 V DC)	8	Current input (4 to 20 mA DC)
4	Voltage input (0 to 5 V DC)	9	Voltage input (–5 to +5 V DC)
5	Voltage input (0 to 10 V DC) *	A	Voltage input (–10 to +10 V DC)
6	Voltage input (1 to 5 V DC)		

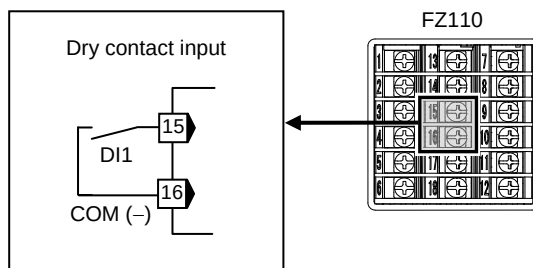
* Factory set value when the Initial setting code (11) is "N: None."

- Remote setting input is not isolated from the Measured input 1.

■ Option 1: B [Digital input 1 (DI1), Output 3 (OUT3)]

Digital input 1 (DI1):

- Terminal 15 and 16 are used for Digital input 1 (DI1).



Option 1 function: In the case of “B,” the SG of the communication (Option 2) and the COM (–) of Digital input use terminal No. 16 in common.

- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

Contact specifications: At OFF (contact open): 50 k Ω or more
At ON (contact closed): 1 k Ω or less
Contact current: 3.3 mA DC or less
Capture judgment time: Within 200 ms

Continued on the next page.

- The following functions can be assigned to Digital input 1 (DI1). Function assignment for Digital input 1 (DI1) can be done in the Engineering mode.

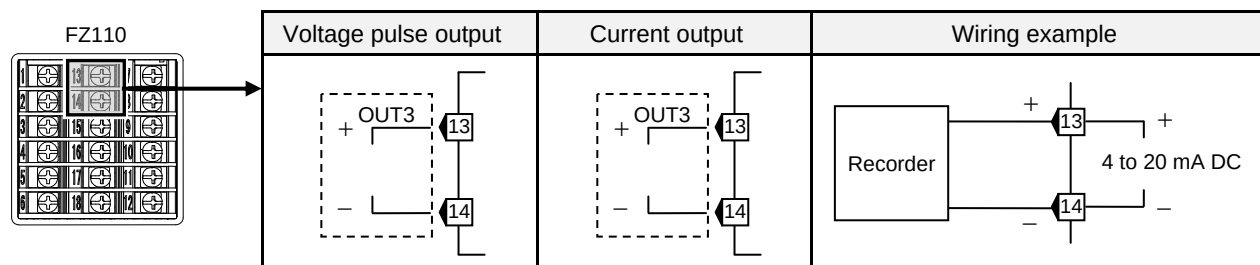
- RUN/STOP transfer
- Auto/Manual transfer
- Remote/Local transfer
- Interlock release
- Peak/Bottom holds release
- Autotuning (AT) ON/OFF
- Set data Unlock/Lock
- Direct/Reverse action transfer
- Memory area transfer 2 points (Without area set signal) *
- Area jump *

* Settable only at DI1 function selection in the Engineering mode

To assign functions to Digital input 1 (DI1), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3):

- Terminal 13 and 14 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).



: The dotted box diagram describes the output state inside the instrument.

- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at “Universal output type selection (OUT3)” in the Engineering mode.

For the details of changing the Output 3 (OUT3), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

OUT3 type	Specifications
Voltage pulse output	0/14 V DC (Allowable load resistance: 600 Ω or more)
Current output	4 to 20 mA DC (Allowable load resistance: 500 Ω or less) [Factory set value]
Current output	0 to 20 mA DC (Allowable load resistance: 500 Ω or less)

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

For the details of Output signal (function) assignment, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function)

(✓: Assignable)

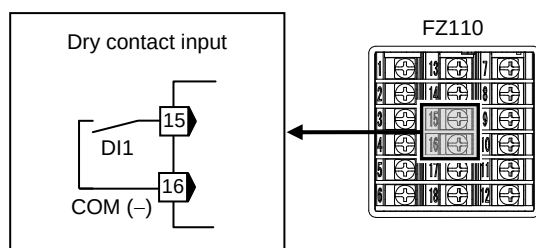
Output signals (function)	OUT3		Output signals (function)	OUT3	
	Voltage pulse	Current		Voltage pulse	Current
Input 1_Control output (Heat-side)	✓	✓	RUN state output	✓	✓
Input 1_Control output (Cool-side)	✓	✓	Output of the communication monitoring result	✓	✓
Input 1_Control output (Position proportioning)	✓	✓	Manual mode state output	✓	✓
Logic calculation output (Event output)	✓	✓	Remote mode state output	✓	✓
Logic calculation output (Control loop break alarm (LBA) output)	✓	✓	AT state output	✓	✓
Logic calculation output (Heater break alarm (HBA) output)	✓	✓	FAIL output	✓	✓
			Output while Set value (SV) is changing	✓	✓
			Retransmission output *		✓

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

■ Option 1: C, D, E [Digital input 1 (DI1), Current transformer input 1 (CT1)]

Digital input 1 (DI1):

- Terminal 15 and 16 are used for Digital input 1 (DI1).



Option 1 function: When the option is C, D, or E, the SG of the communication (Option 2) and the COM (-) of Digital input use terminal No. 16 in common.

- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

Contact specifications: At OFF (contact open): 50 k Ω or more

At ON (contact closed): 1 k Ω or less

Contact current: 3.3 mA DC or less

Capture judgment time: Within 200 ms

- The following functions can be assigned to Digital input 1 (DI1). Function assignment for Digital input 1 (DI1) can be done in the Engineering mode.
 - RUN/STOP transfer
 - Auto/Manual transfer
 - Remote/Local transfer
 - Interlock release
 - Peak/Bottom holds release
 - Autotuning (AT) ON/OFF
 - Set data Unlock/Lock
 - Direct/Reverse action transfer
 - Memory area transfer 2 points (Without area set signal) *
 - Area jump *

* Settable only at DI1 function selection in the Engineering mode

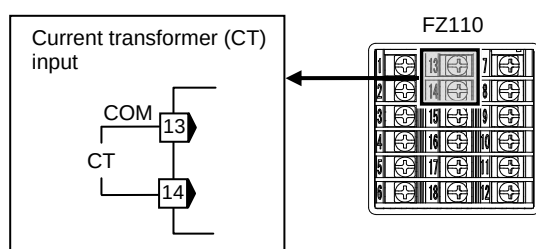


To assign functions to Digital input 1 (DI1), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Current transformer input 1 (CT1):

- Terminal 13 and 14 are used for Current transformer input 1 (CT1).

Connect the current transformer (CT) specified at the time of order to the relevant terminal.



Current transformer model code:

When Option “C” is specified:

CTL-6-P-N

[Measurable current range: 0.0 to 30.0 A] (sold separately)

When Option “D” is specified:

CTL-12-S56-10L-N

[Measurable current range: 0.0 to 100.0 A] (sold separately)

When Option “E” is specified:

CTL-6-P-Z

[Measurable current range: 0.0 to 10.0 A] (sold separately)

- Current transformer input 1 (CT1) is not isolated from the Measured input 1.
- Even after the delivery of the instrument, the type of the current transformer 1 (CT1) can be changed at “CT1 type” in the Engineering mode.

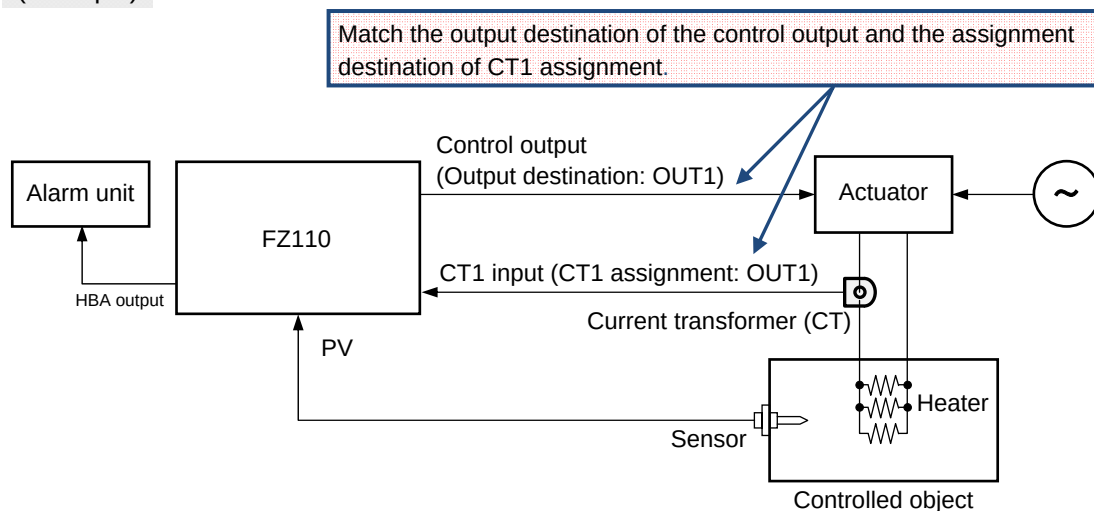


For details on changing the CT type, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Continued on the next page.

- When using Heater break alarm (HBA), set the same output for the control output detected by the current transformer (CT) [to be configured at “CT1 assignment”] and the control output of the instrument. The CT1 assignment can be done in the Engineering mode.

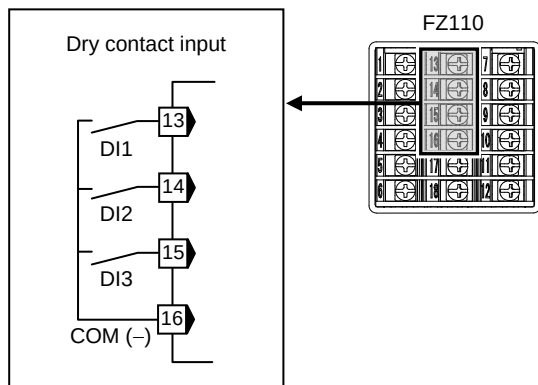
(Example)



- For the Heater break alarm (HBA) function, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

■ Option 1: F [Digital input 1 to 3 (DI1 to DI3)]

- Terminals 13 through 16 are used for Digital inputs 1 to 3 (DI1 to DI3).



Option 1 function: In the case of “F,” the SG of the communication (Option 2) and the COM (–) of Digital input use terminal No. 16 in common.

- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

Contact specifications: At OFF (contact open): 50 kΩ or more
At ON (contact closed): 1 kΩ or less
Contact current: 3.3 mA DC or less
Capture judgment time: Within 200 ms

- The following functions can be assigned to Digital inputs 1 to 3 (DI1 to DI3). Function assignment of Digital inputs 1 to 3 (DI1 to DI3) can be done in the Engineering mode.

– RUN/STOP transfer	– Set data Unlock/Lock
– Auto/Manual transfer	– Direct/Reverse action transfer
– Remote/Local transfer	– Memory area transfer 2 points (Without area set signal) *
– Interlock release	– Memory area transfer 8 points (Without area set signal) *
– Peak/Bottom holds release	– Area jump *
– Autotuning (AT) ON/OFF	

* Settable only at DI1 function selection in the Engineering mode



For the details of function assignment of Digital inputs 1 to 3 (DI1 to DI3), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

3.3.6 Option 2

- Terminal Nos. 16 to 18 are for Option 2.
- The Option 2 types are as follows.

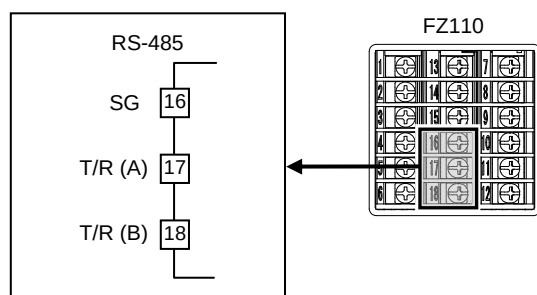
FZ110 - * /

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

Suffix code	Contents of Option 2	See page
N	None	
A	Communication (RS-485)	P. 3-20 to 3-23

■ Option 2: A [Communication (RS-485)]

- Terminals 16 through 18 are used for Communication (RS-485).



Option 2 function: In the case of “A,” the SG of the communication (Option 2) and the COM (-) of Digital input use terminal No. 16 in common.

- The Communication protocol is either specified by Quick start code (Initial setting code) when the order is placed, or set in Engineering mode.

FZ110 ☐ ☐☐☐-☐ ☐ ☐ * ☐ ☐ **A** ☐ ☐ / **1**

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

The designation of the initial setting code must be “1: Specify quick start code.”

[Quick start code (Initial setting code)]

□ □ − □ □ □ □ − □

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

Code	Communication protocol	Wiring example
N	None	
1	RKC communication (ANSI X3.28-1976) *	P. 3-21 to 3-22
2	Modbus	P. 3-21 to 3-22
3	PLC communication: MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4)	P. 3-23

* Factory set value when the Initial setting code (11) is "N: None."

-  For the details of communication (For example, protocol setting in the Engineering mode), refer to the following manuals.

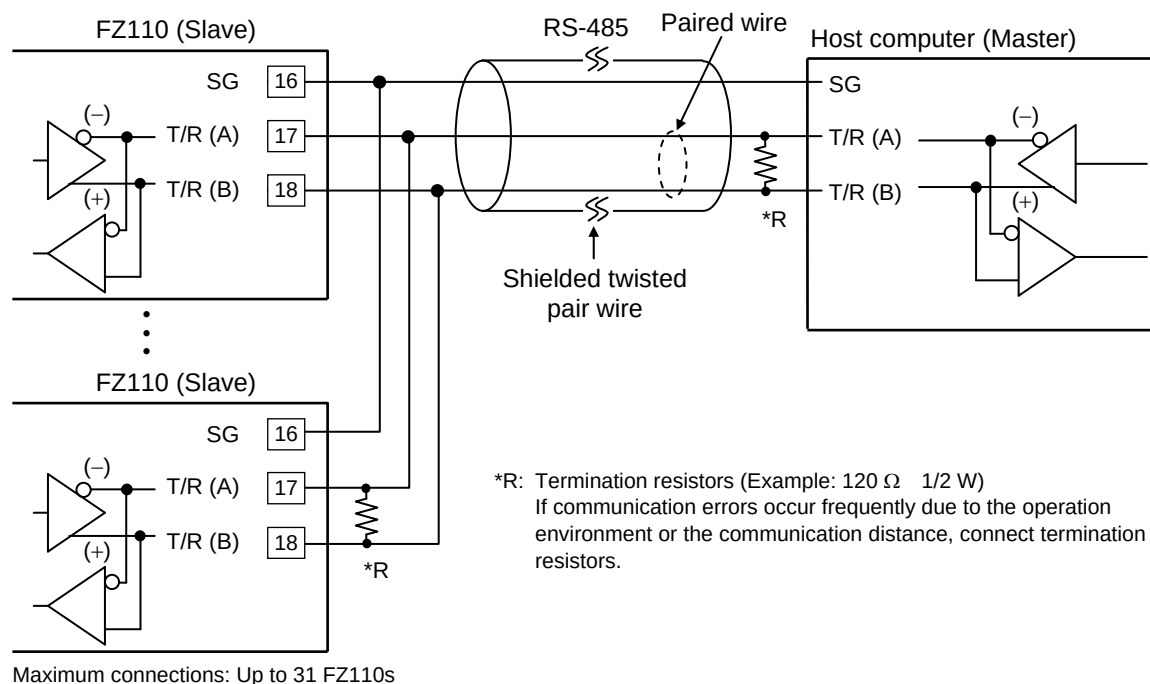
FZ110/FZ400/FZ900 Instruction Manual [Host Communication]

FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]

Continued on the next page.

● Wiring example 1

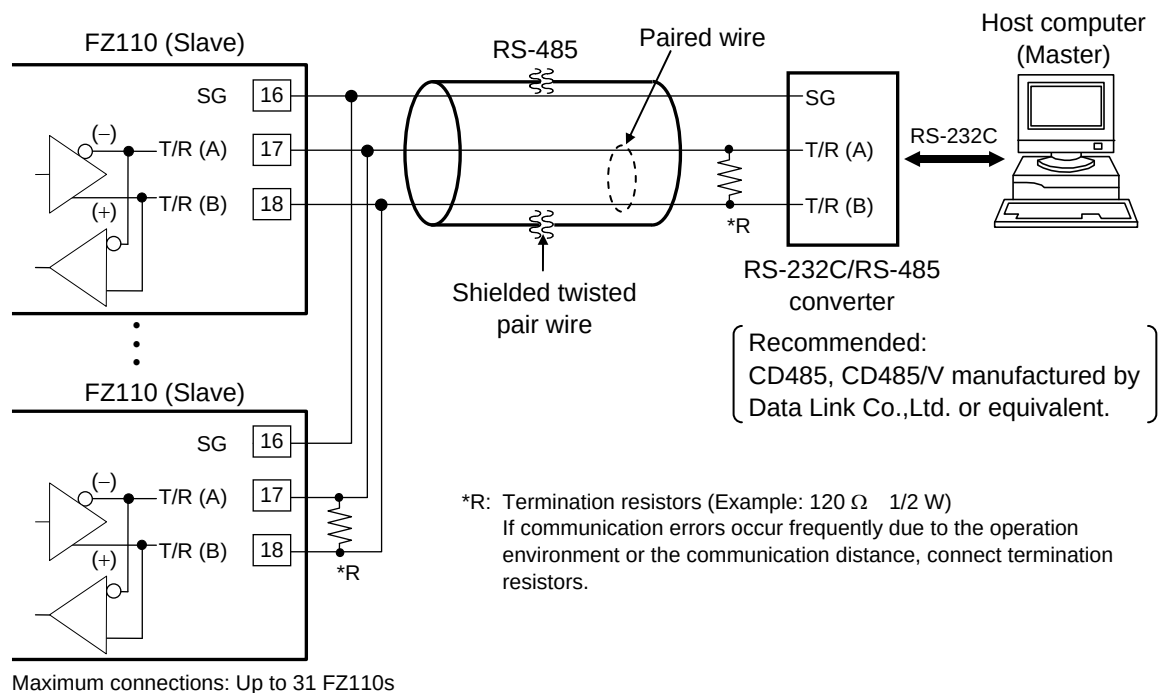
Connection to the RS-485 port of the host computer (master)



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

● Wiring example 2

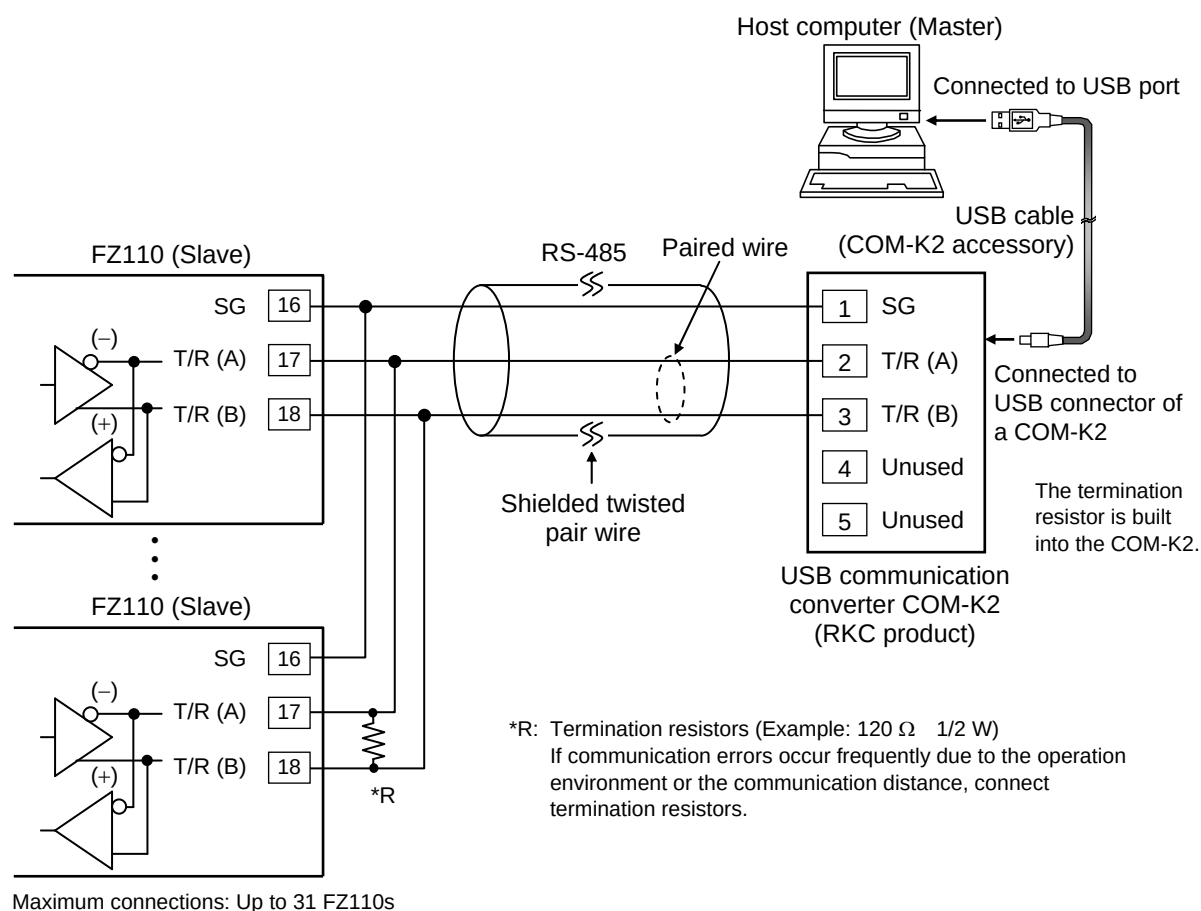
Connection to the RS-232C port of the host computer (master)



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

● Wiring example 3

Connection to the USB of the host computer (master)



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



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

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



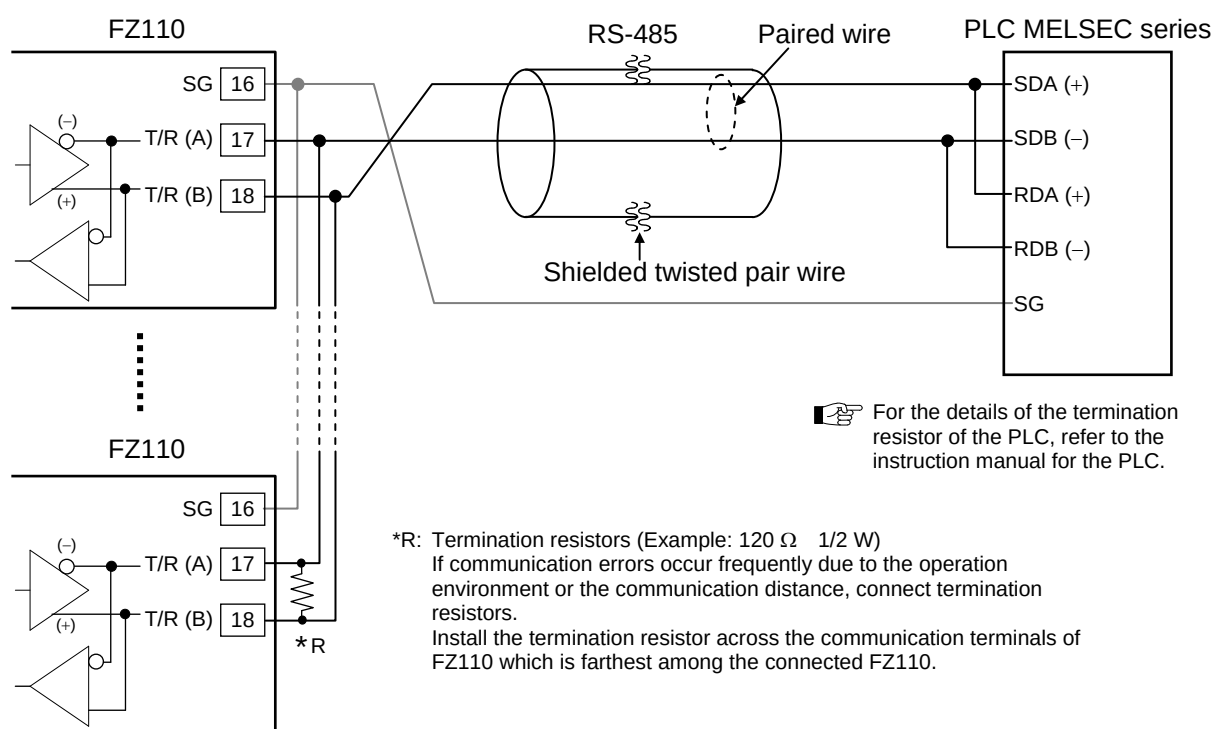
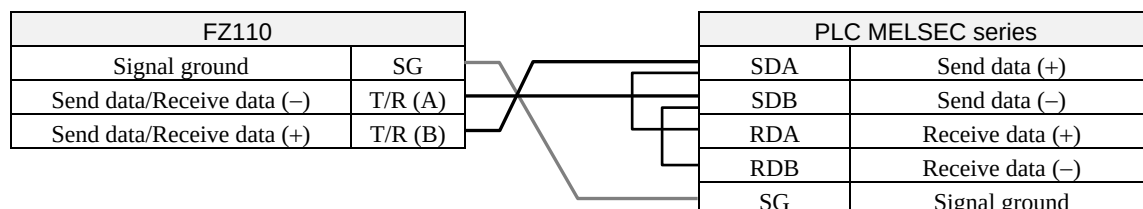
A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM2 is used using a COM-K, the PROTEM2 will not be supported by Windows 8 or later.

● Wiring example 4

When the PLC to be connected is MITSUBISHI MELSEC series

NOTE

Note that the signal polarity symbols (A and B) are opposite to each other between the PLC (MELSEC series) and the FZ series controller. Normally A is connected to A and B to B. However, in this case, A must be connected to B, and B must be connected to A.



*R: Termination resistors (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors.
Install the termination resistor across the communication terminals of FZ110 which is farthest among the connected FZ110.

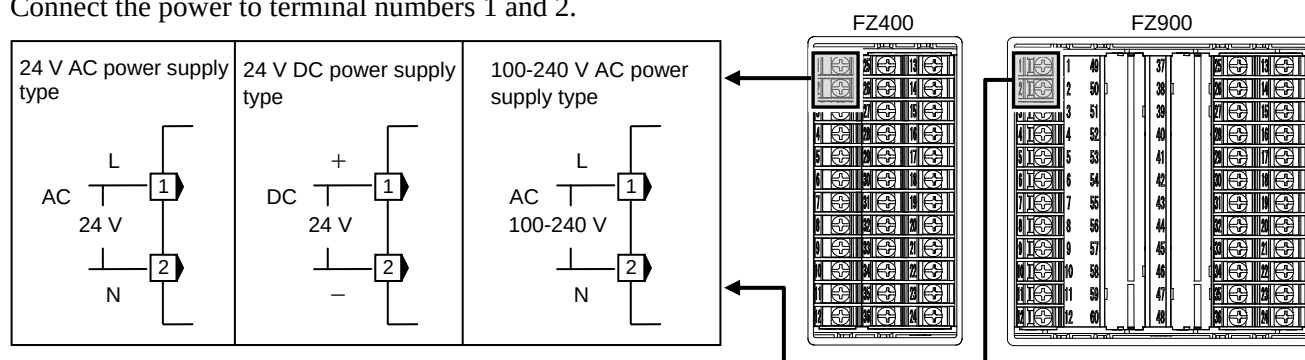
Maximum connections: Up to 31 FZ110s

3.4 Wiring of Each Terminal [FZ400/900]

Always check the polarity of each terminal prior to wiring.

3.4.1 Power supply

- Connect the power to terminal numbers 1 and 2.



- Power supply voltage for the controller must be within the range shown below.

FZ400 - * /
FZ900 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

Suffix code	Power supply type	Power consumption	Rush current
3	20.4 to 26.4 V AC [Including power supply voltage variation] (Rated: 24 V AC) Power supply frequency: 50/60 Hz Frequency variation: 50 Hz (−10 to +5 %) 60 Hz (−10 to +5 %)	FZ400: 6.7 VA max. (at 24 V AC) FZ900: 7.2 VA max. (at 24 V AC)	16.3 A or less (at 24 V AC)
3	20.4 to 26.4 V DC [Including power supply voltage variation] (Rated: 24 V DC)	FZ400: 170 mA max. (at 24 V DC) FZ900: 185 mA max. (at 24 V DC)	11.5 A or less (at 24 V DC)
4	85 to 264 V AC [Including power supply voltage variation] (Rated: 100 to 240 V AC) Power supply frequency: 50/60 Hz Frequency variation: 50 Hz (−10 to +5 %) 60 Hz (−10 to +5 %)	FZ400: 6.6 VA max. (at 100 V AC) 9.8 VA max. (at 240 V AC) FZ900: 7.2 VA max. (at 100 V AC) 10.6 VA max. (at 240 V AC)	5.6 A or less (at 100 V AC) 13.3 A or less (at 240 V AC)

- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply input, supply power from “SELV” circuit defined as IEC 60950-1.
- This instrument is not provided with an overcurrent protection device. For safety install an overcurrent protection device (such as a fuse) with adequate breaking close to the instrument.

Fuse type: Time-lag fuse (IEC60127-2, UL248-14)

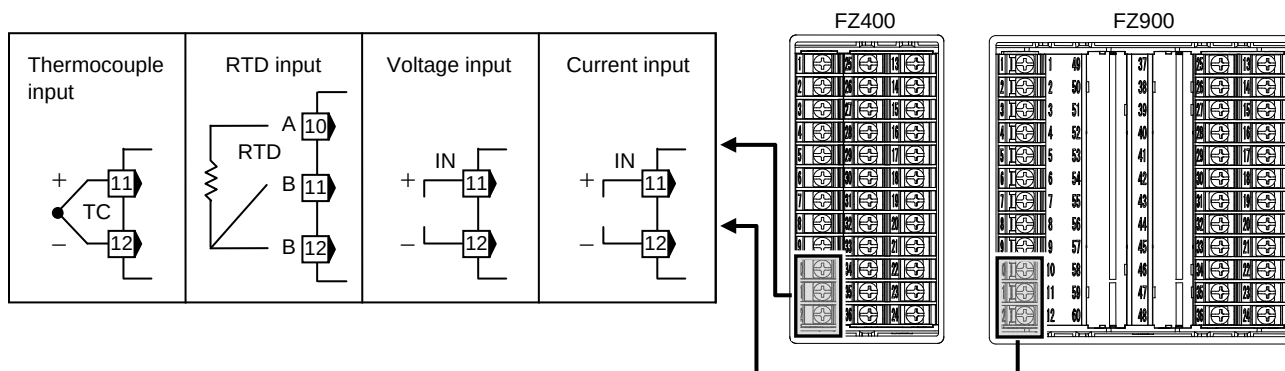
Fuse rating: Rated voltage 250 V AC

Rated current 0.5 A (24 V AC/DC type)

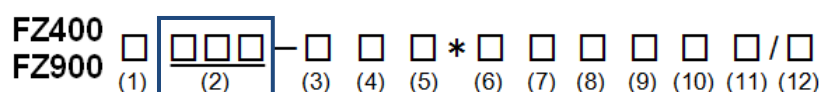
1 A (100 to 240 V AC type)

3.4.2 Measured input 1 (Thermocouple/RTD/Voltage/Current)

- For the measured input type, terminals 10 through 12 are allocated to the measured input.



- The input types (input group) are as follows.



Suffix code	Input group	Input type
Refer to Range Code Table (P. 1-10)	Thermocouple (TC) input	K, J, T, S, R, E, B, N (JIS C1602-1995), PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002]), U, L (DIN43710-1985), PR40-20 (ASTM-E1751-00)
	RTD input	Pt100 (JIS C1604-1997), JPt100 (JIS C1604-1997, Pt100 of JIS C1604-1981)
	Low voltage input	0 to 10 mV DC, 0 to 100 mV DC
	High voltage input	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, -5 to +5 V DC, -10 to +10 V DC
	Current input	0 to 20 mA DC, 4 to 20 mA DC



NOTE

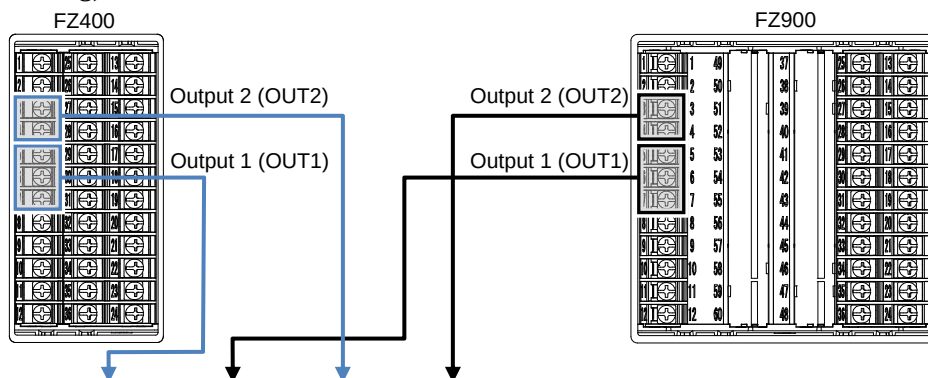
When the input type is changed from current or high voltage input to TC, RTD or low voltage input, remove the wirings of the measured input before attempting the input change. Changing the input type with the signal applied to the instrument may lead to a failure of the instrument.

- For details on changing the Input type, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- Signal connected to Voltage input and Current input shall be low voltage defined as “SELV” circuit per IEC 60950-1.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.

3.4.3 Output 1 (OUT1)/Output 2 (OUT2)

- Terminals 5 through 7 are used for Output 1 (OUT1); and Terminal 3 and 4 are used for Output 2 (OUT2).
- Connect an appropriate load according to the output type of Output 1 (OUT1) and Output 2 (OUT2).
(Specify when ordering)



	Output 1 (OUT1)	Output 2 (OUT2)	Wiring example
Relay contact output			
★ Voltage pulse output			
★ Continuous voltage output Current output			
★ Transistor output			

NO: Normally open

NC: Normally close

★: To prevent malfunctioning, do not connect wires to unused terminals (terminal No. 7).

: The dotted box diagram describes the output state inside the instrument.

Continued on the next page.

¹ The following table shows factory set values of Output signals (function) which are assigned to OUT1 and OUT2 when the suffix code other than "N" is specified.

Control action	Option 3 [Suffix code (9)]	Factory set value	
PID control	N: None or 1: Remote setting input	OUT1: Input 1_Control output	OUT2: Heater break alarm 1 (HBA1) output Heater break alarm 2 (HBA2) output
	2: Measured input 2	OUT1: Input 1_Control output	OUT2: Input 2_Control output
Heat/Cool PID control	N: None or 1: Remote setting input	OUT1: Input 1_Control output (Heat-side)	OUT1: Input 1_Control output (Cool-side)
Position proportioning PID control		OUT1: Input 1_Control output (Open-side)	OUT1: Input 1_Control output (Close-side)

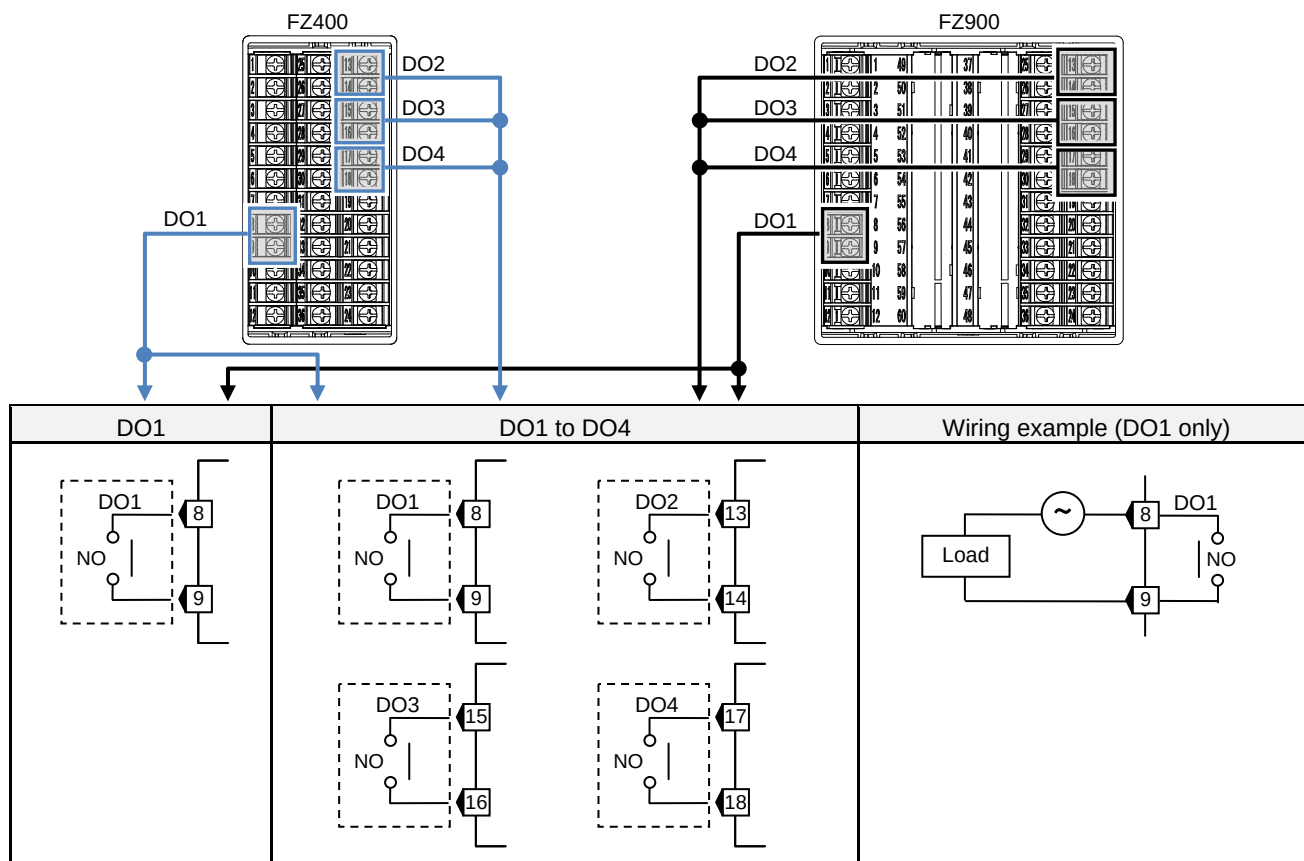
² Factory preset is available by specifying the Initial setting code at the time of order. [1.3.2 Quick start code (Initial setting code) (P. 1-8)]

³ Configurable at "OUT1 function selection" and "OUT2 function selection" in the Engineering mode.

⁴ Multiple functions can be specified for "OUT1 logic calculation selection" and "OUT2 logic calculation selection" in the Engineering mode. (OR-output)

3.4.4 Digital output (DO1/DO2/DO3/DO4)

- Terminal 8 and 9 are used for DO1; and Terminals 13 through 18 are used for DO2 to DO4.
- Connect the load(s) according to the number of output (specify when ordering) of Digital outputs (DO1 to DO4).



NO: Normally open

: The dotted box diagram describes the output state inside the instrument.

Continued on the next page.

- Output type is only relay contact output.

FZ400 ☐ ☐ ☐ ☐ ☐ ☐ * ☐ ☐ ☐ ☐ ☐ / ☐
FZ900 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

Suffix code	Number of output	Specifications
1	Digital output [1 point] (DO1)	Contact type: a contact Contact rating (Resistive load): 250 V AC 1 A, 30 V DC 0.5 A
4	Digital output [4 points] (DO1 to DO4)	Electrical life: 150,000 times or more (Rated load) Mechanical life: 20 million times or more (Switching: 300 times/min)

- Output signals (function) can be assigned to each Digital output (DO1 to DO4). Output signal (function) assignment is available either Initial setting code at the time of order or reconfiguration in the Engineering mode.

 For the details of Output signals (function) assignment, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Digital outputs (DO1 to DO4) and Output signals (function)

(✓: Assignable)

Output signals (function)	DO1 ¹	DO2 ¹	DO3 ¹	DO4 ¹	Remarks
Logic calculation output (Event output) ^{2,4}	✓	✓	✓	✓	¹ Factory set values of Output signals (function) assigned to DO1 to DO4 are as follows. Digital output 1point (DO1): DO1: Event 1, DO2 to DO4: No assignment Digital output points (DO1 to DO4): DO1: Event 1 DO2: Event 2 DO3: Event 3 DO4: Event 4
Logic calculation output (Control loop break alarm (LBA) output) ^{2,4}	✓	✓	✓	✓	
Logic calculation output (Heater break alarm (HBA) output) ^{2,4}	✓	✓	✓	✓	
RUN state output ³	✓	✓	✓	✓	
Output of the communication monitoring result ³	✓	✓	✓	✓	² Factory preset is available by specifying the Initial setting code at the time of order. [1.3.2 Quick start code (Initial setting code) (P. 1-8)]
Manual mode state output ³	✓	✓	✓	✓	
Remote mode state output ³	✓	✓	✓	✓	³ Configurable at "DO1 function selection" to "DO4 function selection" in the Engineering mode.
AT state output ³	✓	✓	✓	✓	
Output while Set value (SV) is changing ³	✓	✓	✓	✓	⁴ Multiple functions can be specified for "DO1 logic calculation selection" to "DO4 logic calculation selection" in the Engineering mode. (<i>OR-output</i>)
FAIL output ²	✓	✓	✓	✓	

3.4.5 Option 1

- Terminal Nos. 19 to 21 are for Option 1.
- The Option 1 types are as follows.

FZ400
FZ900
☐ (1)
 ☐ (2)
 ☐ (3)
 ☐ (4)
 ☐ (5)
 ☐ (6)
 ☐ (7)
 ☐ (8)
 ☐ (9)
 ☐ (10)
 ☐ (11)
 ☐ (12)

Suffix code	Contents of Option 1	See page
N	None	
T	CT input [2 points] (CT1, CT2) [CTL-6-P-N]	P. 3-30 to 3-31
U	CT input [2 points] (CT1, CT2) [CTL-12-S56-10L-N]	P. 3-30 to 3-31
V	CT input [2 points] (CT1, CT2) [CTL-6-P-Z]	P. 3-30 to 3-31
W	Feedback resistance (FBR) input	P. 3-32

■ Option 1: T, U, V

[Current transformer input 1 (CT1), Current transformer input 2 (CT2)]

- Terminal 19 and 20 are used for Current transformer input 1 (CT1); and Terminal 19 and 21 are used for Current transformer input 2 (CT2).
Connect the current transformer (CT) specified at the time of order to the relevant terminal.

Current transformer model code:

When Option “T” is specified: CTL-6-P-N

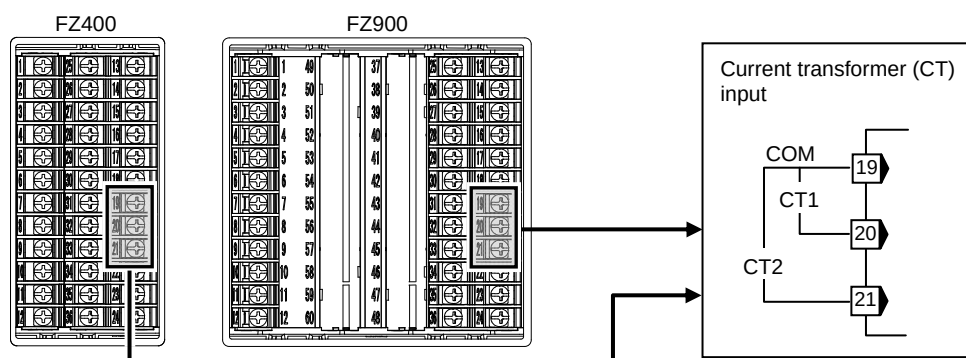
[Measurable current range: 0.0 to 30.0 A] (sold separately)

When Option “U” is specified: CTL-12-S56-10L-N

[Measurable current range: 0.0 to 100.0 A] (sold separately)

When Option “V” is specified: CTL-6-P-Z

[Measurable current range: 0.0 to 10.0 A] (sold separately)

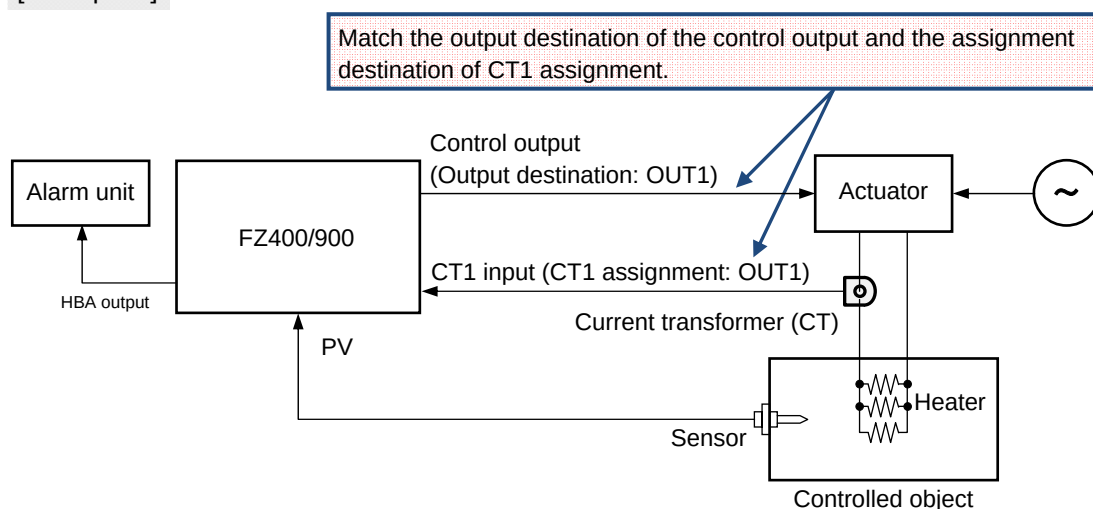


- Current transformer input 1 (CT1) and Current transformer input 2 (CT 2) is not isolated from the Measured input 1.
- Even after the delivery of the instrument, the type of the current transformer 1 (CT1) and the current transformer 2 (CT2) can be changed at “CT1 type” and “CT2 type” in the Engineering mode.

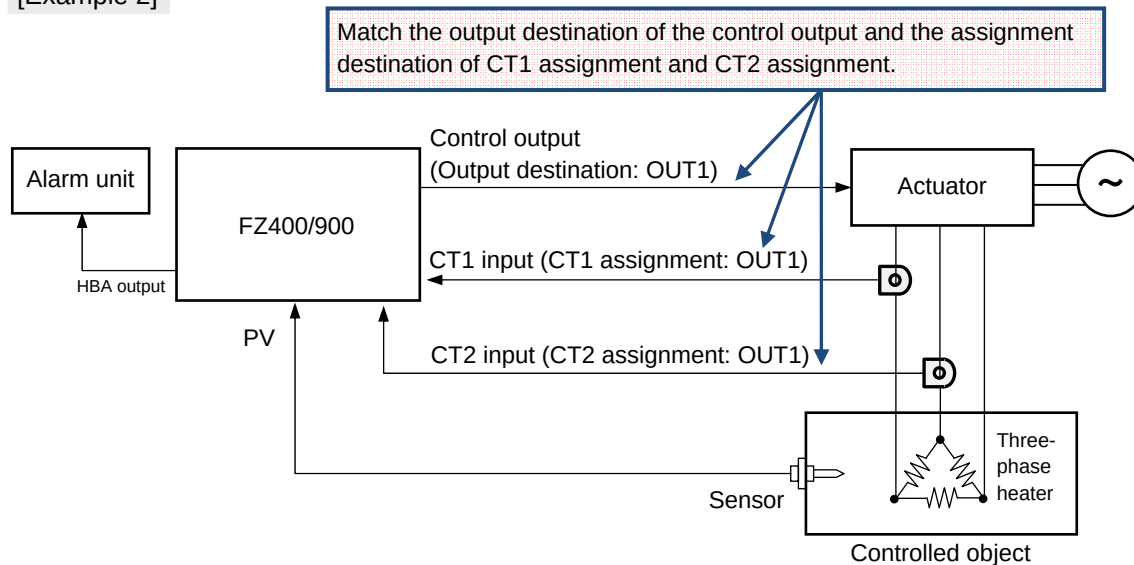
For details on changing the CT type, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

- When using Heater break alarm (HBA), set the same output for the control output detected by the current transformer (CT) [to be configured at “CT1 assignment,” “CT2 assignment”] and the control output of the instrument. “CT1 assignment” and “CT2 assignment” can be done in the Engineering mode.

[Example 1]



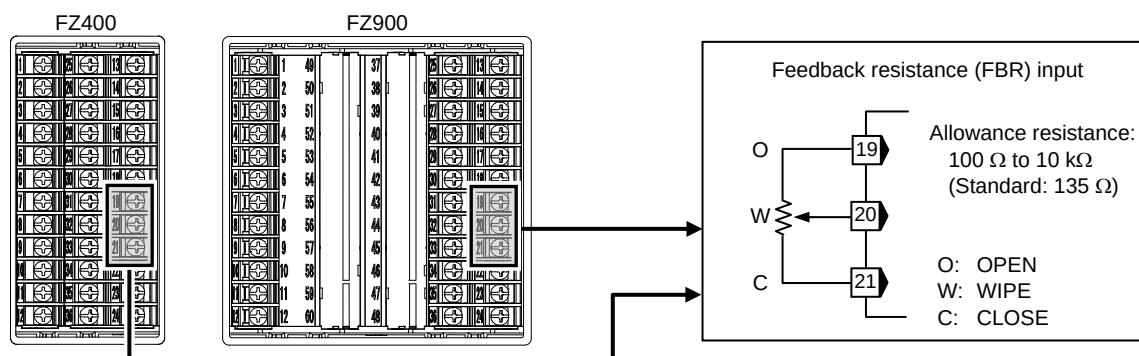
[Example 2]



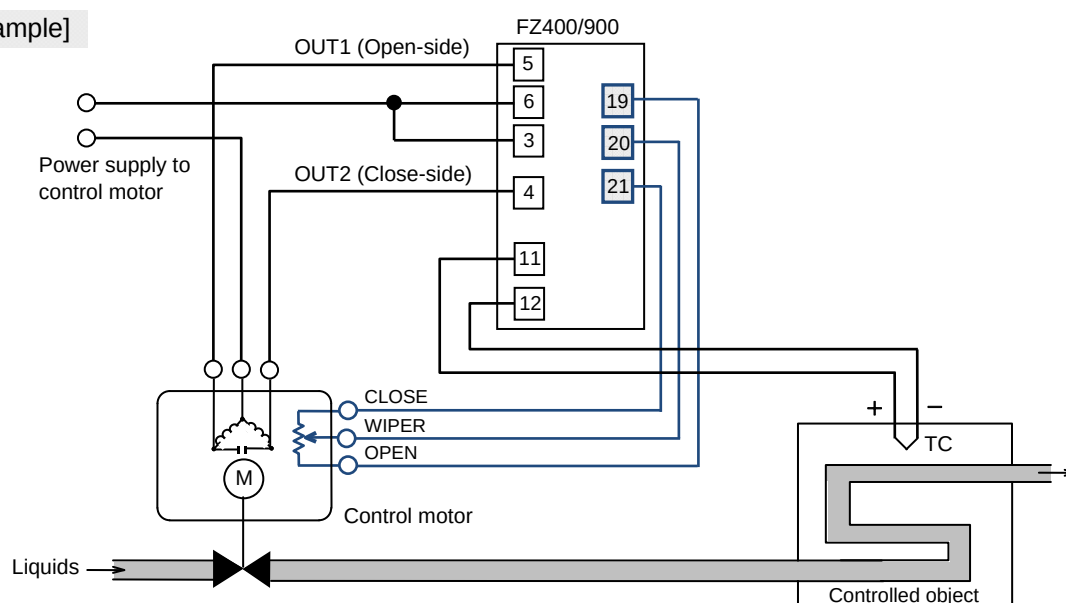
For the Heater break alarm (HBA) function, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

■ Option 1: W [Feedback resistance (FBR) input]

- Terminals 19 through 21 are used for Feedback resistance (FBR) input.
Connect a potentiometer at the relevant terminal.



[Example]



- Feedback resistance (FBR) input is not isolated from the Measured input 1.

3.4.6 Option 2

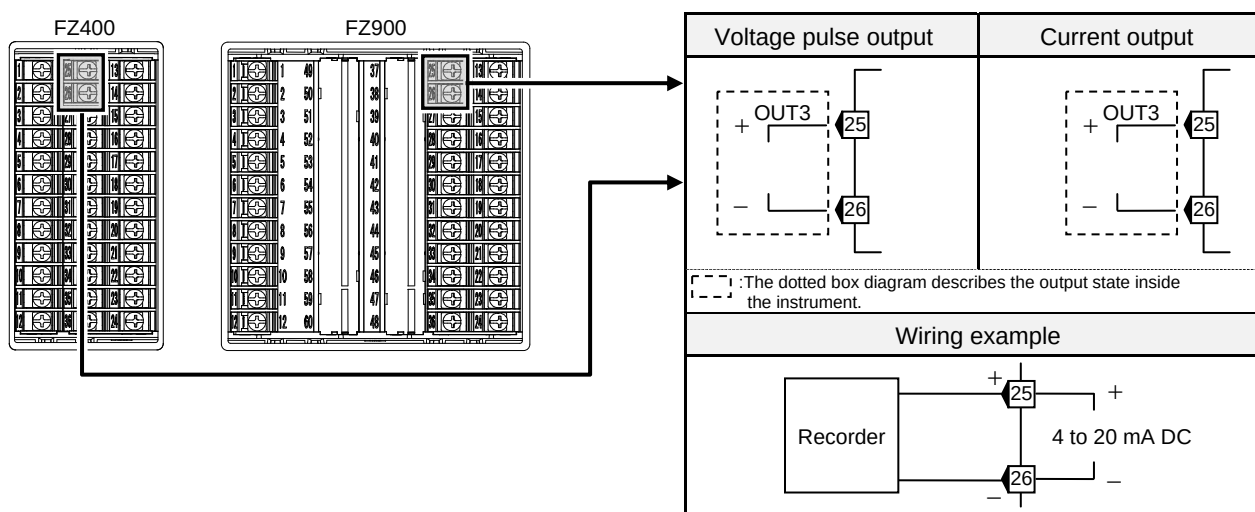
- Terminal Nos. 25 to 36 are for Option 2.
- The Option 2 types are as follows.

FZ400
FZ900
☐ (1)
 ☐ (2)
 ☐ (3)
 ☐ (4)
 ☐ (5)
 ☐ (6)
 ☐ (7)
 ☐ (8)
 ☐ (9)
 ☐ (10)
 ☐ (11)
 ☐ (12)

Suffix code	Contents of Option 2	See page
N	None	
A	Output 3 (OUT3)	P. 3-33 to 3-34
B	Digital input [6 points] (DI1 to DI6)	P. 3-35
C	Communication (RS-422A)	P. 3-36 to 3-39
D	Communication (RS-485)	P. 3-40 to 3-43
E	Output 3 (OUT3)+Digital input [6 points] (DI1 to DI6)	P. 3-44 to 3-45
F	Output 3 (OUT3)+Communication (RS-422A)	P. 3-46 to 3-47
G	Output 3 (OUT3)+Communication (RS-485)	P. 3-48 to 3-49
H	Output 3 (OUT3)+Digital input [4 points] (DI1 to DI4)+Communication (RS-422A)	P. 3-50 to 3-52
J	Output 3 (OUT3)+Digital input [6 points] (DI1 to DI6)+Communication (RS-485)	P. 3-53 to 3-55

■ Option 2: A [Output 3 (OUT3)]

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).



- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at “Universal output type selection (OUT3)” in the Engineering mode.

For the details of changing the Output 3 (OUT3), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

OUT3 type	Specifications
Voltage pulse output	0/14 V DC (Allowable load resistance: 600 Ω or more)
Current output	4 to 20 mA DC (Allowable load resistance: 500 Ω or less) [Factory set value]
Current output	0 to 20 mA DC (Allowable load resistance: 500 Ω or less)

Continued on the next page.

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

For the details of Output signal (function) assignment, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function)

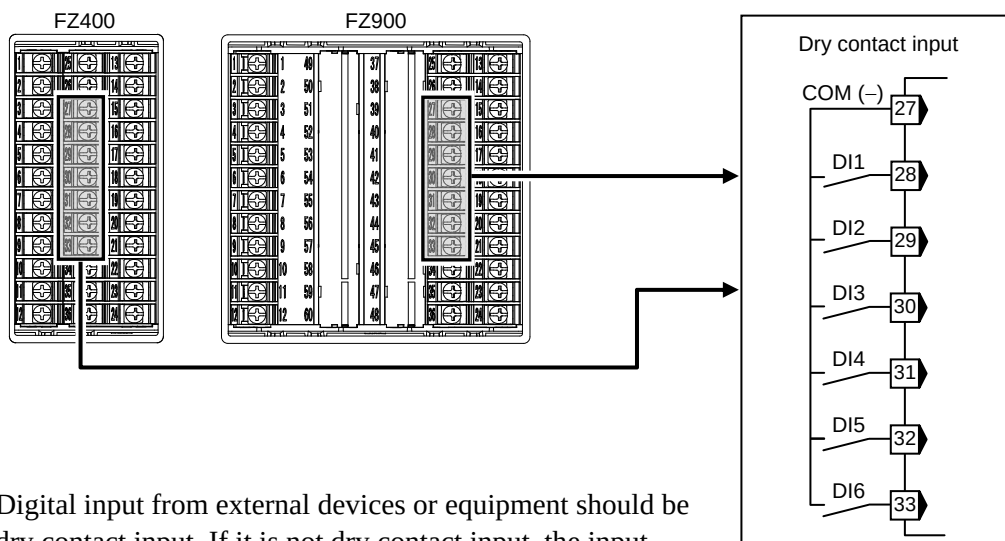
(✓: Assignable)

Output signals (function)	OUT3		Output signals (function)	OUT3	
	Voltage pulse	Current		Voltage pulse	Current
Input 1_Control output (Heat-side)	✓	✓	RUN state output	✓	✓
Input 1_Control output (Cool-side)	✓	✓	Output of the communication monitoring result	✓	✓
Input 1_Control output (Position proportioning)	✓	✓	Manual mode state output	✓	✓
Logic calculation output (Event output)	✓	✓	Remote mode state output	✓	✓
Logic calculation output (Control loop break alarm (LBA) output)	✓	✓	AT state output	✓	✓
			FAIL output	✓	✓
Logic calculation output (Heater break alarm (HBA) output)	✓	✓	Output while Set value (SV) is changing	✓	✓
			Retransmission output *	✓	✓

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

■ **Option 2: B [Digital input 1 to 6 (DI1 to DI6)]**

- Terminals 27 through 33 are used for Digital inputs 1 to 6 (DI1 to DI6).



- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

Contact specifications:

At OFF (contact open): 50 kΩ or more

At ON (contact closed): 1 k Ω or less

Contact current: 3.3 mA DC or less

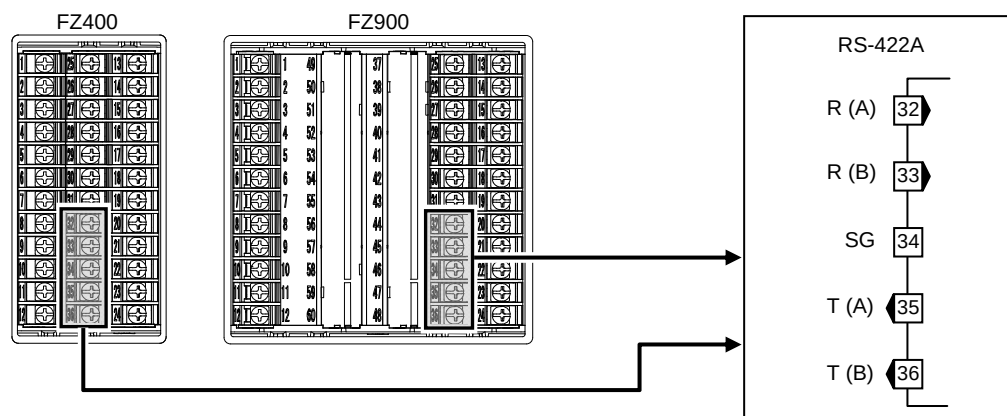
Capture judgment time: Within 200 ms

- The following functions can be assigned to Digital inputs 1 to 6 (DI1 to DI6). Function assignment of Digital inputs 1 to 6 (DI1 to DI6) can be done in the Engineering mode.
 - RUN/STOP transfer
 - Auto/Manual transfer
 - Remote/Local transfer
 - Cascade mode transfer
 - PV select transfer
 - 2-loop control/Differential temperature control
 - Interlock release
 - Peak/Bottom holds release
 - Autotuning (AT) ON/OFF
 - Set data Unlock/Lock
 - Direct/Reverse action transfer
 - Memory area transfer 2 points (Without area set signal) *
 - Memory area transfer 8 points (Without area set signal) *
 - Memory area transfer 8 points (With area set signal) *
 - Memory area transfer 16 points (Without area set signal) *
 - Memory area transfer 16 points (With area set signal) *
 - Area jump *

* Settable only at DI1 function selection in the Engineering mode

 For the details of function assignment of Digital inputs 1 to 6 (DI1 to DI6), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

- Terminals 32 through 36 are used for Communication (RS-422A).



- FZ400 - * **C** / **1**
FZ900 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

The designation of the initial setting code must be "1: Specify quick start code."

□ □ − □ □ □ □ − □

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

Code	Communication protocol	Wiring example
N	None	
1	RKC communication (ANSI X3.28-1976) *	P. 3-37 to 3-38
2	Modbus	P. 3-37 to 3-38
3	PLC communication: MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4)	P. 3-39

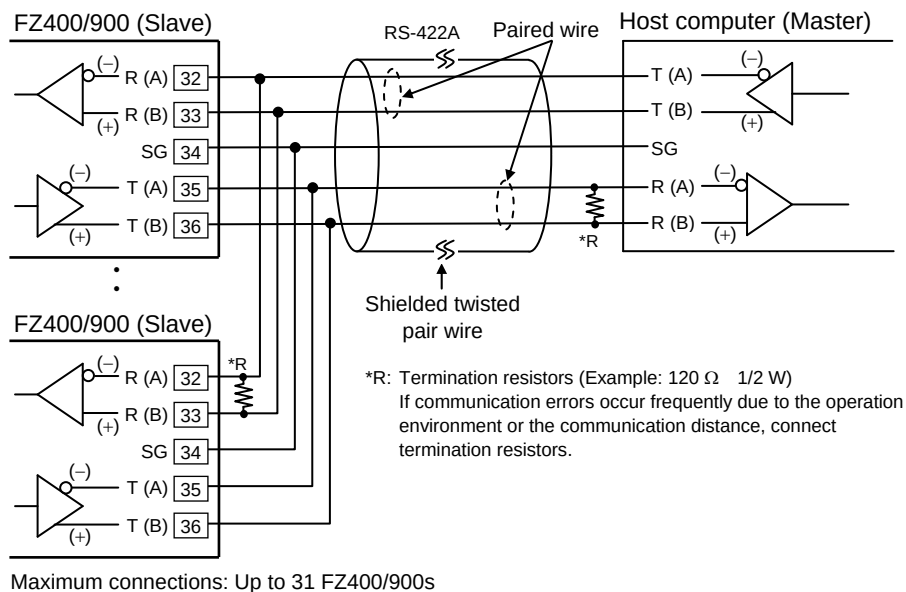
* Factory set value when the Initial setting code (12) is "N: None."

- FZ110/FZ400/FZ900 Instruction Manual [Host Communication]**
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]

Continued on the next page.

● Wiring example 1

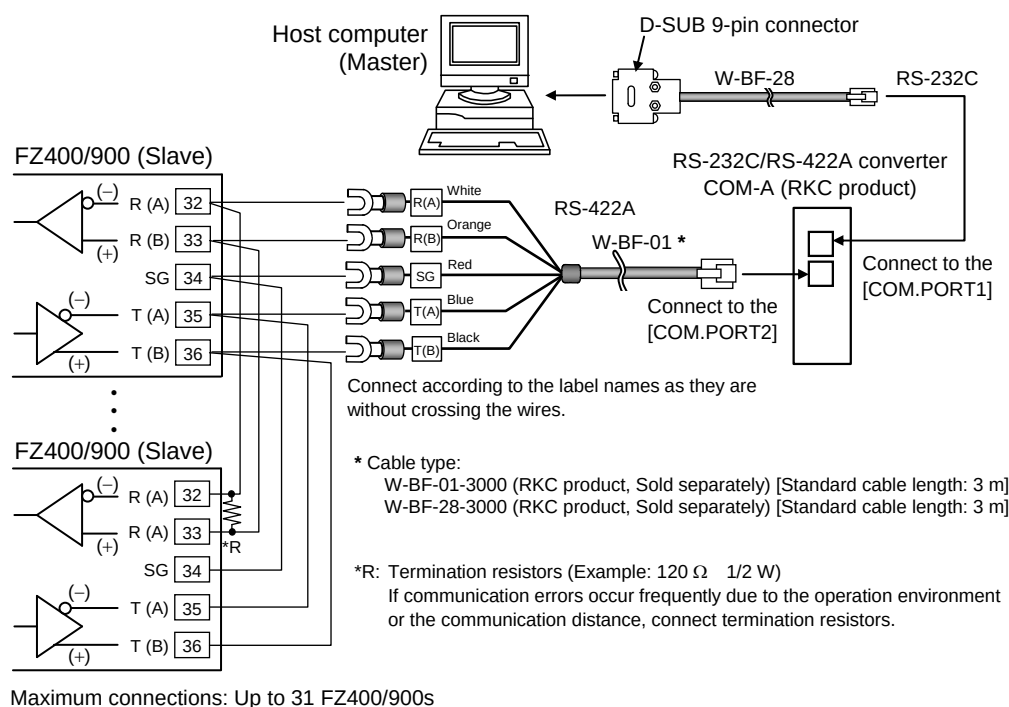
Connection to the RS-422A port of the host computer (master)



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

● Wiring example 2

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



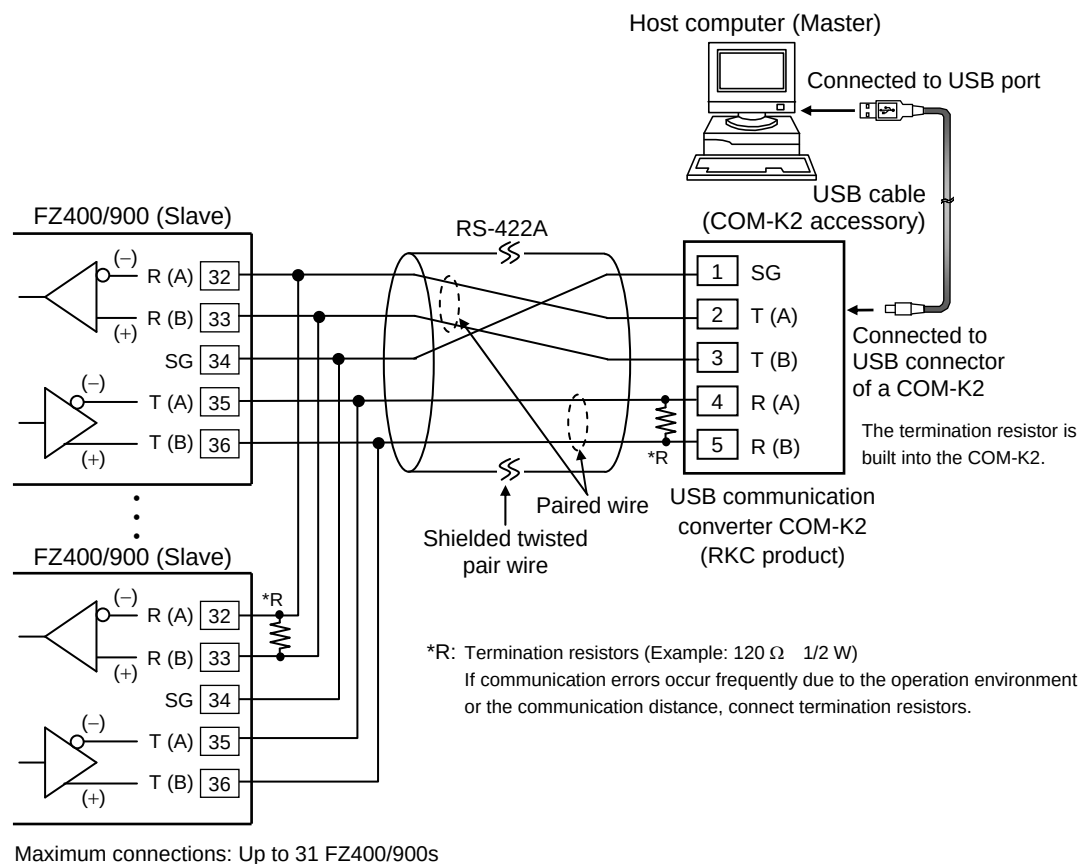
The communication cable and termination resistor(s) must be provided by the customer.

W-BF-01 or W-BF-28 communication cable (RKC product) can be used as communication cable (sold separately). If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.

Recommended RS-232C/RS-422A converter: **COM-A** (RKC product)
For the COM-A, refer to the **COM-A/COM-B Instruction Manual**.

● Wiring example 3

Connection to the USB of the host computer (master)



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



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

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



A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM2 is used using a COM-K, the PROTEM2 will not be supported by Windows 8 or later.

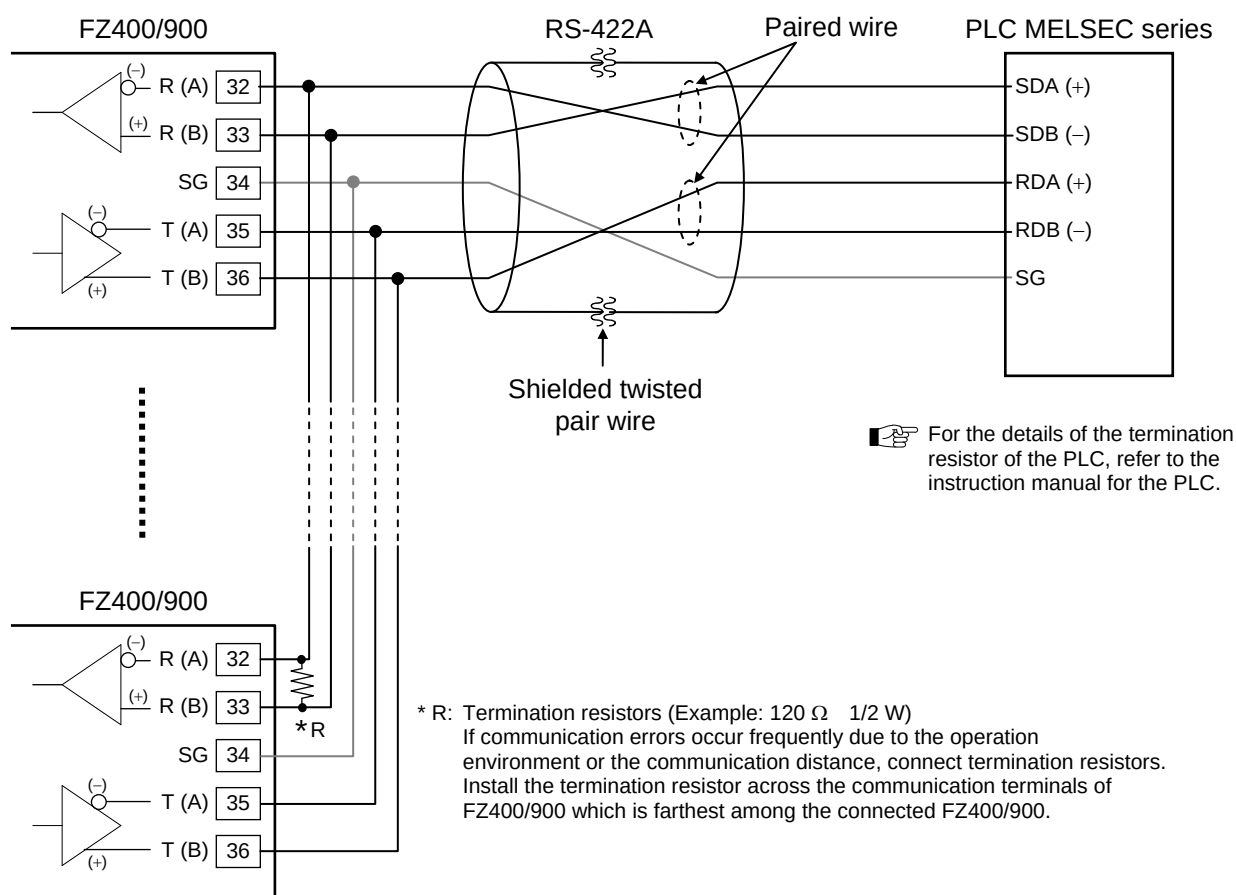
● Wiring example 4

When the PLC to be connected is MITSUBISHI MELSEC series

NOTE

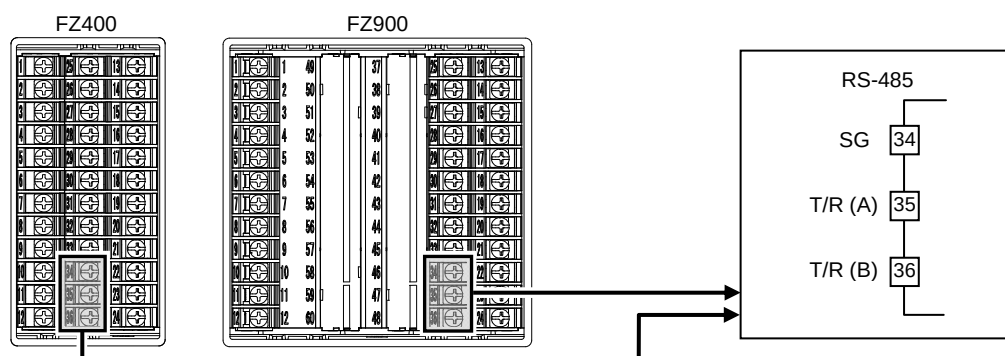
Note that the signal polarity symbols (A and B) are opposite to each other between the PLC (MELSEC series) and the FZ series controller. Normally A is connected to A and B to B. However, in this case, A must be connected to B, and B must be connected to A.

FZ400/900		PLC MELSEC series	
Receive data (-)	R (A)	SDA	Send data (+)
Receive data (+)	R (B)	SDB	Send data (-)
Signal ground	SG	RDA	Receive data (+)
Send data (-)	T (A)	RDB	Receive data (-)
Send data (+)	T (B)	SG	Signal ground



Maximum connections: Up to 31 FZ400/900s

- Terminals 34 through 36 are used for Communication (RS-485).



- FZ400** ☐ ☐☐☐-☐ ☐ ☐*☐ ☐ **D** ☐ ☐ ☐/ **1**
FZ900 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

The designation of the initial setting code must be "1: Specify quick start code."

□ □ − □ □ □ □ − □
(1) (2) (3) (4) (5) (6) (7)

Code	Communication protocol	Wiring example
N	None	
1	RKC communication (ANSI X3.28-1976) *	P. 3-41 to 3-42
2	Modbus	P. 3-41 to 3-42
3	PLC communication: MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4)	P. 3-43

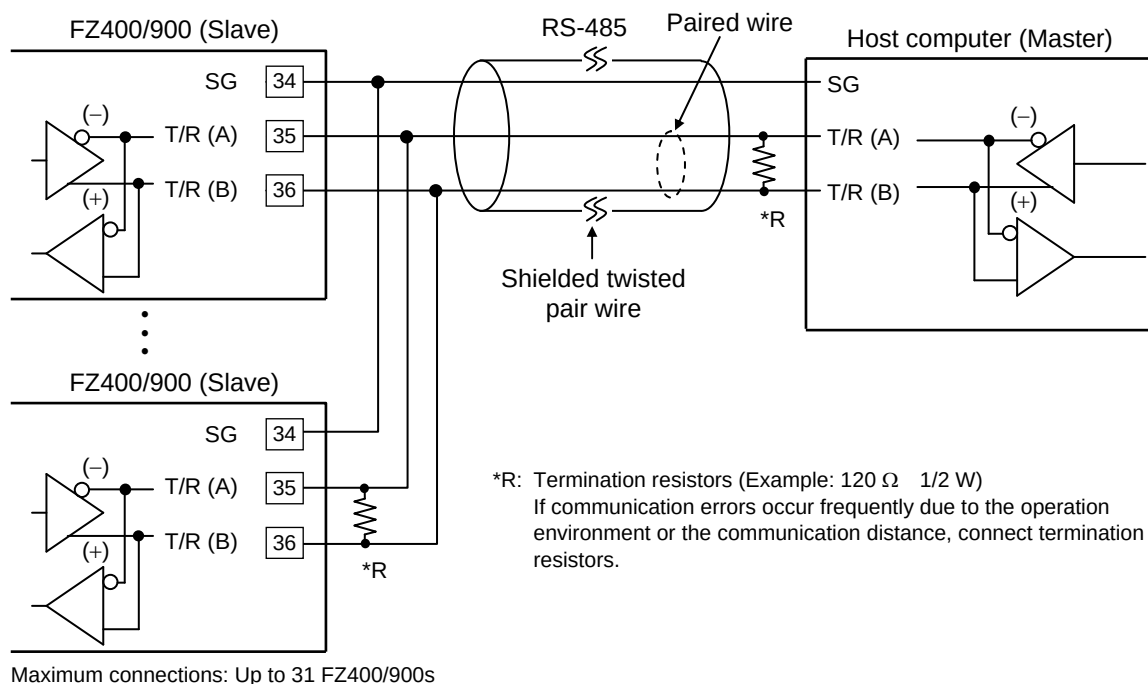
* Factory set value when the Initial setting code (12) is "N: None."

- FZ110/FZ400/FZ900 Instruction Manual [Host Communication]**
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]

Continued on the next page.

● Wiring example 1

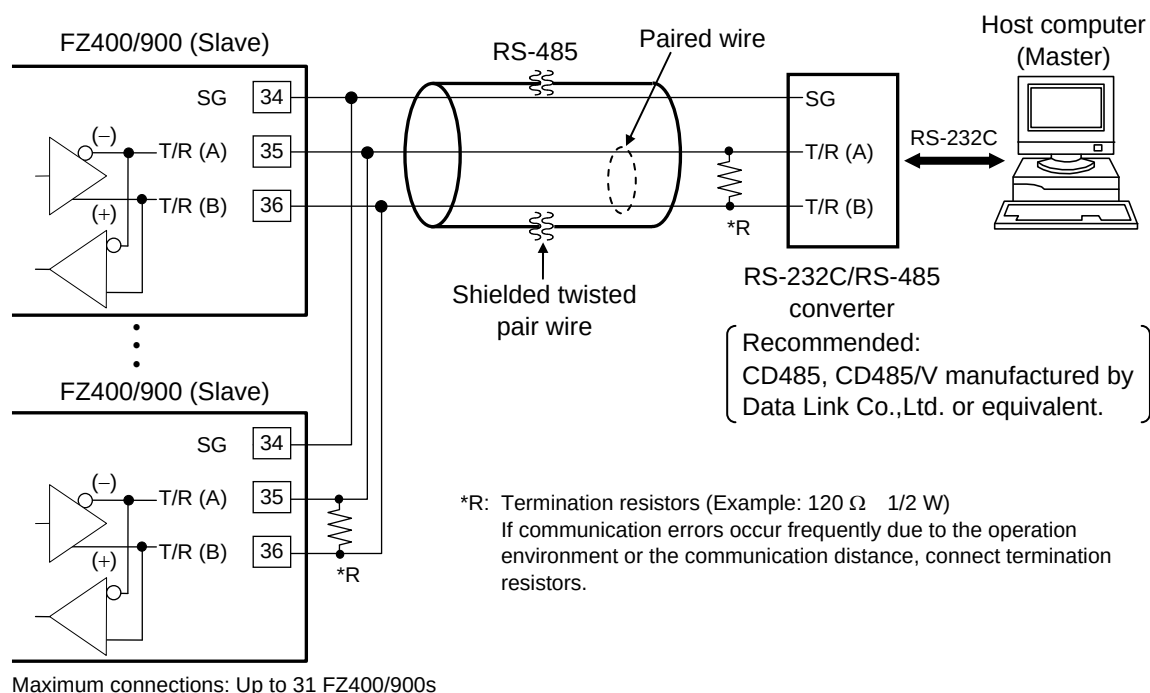
Connection to the RS-485 port of the host computer (master)



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

● Wiring example 2

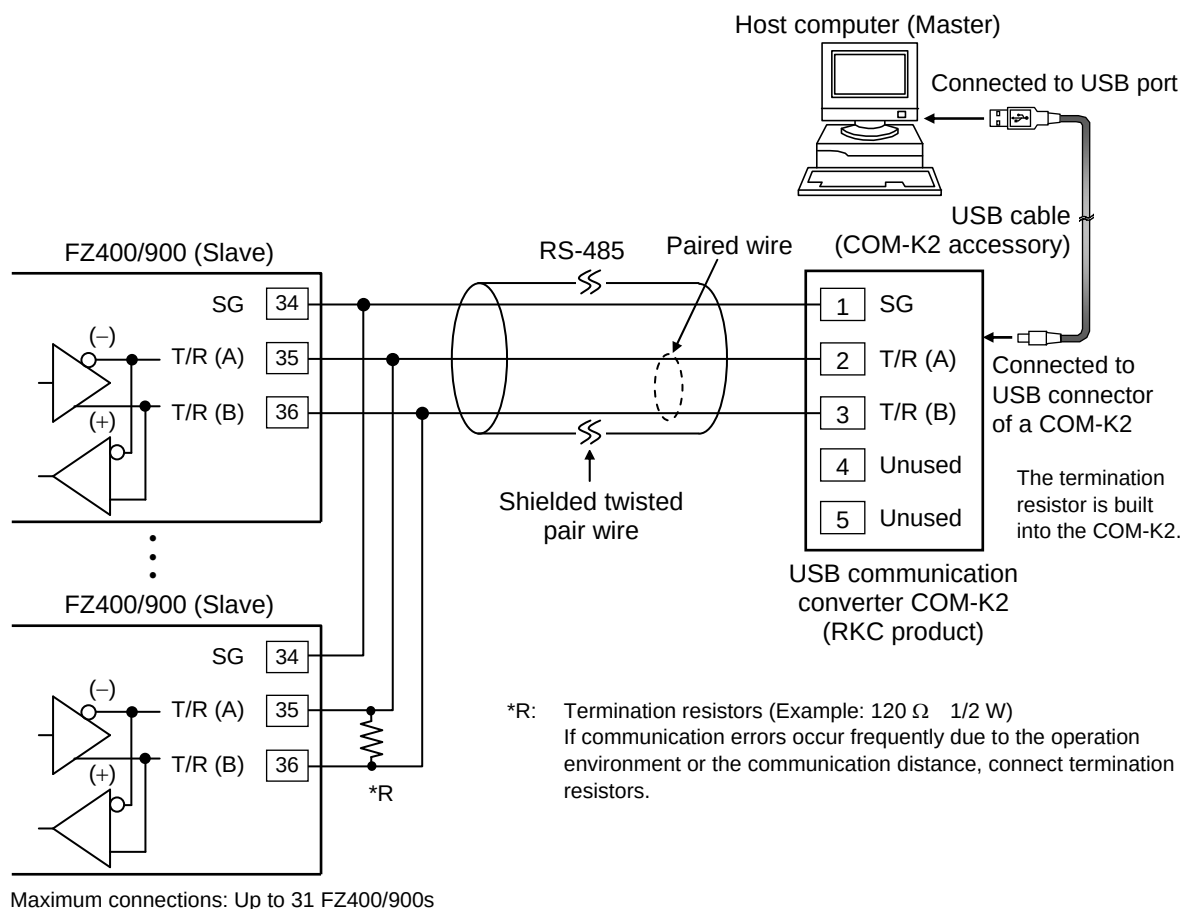
Connection to the RS-232C port of the host computer (master)



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

● Wiring example 3

Connection to the USB of the host computer (master)



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



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

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



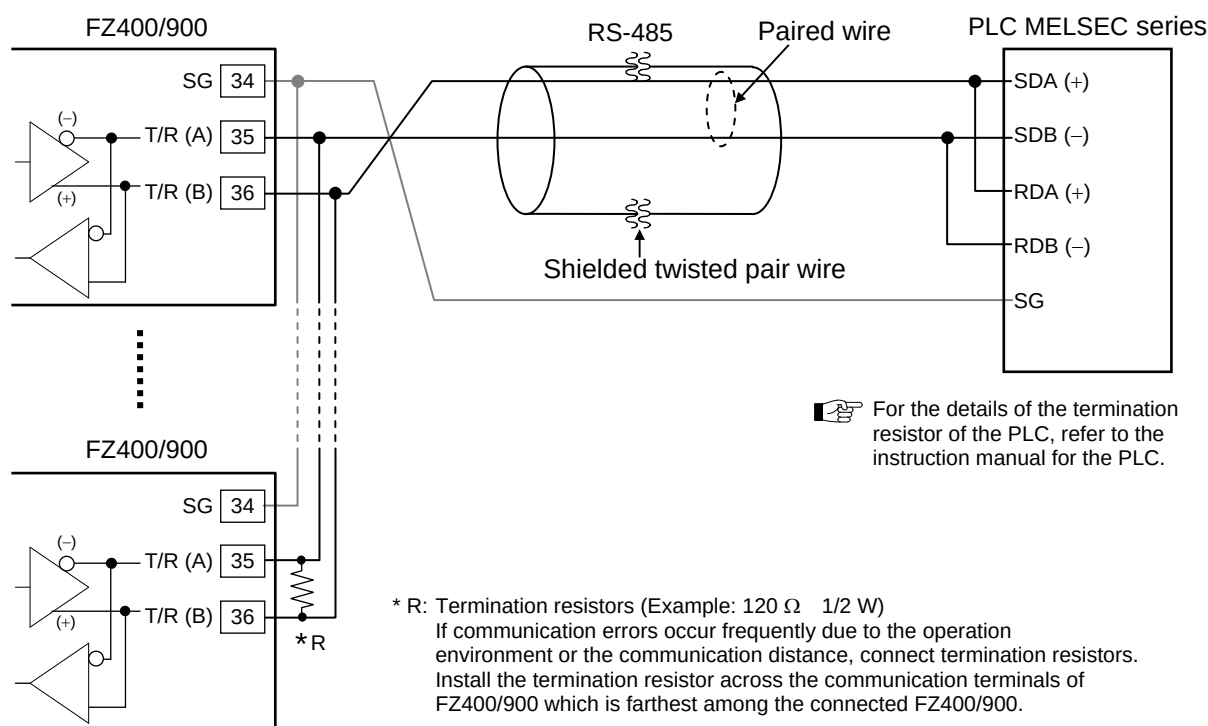
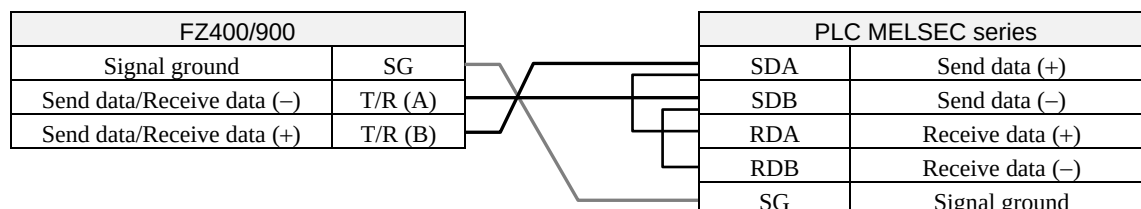
A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM2 is used using a COM-K, the PROTEM2 will not be supported by Windows 8 or later.

● Wiring example 4

When the PLC to be connected is MITSUBISHI MELSEC series

NOTE

Note that the signal polarity symbols (A and B) are opposite to each other between the PLC (MELSEC series) and the FZ series controller. Normally A is connected to A and B to B. However, in this case, A must be connected to B, and B must be connected to A.

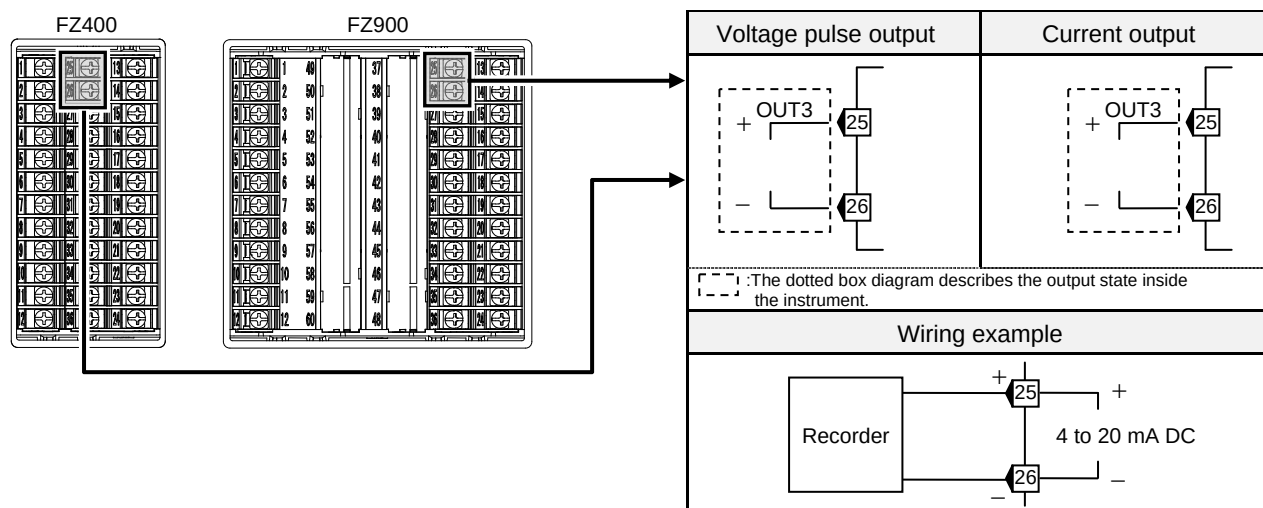


Maximum connections: Up to 31 FZ400/900s

■ Option 2: E [Output 3 (OUT3), Digital input 1 to 6 (DI1 to DI6)]

Output 3 (OUT3):

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).



- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at “Universal output type selection (OUT3)” in the Engineering mode.

☞ For the details of changing the Output 3 (OUT3), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

OUT3 type	Specifications	
Voltage pulse output	0/14 V DC (Allowable load resistance: 600 Ω or more)	
Current output	4 to 20 mA DC (Allowable load resistance: 500 Ω or less)	[Factory set value]
Current output	0 to 20 mA DC (Allowable load resistance: 500 Ω or less)	

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

☞ For the details of Output signal (function) assignment, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function)

(✓: Assignable)

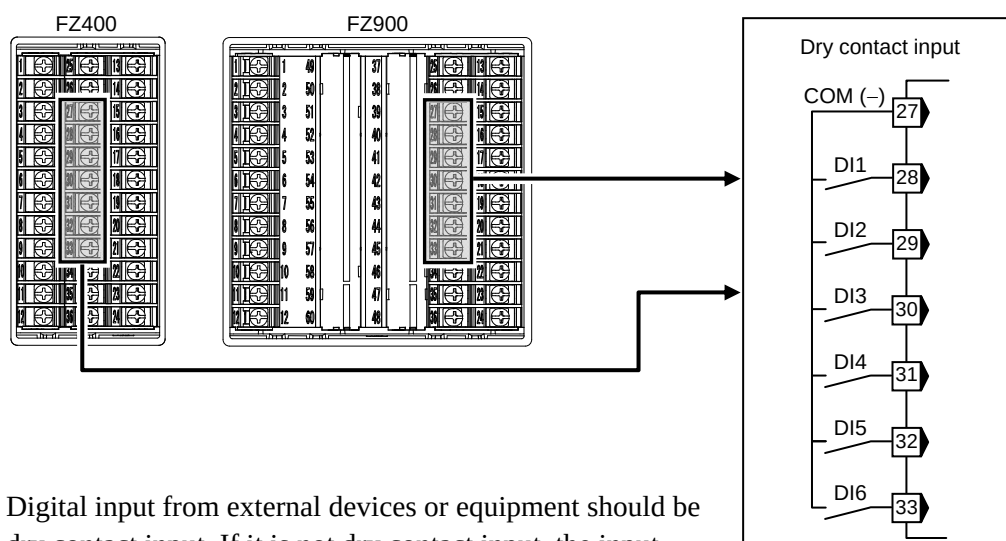
Output signals (function)	OUT3		Output signals (function)	OUT3	
	Voltage pulse	Current		Voltage pulse	Current
Input 1_Control output (Heat-side)	✓	✓	RUN state output	✓	✓
Input 1_Control output (Cool-side)	✓	✓	Output of the communication monitoring result	✓	✓
Input 1_Control output (Position proportioning)	✓	✓	Manual mode state output	✓	✓
Logic calculation output (Event output)	✓	✓	Remote mode state output	✓	✓
Logic calculation output (Control loop break alarm (LBA) output)	✓	✓	AT state output	✓	✓
Logic calculation output (Heater break alarm (HBA) output)	✓	✓	FAIL output	✓	✓
			Output while Set value (SV) is changing	✓	✓
			Retransmission output *	✓	✓

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

Continued on the next page.

Digital input 1 to 6 (DI1 to DI6):

- Terminals 27 through 33 are used for Digital inputs 1 to 6 (DI1 to DI6).



- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

Contact specifications:

At OFF (contact open): 50 k Ω or more

At ON (contact closed): 1 k Ω or less

Contact current: 3.3 mA DC or less

Capture judgment time: Within 200 ms

- The following functions can be assigned to Digital inputs 1 to 6 (DI1 to DI6). Function assignment of Digital inputs 1 to 6 (DI1 to DI6) can be done in the Engineering mode.

– RUN/STOP transfer	– Set data Unlock/Lock
– Auto/Manual transfer	– Direct/Reverse action transfer
– Remote/Local transfer	– Memory area transfer 2 points (Without area set signal) *
– Cascade mode transfer	– Memory area transfer 8 points (Without area set signal) *
– PV select transfer	– Memory area transfer 8 points (With area set signal) *
– 2-loop control/Differential temperature control	– Memory area transfer 16 points (Without area set signal) *
– Interlock release	– Memory area transfer 16 points (With area set signal) *
– Peak/Bottom holds release	– Area jump *
– Autotuning (AT) ON/OFF	

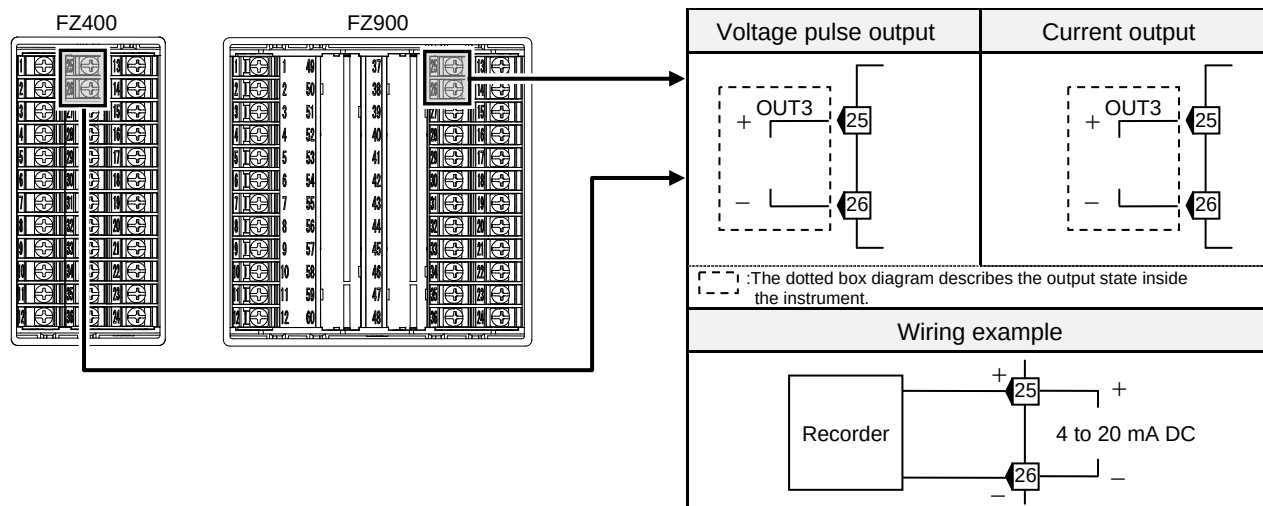
* Settable only at DI1 function selection in the Engineering mode

For the details of function assignment of Digital inputs 1 to 6 (DI1 to DI6), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

■ Option 2: F [Output 3 (OUT3), Communication (RS-422A)]

Output 3 (OUT3):

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).



- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at “Universal output type selection (OUT3)” in the Engineering mode.

For the details of changing the Output 3 (OUT3), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

OUT3 type	Specifications	
Voltage pulse output	0/14 V DC (Allowable load resistance: 600 Ω or more)	
Current output	4 to 20 mA DC (Allowable load resistance: 500 Ω or less)	[Factory set value]
Current output	0 to 20 mA DC (Allowable load resistance: 500 Ω or less)	

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

For the details of Output signal (function) assignment, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function)

(✓: Assignable)

Output signals (function)	OUT3		Output signals (function)	OUT3	
	Voltage pulse	Current		Voltage pulse	Current
Input 1_Control output (Heat-side)	✓	✓	RUN state output	✓	✓
Input 1_Control output (Cool-side)	✓	✓	Output of the communication monitoring result	✓	✓
Input 1_Control output (Position proportioning)	✓	✓	Manual mode state output	✓	✓
Logic calculation output (Event output)	✓	✓	Remote mode state output	✓	✓
Logic calculation output (Control loop break alarm (LBA) output)	✓	✓	AT state output	✓	✓
Logic calculation output (Heater break alarm (HBA) output)	✓	✓	FAIL output	✓	✓
			Output while Set value (SV) is changing	✓	✓
			Retransmission output *	✓	✓

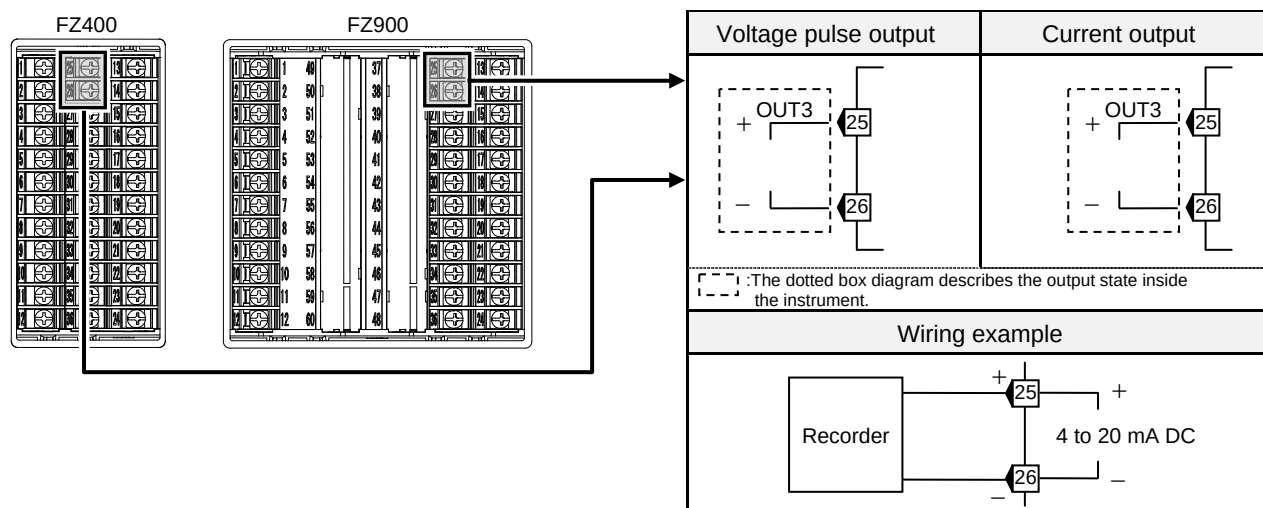
* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

Continued on the next page.

■ Option 2: G [Output 3 (OUT3), Communication (RS-485)]

Output 3 (OUT3):

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).



- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at “Universal output type selection (OUT3)” in the Engineering mode.

For the details of changing the Output 3 (OUT3), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

OUT3 type	Specifications	
Voltage pulse output	0/14 V DC (Allowable load resistance: 600 Ω or more)	
Current output	4 to 20 mA DC (Allowable load resistance: 500 Ω or less)	[Factory set value]
Current output	0 to 20 mA DC (Allowable load resistance: 500 Ω or less)	

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

For the details of Output signal (function) assignment, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function)

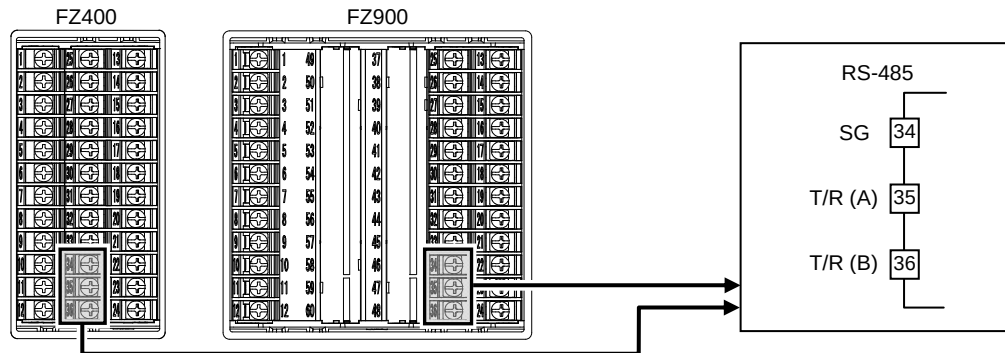
(✓: Assignable)

Output signals (function)	OUT3		Output signals (function)	OUT3	
	Voltage pulse	Current		Voltage pulse	Current
Input 1_Control output (Heat-side)	✓	✓	RUN state output	✓	✓
Input 1_Control output (Cool-side)	✓	✓	Output of the communication monitoring result	✓	✓
Input 1_Control output (Position proportioning)	✓	✓	Manual mode state output	✓	✓
Logic calculation output (Event output)	✓	✓	Remote mode state output	✓	✓
Logic calculation output (Control loop break alarm (LBA) output)	✓	✓	AT state output	✓	✓
Logic calculation output (Heater break alarm (HBA) output)	✓	✓	FAIL output	✓	✓
			Output while Set value (SV) is changing	✓	✓
			Retransmission output *	✓	✓

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

Continued on the next page.

- Terminals 34 through 36 are used for Communication (RS-485).



- The Communication protocol is either specified by Quick start code (Initial setting code) when the order is placed, or set in Engineering mode.

FZ400 FZ900

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

The designation of the initial setting code must be "1: Specify quick start code."

[Quick start code (Initial setting code)]

□ □ — □ □ □ □ — □
(1) (2) (3) (4) (5) (6) (7)

Code	Communication protocol	Wiring example
N	None	
1	RKC communication (ANSI X3.28-1976) *	P. 3-41 to 3-42
2	Modbus	P. 3-41 to 3-42
3	PLC communication: MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4)	P. 3-43

* Factory set value when the Initial setting code (12) is "N: None."

- For the details of communication (For example, protocol setting in the Engineering mode), refer to the following manuals.

FZ110/FZ400/FZ900 Instruction Manual [Host Communication]

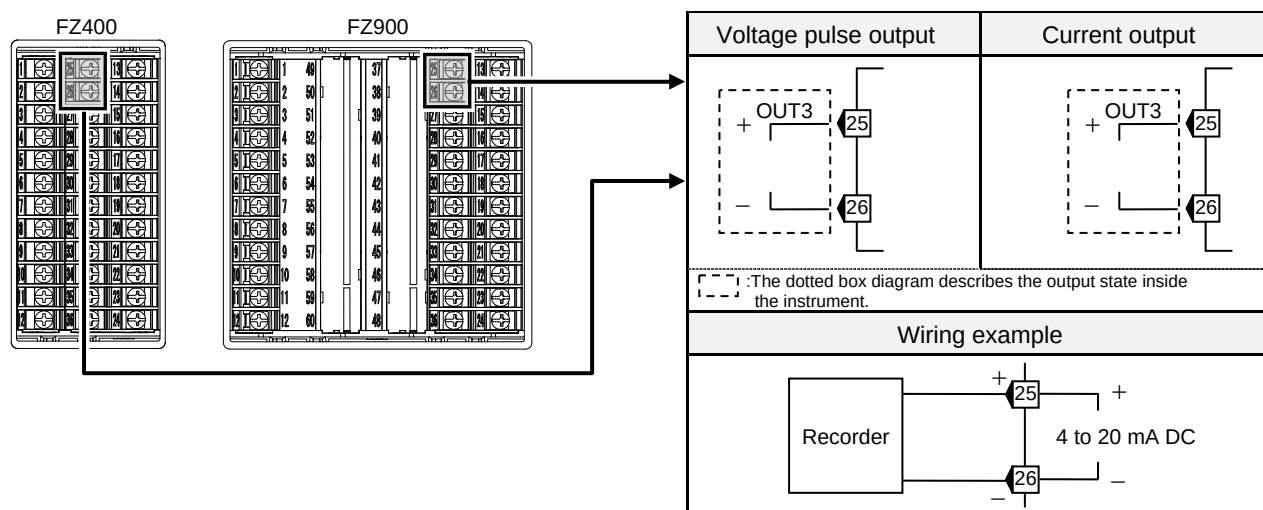
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]

■ Option 2: H

[Output 3 (OUT3), Digital input 1 to 4 (DI1 to DI4), Communication (RS-422A)]

Output 3 (OUT3):

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).



- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at “Universal output type selection (OUT3)” in the Engineering mode.

☞ For the details of changing the Output 3 (OUT3), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

OUT3 type	Specifications	
Voltage pulse output	0/14 V DC (Allowable load resistance: 600 Ω or more)	
Current output	4 to 20 mA DC (Allowable load resistance: 500 Ω or less)	[Factory set value]
Current output	0 to 20 mA DC (Allowable load resistance: 500 Ω or less)	

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

☞ For the details of Output signal (function) assignment, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function)

(✓: Assignable)

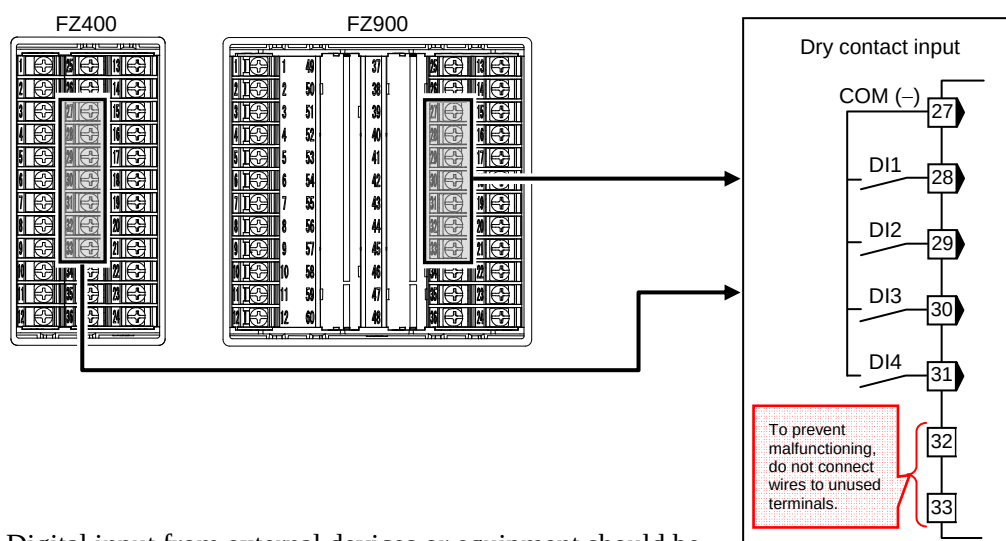
Output signals (function)	OUT3		Output signals (function)	OUT3	
	Voltage pulse	Current		Voltage pulse	Current
Input 1_Control output (Heat-side)	✓	✓	RUN state output	✓	✓
Input 1_Control output (Cool-side)	✓	✓	Output of the communication monitoring result	✓	✓
Input 1_Control output (Position proportioning)	✓	✓	Manual mode state output	✓	✓
Logic calculation output (Event output)	✓	✓	Remote mode state output	✓	✓
Logic calculation output (Control loop break alarm (LBA) output)	✓	✓	AT state output	✓	✓
Logic calculation output (Heater break alarm (HBA) output)	✓	✓	FAIL output	✓	✓
			Output while Set value (SV) is changing	✓	✓
			Retransmission output *	✓	✓

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

Continued on the next page.

Digital input 1 to 4 (DI1 to DI4):

- Terminals 27 through 31 are used for Digital inputs 1 to 4 (DI1 to DI4).



- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

Contact specifications:

At OFF (contact open): 50 kΩ or more

At ON (contact closed): 1 kΩ or less

Contact current: 3.3 mA DC or less

Capture judgment time: Within 200 ms

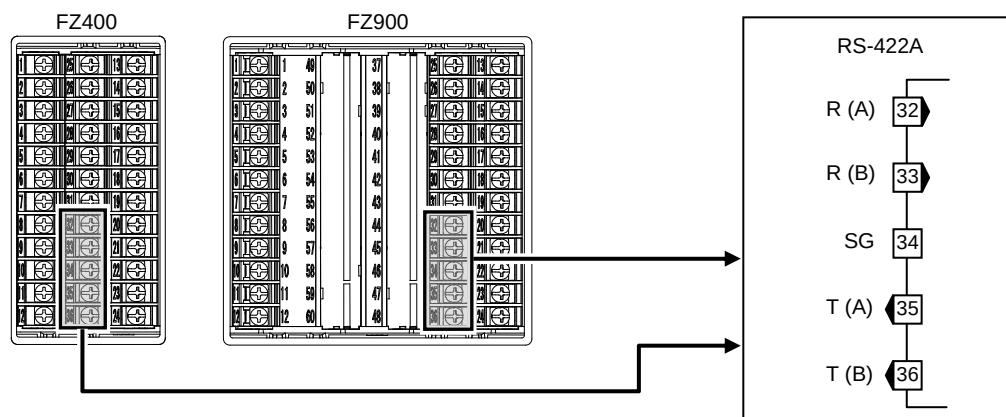
- The following functions can be assigned to Digital inputs 1 to 4 (DI1 to DI4). Function assignment of Digital inputs 1 to 4 (DI1 to DI4) can be done in the Engineering mode.

– RUN/STOP transfer	– Autotuning (AT) ON/OFF
– Auto/Manual transfer	– Set data Unlock/Lock
– Remote/Local transfer	– Direct/Reverse action transfer
– Cascade mode transfer	– Memory area transfer 2 points (Without area set signal) *
– PV select transfer	– Memory area transfer 8 points (Without area set signal) *
– 2-loop control/Differential temperature control	– Memory area transfer 8 points (With area set signal) *
– Interlock release	– Memory area transfer 16 points (Without area set signal) *
– Peak/Bottom holds release	– Area jump *

* Settable only at DI1 function selection in the Engineering mode

For the details of function assignment of Digital inputs 1 to 4 (DI1 to DI4), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

- Terminals 32 through 36 are used for Communication (RS-422A).



- FZ400 - * **H** / **1**
FZ900 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

The designation of the initial setting code must be "1: Specify quick start code."

□ □ — □ □ □ □ — □
(1) (2) (3) (4) (5) (6) (7)

Code	Communication protocol	Wiring example
N	None	
1	RKC communication (ANSI X3.28-1976) *	P. 3-37 to 3-38
2	Modbus	P. 3-37 to 3-38
3	PLC communication: MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4)	P. 3-39

 For the details of communication (For example, protocol setting in the Engineering mode), refer to the following manuals.

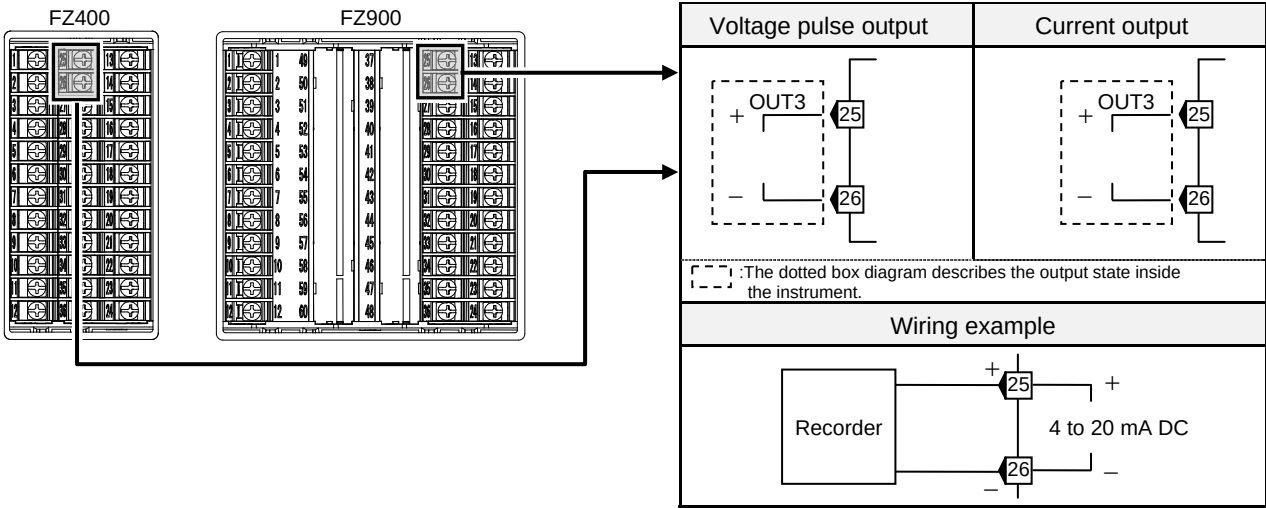
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]

■ Option 2: J

[Output 3 (OUT3), Digital input 1 to 6 (DI1 to DI6), Communication (RS-485)]

Output 3 (OUT3):

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).



- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at “Universal output type selection (OUT3)” in the Engineering mode.

☞ For the details of changing the Output 3 (OUT3), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

OUT3 type	Specifications
Voltage pulse output	0/14 V DC (Allowable load resistance: 600 Ω or more)
Current output	4 to 20 mA DC (Allowable load resistance: 500 Ω or less) [Factory set value]
Current output	0 to 20 mA DC (Allowable load resistance: 500 Ω or less)

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

☞ For the details of Output signal (function) assignment, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function)

(✓: Assignable)

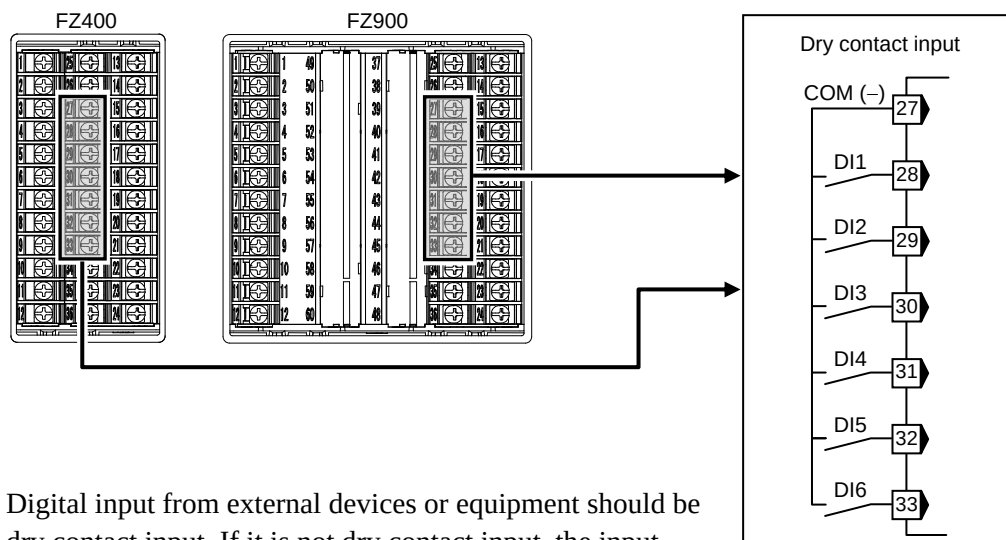
Output signals (function)	OUT3		Output signals (function)	OUT3	
	Voltage pulse	Current		Voltage pulse	Current
Input 1_Control output (Heat-side)	✓	✓	RUN state output	✓	✓
Input 1_Control output (Cool-side)	✓	✓	Output of the communication monitoring result	✓	✓
Input 1_Control output (Position proportioning)	✓	✓	Manual mode state output	✓	✓
Logic calculation output (Event output)	✓	✓	Remote mode state output	✓	✓
Logic calculation output (Control loop break alarm (LBA) output)	✓	✓	AT state output	✓	✓
Logic calculation output (Heater break alarm (HBA) output)	✓	✓	FAIL output	✓	✓
			Output while Set value (SV) is changing	✓	✓
			Retransmission output *	✓	✓

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

Continued on the next page.

Digital input 1 to 6 (DI1 to DI6):

- Terminals 27 through 33 are used for Digital inputs 1 to 6 (DI1 to DI6).



- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

Contact specifications:

At OFF (contact open): 50 kΩ or more

At ON (contact closed): 1 kΩ or less

Contact current: 3.3 mA DC or less

Capture judgment time: Within 200 ms

- The following functions can be assigned to Digital inputs 1 to 6 (DI1 to DI6). Function assignment of Digital inputs 1 to 6 (DI1 to DI6) can be done in the Engineering mode.

– RUN/STOP transfer	– Set data Unlock/Lock
– Auto/Manual transfer	– Direct/Reverse action transfer
– Remote/Local transfer	– Memory area transfer 2 points (Without area set signal) *
– Cascade mode transfer	– Memory area transfer 8 points (Without area set signal) *
– PV select transfer	– Memory area transfer 8 points (With area set signal) *
– 2-loop control/Differential temperature control	– Memory area transfer 16 points (Without area set signal) *
– Interlock release	– Memory area transfer 16 points (With area set signal) *
– Peak/Bottom holds release	– Area jump *
– Autotuning (AT) ON/OFF	

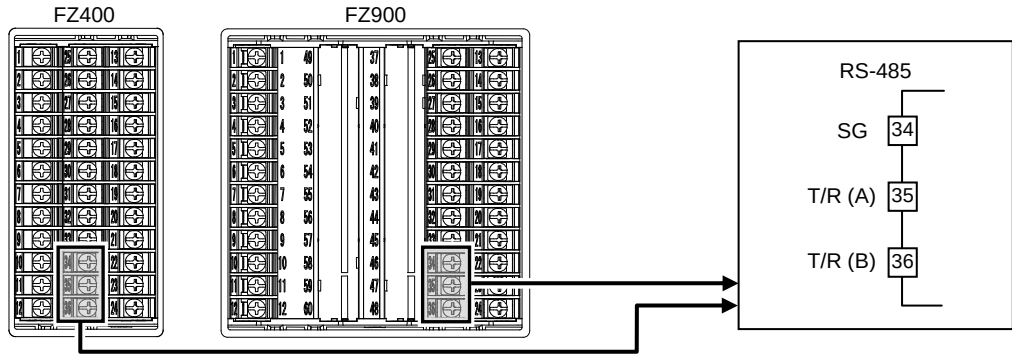
* Settable only at DI1 function selection in the Engineering mode

For the details of function assignment of Digital inputs 1 to 6 (DI1 to DI6), refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Continued on the next page.

Communication (RS-485):

- Terminals 34 through 36 are used for Communication (RS-485).



- The Communication protocol is either specified by Quick start code (Initial setting code) when the order is placed, or set in Engineering mode.

FZ400 ☐ ☐ ☐ ☐ - ☐ ☐ ☐ ☐ * ☐ ☐ **J** ☐ ☐ ☐ / **1**

FZ900 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

The designation of the initial setting code must be "1: Specify quick start code."

[Quick start code (Initial setting code)]

☐ ☐ - ☐ ☐ ☐ ☐ - ☐

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

Code	Communication protocol	Wiring example
N	None	
1	RKC communication (ANSI X3.28-1976) *	P. 3-41 to 3-42
2	Modbus	P. 3-41 to 3-42
3	PLC communication: MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4)	P. 3-43

* Factory set value when the Initial setting code (12) is "N: None."

- ☞ For the details of communication (For example, protocol setting in the Engineering mode), refer to the following manuals.

FZ110/FZ400/FZ900 Instruction Manual [Host Communication]
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]

3.4.7 Option 3

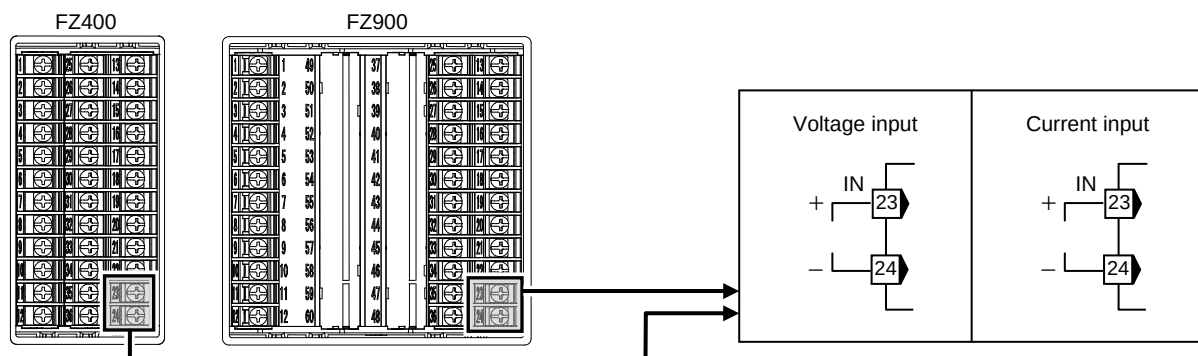
- Terminal Nos. 22 to 24 are for Option 3.
- The Option 3 types are as follows.

FZ400 ☐ ☐☐☐-☐ ☐ ☐*☐ ☐ ☐ ☐ ☐ ☐/☐
FZ900 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

Suffix code	Contents of Option 3	See page
N	None	
1	Remote setting input	P. 3-56
2	Measured input 2	P. 3-57 to 3-58

■ Option 3: 1 [Remote setting input]

- Terminal 23 and 24 are used for Remote setting input.
- Connect an appropriate input to terminals 23 and 24 according to the specification of the Remote setting input.



- Remote setting input type must be specified when ordering.

FZ400 □ □□□ — □ □ □ * □ □ □ 1 □ □ / 1
FZ900 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

The designation of the initial setting code must be “1: Specify quick start code.”

[Quick start code (Initial setting code)]

□ □ — □ □ □ — □
(1) (2) (3) (4) (5) (6) (7)

Code	Input type	Code	Input type
N	None	7	Current input (0 to 20 mA DC)
3	Voltage input (0 to 1 V DC)	8	Current input (4 to 20 mA DC)
4	Voltage input (0 to 5 V DC)	9	Voltage input (–5 to +5 V DC)
5	Voltage input (0 to 10 V DC) *	A	Voltage input (–10 to +10 V DC)
6	Voltage input (1 to 5 V DC)		

* Factory set value when the Initial setting code (12) is "N: None."

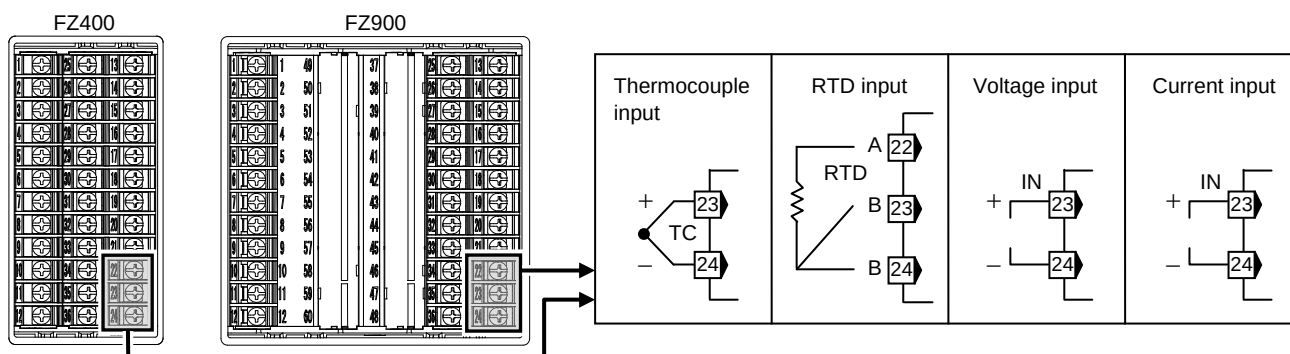
 To select voltage input (0 to 100 mV DC or 0 to 10 mV DC) for Remote setting input, go to “Input 2_Input type” in the Engineering mode. To actually enable this change, the suffix code must be designated as “1: Remote setting input” and the Initial setting code must be designated other than as “N: None.”

 For the Input 2_Input type, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

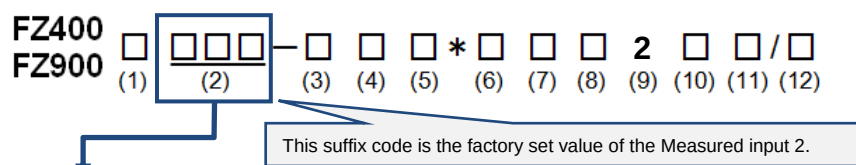
- Remote setting input is isolated from the Measured input 1.

Option 3: 2 [Measured input 2]

- Terminals 22 through 24 are used for Measured input 2.
- Connect an appropriate input to terminals 22 through 24 according to the specification of the input.



- The input range code specified at the time of order will be the factory set value of the Measured input 2 (same as the factory set value of Measured input 1).



Suffix code	Input group	Input type
Refer to Range Code Table (P. 1-10)	Thermocouple (TC) input	K, J, T, S, R, E, B, N (JIS C1602-1995), PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002]), U, L (DIN43710-1985), PR40-20 (ASTM-E1751-00)
	RTD input	Pt100 (JIS C1604-1997), JPt100 (JIS C1604-1997, Pt100 of JIS C1604-1981)
	Low voltage input	0 to 10 mV DC, 0 to 100 mV DC
	High voltage input	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, -5 to +5 V DC, -10 to +10 V DC
	Current input	0 to 20 mA DC, 4 to 20 mA DC

NOTE

When the input type is changed from current or high voltage input to TC, RTD or low voltage input, remove the wirings of the measured input before attempting the input change. Changing the input type with the signal applied to the instrument may lead to a failure of the instrument.

For details on changing the Input type, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

When “Measured input 2” is specified at Option 3 type, thermocouple input or RTD input can be specified as Remote setting input. To use thermocouple input or RTD input as Remote setting input, set the Remote setting input at “Select function for input 2” in the Engineering mode.

For the Select function for input 2, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

When “Remote setting input” is specified at Option 3 type, thermocouple input and RTD input cannot be selected as Remote setting input.

Continued on the next page.

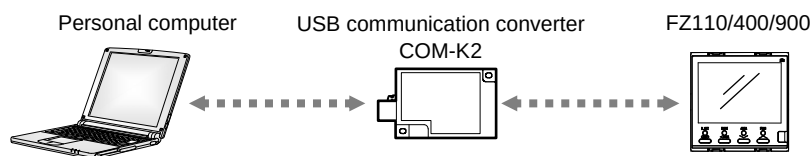


3. WIRING

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- Signal connected to Voltage input and Current input shall be low voltage defined as “SELV” circuit per IEC 60950-1.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- Measured input 2 is isolated from the Measured input 1.

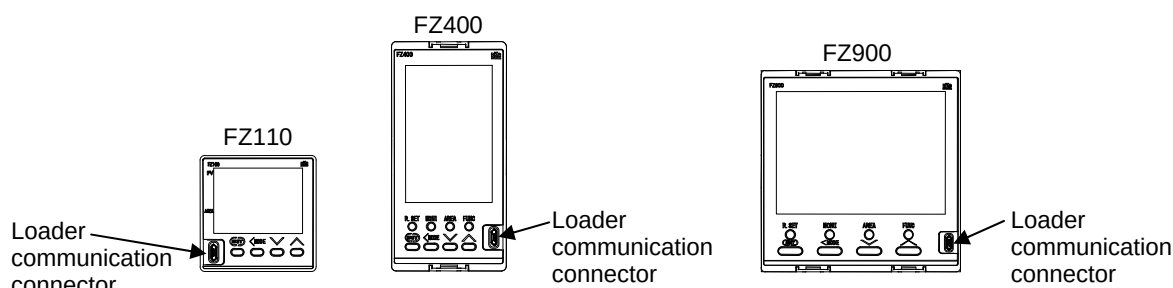
3.5 Connections for Loader Communication

The data of the instrument (FZ110/400/900) can be set via the loader communication using our “Communication tool PROTEM2.” To connect the instrument to the personal computer, the USB communication converter COM-K2 (RKC product, sold separately), the loader communication cable and the USB cable are required.



■ Position of loader communication connector

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

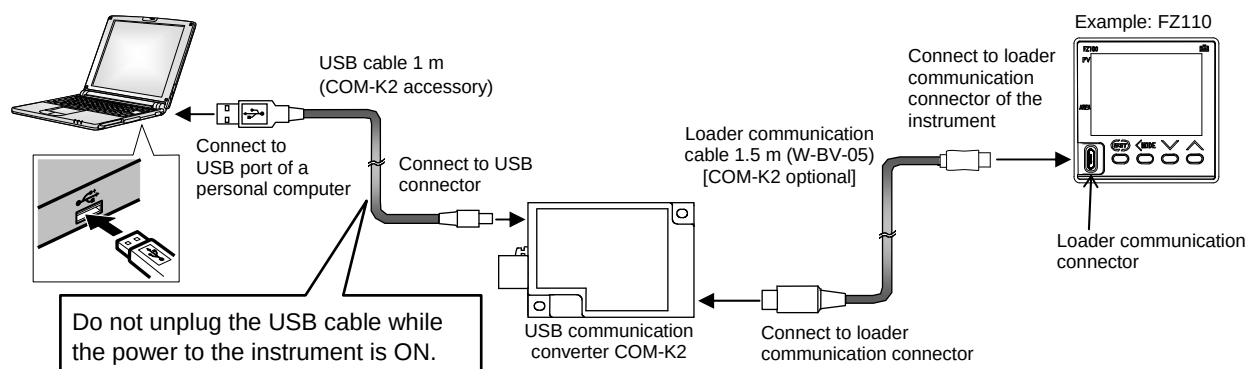


■ Wiring method

Connect the FZ110/400/900, COM-K2, and personal computer using a USB cable and a loader communication cable. Make sure the connectors are oriented correctly when connecting.

NOTE

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



- Communication Tool
PROTEM2
Software operation environment:
Consult the manual that you downloaded
- Communication settings on the computer
(The following values are all fixed)
Communication speed: 38400 bps
Start bit: 1
Data bit: 8
Parity bit: Without
Stop bit: 1
- Communication port of host computer
USB port: Based on USB Ver. 2.0



- The device address of the loader communication is fixed at “0.” The setting of the device address is disregarded.
- The loader communication corresponds to the RKC communication protocol “Based on ANSI X3.28-1976 subcategories 2.5 and A4.”
- Loader communication can be used on a FZ110/400/900 even when the Communication function (optional) is not installed.



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



When using the loader communication, USB driver for COM-K2 must be installed on the personal computer.

The USB driver for COM-K2 can be downloaded the official RKC website:

<http://www.rkcinst.com>



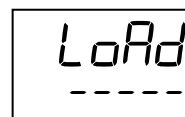
A previous version of COM-K (version 1) can be also used.

However, if communication tool PROTEM2 is used using a COM-K, the PROTEM2 will not be supported by Windows 8 or later.



When the instrument is powered off, power can be supplied to the instrument from COM-K2 (or COM-K version 1). This function is exclusive for parameter setting, and the instrument functions as follows.

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



While the instrument is powered by COM-K2 (or COM-K version 1), if power is applied to the instrument, the instrument will be reset and starts for normal operation.



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

3.6 Handling of the Terminal Cover [Optional]

When mounting and removing the terminal cover, take the following steps:

WARNING

To prevent electric shock or instrument failure, always turn off the power before mounting or removing the terminal cover.

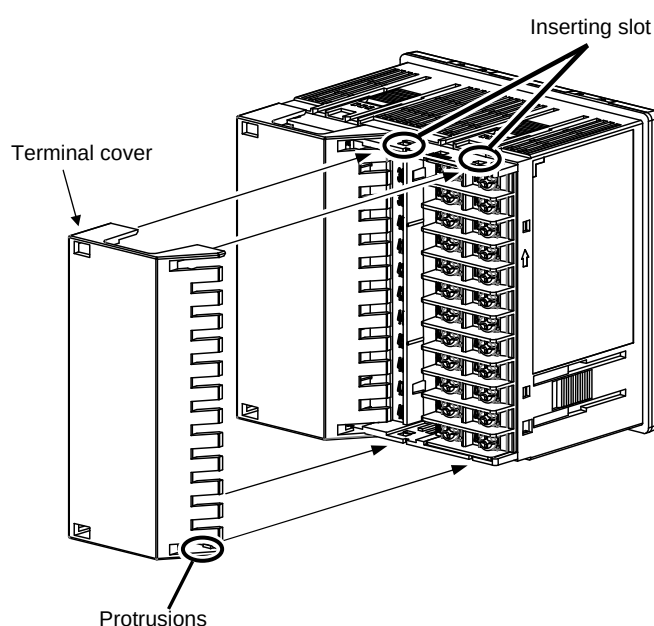


NOTE

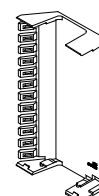
When mounting and removing the terminal cover, apply pressure very carefully to avoid damage to the terminal cover.

■ Mounting procedures

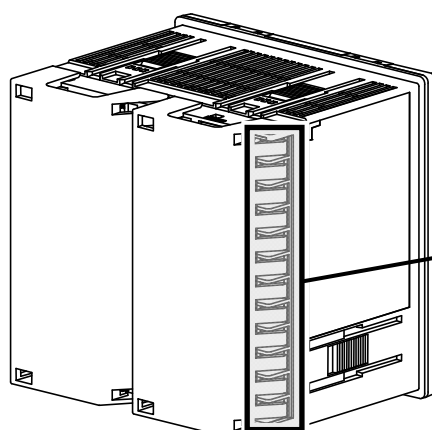
1. Check the mounting direction of the terminal cover.
2. Push the protrusions of terminal cover into the insertion slots for mounting the terminal cover.



FZ110 terminal cover



FZ400/900 common terminal cover

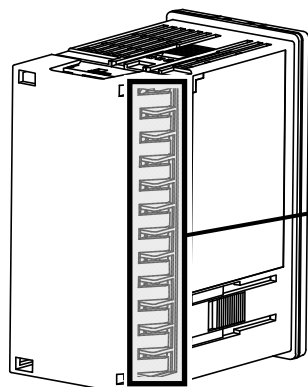


This section of FZ400/900 terminal cover can be removed by bending it. Remove unnecessary part(s) depending on the wiring condition.



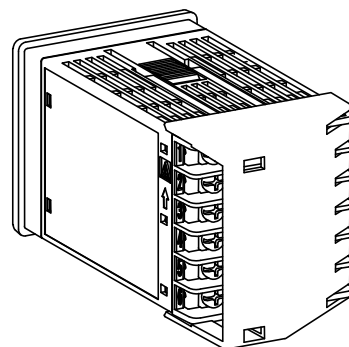
FZ900 is used in the explanatory drawing. The above mounting procedures in the example shown are the same for FZ110 and FZ400.

Drawing of FZ400 with terminal cover



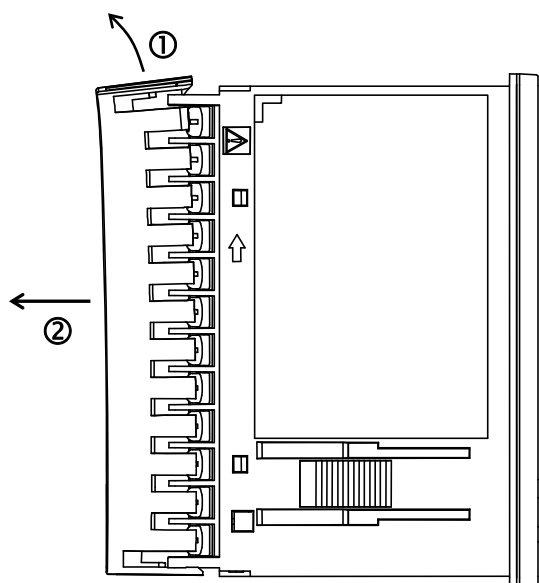
This section of FZ400/900 terminal cover can be removed by bending it. Remove unnecessary part(s) depending on the wiring condition.

Drawing of FZ110 with terminal cover



■ Removal procedures

Release the protrusions of terminal cover from the insertion slots (①) shown in the following figure, and then pull the terminal cover (②) to remove it from the case.





PARTS DESCRIPTION AND BASIC OPERATION

4

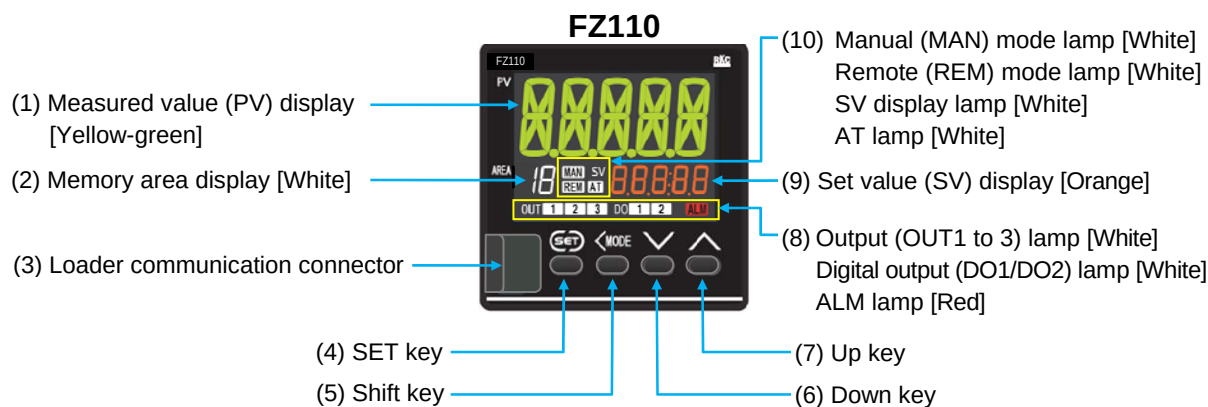
This chapter describes name of parts, switching modes, setting and modifying values and other basic operations.

4.1 Parts Description.....	4-2
4.2 Mode Switching.....	4-5
4.3 Changing Set Value	4-6
4.4 Operation of the Direct Key (FUNC key) [FZ400/900].....	4-7
4.5 Protecting Setting Data	4-8

4.1 Parts Description

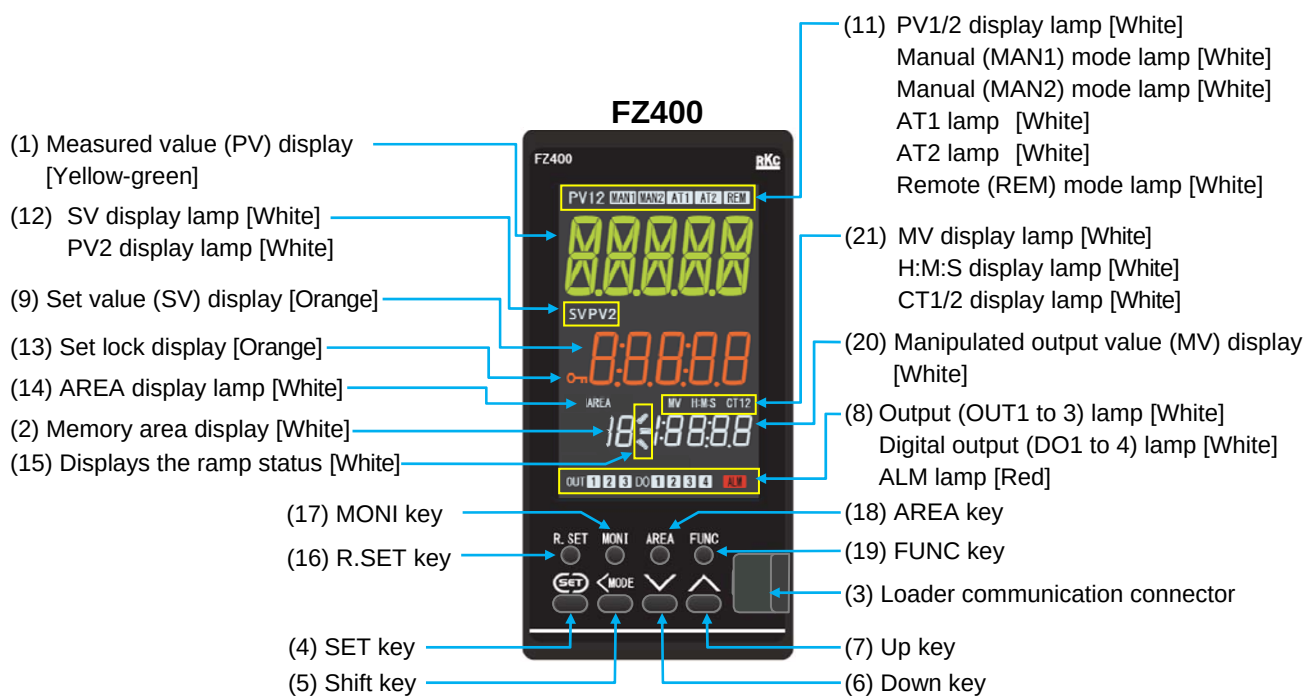
This section describes various display units and the key functions.

■ Front panel view



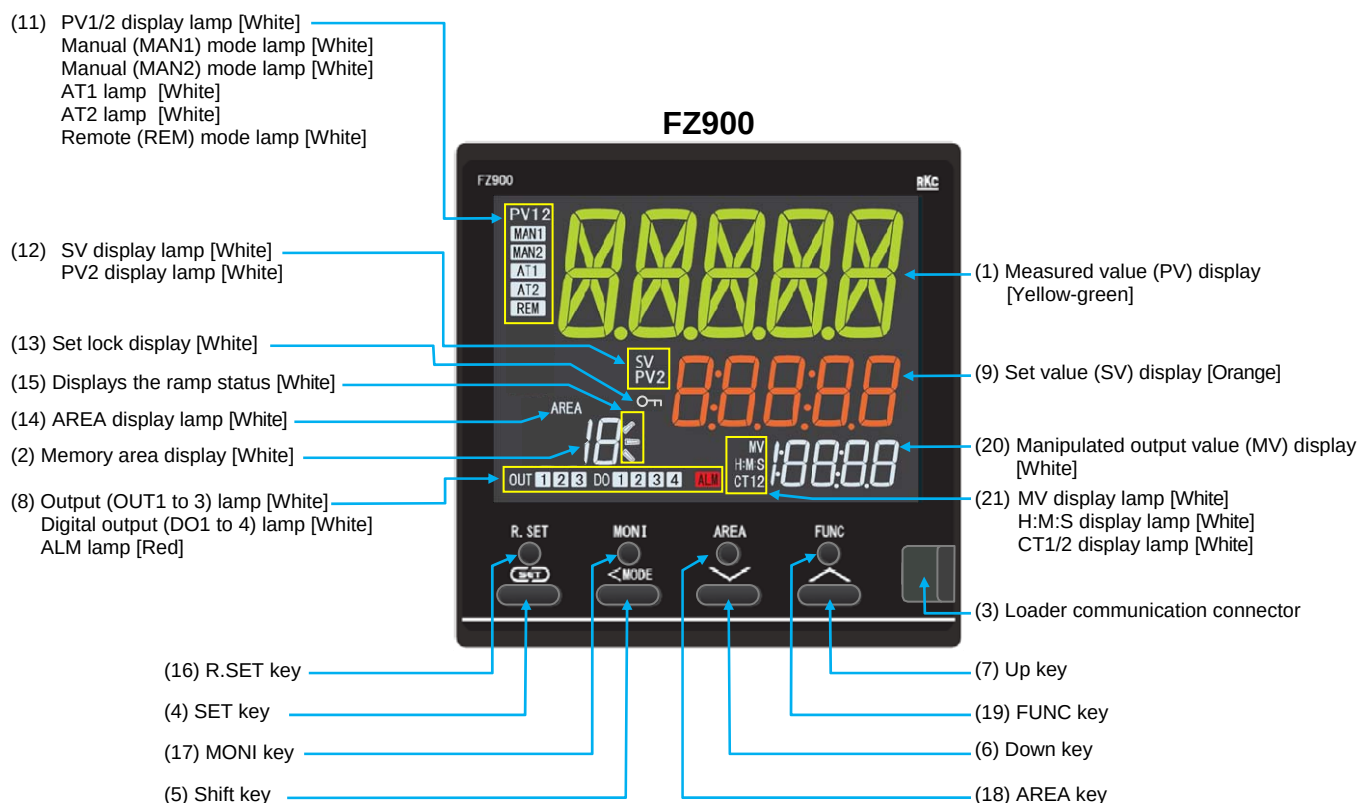
NOTE

To avoid damage to the instrument, never use a sharp object to press keys.



NOTE

To avoid damage to the instrument, never use a sharp object to press keys.



NOTE

To avoid damage to the instrument, never use a sharp object to press keys.

(1)	Measured value (PV) display [Yellow-green]	Displays Measured value (PV) or various parameter symbols.
(2)	Memory area display [White]	Displays the memory area No. (1 to 16).
(3)	Loader communication connector	Setting and monitoring on a computer (PC) is possible if the controller is connected with our cable to a PC via our USB communication converter COM-K2 (sold separately) ^a . Our communication software ^b must be installed on the PC. ^a For the COM-K2 *, refer to the official RKC website. ^b Only available as a download from the official RKC website (http://www.rkcinst.com).
(4)	SET key	Used for calling up parameters and set value registration.
(5)	Shift key	Shifts digits when settings are changed. Used to switch the modes.
(6)	Down key	Decreases numerals.
(7)	Up key	Increases numerals.
(8)	OUT1 to 3 lamp [White]	Lights when Outputs 1 to 3 (OUT1 to 3) [*] are turned on.
	DO1 to 4 lamp [White]	Lights when Digital outputs 1 to 4 (DO1 to 4) [*] are turned on. (FZ110: DO1 and DO2)
	ALM lamp [Red]	Lights when any of the following occurs. - Event 1 to 4 - Heater break alarm (HBA) 1 or 2 - Control loop break alarm (LBA) 1 or 2 - Input error of input 1 or 2
(9)	Set value (SV) display [Orange]	Displays Set value (SV) or various parameter set values.

* Outputs, such as control output, retransmission output, event output, are assigned to Outputs 1 to 3 (OUT1 to 3) and Digital outputs 1 to 4 (DO1 to 4). (Control output can be assigned to OUT1 to 3 only.)

Outputs are assigned in Engineering mode. For detailed, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Continued on the next page.



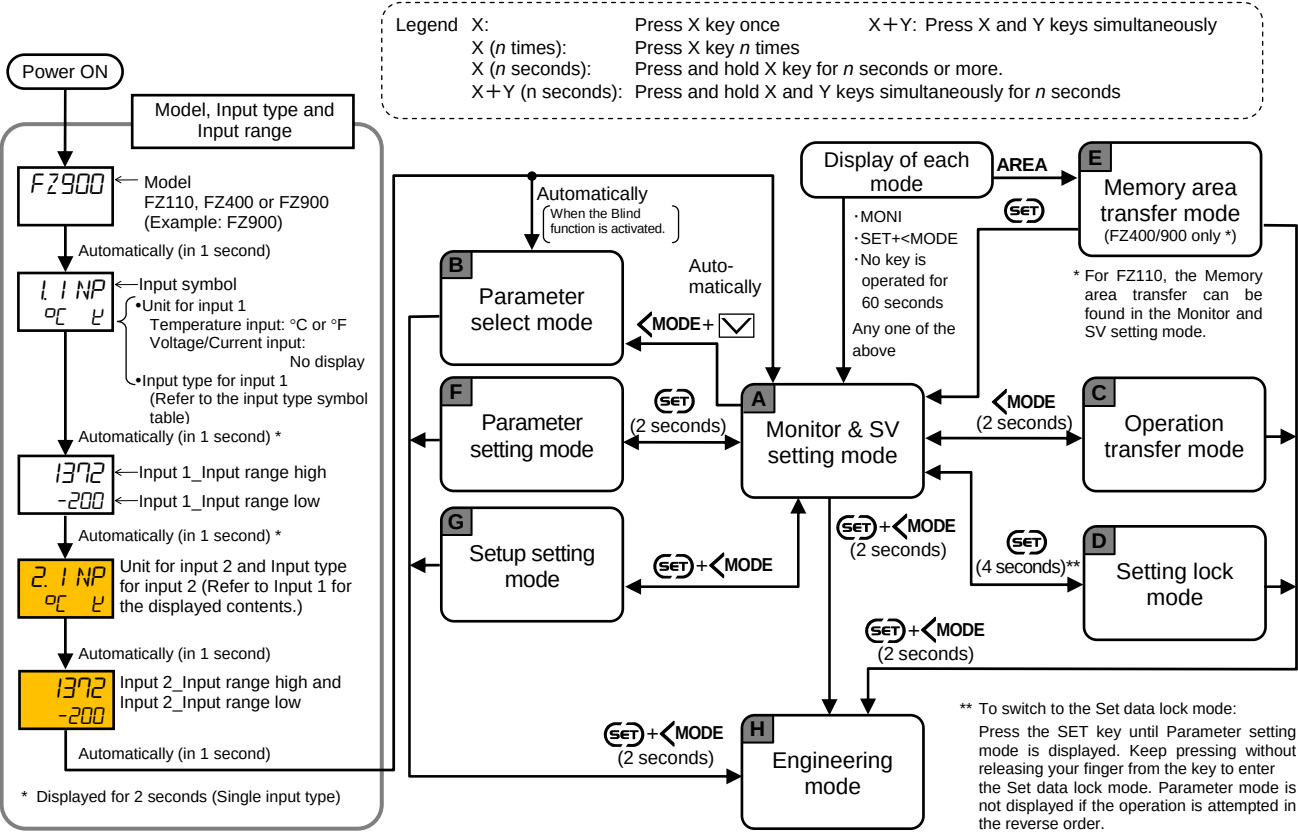
4. PARTS DESCRIPTION AND BASIC OPERATION

The below items are for FZ110 only.		
(10)	Manual (MAN) mode lamp [White]	Lights in Manual (MAN) mode. When lit, the SV display unit shows a manipulated output value.
	Remote (REM) mode lamp [White]	Lights in Remote (REM) mode. When lit, the SV display unit shows a remote setting input value.
	SV display lamp [White]	Lights when the SV display unit shows a Set value (SV).
	AT lamp [White]	- Flashes when Autotuning (AT) is activated. (After AT is completed: AT lamp will go out) - Lights during Startup tuning (ST) execution. (After ST is completed: AT lamp will go out)
The below items are for FZ400/900 only.		
(11)	PV1/2 display lamp [White]	PV1 Lights when the Input 1_Measured value (PV) is displayed on the PV display unit. PV2 Lights when the Input 2_Measured value (PV) is displayed on the PV display unit.
	Manual (MAN1) mode lamp [White]	Lights when Input 1 is in Manual (MAN) mode. When lit, the SV display unit shows an Input 1_Manual manipulated output value.
	Manual (MAN2) mode lamp [White]	Lights when Input 2 is in Manual (MAN) mode. When lit, the SV display unit shows an Input 2_Manual manipulated output value.
	AT1 lamp [White]	- Flashes when Autotuning (AT) is activated on Input 1. (After AT is completed: AT lamp will go out) - Lights when Startup tuning (ST) is activated on Input 1. (After ST is completed: AT lamp will go out)
	AT2 lamp [White]	- Flashes when Autotuning (AT) is activated on Input 2. (After AT is completed: AT lamp will go out) - Lights when Startup tuning (ST) is activated on Input 2. (After ST is completed: AT lamp will go out)
	Remote (REM) mode lamp [White]	Lights in Remote (REM) mode. When lit, the SV display unit shows a remote setting input value.
(12)	SV display lamp [White]	Lights when the SV display unit shows a Set value (SV).
	PV2 display lamp [White]	PV2 Lights when the Input 2_Measured value (PV) is displayed on the SV display unit.
(13)	Set lock display [FZ400: Orange FZ900: White]	Lights when the settings are locked.
(14)	AREA display lamp [White]	Lights when Memory area is displayed.
(15)	Displays the ramp status [White]	SV ramp status is displayed; (rise, soak, fall) Rise:  Soak:  Fall: 
(16)	 R.SET	R.SET key
(17)	 MONI	MONI key
(18)	 AREA	AREA key
(19)	 FUNC	FUNC key
(20)	Manipulated output value (MV) display [White]	Displays one of the following 3 *: Manipulated output value (MV), Memory area soak time, or Current transformer (CT) input value.
(21)	MV display lamp [White]	Lights when Manipulated output value (MV) is displayed on the MV display.
	H:M:S display lamp [White]	Lights when time (hour:minute:second) is displayed on the MV display.
	CT1/2 display lamp [White]	- CT1 lights when the Current transformer 1 (CT1) input value is displayed on the MV display. - CT2 lights when the Current transformer 2 (CT2) input value is displayed on the MV display.

* Functions are configured in the Engineering mode. For detailed, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

4.2 Mode Switching

The instrument has eight different modes (seven modes for FZ110) for operation and setting. Modes can be switched through the key operation of **SET** and **MODE** keys.



A	Monitor & SV setting mode	In this mode, setting of SV (control target value) and monitoring of PV, SV, and MV can be conducted. Conduct operation in this mode.
B	Parameter select mode	Only desired screens can be grouped for display. When the Blind function is valid, unnecessary modes can be hidden.
C	Operation transfer mode	In this mode, switching between RUN/STOP, Auto/Manual, and Remote/Local can be done as well as conducting AT and ST.
D	Setting lock mode	Set data lock can be set to prevent accidental key operations. Parameter select mode can be set up to group desired screens for display.
E	Memory area transfer mode	The memory area to be used for control (control area) can be switched in this mode.
F	Parameter setting mode	Parameters related to the control can be set. Parameters in this mode can be used in the memory area function, and up to 16 areas can be set.
G	Setup setting mode	Control related parameters not available in Memory area can be set up here.
H	Engineering mode	The instrument can be configured to the user's requirements (input, output, control mode, etc).

Input type symbol

Symbol	U	J	T	S	R	E	B	N	P
Input type	Thermocouple (TC) input								
	K	J	T	S	R	E	B	N	PLII
Symbol	U	U	L	P _r	P _r	J _P	H	I	
Input type	Thermocouple (TC) input			RTD input			Voltage	Current	
	W5Re/ W26Re	U	L	PR40- 20	Pt100	JPt100			

☞ For the details of the parameters from **A** Monitor & SV setting mode to the parameters in the **H** Engineering mode, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

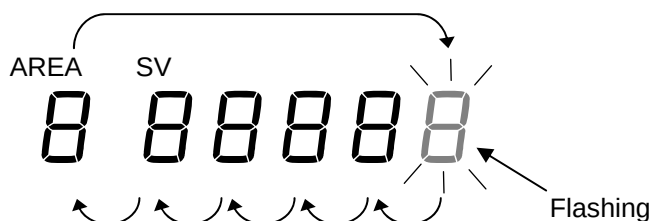
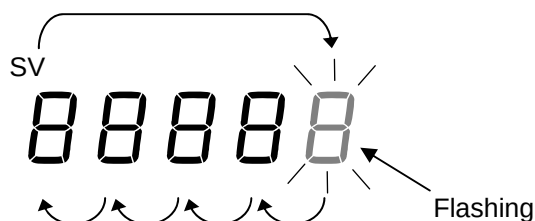
4.3 Changing Set Value

- The flashing digit indicates which digit can be set. Press **MODE** key to go to a different digit. Every time the shift key is pressed, the flashing digit moves as follows.

All modes except SV setting mode and Parameter setting mode

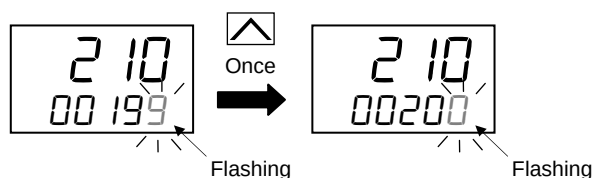
A : SV setting mode

F : Parameter setting mode

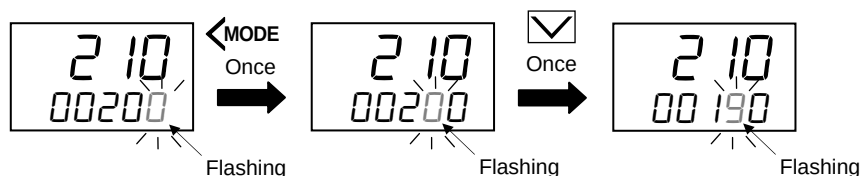


- The following is also available when changing the set value.

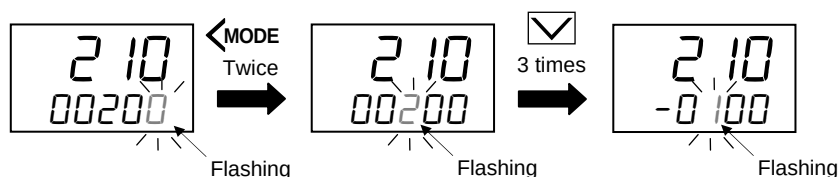
Increase SV from 199 °C to 200 °C:



Decrease SV from 200 °C to 190 °C:



Decrease SV from 200 °C to -100 °C:



- To store a new value for the parameter, always press the **SET** key.** The display changes to the next parameter and the new value will be stored.

The modified data will not be stored only by operating the and keys. In the Operation transfer mode, however, the selected mode will be valid only by the operations of these keys.

In case of the Set value (SV), the instrument can be configured in the **H** Engineering mode so that the modified set value will be adopted 2 seconds after the change without pressing the **SET** key.

- In case no operation is performed within 60 seconds after the change of the setting, the mode will return to **A** Monitor & SV setting mode. The modified data will not be registered in this case.

4.4 Operation of the Direct Key (FUNC key) [FZ400/900]

FZ400/900 has a FUNC key which allows a specified function to be assigned to it. The action of the FUNC key can be also set (Press once or Press and hold). Function assignment to the FUNC key and the key operation method can be configured at “FUNC key assignment” and “FUNC key operation selection” in the Engineering mode.

- ☞ For the details of Function assignment to the FUNC key and the key operation method, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.



■ Functions assignable to the FUNC key

Function	*
RUN/STOP transfer (Factory set value)	A
Autotuning (AT) (Common to Input 1 and 2)	B
Input 1_Autotuning (AT)	B
Input 2_Autotuning (AT)	B
Auto/Manual transfer (Common to Input 1 and 2)	A
Input 1_Auto/Manual transfer	A
Input 2_Auto/Manual transfer	A
Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control)	A
Control area Local/External transfer	A
Interlock release	C
Hold reset (Common to Input 1 and 2)	C
Input 1_Hold reset	C
Input 2_Hold reset	C
Set data unlock/lock transfer	A
Area jump	D

* Explanation of key action

A: Mode is changed for every press of the key.

B: Function is turned on and off for every press of the key.

C: Function is released or reset by pressing the key.

D: Pressing the key switches the memory area to the preset area set in the Link area number in the Parameter setting mode.

When the Link area number is not specified, a memory area with the number of the current control area number +1 will be used.



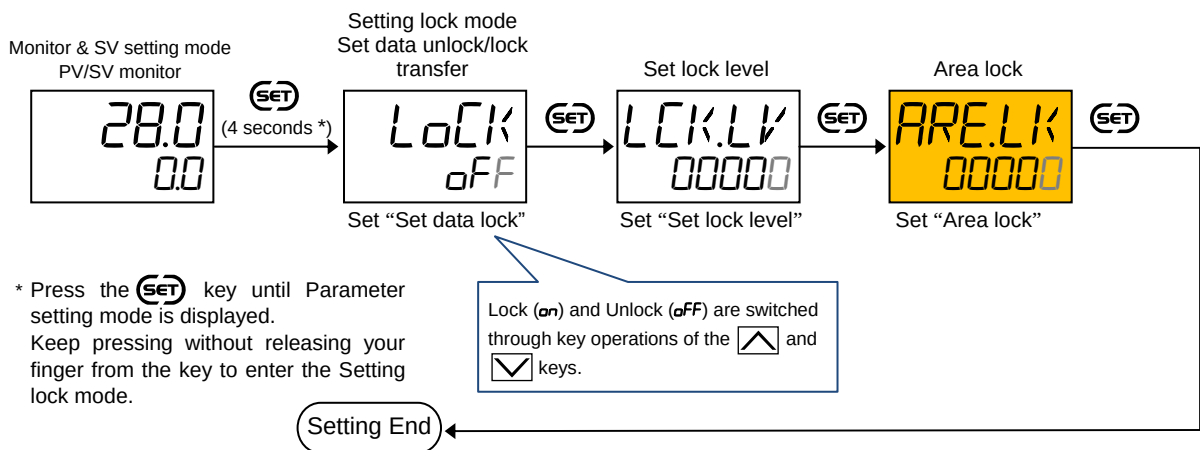
The function assigned to the FUNC key is accessible even when the Set data lock is used.

4.5 Protecting Setting Data

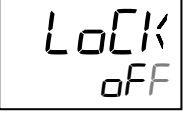
The Set data lock function limits access of unauthorized personnel to the parameters and prevents parameter change by mistake. The Set data lock function enables the restriction of setting changes for each mode (Setting lock level). The Area lock restricts switching the Memory areas. Both functions can be configured in the Setting lock mode.


For details on the Set data lock function, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Setting procedure



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

Setting lock mode Set data unlock/lock transfer  Factory set value: OFF	The items locked in “Set lock level” and “Area lock” can be switched between lock and unlock. Set value: off: Unlock state on: Lock state * * A key symbol (Set lock display) appears on the front display. (FZ400/900 only)
Setting lock mode Set lock level  Factory set value: 00000	Select the operation mode to lock. The Set lock level can be changed even after the set data lock has been set.  Set value: 0: Unlock 1: Lock SV setting mode * + Parameter select mode * Set value (SV), Interlock release and Memory area transfer (FZ110 only) Operation select mode Parameter setting mode Setup setting mode Engineering mode

Setting lock mode Area lock  (FZ400/900 only) Factory set value: 00000	For FZ400/900, select to enable/disable the Memory area switching. For FZ110, locking Memory area switching is available by the Set lock level. 00000 ↑ Set value: 0: Memory area is adjustable when the setting data is locked. 1: Memory area is not adjustable when the setting data is locked. (Memory area transfer mode is not displayed)

-  Switching the Set data lock is available anytime irrespective of RUN or STOP state.
-  Parameter switching is available during the Set data lock state for checking the data. When the SV setting mode is locked, the Set value (SV) setting screen in the SV setting mode will not be displayed.
-  Even during the Set data lock state, setting through the communication (optional function) and selection of functions by the FUNC key is possible. It should be noted that when the parameters in the Engineering mode are changed, the instrument must be stopped (or stay in the STOP mode).



MEMO



OPERATION

5

This chapter describes caution for first time use, parameter setting required before operation, and others.

5.1 Operating Precautions	5-2
5.2 Setup Procedures	5-3
5.3 Initial Setup Before Operation	5-4
5.3.1 Initial setting of setup example 1 (Setting parameters related to the event)	5-5
5.3.2 Initial setting of setup example 2 (Setting parameters related to the input, control, output and event)	5-7
5.4 Setting the Control Set Value [Set value (SV)]	5-10
5.5 Setting the Event Set Value	5-11
5.6 Tuning the PID Parameters (Execution of AT)	5-13

5.1 Operating Precautions

Before starting the operation, check the following items.

■ Power ON

As soon as the instrument is powered up, operation is started after the display of the input type and the input range. [Factory set value: RUN]

■ Action at input error

The measures for input errors can be selected from Input burnout direction, Input error determination point, Manipulated output value at input error, PV flashing display at input error, and Input error status output. When this instrument has an input error, actions and outputs are provided according to the setting.

 For details on the action at input error, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

■ Checking each parameter

The settings for the Set value (SV) and all parameters should be appropriate for the controlled system. There are parameters in Engineering mode which cannot be changed when the controller is in RUN mode. Change the RUN/STOP mode from RUN to STOP when a change for the parameters in Engineering mode is necessary.

 For details on the RUN/STOP transfer and the each parameter, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

■ Operation at power failure

A power failure of 20 ms (24 V DC type: 5 ms) or less will not affect the control action. When a power failure of more than 20 ms (24 V DC type: 5 ms) occurs the instrument assumes that the power has been turned off. When the power returns, the operation of instrument will be re-starts in accordance with the content selected by Hot/Cold start.

 For details on the Hot/Cold start, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

■ Event hold action

- The event hold action is activated when the power is turned on or when transferred from STOP mode to RUN mode.
- The event re-hold action is activated when not only the SV is changed, but also the power is turned on or when transferred from STOP mode to RUN mode.

 For details on the event hold action, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

5.2 Setup Procedures

Set up the instrument prior to operating it referring to the following operating procedure.
Refer to the following setup example.

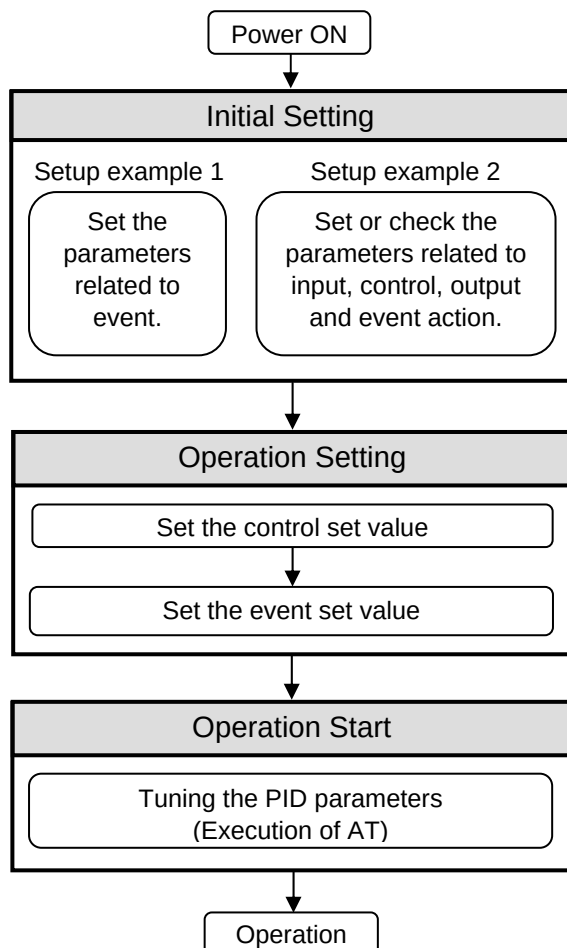
Setup example 1	Setup example 2
Model code: FZ110 F K02—M N 4 * 1 N N N N / N Input: Thermocouple (K), 0 to 400 °C Control: PID control with AT (reverse action) Output: Control output: Uses OUT1 Event output: Uses DO1 Event: Number of event points: 1 point (Uses Event 1) Deviation high * →Change the event action to Deviation high/low with hold function. Event timer: 0.0 second * Without interlock function * Control set value: 200 °C Event 1 set value: 10 °C PID constants: Automatic setting by Autotuning (AT)	Model code: FZ110 A D35—M M 4 * 2 N N N N / N Input: RTD (Pt100), –200.0 to +850.0 °C * →Change the input range to –200.0 to +400.0 °C Control: Heat/Cool PID control with AT (air cooling) Output: Control output: Heat-side: Uses OUT1 Cool-side: Uses OUT2 Event output: Uses DO1 and DO2 Event: Number of event points: 2 points (Uses Event 1 and 2) Event 1, 2: Deviation high * →Change the Event 2 to Deviation low. Event timer: 0.0 second * Without interlock function * →Change to “with Interlock function.” Control set value: 100.0 °C Event set value: Event 1: 10.0 °C, Event 2: –10.0 °C PID constants: Automatic setting by Autotuning (AT)

* Factory set value

■ : Values to be set in the Initial setting

* Factory set value

■ : Values to be set or checked in the Initial setting



☞ For operation in initial setting (Engineering mode), refer to **5.3 Initial Setup Before Operation (P. 5-4)**.

☞ For operation setting, refer to the following:

- **5.4 Setting the Control Set Value [Set value (SV)] (P. 5-10)**
- **5.5 Setting the Event Set Value (P. 5-11)**

☞ For starting the operation, refer to **5.6 Tuning the PID Parameters (Execution of AT) (P. 5-13)**.

5.3 Initial Setup Before Operation

Before starting the operation, confirm that the set value of the parameter matches the model code as specified when ordered. Parameters which were not specified when ordered must be set before use.

Some functions may need to be set in the Engineering mode. Read the following part before attempting the setting.

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.



NOTE

Parameters in Engineering mode are settable only when the controller is in STOP mode. However, only checking can be made even in the RUN state.

■ Set value change and registration

- The flashing digit indicates which digit can be set. Every time the  key is pressed, the flashing digit moves.
- **To store a new value for the parameter, always press the  key.** The display changes to the next parameter and the new value will be stored.

The modified data will not be stored only by operating the  and  keys. In the Operation transfer mode, however, the selected mode will be valid only by the operations of these keys.



In case of the Set value (SV), the instrument can be configured in the  Engineering mode so that the modified set value will be adopted 2 seconds after the change without pressing the  key.

- In case no operation is performed within 60 seconds after the change of the setting, the mode will return to  Monitor & SV setting mode. The modified data will not be registered in this case.

5.3.1 Initial setting of setup example 1 (Setting parameters related to the event)

In the Setup example 1 (refer to P. 5-3), all default factory set values except event related parameters can be used in actual applications without any changes.

This section describes the Initial setting of the alarm related operation used in the Setup example 1.

Setup example 1:

Model code: FZ110 F K02—M N 4 * 1 N N N N / N

Event: Number of event points: 1 point (Uses Event 1)

Deviation high (Factory set value)

→Change the event action to Deviation high/low with hold function.

Without interlock function (Factory set value)

Deviation high/low



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

Parameters to be set (Engineering mode):

- Mandatory setting items:

Function block No. 41 (F_n41): Event 1 type (E_S I), Event 1 hold action (E_H a I)

- Related setting items (Set only when necessary):

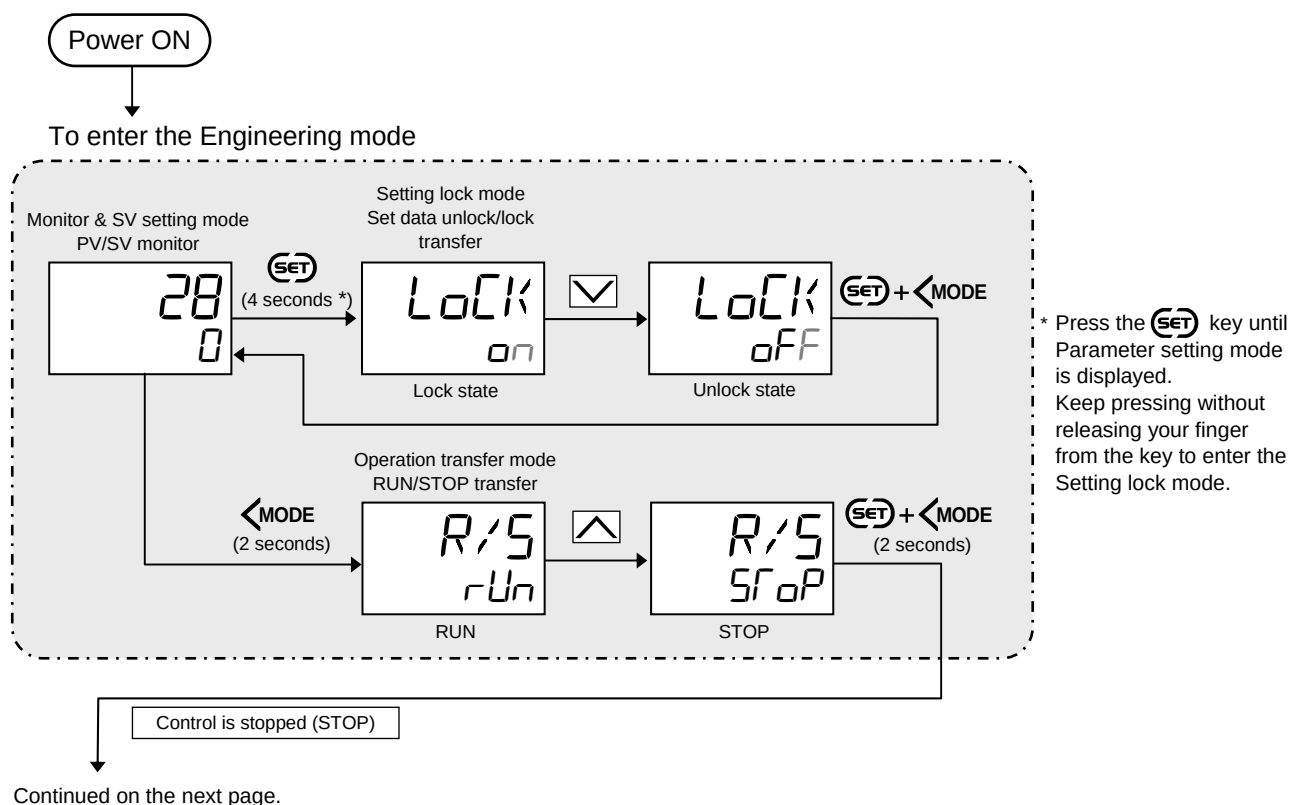
Function block No. 41 (F_n41): Event 1 differential gap (E_H I), Event 1 timer (E_V I)

- Items unnecessary to set (Used with factory setting):

Function block No. 34 (F_n34): DO1 function selection (d_oSL I), DO1 logic calculation selection (d_oLG I)

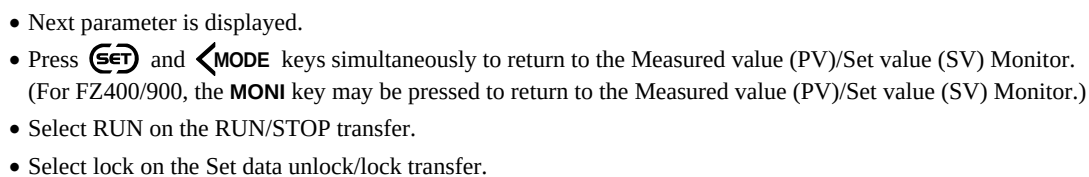
Function block No. 30 (F_n30): Energized/De-energized selection (E_x I), Interlock selection (I L5), Output action at control stop (55)

■ Setting procedure



Continued on the next page.

Continued from the previous page.



5.3.2 Initial setting of setup example 2 (Setting parameters related to the input, control, output and event)

The setup example 2 (refer to P. 5-3) describes the initial setting of input, control, output and event action.

Setup example 2:

Model code: FZ110 A D35—M M 4 * 2 N N N N / N

Input: RTD (Pt100),
–200.0 to +850.0 °C (Factory set value)
→Change the input range –200.0 to +400.0 °C

Control: Heat/Cool PID control with AT (air cooling)

Output: Control output: Heat-side: Uses OUT1
Cool-side: Uses OUT2

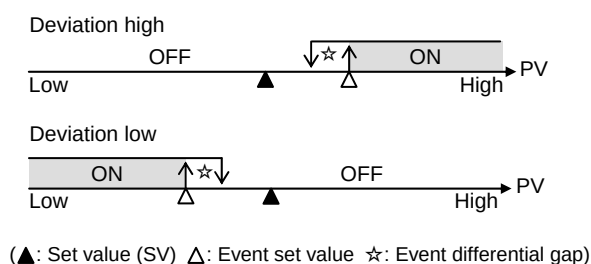
Event output: Uses DO1 and DO2

Event: Number of event points: 2 points
(Uses Event 1 and 2)
Event 1, 2: Deviation high (Factory set value)
→Change the Event 2 to Deviation low.

Event timer: 0.0 second (Factory set value)

Without interlock function (Factory set value)

→Change to “with Interlock function.”



Parameters to be set (Engineering mode):

• Mandatory setting items:

Function block No. 21 (Fn21): Input 1_Input type (I1NP),
Input 1_Display unit (I1UNIT),
Input 1_Decimal point position (I1PGDP),
Input 1_Input range high (I1PGSH),
Input 1_Input range low (I1PGSL)

Function block No. 30 (Fn30): OUT1 function selection (oSL1),
OUT2 function selection (oSL2),
Interlock selection (IL5)

Function block No. 34 (Fn34): DO1 function selection (doSL1),
DO2 function selection (doSL2),
DO1 logic calculation selection (doLG1),
DO2 logic calculation selection (doLG2)

Function block No. 41 (Fn41): Event 1 type (E51)

Function block No. 42 (Fn42): Event 2 type (E52)

Function block No. 51 (Fn51): Input 1_Control action (I1o5)

• Related setting items (Set only when necessary):

Function block No. 30 (Fn30): Energized/De-energized selection (E×C)

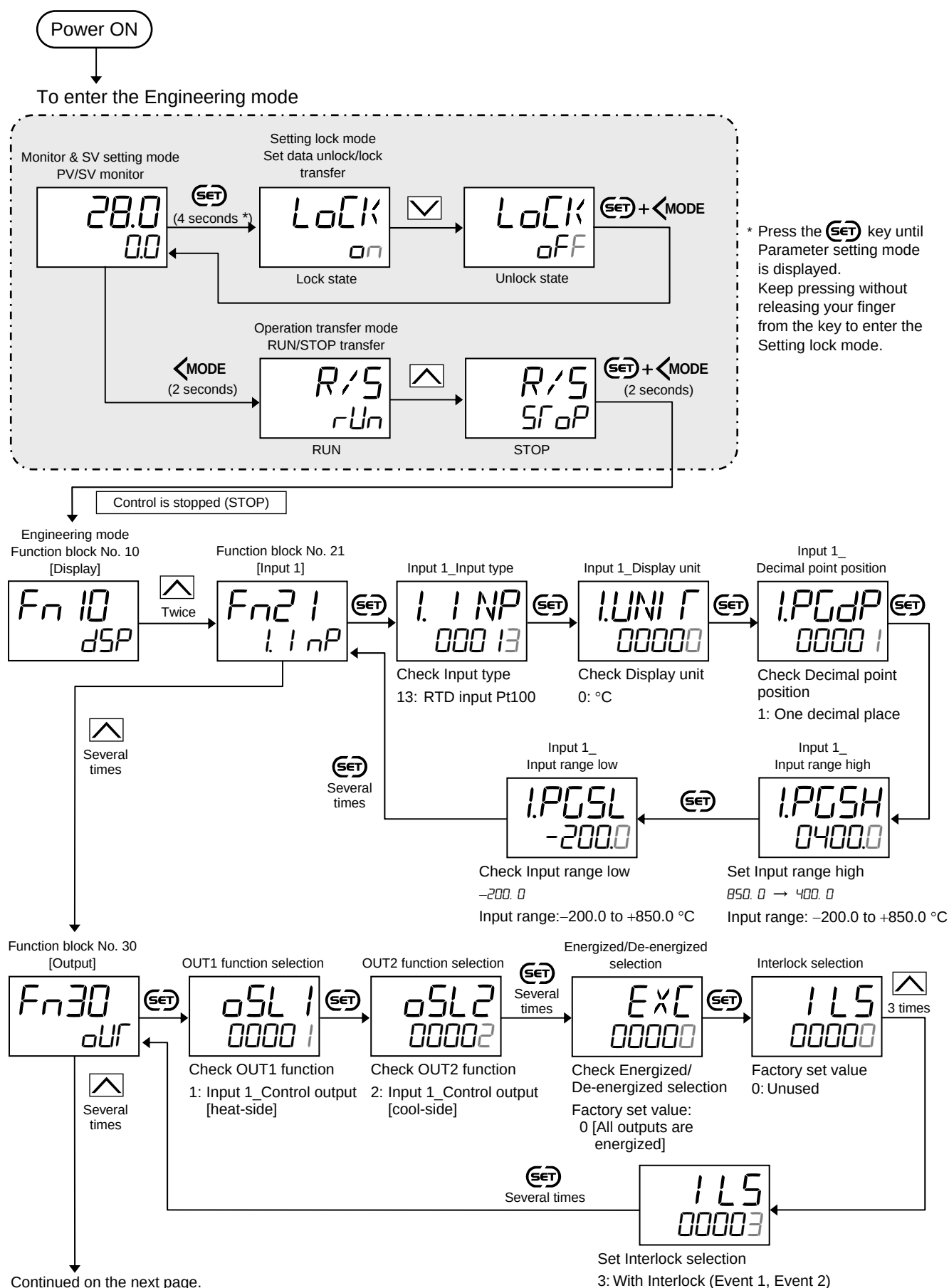
Function block No. 41 (Fn41): Event 1 differential gap (EH1),
Event 1 timer (EV11)

Function block No. 42 (Fn42): Event 2 differential gap (EH2),
Event 2 timer (EV12)

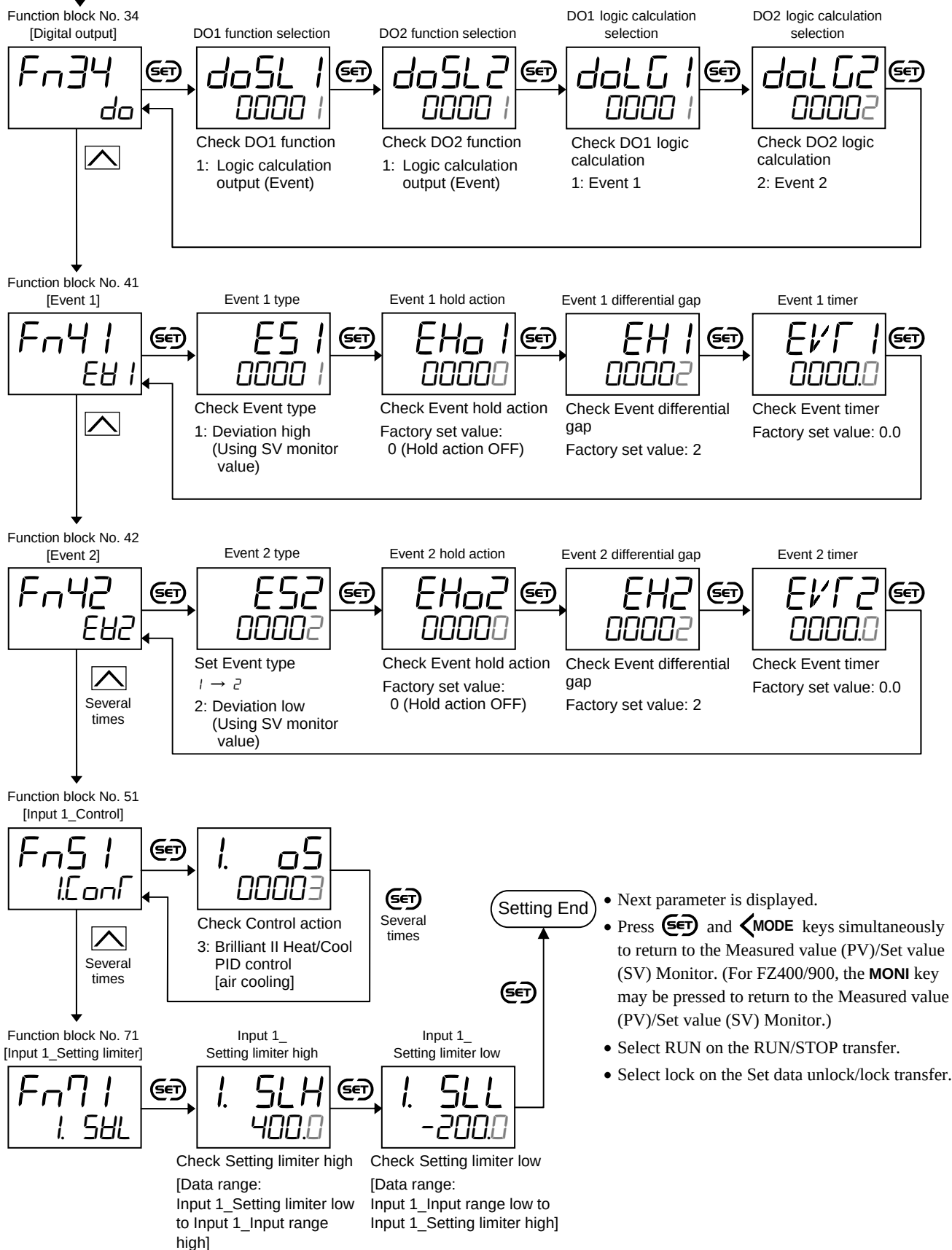
Function block No. 71 (Fn71): Input 1_Setting limiter high (I1SLH),
Input 1_Setting limiter low (I1SLL)

Continued on the next page.

Setting procedure



Continued from the previous page.



5.4 Setting the Control Set Value [Set value (SV)]

After finishing the initial settings, set the control target value, SV.

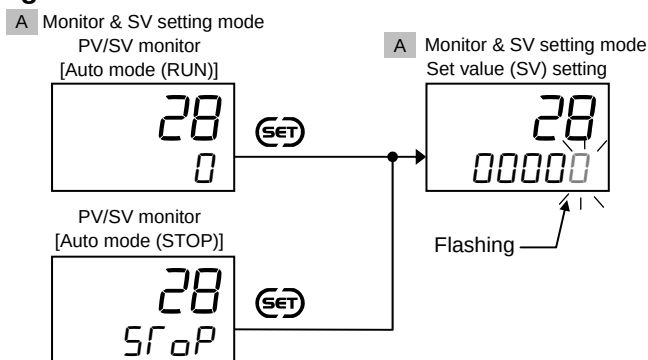
[Setting example: Set Input 1_Set value (SV) to 200 °C]

1. Switch the display to the Set value (SV) setting mode

Press the **SET** key (or **▲** **▼** key)* to switch the display to the SV setting screen from the PV/SV monitor of Input 1.

* Valid only when "Direct registration" is set in "Data registration" in Fn11 in the Engineering mode.

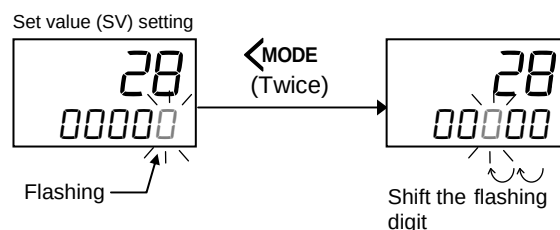
When the instrument is set to "Direct registration" method and no key is operated for 2 seconds on the Set value (SV) setting screen, the screen will return to the PV/SV monitor.



2. Shift the flashing digit to the hundreds digit

Press **◀MODE** key to shift the flashing digit to the hundreds digit.

The flashing digit indicates which digit can be set.



3. Change the numerical value from "0" to "2"

Press the **▲** key twice to change the numerical value from "0" to "2."

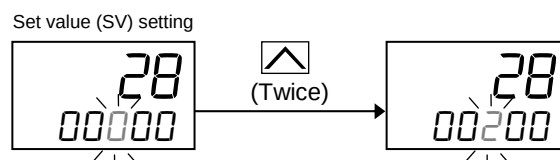
Setting range:

Input 1_Setting limiter low to

Input 1_Setting limiter high

Varies with the setting of the Decimal point position.

Factory set value: 0



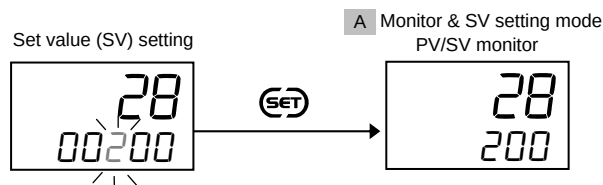
4. Store the set value (SV)

Press the **SET** key to store the set value.

The display changes to the next parameter.



The parameter displayed after the set value (SV) varies depends on the product specifications.



Set value change and registration

- The flashing digit indicates which digit can be set. Every time the **◀MODE** key is pressed, the flashing digit moves.
- To store a new value for the parameter, always press the **SET** key. The display changes to the next parameter and the new value will be stored. The modified data will not be stored only by operating the **▲** and **▼** keys.
- In case no operation is performed within 60 seconds after the change of the setting, the mode will return to

A Monitor & SV setting mode. The modified data will not be registered in this case.

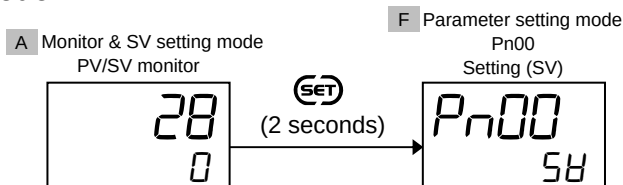
5.5 Setting the Event Set Value

After finishing the initial settings, set the event set values if they are used.

[Setting example: Set the Event 1 set value (EV1) to 20 °C]

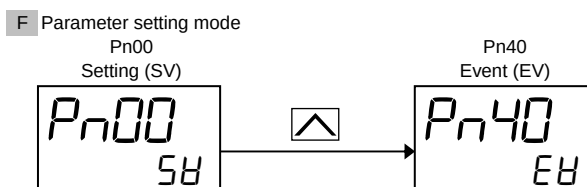
1. Switch the mode to the Parameter setting mode

Press and hold the **(SET)** key for 2 seconds or more on the PV/SV monitor screen of Input 1 until the first screen (Parameter group No. 00 [Pn00]) in the Parameter setting mode is displayed.



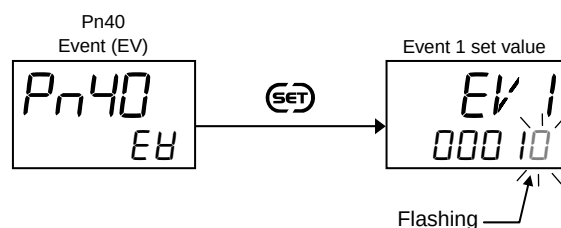
2. Switch the display to Parameter group No. 40

Press the **▲** key to switch the display to the Parameter group No. 40 [Pn40] screen from the Parameter group No. 00 [Pn00] screen.



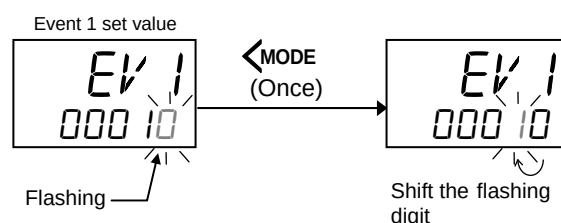
3. Switch the screen to Event 1 set value (EV1)

Press the **(SET)** key to switch the display to the Event 1 set value (EV1) screen from the Parameter group No. 40 [Pn40] screen.



4. Shift the flashing digit to the tens digit

Press **◀MODE** key to shift the flashing digit to the tens digit. The flashing digit indicates which digit can be set.



5. Change the numerical value from “1” to “2”

Press the **▲** key to change the numerical value from “1” to “2.”

Setting range:

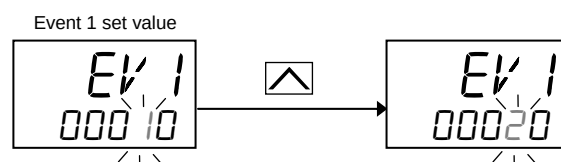
Deviation (When assigned to Input 1 or Differential temperature input):

–(Input 1_Input span) to +(Input 1_Input span)

Varies with the setting of the Decimal point position.

Factory set value:

10 (at TC/RTD inputs)



For more details of the setting range and the factory set values other than the above, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Continued on the next page.

6. Store the Event 1 set value

Press the **SET** key to store the set value.
The display changes to the next parameter.



The parameter displayed after the Event 1 set value (EV1) varies depends on the product specifications.



Set value change and registration

- The flashing digit indicates which digit can be set. Every time the **MODE** key is pressed, the flashing digit moves.
- To store a new value for the parameter, always press the **SET** key. The display changes to the next parameter and the new value will be stored. The modified data will not be stored only by operating the **▲** and **▼** keys.
- In case no operation is performed within 60 seconds after the change of the setting, the mode will return to **A** Monitor & SV setting mode. The modified data will not be registered in this case.

5.6 Tuning the PID Parameters (Execution of AT)

Suitable PID values are automatically calculated by Autotuning (AT) function.

The Autotuning (AT) function automatically measures, computes and sets the optimum PID values.



Before starting the Autotuning, make sure that all required conditions to start the AT are satisfied.

● Requirements for Autotuning (AT) start

To start Autotuning (AT), go to **C** Operation transfer mode.

Operation state	RUN/STOP transfer	RUN
	Auto/Manual transfer	Auto mode
	Remote /Local transfer	Local mode
	Autotuning (AT) setting	PID control (State before starting AT)
Parameter setting	PID control of Input 1 or Position proportioning PID control	Input 1_Output limiter high [heat-side] > 0 % Input 1_Output limiter low [heat-side] < 100 %
	PID control of Input 2	Input 2_Output limiter high > 0 % Input 2_Output limiter low < 100 %
	Heat/Cool PID control	Input 1_Output limiter high [heat-side] > 0 % Input 1_Output limiter low [heat-side] < 100 % Input 1_Output limiter high [cool-side] > 0 % Input 1_Output limiter low [cool-side] < 100 %
Input value state	The Measured value (PV) is not inside the Input error range. [Input error range: Input error determination point (high) ≥ Measured value (PV), Input error determination point (low) ≤ Measured value (PV)]	

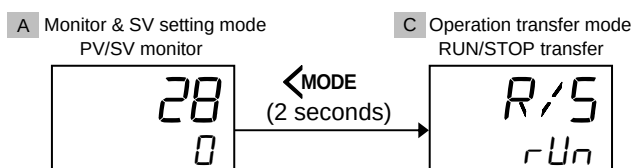


For the details of the “Caution for using the Autotuning (AT)” and “Requirements for Autotuning (AT) cancellation,” refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

1. Switch the mode to the Operation transfer mode

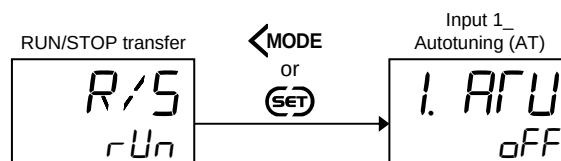
Press and hold the **MODE** key for 2 seconds or more on the PV/SV monitor screen of Input 1 until the Operation transfer mode is displayed.

The first screen in the Operation transfer mode is RUN/STOP transfer screen.



2. Switch the display to the Autotuning (AT)

Press the **MODE** or the **SET** key on the RUN/STOP transfer screen to select the Input 1_Autotuning (AT) screen.



Continued on the next page.

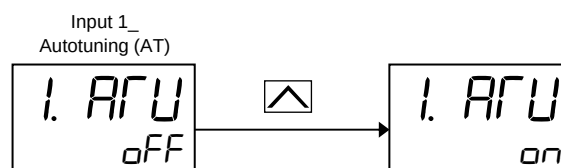
3. Start the Autotuning (AT)

Press the key to switch from “*oFF*” to “*on*” to start the Autotuning (AT).

The AT1 () lamp starts flashing.

Setting range: *oFF*: PID control
on: Start Autotuning (AT)

Factory set value: *oFF*



To return to the PV/SV monitor screen during the AT, press and hold the **MODE** key for 2 seconds or more, or press the **MODE** key while pressing and holding the **SET** key.

4. Finish the Autotuning (AT)

When the Autotuning (AT) is finished, the control will automatically return to “*oFF*: PID control” and AT1 () lamp turns off.

- The Autotuning (AT) can be started by Digital input (DI). Refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]** for more information on assigning Digital input (DI).
- The Autotuning (AT) can be started on FZ400/900 by a key operation of the direct key (FUNC key). For “FUNC key assignment,” refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Parts 2: Parameters/Functions]**.



TROUBLE SHOOTING

6

This chapter describes error displays and countermeasures for errors.

6.1 Error Displays	6-2
6.2 Solutions for Problems	6-5
6.3 Verifying Instrument Information	6-14

6.1 Error Displays

This Section describes error display when the measured value (PV) exceeds the display range limit and the self-diagnostic error.

■ Input error displays

The table below shows displays, description, actions and solutions when the measured value (PV) exceeds the display range.

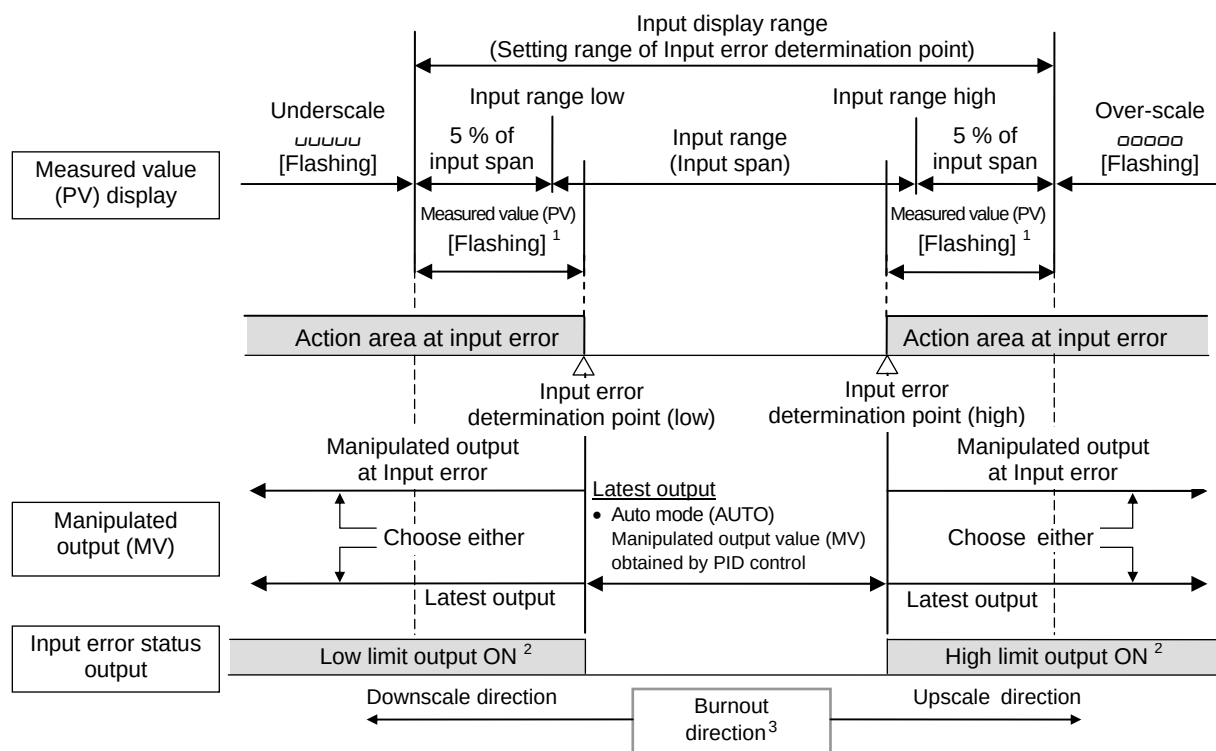


NOTE

Before replacing the sensor, always turn OFF the power of the FZ110/400/900 or switch the mode to STOP with RUN/STOP transfer.

Display	Description	Action (Output)	Solution
Measured value (PV) [Flashing]	Measured value (PV) exceeded the input error determination point or the input range. Display does not flash when “Non-flashing display” is set.	● Action at input error: Output depending on the action at Input error (high/low limit) ● Event output: Output depending on the event action at input error	Check input type, input range, sensor connection and sensor break.
00000 [Flashing]	Over-scale Measured value (PV) exceeded the high limit of display range.		
UUUUUU [Flashing]	Underscale Measured value (PV) exceeded the low limit of display range.		

● Input error determination point is set within the input range



¹ Flashing can be suppressed by setting “PV flashing display at input error” (Function block No. 10 in the Engineering mode).

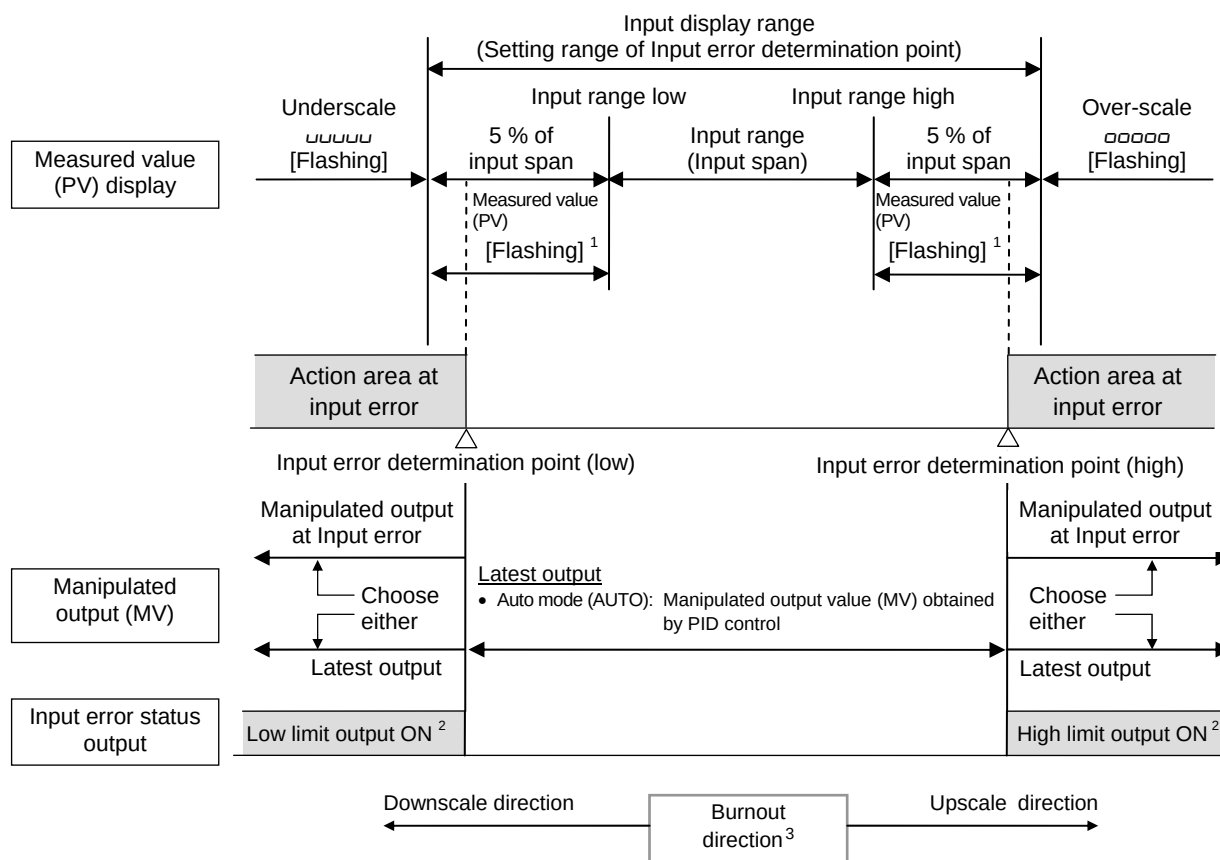
² For Input error status output, refer to ● **Details of OUT1 to 3 as well as DO1 to 4 logic calculation selection (Separate manual [Part 2: Parameters/Functions]).**

³ Setting Burnout direction is valid for thermocouple input and low voltage input (0 to 10 mV DC, 0 to 100 mV DC). Actions of other input types are fixed as follows.

RTD input: Upscale

High voltage/Current inputs: Downscale (Indicates value near 0)

● Input error determination point is set outside the input range



¹ Flashing can be suppressed by setting "PV flashing display at input error" (Function block No. 10 in the Engineering mode).

² For Input error status output, refer to ● **Details of OUT1 to 3 as well as DO1 to 4 logic calculation selection (Separate manual [Part 2: Parameters/Functions]).**

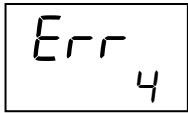
³ Setting Burnout direction is valid for thermocouple input and low voltage input (0 to 10 mV DC, 0 to 100 mV DC). Actions of other input types are fixed as follows.

RTD input: Upscale

High voltage/Current inputs: Downscale (Indicates value near 0)

Self-diagnostic error

In an error is detected by the Self-diagnostic function, the PV display shows “Err,” and the SV display shows the error code. If two or more errors occur simultaneously, the total summation of these error code is displayed.

Error code	Description	Action	Solution
1	Adjustment data error • Adjusted data range is abnormal.	Display: Error code display Output: All the outputs are OFF Communication: Relevant error code to be sent	Turn off the power once. If the FZ110/400/900 is restored to normal after the power is turned on again, then probable cause may be external noise source affecting the control system. Check for the external noise source.
2	Data back-up error • Back-up action is abnormal. • Data write failure		
4	A/D conversion error • Error in A/D conversion circuit is detected. Temperature compensation error • Out of the temperature measurement range	< Example of error display > 	If an error is repeated after the power is turned on again, the FZ110/400/900 may need to be repaired or replaced. Please contact RKC sales office or the agent.

If any of the following errors occur, all action of the FZ110/400/900 is stopped.
In this case the error code is not displayed.

Error code	Description	Action	Solution
No error display	Watchdog timer error • Part of the internal program stops running.	Display: All displays are OFF Output: All outputs are OFF Communication: Stopped	Turn off the power once. If an error is repeated after the power is turned on again, the FZ110/400/900 may need to be repaired or replaced. Please contact RKC sales office or the agent.
	Power supply voltage is abnormal (power supply voltage monitoring) • Decrease of power supply voltage	Display: All displays are OFF Output: All outputs are OFF Communication: Stopped	
	Display units error	Display: All displays are OFF Output: All outputs are OFF Communication: Sends error code 64	

6.2 Solutions for Problems

This section explains possible causes and solutions of the errors. For any inquiries or to confirm the specifications of the product, please contact RKC sales office or the agent.

If the instrument needs to be replaced, 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.



■ Display related errors

Problem	Possible cause	Solution
No display appears	The internal assembly is not inserted into the case correctly. (FZ400/900 only)	Insert the internal assembly into the case correctly.
	Power supply terminal connection is not correct.	Connect power supply correctly by referring to 3.3 Wiring of Each Terminal [FZ110] (P. 3-9) or 3.4 Wiring of Each Terminal [FZ400/900] (P. 3-24) .
	Power supply terminal contact failure.	Retighten the terminal screws.
	Supply voltage is not correct.	Apply proper power supply voltage by referring to ■ General specifications (P. 7-22) .
Display is unstable	Noise source is present near the instrument.	Separate the noise source from the instrument. Set the appropriate value at Digital filter according to the input response.
	The terminal block of the instrument (with thermocouple input) is directly exposed to the air flow from an air conditioner.	Do not directly expose the terminal block to the air from the air conditioner.
Measured value (PV) display differs from the actual value	Wrong sensor is used.	Check the instrument specification and use a proper sensor.
	Input type setting is wrong.	Make proper setting by referring to the separate manual [Part 2: Parameters/Functions].
	Connection between the sensor (thermocouple) and the instrument is made with a cable other than compensating wire.	Be sure to use a compensating wire.
	For RTD input, leadwire resistance in three wires between the sensor and the instrument is different from one another.	Use a leadwire with the same resistance among three leadwires.
	PV bias is set.	Set PV bias to "0" by referring to the separate manual [Part 2: Parameters/Functions]. However, this is limited only to when the PV bias setting can be changed.
	PV ratio is set.	Change the PV ratio setting by referring to the separate manual [Part 2: Parameters/Functions]. However, this is limited only to when the PV ratio setting can be changed.



How to check the input

- When the input is configured as Thermocouple input:

Short the input terminals*, and if a temperature around the ambient temperature of the input terminals is displayed, the controller is working properly.

* FZ110: Measured input terminals 11-12 FZ400/900: Measured input 1 terminals 11-12, Measured input 2 terminals 23-24 (optional)

- When the input is configured as RTD input:

Insert a 100 Ω resistor across Input terminals A-B.¹ Short terminals between B-B.²

If temperature around 0 °C is displayed, the instrument is working fine.

¹ FZ110: Measured input terminals 10-11 FZ400/900: Measured input 1 terminals 10-11, Measured input 2 terminals 22-23 (optional)

² FZ110: Measured input terminals 11-12 FZ400/900: Measured input 1 terminals 11-12, Measured input 2 terminals 23-24 (optional)

- When the input is configured as Voltage/Current input:

Input* a certain voltage or current from a voltage/current generator to the controller. If the controller shows the equivalent input value, the input setting and function of the controller is working correctly.

* FZ110: Measured input terminals 11-12 FZ400/900: Measured input 1 terminals 11-12, Measured input 2 terminals 23-24 (optional)

■ Control related errors

Problem	Possible cause	Solution
Control is abnormal	Supply voltage is not correct.	Apply proper power supply voltage by referring to ■ General specifications (P. 7-22) .
	Disconnection of sensor or sensor wire.	Turn off the power or STOP the operation by “RUN/STOP transfer” and repair the sensor or replace it.
	The sensor is not wired correctly.	Conduct correct wiring of sensor by referring to 3.3 Wiring of Each Terminal [FZ110] (P. 3-9) or 3.4 Wiring of Each Terminal [FZ400/900] (P. 3-24) .
	Wrong sensor is used.	Check the instrument specification and use a proper sensor.
	Input type setting is wrong.	Make proper setting by referring to the separate manual [Part 2: Parameters/Functions].
	Sensor insertion depth is insufficient.	Check the sensor insertion. If insertion is loose, firmly insert the sensor.
	Sensor insertion position is wrong.	Insert the sensor at the specified location.
	Input signal wires are not separated from instrument power and/or load wires.	Separate input signal wires from instrument power and load wires
	Noise source is present near the instrument.	Separate the noise source from the instrument.
	Inappropriate PID constants.	Set appropriate PID constants.
Startup tuning (ST) cannot be activated	Startup tuning (ST) mode is “OFF (ST unused).” (Factory set value: OFF)	Refer to the separate manual [Part 2: Parameters/Functions].
	Requirements for performing the Startup tuning (ST) are not satisfied.	Satisfy the requirements for performing the Startup tuning (ST) by referring to the separate manual [Part 2: Parameters/Functions].
Autotuning (AT) cannot be activated	Requirements for performing the Autotuning (AT) are not satisfied.	Satisfy the requirements for performing the Autotuning (AT) by referring to the separate manual [Part 2: Parameters/Functions].
Autotuning (AT) aborted	Requirements for aborting the Autotuning (AT) are established.	Identify causes for Autotuning (AT) abort by referring to the separate manual [Part 2: Parameters/Functions] and then remove them. Then, execute Autotuning (AT) again.
Optimum PID values cannot be obtained by Autotuning (AT)	Autotuning (AT) does not match the characteristics of the controlled object.	Set PID constants manually by referring to the separate manual [Part 2: Parameters/Functions].

Continued on the next page.



Continued from the previous page.

Problem	Possible cause	Solution
Autotuning (AT) cannot be finished normally	Temperature change of the process is too slow (1 °C or less per minute for temperature rise and fall).	Set PID constants manually by referring to the separate manual [Part 2: Parameters/Functions].
	Autotuning (AT) was executed around the ambient temperature or close to the maximum temperature achieved by the load.	
Measured value (PV) overshoots or undershoots	Proportional band is narrow. Proportional (P) constant is small.	Increase Proportional (P) value within the acceptable limit of response delay.
	Integral time is short. Integral (I) constant is small.	Increase Integral (I) value within the acceptable limit of response delay.
	Derivative time is short. Derivative (D) constant is small.	Increase Derivative (D) value within the acceptable limit of process stability.
	The instrument is configured for ON/OFF control.	Change the control mode to Proportional control or PID control.
No output change in step	Output change rate limiter is set.	Set the Output change rate limiter to “0.0: OFF” by referring to the separate manual [Part 2: Parameters/Functions]. However, this is limited only to when the Output change rate limiter setting can be changed.
Output does not rise over (or goes below) a certain value	Output limiter is set.	Change the Output limiter setting by referring to the separate manual [Part 2: Parameters/Functions]. However, this is limited only to when the Output limiter setting can be changed.

■ Operation related errors

Problem	Possible cause	Solution
No setting change can be made by key operation	Set data is locked.	Release the Set data lock by referring to the separate manual [Part 2: Parameters/Functions] .
A set value (SV) above (or below) a certain limit cannot be set	Setting limiter is set.	Change the Setting limiter setting by referring to the separate manual [Part 2: Parameters/Functions] . However, this is limited only to when the Setting limiter setting can be changed.
Set value (SV) does not change immediately when the Set value (SV) is changed	Setting change rate limiter is set.	Set the Setting change rate limiter to “0: No function” by referring to the separate manual [Part 2: Parameters/Functions] .
Remote setting input value display differs from the actual value	RS bias is set.	Set the RS bias to “0” by referring to the separate manual [Part 2: Parameters/Functions] . However, this is limited only to when the RS bias setting can be changed.
	RS ratio is set.	Change the RS ratio setting by referring to the separate manual [Part 2: Parameters/Functions] . However, this is limited only to when the RS ratio setting can be changed.
For Voltage/Current input types, the displayed value for the input voltage or the input current are inverted.	Invert setting is done.	Set the Inverting input to “0: Unused” by referring to the separate manual [Part 2: Parameters/Functions] .
Unable to select the 2-loop control (except Remote setting input) such as 2-loop control, Differential temperature control, Control with PV select, Cascade control, or Input circuit error alarm). (FZ400/900 only)	“Remote setting input” is selected at Option 3 type at the time of order.	Check the specification code of Option 3 type. When “Measured input 2” is not specified, switching to 2-loop control (2-loop control, Differential temperature control, Control with PV select, Cascade control, or Input circuit error alarm) is not possible.



■ Event related errors

Problem	Possible cause	Solution
Event function is abnormal	Event function is different from the specification.	Change the Event action type by referring to the separate manual [Part 2: Parameters/Functions] after the instrument specification is confirmed.
	Event output relay contact Energized/De-energized is reversed.	Check the setting details by referring to the separate manual [Part 2: Parameters/Functions] .
	Setting of Event differential gap is not appropriate.	Set the appropriate Event differential gap by referring to the separate manual [Part 2: Parameters/Functions] .
No output of the Event function is turned on	Event is not assigned to the output.	Check the contents of Output assignment by referring to the separate manual [Part 2: Parameters/Functions] .
Event hold action is not activated	Setting change rate limiter is set.	Set the Setting change rate limiter to “0: No function” by referring to the separate manual [Part 2: Parameters/Functions] . However, this is limited only to when the Setting limiter setting can be changed.

■ Control loop break alarm (LBA) related errors

Problem	Possible cause	Solution
Control loop break alarm (LBA) is not generated under the alarm condition	LBA time setting is not appropriate.	Set an appropriate value by referring to the separate manual [Part 2: Parameters/Functions] .
	LBA deadband (LBD) setting is not appropriate.	
	Autotuning (AT) is in execution.	Wait for Autotuning (AT) to finish or abort Autotuning (AT).
	The instrument stays in control stop (STOP).	Switch the mode to RUN (control) by referring to the separate manual [Part 2: Parameters/Functions] . Attempt this only when the mode is allowed to be transferred to RUN (control start).
	LBA is not assigned to the output.	Check the contents of Output assignment by referring to the separate manual [Part 2: Parameters/Functions] .
	LBA does not match the characteristics of the process (controlled object).	Try another type of alarm.
Control loop break alarm (LBA) is generated under the no alarm condition	LBA time setting is not appropriate.	Refer to the separate manual [Part 2: Parameters/Functions] , and set a suitable value.
	LBA deadband (LBD) setting is not appropriate.	
	LBA does not match the characteristics of the process (controlled object).	Try another type of alarm.



■ Heater break alarm (HBA) related errors

Problem	Possible cause	Solution
No heater break can be detected	Setting of Heater break alarm (HBA) is not appropriate.	Set the appropriate Heater break alarm value by referring to the separate manual [Part 2: Parameters/Functions].
	CT is not connected.	Connect the CT by referring to 3.3 Wiring of Each Terminal [FZ110] (P. 3-9) or 3.4 Wiring of Each Terminal [FZ400/900] (P. 3-24) .
CT input value is abnormal	Proper CT is not used.	Change the CT type by referring to the separate manual [Part 2: Parameters/Functions] after the instrument specification is confirmed.
	The heater is broken.	Check the heater.
	CT wiring improperly.	Conduct CT wiring correctly by referring to 3.3 Wiring of Each Terminal [FZ110] (P. 3-9) or 3.4 Wiring of Each Terminal [FZ400/900] (P. 3-24) .
	Input terminal contact defect.	Retighten the terminal screws.
No output of the Heater break alarm (HBA) is turned on	HBA is not assigned to the output.	Check the contents of Output assignment by referring to the separate manual [Part 2: Parameters/Functions].



■ Communication related errors

● RKC communication

Problem	Possible cause	Solution
No response	Wrong connection, no connection or disconnection of the communication cable	Check connection and connect cable properly.
	Disconnection, contact failure, or wrong connection of communication cable	Check wiring and connector. Repair or replace, if necessary.
	Communication setting (communication speed, data bit configuration) is different from a host computer	Check setting and make a proper setting.
	Address setting is wrong	Review communication program
	Data format is wrong	
	Transmission line is not set to receive state after data send (for RS-485)	
	Communication protocol setting is wrong	Refer to the separate manual [Host communication], and set Communication protocol to “0: RKC communication.”
EOT return	Invalid communication identifiers	Check if communication identifiers are correct and if there are any identifiers for unsupplied functions.
	Data format is wrong	Review communication program
NAK return	Communication error occurred (parity bit error, framing error, etc.)	Identify the error and take necessary actions (e.g. check of transmitted data, retransmission)
	BCC error occurred	
	Data is out of the setting range	Check the setting range and correct the data.
	Invalid communication identifiers	Check if communication identifiers are correct and if there are any identifiers for unsupplied functions.

● Modbus

Problem	Possible cause	Solution
No response	Wrong connection, no connection or disconnection of the communication cable	Check connection and connect cable properly.
	Disconnection, contact failure, or wrong connection of communication cable	Check wiring and connector. Repair or replace, if necessary.
	Communication setting (communication speed, data bit configuration) is different from a host computer	Check setting and make a proper setting.
	Address setting is wrong	Retransmit after time-out or Review program on master side
	Transmission error detected. (Overrun error, framing error, parity error, or CRC-16 error)	
	Time interval between the data that composes a message is more than 24-bit time.	

Continued on the next page.

Continued from the previous page.

Problem	Possible cause	Solution
No response	Communication protocol setting is wrong	Set Communication protocol to “1” or “2” by referring to the separate manual [Host communication] . 1: Modbus (Order of data transfer: upper word to lower word) 2: Modbus (Order of data transfer: lower word to upper word)
Error code: 1	Function cod error (Specifying nonexistent function code)	Confirm the function code
Error code: 2	When the mismatched address is specified	Confirm the address of holding register
Error code: 3	When the specified number of data items in the query message exceeds the maximum number of data items available	Confirm the setting data
Error code: 4	Self-diagnostic error	Turn off the power to the instrument. If the same error occurs when the power is turned back on, please contact RKC sales office or the agent.

● PLC communication (MAPMAN)

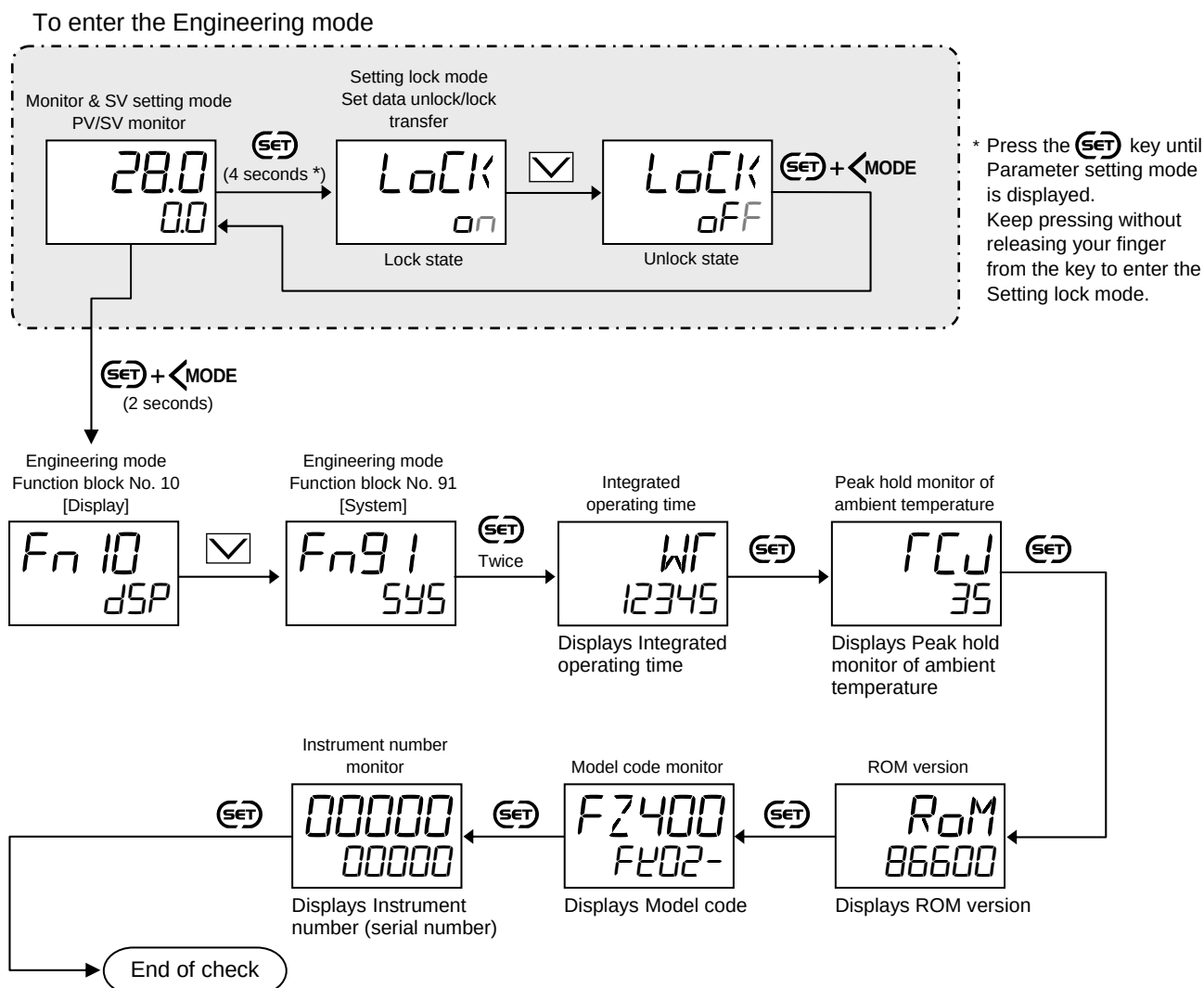
Problem	Possible cause	Solution
- Even if “1” is set to the sitting request bit or monitor request bit in request command, transfer is not finished. Request command does not return to “0” - It looks like communication is done properly, but the monitor values are not sent to the PLC. - No response	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Mismatch of the setting data of communication speed, data bit configuration and protocol with those of the PLC	Confirm the communication settings of controller (FZ110/400/900) and set them correctly
	Wrong setting of PLC communication data	Confirm the PLC communication settings and set them correctly
		Setting of termination resistor in accordance with PLC or the insertion is done
	Setting of PLC becomes write inhibit	Setting of PLC is turned into write enable (Write enable in RUN, shift to monitor mode, etc.)
	Accesses outside the range of memory address of PLC (wrong setting of address)	Confirm the PLC communication environment setting and set them correctly
If two or more controllers are connected, no units after the second unit are recognized	Instrument link recognition time is short	Set the Instrument link recognition time * longer. * Set the Instrument link recognition time only for a master controller (address 0).
When the setting request command of request command is set in “1,” setting error is become	Data rang error	Confirm the setting range of set value and set them correctly

6.3 Verifying Instrument Information

When error occurs and when you contact us, you are requested to provide us with the information on the instrument model code and specification. You can check the ROM version, model code and serial number of the instrument on the instrument display. The Integrated operating time and the maximum ambient temperature (Peak hold monitor of the ambient temperature).

■ How to display the information

ROM version, Model code monitor and Serial number monitor can be set at *F_n91* in the Engineering mode.

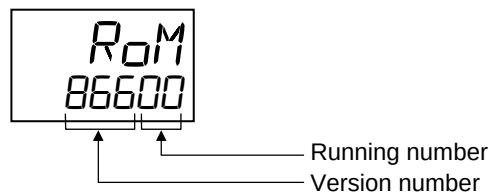


- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor.)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

How to check

ROM Version

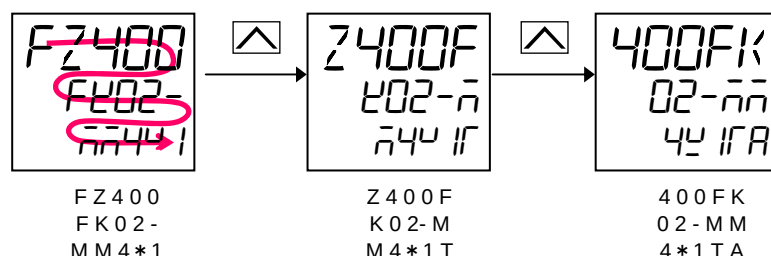
[Example]



Model code monitor

Displays the model code of the instrument. As the Model code is too long to be displayed on a single screen, it can be scrolled left and right with and keys.

Example: Model code is FZ400FK02-MM4*1TA2NN/1



FZ400
FK02-
MM4*1

The model code scrolls from the PV display to the SV display continuously over two displays screens.

Z400F
K02-M
M4*1T

The Up key was pressed once.
The model code was scrolled one digit left.

400FK
02-MM
4*1TA

The Up key was pressed once more.
The displayed characters were scrolled one more digit to the left.

FZ400 and FZ900 come with three display units; PV, SV, and MV are displayed. FZ110 only has PV and SV display only.

Instrument number monitor

Displays the serial number of the instrument.



To read the displayed characters, refer to “**Character Symbols**” (P. i-3).



Alternatively, you can check the model code (MODEL), serial number (S/N) and suffix code (CODE) on the label on the side of the instrument if you are unable to check the information on the display.

Integrated operating time

As soon as the instrument is powered, “1” is added. Thereafter, “1” is accumulated for each hour.

Peak hold monitor of ambient temperature

Temperature around the rear terminal is measured and the maximum value is stored.



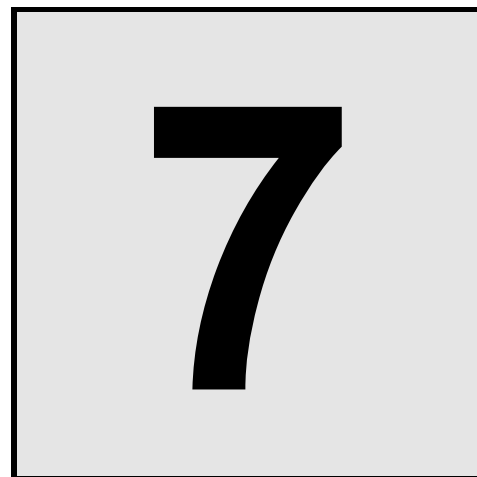
The Integrated operating time and the Peak hold monitor of the ambient temperature (maximum ambient temperature) cannot be reset.



MEMO



SPECIFICATIONS



This chapter describes Specifications.



■ Measured input

Number of input:	1 point + 1 point (optional)* (Isolated between each input) * Option: FZ400/900 only
Input type:	Thermocouple (TC) input: K, J, T, S, R, E, B, N (JIS-C1602-1995) PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002]) U, L (DIN43710-1985) PR40-20 (ASTM-E1751-00) RTD input: Pt100 (JIS-C1604-1997) JPt100 (JIS-C1604-1997, Pt100 of JIS-C1604-1981) 3-wire system Low voltage input: 0 to 10 mV DC, 0 to 100 mV DC High voltage input: 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, -5 to +5 V DC, -10 to +10 V DC Current input: 0 to 20 mA DC, 4 to 20 mA DC

Input range:

Thermocouple (TC) input

Input type	Measured range
K	-200.0 to +400.0 °C (-328.0 to +752.0 °F) -200.0 to +1372.0 °C (-328.0 to +2502.0 °F)
J	-200.0 to +400.0 °C (-328.0 to +752.0 °F) -200.0 to +1200.0 °C (-328.0 to +2192.0 °F)
T	-200.0 to +400.0 °C (-328.0 to +752.0 °F)
S	-50 to +1768 °C (-58 to +3214 °F)
R	-50 to +1768 °C (-58 to +3214 °F)
E	-200 to +1000 °C (-328 to +1832 °F)
B	0 to 1800 °C (0 to 3272 °F)
N	0 to 1300 °C (0 to 2372 °F)
PLII	0 to 1390 °C (0 to 2534 °F)
W5Re/W26Re	0 to 2300 °C (0 to 4200 °F)
U	-200.0 to +600.0 °C (-328.0 to +1112.0 °F)
L	0 to 900 °C (0 to 3200 °F)
PR40-20	0 to 1800 °C (0 to 3200 °F)

RTD input

Input type	Measured range
Pt100	-200.0 to +850.0 °C (-328.0 to +1562.0 °F) -100.00 to +100.00 °C (-148.00 to +212.00 °F) 0.00 to 50.00 °C (32.00 to 122.00 °F)
JPt100	-200.0 to +640.0 °C (-328.0 to +1184.0 °F) -100.00 to +100.00 °C (-148.00 to +212.00 °F) 0.00 to 50.00 °C (32.00 to 122.00 °F)

Voltage/Current input

Input type	Measured range
Low voltage	0 to 10 mV DC, 0 to 100 mV DC
High voltage	0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, -5 to +5 V DC, -10 to +10 V DC
Current	0 to 20 mA DC, 4 to 20 mA DC

Sampling cycle:	0.05 seconds When Input 2 is configured for 2-loop control or cascade control: 0.1 seconds

Influence of signal source resistance (TC input):

Approx. 0.18 $\mu\text{V}/\Omega$ (Converted depending on TC types)

**Influence of input lead (RTD input):**

Approx. 0.006 %/ Ω of span (100 Ω or less per wire)

If the resistance is 100 Ω or more, the measuring range may be limited.

Input impedance (Voltage/Current input):

Low voltage input: 1 M Ω or more

High voltage input: 1 M Ω or more

Current input: Approx. 50 Ω

Measured current (RTD input):

Approx. 1 mA

Action at input break:

TC input: Upscale or Downscale (selectable)

RTD input: Upscale

Low voltage input: Upscale or Downscale (selectable)

High voltage input: Downscale (Indicates value near 0)

Current input: Downscale (Indicates value near 0)

Action at input short circuit (RTD input):

Downscale (Measured range: except 0.00 to 50.00 $^{\circ}\text{C}$ [32.00 to 122.00 $^{\circ}\text{F}$] range)

Upscale (Measured range: 0.00 to 50.00 $^{\circ}\text{C}$ [32.00 to 122.00 $^{\circ}\text{F}$])

Action at input error:

- Input error determination point (high), Input error determination point (low)

Input range low – (5 % of input span) to

Input range high + (5 % of input span)

When the input type is Pt100 or JPt100, the low limit value cannot be –5 %.

Low limit of Pt100: –245.5 $^{\circ}\text{C}$ (–409.8 $^{\circ}\text{F}$), corresponding to approximately 2 Ω

Low limit of JPt100: –237.6 $^{\circ}\text{C}$ (–395.7 $^{\circ}\text{F}$), corresponding to approximately 2 Ω

It is also used as Input error determination of the Event action.

- Action (high) input error, Action (low) input error

“Control continues” or “Manipulated output value at input error” (selectable)

- Manipulated output value at input error

PID control: –5.0 to +105.0 %

Heat/Cool PID control: –105.0 to +105.0 %

Position proportioning PID control: –5.0 to +105.0 %

Actual output value is limited by the Output limiter.

When “Control action continued” is selected at “Action at feedback resistance (FBR) input error” on the position proportioning PID control with or without Feedback resistance input, the action will follow “Valve action at STOP.”

- PV flashing display at input error

Flashing display or Non-flashing display (selectable)

Measured input correction:

PV bias: –Input span to +Input span

PV ratio: 0.500 to 1.500

PV digital filter (First order lag digital filter):
0.0 to 100.0 seconds (0.0: Filter OFF)

Allowable input range:

–1.0 to +3.0 V (TC input/RTD input/Low voltage input)

–12 to +12 V (High voltage input)

–20.0 to +30.0 mA (Current input)

Square root extraction function (Voltage/Current input):

Calculation method: Measured value = $\sqrt{(\text{Input value})} \times \text{PV ratio} + \text{PV bias}$

PV low input cut-off: 0.00 to 25.00 % of input span



■ Remote setting input

Number of input:	1 point (FZ110: Non-isolated from PV, FZ400/900: Isolated from PV)
Input type:	Thermocouple (TC) input (Select from the list below when Measured input 2 is selected for FZ400/900): K, J, T, S, R, E, B, N (JIS-C1602-1995) PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002]) U, L (DIN43710-1985) PR40-20 (ASTM-E1751-00) RTD input (Select from the list below when Measured input 2 is selected for FZ400/900): Pt100 (JIS-C1604-1997) JPt100 (JIS-C1604-1997, Pt100 of JIS-C1604-1981) 3-wire system Low voltage input (FZ400/900 only): 0 to 10 mV DC, 0 to 100 mV DC High voltage input: 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, -5 to +5 V DC, -10 to +10 V DC Current input: 0 to 20 mA DC, 4 to 20 mA DC
Input range:	Programmable range
Sampling cycle:	0.05 seconds
Input impedance:	Low voltage input: 1 M Ω or more High voltage input: 1 M Ω or more Current input: Approx. 50 Ω
Action at input break:	TC input: Upscale or Downscale (selectable) RTD input: Upscale Low voltage input: Upscale or Downscale (selectable) High voltage input: Downscale (Indicates value near 0) Current input: Downscale (Indicates value near 0)
Remote input correction:	RS bias: -Input span to +Input span RS ratio: 0.001 to 9.999 RS digital filter (First order lag digital filter): 0.0 to 100.0 seconds (0.0: Filter OFF)
Allowable input range:	-1.0 to +3.0 V (TC input/RTD input/Low voltage input) -12 to +12 V (High voltage input) -20.0 to +30.0 mA (Current input)

■ Current transformer (CT) input

Number of input:	FZ110: 1 point, FZ400/900: 2 points
CT type:	CTL-6-P-Z, CTL-6-P-N or CTL-12-S56-10L-N (Sold separately)
Input range:	0.0 to 0.1 Arms
Measurable current range:	CTL-6-P-Z: 0.0 to 10.0 A (high accurate type) CTL-6-P-N: 0.0 to 30.0 A CTL-12-S56-10L-N: 0.0 to 100.0 A
Sampling cycle:	0.5 seconds
Voltage of through current:	300 V or less

■ Feedback resistance (FBR) input [FZ400/900 only]

Number of input:	1 point (Non-isolated from PV1)
Permissible resistance range:	100 Ω to 10 k Ω (Standard: 135 Ω)
Input range:	0.0 to 100.0 % (for adjustment span of open and close) The value is displayed on the Manipulated output value monitor (FBR input at disconnection: 0.0 %)
Sampling cycle:	0.5 seconds
Action at FBR break:	To be selected from OPEN, CLOSE, OFF, and Continue control.

■ Digital input (DI)

Number of input:	FZ110: Up to 3 points (DI1 to DI3), FZ400/900: Up to 6 points (DI1 to DI6)
Input method:	Dry contact input OFF (Open state): 50 k Ω or more ON (Close state): 1 k Ω or less Contact current: 3.3 mA DC or less Voltage at open: Approx. 5 V DC
Capture judgment time:	Within 200 ms

■ Output

Assign output:	Number of output: Output (OUT): 3 points (OUT1 to OUT3) Event output (DO): FZ110: 2 points (DO1, DO2), FZ400/900: 4 points (DO1 to DO4) Output assignment: Refer to Output assignment list

Output assignment list (FZ110 type)

Output specification	OUT1, OUT2					OUT3		DO
	Relay contact (1)	Voltage pulse (1)	Current	Continuous voltage	Transistor	Voltage pulse (2)	Current	Relay contact (4)
Control output (Heat-side)	✓	✓	✓	✓	✓	✓	✓	✓
Control output (Cool-side)	✓	✓	✓	✓	✓	✓	✓	✓
Control output (Position proportioning)	✓	✓	✓	✓	✓	✓	✓	✓
Logic calculation output (Event output)	✓	✓	✓	✓	✓	✓	✓	✓
Logic calculation output (Control loop break alarm (LBA) output)	✓	✓	✓	✓	✓	✓	✓	✓
Logic calculation output (Heater break alarm (HBA) output)	✓	✓	✓	✓	✓	✓	✓	✓
RUN state output	✓	✓	✓	✓	✓	✓	✓	✓
Output of the communication monitoring result	✓	✓	✓	✓	✓	✓	✓	✓
Manual mode state output	✓	✓	✓	✓	✓	✓	✓	✓
Remote mode state output	✓	✓	✓	✓	✓	✓	✓	✓
AT state output	✓	✓	✓	✓	✓	✓	✓	✓
Output while Set value (SV) is changing	✓	✓	✓	✓	✓	✓	✓	✓
FAIL output	✓	✓	✓	✓	✓	✓	✓	✓
Retransmission output	✓	✓	✓	✓	✓	✓	✓	✓

Output assignment list (FZ400/900 type)

Output specification	OUT1, OUT2					OUT3		DO
	(Note)	Voltage pulse (1)	Current	Continuous voltage	Transistor	Voltage pulse (2)	Current	Relay contact (4)
Control output (Heat-side)	✓	✓	✓	✓	✓	✓	✓	✓
Control output (Cool-side)	✓	✓	✓	✓	✓	✓	✓	✓
Control output (Position proportioning)	✓	✓	✓	✓	✓	✓	✓	✓
Logic calculation output (Event output)	✓	✓	✓	✓	✓	✓	✓	✓
Logic calculation output (Control loop break alarm (LBA) output)	✓	✓	✓	✓	✓	✓	✓	✓
Logic calculation output (Heater break alarm (HBA) output)	✓	✓	✓	✓	✓	✓	✓	✓
RUN state output	✓	✓	✓	✓	✓	✓	✓	✓
Output of the communication monitoring result	✓	✓	✓	✓	✓	✓	✓	✓
Manual mode state output	✓	✓	✓	✓	✓	✓	✓	✓
Remote mode state output	✓	✓	✓	✓	✓	✓	✓	✓
AT state output	✓	✓	✓	✓	✓	✓	✓	✓
Output while Set value (SV) is changing	✓	✓	✓	✓	✓	✓	✓	✓
FAIL output	✓	✓	✓	✓	✓	✓	✓	✓
Retransmission output	✓	✓	✓	✓	✓	✓	✓	✓

(Note) OUT1: Relay contact (2), OUT2: Relay contact (3)

Output type:

• Relay contact output (1) [FZ110: OUT1 and OUT2]

Contact type: a contact

Contact rating (Resistive load):

250 V AC 3 A, 30 V DC 1 A

Electrical life: 100,000 times or more (Rated load)

Mechanical life: 20 million times or more (Switching: 300 times/min)

Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

• Relay contact output (2) [FZ400/900: OUT1]

Contact type: c contact

Contact rating (Resistive load):

250 V AC 3 A, 30 V DC 1 A

Electrical life: 300,000 times or more (Rated load)

Mechanical life: 50 million times or more (Switching: 180 times/min)

Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

• Relay contact output (3) [FZ400/900: OUT2]

Contact type: a contact

Contact rating (Resistive load):

250 V AC 3 A, 30 V DC 1 A

Electrical life: 300,000 times or more (Rated load)

Mechanical life: 50 million times or more (Switching: 180 times/min)

Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

• Relay contact output (4) [FZ110: DO1 to DO2, FZ400/900: DO1 to DO4]

Contact type: a contact

Contact rating (Resistive load):

250 V AC 1 A, 30 V DC 0.5 A

Electrical life: 150,000 times or more (Rated load)

Mechanical life: 20 million times or more (Switching: 300 times/min)

Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)



- **Voltage pulse output (1) [OUT1 and OUT2]**

Output voltage: 0/12 V DC (Rated)
ON voltage: 10 to 13 V
OFF voltage: 0.5 V or less

Allowable load resistance: 500 Ω or more

Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

- **Voltage pulse output (2) [OUT3]**

Output voltage: 0/14 V DC (Rated)
ON voltage: 12 to 17 V
OFF voltage: 0.5 V or less

Allowable load resistance: 600 Ω or more

Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

- **Current output [OUT1, OUT2 and OUT3]**

Output current: 4 to 20 mA DC, 0 to 20 mA DC
Output range: 3.2 to 20.8 mA DC, 0 to 21 mA DC
Allowable load resistance: 500 Ω or less

- **Continuous voltage output [OUT1 and OUT2]**

Output voltage: 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC
Output range: 0 to 5.25 V DC, 0.8 to 5.2 V DC, 0 to 10.5 V DC
Allowable load resistance: 1 k Ω or more

- **Transistor output [OUT1 and OUT2]**

Allowable load current: 100 mA
Load voltage: 30 V DC or less
Voltage drop at ON: 2 V or less (at allowable load current)
Leakage current at OFF: 0.1 mA or less
Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

Related function:

- **Output logic selection**

Energized/De-energized is selectable.
FAIL output functions as “De-energized” even if it is set to “Energized.”

- **Universal output type selection (OUT3)**

Output type is selectable.

■ Performance

Reference performance (Performance under the standard performance condition)

• Measured input (PV):

Accuracy:

Input type	Input range	Accuracy
K, J, T, E, U, L (Accuracy is not guaranteed for less than -100 °C)	Less than -100 °C	±1.0 °C (Approximate value)
	-100 °C or more, Less than +500 °C	±0.5 °C
	500 °C or more	±(0.1 % of Reading)
N, S, R, PLII, W5Re/W26Re (Accuracy is not guaranteed for less than 400 °C for input type S, R and W5Re/W26Re)	Less than 0 °C	±2.0 °C
	0 °C or more, Less than 1000 °C	±1.0 °C
	1000 °C or more	±0.1 % of Reading
B (Accuracy is not guaranteed for less than 400 °C)	Less than 400 °C	±70 °C (Approximate value)
	400 °C or more, Less than 1000 °C	±1.4 °C
	1000 °C or more	±0.1 % of Reading
PR40-20 (Accuracy is not guaranteed for less than 400 °C)	Less than 400 °C	±20 °C (Approximate value)
	400 °C or more, Less than 1000 °C	±10 °C
	1000 °C or more	±0.1 % of Reading
Pt100, JPt100	Less than 200 °C	±0.2 °C
	200 °C or more	±0.1 % of Reading
	0.00 to 50.00 °C	±0.10 °C
Voltage/Current input		±0.1 % of span

Display accuracy:

Is equal to the above accuracy with the value below the minimum resolution rounded up.

Noise elimination ratio: Series mode: 60 dB or more (50/60 Hz)

Common mode: 120 dB or more (50/60 Hz)

Resolution:

Input type		Input Resolution
K, J, T, E, U, L, N, S, R, PLII, W5Re/W26Re		1/200000
PR40-20, B		1/100000
Pt100, JPt100	-200 to +850 °C	1/200000
	-100.00 to +100.00 °C	1/60000
	0.00 to 50.00 °C	
Low voltage input	0 to 10 mV DC	1/120000
	0 to 100 mV DC	
High voltage input	0 to 1 V DC	1/200000
	0 to 5 V DC	
	1 to 5 V DC	
	0 to 10 V DC	
	-5 to +5 V DC	
	-10 to +10 V DC	
Current input	0 to 20 mA DC	1/200000
	4 to 20 mA DC	

Cold-junction temperature compensation error:

±0.5 °C

(range of the standard performance condition: 23 °C±2 °C)

±1.5 °C (Between -10 to +55 °C)

Close horizontal mounting error:

Close horizontal mounting: Within ±1.5 °C

Close vertical mounting: Within ±3.0 °C



- **Remote setting input:**
 - Accuracy:
 - Noise elimination ratio:
 - Resolution:
 - Cold-junction temperature compensation error:
- **Current transformer (CT) input:**
 - Accuracy: 0.0 to 10.0 A (high accurate type): ± 0.3 A
 - 0.0 to 30.0 A, 0.0 to 100.0 A: $\pm (5 \% \text{ of Reading})$ or ± 2.0 A (whichever is larger)
 - Resolution: 100 counts/mA or more
- **Feedback resistance (FBR) input:**
 - Accuracy: $\pm 0.5 \%$ of span (for adjustment span of open and close)
 - Resolution: 150 counts/% or more
- **Current output:**
 - Accuracy: $\pm 0.1 \%$ of span
 - Resolution: Approx. 1/25000
- **Voltage output:**
 - Accuracy: $\pm 0.1 \%$ of span
 - Resolution: Approx. 1/25000

Operating influence (Variation under the operating condition)

- **Influence ambient temperature:**
 - Input: TC input: $\pm 0.006 \% / ^\circ\text{C}$ of span
 - RTD input: $\pm 0.006 \% / ^\circ\text{C}$ of span
 - Voltage/Current input: $\pm 0.006 \% / ^\circ\text{C}$ of span
 - Output: Voltage/Current output: $\pm 0.015 \% / ^\circ\text{C}$ of span
- **Influence of physical orientation:**
 - Input: TC input: $\pm 0.3 \%$ of span or $\pm 3 ^\circ\text{C}$ or less
 - RTD input: $\pm 0.5 ^\circ\text{C}$ or less
 - Voltage/Current input: Less than $\pm 0.1 \%$ of span
 - Output: Voltage/Current output: Less than $\pm 0.3 \%$ of span



■ Display

Measured input display (PV1, PV2):	5-digit 11-segment LCD (Yellow-green)
Display range:	Input range low – (5 % of input span) to Input range high + (5 % of input span)
	When the input type is Pt100 or JPt100, the low limit value cannot be –5 %
	Low limit of Pt100: –245.5 °C (–409.8 °F), corresponding to approximately 2 Ω
	Low limit of JPt100: –237.6 °C (–395.7 °F), corresponding to approximately 2 Ω
	The display starts flashing when the Input range or the Input error determination point has been exceeded
	The display starts flashing “oooo” when the input exceeds the display range.
	The display starts flashing “uuuuu” when the input goes below the display range.
Setting display, PV2 display (SV, PV2):	5-digit 7-segment LCD (Orange)
Output value, Time, CT value displays (MV, TIME, CT1, CT2) [FZ400/900 only]:	4-1/2 digit 7-segment LCD (White)
Memory area display:	1-1/2 digit 7-segment LCD (White)
Output display (OUT1 to OUT3):	Action indicator LCD (White) × 3 points
Manual display (MAN):	Action indicator LCD (White)
Remote display (REM):	Action indicator LCD (White)
Autotuning display (AT):	Action indicator LCD (White)
Alarm display (ALM):	Action indicator LCD (Red)
Event output display (DO):	Action indicator LCD (White) × 4 points [FZ400/900] Action indicator LCD (White) × 2 points [FZ110]
Set lock display:	Action indicator LCD (FZ400: Orange FZ900: White)
Ramp state display:	Action indicator LCD (White) × 3 points [FZ400/900]

■ Operation keys

Select items/Set parameters:	4 keys (SET), MODE , ↓ , ↑)
Reverse set:	key (R.SET) [FZ400/900]
Display/Setting mode selector:	key (MONI) [FZ400/900]
Memory area transfer:	key (AREA) [FZ400/900]
Direct access key:	key (FUNC) [FZ400/900] A desired function can be assigned to the FUNC key.



■ Control

● Brilliant II PID control

Overshoot suppression function:	Reset feedback (RFB) method
Proportional band:	• TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C, °F) • Voltage/Current inputs: 0.0 to 1000.0 % of input span 0 (0.0, 0.00): ON/OFF action
Integral time:	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Output is 50 % when the deviation is zero.
Derivative time:	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action
Control response parameter:	Slow, Medium and Fast (3-step selection)
Proportional cycle time:	0.1 to 100.0 seconds
ON/OFF action differential gap:	High/Low individual setting • TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C, °F) • Voltage/Current inputs: 0.0 to 100.0 % of input span
Output limiter high:	Output limiter low to +105.0 % *
Output limiter low:	-5.0 % to Output limiter high *
	* Output limiter low ≤ Output limiter high
Output change rate limiter (up/down):	0.0 to 1000.0 %/seconds of manipulated output 0.0: Output change rate limiter OFF
Manipulated output value at STOP:	-5.0 to +105.0 %
Direct action /Reverse action transfer:	Selectable

● Brilliant II Heat/Cool PID control (Water cooling/Air cooling/Cooling linear type)

Overshoot suppression function:	Reset feedback (RFB) method
Proportional band [heat-side]:	• TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C, °F) • Voltage/Current inputs: 0.0 to 1000.0 % of input span 0 (0.0, 0.00): Heat-side and Cool-side are both ON/OFF action
Integral time [heat-side]:	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Output is 0 % when the deviation is zero.
Derivative time [heat-side]:	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action



Proportional band [cool-side]:	• TC/RTD inputs: 1 (0.1, 0.01) to Input span (Unit: °C, °F) • Voltage/Current inputs: 0.1 to 1000.0 % of input span This setting is disabled by setting the Proportional band [heat-side] to zero. ON/OFF action of cool-side only is not possible.
Integral time [cool-side]:	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Output is 0 % when the deviation is zero.
Derivative time [cool-side]:	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action
Overlap/Deadband:	• TC/RTD inputs: –Input span to +Input span (Unit: °C, °F) • Voltage/Current inputs: –100.0 to +100.0 % of input span Minus (–) setting results in overlap. However, the overlapping range is within the proportional range.
Control response parameter:	Slow, Medium and Fast (3-step selection)
Proportional cycle time [heat-side]:	0.1 to 100.0 seconds
Proportional cycle time [cool-side]:	0.1 to 100.0 seconds
ON/OFF action differential gap:	High/Low individual setting • TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C, °F) • Voltage/Current inputs: 0.0 to 100.0 % of input span
Output limiter high [heat-side]:	Output limiter low [heat-side] to +105.0 % *
Output limiter low [heat-side]:	–5.0 % to Output limiter high [heat-side] * * Output limiter low [heat-side] ≤ Output limiter high [heat-side]
Output limiter high [cool-side]:	Output limiter low [cool-side] to +105.0 % **
Output limiter low [cool-side]:	–5.0 % to Output limiter high [cool-side] ** ** Output limiter low [cool-side] ≤ Output limiter high [cool-side]
Output change rate limiter (up/down) [heat-side]:	0.0 to 1000.0 %/seconds of manipulated output 0.0: Output change rate limiter OFF
Output change rate limiter (up/down) [cool-side]:	0.0 to 1000.0 %/seconds of manipulated output 0.0: Output change rate limiter OFF
Manipulated output value at STOP [heat-side]:	–5.0 to +105.0 %
Manipulated output value at STOP [cool-side]:	–5.0 to +105.0 %
Undershoot suppression factor:	0.000 to 1.000 When the contro action is changed, this parameter is initialized to the following value. Water cooling: 0.1, Air cooling: 0.25, Cooling linear type: 1.0
Overlap/Deadband reference point:	0.0 to 1.0 (0.0: Proportional band on heat-side, 1.0: Proportional band on cool-side, 0.5: Midpoint)



● Position proportioning PID control

Overshoot suppression function:	Reset feedback (RFB) method
Proportional band:	• TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C, °F) • Voltage/Current inputs: 0.0 to 1000.0 % of input span 0 (0.0, 0.00): ON/OFF action
Integral time:	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds
Derivative time:	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action
Control response parameter:	Slow, Medium and Fast (3-step selection)
Open/Close output neutral zone:	0.1 to 10.0 % of output
Open/Close output differential gap:	0.1 to 5.0 % of output
ON/OFF action differential gap:	High/Low individual setting • TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C, °F) • Voltage/Current inputs: 0.0 to 100.0 % of input span
Output limiter high:	Output limiter low to +105.0 % When without FBR input: Invalid
Output limiter low:	-5.0 % to Output limiter high When without FBR input: Invalid Output limiter low ≤ Output limiter high
Manipulated output value at STOP:	-5.0 to +105.0 % When without FBR input: Invalid
Control motor time:	5 to 1000 seconds
Integrated output limiter:	0.0 to 200.0 % of control motor time 0.0: OFF When with FBR input: Invalid
Valve action at STOP:	a) Close-side output OFF, Open-side output OFF b) Open-side output OFF, Close-side output ON, c) Open-side output ON, Close-side output OFF Selectable from a) to c)
Action at saturated output:	Invalid/Valid is selectable When the Action at saturated output is valid: • The close-side output remains ON when the valve position is fully closed • The open-side output remains ON when the valve position is fully opened To validate the Action at saturated output, make sure to use valve with limit switch.
Manipulated output monitor:	When with FBR input: FBR value is output in the range of 0.0 to 100.0 % (0.0 % at FBR disconnection) When without FBR input: Invalid
Direct action/Reverse action transfer:	Selectable



● Manual control

Setting range of Manual manipulated output value:

- PID control: Output limiter low to Output limiter high
- Heat/Cool PID control: –Output limiter high [cool-side] to
+Output limiter high [heat-side]
- Position proportioning PID control:
With FBR input
Output limiter low to Output limiter high
Without FBR input
It is possible to turn ON/OFF output by using the UP key or
the DOWN key.

● Cascade control

The instrument with dual inputs can perform Cascade control by itself.

Master/Slave: Input 1: Master
Input 2: Slave

Control mode (Selectable at Select function for input 2):

- Cascade control (Cascade $\longleftrightarrow$ Slave single)
- Cascade control (Cascade $\longleftrightarrow$ Master single)

Setting item and Setting range:

Cascade_Proportional band (master-side):

- TC/RTD inputs:
1 (0.1, 0.01) to Input 1_Input span (Unit: °C, °F)
- Voltage/Current inputs:
0.1 to 1000.0 % of Input 1_Input span

Cascade_Integral time (master-side):

1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds

Cascade_Derivative time (master-side):

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

Cascade_Proportional band (slave-side):

- TC/RTD inputs:
1 (0.1, 0.01) to Input 2_Input span (Unit: °C, °F)
- Voltage/Current inputs:
0.1 to 1000.0 % of Input 2_Input span

Cascade_Integral time (slave-side):

1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds

Cascade_Derivative time (slave-side):

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

Cascade_Scale high: Cascade_Scale low to Input 2_Setting limiter high

Cascade_Scale low: Input 2_Setting limiter low to Cascade_Scale high

Cascade_Digital filter: 0.0 to 100.0 seconds (0.0: Filter OFF)

**Proportional band (for Master single [Input 1]):**

- TC/RTD inputs:
0 (0.0, 0.00) to Input span (Unit: °C, °F)
- Voltage/Current inputs:
0.0 to 1000.0 % of input span
- 0 (0.0, 0.00): ON/OFF action

Integral time (for Master single [Input 1]):

0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds
0 (0.0, 0.00): PD action
Output is 50 % when the deviation is zero.

Derivative time (for Master single [Input 1]):

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

Proportional band (for Slave single [Input 2]):

- TC/RTD inputs:
0 (0.0, 0.00) to Input span (Unit: °C, °F)
- Voltage/Current inputs:
0.0 to 1000.0 % of input span
- 0 (0.0, 0.00): ON/OFF action

Integral time (for Slave single [Input 2]):

0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds
0 (0.0, 0.00): PD action
Output is 50 % when the deviation is zero.

Derivative time (for Slave single [Input 2]):

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

● Mode switching**Auto/Manual transfer:**

Bidirectional bumpless Auto/Manual transfer (switching between PID control output and manual output).
Bumpless transfer can be disabled at the time of transfer from Auto to Manual.

Remote/Local transfer:

For selection of functions that can be switched by Select function for Input 2.

- Remote/Local transfer
Switching between Remote input (set value) and Local set value inside the instrument.
- PV select transfer
Selection of PV for control from Input 1 or Input 2.
- Differential temperature control/2-loop control
Switching between Differential temperature control and 2-loop control.
- Cascade mode transfer
Switching between Cascade control and Single loop control.

RUN/STOP transfer:

Used to switch the mode between RUN and STOP.
When switching the mode from STOP to RUN, the action is the same as that at power on.
RUN: Performs PID control or Manual control.
STOP: PID control, Manual control and Event function are deactivated, and the output is set to the minimum.



● Control action transfer

PID control (Selectable on both Input 1 and Input 2),
Heat/Cool PID control (Selectable only on Input 1),
Position proportioning PID control (Selectable only on Input 1)
Input 1 side and Input 2 side can be operated simultaneously.

● Autotuning (AT)

Tuning method: Computed by Limit cycle system
AT bias: –Input span to +Input span
AT remaining time monitor: 0 hours 00 minutes to 48 hours 00 minutes

● Autotuning (AT) [for Cascade control]

Tuning method: Slave AT and Master AT are combinedly executed to calculate the PID values for the Cascade control and for the Single loop.
AT bias: –Input span to +Input span
Cascade AT mode: Master and Slave sides, independently adjustable
0: Easy adjustment (AT: one cycle)
1: Load factor adjustment (AT: 2 cycles)

● Startup tuning (ST)

Startup tuning (ST): Input 1 and Input 2, independently adjustable.
0: ST OFF
1: Execute once
2: Execute always
ST start condition: 0: Activate the ST function when the power is turned on; when transferred from STOP to RUN; or when the Set value (SV) is changed.
1: Activate the ST function when the power is turned on; or when transferred from STOP to RUN.
2: Activate the ST function when the Set value (SV) is changed.

● Proactive function

Proactive intensity: 0 to 4 (0: No function) *
FF amount: –100.0 to +100.0 % *
FF amount learning: 0 to 3
(0: No learning, +1: Learn Input 1, +2: Learn Input 2)
Determination point of external disturbance: –Input span to +Input span *
Bottom suppression function: 0: No function
1: FF amount is added by level
2: FF amount is forcibly added
* Input 1 and Input 2, independently adjustable.



● Level PID

8 types of PID parameters are selectable according to the position of the Set value (SV) or the Measured value (PV).

Number of levels: 8 levels (PID memory group 1 to 8)

Level setting range: Input range low to Input range high

The values of the Level PID must always have the following relation.

(Level PID setting 1 $\leq$ Level PID setting 2 $\leq$ Level PID setting 3 $\leq$

Level PID setting 4 $\leq$ Level PID setting 5 $\leq$ Level PID setting 6 $\leq$

Level PID setting 7)

Level:

When the setting of PID memory group 1 is used:

Input range low limit $\leq$ Set value (SV) or Measured value (PV) $\leq$ Level PID setting 1

When the setting of PID memory group 2 is used:

Level PID setting 1 $<$ Set value (SV) or Measured value (PV) $\leq$ Level PID setting 2

When the setting of PID memory group 3 is used:

Level PID setting 2 $<$ Set value (SV) or Measured value (PV) $\leq$ Level PID setting 3

When the setting of PID memory group 4 is used:

Level PID setting 3 $<$ Set value (SV) or Measured value (PV) $\leq$ Level PID setting 4

When the setting of PID memory group 5 is used:

Level PID setting 4 $<$ Set value (SV) or Measured value (PV) $\leq$ Level PID setting 5

When the setting of PID memory group 6 is used:

Level PID setting 5 $<$ Set value (SV) or Measured value (PV) $\leq$ Level PID setting 6

When the setting of PID memory group 7 is used:

Level PID setting 6 $<$ Set value (SV) or Measured value (PV) $\leq$ Level PID setting 7

When the setting of PID memory group 8 is used:

Level PID setting 7 $<$ Set value (SV) or Measured value (PV) $\leq$ Input range high limit

When the same value is set to two or more Levels, the setting in the PID memory group with the smallest number will be used.

PID memory group setting:

Group number: 1 to 8

Items to be set: Proportional band [heat-side], Integral time [heat-side], Derivative time [heat-side], Control response parameter, Proportional band [cool-side], Integral time [cool-side], Derivative time [cool-side], Overlap/Deadband, Manual reset, Proactive intensity, FF amount, Control loop break alarm (LBA) time, LBA deadband (LBD), Output limiter high [heat-side], Output limiter low [heat-side], Output limiter high [cool-side], Output limiter low [cool-side]



■ Event function

Number of event:	4 points (Output selection is possible)
Event type:	Deviation high (Using SV monitor value) ¹ Deviation low (Using SV monitor value) ¹ Deviation high/low (Using SV monitor value) ¹ Band (Using SV monitor value) ¹ Deviation high/low (Using SV monitor value) [High/Low individual setting] ¹ Band (Using SV monitor value) [High/Low individual setting] ¹ SV high (Using SV monitor value) SV low (Using SV monitor value) Process high ² Process low ² Deviation high (Using local SV) ¹ Deviation low (Using local SV) ¹ Deviation high/low (Using local SV) ¹ Band (Using local SV) ¹ Deviation high/low (Using local SV) [High/Low individual setting] ¹ Band (Using local SV) [High/Low individual setting] ¹ SV high (Using local SV) SV low (Using local SV) MV high [heat-side] ^{2,3} MV low [heat-side] ^{2,3} MV high [cool-side] ² MV low [cool-side] ² Process high/low [High/Low individual setting] ² Process band [High/Low individual setting] ²
	¹ Event hold and re-hold action is available.
	² Event hold action is available.
	³ The Manipulated output value (MV) corresponds to the Feedback resistance (FBR) input value when the Control action is a Position proportioning PID controller with Feedback resistance (FBR) input.
Setting range:	a) Deviation Event setting: –Input span to +Input span Differential gap: 0 to Input span b) Process and SV Event setting: Same as measured range (When Control with PV select: –Input span to +Input span) Differential gap: 0 to Input span c) MV Event setting: –5.0 to +105.0 % Differential gap: 0.0 to 110.0 %
Additional function:	Hold action: a) Hold action OFF b) Hold action ON c) Re-hold action ON Event timer: 0.0 to 600.0 seconds

Interlock selection:	0 to 4095 ^a
Interlock release:	on (Interlock state), oFF (Interlock release)
ALM lamp lighting condition:	0 to 4095 ^a
Logic calculation selection (OUT1 to 3, DO1 to 4):	0 to 4095 ^a
Event assignment:	Input 1, Input 2, or Differential temperature input is assignable.
Output action at control stop:	0 to 7 ^b
^a OR-selectable from Event 1 to 4, HBA1, HBA2, LBA1, LBA2, Input error high, or Input error low.	
^b OR-selectable from Logic calculation output (continue control), Retransmission output (continue control), Instrument status output (continue control).	

■ Control loop break alarm (LBA)

Control loop break alarm (LBA) time:	0 to 7200 seconds (0: No function)
LBA deadband (LBD):	0 to Input span

■ Heater break alarm (HBA) [for time-proportional control output]

Number of HBA:	FZ110: 1 point FZ400/900: 2 points (1 point per CT input)
Setting range:	0.0 to 100.0 A (0.0: HBA function OFF [Current value monitoring is still available]) CT does not detect current value when the control output ON time or control output OFF time is less than 250 ms.
Number of heater break alarm (HBA) times:	0 to 255 times
CT assignment:	0 (None), 1 (OUT1), 2 (OUT2), 3 (OUT3) (0: HBA function OFF)

■ Retransmission output

Output type:	Mesured value (PV), Local SV, SV monitor value, Deviation, Manipulated output value [heat-side] ¹ , Manipulated output value [cool-side] ² , Remote setting input value, Current transformer (CT) input value, Measured value (PV) of differential temperature input
	¹ Heat/Cool PID control: Output value [heat-side] ² Output value [cool-side] in Heat/Cool PID control
Output scaling:	High/Low individual setting (High limit > Low limit)
	Mesured value (PV): Same as measured range
	Local SV: Same as measured range
	SV monitor value: Same as measured range
	Deviation: -Input span to +Input span
	Manipulated output value [heat-side]: -5.0 to +105.0 %
	Manipulated output value [cool-side]: -5.0 to +105.0 %
	Remote setting input value: Same as measured range
	Current transformer (CT) input value: 0.0 to 100.0 %
	Measured value (PV) of differential temperature input: -(Input 1_Input span) to +(Input 1_Input span)



■ Multi-memory area

● Memory area function

Number of areas: 16 points

Stored parameters: Set value (SV), Set value (SV) of differential temperature input, Event set value (or Event set value [high]), Event set value [low], Proportional band [heat-side], Integral time [heat-side], Derivative time [heat-side], Control response parameter, Proactive intensity, Manual reset, FF amount, Output limiter high [heat-side], Output limiter low [heat-side], Control loop break alarm (LBA) time, LBA deadband (LBD), Proportional band [cool-side], Integral time [cool-side], Derivative time [cool-side], Overlap/Deadband, Output limiter high [cool-side], Output limiter low [cool-side], Select Trigger type for Memory area transfer, Area soak time, Link area number, Setting change rate limiter (up), Setting change rate limiter (down), Manipulated output value (Area), Auto/Manual transfer selection (Area), Remote/Local transfer selection (Area)

Method of area transfer: Memory area transfer can be carried out

- through key operations.
- through the communication function.
- through external contact signal.
- through the set area soak time.
- through the event function.

● Memory area link function

Area soak time: 0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds (FZ400/900 only)
0 hours 00 minutes to 99 hours 59 minutes
0 minutes 00 seconds to 199 minutes 59 seconds
Accuracy: ± 0.01 % of set value +1 sampling time

Soak time unit: 0: 0 hours 00 minutes to 99 hours 59 minutes
1: 0 minutes 00 seconds to 199 minutes 59 seconds
2: 0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds (FZ400/900 only)

Link area number: 0 to 16 (0: No link)



■ Communication

● Host communication

Interface:	Based on RS-485, EIA standard Based on RS-422A, EIA standard (FZ400/900 only)
Protocol:	RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4) Modbus-RTU PLC communication (MAPMAN)

● Loader communication

Protocol:	For RKC communication protocol only (ANSI X3.28-1976 subcategories 2.5 and A4)
Synchronous method:	Start/Stop synchronous type
Communication speed:	38400 bps
Data format:	Start bit: 1 Data bit: 8 Parity bit: Witout Stop bit: 1 Number of data digit: 7-digit (fixed)
Maximum connections:	1 point
Connection method:	Exclusive cable (not complying with the USB standard)
Interval time:	10 ms
Other:	① The instrument can be powered from the COM-K2 (our USB communication converter) * This power supply is designed for setting up the internal set values. Control is stopped (output off, relay open) and host communication is also stopped. The PV/SV monitor shows “LoAd” for the Measured value (PV) display and “-----” for the Set value (SV) display. The LCD backlight is partially turned off. ② While the instrument is powered by COM-K2 *, if power is applied to the instrument, the instrument will be reset and starts for normal operation. ③ When the instrument is normally powered, the host communication can be used simultaneously. * COM-K (Version 1) is also available.

■ Self-diagnostic function

Control stop (Error number is displayed):	Adjustment data error (Err 1) Data back-up error (Err 2) A/D conversion error (Err 4) Temperature compensation error (Err 4) Display units error (Err 64)

Action stop (Error number is not displayed):	Power supply voltage is abnormal Watchdog timer error



■ General specifications

Power supply voltage: 100 to 240 V AC type:
 85 to 264 V AC [Including power supply voltage variation], 50/60 Hz
 (Rated: 100 to 240 V AC)
 Frequency variation: 50 Hz (−10 to +5 %), 60 Hz (−10 to +5 %)
 24 V AC type:
 20.4 to 26.4 V AC [Including power supply voltage variation], 50/60 Hz
 (Rated: 24 V AC)
 Frequency variation 50 Hz (−10 to +5 %), 60 Hz (−10 to +5 %)
 24 V DC type:
 20.4 to 26.4 V DC [Including power supply voltage variation]
 (Rated: 24 V DC)

Power consumption (at maximum load):

FZ110: 5.2 VA max. (at 100 V AC)
 8.1 VA max. (at 240 V AC)
 5.2 VA max. (at 24 V AC)
 126 mA max. (at 24 V DC)
 FZ400: 6.6 VA max. (at 100 V AC)
 9.8 VA max. (at 240 V AC)
 6.7 VA max. (at 24 V AC)
 170 mA max. (at 24 V DC)
 FZ900: 7.2 VA max. (at 100 V AC)
 10.6 VA max. (at 240 V AC)
 7.2 VA max. (at 24 V AC)
 185 mA max. (at 24 V DC)

Rush current: 5.6 A or less (at 100 V AC)
 13.3 A or less (at 240 V AC)
 16.3 A or less (at 24 V AC)
 11.5 A or less (at 24 V DC)

Insulation resistance:

	①	②	③	④	⑤	⑥	⑦
① Grounding							
② Power supply terminal	20 MΩ or more at 500 V DC						
③ Measured input terminal 1/ CT/FBR	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC					
④ Measured input terminal 2	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC				
⑤ Output terminal (Relay)	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC			
⑥ Output terminal (other than Relay)	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC			
⑦ DO terminal (Relay)	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	
⑧ Communication, Digital input terminal	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC	20 MΩ or more at 500 V DC

Grounding is done on the control panel.

Withstand voltage:

Time: 1 min.	①	②	③	④	⑤	⑥	⑦
① Grounding							
② Power supply terminal	1500 V AC						
③ Measured input terminal 1/ CT/FBR	1500 V AC	2300 V AC					
④ Measured input terminal 2	1500 V AC	2300 V AC	1000 V AC				
⑤ Output terminal (Relay)	1500 V AC	2300 V AC	2300 V AC	AC 2300 V			
⑥ Output terminal (other than Relay)	1500 V AC	2300 V AC	1000 V AC	1500 V AC			
⑦ DO terminal (Relay)	1500 V AC	2300 V AC	2300 V AC	2300 V AC	2300 V AC	2300 V AC	
⑧ Communication, Digital input terminal	1500 V AC	2300 V AC	1000 V AC	1000 V AC	2300 V AC	1500 V AC	2300 V AC

Withstand voltage values may vary depending on the model.

Power failure handling:
Power failure:

100 to 240 V AC type/24 V AC type:

A power failure of 20 ms or less will not affect the control action

24 V DC type:

A power failure of 5 ms or less will not affect the control action

Memory backup:

Backed up by non-volatile memory

Number of writing: Approx. One trillion (10^{12}) times (FRAM)

Data storage period: Approx. 10 years (FRAM)

Power failure recovery:

Hot/Cold start:

a) Hot start 1

Operation is resumed from the state before the power failure and from the output before the failure.

b) Hot start 2

Operation is resumed from the state before the power failure. In case of Manual mode, the operation starts from the Output limiter low limit.

c) Cold start

Operation starts in Manual mode, irrespective of the mode before the power failure. The operation starts from the Output limiter low limit.

d) STOP start

The operation starts from the STOP state irrespective of the mode before the power failure.

Selectable from a) to d)

Start determination point:

0 to Input span

(0: Action conforms to the Hot/Cold start)

Unit: same as the reading



■ Environment Condition

● Operating environmental conditions

Ambient temperature:	−10 to +55 °C
Ambient humidity:	5 to 95 %RH (Absolute humidity: MAX.W.C 29 g/m ³ dry air at 101.3 kPa)
Vibration:	Frequency range: 10 to 150 Hz Maximum amplitude: 0.075 mm Maximum acceleration: 9.8 m/s ² Each direction of XYZ axes
Shock:	Free fall from 50 mm in height Each direction of XYZ axes (In non-energization)

● Reference operating conditions

Reference temperature:	23 °C±2 °C Temperature variation: ±5 °C/h
Reference humidity:	50 %RH ± 10 %RH
Magnetic field:	Geomagnetism
Power supply voltage:	Alternating current, Direct current: Reference value ± 1 %

● Transportation and Storage environment conditions

Vibration:	Number of vibration [Hz]	Level		Attenuation slope [dB/oct]
		(m/s ²) ² /Hz	[g ² (1)/Hz]	
	3	0.048	(0.0005)	—
	3 to 6	—	—	+13.75
	6 to 18	1.15	(0.012)	—
	18 to 40	—	—	−9.34
	40	0.096	(0.001)	—
	40 to 200	—	—	−1.29
	200	0.048	(0.0005)	—

The effective value of the acceleration is 5.8 m/s² [0.59 g (1)] within the number of vibration.

NOTE: (1) g = 9.806658 m/s²

Shock:	Height 60 cm or less
Temperature:	−40 to +70 °C
Humidity:	5 to 95 %RH (Non condensing) Absolute humidity: MAX.W.C 35 g/m ³ dry air at 101.3 kPa



■ Mounting and Structure

Mounting method:	Panel-mounted FZ110: Close horizontal mounting only FZ400/900: Close horizontal mounting, Close vertical mounting
Mounting orientation:	Datum plane $\pm 90^\circ$
Case color:	Black
Case material:	PC (Flame retardancy: UL94 V-0)
Front panel material:	PC (Flame retardancy: UL94 V-0)
Terminal block material:	PPE (Flame retardancy: UL94 V-1)
Filter material:	PC
Panel sealing:	Based on IP65 (IEC60529) [Front panel (when the front loader connector cover is installed)] * * When the front loader connector cover is not installed: IP00
Weight:	FZ110: Approx. 122 g FZ400: Approx. 221 g FZ900: Approx. 291 g
Dimensions:	FZ110: 48 mm × 48 mm × 81 mm (W × H × Depth behind the panel) FZ400: 48 mm × 96 mm × 65 mm (W × H × Depth behind the panel) FZ900: 96 mm × 96 mm × 65 mm (W × H × Depth behind the panel)

■ Standard

● Safety standards

UL:	UL61010-1
cUL:	CAN/CSA-C22.2 No.61010-1

● Other approved standards

CE marking:	LVD: EN61010-1 EMC: EN61326-1 RoHS: EN50581
RCM:	EN55011

● Environment Condition

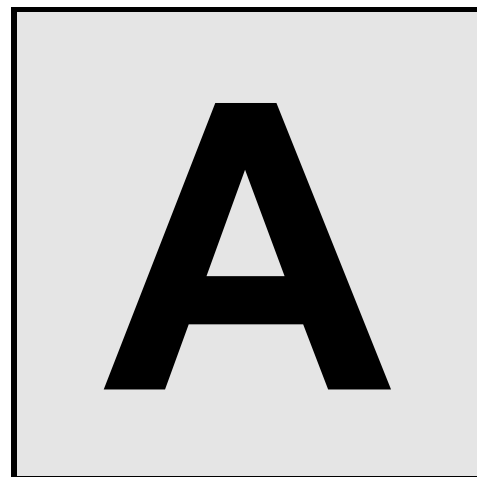
Protection against electric shock:	Class II (Reinforced insulation)
Overvoltage category:	OVERVOLTAGE CATEGORY II
Pollution degree:	POLLUTION DEGREE 2
Altitude:	Altitude up to 2000 m (Indoor use)
Recommended fuse:	Fuse type: Time-lag fuse (IEC60127-2, UL248-14) Fuse rating: Rated voltage 250 V AC Rated current 0.5 A (for 24 V AC/DC type) 1 A (for 100 to 240 V AC type)



MEMO



APPENDIX



A.1 Replacing the Waterproof/Dustproof Gasket [Optional]	A-2
A.2 Current Transformer (CT) Dimensions [Optional].....	A-5

A.1 Replacing the Waterproof/Dustproof Gasket [Optional]

FZ110/400/900 can be equipped with an optional water- and dust-proof structure, which has to be specified at the time of ordering. This waterproof and dustproof construction uses rubber gaskets. If the waterproof and dustproof gasket deteriorates, please contact RKC sales office or the agent.

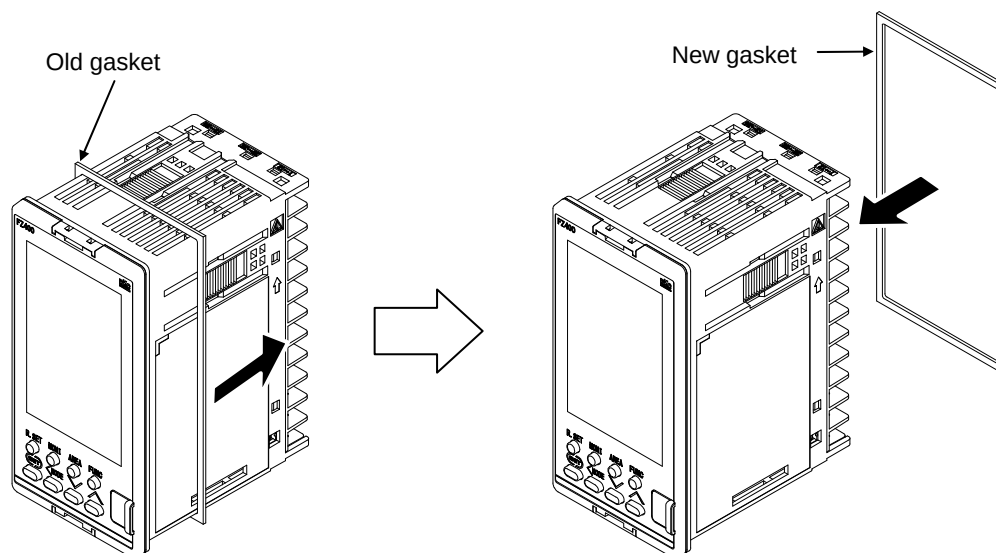
To replace the gasket, take the following steps:

WARNING

- In order to prevent electric shock and instrument failure, always turn off the power supply before replacing the gasket.
- In order to prevent electric shock and instrument failure, always turn off the power supply before pulling out the internal chassis.
- In order to prevent injury or instrument failure, do not touch the internal printed wiring board.

■ Replacement of the gasket for the case

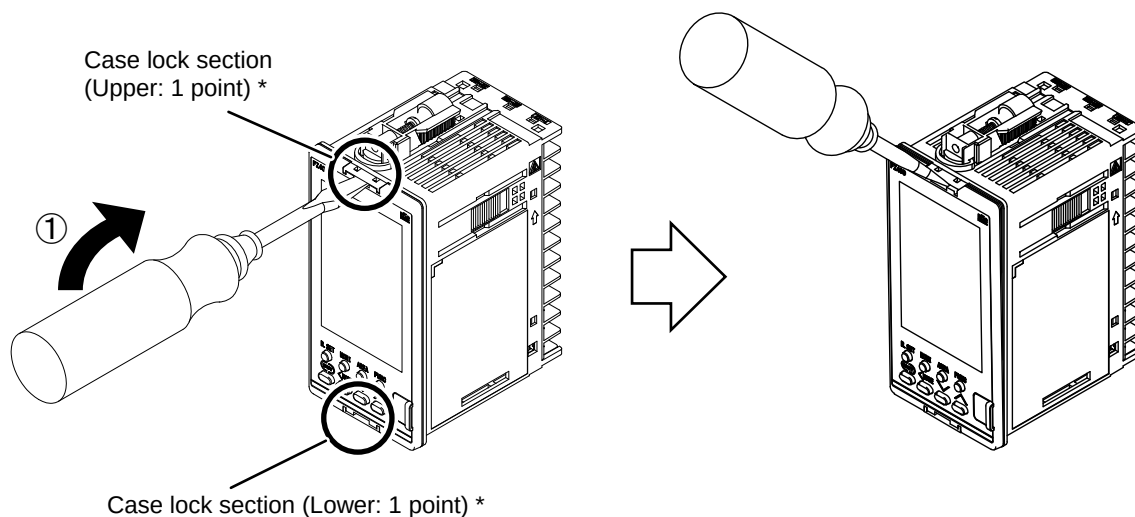
1. Turn the power OFF.
 2. Remove the wiring.
 3. Remove the mounting bracket, and then remove the instrument from the control panel.
- Refer to **2.3 Procedures of Mounting and Removing (P. 2-5)**.
4. Remove the old gasket, and then replace the old gasket with a new one.



Gasket for the case: FZ110: KFZ100-317
 FZ400: KFZ400-317
 FZ900: KFZ900-317

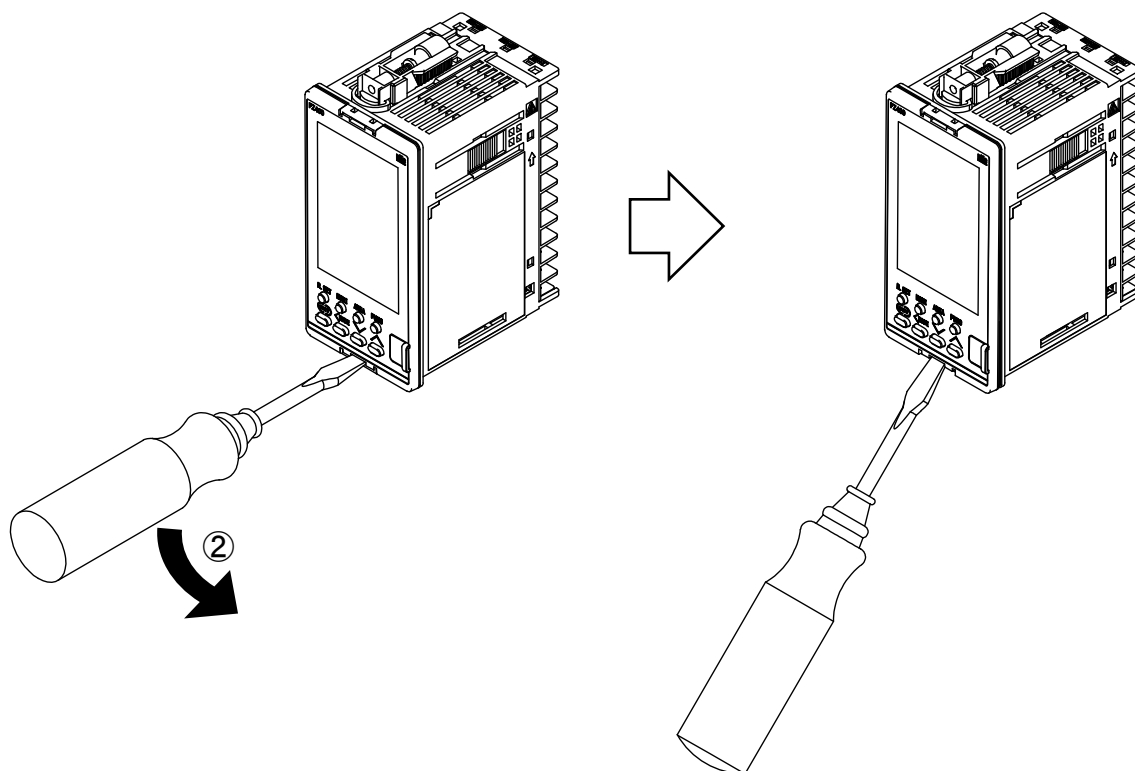
■ Replacing the gasket for the front frame (FZ400/900 only)

1. Turn the power OFF.
2. Wedge the slotted screwdriver into the upper case lock section, and lift the grip slowly (①).
The case lock is released.

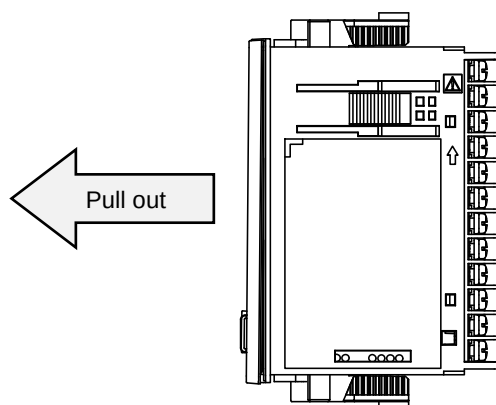


* There are two locks on each side of the case (upper/lower) for the FZ900.

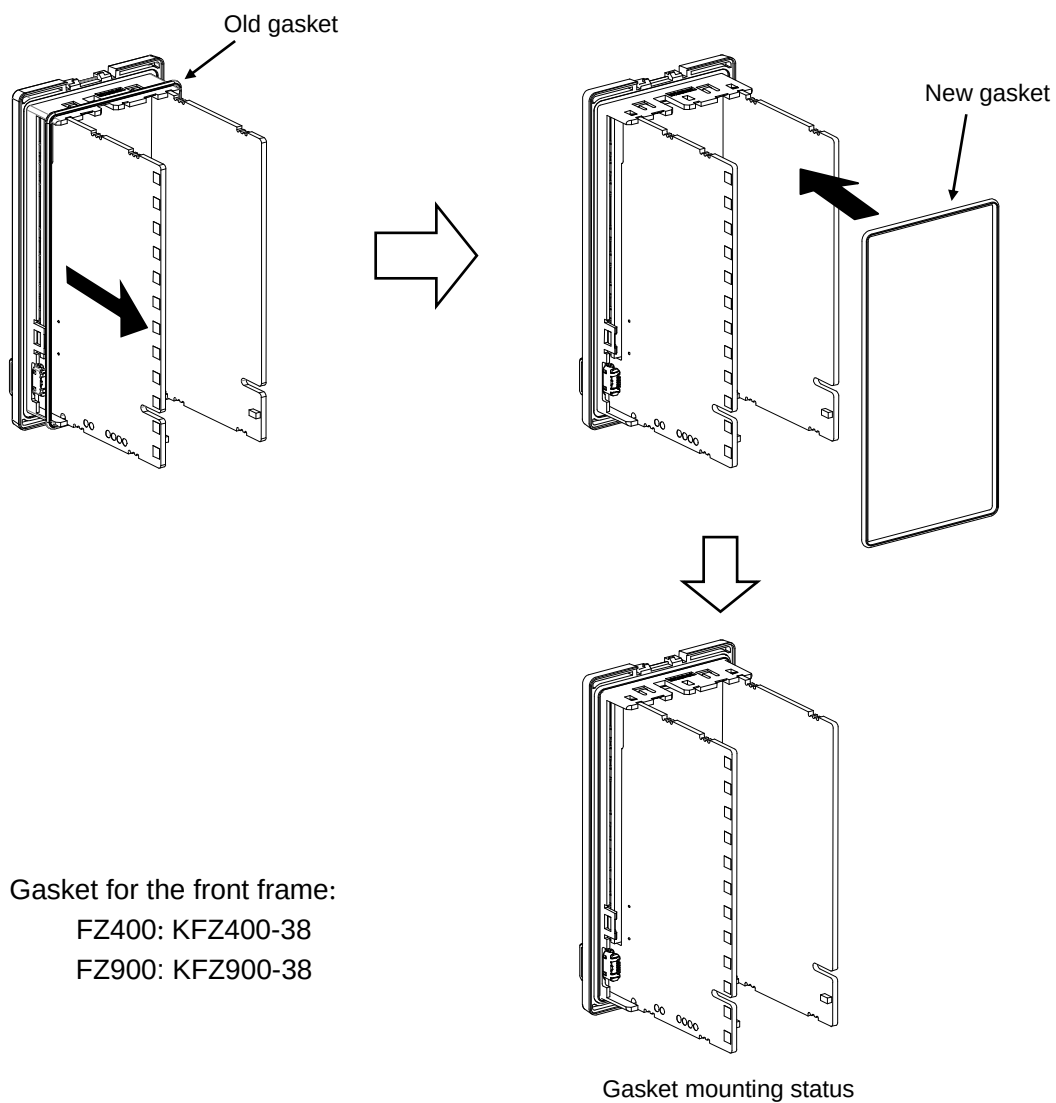
3. Wedge the slotted screwdriver into the lower case lock section, and hold down the grip slowly (②).
The case lock is released.



4. As the internal unit slightly comes out of the case, pull it out toward you.



5. Remove the old gasket, and then replace the old gasket with a new one.

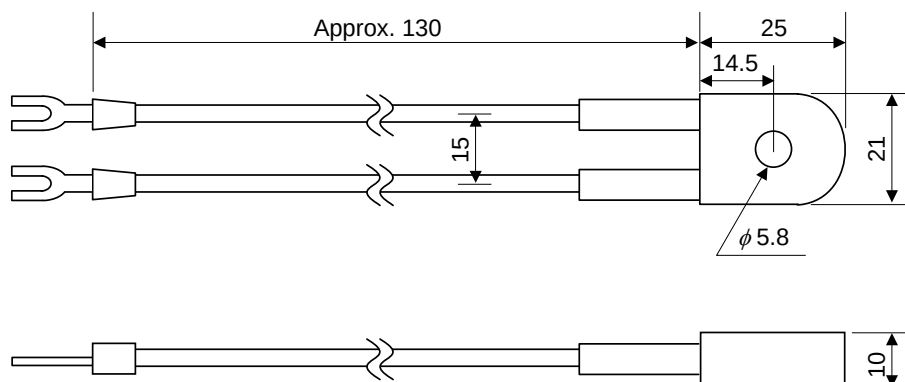


6. Insert the internal assembly in the case.

A.2 Current Transformer (CT) Dimensions [Optional]

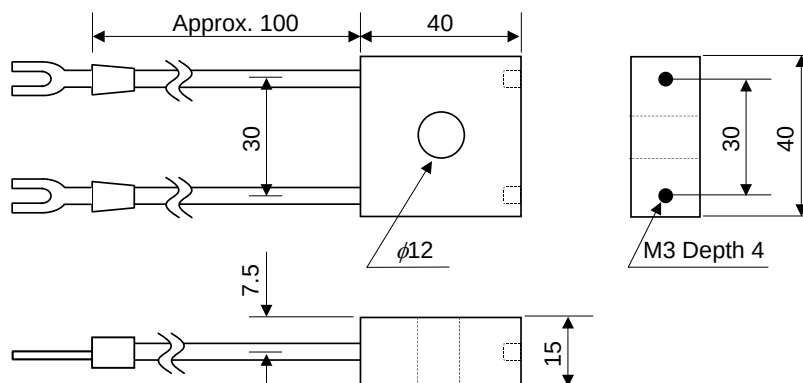
■ CTL-6-P-N (For 0 to 30 A)

(Unit: mm)



■ CTL-12-S56-10L-N (For 0 to 100 A)

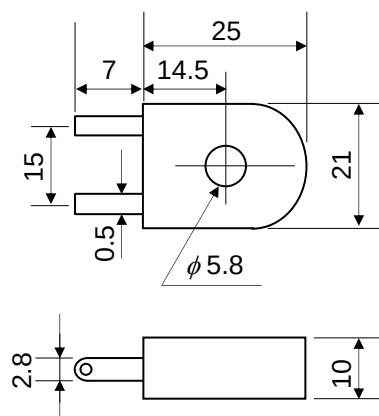
(Unit: mm)



■ CTL-6-P-Z (For 0 to 10 A) *

* A product of U.R.D.Co., LTD.

(Unit: mm)





MEMO





RKC INSTRUMENT INC.

HEADQUARTERS: 16-6, KUGAHARA 5-CHOME, OHTA-KU TOKYO 146-8515 JAPAN

PHONE: 03-3751-9799 (+81 3 3751 9799)

FAX: 03-3751-8585 (+81 3 3751 8585)

E-mail: info@rkcinst.co.jp

Website: <http://www.rkcinst.com/>





Temperature Controller

FZ110/FZ400/FZ900

Instruction Manual
[Part2: Parameters/Functions]



NOTICE

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

- Modbus is a registered trademark of Schneider Electric.
- Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.

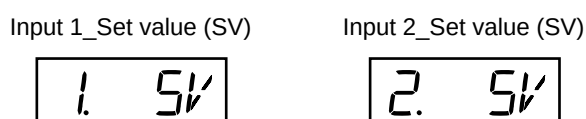
Symbols

■ Screens used in this manual

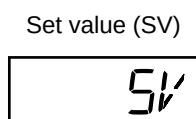
It should be noted that this manual describes various screens of F110/400/900 according to the following rules.

- FZ110/400/900 are available in two types: single input type and dual input type.
The dual input type is further categorized into two types: Dual PV type (for FZ400/900) and PV + Remote setting type (for FZ110/400/900).
For a dual input model, the same parameter may exist in both Input 1 and Input 2. “1.” or “2.” is added to the top of the parameters for identification. “1.” is not added to the top of the parameters list for the single input type.

[Display example of the dual input type]



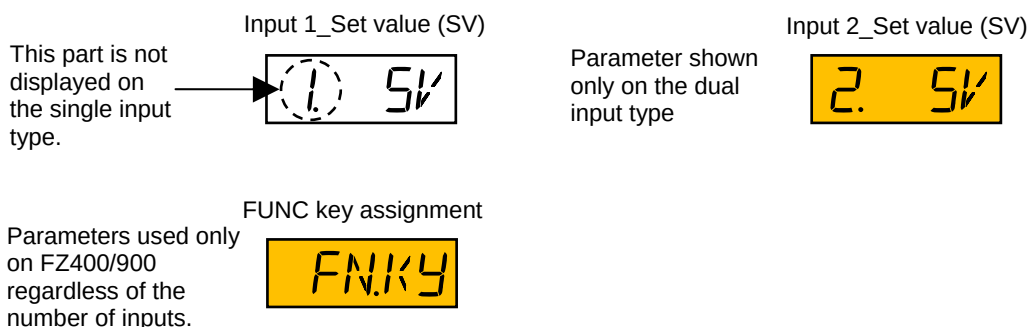
[Display example of a single input type]



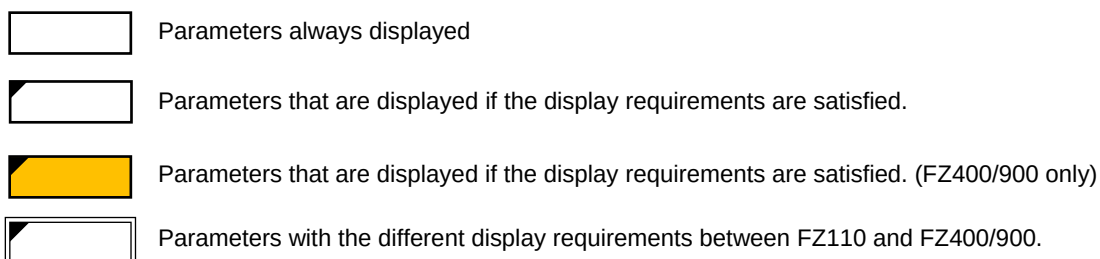
This manual uses the dual inputs for explanation. For other types such as a single input type, ignore the first character “1.” at the top of the parameter.

The parameters used only on FZ400 and FZ900 (including parameters used only on the dual input type) are displayed in the colored background.

[Notation in this manual]



- In the explanation of the operating navigation “2. SELECTING PARAMETERS (P. 2-1),” such display frames as shown below are used to show the difference.



■ Character Symbols

11-segment character

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

7-segment character

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

■ Abbreviation symbols

These abbreviations are used in this manual:

Abbreviation symbols	Name	Abbreviation symbols	Name
PV	Measured value	TC (input)	Thermocouple (input)
SV	Set value	RTD (input)	Resistance temperature detector (input)
MV	Manipulated output value	V (input)	Voltage (input)
AT	Autotuning	I (input)	Current (input)
ST	Startup tuning	HBA (1, 2)	Heater break alarm (1, 2)
OUT (1 to 3)	Output (1 to 3)	CT (1, 2)	Current transformer (1, 2)
DI (1 to 6)	Digital input (1 to 6)	LBA	Control loop break alarm
DO (1 to 4)	Digital output (1 to 4)	LBD	LBA deadband
FBR	Feedback resistance		



Document Configuration

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

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

http://www.rkcinst.com/english/manual_load.htm.

Manual	Manual Number	Remarks
FZ110/FZ400/FZ900 Installation Manual	IMR03A01-E□	This manual is enclosed with instrument. This manual explains the mounting and wiring.
FZ110/FZ400/FZ900 Quick Operation Manual	IMR03A02-E□	This manual is enclosed with instrument. This manual explains the basic key operation, mode menu, and data setting.
FZ110/FZ400/FZ900 Parameter List	IMR03A03-E□	This manual is enclosed with instrument. This list is a compilation of the parameter data of each mode.
FZ110/FZ400/FZ900 Instruction Manual [Part 1: Hardware]	IMR03A04-E□	This manual describes installation, wiring, troubleshooting and product specification.
FZ110/FZ400/FZ900 Instruction Manual [Part 2: Parameters/Functions]	IMR03A05-E3	This manual you are reading now. [Parameters] This manual describes how to switch the operation modes and parameters, the range of parameters, and initialization/automatic conversion associated with the change of settings. [Functions] This manual describes how to set up and each function.
FZ110/FZ400/FZ900 Instruction Manual [Host Communication]	IMR03A07-E□	This manual explains RKC communication protocol (ANSI X3.28-1976) and Modbus relating to communication parameters setting.
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]	IMR03A08-E□	This manual describes how to set up the instrument for communication with a programmable controller (PLC).



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

Contents

	Page
NOTICE	
Symbols.....	i-1
■ Screens used in this manual.....	i-1
■ Character Symbols	i-2
■ Abbreviation symbols.....	i-2
Document Configuration.....	i-3

[Parameters]

1. MODE SWITCHING 1-1

Chapter 1 describes various mode types and how to switch between them.

2. SELECTING PARAMETERS.....2-1

Chapter 2 describes various parameter types and how to switch between them.

2.1 Monitor & SV Setting Mode [A]	2-2
■ 1-loop control (Including Remote setting input/Input circuit error alarm)	2-2
■ 2-loop control/Cascade control [FZ400/900]	2-3
■ Control with PV select [FZ400/900]	2-4
■ Differential temperature control [FZ400/900]	2-5
2.2 Parameter Select Mode [B].....	2-6
2.3 Operation Transfer Mode [C]	2-7
2.4 Setting Lock Mode [D]	2-8
2.5 Memory Area Transfer Mode [E] (FZ400/900)	2-9
2.6 Parameter Setting Mode [F].....	2-10
2.7 Setup Setting Mode [G]	2-12
2.8 Engineering Mode [H]	2-15

3. PARAMETER LIST 3-1

Chapter 3 describes displays, names and data ranges of each parameter.

3.1 How to Read the Table	3-2
3.2 Monitor & SV Setting Mode [A]	3-3
3.3 Parameter Select Mode [B].....	3-5
3.4 Operation Transfer Mode [C]	3-6
3.5 Setting Lock Mode [D]	3-7
3.6 Memory Area Transfer Mode [E] (FZ400/900)	3-8



	Page
3.7 Parameter Setting Mode [F].....	3-9
■ Parameter group No. 00: Setting (<i>SB</i>)	3-9
■ Parameter group No. 40: Event (<i>EB</i>)	3-9
■ Parameter group No. 51: Input 1_Control (<i>1.Conf</i>).....	3-10
■ Parameter group No. 52: Input 2_Control (<i>2.Conf</i>).....	3-12
■ Parameter group No. 56: Input 1_Cooling control (<i>1.Coal</i>)	3-13
■ Parameter group No. 70: Memory area (<i>RR-ER</i>).....	3-14
3.8 Setup Setting Mode [G]	3-16
■ Setting group No. 10: Display (<i>dSP</i>).....	3-16
■ Setting group No. 21: Input 1 (<i>1.I nP</i>).....	3-16
■ Setting group No. 22: Input 2 (<i>2.I nP</i>).....	3-16
■ Setting group No. 30: Output (<i>oUf</i>).....	3-17
■ Setting group No. 45: Heater break alarm 1 (<i>HbA 1</i>).....	3-17
■ Setting group No. 46: Heater break alarm 2 (<i>HbA2</i>).....	3-18
■ Setting group No. 51: Input 1_Control (<i>1.Conf</i>)	3-18
■ Setting group No. 52: Input 2_Control (<i>2.Conf</i>)	3-19
■ Setting group No. 53: Input 1_Tuning (<i>1.fUnE</i>).....	3-19
■ Setting group No. 54: Input 2_Tuning (<i>2.fUnE</i>).....	3-20
■ Setting group No. 55: Position proportioning control (<i>PosI f</i>)	3-20
■ Setting group No. 57: Proactive (<i>PRCF</i>).....	3-20
■ Setting group No. 58: 2-input function (<i>2PB</i>).....	3-21
■ Setting group No. 91: System (<i>SYS</i>)	3-22
3.9 Engineering Mode [H]	3-23
■ Function block No. 10: Display (<i>dSP</i>).....	3-23
■ Function block No. 11: Key operation (<i>KEY</i>)	3-24
■ Function block No. 21: Input 1 (<i>1.I nP</i>).....	3-25
■ Function block No. 22: Input 2 (<i>2.I nP</i>).....	3-27
■ Function block No. 23: Digital input (<i>di</i>)	3-29
■ Function block No. 30: Output (<i>oUf</i>).....	3-30
■ Function block No. 31: Retransmission output 1 (<i>Ro 1</i>).....	3-31
■ Function block No. 32: Retransmission output 2 (<i>Ro2</i>).....	3-32
■ Function block No. 33: Retransmission output 3 (<i>Ro3</i>).....	3-32
■ Function block No. 34: Digital output (<i>do</i>)	3-33
■ Function block No. 41: Event 1 (<i>EB 1</i>)	3-34
■ Function block No. 42: Event 2 (<i>EB2</i>)	3-35
■ Function block No. 43: Event 3 (<i>EB3</i>)	3-35
■ Function block No. 44: Event 4 (<i>EB4</i>)	3-35
■ Function block No. 45: CT1 (<i>CF 1</i>).....	3-36
■ Function block No. 46: CT2 (<i>CF 2</i>).....	3-36
■ Function block No. 50: Control (<i>Conf</i>)	3-37
■ Function block No. 51: Input 1_Control (<i>1.Conf</i>)	3-38
■ Function block No. 52: Input 2_Control (<i>2.Conf</i>)	3-39
■ Function block No. 55: Position proportioning control (<i>PosI f</i>)	3-40
■ Function block No. 56: Input 1_Cooling control (<i>1.Coal</i>)	3-40
■ Function block No. 57: Proactive (<i>PRCF</i>).....	3-40



	Page
■ Function block No. 58: 2-input function (<i>2PV</i>).....	3-41
■ Function block No. 60: Communication (<i>SCI</i>)	3-42
■ Function block No. 62: PLC communication (<i>RAP</i>)	3-43
■ Function block No. 70: Memory area (<i>RRER</i>)	3-43
■ Function block No. 71: Input 1_Setting limiter (<i>1.5HL</i>)	3-43
■ Function block No. 72: Input 2_Setting limiter (<i>2.5HL</i>)	3-44
■ Function block No. 91: System (<i>SY5</i>)	3-44

4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED 4-1

Chapter 4 describes the parameters that are initialized/modified when setting is changed.

4.1 Parameters to Be Initialized.....	4-2
4.1.1 When Select function for input 2 (<i>2PV</i>) is changed [Engineering mode: Function block No. 58]	4-3
4.1.2 When Input 1_Input type (<i>1.1NP</i>) and Input 1_Display unit (<i>1.UNI F</i>) are changed [Engineering mode: Function block No. 21]	4-6
4.1.3 When Input 1_Decimal point position (<i>1.PGdP</i>) is changed [Engineering mode: Function block No. 21]	4-9
4.1.4 When Input 2_Input type (<i>2.1NP</i>) and Input 2_Display unit (<i>2.UNI F</i>) are changed [Engineering mode: Function block No. 22]	4-10
4.1.5 When Input 1_Control action (<i>1.α5</i>) is changed [Engineering mode: Function block No. 51]	4-13
4.1.6 When Input 2_Control action (<i>2.α5</i>) is changed [Engineering mode: Function block No. 52]	4-14
4.1.7 If Open/Close output neutral zone (<i>Ydb</i>) is changed [Setup setting mode: Setting group No. 55]	4-14
4.1.8 When OUT1 function selection (<i>α5L 1</i>) is changed [Engineering mode: Function block No. 30]	4-14
4.1.9 When OUT2 function selection (<i>α5L 2</i>) is changed [Engineering mode: Function block No. 30]	4-15
4.1.10 When OUT3 function selection (<i>α5L 3</i>) and Universal output type selection (<i>UNI α</i>) are changed [Engineering mode: Function block No. 30].....	4-15
4.1.11 When Retransmission output 1 type (<i>Rα 1</i>) is changed [Engineering mode: Function block No. 31].....	4-16
4.1.12 When Retransmission output 2 type (<i>Rα 2</i>) is changed [Engineering mode: Function block No. 32].....	4-16
4.1.13 When Retransmission output 3 type (<i>Rα 3</i>) is changed [Engineering mode: Function block No. 33].....	4-17
4.1.14 When Event 1 type (<i>E5 1</i>) and Event 1 assignment (<i>EVR 1</i>) are changed [Engineering mode: Function block No. 41].....	4-17
4.1.15 When Event 2 type (<i>E5 2</i>) and Event 2 assignment (<i>EVR 2</i>) are changed [Engineering mode: Function block No. 42].....	4-17



	Page
4.1.16 When Event 3 type (<i>ES3</i>) and Event 3 assignment (<i>EV3</i>) are changed [Engineering mode: Function block No. 43].....	4-18
4.1.17 When Event 4 type (<i>ES4</i>) and Event 4 assignment (<i>EV4</i>) are changed [Engineering mode: Function block No. 44].....	4-18
4.1.18 When CT1 type (<i>CT1</i>) is changed [Engineering mode: Function block No. 45].....	4-18
4.1.19 When CT2 type (<i>CT2</i>) is changed [Engineering mode: Function block No. 46].....	4-19
4.1.20 When Integral/Derivative time decimal point position (<i>IDP</i>) is changed [Engineering mode: Function block No. 50].....	4-19
4.1.21 When Communication protocol (<i>MP5</i>) is changed [Engineering mode: Function block No. 60].....	4-19
4.1.22 When Register type (<i>MP.REG</i>) is changed [Engineering mode: Function block No. 62].....	4-20
4.1.23 When Soak time unit (<i>STDP</i>) is changed [Engineering mode: Function block No. 70].....	4-20
4.1.24 When Initialization (<i>DEF</i>) is changed [Engineering mode: Function block No. 91].....	4-20
4.2 Parameters to Be Automatically Converted	4-21
■ Example of automatic conversion	4-22
4.2.1 When Input data type (<i>INDT</i>) is changed [Engineering mode: Function block No. 21]	4-23
4.2.2 When Input 1_Decimal point position (<i>IPGDP</i>), Input 1_Input range high (<i>IPGSH</i>) and Input 1_Input range low (<i>IPGSL</i>) are changed [Engineering mode: Function block No. 21]	4-25
4.2.3 When Input 1_Setting limiter high/low (<i>ISLH</i> , <i>ISLL</i>) is changed [Engineering mode: Function block No. 71]	4-27
4.2.4 When Input 1_Output limiter high/low (heat-side) (<i>IOLH</i> , <i>IOLL</i>) is changed [Parameter setting mode: Parameter group No. 51].....	4-27
4.2.5 When Input 1_Output limiter high/low (cool-side) (<i>IOLHC</i> , <i>IOLLC</i>) is changed [Parameter setting mode: Parameter group No. 56].....	4-27
4.2.6 When Input 2_Decimal point position (<i>2PGDP</i>) is changed [Engineering mode: Function block No. 22]	4-28
4.2.7 When Input 2_Input range high/low (<i>2PGSH</i> , <i>2PGSL</i>) is changed [Engineering mode: Function block No. 22]	4-30
4.2.8 When Input 2_Setting limiter high/low (<i>2SLH</i> , <i>2SLL</i>) is changed [Engineering mode: Function block No. 72]	4-32
4.2.9 When Input 2_Output limiter high/low (<i>2OLH</i> , <i>2OLL</i>) is changed [Parameter setting mode: Parameter group No. 52]	4-32
4.2.10 When Memory area transfer (<i>RRER</i>) is changed [Monitor & SV setting mode (FZ110) and Memory area transfer mode (FZ400/900)].....	4-32
4.2.11 When Input 1_Level PID setting 1 (<i>ILEV1</i>) is changed [Setup setting mode: Setting group No. 51].....	4-32



	Page
4.2.12 When Input 1_Level PID setting 2 (<i>1LEV2</i>) is changed [Setup setting mode: Setting group No. 51].....	4-33
4.2.13 When Input 1_Level PID setting 3 (<i>1LEV3</i>) is changed [Setup setting mode: Setting group No. 51].....	4-33
4.2.14 When Input 1_Level PID setting 4 (<i>1LEV4</i>) is changed [Setup setting mode: Setting group No. 51].....	4-33
4.2.15 When Input 1_Level PID setting 5 (<i>1LEV5</i>) is changed [Setup setting mode: Setting group No. 51].....	4-34
4.2.16 When Input 1_Level PID setting 6 (<i>1LEV6</i>) is changed [Setup setting mode: Setting group No. 51].....	4-34
4.2.17 When Input 1_Level PID setting 7 (<i>1LEV7</i>) is changed [Setup setting mode: Setting group No. 51].....	4-34
4.2.18 When Input 2_Level PID setting 1 (<i>2LEV1</i>) is changed [Setup setting mode: Setting group No. 52].....	4-35
4.2.19 When Input 2_Level PID setting 2 (<i>2LEV2</i>) is changed [Setup setting mode: Setting group No. 52].....	4-35
4.2.20 When Input 2_Level PID setting 3 (<i>2LEV3</i>) is changed [Setup setting mode: Setting group No. 52].....	4-35
4.2.21 When Input 2_Level PID setting 4 (<i>2LEV4</i>) is changed [Setup setting mode: Setting group No. 52].....	4-36
4.2.22 When Input 2_Level PID setting 5 (<i>2LEV5</i>) is changed [Setup setting mode: Setting group No. 52].....	4-36
4.2.23 When Input 2_Level PID setting 6 (<i>2LEV6</i>) is changed [Setup setting mode: Setting group No. 52].....	4-36
4.2.24 When Input 2_Level PID setting 7 (<i>2LEV7</i>) is changed [Setup setting mode: Setting group No. 52].....	4-37



[Functions]

5. INPUT FUNCTION 5-1

This chapter describes input related functions, setting contents and setting procedure based on the key words related to inputs.

5.1 Changing Input	5-2
5.2 Switching Functions Using Digital Inputs (DI)	5-16
5.3 Correcting Input	5-28
5.4 Preventing the Input Flicker	5-31
5.5 Inverting the Input.....	5-33
5.6 Extracting Square Root of Input.....	5-35
5.7 Changing Error Handling at Input Error	5-39
5.8 Using Dual Input Function	5-48

6. OUTPUT FUNCTION 6-1

This chapter describes output related functions, setting contents and setting procedure based on the key words related to outputs.

6.1 Changing Output Assignment [Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output]	6-2
6.2 Changing Output Type of OUT3.....	6-12
6.3 Using Retransmission Output.....	6-14
6.4 Changing Proportional Cycle Time.....	6-20
6.5 Changing Energizing/De-energizing Output.....	6-24
6.6 Limiting Output	6-26
6.7 Suppressing Sudden Change in Output (Output Change Rate Limiter)	6-29
6.8 Suppressing Sudden Change in Output (Balanceless Bumpless).....	6-33
6.9 Changing the Output Action While in Control Stop Mode.....	6-39
6.10 Monitoring Manipulated Output Value	6-42

7. EVENT FUNCTION 7-1

This chapter describes event related functions, setting contents and setting procedure based on the key words related to events.

7.1 Using Event Function	7-2
7.1.1 Changing input for event.....	7-3
7.1.2 Changing event type	7-7
7.1.3 Adding hold action to the event action.....	7-16



	Page
7.1.4 Setting a differential gap in event action.....	7-19
7.1.5 Preventing event from turning on due to a transient abnormal input.....	7-21
7.1.6 Changing event output assignment	7-23
7.1.7 Changing the event set value	7-23
7.2 Using Heater Break Alarm (HBA).....	7-24
7.2.1 Setting the Heater break alarm (HBA) set value.....	7-25
7.2.2 Preventing Heater break alarm (HBA) from turning on due to a transient abnormal input	7-28
7.2.3 Changing the output monitored by the Heater break alarm (HBA).....	7-30
7.2.4 Changing the Current transformer (CT) type	7-33
7.2.5 Forcing the CT input value to 0.0 A when the heater is OFF	7-35
7.3 Using Control Loop Break Alarm (LBA).....	7-36
7.4 Checking Event ON State	7-40
7.5 Keeping the Event State (Interlock Function)	7-42
7.6 Releasing the Event State (Interlock Release).....	7-44
7.7 Preventing Control with Input Errors (Input Circuit Error Alarm) [FZ400/900].....	7-46

8. CONTROL FUNCTION 8-1

This chapter describes control related functions, setting contents and setting procedure based on the key words related to controls.

8.1 Running/Stopping Control (RUN/STOP Transfer)	8-2
8.2 Changing Control Action	8-5
8.3 Setting PID Values Automatically (Autotuning)	8-11
8.4 Setting PID Values Automatically (Startup tuning)	8-18
8.5 Setting PID Values Manually	8-24
8.6 Controlling with ON/OFF Action	8-31
8.7 Controlling with Heat/Cool Action	8-36
8.8 Controlling with Position Proportioning Control	8-44
8.9 Controlling with Manual Control	8-56
8.10 Using Remote Setting Input	8-61
8.11 Executing 2-Loop Control [FZ400/900]	8-67
8.12 Executing Differential Temperature Control [FZ400/900]	8-70
8.13 Executing Control with PV Select [FZ400/900]	8-75
8.14 Executing Cascade Control [FZ400/900]	8-84
8.15 Controlling with Level PID	8-98
8.16 Eliminating Offset Inherent to Proportioning Control (Manual Reset).....	8-108
8.17 Continuing Stable Control after the Operation Transfer (SV Tracking)	8-110



	Page
8.18 Suppressing Overshoot.....	8-116
8.19 Changing the Action at Power ON (Hot/Cold Start).....	8-124

9. DISPLAY RELATED FUNCTIONS.....9-1

This chapter describes display related functions, setting contents and setting procedure based on the key words related to Display.

9.1 Grouping Necessary Screens (Parameter Select Function).....	9-2
9.2 Hiding Unnecessary Screens	9-12
9.3 Hiding the Display of the Set Value (SV).....	9-18
9.4 Changing the Display Position of STOP during the Control Stop	9-20
9.5 Changing the ALM Lamp Lighting Condition	9-22
9.6 Changing the Display Contents of the MV Display [FZ400/900].....	9-24
9.7 Checking Input Peak Value/Bottom Value.....	9-26
9.8 Suppressing the Display Flickering	9-30
9.9 Checking the Instrument Information	9-32

10. SETTING AND KEY OPERATION 10-1

This chapter describes setting and key operation related functions, setting contents and setting procedure based on the keywords related to setting and key operation.

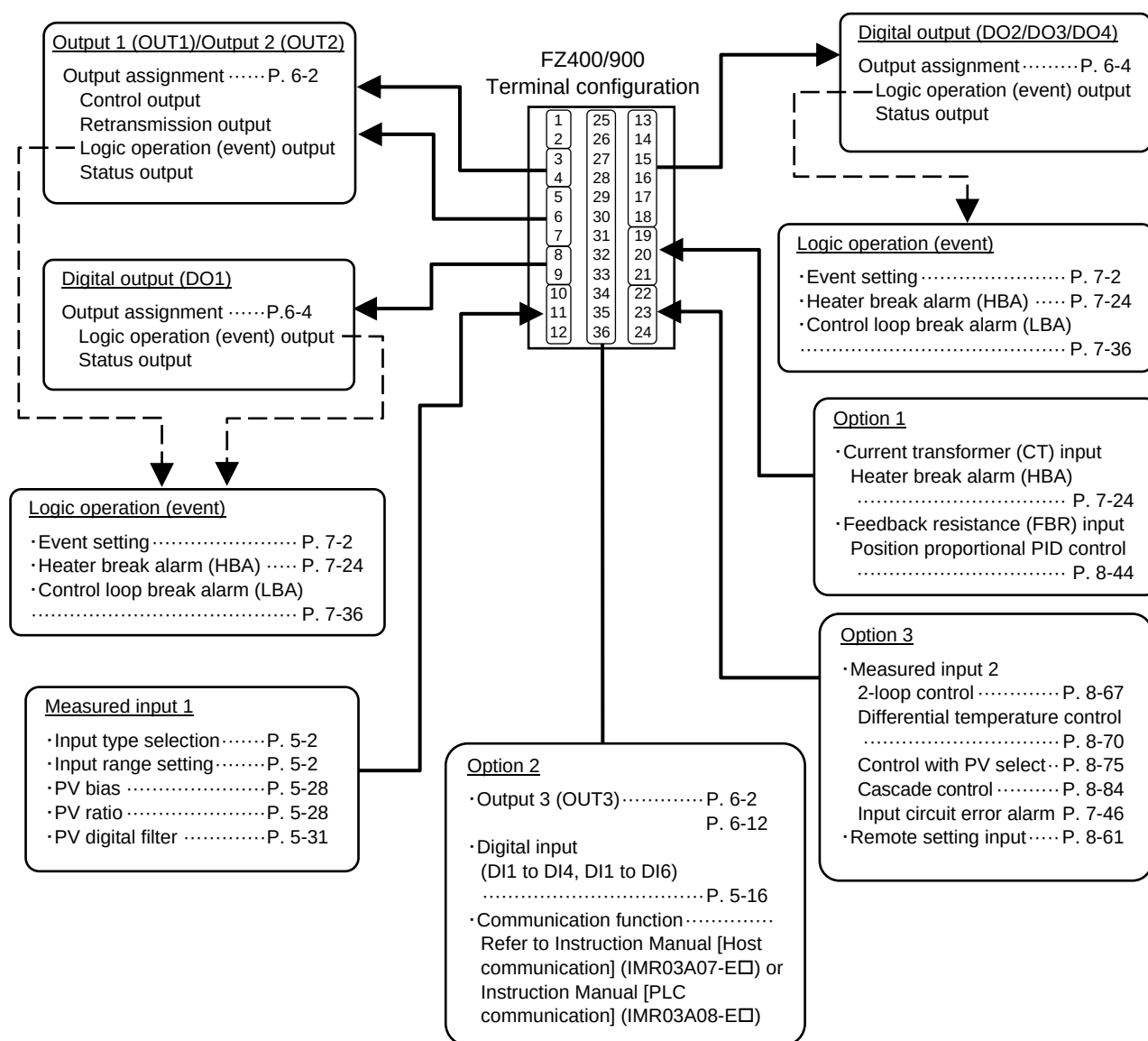
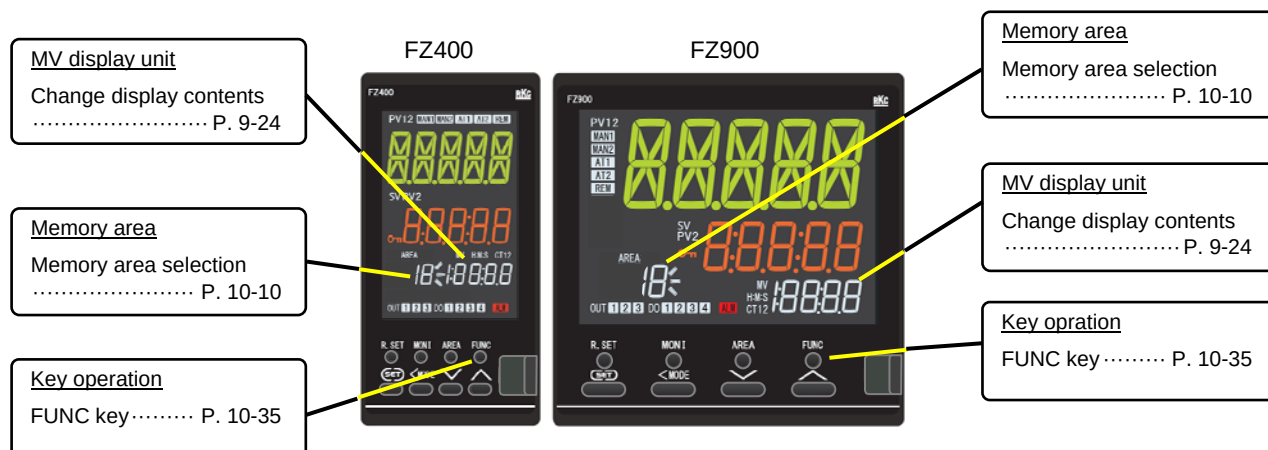
10.1 Limiting the Setting Range of Set Value (SV)	10-2
10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter) ...	10-6
10.3 Storing the Control Related Set Values (Memory Area Function)	10-10
10.4 Copying the Data in Memory Area to Set Other Areas.....	10-16
10.5 Running a Simple Ramp/Soak Control.....	10-18
10.6 Using a Simple Sequence Operation	10-26
10.7 Registering a Set Value (SV) Without Pressing the SET Key	10-33
10.8 Accessing Some Functions Directly (FUNC Key) [FZ400/900]	10-35
10.9 Restricting Key Operation (Set Data Lock)	10-38
10.10 Initializing the Set Data.....	10-41

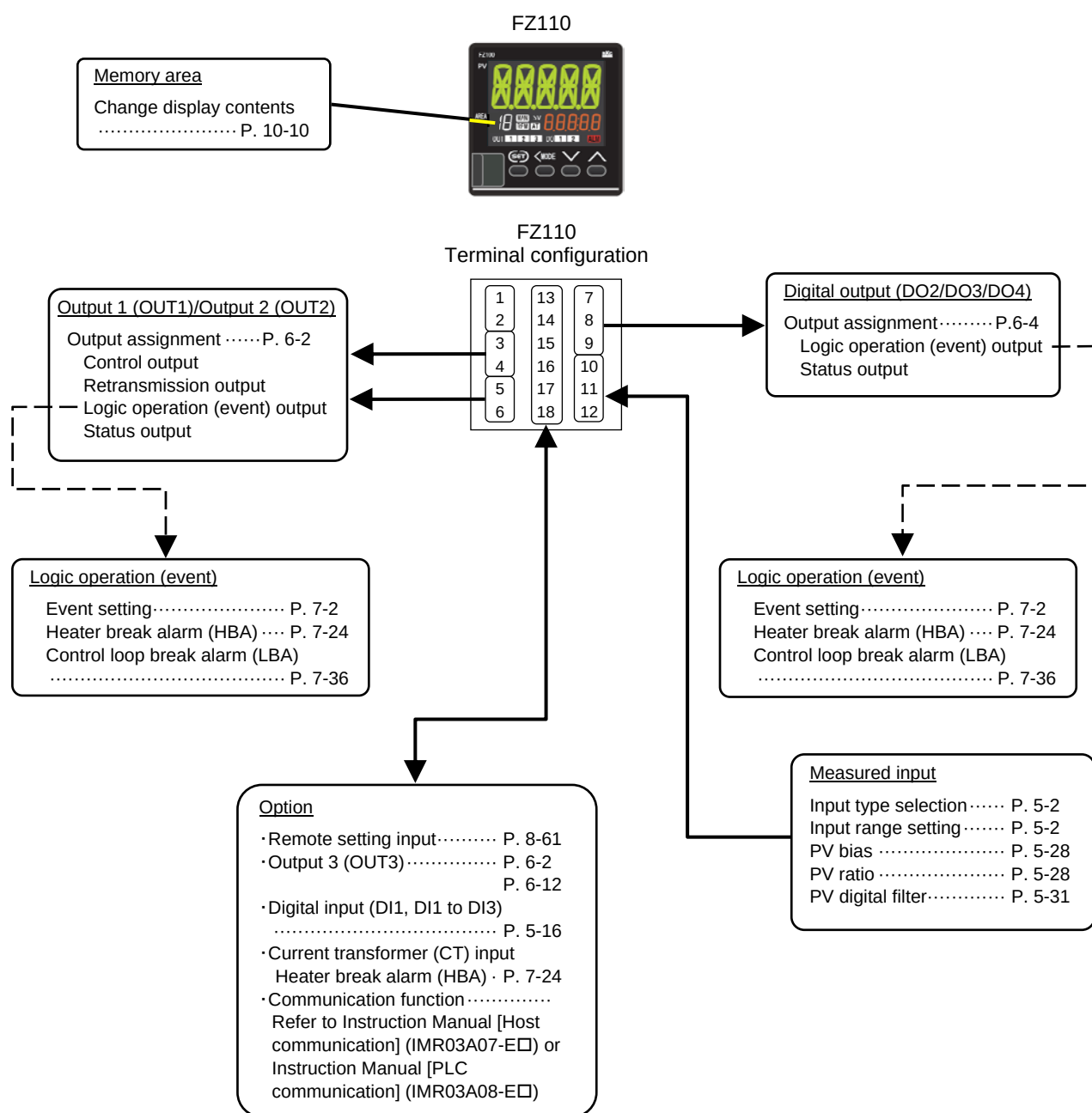
INDEX [Alphabetical order] A-1

INDEX [Character order] A-10

Pictorial table of contents

Pages that mainly describe the hardware are shown.





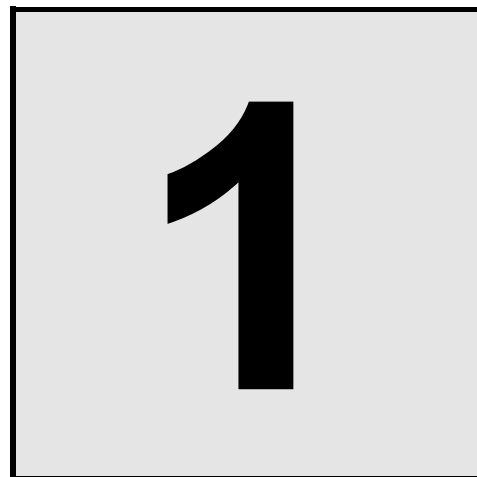


MEMO



[Parameters]

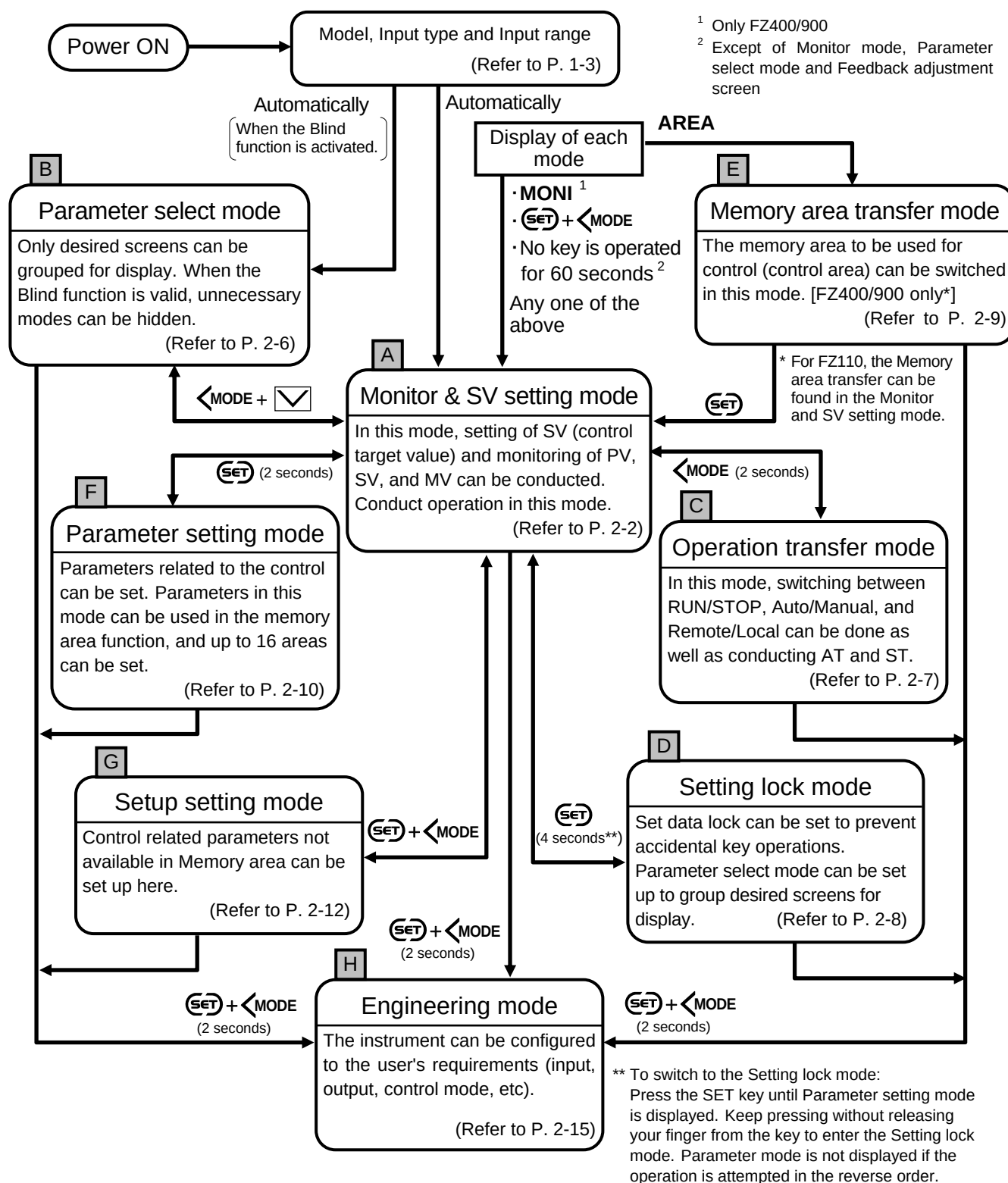
MODE SWITCHING



This chapter describes various modes and how to switch between them.

Mode switching

The instrument has eight different modes (seven modes for FZ110) for operation and setting. Modes can be switched through the key operation of **SET** and **MODE** keys.



Legend

- X: Press X key once
- X (n times): Press X key n times
- X (n seconds): Press and hold X key for n seconds or more
- X+Y (n seconds): Press and hold X and Y keys simultaneously for n seconds
- X+Y: Press X and Y key simultaneously

■ Model, Input type, Unit and Input range

Immediately after the instrument is powered, the input type, the unit symbol and the input range will be displayed.

Example: FZ900, Thermocouple input (type K) and –200 to +1372 °C

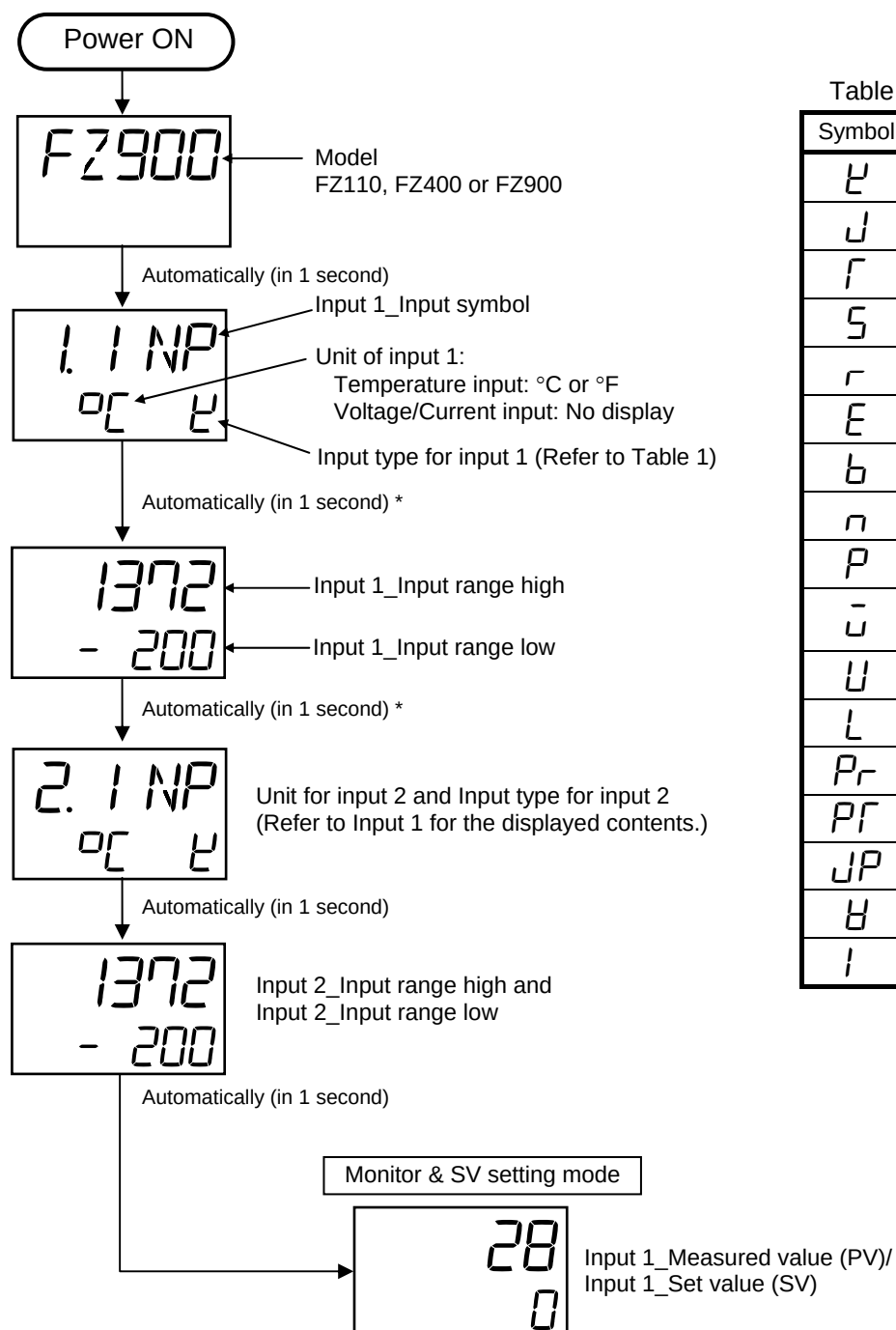


Table 1 Input type symbol

Symbol	Input type
K	Thermocouple K
J	Thermocouple J
T	Thermocouple T
S	Thermocouple S
R	Thermocouple R
E	Thermocouple E
B	Thermocouple B
N	Thermocouple N
P	Thermocouple PLII
W	Thermocouple W5Re/W26Re
U	Thermocouple U
L	Thermocouple L
Pr	Thermocouple PR40-20
Pt	RTD Pt100
JPt	RTD JPt100
V	Voltage
I	Current

* Displayed for 2 seconds (Single input type)



MEMO



SELECTING PARAMETERS

2

This chapter describes various parameter types and how to switch between them.

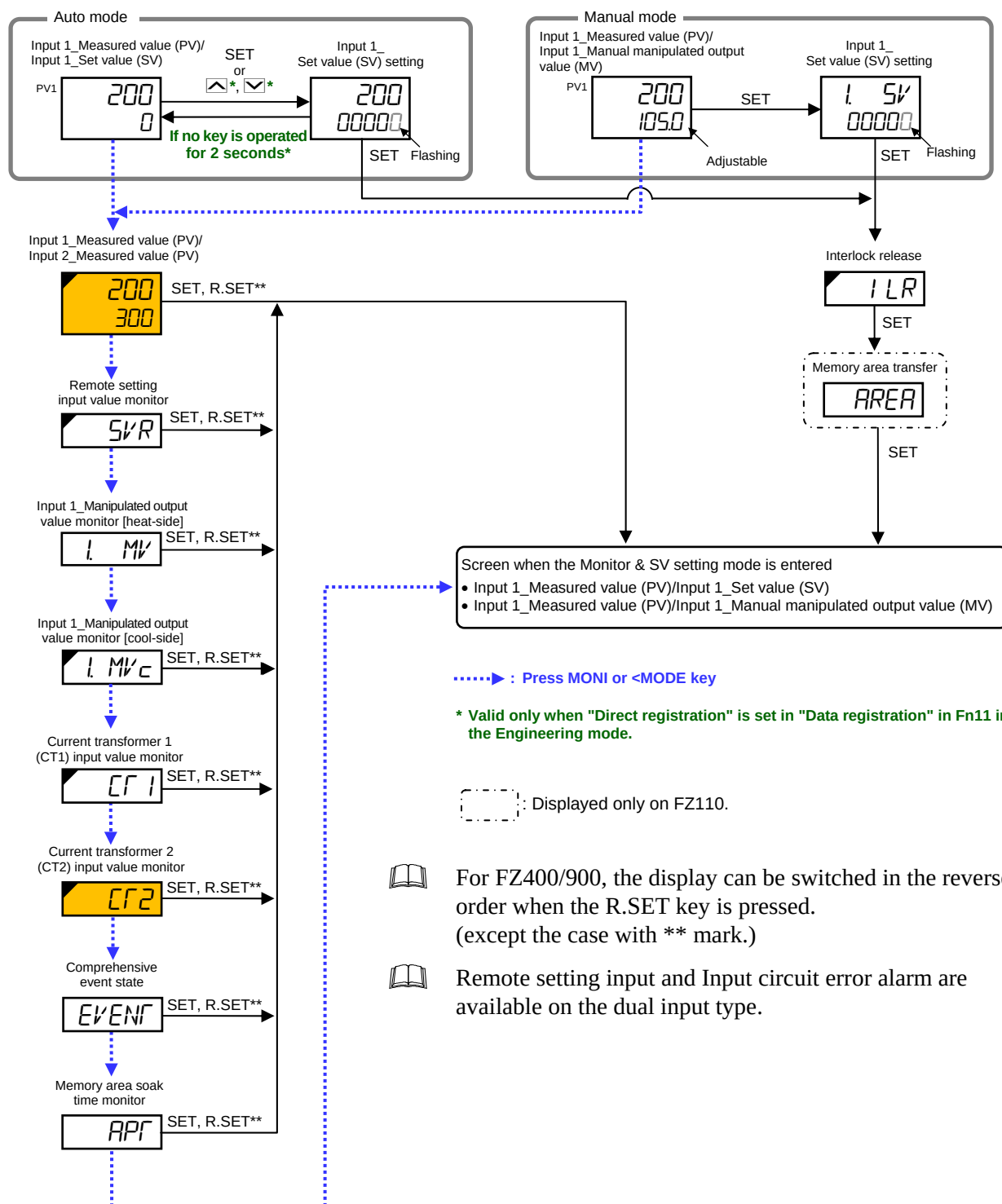
2.1 Monitor & SV Setting Mode [A].....	2-2
2.2 Parameter Select Mode [B]	2-6
2.3 Operation Transfer Mode [C].....	2-7
2.4 Setting Lock Mode [D]	2-8
2.5 Memory Area Transfer Mode [E] (FZ400/900)	2-9
2-6 Parameter Setting Mode [F]	2-10
2.7 Setup Setting Mode [G]	2-12
2.8 Engineering Mode [H]	2-15

2.1 Monitor & SV Setting Mode [A]

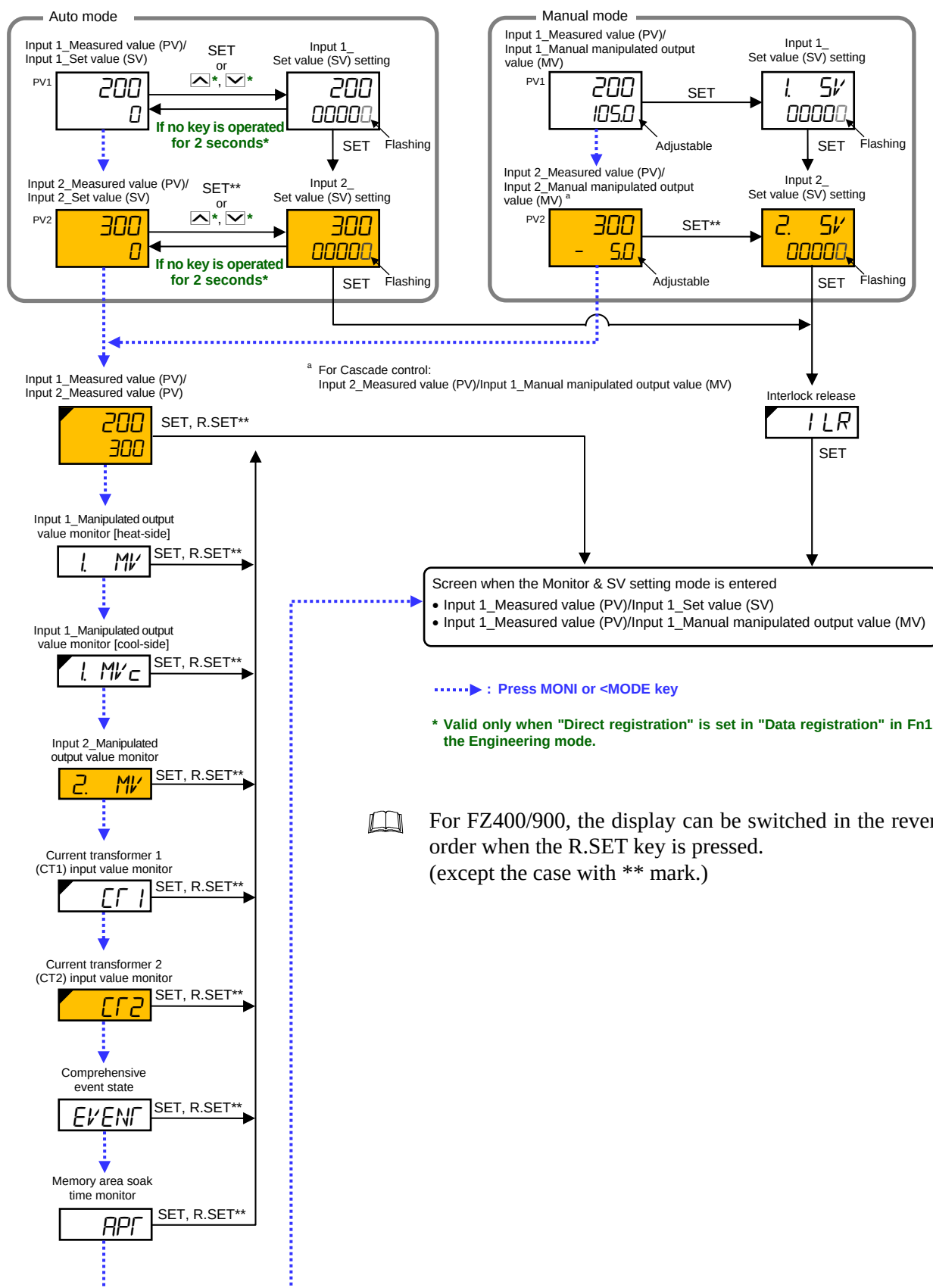
When the Monitor and SV setting mode is entered, there are 4 (four) display contents depending on the control. Each display also differs between the Auto mode and the Manual mode.

- 1-loop control (including Remote setting input/Input circuit error alarm) (Input circuit error alarm is available only on FZ400/900)
 - 2-loop control/Cascade control
 - Control with PV select
 - Differential temperature control
- } FZ400/900 only

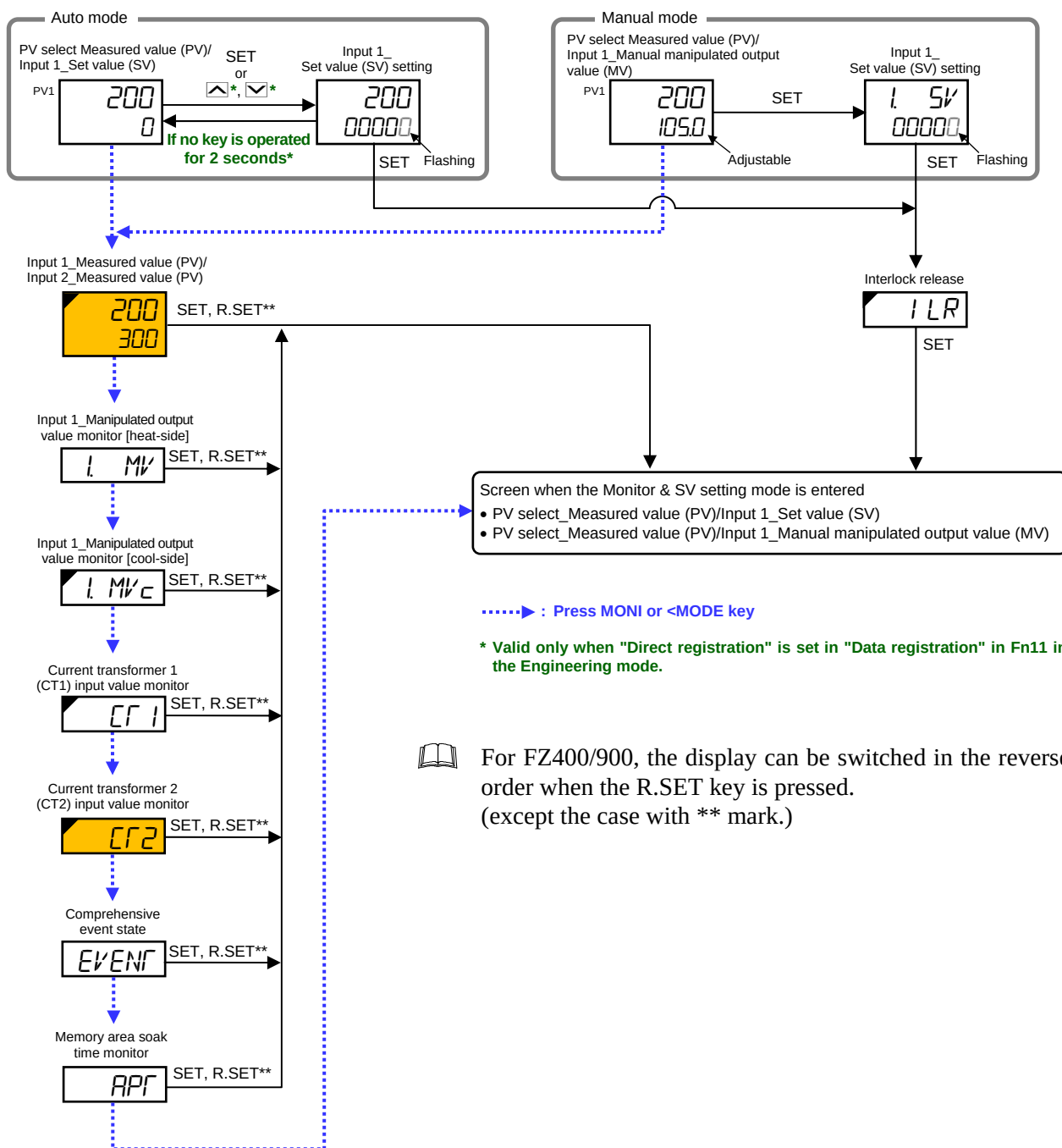
■ 1-loop control (including Remote setting input/Input circuit error alarm)



2-loop control/Cascade control [FZ400/900]

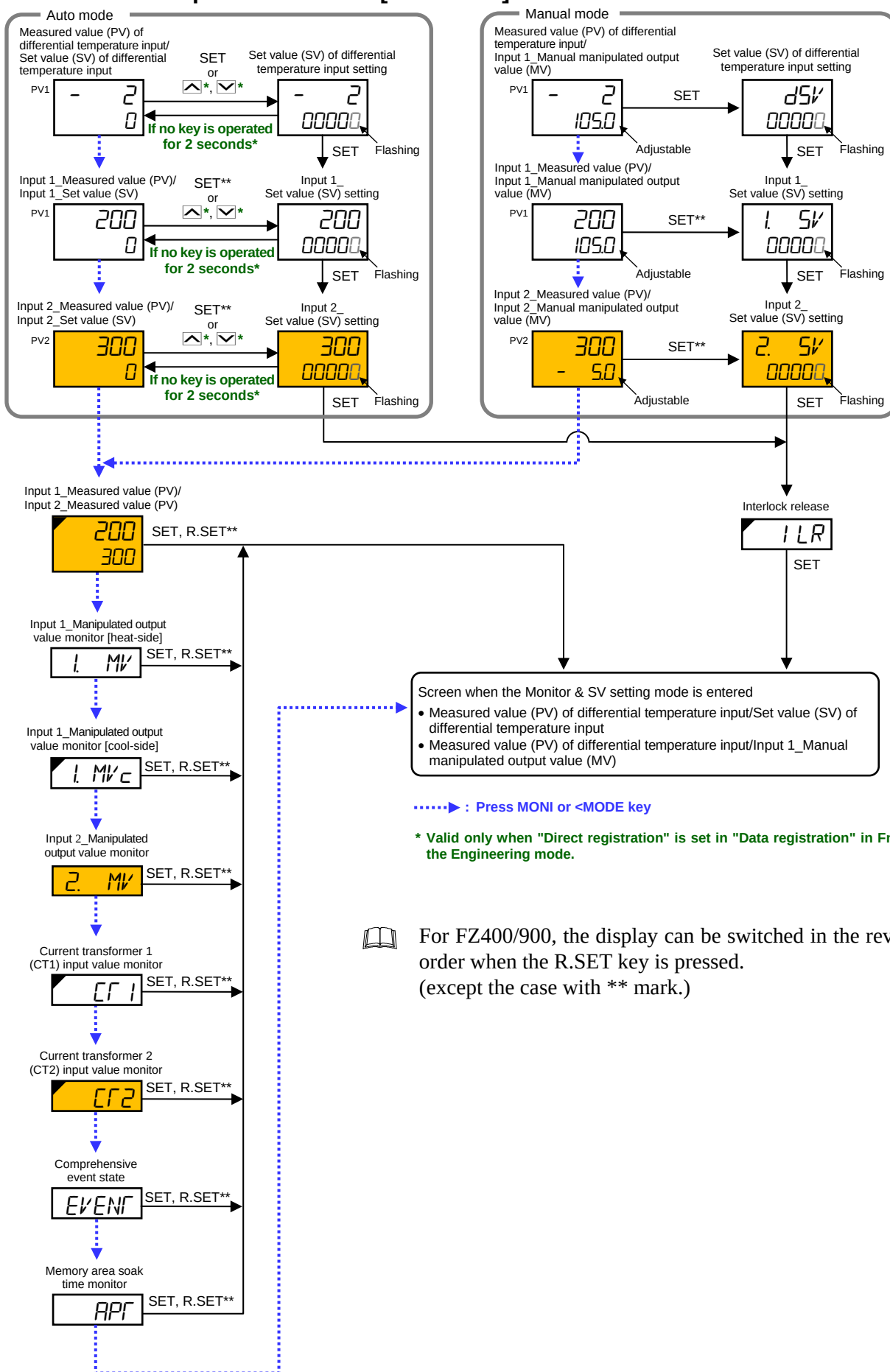


Control with PV select [FZ400/900]



For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed. (except the case with ** mark.)

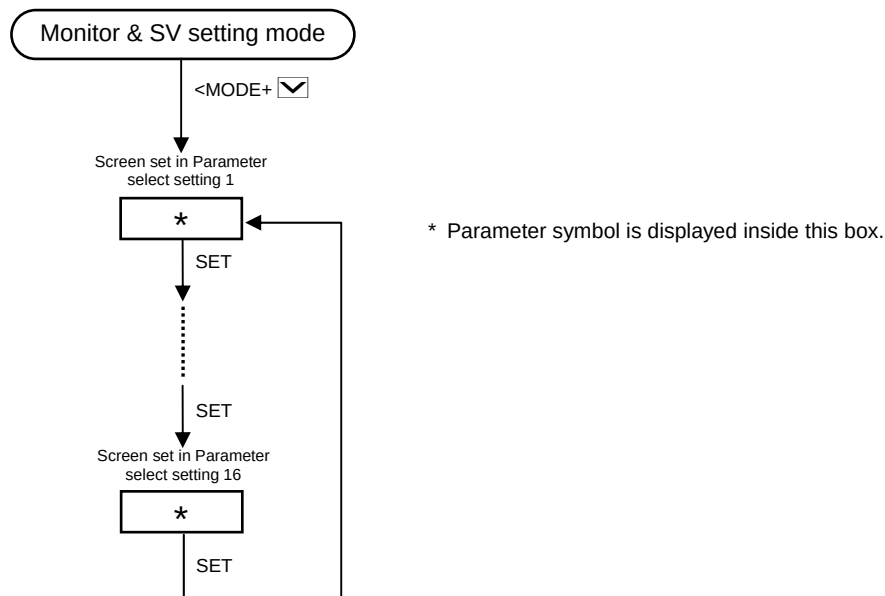
Differential temperature control [FZ400/900]





2.2 Parameter Select Mode [B]

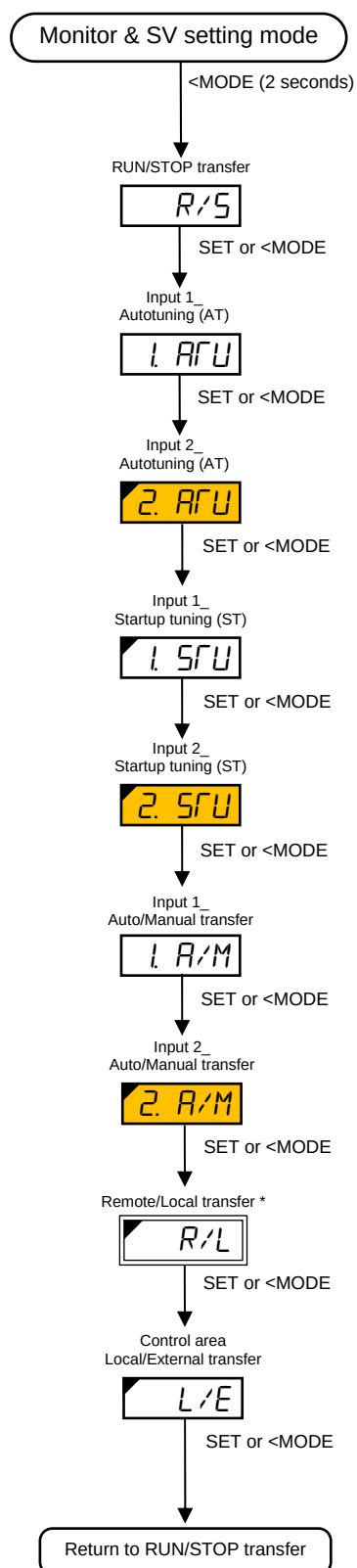
Displays the screens registered in Parameter select setting.



- For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.
- While the Blind function is valid, only Parameter select setting screen, Set data lock mode, and PV/SV monitor * screens are displayed. The instrument starts from the Parameter select mode after powered on.

* The PV/SV monitor includes SV setting mode and Manual manipulated output value setting.

2.3 Operation Transfer Mode [C]

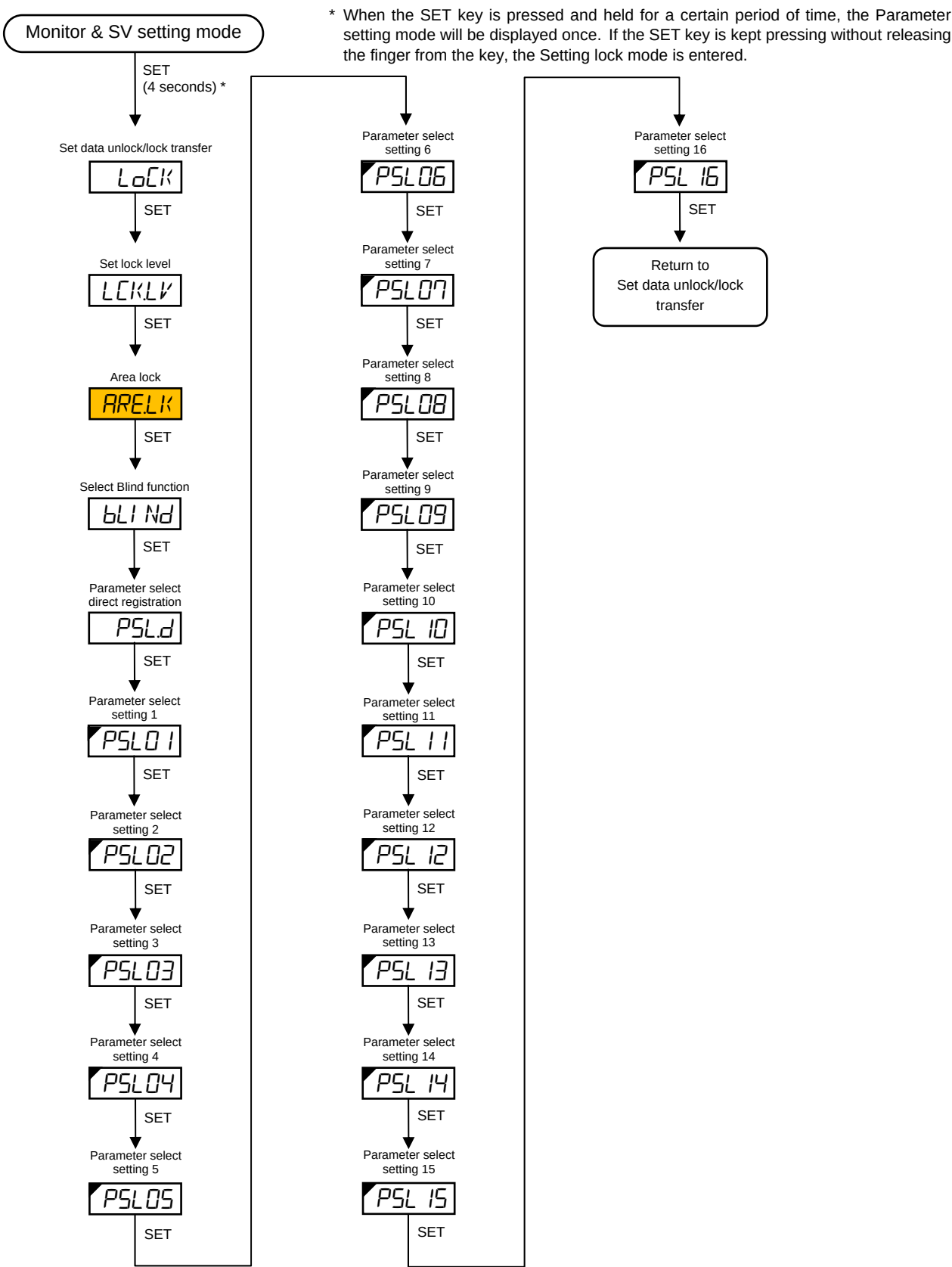


* For FZ400/900, this parameter is displayed when any of the following is selected in Select function for input 2: "Remote setting input," "Cascade control," "Control with PV select," or "2-loop control/Differential temperature control." For FZ110, this parameter is displayed when Remote setting input is supplied.



For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.

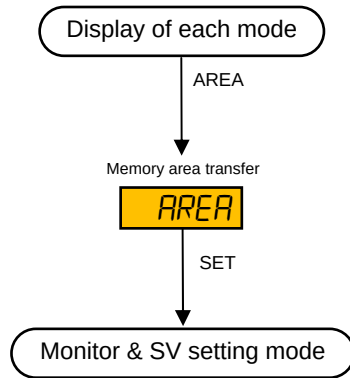
2.4 Setting Lock Mode [D]



For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.
(Except the operation to enter the Set data lock)

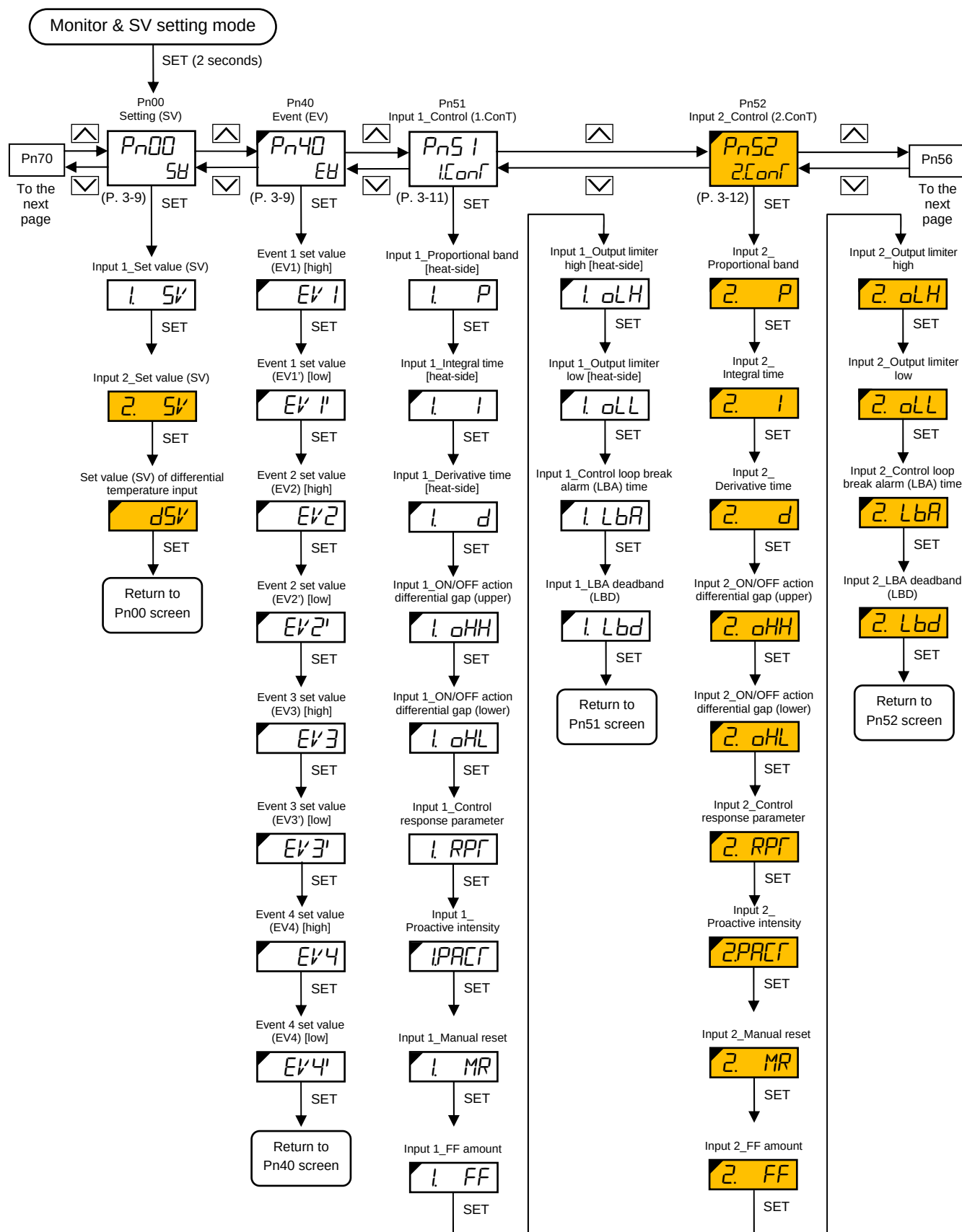


2.5 Memory Area Transfer Mode [E] (FZ400/900)



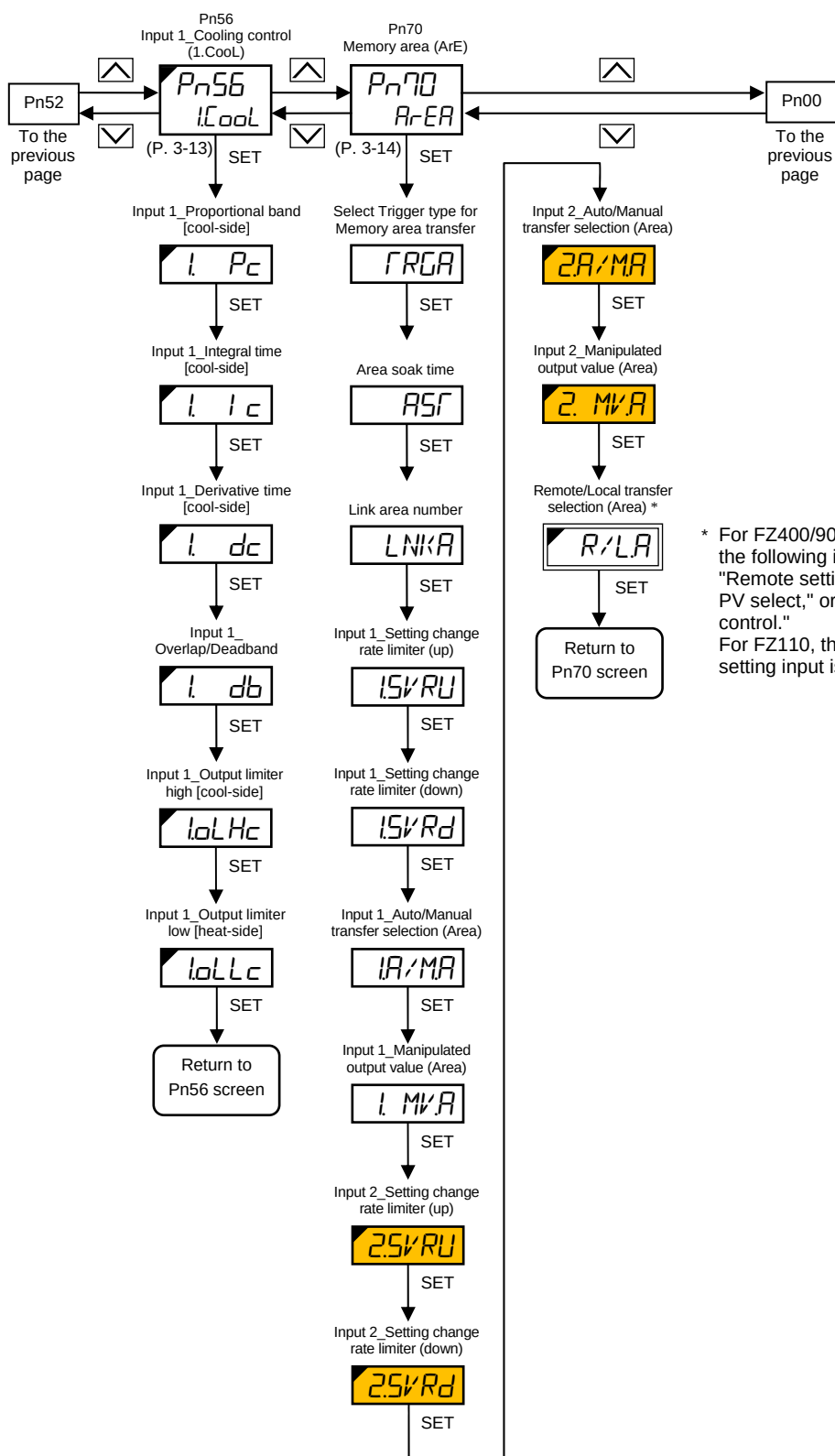
For FZ100, the Memory area selection screen can be found in the Monitor & SV setting mode.

2.6 Parameter Setting Mode [F]



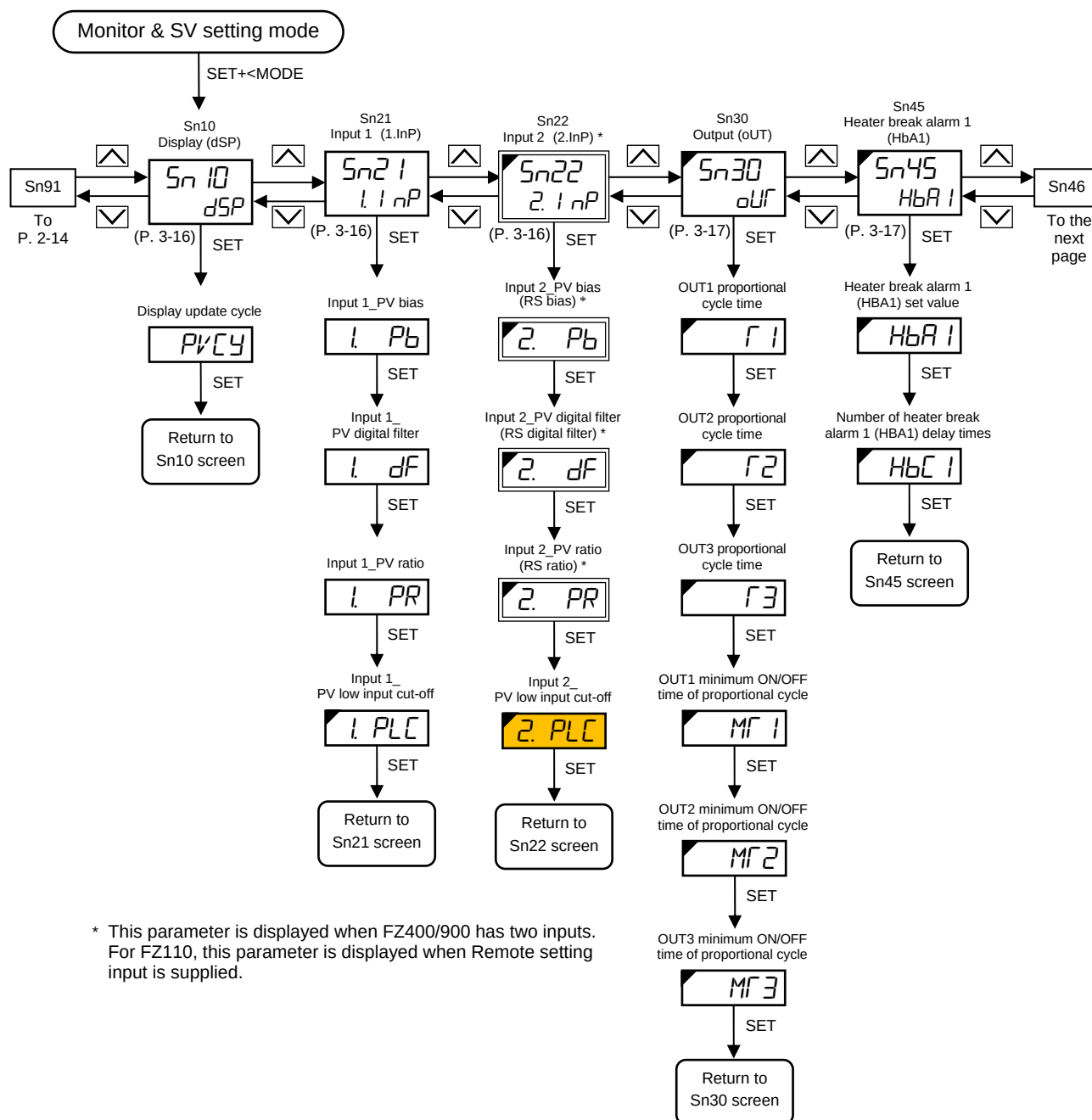


For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.
(Except the operation to enter the Set data lock)



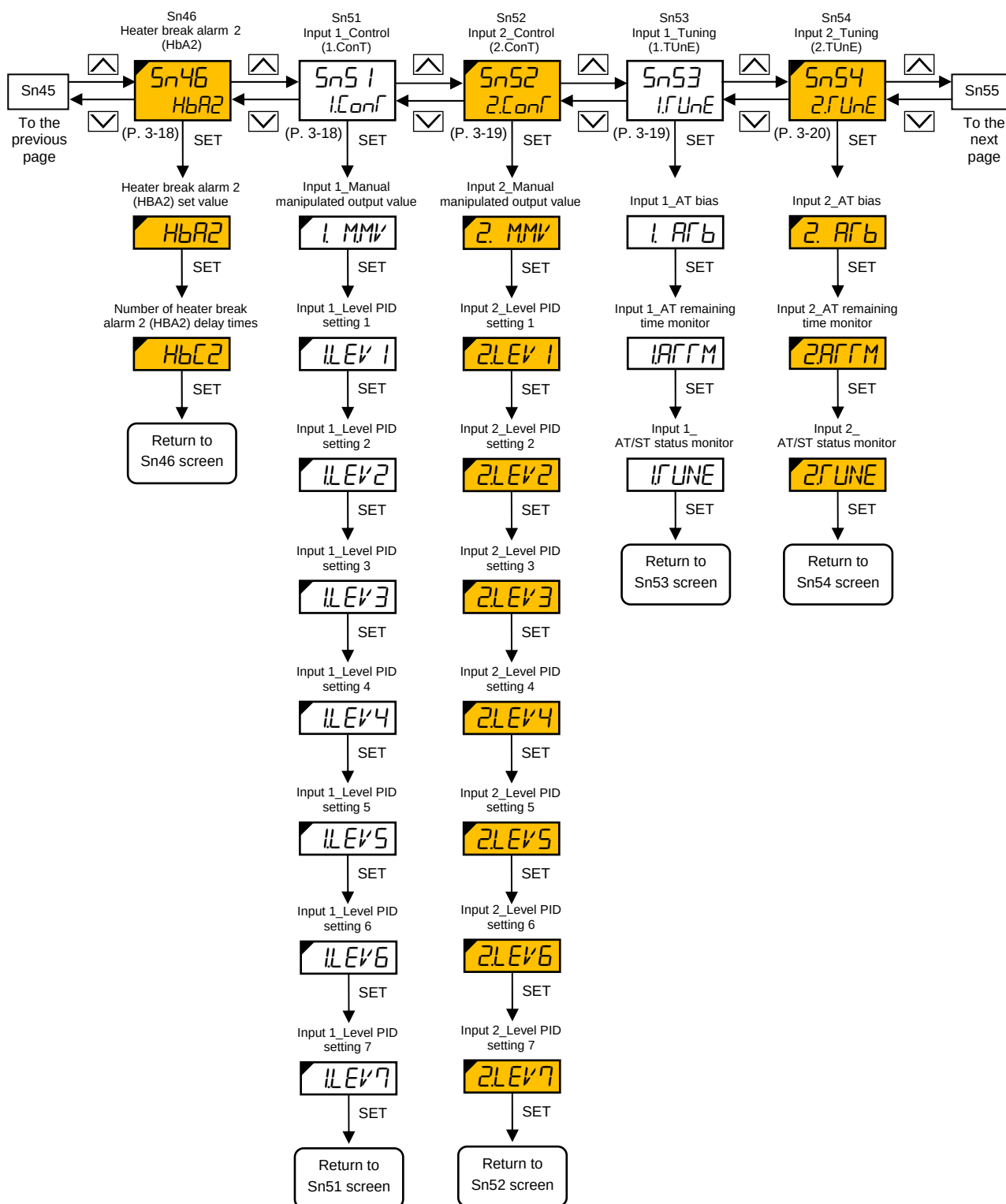
* For FZ400/900, this parameter is displayed when any of the following is selected in Select function for input 2: "Remote setting input," "Cascade control," "Control with PV select," or "2-loop control/Differential temperature control."
For FZ110, this parameter is displayed when Remote setting input is supplied.

2.7 Setup Setting Mode [G]



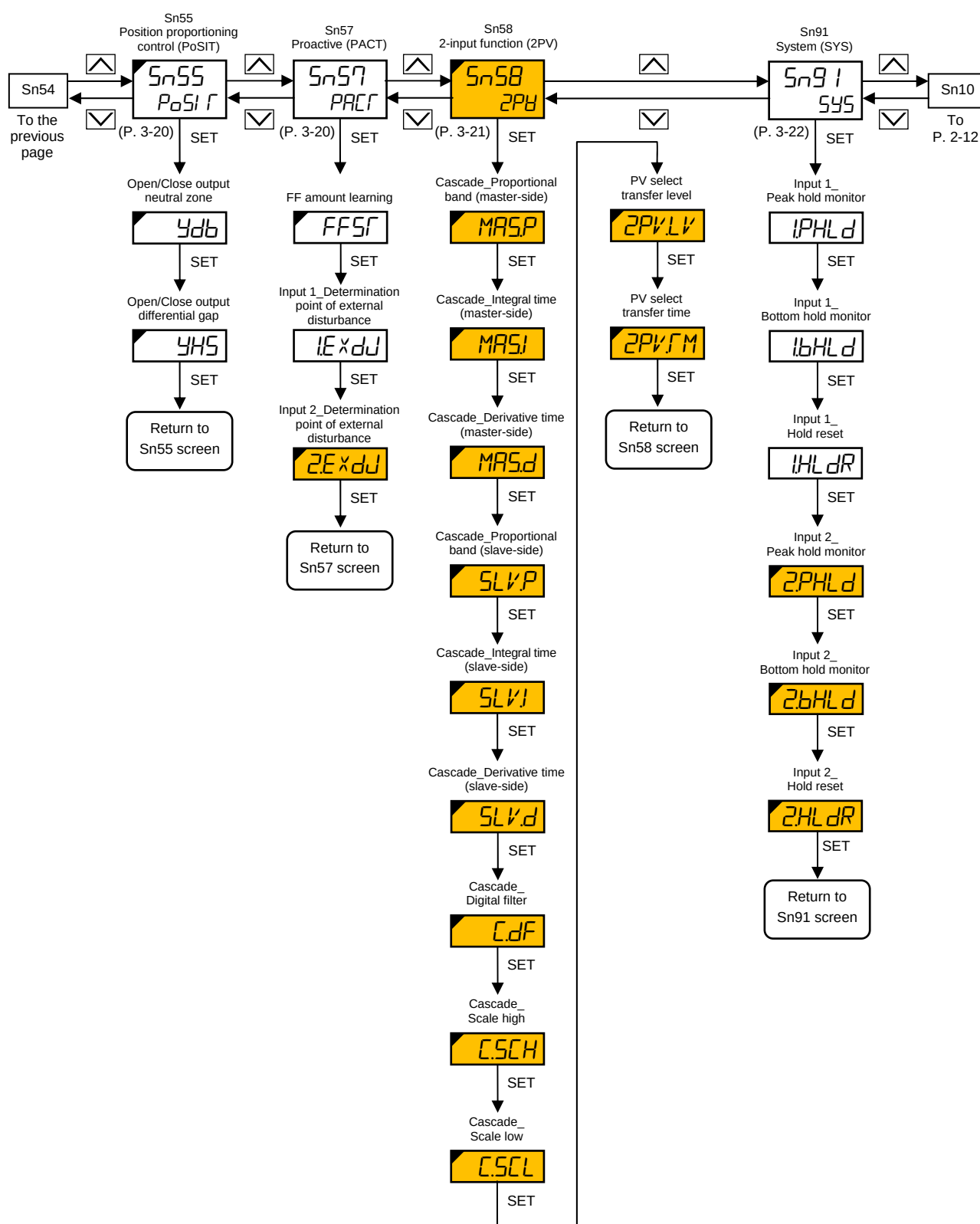


For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.

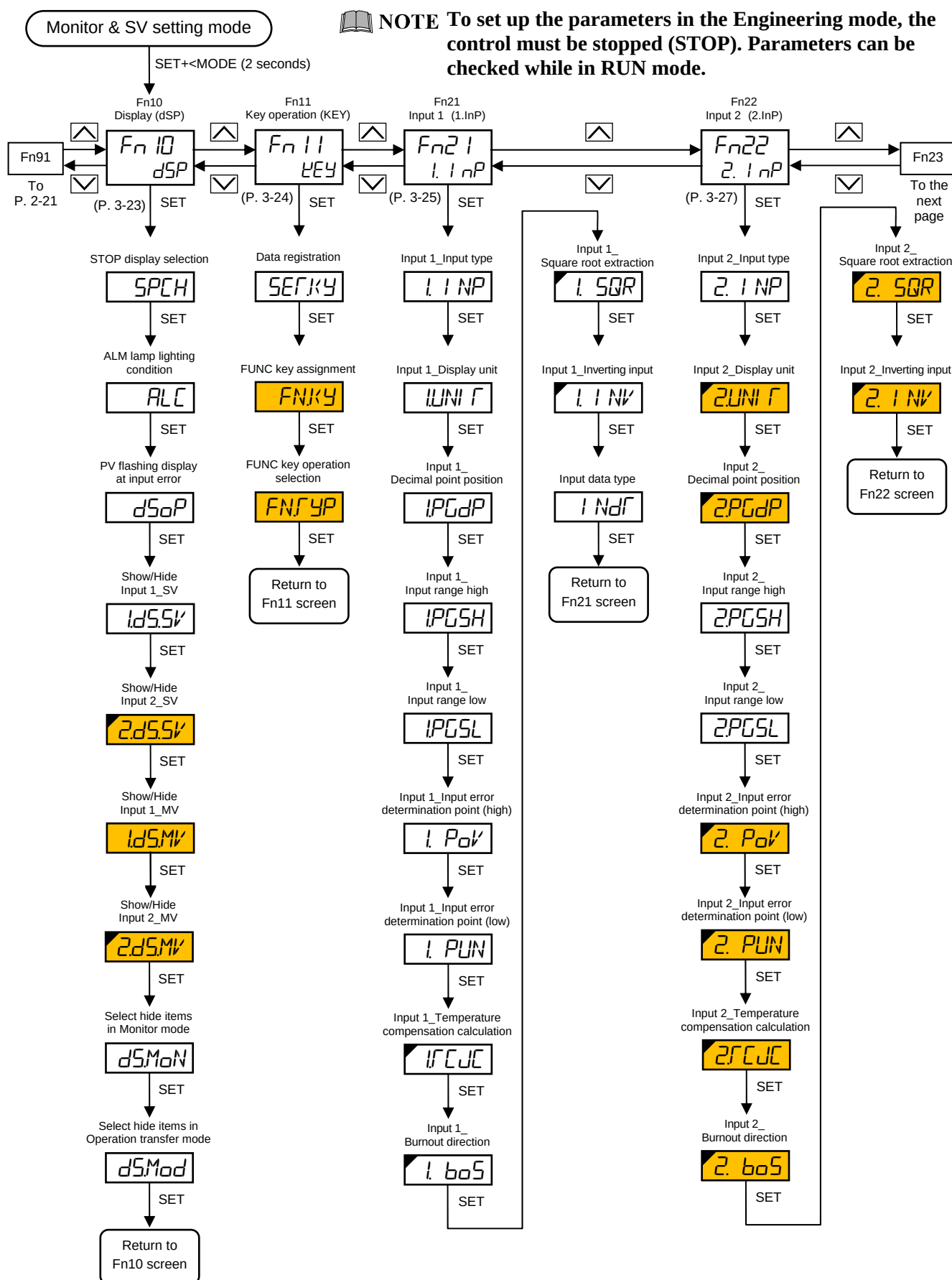




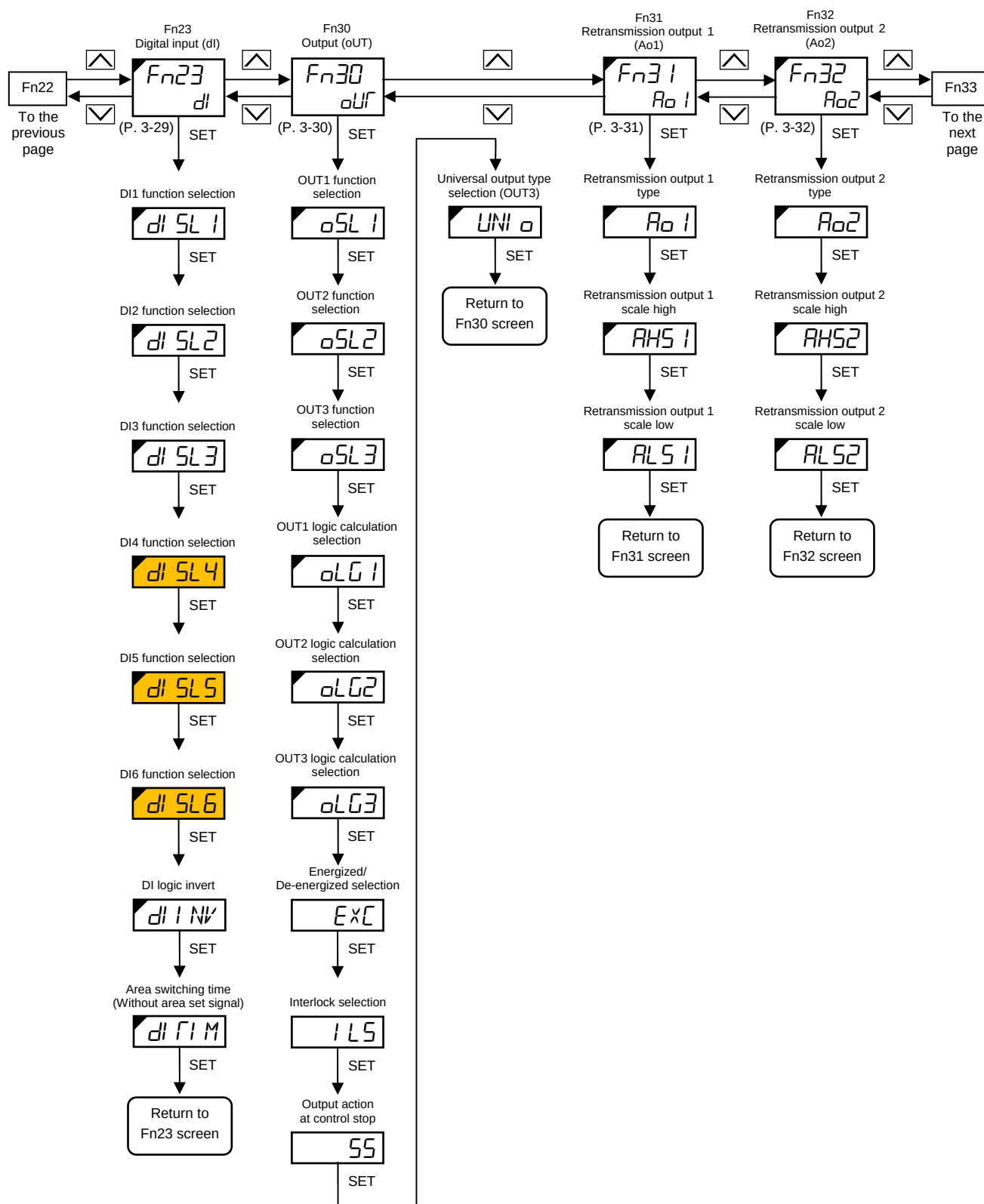
2. SELECTING PARAMETERS [Setup setting mode]

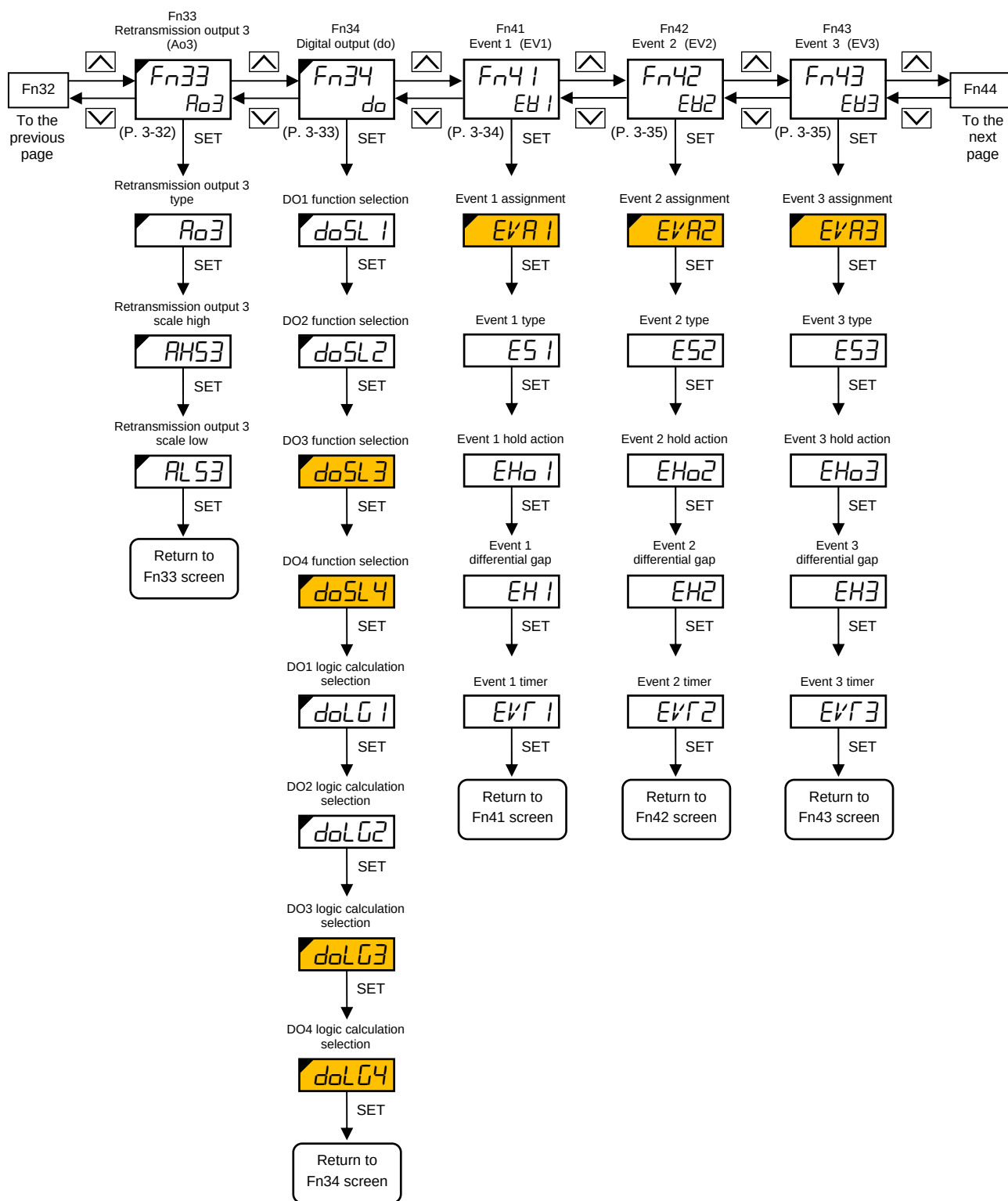


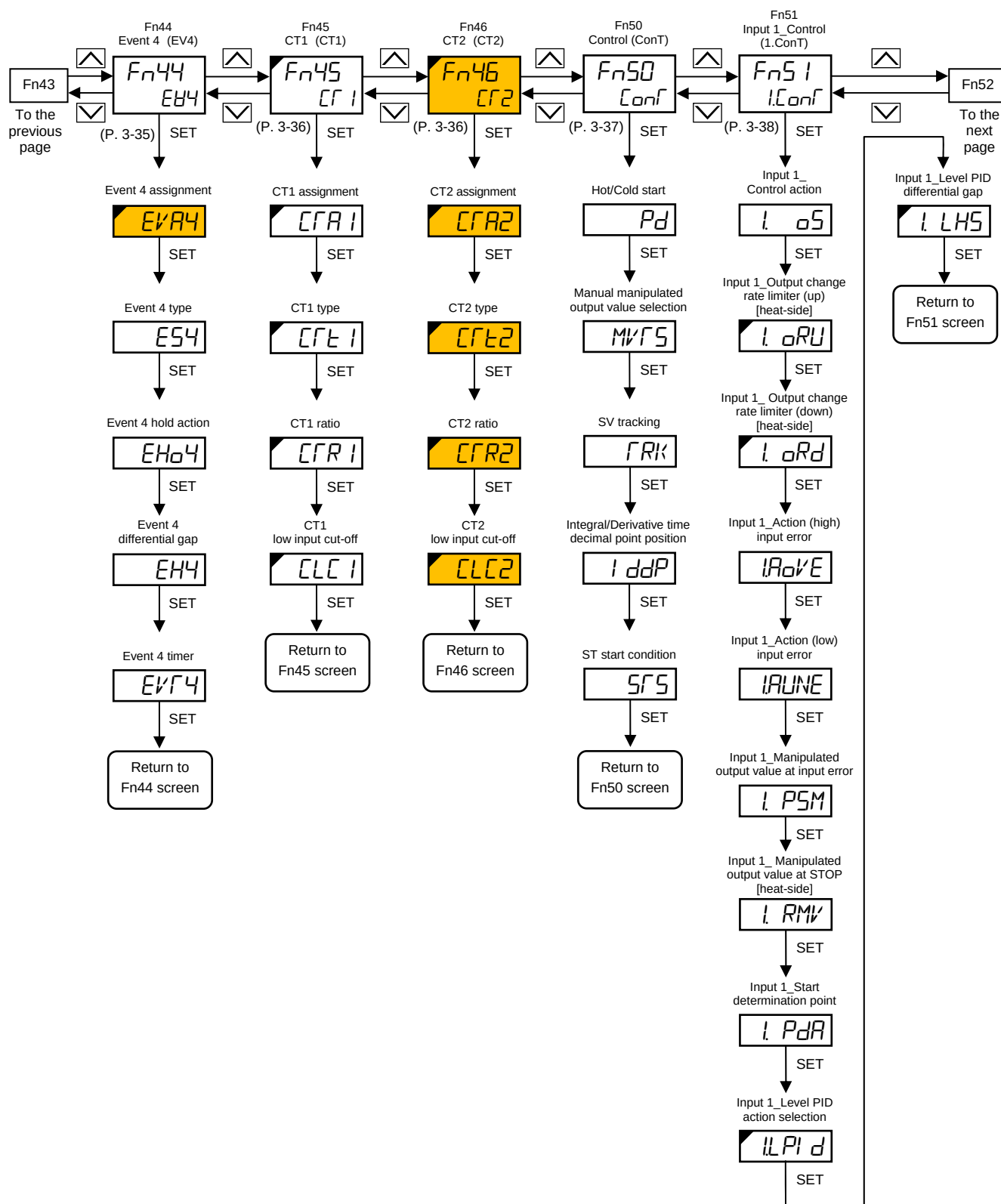
2.8 Engineering Mode [H]

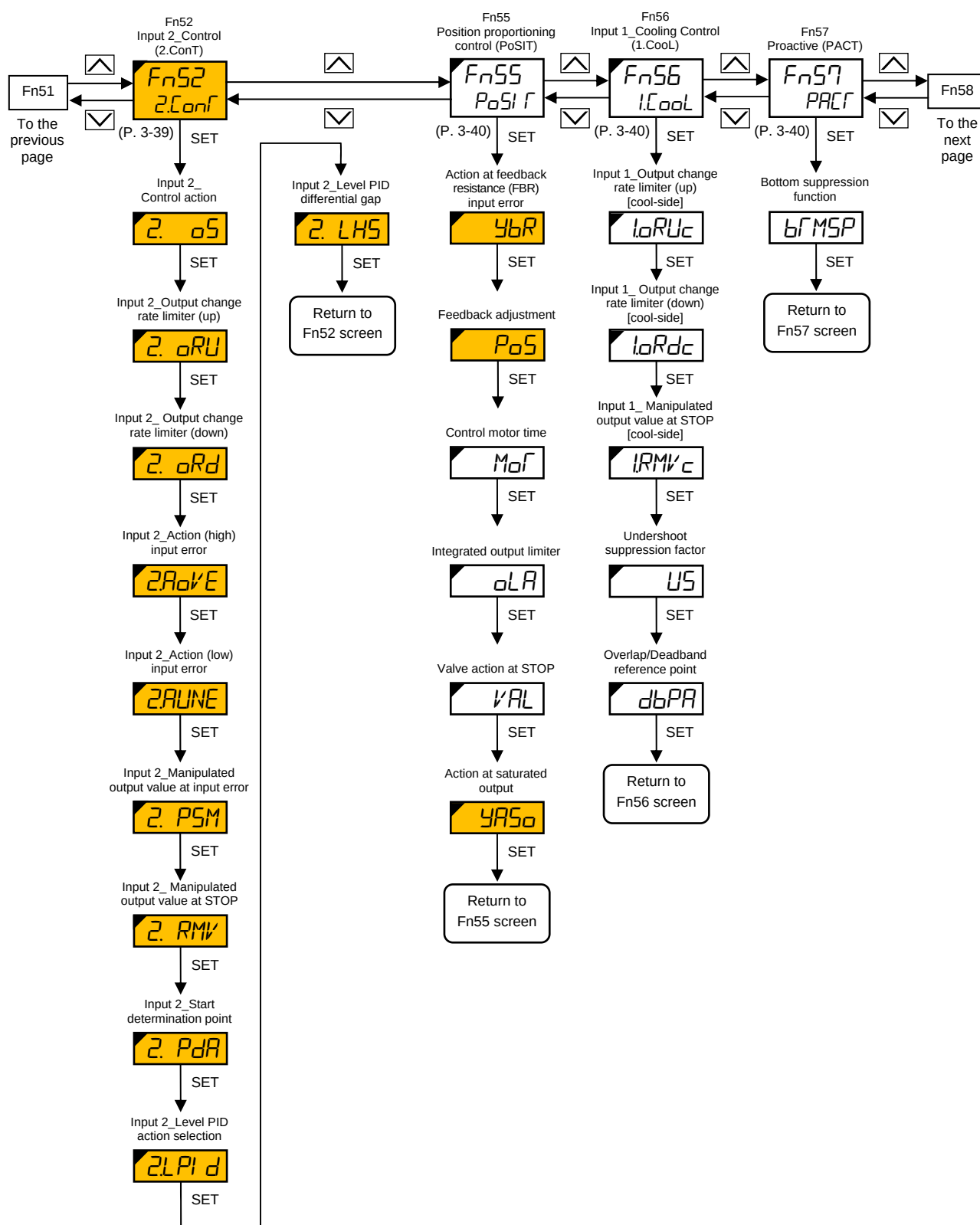


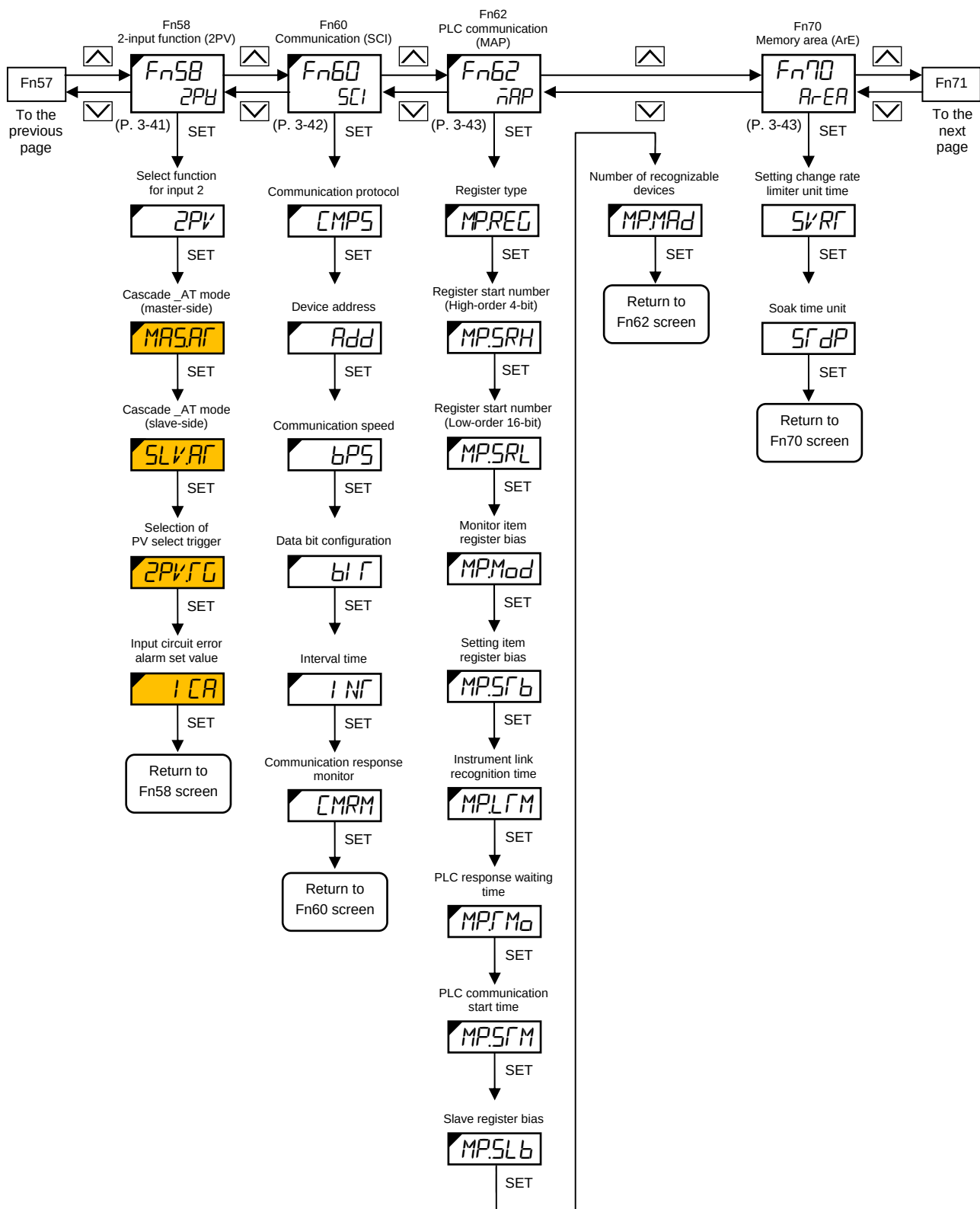
For FZ400/900, the display can be switched in the reverse order when the R.SET key is pressed.

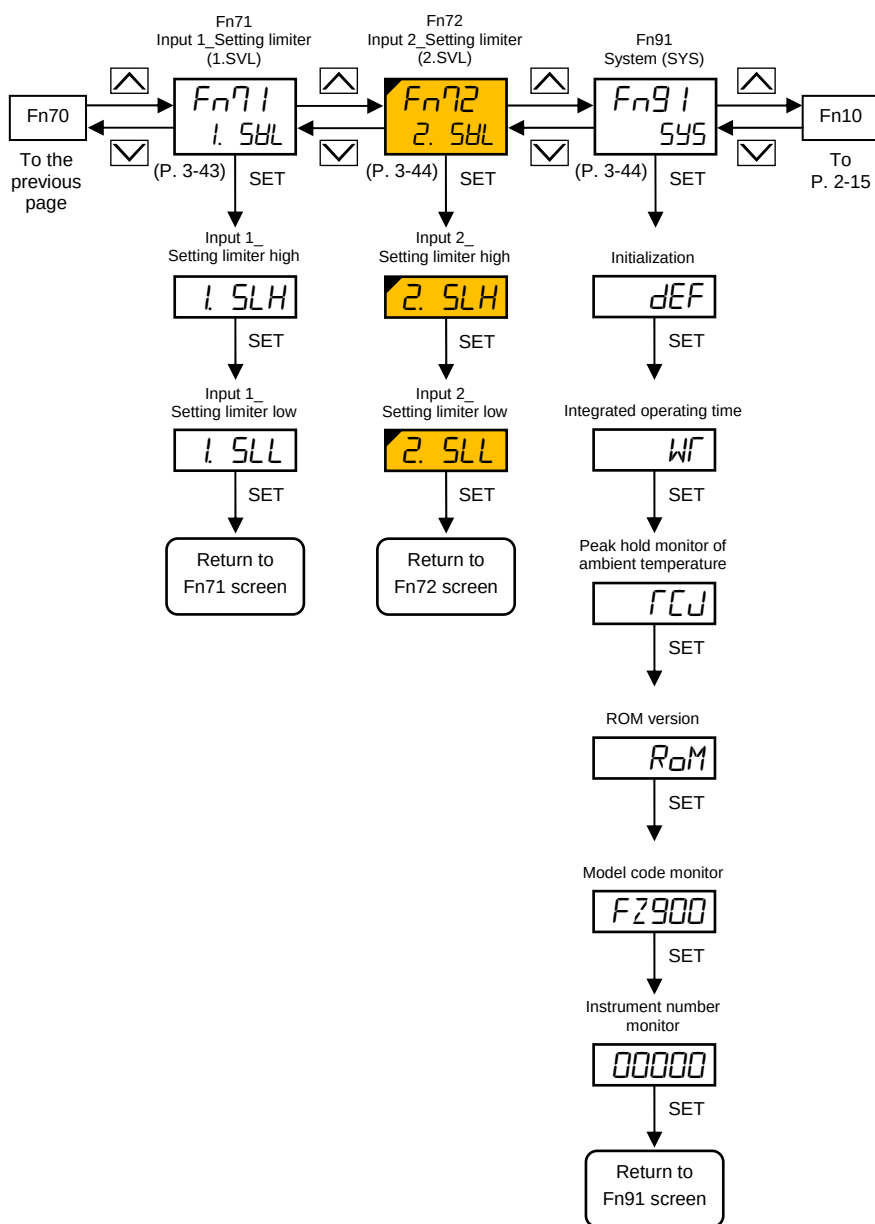














MEMO



PARAMETER LIST

3

This chapter describes displays, names and data ranges of each parameter.

3.1 How to Read the Table	3-2
3.2 Monitor & SV Setting Mode [A].....	3-3
3.3 Parameter Select Mode [B]	3-5
3.4 Operation Transfer Mode [C].....	3-6
3.5 Setting Lock Mode [D].....	3-7
3.6 Memory Area Transfer Mode [E] (FZ400/900)	3-8
3.7 Parameter Setting Mode [F]	3-9
3.8 Setup Setting Mode [G].....	3-16
3.9 Engineering Mode [H]	3-23



3.1 How to Read the Table

(1) ↓	(2) ↓	(3) ↓	(4) ↓	(5) ↓	(6) ↓
No.	Symbol	Name	Data range	Factory set value	User set value

- (1) No. :** This is a screen number used to register screens displayed in the Parameter select mode. The screen number can be registered in the Parameter select setting screen. Parameters without the number can not be registered in Parameter select setting screen. If there are two items with the same number, one of them will be displayed according to the display requirements.
- (2) Symbol:** 11-segment parameter symbols shown on the PV display.
- (3) Name:** Name of parameter
- (4) Data range:** Data range of parameter
- (5) Factory set value:** Factory set value of parameters
- (6) User set value:** Stores parameter values set by the user
This may be useful when the data is initialized.



In the data range and the factory set value some unfamiliar expressions are used. These are used for Control with PV select and can be rephrased as follows:

PV select input span as Input span

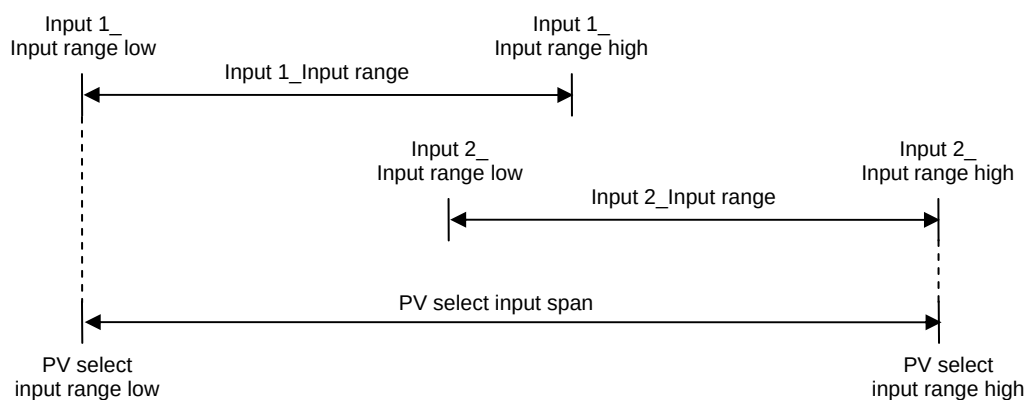
PV select input range high as Input range high

PV select input range low as Input range low

The setting range is as follows.

- PV select input range high: Input range high of Input 1 and Input 2, whichever is larger
- PV select input range low: Input range low of Input 1 and Input 2, whichever is smaller
- PV select input span: PV select input range low up to PV select input range high

[Example] When there is a relation as follows between the Input range of Input 1 and Input 2.



3.2 Monitor & SV Setting Mode [A]

No.	Symbol	Name	Data range	Factory set value	User set value
1	—	Input 1_Measured value (PV)/ Input 1_Set value (SV) ¹	PV display unit: Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.] SV display unit ² : - Input 1_Set value (SV) (Auto mode: at RUN) - STOP display [S_{TOP}, dS_{FP}, E_{SP}] - Remote setting input value (at Remote mode) - Input 1_Manual manipulated output value (at Manual mode)	—	—
1	—	PV select Measured value (PV)/ Input 1_Set value (SV) ³	PV display unit: When controlling with Input 1: Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) When controlling with Input 2: Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.] SV display unit ² : - Input 1_Set value (SV) (Auto mode: at RUN) - STOP display [S_{TOP}, dS_{FP}, E_{SP}] - Input 1_Manual manipulated output value (at Manual mode)	—	—
2	—	Input 2_Measured value (PV)/ Input 2_Set value (SV) ⁴	PV display unit: Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.] SV display unit ¹ : - Input 2_Set value (SV) (Auto mode: at RUN) - STOP display [S_{TOP}, dS_{FP}, E_{SP}] - Input 2_Manual manipulated output value (at Manual mode)	—	—

Displayed in case of FZ400/900.

¹ Not displayed when "Control with PV select" is selected in "Select function for input 2."

² Refer to the following table for the display range and the setting range of each data.

Display data	Data type	Data range
Input 1_Set value (SV)	Monitor/Setting	Input 1_Setting limiter low to Input 1_Setting limiter high
Input 2_Set value (SV)	Monitor/Setting	Input 2_Setting limiter low to Input 2_Setting limiter high
Remote setting input value	Monitor	Input 1_Setting limiter low to Input 1_Setting limiter high
Input 1_Manual manipulated output value	Setting	- In case of PID control or Position proportioning PID control with Feedback resistor (FBR): Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side] - In case of Heat/Cool PID control: –Input 1_Output limiter low [cool-side] to +Input 1_Output limiter high [heat-side] - In case of Position proportioning PID control without Feedback resistor (FBR): Not displayed
Input 2_Manual manipulated output value	Setting	Input 2_Output limiter low to Input 2_Output limiter high

³ Displayed when "Control with PV select" is selected in "Select function for input 2."

⁴ Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

Continued on the next page.



3.2 Monitor & SV Setting Mode [A]

No.	Symbol	Name	Data range	Factory set value	User set value
3	—	Measured value (PV) of differential temperature input/ Set value (SV) of differential temperature input ¹	PV display unit: –19999 to +99999* or –1999 to +9999** * In case of Input data type 0 ** In case of Input data type 1 [Varies with the setting of the Decimal point position.] SV display unit: –(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	—	—
4	—	Input 1_Measured value (PV)/ Input 2_Measured value (PV) ²	PV display unit: Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.] SV display unit: Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
24	1. SV	Input 1_Set value (SV) ³ ★	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	0	—
25	2. SV	Input 2_Set value (SV) ^{3,4} ★	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	0	—
26	dSV	Set value (SV) of differential temperature input ^{1,3} ★	–(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	0	—
5	SVR	Remote setting input value monitor ⁵	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	—	—
6	1. MV	Input 1_Manipulated output value monitor [heat-side] ⁶	–5.0 to +105.0 %	—	—
7	1. MVc	Input 1_Manipulated output value monitor [cool-side] ⁷	–5.0 to +105.0 %	—	—
8	2. MV	Input 2_Manipulated output value monitor ⁸	–5.0 to +105.0 %	—	—
9	CT1	Current transformer 1 (CT1) input value monitor ⁹	0.0 to 100.0 A	—	—
10	CT2	Current transformer 2 (CT2) input value monitor ¹⁰	0.0 to 100.0 A	—	—
11	EVENT	Comprehensive event state	When an event occurs, the character of the occurring event is displayed on the Set value (SV) display unit. If two or more events occur at the same time, the relevant characters are displayed alternately every 0.5 seconds. Ebf1: Event 1 Ebf2: Event 2 Ebf3: Event 3 Ebf4: Event 4 HbA1: Heater break alarm 1 (HBA1) HbA2: Heater break alarm 2 (HBA2) LbA1: Control loop break alarm 1 (LBA1) LbA2: Control loop break alarm 2 (LBA2) In1UP: Input 1_Input error high In1dn: Input 1_Input error low In2UP: Input 2_Input error high In2dn: Input 2_Input error low	—	—

Displayed in case of FZ400/900.

★ Data included in Memory area

¹ Displayed when "2-loop control/Differential temperature control" is selected in "Select function for input 2" AND "Differential temperature control" is selected in "2-loop control/Differential temperature control."

² Displayed when "2-loop control/Differential temperature control," "Cascade control," "Control with PV select" or "Input circuit error alarm" is selected in "Select function for input 2."

³ Displayed in Manual mode.

⁴ Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

⁵ For FZ400/900, this parameter is displayed when "Remote setting input" is selected in "Select function for input 2."
For FZ110, this parameter is displayed when Remote setting input is supplied.

⁶ Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.
Feedback resistance (FBR) input value is displayed when the Control action is a Position proportioning PID controller with Feedback resistance (FBR) input.

⁷ Displayed when Input 1 is Heat/Cool PID control.

⁸ Displayed when "2-loop control/Differential temperature control" is selected in "Select function for input 2."

⁹ Displayed when Current transformer (CT) input is supplied.

¹⁰ Displayed when two Current transformer (CT) inputs are supplied.

Continued on the next page.



No.	Symbol	Name	Data range	Factory set value	User set value
12	<i>APF</i>	Memory area soak time monitor	0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds * Displayed only for FZ400/900 when the input data type is 0. [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	—	—
13	<i>ILR</i>	Interlock release ¹	<i>oFF</i> : Interlock release <i>on</i> : Interlock state	<i>oFF</i>	
14	<i>AREA</i>	Memory area transfer ²	1 to 16	1	

¹ Displayed when Interlock function is valid.

² Displayed on FZ110. For FZ400/900, this parameter is displayed in the Memory area transfer mode.
This parameter is display only (not settable) if "Memory area transfer (without area set signal)" is selected in DI function selection AND "External mode" is selected in "Control area Local/External transfer."

3.3 Parameter Select Mode [B]

Up to 16 screens registered on the Parameter select setting screen (Set data lock mode) by the user can be displayed.



3.4 Operation Transfer Mode [C]

No.	Symbol	Name	Data range	Factory set value	User set value
15	<i>R/S</i>	RUN/STOP transfer	<i>rUn</i> : RUN (Control start) <i>SrOP</i> : STOP (Control stop)	<i>rUn</i>	
16	<i>1. ARU</i>	Input 1_Autotuning (AT)	<i>aFF</i> : PID control <i>on</i> : Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to "aFF."	<i>aFF</i>	
17	<i>2. ARU</i>	Input 2_Autotuning (AT) ¹	<i>aFF</i> : PID control <i>on</i> : Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to "aFF."	<i>aFF</i>	
18	<i>1. SRU</i>	Input 1_Startup tuning (ST) ²	<i>aFF</i> : ST unused <i>on I</i> : Execute once * <i>on C</i> : Execute always * When the ST is finished, the control will automatically return to "aFF."	<i>aFF</i>	
19	<i>2. SRU</i>	Input 2_Startup tuning (ST) ¹	<i>aFF</i> : ST unused <i>on I</i> : Execute once * <i>on C</i> : Execute always * When the ST is finished, the control will automatically return to "aFF."	<i>aFF</i>	
20	<i>1. A/M</i>	Input 1_Auto/Manual transfer	<i>RUfo</i> : Auto mode <i>nAn</i> : Manual mode	<i>RUfo</i>	
21	<i>2. A/M</i>	Input 2_Auto/Manual transfer ¹	<i>RUfo</i> : Auto mode <i>nAn</i> : Manual mode	<i>RUfo</i>	
22	<i>R/L</i>	Remote/Local transfer ³	- When "Remote setting input" is selected at Select function for Input 2 ⁴ <i>LoC</i>: Local mode <i>rEn</i>: Remote mode - When "Cascade control" is selected at Select function for input 2 ⁵ <i>SnGL</i>: Single control <i>CAS</i>: Cascade control - When "Control with PV select" is selected at Select function for input 2 ⁶ <i>InP I</i>: Input 1 <i>InP2</i>: Input 2 - When "2-loop control/Differential temperature control" is selected at Select function for input 2 ¹ <i>2LoaP</i>: 2-loop control <i>dIFF</i>: Differential temperature control	<i>LoC</i>	
23	<i>L/E</i>	Control area Local/External transfer ⁷	<i>LoC</i> : Local mode <i>EXf</i> : External mode	<i>LoC</i>	

 Displayed in case of FZ400/900.

¹ Displayed when "2-loop control/Differential temperature control" is selected in "Select function for input 2."

² Displayed when the Control action is not a Position proportioning PID control.

³ For FZ400/900, this parameter is displayed when any of the following is selected in Select function for input 2: "Remote setting input," "Cascade control," "Control with PV select," or "2-loop control/Differential temperature control."
For FZ110, this parameter is displayed when Remote setting input is supplied.

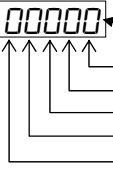
⁴ For FZ400/900, this parameter is displayed when "Remote setting input" is selected in "Select function for input 2."
For FZ110, this parameter is displayed when Remote setting input is supplied.

⁵ Displayed when "Cascade control" is selected in "Select function for input 2."

⁶ Displayed when "Control with PV select" is selected in "Select function for input 2."
When "Switching by level" is selected at "Selection of PV select trigger," the parameter becomes display only.

⁷ Displayed when "Memory area transfer (without area set signal)" is selected in DI function selection.

3.5 Setting Lock Mode [D]

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>LOCK</i>	Set data unlock/lock transfer	<i>oFF</i> : Unlock state <i>on</i> : Lock state	<i>oFF</i>	
—	<i>LCKLV</i>	Set lock level	0: Unlock 1: Lock  Set Lock/Unlock at each digit. * Set value (SV), Interlock release and Memory area transfer (FZ110 only)	00000	
—	<i>ARELK</i>	Area lock	0: Memory area is adjustable when the setting data is locked. 1: Memory area is not adjustable when the setting data is locked. (Memory area transfer mode is not displayed)	0	
—	<i>BLIND</i>	Select Blind function	<i>oFF</i> : Blind function: OFF <i>on</i> : Blind function: ON	<i>oFF</i>	
—	<i>PSLd</i>	Parameter select direct registration	<i>oFF</i> : Direct registration: OFF <i>on</i> : Direct registration: ON	<i>oFF</i>	
—	<i>PSLO1</i>	Parameter select setting 1	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSLO2</i>	Parameter select setting 2	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSLO3</i>	Parameter select setting 3	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSLO4</i>	Parameter select setting 4	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSLO5</i>	Parameter select setting 5	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSLO6</i>	Parameter select setting 6	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSLO7</i>	Parameter select setting 7	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSLO8</i>	Parameter select setting 8	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSLO9</i>	Parameter select setting 9	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSL 10</i>	Parameter select setting 10	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSL 11</i>	Parameter select setting 11	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSL 12</i>	Parameter select setting 12	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSL 13</i>	Parameter select setting 13	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSL 14</i>	Parameter select setting 14	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSL 15</i>	Parameter select setting 15	0 to 303 (Screen No.) 0: No registration	0	
—	<i>PSL 16</i>	Parameter select setting 16	0 to 303 (Screen No.) 0: No registration	0	

 Displayed in case of FZ400/900.

3.6 Memory Area Transfer Mode [E] (FZ400/900)

No.	Symbol	Name	Data range	Factory set value	User set value
14	<i>AREA</i>	Memory area transfer *	1 to 16	1	

 Displayed in case of FZ400/900.

* For FZ110, this parameter is displayed in the Monitor & SV setting mode.
This parameter is display only (not settable) if "Memory area transfer (without area set signal)" is selected in DI function selection AND "External mode" is selected in "Control area Local/External transfer."
Not displayed when "Memory area is not adjustable when the setting data is locked" is selected in Area lock.

3.7 Parameter Setting Mode [F]

■ Parameter group No. 00: Setting (5H)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Pn00</i>	Parameter group No. 00	This is the first parameter symbol of Parameter group No. 00.	—	—
24	<i>1. SV</i>	Input 1_Set value (SV) ★	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	0	
25	<i>2. SV</i>	Input 2_Set value (SV) ¹ ★	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	0	
26	<i>dSV</i>	Set value (SV) of differential temperature input ² ★	-(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	0	

 Displayed in case of FZ400/900.

★ Data included in Memory area

¹ Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

² Displayed when "2-loop control/Differential temperature control" is selected in "Select function for input 2" AND "Differential temperature control" is selected in "2-loop control/Differential temperature control."

■ Parameter group No. 40: Event (EH)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Pn40</i>	Parameter group No. 40 ¹	This is the first parameter symbol of Parameter group No. 40.	—	—
27	<i>EV 1</i>	Event 1 set value (EV1) ² Event 1 set value (EV1) [high] ^{2,3}	<u>Deviation:</u> - When assigned to Input_1 or Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) - When assigned to Input 2 -(Input 2_Input span) to +(Input 2_Input span) - When Control with PV select is selected at Select function for input 2. -(PV select input span) to +(PV select input span) [Varies with the setting of the Decimal point position.] <u>Input value or Set value:</u> - When assigned to Input 1 Input 1_Input range low to Input 1_Input range high - When assigned to Input 2 Input 2_Input range low to Input 2_Input range high - When assigned to Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) - When Control with PV select is selected at Select function for input 2. PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.] ★ <u>Manipulated output value:</u> -5.0 to +105.0 %	For Deviation, Input value and Set value: TC/RTD inputs: 10 V/I inputs: 5 % of input span For Manipulated output value: 50.0	
28	<i>EV 1'</i>	Event 1 set value (EV1') [low] ^{2,3}	<u>Deviation:</u> - When assigned to Input_1 or Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) - When assigned to Input 2 -(Input 2_Input span) to +(Input 2_Input span) - When Control with PV select is selected at Select function for input 2. -(PV select input span) to +(PV select input span) <u>Input value or Set value:</u> - When assigned to Input 1 Input 1_Input range low to Input 1_Input range high - When assigned to Input 2 Input 2_Input range low to Input 2_Input range high - When assigned to Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) - When Control with PV select is selected at Select function for input 2. PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.] ★	TC/RTD inputs: -10 V/I inputs: -5 % of input span	

★ Data included in Memory area

¹ Displayed when the Event function is valid.

² Displayed when Event 1 is valid.

³ Displayed when Event 1 type is high/low with individual setting.

Continued on the next page.



3.7 Parameter Setting Mode [F]

No.	Symbol	Name	Data range	Factory set value	User set value
29	EV2	Event 2 set value (EV2) ¹ Event 2 set value (EV2) [high] ^{1, 2} ★	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]		
30	EV2'	Event 2 set value (EV2') [low] ^{1, 2} ★	Same as Event 1 set value (EV1') [low]		
31	EV3	Event 3 set value (EV3) ³ Event 3 set value (EV3) [high] ^{3, 4} ★	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]		
32	EV3'	Event 3 set value (EV3') [low] ^{3, 4} ★	Same as Event 1 set value (EV1') [low]		
33	EV4	Event 4 set value (EV4) ⁵ Event 4 set value (EV4) [high] ^{5, 6} ★	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]		
34	EV4'	Event 4 set value (EV4') [low] ^{5, 6} ★	Same as Event 1 set value (EV1') [low]		

★ Data included in Memory area

¹ Displayed when Event 2 is valid.

² Displayed when Event 2 type is high/low with individual setting.

³ Displayed when Event 3 is valid.

⁴ Displayed when Event 3 type is high/low with individual setting.

⁵ Displayed when Event 4 is valid.

⁶ Displayed when Event 4 type is high/low with individual setting.

■ Parameter group No. 51: Input 1_Control (I_{Control})

No.	Symbol	Name	Data range	Factory set value	User set value
—	Pn51	Parameter group No. 51	This is the first parameter symbol of Parameter group No. 51	—	—
35	I. P	Input 1_Proportional band [heat-side] ★	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0	
36	I. I	Input 1_Integral time [heat-side] ¹ ★	PID control or Heat/Cool PID control: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control: 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240	
37	I. D	Input 1_Derivative time [heat-side] ¹ ★	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60	

★ Data included in Memory area

¹ Displayed when the "Input 1_Proportional band [heat-side]" in the same memory area is other than 0 (0.0).

Continued on the next page.

No.	Symbol	Name	Data range	Factory set value	User set value
38	<i>I. dHH</i>	Input 1_ON/OFF action differential gap (upper) ¹	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1	
39	<i>I. dHL</i>	Input 1_ON/OFF action differential gap (lower) ¹	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1	
40	<i>I. RPF</i>	Input 1_Control response parameter ★	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2	
41	<i>I.PACT</i>	Input 1_Proactive intensity ^{2,3} ★	0 to 4 0: No function	2	
42	<i>I. MR</i>	Input 1_Manual reset ⁴ ★	-100.0 to +100.0 %	0.0	
43	<i>I. FF</i>	Input 1_FF amount ^{1, 3, 5, 6} ★	-100.0 to +100.0 %	0.0	
44	<i>I. dLH</i>	Input 1_Output limiter high [heat-side] ⁷ ★	Input 1_Output limiter low [heat-side] to 105.0 %	105.0	
45	<i>I. dLL</i>	Input 1_Output limiter low [heat-side] ⁷ ★	-5.0 % to Input 1_Output limiter high [heat-side]	-5.0	
46	<i>I. LbA</i>	Input 1_Control loop break alarm (LBA) time ★	0 to 7200 seconds 0: No function	LBA function is specified: 480 LBA function is not specified: 0	
47	<i>I. LbD</i>	Input 1_LBA deadband (LBD) ★	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	0	

★ Data included in Memory area

¹ Displayed when the "Input 1_Proportional band [heat-side]" in any memory area is 0 (0.0). (Common setting in memory area)

² Displayed when the "Input 1_Proportional band [heat-side]" in the same memory area is other than 0 (0.0).

³ Displayed when the "Input 1_Integral time [heat-side]" in the same memory area is other than 0 (0.0, 0.00).

⁴ Displayed when the "Input 1_Integral time [heat-side]" in the same memory area is 0 (0.0, 0.00).

⁵ Displayed when Bottom suppression function is valid.

⁶ Displayed when the "Input 1_Control action" is other than Position proportioning PID control.

⁷ Not displayed when the "Input 1_Control action" is Position proportioning PID control AND Feedback resistance (FBR) input is not supplied.



■ Parameter group No. 52: Input 2_Control (2_Conf)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Pn52</i>	Parameter group No. 52 ¹	This is the first parameter symbol of Parameter group No. 52	—	—
48	<i>2. P</i>	Input 2_Proportional band ¹	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 2_Input span ★ 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0	
49	<i>2. I</i>	Input 2_Integral time ^{1,2}	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds ★ 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240	
50	<i>2. d</i>	Input 2_Derivative time ^{1,2}	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds ★ 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60	
51	<i>2. dHH</i>	Input 2_ON/OFF action differential gap (upper) ^{2,3}	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1	
52	<i>2. dHL</i>	Input 2_ON/OFF action differential gap (lower) ^{2,3}	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1	
53	<i>2. RPR</i>	Input 2_Control response parameter ¹	0: Slow 1: Medium 2: Fast ★ [When the P or PD action is selected, this setting becomes invalid]	0	
54	<i>2.PACr</i>	Input 2_Proactive intensity ^{1,2,4}	0 to 4 ★ 0: No function	2	
55	<i>2. MR</i>	Input 2_Manual reset ^{1,5}	–100.0 to +100.0 % ★	0.0	
56	<i>2. FF</i>	Input 2_FF amount ^{1,2,4,6}	–100.0 to +100.0 % ★	0.0	
57	<i>2. dLH</i>	Input 2_Output limiter high ²	Input 2_Output limiter low to 105.0 % ★	105.0	
58	<i>2. dLL</i>	Input 2_Output limiter low ²	–5.0 % to Input 2_Output limiter high ★	–5.0	
59	<i>2. LbA</i>	Input 2_Control loop break alarm (LBA) time ¹	0 to 7200 seconds 0: No function ★	LBA function is specified: 480 LBA function is not specified: 0	
60	<i>2. LbD</i>	Input 2_LBA deadband (LBD) ¹	0 to Input 2_Input span ★ [Varies with the setting of the Decimal point position.]	0	

Displayed in case of FZ400/900.

★ Data included in Memory area

¹ Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

² Displayed when the "Input 2_Proportional band" in the same memory area is other than 0 (0.0).

³ Displayed when the "Input 2_Proportional band" in any memory area is 0 (0.0). (Common setting in memory area)

⁴ Displayed when the "Input 2_Integral time" in the same memory area is other than 0 (0.0, 0.00).

⁵ Displayed when the "Input 2_Integral time" in the same memory area is 0 (0.0, 0.00).

⁶ Displayed when Bottom suppression function is valid.

Parameter group No. 56: Input 1_Cooling control (I.Cool)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Pn56</i>	Parameter group No. 56 ¹	This is the first parameter symbol of Parameter group No. 56	—	—
61	<i>I. Pc</i>	Input 1_Proportional band [cool-side] ^{1,2}	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.1 to 1000.0 % of PV select input span)	TC/RTD inputs: 30 V/I inputs: 3.0	
62	<i>I. Ic</i>	Input 1_Integral time [cool-side] ^{1,2}	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240	
63	<i>I. dc</i>	Input 1_Derivative time [cool-side] ^{1,2}	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60	
64	<i>I. db</i>	Input 1_Overlap/Deadband ¹	TC/RTD inputs: –(Input 1_Input span) to +(Input 1_Input span) [When Control with PV select: –(PV select input span) to +(PV select input span)] (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: –100.0 to +100.0 % of Input 1_Input span [When Control with PV select: –100.0 to +100.0 % of PV select input span] ★ Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0	
65	<i>I.oLHc</i>	Input 1_Output limiter high [cool-side] ¹	Input 1_Output limiter low [cool-side] to 105.0 %	105.0	
66	<i>I.oLLc</i>	Input 1_Output limiter low [cool-side] ¹	–5.0 % to Input 1_Output limiter high [cool-side]	–5.0	

★ Data included in Memory area

¹ Displayed when the “Input 1_Control action” is Heat/Cool PID control.

² Displayed when the “Input 1_Proportional band [heat-side]” in the same memory area is other than 0 (0.0).



■ Parameter group No. 70: Memory area (R-ER)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Pn70</i>	Parameter group No. 70	This is the first parameter symbol of Parameter group No. 70	—	—
67	<i>TRCA</i>	Select Trigger type for Memory area transfer	0 to 63 0: No assignment +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Digital input 1 (DI1) Close edge +32: Digital input 1 (DI1) Open edge ★ To select two or more functions, sum each value.	0	
68	<i>AST</i>	Area soak time	0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds * Settable only for FZ400/900 when the Input data type is 0. [Data range of Area soak time can be selected on the Soak time unit.] ★	0:00 (0 minutes 00 seconds)	
69	<i>LNKA</i>	Link area number	0 to 16 0: No link ★	0	
70	<i>ISVRU</i>	Input 1_Setting change rate limiter (up)	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function ★ [Varies with the setting of the Decimal point position.]	0	
71	<i>ISVRD</i>	Input 1_Setting change rate limiter (down)	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function ★ [Varies with the setting of the Decimal point position.]	0	
72	<i>IA/MA</i>	Input 1_Auto/Manual transfer selection (Area)	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump) ★	0	
73	<i>I.MVA</i>	Input 1_Manipulated output value (Area)	PID control, Position proportioning PID control: –5.0 to +105.0 % Heat/Cool PID control: –105.0 to +105.0 % ★	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0	
74	<i>2SVRU</i>	Input 2_Setting change rate limiter (up) ¹	0 to Input 2_Input span 0: No function ★ [Varies with the setting of the Decimal point position.]	0	
75	<i>2SVRD</i>	Input 2_Setting change rate limiter (down) ¹	0 to Input 2_Input span 0: No function ★ [Varies with the setting of the Decimal point position.]	0	
76	<i>2A/MA</i>	Input 2_Auto/Manual transfer selection (Area) ²	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump) ★	0	
77	<i>2.MVA</i>	Input 2_Manipulated output value (Area) ²	–5.0 to +105.0 % ★	–5.0	

Displayed in case of FZ400/900.

★ Data included in Memory area

¹ Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

² Displayed when "2-loop control/Differential temperature control" is selected in "Select function for input 2."

Continued on the next page.



No.	Symbol	Name	Data range	Factory set value	User set value
78	<i>R/LA</i>	Remote/Local transfer selection (Area) ¹	- When "Remote setting input" is selected at Select function for Input 2² 0: No transfer 1: Local mode 2: Remote mode - When "Cascade control" is selected at Select function for input 2³ 0: No transfer 1: Single control 2: Cascade control - When "Control with PV select" is selected at Select function for input 2⁴ 0: No transfer 1: Input 1 2: Input 2 - When "2-loop control/Differential temperature control" is selected at Select function for input 2⁵ 0: No transfer 1: 2-loop control 2: Differential temperature control	0	

Displayed in case of FZ400/900.

★ Data included in Memory area

¹ For FZ400/900, this parameter is displayed when any of the following is selected in Select function for input 2: "Remote setting input," "Cascade control," "Control with PV select," or "2-loop control/Differential temperature control."
For FZ110, this parameter is displayed when Remote setting input is supplied.

² For FZ400/900, this parameter is displayed when "Remote setting input" is selected in "Select function for input 2."
For FZ110, this parameter is displayed when Remote setting input is supplied.

³ Displayed when "Cascade control" is selected in "Select function for input 2."

⁴ Displayed when "Control with PV select" is selected in "Select function for input 2."

⁵ Displayed when "2-loop control/Differential temperature control" is selected in "Select function for input 2."



3.8 Setup Setting Mode [G]

■ Setting group No. 10: Display (*dSP*)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Sn10</i>	Setting group No. 10	This is the first parameter symbol of Setting group No. 10	—	—
79	<i>PVcy</i>	Display update cycle	1: 50 ms 5: 250 ms 9: 450 ms 2: 100 ms 6: 300 ms 10: 500 ms 3: 150 ms 7: 350 ms 4: 200 ms 8: 400 ms	1	

■ Setting group No. 21: Input 1 (*1. InP*)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Sn21</i>	Setting group No. 21	This is the first parameter symbol of Setting group No. 21	—	—
80	<i>1. Pb</i>	Input 1_PV bias	–(Input 1_Input span) to +(Input 1_Input span) [When Control with PV select: –(PV select input span) to +(PV select input span)] [Varies with the setting of the Decimal point position.]	0	
81	<i>1. dF</i>	Input 1_PV digital filter	0.0 to 100.0 seconds 0.0: Filter OFF	0.0	
82	<i>1. PR</i>	Input 1_PV ratio	0.500 to 1.500	1.000	
83	<i>1. PLC</i>	Input 1_PV low input cut-off *	0.00 to 25.00 % of Input 1_Input span (When Control with PV select: 0.00 to 25.00 % of PV select input span)	0.00	

* This parameter is displayed when Input 1 is Voltage/Current and when Square root extraction is valid.

■ Setting group No. 22: Input 2 (*2. InP*)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Sn22</i>	Setting group No. 22 ¹	This is the first parameter symbol of Setting group No. 22	—	—
84	<i>2. Pb</i>	Input 2_PV bias ² (RS bias) ³	Input 2_PV bias –(Input 2_Input span) to +(Input 2_Input span) RS bias –(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	0	
85	<i>2. dF</i>	Input 2_PV digital filter ² (RS digital filter) ⁴	0.0 to 100.0 seconds 0.0: Filter OFF	0.0	
86	<i>2. PR</i>	Input 2_PV ratio ² (RS ratio) ⁵	Input 2_PV ratio 0.500 to 1.500 RS ratio 0.001 to 9.999	1.000	
87	<i>2. PLC</i>	Input 2_PV low input cut-off ⁶	0.00 to 25.00 % of Input 2_Input span	0.00	

Displayed in case of FZ400/900.

¹ Displayed on FZ400/900 with dual inputs. Not displayed when "No function" is selected in "Select function for input 2."
For FZ110, this parameter is displayed when Remote setting input is supplied.

² Displayed on FZ400/900 with dual inputs. Not displayed when "No function" is selected in "Select function for input 2."

³ This parameter is displayed as "RS bias" on FZ400/900 if "Remote setting input" is selected in Select function for input 2.
For FZ110: Displayed as "RS bias" when Remote setting input is supplied.

⁴ This parameter is displayed as "RS digital filter" on FZ400/900 if "Remote setting input" is selected in Select function for input 2.
For FZ110: Displayed as "RS digital filter" when Remote setting input is supplied.

⁵ This parameter is displayed as "RS ratio" on FZ400/900 if "Remote setting input" is selected in Select function for input 2.
For FZ110: Displayed as "RS ratio" when Remote setting input is supplied.

⁶ This parameter is displayed when Input 2 is Voltage/Current and when Square root extraction is valid. Not displayed when "No function" or "Remote setting input" is selected in "Select function for input 2."

Setting group No. 30: Output (OUT)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Sn30</i>	Setting group No. 30 ¹	This is the first parameter symbol of Setting group No. 30	—	—
88	<i>r1</i>	OUT1 proportional cycle time ²	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note1	
89	<i>r2</i>	OUT2 proportional cycle time ³	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note2	
90	<i>r3</i>	OUT3 proportional cycle time ⁴	0.1 to 100.0 seconds	Voltage pulse output: Note3	
91	<i>MF1</i>	OUT1 minimum ON/OFF time of proportional cycle ²	0 to 1000 ms	0	
92	<i>MF2</i>	OUT2 minimum ON/OFF time of proportional cycle ³	0 to 1000 ms	0	
93	<i>MF3</i>	OUT3 minimum ON/OFF time of proportional cycle ⁴	0 to 1000 ms	0	

Note1: In case OUT1 function selection is "Input 1_Control output [cool-side]" AND Inpu1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other casees: 2.0

Note2: In case OUT2 function selection is "Input 1_Control output [cool-side]" AND Inpu1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other casees: 2.0

Note3: In case OUT3 function selection is "Input 1_Control output [cool-side]" AND Inpu1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other casees: 2.0

¹ Displayed when any one of OUT1 to OUT3 is Relay contact output, Voltage pulse output or Transistor output.

² Displayed when OUT1 is Relay contact output, Voltage pulse output or Transistor output.

³ Displayed when OUT2 is Relay contact output, Voltage pulse output or Transistor output.

⁴ Displayed when OUT3 is supplied and "Universal output type selection" is "Voltage pulse output."

Setting group No. 45: Heater break alarm 1 (HbA1)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Sn45</i>	Setting group No. 45	This is the first parameter symbol of Setting group No. 45	—	—
94	<i>HbA1</i>	Heater break alarm 1 (HBA1) set value ^{1,2}	0.0 to 100.0 A 0.0: HBA function OFF	0.0	
95	<i>HbC1</i>	Number of heater break alarm 1 (HBA1) delay times ¹	0 to 255 times	5	

¹ Displayed when Current transformer (CT) input is supplied. Not displayed in the following cases.

- CT1 assignment is "None."
- The output type of CT1 assignment is Current output or Continuous voltage output.

² For FZ400/900: Current transformer 1 (CT1) input is displayed on the MV display.



■ Setting group No. 46: Heater break alarm 2 (HbA2)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Sn46</i>	Setting group No. 46	This is the first parameter symbol of Setting group No. 46	—	—
96	<i>HbA2</i>	Heater break alarm 2 (HBA2) set value ^{1,2}	0.0 to 100.0 A 0.0: HBA function OFF	0.0	
97	<i>HbC2</i>	Number of heater break alarm 2 (HBA2) delay times ¹	0 to 255 times	5	

 Displayed in case of FZ400/900.

¹ Displayed when two Current transformer (CT) inputs are supplied. Not displayed in the following cases.

- CT2 assignment is "None."
- The output type of CT2 assignment is Current output or Continuous voltage output.

² For FZ400/900: Current transformer 2 (CT2) input is displayed on the MV display.

■ Setting group No. 51: Input 1_Control (I.Cntrl)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Sn51</i>	Setting group No. 51	This is the first parameter symbol of Setting group No. 51	—	—
98	<i>I.MMV</i>	Input 1_Manual manipulated output value ¹	PID control, Position proportioning PID control: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side] Heat/Cool PID control ² : –(Input 1_Output limiter high [cool-side]) to +(Input 1_Output limiter high [heat-side])	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0	
99	<i>I.LEV1</i>	Input 1_Level PID setting 1 ^{3,4}	Input 1_Input range low to Input 1_Input range high [When Control with PV select: PV select input range low to PV select input range high] [Varies with the setting of the Decimal point position.]	Input 1_ Input range high [Control with PV select: PV select input range high]	
100	<i>I.LEV2</i>	Input 1_Level PID setting 2 ^{3,4}	Same as Input 1_Level PID setting 1		
101	<i>I.LEV3</i>	Input 1_Level PID setting 3 ^{3,4}	Same as Input 1_Level PID setting 1		
102	<i>I.LEV4</i>	Input 1_Level PID setting 4 ^{3,4}	Same as Input 1_Level PID setting 1		
103	<i>I.LEV5</i>	Input 1_Level PID setting 5 ^{3,4}	Same as Input 1_Level PID setting 1		
104	<i>I.LEV6</i>	Input 1_Level PID setting 6 ^{3,4}	Same as Input 1_Level PID setting 1		
105	<i>I.LEV7</i>	Input 1_Level PID setting 7 ^{3,4}	Same as Input 1_Level PID setting 1		

¹ Not displayed on a Position proportioning PID controller without Feedback resistor (FBR).

² In case of Heat/Cool PID control, the data range has such exceptional conditions as shown below.

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

³ Displayed when Input 1 is with Level-PID AND any code other than "Cascade control" is selected in Select function for input 2.

⁴ Input 1_Level PID settings 1 to 7 always maintain the following relation.

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

Setting group No. 52: Input 2_Control (2.Conf)

No.	Symbol	Name	Data range	Factory set value	User set value
—	5n52	Setting group No. 52 ¹	This is the first parameter symbol of Setting group No. 52	—	—
106	2.MMV	Input 2_Manual manipulated output value ¹	Input 2_Output limiter low to Input 2_Output limiter high	−5.0	
107	2.LEV1	Input 2_Level PID setting 1 ^{2,3}	Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.]	Input 2_ Input range high	
108	2.LEV2	Input 2_Level PID setting 2 ^{2,3}	Same as Input 2_Level PID setting 1		
109	2.LEV3	Input 2_Level PID setting 3 ^{2,3}	Same as Input 2_Level PID setting 1		
110	2.LEV4	Input 2_Level PID setting 4 ^{2,3}	Same as Input 2_Level PID setting 1		
111	2.LEV5	Input 2_Level PID setting 5 ^{2,3}	Same as Input 2_Level PID setting 1		
112	2.LEV6	Input 2_Level PID setting 6 ^{2,3}	Same as Input 2_Level PID setting 1		
113	2.LEV7	Input 2_Level PID setting 7 ^{2,3}	Same as Input 2_Level PID setting 1		

Displayed in case of FZ400/900.

¹ Displayed if "2-loop control/Differential temperature control" is selected in "Select function for input 2."

² Displayed when Input 2 is with Level-PID AND "2-loop control/Differential temperature control" is selected in "Select function for input 2."

³ Input 2_Level PID settings 1 to 7 always maintain the following relation.

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

Setting group No. 53: Input 1_Tuning (1.FUNE)

No.	Symbol	Name	Data range	Factory set value	User set value
—	5n53	Setting group No. 53	This is the first parameter symbol of Setting group No. 53	—	—
114	1.Afb	Input 1_AT bias	−(Input 1_Input span) to +(Input 1_Input span) When Control with PV select: −(PV select input span) to +(PV select input span) [Varies with the setting of the Decimal point position.]	0	
115	1.AFTM	Input 1_AT remaining time monitor	0 hours 00 minutes to 48 hours 00 minutes	—	—
116	1.FUNE	Input 1_AT/ST status monitor	0: AT/ST complete 1: AT running now 2: ST running now −1: Aborted. Setting changed. −2: Aborted. Abnormal input. −3: Aborted. Timeout. −4: Aborted. Abnormal calculated values.	—	—



■ Setting group No. 54: Input 2_Tuning (2.FUNE)

No.	Symbol	Name	Data range	Factory set value	User set value
—	5n54	Setting group No. 54 *	This is the first parameter symbol of Setting group No. 54	—	—
117	2.ATb	Input 2_AT bias *	-(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	0	
118	2.ATRM	Input 2_AT remaining time monitor *	0 hours 00 minutes to 48 hours 00 minutes	—	—
119	2.FUNE	Input 2_AT/ST status monitor *	0: AT/ST complete 1: AT running now 2: ST running now -1: Aborted. Setting changed. -2: Aborted. Abnormal input. -3: Aborted. Timeout. -4: Aborted. Abnormal calculated values.	—	—

Displayed in case of FZ400/900.

* Displayed when "2-loop control/Differential temperature control" is selected in "Select function for input 2."

■ Setting group No. 55: Position proportioning control (PδSI Γ)

No.	Symbol	Name	Data range	Factory set value	User set value
—	5n55	Setting group No. 55 *	This is the first parameter symbol of Setting group No. 55	—	—
120	Ydb	Open/Close output neutral zone *	0.1 to 10.0 % of output	2.0	
121	YHS	Open/Close output differential gap *	0.1 to 5.0 % of output	1.0	

* Displayed when the control action is Position proportioning PID control.

■ Setting group No. 57: Proactive (PACΓ)

No.	Symbol	Name	Data range	Factory set value	User set value
—	5n57	Setting group No. 57	This is the first parameter symbol of Setting group No. 57	—	—
122	FF5Γ	FF amount learning ¹	0 to 3 0: No learning +1: Learn Input 1 +2: Learn Input 2 To select two or more functions, sum each value.	0	
123	1.E×dJ	Input 1_Determination point of external disturbance	-(Input 1_Input span) to +(Input 1_Input span) [When Control with PV select: -(PV select input span) to +(PV select input span)] [Varies with the setting of the Decimal point position.]	-1	
124	2.E×dJ	Input 2_Determination point of external disturbance ²	-(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	-1	

Displayed in case of FZ400/900.

¹ Displayed when Bottom suppression function is valid.

² Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

Setting group No. 58: 2-input function (2PV)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Sn58</i>	Setting group No. 58 ^{1,2}	This is the first parameter symbol of Setting group No. 58	—	—
125	<i>MRS.P</i>	Cascade_Proportional band (master-side) ¹	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span	TC/RTD inputs: 30 V/I inputs: 3.0	
126	<i>MRS.I</i>	Cascade_Integral time (master-side) ¹	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240	
127	<i>MRS.D</i>	Cascade_Derivative time (master-side) ¹	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60	
128	<i>SLV.P</i>	Cascade_Proportional band (slave-side) ¹	TC/RTD inputs: 1 (0.1, 0.01) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 2_Input span	TC/RTD inputs: 30 V/I inputs: 3.0	
129	<i>SLV.I</i>	Cascade_Integral time (slave-side) ¹	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240	
130	<i>SLV.D</i>	Cascade_Derivative time (slave-side) ¹	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60	
131	<i>CLDF</i>	Cascade_Digital filter ¹	0.0 to 100.0 seconds 0.0: Filter OFF	10.0	
132	<i>CLSCH</i>	Cascade_Scale high ¹	Cascade_Scale low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	Input 2_Setting limiter high	
133	<i>CLSEL</i>	Cascade_Scale low ¹	Input 2_Setting limiter low to Cascade_Scale high [Varies with the setting of the Decimal point position.]	Input 2_Setting limiter low	
134	<i>2PV.LV</i>	PV select transfer level ²	Input 1_Input range low to Input 1_Input range high [Varies with the setting of the Decimal point position.]	Input 1_Input range high	
135	<i>2PV.TM</i>	PV select transfer time ²	0.0 to 100.0 seconds	0.0	

Displayed in case of FZ400/900.

¹ Displayed when "Cascade control" is selected in "Select function for input 2."

² Displayed when "Control with PV select" is selected in "Select function for input 2."



■ Setting group No. 91: System (545)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>5n91</i>	Setting group No. 91	This is the first parameter symbol of Setting group No. 91	—	—
136	<i>1.PHLd</i>	Input 1_Peak hold monitor	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
137	<i>1.bHLd</i>	Input 1_Bottom hold monitor	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
138	<i>1.HLdR</i>	Input 1_Hold reset	<i>HoLd</i> : Hold <i>rESEt</i> : Reset Returns to Hold state automatically after reset.	<i>HoLd</i>	—
139	<i>2.PHLd</i>	Input 2_Peak hold monitor *	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
140	<i>2.bHLd</i>	Input 2_Bottom hold monitor *	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—	—
141	<i>2.HLdR</i>	Input 2_Hold reset *	<i>HoLd</i> : Hold <i>rESEt</i> : Reset Returns to Hold state automatically after reset.	<i>HoLd</i>	—

 Displayed in case of FZ400/900.

* This parameter is displayed when any of the following is selected in Select function for input 2: "Cascade control," "Control with PV select," "2-loop control/Differential temperature control" or "Input circuit error alarm."

3.9 Engineering Mode [H]

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.



NOTE

Parameters in Engineering mode are settable only when the controller is in STOP mode. However, only checking can be made even in the RUN state.

■ Function block No. 10: Display (dSP)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n 10</i>	Function block No. 10	This is the first parameter symbol of Function block No. 10	—	—
142	<i>SPCH</i>	STOP display selection	0: Stop on PV display 1: Stop on SV display 2: Stop on MV display * * Selectable only for FZ400/900.	1	
143	<i>ALC</i>	ALM lamp lighting condition	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	255	
144	<i>dSP</i>	PV flashing display at input error	0: Flashing display 1: Non-flashing display	0	
145	<i>1.dS.SV</i>	Show/Hide Input 1_SV	0: Hide Input 1_SV 1: Show Input 1_SV	1	
146	<i>2.dS.SV</i>	Show/Hide Input 2_SV ¹	0: Hide Input 2_SV 1: Show Input 2_SV	1	
147	<i>1.dS.MV</i>	Show/Hide Input 1_MV	0: Hide 1: Show Input 1_Manipulated output value (MV) 2: Show Memory area soak time 3: Show Current transformer 1 (CT1) input value 4: Show Current transformer 2 (CT2) input value	1	
148	<i>2.dS.MV</i>	Show/Hide Input 2_MV ²	0: Hide 1: Show Input 2_Manipulated output value (MV) 2: Show Memory area soak time 3: Show Current transformer 1 (CT1) input value 4: Show Current transformer 2 (CT2) input value	1	

Displayed in case of FZ400/900.

¹ Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

² Displayed when "2-loop control/Differential temperature control" is selected in "Select function for input 2."



No.	Symbol	Name	Data range	Factory set value	User set value
149	<i>dS.Mon</i>	Select hide items in Monitor mode	0 to 31 0: Show all +1: Remote setting input value monitor +2: Manipulated output value (MV) monitor +4: Current transformer (CT) monitor +8: Comprehensive event state +16: Memory area soak time To select two or more functions, sum each value.	0	
150	<i>dS.Mod</i>	Select hide items in Operation transfer mode	0 to 63 0: Show all +1: RUN/STOP transfer +2: Autotuning (AT) +4: Startup tuning (ST) +8: Auto/Manual transfer +16: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +32: Control area Local/External transfer To select two or more functions, sum each value.	0	

■ Function block No. 11: Key operation (*KEY*)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Fn 11</i>	Function block No. 11	This is the first parameter symbol of Function block No. 11	—	—
151	<i>SEt.KY</i>	Data registration	0: SET key method Used to register the Set value (SV) using the SET key. 1: Direct registration Used to register the Set value (SV) without pressing the SET key.	0	
152	<i>FN.KY</i>	FUNC key assignment	0: Unused 1: RUN/STOP transfer 2: Autotuning (AT) (Common to Input 1 and 2) 3: Input 1_Autotuning (AT) 4: Input 2_Autotuning (AT) 5: Auto/Manual transfer (Common to Input 1 and 2) 6: Input 1_Auto/Manual transfer 7: Input 2_Auto/Manual transfer 8: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 9: Control area Local/External transfer 10: Interlock release 11: Hold reset (Common to Input 1 and 2) 12: Input 1_Hold reset 13: Input 2_Hold reset 14: Set data unlock/lock transfer 15: Area jump	1	
153	<i>FN.FYP</i>	FUNC key operation selection	0: Press once The function set at "FUNC key assignment" is activated upon a press of the FUNC key. 1: Press and hold The function set at "FUNC key assignment" is activated by holding the FUNC key pressed.	0	

Displayed in case of FZ400/900.

Function block No. 21: Input 1 (I, I nP)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_{n21}</i>	Function block No. 21	This is the first parameter symbol of Function block No. 21	—	—
154	<i>I, I nP</i>	Input 1_Input type	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PLII 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input –10 to +10 V DC 22: Voltage input –5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC	Same as the input type of the input range code specified at the time of order.	
155	<i>I, UNI F</i>	Input 1_Display unit ¹	0: °C 1: °F	Same as the display unit of the input range code specified at the time of order.	
156	<i>I, PGDP</i>	Input 1_Decimal point position	0: No decimal place 1: One decimal place 2: Two decimal place 3: Three decimal place 4: Four decimal place TC input: K, J, T, U, L: 0 to 1 Thermocouples other than those shown above: 0 (fixed) RTD input: 0 to 2 Voltage (V)/Current (I) input: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3 (When Control with PV select: Decimal point position setting of Input 1 and Input 2 is compared and the smaller will be used.)	Same as the decimal point position of the input range code specified at the time of order. For V/I inputs: 1	
157	<i>I, PGSH</i>	Input 1_Input range high	(Input 1_Input range low + 1digit) to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.]	High limit value of the input range code specified at the time of order. For V/I inputs: 100.0	
158	<i>I, PGSL</i>	Input 1_Input range low	Input 1_Minimum value of input range to (Input 1_Input range high – 1digit) [Varies with the setting of the Decimal point position.]	Low limit value of the input range code specified at the time of order. For V/I inputs: 0.0	
159	<i>I, P_oH</i>	Input 1_Input error determination point (high)	Input 1_Input error determination point (low) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	Input 1_ Input range high + (Input 1_5 % of input span)	
160	<i>I, P_oL</i>	Input 1_Input error determination point (low)	Input 1_Input range low – (Input 1_5 % of input span) * to Input 1_Input error determination point (high) [Varies with the setting of the Decimal point position.] * When Input type of Input 1 is RTD, low limit value is about 2 Ohms. (Pt100: –245.5 °C [–409.8 °F], JPt100: –237.6 °C [–395.7 °F])	Input 1_ Input range low – (Input 1_5 % of input span)	
161	<i>I, TCJC</i>	Input 1_Temperature compensation calculation ²	0: No temperature compensation calculation 1: With temperature compensation calculation	1	
162	<i>I, b_oS</i>	Input 1_Burnout direction ³	0: Upscale 1: Downscale	0	

¹ Displayed when "Input 1_Input type" is either Thermocouple (TC) or RTD.

² Displayed when "Input 1_Input type" is Thermocouple (TC).

³ Displayed when "Input 1_Input type" is Thermocouple (TC) or Low voltage input (0 to 100 mV DC and 0 to 10 mV DC).

Continued on the next page.



3.9 Engineering Mode [H]

No.	Symbol	Name	Data range	Factory set value	User set value
163	<i>I. SQR</i>	Input 1_Square root extraction ¹	0: Unused 1: Used	0	
164	<i>I. INV</i>	Input 1_Inverting input ¹	0: Unused 1: Used	0	
165	<i>I. IND</i>	Input data type	0: Number of measured value digits: 5 Number of RKC communication digits: 7 Modbus: Double word PLC communication: Double word (System data: Single word) 1: Number of measured value digits: 4 Number of RKC communication digits: 6 * Modbus: Single word ** PLC communication: Single word * Set "2" to handle the data of REX-D and its equivalent models in RKC communication. ** The data of the FB series and its equivalent are included. The unit of time depends on the Input data type. In case of Input data type 0 FZ400/900: hour/minute/second, hour/minute, minute/second FZ110: hour/minute, minute/second In case of Input data type 1 hour/minute, minute/second	Conforms to Input range code to specified at the time of ordering	

¹ Displayed when Input 1 is Voltage (V)/Current (I).

Function block No. 22: Input 2 (2. I nP)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_{n22}</i>	Function block No. 22 ¹	This is the first parameter symbol of Function block No. 22	—	—
166	<i>2. I nP</i>	Input 2_Input type ^{1,2}	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PLII 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input –10 to +10 V DC 22: Voltage input –5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC • When Measured Input 2 is selected for FZ400/900: 0 to 24 • When Remote setting input is selected for FZ400/900: 15 to 24 • When Remote setting input is selected for FZ110: 15 to 22	Same as Input 1_Input type When Remote setting input is specified at the time of order, but the input type is not specified: 17	
167	<i>2.UNI T</i>	Input 2_Display unit ^{2,3,4}	0: °C 1: °F	Same as Input 1_Display unit	
168	<i>2.PC dP</i>	Input 2_Decimal point position ^{2,4}	0: No decimal place 1: One decimal place 2: Two decimal place 3: Three decimal place 4: Four decimal place TC input: K, J, T, U, L: 0 to 1 Thermocouples other than those shown above: 0 (fixed) RTD input: 0 to 2 Voltage (V)/Current (I) input: For Input data type is 0: 0 to 4 For Input data type is 1: 0 to 3	Same as Input 1_Decimal point position	
169	<i>2.PC SH</i>	Input 2_Input range high ¹	TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): (Input 2_Input range low + 1digit) to Input 2_Maximum value of input range Voltage (V)/Current (I) Inputs (For Remote setting input): Input 2_Input range low to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.]	Same as Input 1_Input range high	
170	<i>2.PC SL</i>	Input 2_Input range low ¹	TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): Input 2_Minimum value of input range to (Input 2_Input range high – 1digit) Voltage (V)/Current (I) Inputs (For Remote setting input): Input 1_Minimum value of input range to Input 2_Input range high [Varies with the setting of the Decimal point position.]	Same as Input 1_Input range low	

Displayed in case of FZ400/900.

¹ For FZ400/900, this parameter is displayed when Remote setting input or Measured input 2 is supplied.
For FZ110, this parameter is displayed when Remote setting input is supplied.

² Not displayed when "No function" is selected in "Select function for input 2."

³ Displayed when Input 2 is either Thermocouple (TC) or RTD.

⁴ Not settable when Remote setting input or Control with PV select is selected.

Continued on the next page.



3.9 Engineering Mode [H]

No.	Symbol	Name	Data range	Factory set value	User set value
171	2. P _o V	Input 2_Input error determination point (high) ¹	Input 2_Input error determination point (low) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	Input 2_Input range high + (Input 2_5 % of input span)	
172	2. P _u N	Input 2_Input error determination point (low) ¹	Input 2_Input range low – (Input 2_5 % of input span) * to Input 2_Input error determination point (high) [Varies with the setting of the Decimal point position.] * When Input type of Input 2 is RTD, low limit value is about 2 Ohms. (Pt100: –245.5 °C [–409.8 °F], JPt100: –237.6 °C [–395.7 °F])	Input 2_Input range low – (Input 2_5 % of input span)	
173	2. TCJC	Input 2_Temperature compensation calculation ^{2,3}	0: No temperature compensation calculation 1: With temperature compensation calculation	1	
174	2. b _o S	Input 2_Burnout direction ^{2,4}	0: Upscale 1: Downscale	0	
175	2. SQR	Input 2_Square root extraction ^{1,5}	0: Unused 1: Used	0	
176	2. I NV	Input 2_Inverting input ^{1,5}	0: Unused 1: Used	0	

 Displayed in case of FZ400/900.

¹ Not displayed when "No function" or "Remote setting input" is selected in "Select function for input 2."

² Not displayed when "No function" is selected in "Select function for input 2."

³ Displayed when Input 2 is either Thermocouple (TC) or RTD.

⁴ Displayed when Input 2 is Thermocouple (TC) or Low voltage input (0 to 100 mV DC and 0 to 10 mV DC).

⁵ Displayed when Input 2 is Voltage (V)/Current (I).

Function block No. 23: Digital input (DI)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n23</i>	Function block No. 23 ¹	This is the first parameter symbol of Function block No. 23	—	—
177	<i>DI SL 1</i>	DI1 function selection ¹	0: No function 1: RUN/STOP transfer 2: Auto/Manual transfer (Common to Input 1 and 2) 3: Input 1_Auto/Manual transfer 4: Input 2_Auto/Manual transfer 5: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 6: Interlock release 7: Hold reset (Common to Input 1 and 2) 8: Input 1_Hold reset 9: Input 2_Hold reset 10: Autotuning (AT) (Common to Input 1 and 2) 11: Input 1_Autotuning (AT) 12: Input 2_Autotuning (AT) 13: Set data unlock/lock transfer 14: Direct/Reverse action transfer 15: Memory area transfer (2 points, without area set signal) 16: Memory area transfer (8 points, without area set signal) 17: Memory area transfer (8 points, with area set signal) 18: Memory area transfer (16 points, without area set signal) 19: Memory area transfer (16 points, with area set signal) 20: Area jump	Based on Model code	
178	<i>DI SL 2</i>	DI2 function selection ²	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code	
179	<i>DI SL 3</i>	DI3 function selection ²	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code	
180	<i>DI SL 4</i>	DI4 function selection ³	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code	
181	<i>DI SL 5</i>	DI5 function selection ⁴	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code	
182	<i>DI SL 6</i>	DI6 function selection ⁴	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code	
183	<i>DI I NV</i>	DI logic invert ¹	0 to 31 0: No logic invert +1: RUN/STOP transfer +2: Auto/Manual transfer +4: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +8: Set data unlock/lock transfer +16: Direct/Reverse action transfer To select two or more functions, sum each value.	0	
184	<i>DI TIM</i>	Area switching time ¹ (without area set signal)	1 to 5 seconds	2	

 Displayed in case of FZ400/900.

¹ Displayed when Digital input function is supplied.

² Displayed when Digital input function is supplied. For FZ110: Displayed when three Digital inputs (DI) are supplied.

³ Displayed when Digital input function is supplied. (FZ400/900 only)

⁴ Displayed when six Digital inputs (DI) are supplied. (FZ400/900 only)



■ Function block No. 30: Output (OUT)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n30</i>	Function block No. 30	This is the first parameter symbol of Function block No. 30	—	—
185	<i>oSL1</i>	OUT1 function selection ¹	0: No assignment 1: Input 1_Control output [heat-side] or [open-side] 2: Input 1_Control output [cool-side] or [close-side] 3: Input 2_Control output 4: Retransmission output 5: Logic calculation output (Event, HBA, LBA, Input error) 6: RUN state output 7: Input 1_Manual mode state output 8: Input 2_Manual mode state output 9: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 10: Input 1_Autotuning (AT) state output 11: Input 2_Autotuning (AT) state output 12: Output while Set value of Input 1 is changing 13: Output while Set value of Input 2 is changing 14: Output of the communication monitoring result 15: FAIL output	Based on Model code	
186	<i>oSL2</i>	OUT2 function selection ²	Same as OUT1 function selection	Based on Model code	
187	<i>oSL3</i>	OUT3 function selection ³	Same as OUT1 function selection	4	
188	<i>oLG1</i>	OUT1 logic calculation selection ¹	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0	
189	<i>oLG2</i>	OUT2 logic calculation selection ²	Same as OUT1 logic calculation selection	Based on Model code	
190	<i>oLG3</i>	OUT3 logic calculation selection ³	Same as OUT1 logic calculation selection	0	
191	<i>EXC</i>	Energized/De-energized selection	0 to 127 0: All outputs are energized +1: OUT1 de-energized +2: OUT2 de-energized +4: OUT3 de-energized +8: DO1 de-energized +16: DO2 de-energized +32: DO3 de-energized +64: DO4 de-energized To select two or more functions, sum each value.	0	
192	<i>ILS</i>	Interlock selection	0 to 4095 0: Unused +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0	

¹ Displayed when OUT1 is supplied.² Displayed when OUT2 is supplied.³ Displayed when OUT3 is supplied.

No.	Symbol	Name	Data range	Factory set value	User set value
193	<i>SS</i>	Output action at control stop	0 to 7 0: OFF +1: Logic calculation output: Action continues +2: Retransmission output: Action continues +4: Instrument status output: Action continues To select two or more functions, sum each value.	0	
194	<i>UNI 0</i>	Universal output type selection (OUT3) *	0: Voltage pulse output 1: Current output (4 to 20 mA) 2: Current output (0 to 20 mA)	1	

* Displayed when OUT3 is supplied.

■ Function block No. 31: Retransmission output 1 (*R01*)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F031</i>	Function block No. 31 *	This is the first parameter symbol of Function block No. 31	—	—
195	<i>R01</i>	Retransmission output 1 type *	0: No retransmission output 1: Input 1_Measured value (PV) 2: Input 1_Local SV 3: Input 1_SV monitor value 4: Input 1_Deviation 5: Input 1_Manipulated output value [heat-side] 6: Input 1_Manipulated output value [cool-side] 7: Input 2_Measured value (PV) 8: Input 2_Local SV 9: Input 2_SV monitor value 10: Input 2_Deviation 11: Input 2_Manipulated output value 12: Remote setting input value 13: Current transformer 1 (CT1) input value 14: Current transformer 2 (CT2) input value 15: Measured value (PV) of differential temperature input	0	
196	<i>R051</i>	Retransmission output 1 scale high *	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low to Input 1_Input range high When Control with PV select: PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.] Input 1_Deviation: -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.] Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Deviation: -(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.] Manipulated output value: -5.0 to +105.0 % Current transformer (CT) input value: 0.0 to 100.0 % Measured value (PV) of differential temperature input: -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high Control with PV select: PV select input range high Input 1_Deviation: +(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range high Input 2_Deviation: +(Input 2_Input span) Manipulated output value, and Current transformer (CT) input value: 100.0 Measured value (PV) of differential temperature input: 100	

* Displayed when OUT1 type is Current output or Continuous voltage output.

Continued on the next page.



No.	Symbol	Name	Data range	Factory set value	User set value
197	<i>AL51</i>	Retransmission output 1 scale low *	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low to Input 1_Input range high When Control with PV select: PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.] Input 1_Deviation: -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.] Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Deviation: -(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.] Manipulated output value: -5.0 to +105.0 % Current transformer (CT) input value: 0.0 to 100.0 % Measured value (PV) of differential temperature input: -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low Control with PV select: PV select input range low Input 1_Deviation: -(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low Input 2_Deviation: -(Input 2_Input span) Manipulated output value, and Current transformer (CT) input value: 0.0 Measured value (PV) of differential temperature input: -100	

* Displayed when OUT1 type is Current output or Continuous voltage output.

■ Function block No. 32: Retransmission output 2 (*Ro2*)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_{n32}</i>	Function block No. 32 *	This is the first parameter symbol of Function block No. 32	—	—
198	<i>Ro2</i>	Retransmission output 2 type *	Same as Retransmission output 1 type	0	
199	<i>RH52</i>	Retransmission output 2 scale high *	Same as Retransmission output 1 scale high		
200	<i>AL52</i>	Retransmission output 2 scale low *	Same as Retransmission output 1 scale low		

* Displayed when OUT2 type is Current output or Continuous voltage output.

■ Function block No. 33: Retransmission output 3 (*Ro3*)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_{n33}</i>	Function block No. 33 *	This is the first parameter symbol of Function block No. 33	—	—
201	<i>Ro3</i>	Retransmission output 3 type *	Same as Retransmission output 1 type	1	
202	<i>RH53</i>	Retransmission output 3 scale high *	Same as Retransmission output 1 scale high		
203	<i>AL53</i>	Retransmission output 3 scale low *	Same as Retransmission output 1 scale low		

* Displayed when OUT3 is supplied and "Universal output type selection" is "Current output."

Function block No. 34: Digital output (do)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n34</i>	Function block No. 34 ¹	This is the first parameter symbol of Function block No. 34	—	—
204	<i>doSL1</i>	DO1 function selection ¹	0: No assignment 1: Logic calculation output (Event, HBA, LBA, Input error) 2: RUN state output 3: Input 1_Manual mode state output 4: Input 2_Manual mode state output 5: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 6: Input 1_Autotuning (AT) state output 7: Input 2_Autotuning (AT) state output 8: Output while Set value of Input 1 is changing 9: Output while Set value of Input 2 is changing 10: Output of the communication monitoring result 11: FAIL output	Based on Model code	
205	<i>doSL2</i>	DO2 function selection ²	Same as DO1 function selection	Based on Model code	
206	<i>doSL3</i>	DO3 function selection ³	Same as DO1 function selection	Based on Model code	
207	<i>doSL4</i>	DO4 function selection ³	Same as DO1 function selection	Based on Model code	
208	<i>doLG1</i>	DO1 logic calculation selection ¹	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	Based on Model code	
209	<i>doLG2</i>	DO2 logic calculation selection ²	Same as DO1 logic calculation selection	Based on Model code	
210	<i>doLG3</i>	DO3 logic calculation selection ³	Same as DO1 logic calculation selection	Based on Model code	
211	<i>doLG4</i>	DO4 logic calculation selection ³	Same as DO1 logic calculation selection	Based on Model code	

 Displayed in case of FZ400/900.

¹ Displayed when Digital output (DO) is supplied.

² For FZ400/900, this parameter is displayed when four Digital outputs (DO) are supplied.
For FZ110, this parameter is displayed when two Digital outputs (DO) are supplied.

³ Displayed when four Digital outputs (DO) are supplied.

Function block No. 41: Event 1 (EH I)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Fn41</i>	Function block No. 41	This is the first parameter symbol of Function block No. 41	—	—
212	<i>EVRI</i>	Event 1 assignment *	1: Input 1 2: Input 2 3: Differential temperature input	1	
213	<i>ESI</i>	Event 1 type	0: None 1: Deviation high (Using SV monitor value) ^a 2: Deviation low (Using SV monitor value) ^a 3: Deviation high/low (Using SV monitor value) ^a 4: Band (Using SV monitor value) ^a 5: Deviation high/low (Using SV monitor value) [High/Low individual setting] ^a 6: Band (Using SV monitor value) [High/Low individual setting] ^a 7: SV high (Using SV monitor value) 8: SV low (Using SV monitor value) 9: Process high ^b 10: Process low ^b 11: Deviation high (Using local SV) ^a 12: Deviation low (Using local SV) ^a 13: Deviation high/low (Using local SV) ^a 14: Band (Using local SV) ^a 15: Deviation high/low (Using local SV) [High/Low individual setting] ^a 16: Band (Using local SV) [High/Low individual setting] ^a 17: SV high (Using local SV) 18: SV low (Using local SV) 19: MV high [heat-side] ^{b, c} 20: MV low [heat-side] ^{b, c} 21: MV high [cool-side] ^b 22: MV low [cool-side] ^b 23: Process high/low [High/Low individual setting] ^b 24: Process band [High/Low individual setting] ^b ^a Event hold and re-hold action is available. ^b Event hold action is available. ^c When the instrument is specified as position proportioning PID control with feedback resistance, this item becomes Feedback resistance (FBR) input.	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1	
214	<i>EHI</i>	Event 1 hold action	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0	
215	<i>EHI</i>	Event 1 differential gap	Deviation, Process and SV: - If event assignment is either Input 1 or Differential temperature. 0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) - If event assignment is Input 2 0 to Input 2_Input span [Varies with the setting of the Decimal point position.] MV: 0.0 to 110.0 %	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2	
216	<i>EVFI</i>	Event 1 timer	0.0 to 600.0 seconds	0.0	

 Displayed in case of FZ400/900.

* Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

■ Function block No. 42: Event 2 (EH2)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n42</i>	Function block No. 42	This is the first parameter symbol of Function block No. 42	—	—
217	<i>EV_A2</i>	Event 2 assignment *	Same as Event 1 assignment		
218	<i>ES2</i>	Event 2 type	Same as Event 1 type		
219	<i>EH_o2</i>	Event 2 hold action	Same as Event 1 hold action		
220	<i>EH2</i>	Event 2 differential gap	Same as Event 1 differential gap		
221	<i>EV_T2</i>	Event 2 timer	Same as Event 1 timer		

 Displayed in case of FZ400/900.

* Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

■ Function block No. 43: Event 3 (EH3)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n43</i>	Function block No. 43	This is the first parameter symbol of Function block No. 43	—	—
222	<i>EV_A3</i>	Event 3 assignment *	Same as Event 1 assignment		
223	<i>ES3</i>	Event 3 type	Same as Event 1 type		
224	<i>EH_o3</i>	Event 3 hold action	Same as Event 1 hold action		
225	<i>EH3</i>	Event 3 differential gap	Same as Event 1 differential gap		
226	<i>EV_T3</i>	Event 3 timer	Same as Event 1 timer		

 Displayed in case of FZ400/900.

* Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

■ Function block No. 44: Event 4 (EH4)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n44</i>	Function block No. 44	This is the first parameter symbol of Function block No. 44	—	—
227	<i>EV_A4</i>	Event 4 assignment *	Same as Event 1 assignment		
228	<i>ES4</i>	Event 4 type	Same as Event 1 type		
229	<i>EH_o4</i>	Event 4 hold action	Same as Event 1 hold action		
230	<i>EH4</i>	Event 4 differential gap	Same as Event 1 differential gap		
231	<i>EV_T4</i>	Event 4 timer	Same as Event 1 timer		

 Displayed in case of FZ400/900.

* Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."



■ Function block No. 45: CT1 (CT1)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n45</i>	Function block No. 45 *	This is the first parameter symbol of Function block No. 45	—	—
232	<i>CTA1</i>	CT1 assignment *	0: None 1: OUT1 2: OUT2 3: OUT3	1	
233	<i>CTL1</i>	CT1 type *	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code	
234	<i>CTR1</i>	CT1 ratio *	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000	
235	<i>CLC1</i>	CT1 low input cut-off *	0.0 to 1.0 A	0.0	

* Displayed when Current transformer (CT) input is supplied.

■ Function block No. 46: CT2 (CT2)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n46</i>	Function block No. 46 *	This is the first parameter symbol of Function block No. 46	—	—
236	<i>CTA2</i>	CT2 assignment *	0: None 1: OUT1 2: OUT2 3: OUT3	Based on Model code	
237	<i>CTL2</i>	CT2 type *	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code	
238	<i>CTR2</i>	CT2 ratio *	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000	
239	<i>CLC2</i>	CT2 low input cut-off *	0.0 to 1.0 A	0.0	

 Displayed in case of FZ400/900.

* Displayed when two Current transformer (CT) inputs are supplied.

■ Function block No. 50: Control (Conf)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n50</i>	Function block No. 50	This is the first parameter symbol of Function block No. 50	—	—
240	<i>Pd</i>	Hot/Cold start	0: Hot start 1 1: Hot start 2 2: Cold start 3: STOP start	0	
241	<i>MVFS</i>	Manual manipulated output value selection	0: The last manipulated output value (Balanceless-bumpless function) 1: Manual manipulated output value	0	
242	<i>FRK</i>	SV tracking	0 to 3 0: No SV tracking function +1: SV tracking at transferring Remote/Local * * Including Cascade mode transfer, 2-loop control/ Differential temperature control transfer +2: SV tracking at transferring Auto/Manual To select two or more functions, sum each value.	1	
243	<i>IdDP</i>	Integral/Derivative time decimal point position	0: No decimal place 1: One decimal place 2: Two decimal place	0	
244	<i>SFS</i>	ST start condition	0: Activate the Startup tuning (ST) function when the power is turned on; when transferred from STOP to RUN; or when the Set value (SV) is changed. 1: Activate the Startup tuning (ST) function when the power is turned on; or when transferred from STOP to RUN. 2: Activate the Startup tuning (ST) function when the Set value (SV) is changed.	0	



■ Function block No. 51: Input 1_Control (I_Conf)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>Fn51</i>	Function block No. 51	This is the first parameter symbol of Function block No. 51	—	—
245	<i>I_oS</i>	Input 1_Control action	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling linear type] 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action) For cascade control, only 0 or 1 is selectable.	Control action specified at the time of order.	
246	<i>I_oRU</i>	Input 1_Output change rate limiter (up) [heat-side] ¹	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
247	<i>I_oRD</i>	Input 1_Output change rate limiter (down) [heat-side] ¹	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
248	<i>I_AoVE</i>	Input 1_Action (high) input error	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2	
249	<i>I_AoNE</i>	Input 1_Action (low) input error	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2	
250	<i>I_PSM</i>	Input 1_Manipulated output value at input error	PID control, Position proportioning PID control: –5.0 to +105.0 % Heat/Cool PID control: –105.0 to +105.0 %	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0	
251	<i>I_RMV</i>	Input 1_Manipulated output value at STOP [heat-side]	–5.0 to +105.0 %	–5.0	
252	<i>I_PdR</i>	Input 1_Start determination point	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of Input 1_Input span Control with PV select: 3 % of PV select input span	
253	<i>I_LPID</i>	Input 1_Level PID action selection ²	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0	
254	<i>I_LHS</i>	Input 1_Level PID differential gap ²	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2	

¹ Not displayed when Control action is Position proportioning PID action.

² Displayed when any code other than "Cascade control" is selected in "Select function for input 2."

Function block No. 52: Input 2_Control (2_Conf)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n52</i>	Function block No. 52 ¹	This is the first parameter symbol of Function block No. 52	—	—
255	<i>2. os</i>	Input 2_Control action ¹	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action)	Same as Input 1_Control action	
256	<i>2. oRU</i>	Input 2_Output change rate limiter (up) ²	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
257	<i>2. oRd</i>	Input 2_Output change rate limiter (down) ²	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
258	<i>2.AoVE</i>	Input 2_Action (high) input error ²	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 2_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 2_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2	
259	<i>2.AoNE</i>	Input 2_Action (low) input error ²	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 2_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 2_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2	
260	<i>2. PSM</i>	Input 2_Manipulated output value at input error ²	–5.0 to +105.0 %	–5.0	
261	<i>2. RMV</i>	Input 2_Manipulated output value at STOP ²	–5.0 to +105.0 %	–5.0	
262	<i>2. PdR</i>	Input 2_Start determination point ¹	0 to Input 2_Input span 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of Input 2_Input span	
263	<i>2.LPI d</i>	Input 2_Level PID action selection ²	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0	
264	<i>2. LHS</i>	Input 2_Level PID differential gap ²	0 to Input 2_Input span [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2	

Displayed in case of FZ400/900.

¹ Displayed when “2-loop control/Differential temperature control” or “Cascade control” is selected in “Select function for input 2.”

² Displayed when “2-loop control/Differential temperature control” is selected in “Select function for input 2.”

Function block No. 55: Position proportioning control ($P_{\alpha SI} \Gamma$)

No.	Symbol	Name	Data range	Factory set value	User set value
—	F_{n55}	Function block No. 55 ¹	This is the first parameter symbol of Function block No. 55	—	—
265	y_{bR}	Action at feedback resistance (FBR) input error ^{1,2}	0: Action depending on the value action at STOP 1: Control action continued	0	
266	$P_{\alpha S}$	Feedback adjustment ^{1,2}	When the <MODE key is pressed and held for 5 seconds, Feedback adjustment is automatically started. Adj : Adjustment end αPEn : During adjustment on the open-side $CL\alpha SE$: During adjustment on the close-side Err : Adjustment error	Adj	—
267	$M_{\alpha T}$	Control motor time ¹	5 to 1000 seconds	10	
268	$\alpha L R$	Integrated output limiter ¹	0.0 to 200.0 % of control motor time 0.0: OFF	150.0	
269	$V_{\alpha L}$	Valve action at STOP ¹	0: Close-side output OFF, Open-side output OFF 1: Close-side output ON, Open-side output OFF 2: Close-side output OFF, Open-side output ON	0	
270	$y_{\alpha S\alpha}$	Action at saturated output ^{1,2}	0: Invalid (The close-side [or open-side] output turns to OFF when the valve position is fully closed [or opened]). 1: Valid (The close-side [or open-side] output remains ON state when the valve position is fully closed [or opened]).	0	

Displayed in case of FZ400/900.

¹ Displayed when the Control action is a Position proportioning PID control.

² Displayed when a Feedback resistance (FBR) input is supplied.

Function block No. 56: Input 1_Cooling control ($I_{\alpha cool}$)

No.	Symbol	Name	Data range	Factory set value	User set value
—	F_{n56}	Function block No. 56 *	This is the first parameter symbol of Function block No. 56	—	—
271	$I_{\alpha RUc}$	Input 1_Output change rate limiter (up) [cool-side] *	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
272	$I_{\alpha Rd c}$	Input 1_Output change rate limiter (down) [cool-side] *	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0	
273	$I_{\alpha RMV c}$	Input 1_Manipulated output value at STOP [cool-side] *	–5.0 to +105.0 %	–5.0	
274	U_S	Undershoot suppression factor *	0.000 to 1.000	Water cooling: 0.100 Air cooling: 0.250 Cooling linear: 1.000	
275	$dbPR$	Overlap/Deadband reference point *	0.0 to 1.0	0.0	

* Displayed when the Control action is Heat/Cool PID control.

Function block No. 57: Proactive ($P_{\alpha \Gamma}$)

No.	Symbol	Name	Data range	Factory set value	User set value
—	F_{n57}	Function block No. 57 *	This is the first parameter symbol of Function block No. 57	—	—
276	$b_{\Gamma MSP}$	Bottom suppression function *	0: No function 1: FF amount is added by level 2: FF amount is forcibly added	0	

* Displayed when the Control action is other than Position proportioning PID control.

Function block No. 58: 2-input function (2PV)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n58</i>	Function block No. 58 ¹	This is the first parameter symbol of Function block No. 58	—	—
277	<i>2PV</i>	Select function for input 2 ¹	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm * This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	• FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 • FZ110: 1	
278	<i>MAS.AT</i>	Cascade_AT mode (master-side) ²	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1	
279	<i>SLV.AT</i>	Cascade_AT mode (slave-side) ²	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1	
280	<i>2PV.FG</i>	Selection of PV select trigger ³	0: Switching by level 1: Switching by signal (Key, DI and Communication)	0	
281	<i>ICR</i>	Input circuit error alarm set value ⁴	0 to Input 1_Input span 0: No function [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 10 V/I inputs: 5 % of Input 1_Input span	

 Displayed in case of FZ400/900.

¹ For FZ400/900, this parameter is displayed when Remote setting input or Measured input 2 ** is supplied.
 For FZ110, this parameter is displayed when Remote setting input is supplied.

** Even if Measured input 2 is specified at the time of order, the Remote setting input can be selected later. In this case, thermocouple (TC) or RTD can be selected as a Remote setting input type. (If Remote setting input is specified, selecting a thermocouple or an RTD is not available.)

² Displayed when "Cascade control" is selected in "Select function for input 2."

³ Displayed when "Control with PV select" is selected in "Select function for input 2."

⁴ Displayed when "Input circuit error alarm" is selected in "Select function for input 2."



■ Function block No. 60: Communication (5C1)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n60</i>	Function block No. 60 *	This is the first parameter symbol of Function block No. 60	—	—
282	<i>CMPS</i>	Communication protocol *	0: RKC communication 1: Modbus (Order of data transfer: upper word to lower word) 2: Modbus (Order of data transfer: lower word to upper word) 3: PLC communication (MITSUBISHI MELSEC series special protocol QnA-compatible 3C frame [format 4])	When the communication protocol is specified at the time of order, the specified communication protocol will be the factory preset value. With communication, communication protocol not specified: 0	
283	<i>Addr</i>	Device address *	RKC communication: 0 to 99 Modbus: 1 to 99 PLC communication: 0 to 30	RKC communication: 0 Modbus: 1 PLC communication: 0	
284	<i>bps</i>	Communication speed *	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps	3	
285	<i>bit</i>	Data bit configuration *	0 to 11 Refer to Data bit configuration table	0	
286	<i>INF</i>	Interval time *	0 to 250 ms	10	
287	<i>CMRM</i>	Communication response monitor *	0000 ← SV display unit Communication response monitor 0: Normal response 1: Overrun error 2: Parity error 4: Framing error 8: Receive buffer overflow If two or more errors occur, the error values are summed up. Errors are displayed in the hexadecimal format (0 to F). 0 (fixed) Reception status monitor * Transmission status monitor * * Each time signal is sent or received, 0 and 1 are displayed in turns. Lights off	—	—

* Displayed when Communication function is supplied.

Data bit configuration table

Set value	Data bit	Parity bit	Stop bit
0	8	Without	1
1	8	Without	2
2	8	Even	1
3	8	Even	2
4	8	Odd	1
5	8	Odd	2

Set value	Data bit	Parity bit	Stop bit
6	7	Without	1
7	7	Without	2
8	7	Even	1
9	7	Even	2
10	7	Odd	1
11	7	Odd	2

: Not settable for Modbus

Function block No. 62: PLC communication ($\bar{R}AP$)

No.	Symbol	Name	Data range	Factory set value	User set value
—	F_n62	Function block No. 62 ¹	This is the first parameter symbol of Function block No. 62	—	—
288	$MP.REG$	Register type ¹	Mitsubishi PLC 0: D register (data register) 1: R register (file register) 2: W register (link register) 3: ZR register (Method of specifying consecutive numbers when 32767 of R register is exceeded.)	0	
289	$MP.SRH$	Register start number (High-order 4-bit) ¹	0 to 15	0	
290	$MP.SRL$	Register start number (Low-order 16-bit) ¹	0 to 65535	1000	
291	$MP.Mod$	Monitor item register bias ¹	12 to 65535	12	
292	$MP.Srb$	Setting item register bias ¹	0 to 65535	0	
293	$MP.LFM$	Instrument link recognition time ¹	0 to 255 seconds	5	
294	$MP.FMo$	PLC response waiting time ¹	0 to 3000 ms	255	
295	$MP.SFM$	PLC communication start time ¹	1 to 255 seconds	5	
296	$MP.SLb$	Slave register bias ¹	0 to 65535	80	
297	$MP.MAd$	Number of recognizable devices ¹	0 to 30	8	

¹ Displayed when both Communication function and PLC communication protocol are supplied.

Function block No. 70: Memory area ($R-ER$)

No.	Symbol	Name	Data range	Factory set value	User set value
—	F_n70	Function block No. 70	This is the first parameter symbol of Function block No. 70	—	—
298	$SVrT$	Setting change rate limiter unit time	1 to 3600 seconds	60	
299	$Sr dP$	Soak time unit	0: 0 hours 00 minutes to 99 hours 59 minutes 1: 0 minutes 00 seconds to 199 minutes 59 seconds 2: 0 hours 0 minutes 0 seconds to 9 hours 59 minutes 59 seconds In case of Input data type 0: 0 to 2 In case of Input data type 1: 0 or 1	1	

Function block No. 71: Input 1_Setting limiter ($I.SBL$)

No.	Symbol	Name	Data range	Factory set value	User set value
—	F_n71	Function block No. 71	This is the first parameter symbol of Function block No. 71	—	—
300	$I.SLH$	Input 1_Setting limiter high	Input 1_Setting limiter low to Input 1_Input range high (When Control with PV select Input 1_Setting limiter low to PV select input range high) [Varies with the setting of the Decimal point position.]	Input 1_ Input range high (Control with PV select: PV select input range high)	
301	$I.SLL$	Input 1_Setting limiter low	Input 1_Input range low to Input 1_Setting limiter high (When Control with PV select PV select input range low to Input 1_Setting limiter high) [Varies with the setting of the Decimal point position.]	Input 1_ Input range low (Control with PV select: PV select input range low)	



■ Function block No. 72: Input 2_Setting limiter (2. 5HL)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n72</i>	Function block No. 72 *	This is the first parameter symbol of Function block No. 72	—	—
302	<i>2. 5LH</i>	Input 2_Setting limiter high *	Input 2_Setting limiter low to Input 2_Input range high [Varies with the setting of the Decimal point position.]	Input 2_ Input range high	
303	<i>2. 5LL</i>	Input 2_Setting limiter low *	Input 2_Input range low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	Input 2_ Input range low	

Displayed in case of FZ400/900.

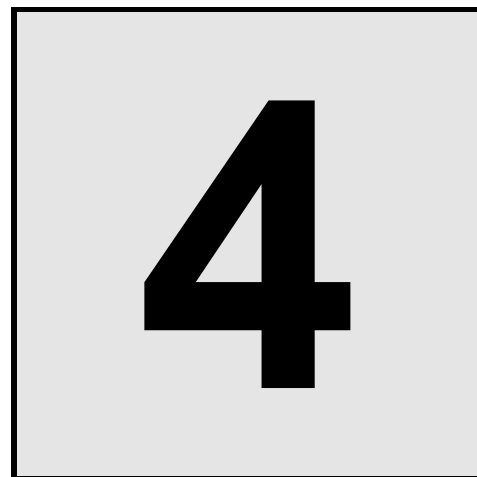
* Displayed when "2-loop control/Differential temperature control" or "Cascade control" is selected in "Select function for input 2."

■ Function block No. 91: System (5Y5)

No.	Symbol	Name	Data range	Factory set value	User set value
—	<i>F_n91</i>	Function block No. 91	This is the first parameter symbol of Function block No. 91	—	—
—	<i>DEF</i>	Initialization	1225: Start initialization Other values: Set values are maintained After the initialization, this instrument is restarted. This setting will automatically go back to zero.	0	—
—	<i>WF</i>	Integrated operating time	0 to 65535 hours	—	—
—	<i>TCU</i>	Peak hold monitor of ambient temperature	−120 to +120 °C	—	—
—	<i>ROM</i>	ROM version	The installed ROM version is displayed	—	—
—	<i>FZ900</i>	Model code monitor	Model code is displayed. Use the UP or DOWN key to scroll the display horizontally (left or right).	—	—
—	<i>00000</i> The serial number of the instrument is displayed.	Instrument number monitor	Instrument number is displayed.	—	—



PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED



This chapter describes the parameters that are initialized/modified when setting is changed.

4.1 Parameters to Be Initialized	4-2
4.2 Parameters to Be Automatically Converted.....	4-21



4.1 Parameters to Be Initialized

Changing any of the following parameters will require initialization * of the related settings.

* Settings are reset to the factory preset values. Some parameters may not be set to a factory preset value (such as change of input type).



NOTE

Make sure all settings are recorded before changing the set values.



NOTE

Check all set values after having changed the settings.

			See page
• Select function for input 2	Engineering Mode	Function block No. 58	4-3
• Input 1_Input type	Engineering Mode	Function block No. 21	4-6
• Input 1_Display unit	Engineering Mode	Function block No. 21	4-6
• Input 1_Decimal point position	Engineering Mode	Function block No. 21	4-9
• Input 2_Input type	Engineering Mode	Function block No. 22	4-10
• Input 2_Display unit	Engineering Mode	Function block No. 22	4-10
• Input 1_Control action	Engineering Mode	Function block No. 51	4-13
• Input 2_Control action	Engineering Mode	Function block No. 52	4-14
• Open/Close output neutral zone	Setup Setting Mode	Setting group No. 55	4-14
• OUT1 function selection	Engineering Mode	Function block No. 30	4-14
• OUT2 function selection	Engineering Mode	Function block No. 30	4-15
• OUT3 function selection	Engineering Mode	Function block No. 30	4-15
• Universal output type selection	Engineering Mode	Function block No. 30	4-15
• Retransmission output 1 type	Engineering Mode	Function block No. 31	4-16
• Retransmission output 2 type	Engineering Mode	Function block No. 32	4-16
• Retransmission output 3 type	Engineering Mode	Function block No. 33	4-17
• Event 1 type	Engineering Mode	Function block No. 41	4-17
• Event 1 assignment	Engineering Mode	Function block No. 41	4-17
• Event 2 type	Engineering Mode	Function block No. 42	4-17
• Event 2 assignment	Engineering Mode	Function block No. 42	4-17
• Event 3 type	Engineering Mode	Function block No. 43	4-18
• Event 3 assignment	Engineering Mode	Function block No. 43	4-18
• Event 4 type	Engineering Mode	Function block No. 44	4-18
• Event 4 assignment	Engineering Mode	Function block No. 44	4-18
• CT1 type	Engineering Mode	Function block No. 45	4-18
• CT2 type	Engineering Mode	Function block No. 46	4-19
• Integral/Derivative time decimal point position	Engineering Mode	Function block No. 50	4-19
• Communication protocol	Engineering Mode	Function block No. 60	4-19
• Register type	Engineering Mode	Function block No. 62	4-20
• Soak time unit	Engineering Mode	Function block No. 70	4-20
• Initialization	Engineering Mode	Function block No. 91	4-20

4.1.1 When Select function for input 2 (2PV) is changed [Engineering Mode: Function block No. 58]

The following parameters will be initialized.

Some parameters may have prerequisites for initialization. (Refer to the prerequisite and P. 4-5)

Mode		Items	Symbol	Initial value	Condition
Operation Transfer Mode		Remote/Local transfer When "Remote setting input" is selected at Select function for Input 2	R/L	LoC	—
		Remote/Local transfer When "Cascade control" is selected at Select function for input 2	R/L	SnGL	—
		Remote/Local transfer When "Control with PV select" is selected at Select function for input 2	R/L	1 nP l	—
		Remote/Local transfer When "2-loop control/Differential temperature control" is selected at Select function for input 2	R/L	2Loop	—
Monitor & SV Setting Mode		Input 1_Set value (SV)		0	1
Parameter Setting Mode	Parameter group No. 00	Input 1_Set value (SV)	$l. SV$	0	1
	Parameter group No. 40	Event 1 set value (EV1)	$EV1$	TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0	4
		Event 1 set value (EV1) [high]			
		Event 2 set value (EV2)	$EV2$		4
		Event 2 set value (EV2) [high]			
		Event 3 set value (EV3)	$EV3$		4
		Event 3 set value (EV3) [high]			
		Event 4 set value (EV4)	$EV4$		4
		Event 4 set value (EV4) [high]			
	Parameter group No. 51	Event 1 set value (EV1') [low]	$EV1'$	TC/RTD inputs: -10 V/I inputs: -5 % of input span	4
		Event 2 set value (EV2') [low]	$EV2'$		4
		Event 3 set value (EV3') [low]	$EV3'$		4
		Event 4 set value (EV4') [low]	$EV4'$		4
		Input 1_Proportional band [heat-side]	$l. P$	TC/RTD inputs: 30 V/I inputs: 3.0	1
		Input 1_Integral time [heat-side]	$l. I$		1
		Input 1_Derivative time [heat-side]	$l. d$		1
		Input 1_Control response parameter	$l. RPF$	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2	1
	Parameter group No. 56	Input 1_Proactive intensity	$l.PACI$	2	1
		Input 1_Manual reset	$l. MR$	0.0	1
		Input 1_FF amount	$l. FF$	0.0	1
		Input 1_Control loop break alarm (LBA) time	$l. LbA$	LBA function is spaeified: 480 LBA function is not specified: 0	1
		Input 1_LBA deadband (LBD)	$l. Lbd$	0	1
		Input 1_ON/OFF action differential gap (upper)	$l. oHH$	TC/RTD inputs: 1 V/I inputs: 0.1	1
		Input 1_ON/OFF action differential gap (lower)	$l. oHL$		1
	Parameter group No. 70	Input 1_Proportional band [cool-side]	$l. Pc$	TC/RTD inputs: 30 V/I inputs: 3.0	1
		Input 1_Integral time [cool-side]	$l. Ic$		1
		Input 1_Derivative time [cool-side]	$l. dc$		1
		Input 1_Overlap/Deadband	$l. db$	TC/RTD inputs: 0 V/I inputs: 0.0	1
Setup Setting Mode	Setting group No. 21	Input 2_PV bias	$l. Pb$	0	1
	Setting group No. 22	Input 2_PV bias (RS bias)	$2. Pb$	0	2



4.1 Parameters to Be Initialized

Mode		Items	Symbol	Initial value	Condition
Setup Setting Mode	Setting group No. 22	Input 2_PV digital filter (RS digital filter)	$2. dF$	0.0	2
		Input 2_PV ratio (RS ratio)	$2. PR$	1.000	2
	Setting group No. 51	Input 1_Level PID setting 1	$1LEV1$	Input 1_Input range high Control with PV select: PV select input range high	1
		Input 1_Level PID setting 2	$1LEV2$		1
		Input 1_Level PID setting 3	$1LEV3$		1
		Input 1_Level PID setting 4	$1LEV4$		1
		Input 1_Level PID setting 5	$1LEV5$		1
		Input 1_Level PID setting 6	$1LEV6$		1
		Input 1_Level PID setting 7	$1LEV7$		1
	Setting group No. 53	Input 1_AT bias	$1. Atb$	0	1
	Setting group No. 57	Input 1_Determination point of external disturbance	$1ExdJ$	-1	1
Engineering Mode	Function block No. 21	Input 1_Decimal point position	$1PGdP$	0	1
	Function block No. 22	Input 2_Input type	$2.INP$	Same as Input 1_Input type When Remote setting input is specified at the time of order: 17	3
		Input 2_Display unit	$2UNI r$	Same as Input 1_Display unit Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Not initialized in other cases.	5
		Input 2_Decimal point position	$2PGdP$	Same as Input 1_Decimal point position Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Zero (0) for other cases.	5
		Input 2_Input range high	$2PGSH$	• TC/RTD inputs Input 2_Maximum value of input range • V/I inputs Remote setting input: Input 1_Maximum value of input range Others: 100	6
		Input 2_Input range low	$2PGSL$	• TC/RTD inputs Input 2_Minimum value of input range • V/I inputs Remote setting input: Input 1_Minimum value of input range Others: 0	6
	Function block No. 31	Retransmission output 1 scale high	$RHS1$	Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high Control with PV select: PV select input range high Input 1_Deviation: +(Input 1_Input span) Measured value (PV) of differential temperature input: 100	1 and 7
		Retransmission output 1 scale low	$RLS1$	Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low Control with PV select: PV select input range low Input 1_Deviation: -(Input 1_Input span) Measured value (PV) of differential temperature input: -100	1 and 7

Mode		Items	Symbol	Initial value	Condition
Engineering Mode	Function block No. 32	Retransmission output 2 scale high	<i>RHS2</i>	Same as Retransmission output 1 scale high	1 and 7
		Retransmission output 2 scale low	<i>RLS2</i>	Same as Retransmission output 1 scale low	1 and 7
	Function block No. 33	Retransmission output 3 scale high	<i>RHS3</i>	Same as Retransmission output 1 scale high	1 and 7
		Retransmission output 3 scale low	<i>RLS3</i>	Same as Retransmission output 1 scale low	1 and 7
	Function block No. 41	Event 1 assignment	<i>EV A1</i>	1	—
		Event 1 differential gap	<i>EH1</i>	TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2	4
	Function block No. 42	Event 2 assignment	<i>EV A2</i>	1	—
		Event 2 differential gap	<i>EH2</i>	TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2	4
	Function block No. 43	Event 3 assignment	<i>EV A3</i>	1	—
		Event 3 differential gap	<i>EH3</i>	TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2	4
	Function block No. 44	Event 4 assignment	<i>EV A4</i>	1	—
		Event 4 differential gap	<i>EH4</i>	TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2	4
	Function block No. 51	Input 1_Start determination point	<i>I. P d R</i>	3 % of Input 1_Input span Control with PV select: 3 % of PV select input span	1
	Function block No. 51	Input 1_Level PID differential gap	<i>I. L H S</i>	TC/RTD inputs: 2 V/I inputs: 0.2	1
	Function block No. 58	Input circuit error alarm set value	<i>I C R</i>	TC/RTD inputs: 10 V/I inputs: 5 % of Input 1_Input span	3
	Function block No. 71	Input 1_Setting limiter high	<i>I. S L H</i>	Input 1_Input range high Control with PV select: PV select input range high	1
		Input 1_Setting limiter low	<i>I. S L L</i>	Input 1_Input range low Control with PV select: PV select input range low	1

Condition

- “Select function for input 2” is switched between “Control with PV select” and “Others *.”
* No function, Remote setting input, 2-loop control/Differential temperature control, Cascade control, and Input circuit error alarm.
- “Select function for input 2” is switched between “Remote setting input” and “Others *.”
* No function, Control with PV select, 2-loop control/Differential temperature control, Cascade control, and Input circuit error alarm.
- “Select function for input 2” is switched between “Input circuit error alarm” and “Others *.”
* No function, Remote setting input, Control with PV select, 2-loop control/Differential temperature control, and Cascade control.
- Event type is other than Manipulated output value AND “Select function for input 2” is switched between “Control with PV select” and “Others *.”
* No function, Remote setting input, 2-loop control/Differential temperature control, Cascade control, and Input circuit error alarm.
- “Select function for input t 2” is switched to any one of “Remote setting input,” “Control with PV select,” or “Input circuit error alarm” and “Others *.”
* No function, 2-loop control/Differential temperature control, and Cascade control.
- “Select function for input 2” is switched to any one of “Remote setting input” or “Input circuit error alarm” and “Others *.”
* No function, Control with PV select, 2-loop control/Differential temperature control, and Cascade control.
- Retransmission output is “No retransmission output,” “Input 1_Measured value (PV),” “Input 1_Set value (SV),” “Input 1_Deviation,” “Input 1_Remote setting input value,” OR Measured value (PV) of differential temperature input.

4.1.2 When Input 1_Input type (*Input*) and Input 1_Display unit (*Unit*) are changed [Engineering Mode: Function block No. 21]

The following parameters will be initialized.

Some parameters may have prerequisites for initialization. (Refer to the prerequisite and P. 4-9)

Mode		Items	Symbol	Initial value	Condition
Monitor & SV Setting Mode		Input 1_Set value (SV)		Input 1_Set value (SV)	—
		Set value (SV) of differential temperature input		Set value (SV) of differential temperature input	—
Parameter Setting Mode	Parameter group No. 00	Input 1_Set value (SV)	<i>SV</i>	0	—
		Set value (SV) of differential temperature input	<i>dSV</i>	0	—
	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	<i>EV1</i>	TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0	3
		Event 2 set value (EV2) Event 2 set value (EV2) [high]	<i>EV2</i>		3
		Event 3 set value (EV3) Event 3 set value (EV3) [high]	<i>EV3</i>		3
		Event 4 set value (EV4) Event 4 set value (EV4) [high]	<i>EV4</i>		3
		Event 1 set value (EV1') [low]	<i>EV1'</i>	TC/RTD inputs: -10 V/I inputs: -5 % of input span	3
		Event 2 set value (EV2') [low]	<i>EV2'</i>		3
		Event 3 set value (EV3') [low]	<i>EV3'</i>		3
		Event 4 set value (EV4') [low]	<i>EV4'</i>		3
	Parameter group No. 51	Input 1_Proportional band [heat-side]	<i>IP</i>	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Input 1_Integral time [heat-side]	<i>II</i>		—
		Input 1_Derivative time [heat-side]	<i>ID</i>		—
		Input 1_Control response parameter	<i>IRPF</i>	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2	—
		Input 1_Proactive intensity	<i>IPACI</i>	2	—
		Input 1_Manual reset	<i>IMR</i>	0.0	—
		Input 1_FF amount	<i>IFF</i>	0.0	—
		Input 1_Control loop break alarm (LBA) time	<i>ILBA</i>	LBA function is specified: 480 LBA function is not specified: 0	—
		Input 1_LBA deadband (LBD)	<i>ILBD</i>		—
		Input 1_ON/OFF action differential gap (upper)	<i>IOHH</i>	TC/RTD inputs: 1 V/I inputs: 0.1	—
		Input 1_ON/OFF action differential gap (lower)	<i>IOHL</i>		—
	Parameter group No. 56	Input 1_Proportional band [cool-side]	<i>IPC</i>	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Input 1_Integral time [cool-side]	<i>IIc</i>		—
		Input 1_Derivative time [cool-side]	<i>IDc</i>		—
		Input 1_Overlap/Deadband	<i>IDb</i>	TC/RTD inputs: 0 V/I inputs: 0.0	—
	Parameter group No. 70	Input 1_Setting change rate limiter (up)	<i>ISVRU</i>	0	—
		Input 1_Setting change rate limiter (down)	<i>ISVRd</i>	0	—
Setup Setting Mode	Setting group No. 21	Input 1_PV bias	<i>IPb</i>	0	—
		Input 1_PV digital filter	<i>IDF</i>	0.0	—
		Input 1_PV ratio	<i>IPR</i>	1.000	—
		Input 1_PV low input cut-off *	<i>IPLC</i>	0.00	—
	Setting group No. 22	Input 2_PV bias (RS bias)	<i>2Pb</i>	0	1
		Input 2_PV digital filter (RS digital filter)	<i>2DF</i>	0.0	1
		Input 2_PV ratio (RS ratio)	<i>2PR</i>	1.000	1

* When the Input 1_Input type was changed.



Mode		Items	Symbol	Initial value	Condition
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	ILEV1	Input 1_Input range high Control with PV select: PV select input range high	—
		Input 1_Level PID setting 2	ILEV2		—
		Input 1_Level PID setting 3	ILEV3		—
		Input 1_Level PID setting 4	ILEV4		—
		Input 1_Level PID setting 5	ILEV5		—
		Input 1_Level PID setting 6	ILEV6		—
		Input 1_Level PID setting 7	ILEV7		—
	Setting group No. 53	Input 1_AT bias	I.ATb	0	—
	Setting group No. 57	Input 1_Determination point of external disturbance	IE×dJ	−1	—
	Setting group No. 58	Cascade_Proportional band (master-side)	MAS.P	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Cascade_Integral time (master-side)	MAS.I	240	—
		Cascade_Derivative time (master-side)	MAS.d	60	—
		Cascade_Proportional band (slave-side)	SLV.P	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Cascade_Integral time (slave-side)	SLV.I	240	—
		Cascade_Derivative time (slave-side)	SLV.d	60	—
		Cascade_Digital filter	C.dF	10.0	—
		Cascade_Scale high	C.SCH	Input 2_Setting limiter high	—
		Cascade_Scale low	C.SCL	Input 2_Setting limiter low	—
		PV select transfer level	2PV.LV	Input 1_Input range high	—
	Setting group No. 91	Input 1_Peak hold monitor	1PHLd		—
		Input 1_Bottom hold monitor	1bHLd		—
Engineering Mode	Function block No. 21	Input 1_Decimal point position ¹	1PGdP	0	—
		Input 1_Input range high	1PGSH	• TC/RTD inputs: Input 1_Maximum value of input range • V/I inputs: 100	—
		Input 1_Input range low	1PGSL	• TC/RTD inputs: Input 1_Minimum value of input range • V/I inputs: 0	—
		Input 1_Input error determination point (high)	I. P _o V	Input 1_Input range high + (Input 1_5 % of input span)	—
		Input 1_Input error determination point (low)	I. P _u N	Input 1_Input range low − (Input 1_5 % of input span)	—
	Function block No. 22	Input 2_Display unit ²	2UNI r	Same as Input 1_Display unit Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Not initialized in other cases.	2
		Input 2_Decimal point position ¹	2PGdP	Same as Input 1_Decimal point position Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Zero (0) for other cases.	2
		Input 2_Input range high	2PGSH	• TC/RTD inputs Input 2_Maximum value of input range • V/I inputs Remote setting input: Input 1_Maximum value of input range Others: 100	1
		Input 2_Input range low	2PGSL	• TC/RTD inputs Input 2_Minimum value of input range • V/I inputs Remote setting input: Input 1_Minimum value of input range Others: 0	1

¹ When the Input 1_Input type was changed.² When the Input 1_Display unit was changed.



4.1 Parameters to Be Initialized

Mode		Items	Symbol	Initial value	Condition
Engineering Mode	Function block No. 31	Retransmission output 1 scale high	<i>RHS1</i>	Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high Control with PV select: PV select input range high	4
		Retransmission output 1 scale low	<i>RLS1</i>	Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low Control with PV select: PV select input range low	4
	Function block No. 32	Retransmission output 2 scale high	<i>RHS2</i>	Same as Retransmission output 1 scale high	4
		Retransmission output 2 scale low	<i>RLS2</i>	Same as Retransmission output 1 scale low	4
	Function block No. 33	Retransmission output 3 scale high	<i>RHS3</i>	Same as Retransmission output 1 scale high	4
		Retransmission output 3 scale low	<i>RLS3</i>	Same as Retransmission output 1 scale low	4
	Function block No. 41	Event 1 differential gap	<i>EH1</i>	TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2	3
	Function block No. 42	Event 2 differential gap	<i>EH2</i>		3
	Function block No. 43	Event 3 differential gap	<i>EH3</i>		3
	Function block No. 44	Event 4 differential gap	<i>EH4</i>		3
	Function block No. 51	Input 1_Start determination point	<i>I.PdR</i>	3 % of Input 1_Input span Control with PV select: 3 % of PV select input span	—
		Input 1_Level PID differential gap	<i>I.LHS</i>	TC/RTD inputs: 2 V/I inputs: 0.2	—
	Function block No. 58	Cascade_AT mode (master-side)	<i>MAS.AT</i>	TC/RTD inputs: 0 V/I inputs: 1	—
		Cascade_AT mode (slave-side)	<i>SLV.AT</i>		—
		Input circuit error alarm set value	<i>ICR</i>	TC/RTD inputs: 10 V/I inputs: 5 % of Input 1_Input span	—
	Function block No. 71	Input 1_Setting limiter high	<i>I.SLH</i>	Input 1_Input range high Control with PV select: PV select input range high	—
		Input 1_Setting limiter low	<i>I.SLL</i>	Input 1_Input range low Control with PV select: PV select input range low	—

Condition

- 1: “Select function for input 2” is Remote setting input AND Input 2_Input type is either voltage input or current input.
- 2: “Select function for input 2” is Remote setting input AND Input 2_Input type is either voltage input or current input, or Select function for input 2 is Control with PV select.
- 3: The condition is either of the following.
 - Event type is other than Manipulated output value AND “Select function for input 2” is set to “Control with PV select.”
 - Event type is other than Manipulated output value AND Event assignment is either “Input 1” or “Differential temperature input.”
- 4: Retransmission output is “No retransmission output,” “Input 1_Measured value (PV),” “Input 1_Set value (SV),” “Input 1_Deviation,” “Input 1_Remote setting input value,” OR Measured value (PV) of differential temperature input.

4.1.3 When Input 1_Decimal point position (*IPdP*) is changed [Engineering Mode: Function block No. 21]

The following parameters will be initialized.

If Select function for input 2 is “Remote setting input” AND Input 2_Input type is Voltage/Current input, OR Select function for input 2 is “Control with PV select.”

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 22	Input 2_Decimal point position	<i>IPdP</i>	Same as Input 1_Decimal point position Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Zero (0) for other cases.



4.1.4 When Input 2_Input type (2_I NP) and Input 2_Display unit (2_UNI T) are changed [Engineering Mode: Function block No. 22]

The following parameters will be initialized.

Some parameters may have prerequisites for initialization. (Refer to the prerequisite and P. 4-12)

Mode		Items	Symbol	Initial value	Condition
Monitor & SV Setting Mode		Input 2_Set value (SV)		0	—
Parameter Setting Mode	Parameter group No. 00	Input 2_Set value (SV)	2. SV	0	—
	Parameter group No. 40	Event 1 set value (EV1)	EV 1	TC/RTD inputs: 10 V/I input: 5 % of input span MV:50.0	3
		Event 1 set value (EV1) [high]			
		Event 2 set value (EV2)	EV 2		3
		Event 2 set value (EV2) [high]			
		Event 3 set value (EV3)	EV 3		3
		Event 3 set value (EV3) [high]			
		Event 4 set value (EV4)	EV 4		3
		Event 4 set value (EV4) [high]			
		Event 1 set value (EV1') [low]	EV 1'	TC/RTD inputs: -10 V/I input: -5 % of input span	3
		Event 2 set value (EV2') [low]	EV 2'		3
		Event 3 set value (EV3') [low]	EV 3'		3
		Event 4 set value (EV4') [low]	EV 4'		3
	Parameter group No. 52	Input 2_Proportional band	2. P	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Input 2_Integral time	2. I	240	—
		Input 2_Derivative time	2. d	60	—
		Input 2_Control response parameter	2. RPT	0	—
		Input 2_Proactive intensity	2.PACT	2	—
		Input 2_Manual reset	2. MR	0.0	—
		Input 2_FF amount	2. FF	0.0	—
		Input 2_Control loop break alarm (LBA) time	2. LBA	LBA function is specified: 480 LBA function is not specified: 0	—
		Input 2_LBA deadband (LBD)	2. Lbd	0	—
		Input 2_ON/OFF action differential gap (upper)	2. oHH	TC/RTD inputs: 1 V/I inputs: 0.1	—
		Input 2_ON/OFF action differential gap (lower)	2. oHL		—
	Parameter group No. 70	Input 2_Setting change rate limiter (up)	2.SVRU	0	—
		Input 2_Setting change rate limiter (down)	2.SVRd	0	—
Setup Setting Mode	Setting group No. 22	Input 2_PV bias (RS bias)	2. Pb	0	—
		Input 2_PV digital filter (RS digital filter)	2. dF	0.0	—
		Input 2_PV ratio (RS ratio)	2. PR	1.000	—
		Input 2_PV low input cut-off *	2. PLC	0.00	—
	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1	Input 2_Input range high	—
		Input 2_Level PID setting 2	2.LEV 2		—
		Input 2_Level PID setting 3	2.LEV 3		—
		Input 2_Level PID setting 4	2.LEV 4		—
		Input 2_Level PID setting 5	2.LEV 5		—
		Input 2_Level PID setting 6	2.LEV 6		—
		Input 2_Level PID setting 7	2.LEV 7		—
	Setting group No. 54	Input 2_AT bias	2. ATb	0	—

* When the Input 2_Input type was changed.



Mode		Items	Symbol	Initial value	Condition
Setup Setting Mode	Setting group No. 57	Input 2_Determination point of external disturbance	$2E \times dU$	-1	—
	Setting group No. 58	Cascade_Proportional band (master-side)	$MRS.P$	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Cascade_Integral time (master-side)	$MRS.I$	240	—
		Cascade_Derivative time (master-side)	$MRS.d$	60	—
		Cascade_Proportional band (slave-side)	$SLV.P$	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Cascade_Integral time (slave-side)	$SLV.I$	240	—
		Cascade_Derivative time (slave-side)	$SLV.d$	60	—
		Cascade_Digital filter	$CLdF$	10.0	—
		Cascade_Scale high	$CLSCH$	Input 2_Setting limiter high	—
		Cascade_Scale low	$CLSCL$	Input 2_Setting limiter low	—
	Setting group No. 91	Input 2_Peak hold monitor	$2PHLD$		—
		Input 2_Bottom hold monitor	$2bHLD$		—
Engineering Mode	Function block No. 21	Input 1_Decimal point position *	$1PGdP$	0	1
	Function block No. 22	Input 2_Decimal point position *	$2PGdP$	Same as Input 1_Decimal point position Only when the input type is Control with PV select, Input circuit error alarm, and Remote setting input (V/I inputs). Zero (0) for other cases.	2
		Input 2_Input range high	$2PGSH$	• TC/RTD inputs Input 2_Maximum value of input range • V/I inputs Remote setting input: Input 1_Maximum value of input range Others: 100	—
		Input 2_Input range low	$2PGSL$	• TC/RTD inputs Input 2_Minimum value of input range • V/I inputs Remote setting input: Input 1_Minimum value of input range Others: 0	—
		Input 2_Input error determination point (high)	$2.PoV$	Input 2_Input range high + (Input 2_5 % of input span)	—
		Input 2_Input error determination point (low)	$2.PUN$	Input 2_Input range low - (Input 2_5 % of input span)	—
	Function block No. 31	Retransmission output 1 scale high	$RHS1$	Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range high Input 2_Deviation: +(Input 2_Input span)	4
		Retransmission output 1 scale low	$RLS1$	Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low Input 2_Deviation: -(Input 2_Input span)	4
	Function block No. 32	Retransmission output 2 scale high	$RHS2$	Same as Retransmission output 1 scale high	4
		Retransmission output 2 scale low	$RLS2$	Same as Retransmission output 1 scale low	4
	Function block No. 33	Retransmission output 3 scale high	$RHS3$	Same as Retransmission output 1 scale high	4
		Retransmission output 3 scale low	$RLS3$	Same as Retransmission output 1 scale low	4

* When the Input 2_Input type was changed.



4.1 Parameters to Be Initialized

Mode		Items	Symbol	Initial value	Condition
Engineering Mode	Function block No. 41	Event 1 differential gap	<i>EH1</i>	TC/RTD inputs: 2 V/I inputs: 0.2	3
	Function block No. 42	Event 2 differential gap	<i>EH2</i>		3
	Function block No. 43	Event 3 differential gap	<i>EH3</i>		3
	Function block No. 44	Event 4 differential gap	<i>EH4</i>		3
	Function block No. 52	Input 2_Start determination point	<i>2_PdR</i>	3 % of Input 2_Input span	—
		Input 2_Level PID differential gap	<i>2_LHS</i>	TC/RTD inputs: 2 V/I inputs: 0.2	—
	Function block No. 58	Cascade_AT mode (master-side)	<i>MAS.AT</i>	TC/RTD inputs: 0 V/I inputs: 1	—
		Cascade_AT mode (slave-side)	<i>SLV.AT</i>		—
	Function block No. 72	Input 2_Setting limiter high	<i>2_SLH</i>	Input 2_Input range high	—
		Input 2_Setting limiter low	<i>2_SLL</i>	Input 2_Input range low	—

Condition

- 1: If “Select function for input 2” is “Control with PV select.”
- 2: If “Select function for input 2” is other than “Control with PV select.”
- 3: If Event type is other than manipulated output AND “Select function for input 2” is other than “Control with PV select,” AND Event assignment is “Input 2.”
- 4: Retransmission output is “Input 1_Measured value (PV),” “Input 1_Set value (SV),” or “Input 1_Deviation.”

4.1.5 When Input 1_Control action (I. 05) is changed [Engineering Mode: Function block No. 51]

The following parameters will be initialized.

Some parameters may have prerequisites for initialization. (See following for the prerequisites)

Mode		Items	Symbol	Initial value	Condition
Parameter Setting Mode	Parameter group No. 51	Input 1_Proportional band [heat-side]	I. P	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Input 1_Integral time [heat-side]	I. I	240	—
		Input 1_Derivative time [heat-side]	I. d	60	—
		Input 1_Control response parameter	I. RPT	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2	—
		Input 1_Proactive intensity	I.PACT	2	—
		Input 1_Manual reset	I. MR	0.0	—
		Input 1_FF amount	I. FF	0.0	—
		Input 1_Control loop break alarm (LBA) time	I. LbA	LBA function is specified: 480 LBA function is not specified: 0	—
		Input 1_LBA deadband (LBD)	I. Lbd	0	—
		Input 1_ON/OFF action differential gap (upper)	I. oHH	TC/RTD inputs: 1 V/I inputs: 0.1	—
		Input 1_ON/OFF action differential gap (lower)	I. oHL		—
	Parameter group No. 56	Input 1_Proportional band [cool-side]	I. Pc	TC/RTD inputs: 30 V/I inputs: 3.0	—
		Input 1_Integral time [cool-side]	I. Ic	240	—
		Input 1_Derivative time [cool-side]	I. dc	60	—
		Input 1_Overlap/Deadband	I. db	TC/RTD inputs: 0 V/I inputs: 0.0	—
	Parameter group No. 70	Input 1_Manipulated output value (Area)	I. MVA	PID control or Position proportioning PID control: -5.0 Heat/Cool PID control: 0.0	4
Setup Setting Mode	Setting group No. 30	OUT1 proportional cycle time	f 1	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note1	1
		OUT2 proportional cycle time	f 2	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note2	2
		OUT3 proportional cycle time	f 3	Voltage pulse output: Note3	3
	Setting group No. 51	Input 1_Manual manipulated output value	I. MMV	PID control or Position proportioning PID control: -5.0 Heat/Cool PID control: 0.0	4
Engineering Mode	Function block No. 51	Input 1_Manipulated output value at input error	I. PSM	PID control or Position proportioning PID control: -5.0 Heat/Cool PID control: 0.0	4
	Function block No. 56	Undershoot suppression factor	US	Water cooling: 0.100 Air cooling: 0.250 Cooling linear: 1.000	—

Note1: In case OUT1 function selection is "Input 1_Control output [cool-side]" AND Inpu1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other cases: 2.0

Note2: In case OUT2 function selection is "Input 1_Control output [cool-side]" AND Inpu1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other cases: 2.0

Note3: In case OUT3 function selection is "Input 1_Control output [cool-side]" AND Inpu1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other cases: 2.0

Condition

- 1: When OUT1 is configured to control output: (Switching between Dir/Rev action in Input 1 is excluded from the initialization).
- 2: When OUT2 is configured to control output: (Switching between Dir/Rev action in Input 1 is excluded from the initialization).
- 3: When OUT3 is configured to control output: (Switching between Dir/Rev action in Input 1 is excluded from the initialization).
- 4: When Input 1_Control action is other than switching between Dir/Rev action and Cooling action.



4.1.6 When Input 2_Control action (2. 05) is changed [Engineering Mode: Function block No. 52]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 52	Input 2_Proportional band	2. P	TC/RTD inputs: 30 V/I inputs: 3.0
		Input 2_Integral time	2. I	240
		Input 2_Derivative time	2. d	60
		Input 2_Control response parameter	2. RPF	0
		Input 2_Proactive intensity	2.PACI	2
		Input 2_Manual reset	2. MR	0.0
		Input 2_FF amount	2. FF	0.0
		Input 2_Control loop break alarm (LBA) time	2. LbA	LBA function is specified: 480 LBA function is not specified: 0
		Input 2_LBA deadband (LBD)	2. Lbd	0
		Input 2_ON/OFF action differential gap (upper)	2. 0HH	TC/RTD inputs: 1 V/I inputs: 0.1
		Input 2_ON/OFF action differential gap (lower)	2. 0HL	

4.1.7 When Open/Close output neutral zone (Ydb) is changed [Setup Setting Mode: Setting group No. 55]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Setup Setting Mode	Setting group No. 55	Open/Close output differential gap	YHS	1.0

4.1.8 When OUT1 function selection (05L I) is changed [Engineering Mode: Function block No. 30]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Setup Setting Mode	Setting group No. 30	OUT1 proportional cycle time	f I	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note1

Note1: In case OUT1 function selection is "Input 1_Control output [cool-side]" AND Inpu1_Control action is "Heat/Cool PID control [air cooling] or [water cooling]": 20.0, Other cases: 2.0

4.1.9 When OUT2 function selection (P5L2) is changed [Engineering Mode: Function block No. 30]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Setup Setting Mode	Setting group No. 30	OUT2 proportional cycle time	P2	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note2

Note2: In case OUT2 function selection is “Input 1_Control output [cool-side]” AND Inpu1_Control action is “Heat/Cool PID control [air cooling] or [water cooling]”: 20.0, Other casees: 2.0

4.1.10 When OUT3 function selection (P5L3) and Universal output type selection (UNI a) are changed [Engineering Mode: Function block No. 30]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Setup Setting Mode	Setting group No. 30	OUT3 proportional cycle time	P3	Voltage pulse output: Note3

Note3: In case OUT3 function selection is “Input 1_Control output [cool-side]” AND Inpu1_Control action is “Heat/Cool PID control [air cooling] or [water cooling]”: 20.0, Other casees: 2.0



4.1.11 When Retransmission output 1 type (R_{o1}) is changed [Engineering Mode: Function block No. 31]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 31	Retransmission output 1 scale high	$RHS1$	• Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high Control with PV select: PV select input range high • Input 1_Deviation: +(Input 1_Input span) • Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range high • Input 2_Deviation: +(Input 2_Input span) • Manipulated output value, and Current transformer (CT) input value: 100.0 • Measured value (PV) of differential temperature input: 100
		Retransmission output 1 scale low	$RLS1$	• Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low Control with PV select: PV select input range low • Input 1_Deviation: -(Input 1_Input span) • Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low • Input 2_Deviation: -(Input 2_Input span) • Manipulated output value, and Current transformer (CT) input value: 0.0 • Measured value (PV) of differential temperature input: -100

4.1.12 When Retransmission output 2 type (R_{o2}) is changed [Engineering Mode: Function block No. 32]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 32	Retransmission output 2 scale high	$RHS2$	Same as Retransmission output 1 scale high
		Retransmission output 2 scale low	$RLS2$	Same as Retransmission output 1 scale low

4.1.13 When Retransmission output 3 type (R_{O3}) is changed [Engineering Mode: Function block No. 33]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 33	Retransmission output 3 scale high	R_{H3}	Same as Retransmission output 1 scale high
		Retransmission output 3 scale low	R_{L3}	Same as Retransmission output 1 scale low

4.1.14 When Event 1 type ($E51$) and Event 1 assignment ($E1A1$) are changed [Engineering Mode: Function block No. 41]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	$E11$	TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0
		Event 1 set value (EV1') [low]	$E11'$	TC/RTD inputs: -10 V/I inputs: -5 % of input span
Engineering Mode	Function block No. 41	Event 1 hold action	E_{H01}	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0
		Event 1 differential gap	E_{H1}	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2
		Event 1 timer	$E1T1$	0.0

4.1.15 When Event 2 type ($E52$) and Event 2 assignment ($E1A2$) are changed [Engineering Mode: Function block No. 42]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 40	Event 2 set value (EV2) Event 2 set value (EV2) [high]	$E12$	TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0
		Event 2 set value (EV2') [low]	$E12'$	TC/RTD inputs: -10 V/I inputs: -5 % of input span
Engineering Mode	Function block No. 42	Event 2 hold action	E_{H02}	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0
		Event 2 differential gap	E_{H2}	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2
		Event 2 timer	$E1T2$	0.0

4.1.16 When Event 3 type ($E53$) and Event 3 assignment ($EVA3$) are changed [Engineering Mode: Function block No. 43]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 40	Event 3 set value (EV3) Event 3 set value (EV3) [high]	$EVA3$	TC/RTD inputs: 10 V/I inputs: 5 % of input span MV: 50.0
		Event 3 set value (EV3') [low]	$EVA3'$	TC/RTD inputs: -10 V/I inputs: -5 % of input span
Engineering Mode	Function block No. 43	Event 3 hold action	$EHA3$	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0
		Event 3 differential gap	$EHD3$	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2
		Event 3 timer	$EVT3$	0.0

4.1.17 When Event 4 type ($E54$) and Event 4 assignment ($EVA4$) are changed [Engineering Mode: Function block No. 44]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 40	Event 4 set value (EV4) Event 4 set value (EV4) [high]	$EVA4$	TC/RTD inputs: 10 V/I input: 5 % of input span MV: 50.0
		Event 4 set value (EV4') [low]	$EVA4'$	TC/RTD inputs: -10 V/I input: -5 % of input span
Engineering Mode	Function block No. 43	Event 4 hold action	$EHA4$	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0
		Event 4 differential gap	$EHD4$	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2
		Event 4 timer	$EVT4$	0.0

4.1.18 When CT1 type ($CTR1$) is changed [Engineering Mode: Function block No. 45]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 45	CT1 ratio	$CTR1$	CTL-6-P-N or CTL-6-P-Z: 800 CTL-12-S56-10L-N: 1000

4.1.19 When CT2 type (CT2) is changed [Engineering Mode: Function block No. 46]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 46	CT2 ratio	CT2	CTL-6-P-N or CTL-6-P-Z: 800 CTL-12-S56-10L-N: 1000

4.1.20 When Integral/Derivative time decimal point position (IDP) is changed [Engineering Mode: Function block No. 50]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 51	Input 1_Integral time [heat-side]	I_1	240
		Input 1_Derivative time [heat-side]	$\text{I}_1.d$	60
	Parameter group No. 52	Input 2_Integral time	I_2	240
		Input 2_Derivative time	$\text{I}_2.d$	60
	Parameter group No. 56	Input 1_Integral time [cool-side]	$\text{I}_1.c$	240
		Input 1_Derivative time [cool-side]	$\text{I}_1.d.c$	60
Setup Setting Mode	Setting group No. 58	Cascade _Integral time (master-side)	MRS.I	240
		Cascade _Derivative time (master-side)	MRS.d	60
		Cascade _Integral time (slave-side)	SLV.I	240
		Cascade _Derivative time (slave-side)	SLV.d	60

4.1.21 When Communication protocol (CP) is changed [Engineering Mode: Function block No. 60]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 60	Device address	Add	RKC communication: 0 Modbus: 1 PLC communication: 0
		Data bit configuration	bit	0
	Function block No. 62	Register type	MPREG	0



4.1.22 When Register type (*MPREG*) is changed [Engineering Mode: Function block No. 62]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Engineering Mode	Function block No. 62	Register start number (High-order 4-bit)	<i>MPSRH</i>	0
		Register start number (Low-order 16-bit)	<i>MP SRL</i>	1000

4.1.23 When Soak time unit (*SP dP*) is changed [Engineering Mode: Function block No. 70]

The following parameters will be initialized.

Mode		Items	Symbol	Initial value
Parameter Setting Mode	Parameter group No. 70	Area soak time	<i>AS P</i>	0:00 (0 minutes 00 seconds)

4.1.24 When Initialization (*dEF*) is changed [Engineering Mode: Function block No. 91]

If Initialization is done by setting “1225” at [Engineering Mode: Function block No. 91], all the settings will be set to the factory set values.



NOTE

Make sure all settings are recorded before Initializing.



4.2 Parameters to Be Automatically Converted

If the data of the following parameter is changed, related set values are also automatically converted.



NOTE

Make sure all settings are recorded before changing the set values.



NOTE

Check all set values after having changed the settings.



Refer to ■ **Example of automatic conversion (P. 4-22)** for details of automatic conversion.

			See page
• Input data type	Engineering Mode	Function block No. 21	4-23
• Input 1_Decimal point position	Engineering Mode	Function block No. 21	4-25
• Input 1_Input range high/low	Engineering Mode	Function block No. 21	4-25
• Input 1_Setting limiter high/low	Engineering Mode	Function block No. 71	4-27
• Input 1_Output limiter high/low [heat-side]	Parameter Setting Mode	Parameter group No. 51	4-27
• Input 1_Output limiter high/low [cool-side]	Parameter Setting Mode	Parameter group No. 56	4-27
• Input 2_Decimal point position	Engineering Mode	Function block No. 22	4-28
• Input 2_Input range high/low	Engineering Mode	Function block No. 22	4-30
• Input 2_Setting limiter high/low	Engineering Mode	Function block No. 72	4-32
• Input 2_Output limiter high/low	Parameter Setting Mode	Parameter group No. 52	4-32
• Memory area transfer	Monitor & SV Setting Mode (FZ110)		
	Memory Area Transfer Mode (FZ400/900)		4-32
• Input 1_Level PID setting 1	Setup Setting Mode	Setting group No. 51	4-32
• Input 1_Level PID setting 2	Setup Setting Mode	Setting group No. 51	4-33
• Input 1_Level PID setting 3	Setup Setting Mode	Setting group No. 51	4-33
• Input 1_Level PID setting 4	Setup Setting Mode	Setting group No. 51	4-33
• Input 1_Level PID setting 5	Setup Setting Mode	Setting group No. 51	4-34
• Input 1_Level PID setting 6	Setup Setting Mode	Setting group No. 51	4-34
• Input 1_Level PID setting 7	Setup Setting Mode	Setting group No. 51	4-34
• Input 2_Level PID setting 1	Setup Setting Mode	Setting group No. 52	4-35
• Input 2_Level PID setting 2	Setup Setting Mode	Setting group No. 52	4-35
• Input 2_Level PID setting 3	Setup Setting Mode	Setting group No. 52	4-35
• Input 2_Level PID setting 4	Setup Setting Mode	Setting group No. 52	4-36
• Input 2_Level PID setting 5	Setup Setting Mode	Setting group No. 52	4-36
• Input 2_Level PID setting 6	Setup Setting Mode	Setting group No. 52	4-36
• Input 2_Level PID setting 7	Setup Setting Mode	Setting group No. 52	4-37

Example of automatic conversion

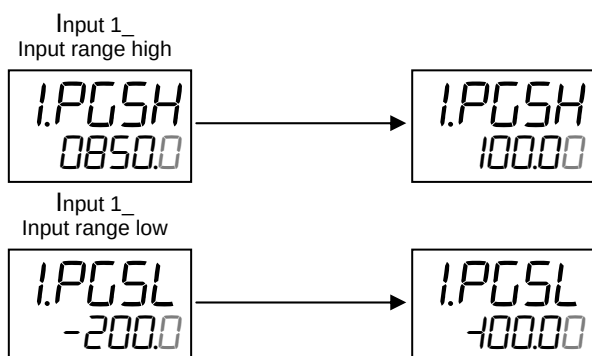
- If the position of a decimal point is changed, the decimal point is shifted according to the setting.

Example 1: When the Input 1_Input range high is set to 400.0 °C, changing the decimal point position to 0 from 1 will change the Input 1_Input range high to 400 °C.



The value will be rounded off to a positive integer.
(400.5 °C is rounded off to 401 °C)

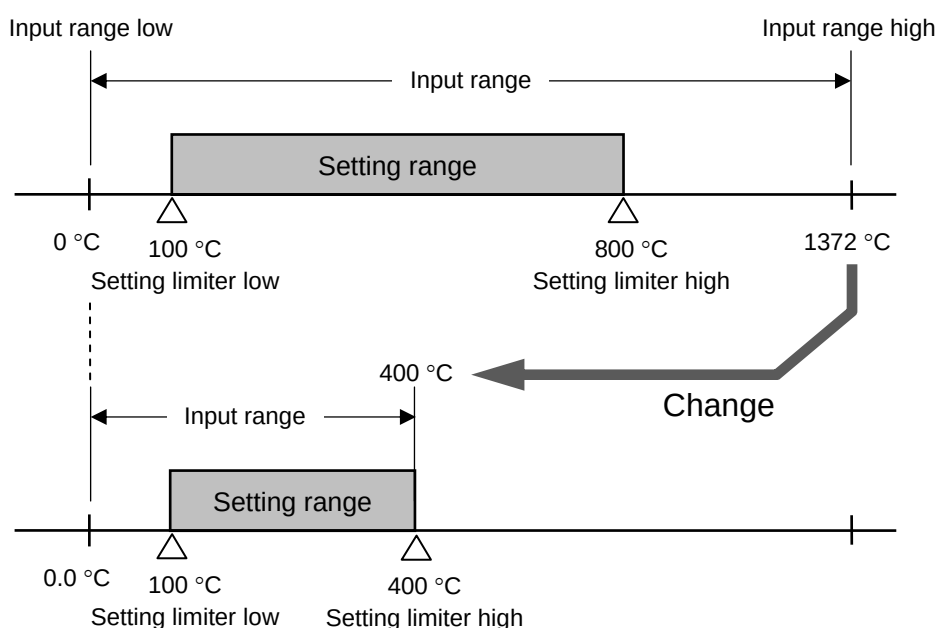
Example 2: When the Input 1_input range is -200.0 to +850.0 °C (Input type: RTD Pt100), changing the decimal point position to 2 from 1 will change the input range to -100.0 to +100.0 °C.



In case of RTD Pt100, as the maximum measuring range with decimal place of 2 is -100.0 to +100.0 °C, this value will not be exceeded.

- When the input range is changed, the setting limiter will be also changed according to the setting.

Example: Input 1_Input range is 0 to 1372 °C, Input 1_Setting limiter high is 800 °C. Changing the Input 1_Input range high to 400 °C will change the Setting limiter high to 400 °C accordingly.



4.2.1 When Input data type (I Ndr) is changed [Engineering Mode: Function block No. 21]

The following parameters will be automatically converted.

Some parameters may have prerequisite for automatic conversion. (Refer to the prerequisite and P. 4-24)

Mode		Items	Symbol	Condition
Monitor & SV Setting Mode		Set value (SV) of differential temperature input		—
Parameter Setting Mode	Parameter group No. 00	Set value (SV) of differential temperature input	dSV	—
	Parameter group No. 40	Event 1 set value (EV1) Event 1 set value (EV1) [high]	EV1	4
		Event 1 set value (EV1') [low]	EV1'	4
		Event 2 set value (EV2) Event 2 set value (EV2) [high]	EV2	4
		Event 2 set value (EV2') [low]	EV2'	4
		Event 3 set value (EV3) Event 3 set value (EV3) [high]	EV3	4
		Event 3 set value (EV3') [low]	EV3'	4
		Event 4 set value (EV4) Event 4 set value (EV4) [high]	EV4	4
		Event 4 set value (EV4') [low]	EV4'	4
	Parameter group No. 51	Input 1_Proportional band [heat-side]	1. P	1
		Input 1_ON/OFF action differential gap (upper)	1. oHH	1
		Input 1_ON/OFF action differential gap (lower)	1. oHL	1
		Input 1_LBA deadband (LBD)	1. Lbd	—
	Parameter group No. 52	Input 2_Proportional band	2. P	1
		Input 2_ON/OFF action differential gap (upper)	2. oHH	1
		Input 2_ON/OFF action differential gap (lower)	2. oHL	1
		Input 2_LBA deadband (LBD)	2. Lbd	—
	Parameter group No. 56	Input 1_Proportional band [cool-side]	1. Pc	1
		Input 1_Overlap/Deadband	1. db	1
	Parameter group No. 70	Input 1_Setting change rate limiter (up)	1SVRU	—
		Input 1_Setting change rate limiter (down)	1SVRd	—
		Input 2_Setting change rate limiter (up)	2SVRU	—
		Input 2_Setting change rate limiter (down)	2SVRd	—
Setup Setting Mode	Setting group No. 53	Input 1_AT bias	1. Atb	—
	Setting group No. 54	Input 2_AT bias	2. Atb	—
	Setting group No. 57	Input 1_Determination point of external disturbance	1ExdJ	—
		Input 2_Determination point of external disturbance	2ExdJ	—
	Setting group No. 91	Input 1_Peak hold monitor	1PHLd	—
		Input 1_Bottom hold monitor	1bHLd	—
		Input 2_Peak hold monitor	2PHLd	—
		Input 2_Bottom hold monitor	2bHLd	—
Engineering Mode	Function block No. 21	Input 1_Input error determination point (high)	1. PoV	—
		Input 1_Input error determination point (low)	1. PUN	—
	Function block No. 22	Input 2_Input error determination point (high)	2. PoV	—
		Input 2_Input error determination point (low)	2. PUN	—
	Function block No. 31	Retransmission output 1 scale high	RHS1	2
		Retransmission output 1 scale low	RLS1	2



4.2 Parameters to Be Automatically Converted

Mode	Items	Symbol	Condition
Engineering Mode	Function block No. 32	Retransmission output 2 scale high	<i>RHS2</i> 2
		Retransmission output 2 scale low	<i>RLS2</i> 2
	Function block No. 33	Retransmission output 3 scale high	<i>RHS3</i> 2
		Retransmission output 3 scale low	<i>RLS3</i> 2
	Function block No. 41	Event 1 differential gap	<i>EH1</i> 3
	Function block No. 42	Event 2 differential gap	<i>EH2</i> 3
	Function block No. 43	Event 3 differential gap	<i>EH3</i> 3
	Function block No. 44	Event 4 differential gap	<i>EH4</i> 3
	Function block No. 51	Input 1_Start determination point	<i>1. PdR</i> —
		Input 1_Level PID differential gap	<i>1. LHS</i> —
	Function block No. 52	Input 2_Start determination point	<i>2. PdR</i> —
		Input 2_Level PID differential gap	<i>2. LHS</i> —
	Function block No. 58	Input circuit error alarm set value	<i>ICR</i> —

Condition

- 1: When Input type is Thermocouple/RTD input.
- 2: When Retransmission output is “Input 1_Deviation,” “Input 2_Deviation,” or Measured value (PV) of differential temperature input.
- 3: Event type is other than Manipulated output value
- 4: In any one of the following cases
 - Event type is a deviation action
 - Event type is an input value action, AND Event assignment is “Differential temperature input.”
 - Event type is a set value action, AND Event assignment is “Differential temperature input.”

4.2.2 When Input 1_Decimal point position (*IPGdP*), Input 1_Input range high (*IPGSH*) and Input 1_Input range low (*IPGSL*) are changed [Engineering Mode: Function block No. 21]

The following parameters will be automatically converted.

Some parameters may have prerequisite for automatic conversion. (Refer to the prerequisite and P. 4-26)

Mode		Items	Symbol	Condition
Monitor & SV Setting Mode		Input 1_Set value (SV)		—
		Set value (SV) of differential temperature input		—
Parameter Setting Mode	Parameter group No. 00	Input 1_Set value (SV)	<i>l. SV</i>	—
		Set value (SV) of differential temperature input	<i>dSV</i>	—
	Parameter group No. 40	Event 1 set value (EV1)	<i>EV 1</i>	3
		Event 1 set value (EV1) [high]		
		Event 1 set value (EV1') [low]	<i>EV 1'</i>	3
		Event 2 set value (EV2)	<i>EV 2</i>	3
		Event 2 set value (EV2) [high]		
		Event 2 set value (EV2') [low]	<i>EV 2'</i>	3
		Event 3 set value (EV3)	<i>EV 3</i>	3
		Event 3 set value (EV3) [high]		
		Event 3 set value (EV3') [low]	<i>EV 3'</i>	3
		Event 4 set value (EV4)	<i>EV 4</i>	3
		Event 4 set value (EV4) [high]		
		Event 4 set value (EV4') [low]	<i>EV 4'</i>	3
	Parameter group No. 51	Input 1_Proportional band [heat-side]	<i>l. P</i>	2
		Input 1_ON/OFF action differential gap (upper)	<i>l. oHH</i>	2
		Input 1_ON/OFF action differential gap (lower)	<i>l. oHL</i>	2
		Input 1_LBA deadband (LBD)	<i>l. Lbd</i>	—
	Parameter group No. 56	Input 1_Proportional band [cool-side]	<i>l. Pc</i>	2
		Input 1_Overlap/Deadband	<i>l. db</i>	2
	Parameter group No. 70	Input 1_Setting change rate limiter (up)	<i>lSV RU</i>	—
		Input 1_Setting change rate limiter (down)	<i>lSV Rd</i>	—
Setup Setting Mode	Setting group No. 21	Input 1_PV bias	<i>l. Pb</i>	—
	Setting group No. 22	Input 2_PV bias (RS bias) *	<i>2. Pb</i>	1
	Setting group No. 51	Input 1_Level PID setting 1	<i>lLEV 1</i>	—
		Input 1_Level PID setting 2	<i>lLEV 2</i>	—
		Input 1_Level PID setting 3	<i>lLEV 3</i>	—
		Input 1_Level PID setting 4	<i>lLEV 4</i>	—
		Input 1_Level PID setting 5	<i>lLEV 5</i>	—
		Input 1_Level PID setting 6	<i>lLEV 6</i>	—
		Input 1_Level PID setting 7	<i>lLEV 7</i>	—
	Setting group No. 53	Input 1_AT bias	<i>l. ATb</i>	—
	Setting group No. 57	Input 1_Determination point of external disturbance	<i>lExdJ</i>	—
	Setting group No. 58	Cascade_Proportional band (master-side)	<i>MRS.P</i>	2
		PV select transfer level	<i>2PV.LV</i>	—
	Setting group No. 91	Input 1_Peak hold monitor	<i>lPHLd</i>	—
		Input 1_Bottom hold monitor	<i>lBHLd</i>	—
Engineering Mode	Function block No. 21	Input 1_Input range high *	<i>IPGSH</i>	—
		Input 1_Input range low *	<i>IPGSL</i>	—

* Only if the Input 1_Decimal point position has been changed. (Not applicable to high and low limit of Input 1)



4.2 Parameters to Be Automatically Converted

Mode		Items	Symbol	Condition
Engineering Mode	Function block No. 21	Input 1_Input error determination point (high)	<i>I. P_{OV}</i>	—
		Input 1_Input error determination point (low)	<i>I. P_{UN}</i>	—
	Function block No. 22	Input 2_Input range high *	<i>2P_{CSH}</i>	1
		Input 2_Input range high *	<i>2P_{CSL}</i>	1
	Function block No. 31	Retransmission output 1 scale high	<i>RHS 1</i>	4
		Retransmission output 1 scale low	<i>RLS 1</i>	4
	Function block No. 32	Retransmission output 2 scale high	<i>RHS2</i>	4
		Retransmission output 2 scale low	<i>RLS2</i>	4
	Function block No. 33	Retransmission output 3 scale high	<i>RHS3</i>	4
		Retransmission output 3 scale low	<i>RLS3</i>	4
	Function block No. 41	Event 1 differential gap	<i>EH 1</i>	3
	Function block No. 42	Event 2 differential gap	<i>EH2</i>	3
	Function block No. 43	Event 3 differential gap	<i>EH3</i>	3
	Function block No. 44	Event 4 differential gap	<i>EH4</i>	3
	Function block No. 51	Input 1_Start determination point	<i>I. P_{dR}</i>	—
		Input 1_Level PID differential gap	<i>I. LHS</i>	—
	Function block No. 58	Input circuit error alarm set value	<i>I CR</i>	—
	Function block No. 71	Input 1_Setting limiter high	<i>I. SLH</i>	—
		Input 1_Setting limiter low	<i>I. SLL</i>	—

* Only if the Input 1_Decimal point position has been changed. (Not applicable to high and low limit of Input 1)

Condition

- 1: “Select function for input 2” is Remote setting input AND Input 2_Input type is either voltage output or current output.
- 2: When Input 1_Input type is Thermocouple/RTD input.
- 3: The condition is either of the following.
 - Event type is other than Manipulated output value AND “Select function for input 2” is set to “Control with PV select.”
 - Event type is other than Manipulated output value AND Event assignment is either “Input 1” or “Differential temperature input.”
- 4: Retransmission output is “No retransmission output,” “Input 1_Measured value (PV),” “Input 1_Set value (SV),” “Input 1_Deviation,” “Input 1_Remote setting input value,” OR Measured value (PV) of differential temperature input.

4.2.3 When Input 1_Setting limiter high/low (I_{5LH} , I_{5LL}) is changed [Engineering Mode: Function block No. 71]

The following parameters will be automatically converted.

Mode		Items	Symbol
Monitor & SV Setting Mode		Input 1_Set value (SV)	
Parameter Setting Mode	Parameter group No. 00	Input 1_Set value (SV)	I_{5L}

4.2.4 When Input 1_Output limiter high/low [heat-side] (I_{OLH} , I_{OLL}) is changed [Parameter Setting Mode: Parameter group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Manual manipulated output value	I_{MMV}

4.2.5 When Input 1_Output limiter high/low [cool-side] (I_{OLHC} , I_{OLLC}) is changed [Parameter Setting Mode: Parameter group No. 56]

The following parameters will be automatically converted.

If the control action is set to “Heat/Cool PID control,” the data of the following parameter will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Manual manipulated output value	I_{MMV}

4.2.6 When Input 2_Decimal point position (2_PCDP) is changed [Engineering Mode: Function block No. 22]

The following parameters will be automatically converted.

Some parameters may have prerequisite for automatic conversion. (Refer to the prerequisite and P. 4-29)

Mode		Items	Symbol	Condition
Monitor & SV Setting Mode		Input 2_Set value (SV)		—
Parameter Setting Mode	Parameter group No. 00	Input 2_Set value (SV)	2. SV	—
	Parameter group No. 40	Event 1 set value (EV1)	EV 1	3
		Event 1 set value (EV1) [high]		
		Event 1 set value (EV1') [low]	EV 1'	3
		Event 2 set value (EV2)	EV 2	3
		Event 2 set value (EV2) [high]		
		Event 2 set value (EV2') [low]	EV 2'	3
		Event 3 set value (EV3)	EV 3	3
		Event 3 set value (EV3) [high]		
		Event 3 set value (EV3') [low]	EV 3'	3
		Event 4 set value (EV4)	EV 4	3
		Event 4 set value (EV4) [high]		
		Event 4 set value (EV4') [low]	EV 4'	3
	Parameter group No. 52	Input 2_Proportional band	2. P	2
		Input 2_ON/OFF action differential gap (upper)	2. oHH	2
		Input 2_ON/OFF action differential gap (lower)	2. oHL	2
		Input 2_LBA deadband (LBD)	2. Lbd	—
	Parameter group No. 70	Input 2_Setting change rate limiter (up)	2.SV RU	—
		Input 2_Setting change rate limiter (down)	2.SV Rd	—
Setup Setting Mode	Setting group No. 22	Input 2_PV bias (RS bias)	2. Pb	1
	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1	—
		Input 2_Level PID setting 2	2.LEV 2	—
		Input 2_Level PID setting 3	2.LEV 3	—
		Input 2_Level PID setting 4	2.LEV 4	—
		Input 2_Level PID setting 5	2.LEV 5	—
		Input 2_Level PID setting 6	2.LEV 6	—
		Input 2_Level PID setting 7	2.LEV 7	—
	Setting group No. 54	Input 2_AT bias	2. Atb	—
	Setting group No. 57	Input 2_Determination point of external disturbance	2.ExdJ	—
	Setting group No. 58	Cascade_Proportional band (master-side)	SLV.P	2
		Cascade_Scale high	CSCH	—
		Cascade_Scale low	CSCL	—
	Setting group No. 91	Input 2_Peak hold monitor	2.PHLd	—
		Input 2_Bottom hold monitor	2.bHLd	—
Engineering Mode	Function block No. 22	Input 2_Input range high	2.PGSH	1
		Input 2_Input range low	2.PGSL	1
		Input 2_Input error determination point (high)	2. PoV	—
		Input 2_Input error determination point (low)	2. PUN	—
	Function block No. 31	Retransmission output 1 scale high	RHS 1	4
		Retransmission output 1 scale low	RLS 1	4
	Function block No. 32	Retransmission output 2 scale high	RHS 2	4
		Retransmission output 2 scale low	RLS 2	4



Mode	Items	Symbol	Condition
Engineering Mode	Function block No. 33	Retransmission output 3 scale high	<i>RHS3</i> 4
		Retransmission output 3 scale low	<i>RLS3</i> 4
	Function block No. 41	Event 1 differential gap	<i>EH1</i> 3
	Function block No. 42	Event 2 differential gap	<i>EH2</i> 3
	Function block No. 43	Event 3 differential gap	<i>EH3</i> 3
	Function block No. 44	Event 4 differential gap	<i>EH4</i> 3
	Function block No. 52	Input 2_Start determination point	<i>2. PdR</i> —
		Input 2_Level PID differential gap	<i>2. LHS</i> —
	Function block No. 72	Input 2_Setting limiter high	<i>2. SLH</i> —
		Input 2_Setting limiter low	<i>2. SLL</i> —

Condition

- 1: “Select function for input 2” is Remote setting input.
- 2: When Input 1_Input type is Thermocouple/RTD input.
- 3: If Event type is other than manipulated output AND “Select function for input 2” is other than “Control with PV select,” AND Event assignment is “Input 2.”
- 4: Retransmission output is “Input 2_Measured value (PV),” “Input 2_Set value (SV),” or “Input 2_Deviation.”



4.2.7 When Input 2_Setting limiter high/low (2PG5H, 2PG5L) is changed [Engineering Mode: Function block No. 22]

The following parameters will be automatically converted.

Some parameters may have prerequisite for automatic conversion. (Refer to the prerequisite and P. 4-31)

Mode		Items	Symbol	Condition
Monitor & SV Setting Mode		Input 2_Set value (SV)		—
Parameter Setting Mode	Parameter group No. 00	Input 1_Set value (SV)	1. SV	1
		Input 2_Set value (SV)	2. SV	—
	Parameter group No. 40	Event 1 set value (EV1)	EV1	5
		Event 1 set value (EV1) [high]		
		Event 1 set value (EV1') [low]	EV1'	5
		Event 2 set value (EV2)	EV2	5
		Event 2 set value (EV2) [high]		
		Event 2 set value (EV2') [low]	EV2'	5
		Event 3 set value (EV3)	EV3	5
		Event 3 set value (EV3) [high]		
		Event 3 set value (EV3') [low]	EV3'	5
		Event 4 set value (EV4)	EV4	5
		Event 4 set value (EV4) [high]		
		Event 4 set value (EV4') [low]	EV4'	5
	Parameter group No. 51	Input 1_Proportional band [heat-side]	1. P	3
		Input 1_ON/OFF action differential gap (upper)	1. oHH	3
		Input 1_ON/OFF action differential gap (lower)	1. oHL	3
		Input 1_LBA deadband (LBD)	1. Lbd	1
	Parameter group No. 52	Input 2_Proportional band	2. P	2
		Input 2_ON/OFF action differential gap (upper)	2. oHH	2
		Input 2_ON/OFF action differential gap (lower)	2. oHL	2
		Input 2_LBA deadband (LBD)	2. Lbd	—
	Parameter group No. 56	Input 1_Proportional band [cool-side]	1. Pc	3
		Input 1_Overlap/Deadband	1. db	3
	Parameter group No. 70	Input 1_Setting change rate limiter (up)	1SVRU	1
		Input 1_Setting change rate limiter (down)	1SVRd	1
		Input 2_Setting change rate limiter (up)	2SVRU	—
		Input 2_Setting change rate limiter (down)	2SVRd	—
Setup Setting Mode	Setting group No. 22	Input 2_PV bias (RS bias)	2. Pb	4
	Setting group No. 51	Input 1_Level PID setting 1	1LEV1	1
		Input 1_Level PID setting 2	1LEV2	1
		Input 1_Level PID setting 3	1LEV3	1
		Input 1_Level PID setting 4	1LEV4	1
		Input 1_Level PID setting 5	1LEV5	1
		Input 1_Level PID setting 6	1LEV6	1
		Input 1_Level PID setting 7	1LEV7	1
	Setting group No. 52	Input 2_Level PID setting 1	2LEV1	—
		Input 2_Level PID setting 2	2LEV2	—
		Input 2_Level PID setting 3	2LEV3	—
		Input 2_Level PID setting 4	2LEV4	—
		Input 2_Level PID setting 5	2LEV5	—
		Input 2_Level PID setting 6	2LEV6	—
		Input 2_Level PID setting 7	2LEV7	—

Mode	Items	Symbol	Condition
Setup Setting Mode	Setting group No. 53	Input 1_AT bias	1. <i>ATb</i> 1
	Setting group No. 54	Input 2_AT bias	2. <i>ATb</i> —
	Setting group No. 57	Input 1_Determination point of external disturbance	1E <i>xdJ</i> 1
		Input 2_Determination point of external disturbance	2E <i>xdJ</i> —
	Setting group No. 58	Cascade_Proportional band (slave-side)	<i>SLVP</i> 2
		Cascade_Scale high	<i>CSCH</i> —
		Cascade_Scale low	<i>CSCL</i> —
	Setting group No. 91	Input 2_Peak hold monitor	2PHL <i>d</i> —
		Input 2_Bottom hold monitor	2bHL <i>d</i> —
Engineering Mode	Function block No. 22	Input 2_Input error determination point (high)	2. <i>PoV</i> —
		Input 2_Input error determination point (low)	2. <i>PUN</i> —
	Function block No. 31	Retransmission output 1 scale high	<i>RHS1</i> 6
		Retransmission output 1 scale low	<i>RLS1</i> 6
	Function block No. 32	Retransmission output 2 scale high	<i>RHS2</i> 6
		Retransmission output 2 scale low	<i>RLS2</i> 6
	Function block No. 33	Retransmission output 3 scale high	<i>RHS3</i> 6
		Retransmission output 3 scale low	<i>RLS3</i> 6
	Function block No. 41	Event 1 differential gap	<i>EH1</i> 5
	Function block No. 42	Event 2 differential gap	<i>EH2</i> 5
	Function block No. 43	Event 3 differential gap	<i>EH3</i> 5
	Function block No. 44	Event 4 differential gap	<i>EH4</i> 5
	Function block No. 51	Input 1_Start determination point	1. <i>PdR</i> 1
		Input 1_Level PID differential gap	1L <i>PI d</i> 1
	Function block No. 52	Input 2_Start determination point	2. <i>PdR</i> —
		Input 2_Level PID differential gap	2. <i>LHS</i> —
	Function block No. 71	Input 1_Setting limiter high	1. <i>SLH</i> 1
		Input 1_Setting limiter low	1. <i>SLL</i> 1
	Function block No. 72	Input 2_Setting limiter high	2. <i>SLH</i> —
		Input 2_Setting limiter low	2. <i>SLL</i> —

Condition

- 1: If “Select function for input 2” is “Control with PV select.”
- 2: When Input type is Thermocouple/RTD input.
- 3: “Select function for input 2” is “Control with PV select” AND Input 2_Input type is Thermocouple/RTD input.
- 4: “Select function for input 2” is other than Remote setting input
- 5: If Event type is other than manipulated output AND “Select function for input 2” is other than “Control with PV select,” AND Event assignment is “Input 2.”
- 6: The condition is either of the following.
 - Retransmission output is “Input 2_Measured value (PV),” “Input 2_Set value (SV),” or “Input 2_Deviation.”
 - When “Select function for Input 2” is “Control with PV select,” the Retransmission output will be as follows.
“No retransmission output,” “Input 1_Measured value (PV),” “Input 1_Set value (SV),” “Input 1_Deviation,”
“Input 1_Remote setting input value,” OR Measured value (PV) of differential temperature input.



4.2.8 When Input 2_Setting limiter high/low (2. 5LH, 2. 5LL) is changed [Engineering Mode: Function block No. 72]

The following parameters will be automatically converted.

Mode		Items	Symbol
Monitor & SV Setting Mode		Input 2_Set value (SV)	
Parameter Setting Mode	Parameter group No. 00	Input 2_Set value (SV)	2. 5V
Setup Setting Mode	Setting group No. 58	Cascade_Scale high	2.5CH
		Cascade_Scale low	2.5CL

4.2.9 When Input 2_Output limiter high/low (2. 6LH, 2. 6LL) is changed [Parameter Setting Mode: Parameter group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Manual manipulated output value	2. MMV

4.2.10 When Memory area transfer (AREA) is changed [Monitor & SV Setting Mode (FZ110), Memory Area Transfer Mode (FZ400/900)]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Manual manipulated output value	1. MMV
	Setting group No. 52	Input 2_Manual manipulated output value	2. MMV

4.2.11 When Input 1_Level PID setting 1 (1LEV1) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 2	1LEV2
		Input 1_Level PID setting 3	1LEV3
		Input 1_Level PID setting 4	1LEV4
		Input 1_Level PID setting 5	1LEV5
		Input 1_Level PID setting 6	1LEV6
		Input 1_Level PID setting 7	1LEV7

4.2.12 When Input 1_Level PID setting 2 (*IL EV 2*) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	<i>IL EV 1</i>
		Input 1_Level PID setting 3	<i>IL EV 3</i>
		Input 1_Level PID setting 4	<i>IL EV 4</i>
		Input 1_Level PID setting 5	<i>IL EV 5</i>
		Input 1_Level PID setting 6	<i>IL EV 6</i>
		Input 1_Level PID setting 7	<i>IL EV 7</i>

4.2.13 When Input 1_Level PID setting 3 (*IL EV 3*) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	<i>IL EV 1</i>
		Input 1_Level PID setting 2	<i>IL EV 2</i>
		Input 1_Level PID setting 4	<i>IL EV 4</i>
		Input 1_Level PID setting 5	<i>IL EV 5</i>
		Input 1_Level PID setting 6	<i>IL EV 6</i>
		Input 1_Level PID setting 7	<i>IL EV 7</i>

4.2.14 When Input 1_Level PID setting 4 (*IL EV 4*) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	<i>IL EV 1</i>
		Input 1_Level PID setting 2	<i>IL EV 2</i>
		Input 1_Level PID setting 3	<i>IL EV 3</i>
		Input 1_Level PID setting 5	<i>IL EV 5</i>
		Input 1_Level PID setting 6	<i>IL EV 6</i>
		Input 1_Level PID setting 7	<i>IL EV 7</i>



4.2.15 When Input 1_Level PID setting 5 (*ILEV5*) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	<i>ILEV1</i>
		Input 1_Level PID setting 2	<i>ILEV2</i>
		Input 1_Level PID setting 3	<i>ILEV3</i>
		Input 1_Level PID setting 4	<i>ILEV4</i>
		Input 1_Level PID setting 6	<i>ILEV6</i>
		Input 1_Level PID setting 7	<i>ILEV7</i>

4.2.16 When Input 1_Level PID setting 6 (*ILEV6*) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	<i>ILEV1</i>
		Input 1_Level PID setting 2	<i>ILEV2</i>
		Input 1_Level PID setting 3	<i>ILEV3</i>
		Input 1_Level PID setting 4	<i>ILEV4</i>
		Input 1_Level PID setting 5	<i>ILEV5</i>
		Input 1_Level PID setting 7	<i>ILEV7</i>

4.2.17 When Input 1_Level PID setting 7 (*ILEV7*) is changed [Setup Setting Mode: Setting group No. 51]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 51	Input 1_Level PID setting 1	<i>ILEV1</i>
		Input 1_Level PID setting 2	<i>ILEV2</i>
		Input 1_Level PID setting 3	<i>ILEV3</i>
		Input 1_Level PID setting 4	<i>ILEV4</i>
		Input 1_Level PID setting 5	<i>ILEV5</i>
		Input 1_Level PID setting 6	<i>ILEV6</i>

4.2.18 When Input 2_Level PID setting 1 (2.LEV 1) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 2	2.LEV 2
		Input 2_Level PID setting 3	2.LEV 3
		Input 2_Level PID setting 4	2.LEV 4
		Input 2_Level PID setting 5	2.LEV 5
		Input 2_Level PID setting 6	2.LEV 6
		Input 2_Level PID setting 7	2.LEV 7

4.2.19 When Input 2_Level PID setting 2 (2.LEV 2) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1
		Input 2_Level PID setting 3	2.LEV 3
		Input 2_Level PID setting 4	2.LEV 4
		Input 2_Level PID setting 5	2.LEV 5
		Input 2_Level PID setting 6	2.LEV 6
		Input 2_Level PID setting 7	2.LEV 7

4.2.20 When Input 2_Level PID setting 3 (2.LEV 3) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV 1
		Input 2_Level PID setting 2	2.LEV 2
		Input 2_Level PID setting 4	2.LEV 4
		Input 2_Level PID setting 5	2.LEV 5
		Input 2_Level PID setting 6	2.LEV 6
		Input 2_Level PID setting 7	2.LEV 7



4.2.21 When Input 2_Level PID setting 4 (2.LEV4) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV1
		Input 2_Level PID setting 2	2.LEV2
		Input 2_Level PID setting 3	2.LEV3
		Input 2_Level PID setting 5	2.LEV5
		Input 2_Level PID setting 6	2.LEV6
		Input 2_Level PID setting 7	2.LEV7

4.2.22 When Input 2_Level PID setting 5 (2.LEV5) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV1
		Input 2_Level PID setting 2	2.LEV2
		Input 2_Level PID setting 3	2.LEV3
		Input 2_Level PID setting 4	2.LEV4
		Input 2_Level PID setting 6	2.LEV6
		Input 2_Level PID setting 7	2.LEV7

4.2.23 When Input 2_Level PID setting 6 (2.LEV6) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2.LEV1
		Input 2_Level PID setting 2	2.LEV2
		Input 2_Level PID setting 3	2.LEV3
		Input 2_Level PID setting 4	2.LEV4
		Input 2_Level PID setting 5	2.LEV5
		Input 2_Level PID setting 7	2.LEV7



4.2.24 When Input 2_Level PID setting 7 (2LEV7) is changed [Setup Setting Mode: Setting group No. 52]

The following parameters will be automatically converted.

Mode		Items	Symbol
Setup Setting Mode	Setting group No. 52	Input 2_Level PID setting 1	2LEV1
		Input 2_Level PID setting 2	2LEV2
		Input 2_Level PID setting 3	2LEV3
		Input 2_Level PID setting 4	2LEV4
		Input 2_Level PID setting 5	2LEV5
		Input 2_Level PID setting 6	2LEV6



MEMO



5

INPUT FUNCTION

This chapter describes input related functions, setting contents and setting procedure based on the key words related to inputs.

5.1 Changing Input	5-2
5.2 Switching Functions Using Digital Inputs (DI)	5-16
5.3 Correcting Input	5-28
5.4 Preventing the Input Flicker	5-31
5.5 Inverting the Input	5-33
5.6 Extracting Square Root of Input.....	5-35
5.7 Changing Error Handling at Input Error	5-39
5.8 Using Dual Input Function	5-48

5.1 Changing Input

Measured input can be changed at following parameters. Set the input according to the sensor and the application.

- Input type
- Display unit
- Decimal point position
- Input range high/Input range low
- Input data type

■ Description of function

Input type

Input type can be easily configured to thermocouple, RTD, current or voltage only by changing the settings.

- TC input type: K, J, R, S, B, E, N, T, W5Re/W26Re, PL II, U, L, PR40-20
- RTD input type: Pt100, JPt100
- Current input type: 0 to 20 mA DC, 4 to 20 mA DC
- Voltage input type: 0 to 10 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 1 V DC, –10 to +10 V DC, –5 to +5 V DC, 0 to 100 mV DC, 0 to 10 mV DC

Display unit

In case of thermocouple or RTD input, the measurement unit can be selected from °C and °F.

Decimal point position

The decimal point position depends on the input type.

- TC input: K, J, T, U, L: No decimal place or One decimal place
Thermocouples other than those shown above: No decimal place (fixed)
- RTD input: No decimal place, One decimal place or Two decimal place
- Voltage/Current input: In case of Input data type 0: No decimal place, One decimal place, Two decimal place, Three decimal place or Four decimal place
In case of Input data type 1: No decimal place, One decimal place, Two decimal place or Three decimal place



For the Input data type, refer to **Input range table (P. 5-11)**.

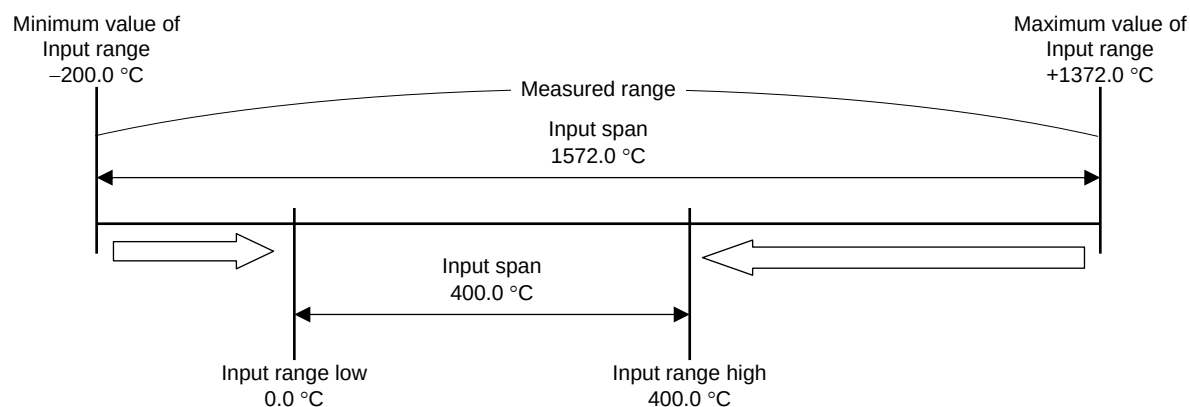
Input range high/low

In the case of temperature input (TC and RTD), input ranges can be changed. In the case of voltage (V) and current (I) inputs, the display range is programmable within –19999 and +99999.

(The input range specified when ordered can be changed by setting the input range high and low.)

Example of input change 1:

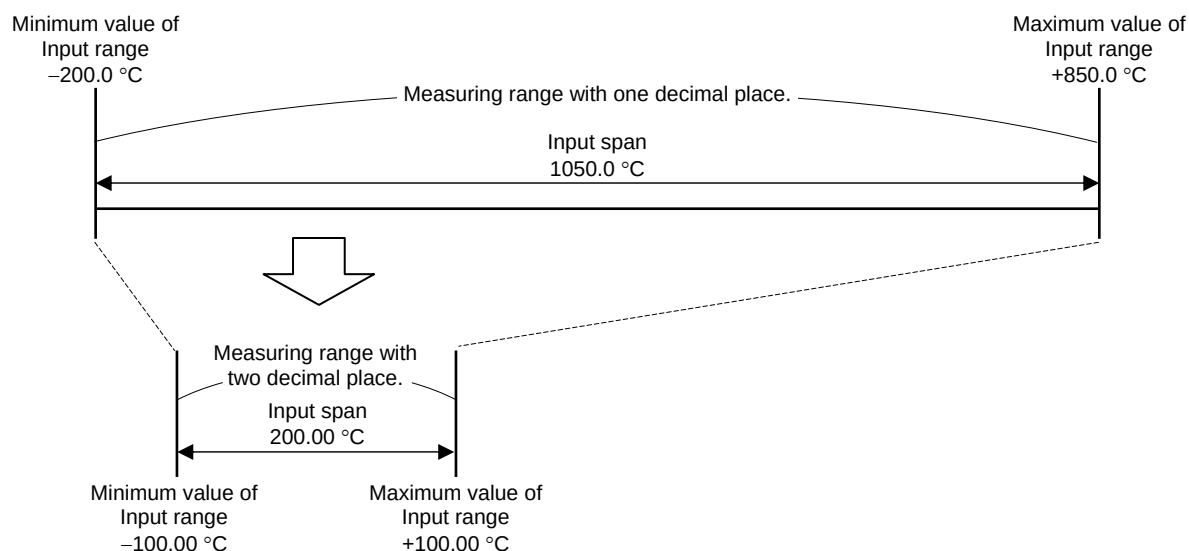
Changing thermocouple K “–200.0 to +1372.0 °C” to “0.0 to 400.0 °C”



Example of input change 2:

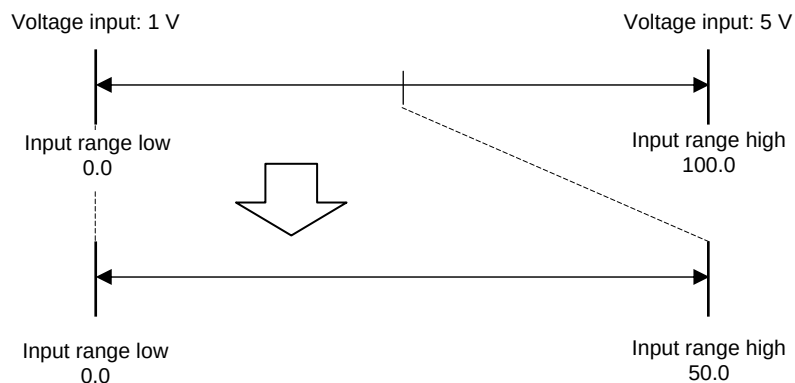
When the input range is -200.0 to $+850.0$ °C (Input type: RTD Pt100), changing the decimal point position to 2 from 1 will change the input range to -100.00 to $+100.00$ °C.

The maximum range with an RTD Pt100 input with two decimal places is -100.00 to $+100.00$ °C. Accordingly setting beyond this range is not possible.



Example of input change 3:

In the case of Voltage input (1 to 5 V DC), the input range has been reduced from “0.0 to 100.0” to “0.0 to 50.0.”



Input data type

The number of digits of the Measured value (PV), the number of data digits in RKC communication, the data type in Modbus communication (double word or single word) can be changed.

Parameter setting

Refer to the **Input range table (P. 5-11)** for the input range of each input type.

For the input range code, refer to **Input range code table (P. 5-13)**.

Input 1_Input type

[Engineering Mode: Function block No. 21 (Fn2 I)]

Parameter symbol	Data range		Factory set value
I. I NP	0: TC input K	15: Current input 0 to 20 mA DC	Same as the input type of the input range code specified at the time of order.
	1: TC input J	16: Current input 4 to 20 mA DC	
	2: TC input R	17: Voltage input 0 to 10 V DC	
	3: TC input S	18: Voltage input 0 to 5 V DC	
	4: TC input B	19: Voltage input 1 to 5 V DC	
	5: TC input E	20: Voltage input 0 to 1 V DC	
	6: TC input N	21: Voltage input -10 to +10 V DC	
	7: TC input T	22: Voltage input -5 to +5 V DC	
	8: TC input W5Re/W26Re	23: Voltage input 0 to 100 mV DC	
	9: TC input PL II	24: Voltage input 0 to 10 mV DC	
	10: TC input U		
	11: TC input L		
	12: TC input PR40-20		
	13: RTD input Pt100		
	14: RTD input JPt100		

NOTE

When the input type is changed from current or high voltage input * to TC, RTD or low voltage input *, remove the wirings of the measured input before attempting the input change. Changing the input type with the signal applied to the instrument may lead to a failure of the instrument.

* High voltage input: 0 to 10 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 1 V DC, -10 to +10 V DC, -5 to +5 V DC
Low voltage input: 0 to 100 mV DC, 0 to 10 mV DC

Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized or changed when the input type is changed.

● Input 2_Input type

[Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range		Factory set value
2. INP	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PL II 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 ● When Measured input 2 is selected for FZ400/900: 0 to 24 ● When Remote setting input is selected for FZ400/900: 15 to 24 ● When Remote setting input is selected for FZ110: 15 to 22	15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input -10 to +10 V DC 22: Voltage input -5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC	Same as Input 1_Input type When Remote setting input is specified at the time of order, but the input type is not specified: 17



NOTE

When the input type is changed from current or high voltage input * to TC, RTD or low voltage input *, remove the wirings of the measured input before attempting the input change. Changing the input type with the signal applied to the instrument may lead to a failure of the instrument.

* High voltage input: 0 to 10 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 1 V DC, -10 to +10 V DC, -5 to +5 V DC
Low voltage input: 0 to 100 mV DC, 0 to 10 mV DC



To display Input 2_Input type, “Measured input 2” or “Remote setting input” must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.



Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized or changed when the input type is changed.

● Input 1_Display unit

[Engineering Mode: Function block No. 21 (F_{n21})]

Parameter symbol	Data range	Factory set value
	0: °C 1: °F	Same as the display unit of the input range code specified at the time of order.



To show “Input 1_Display unit,” thermocouple or RTD must be selected at Input 1_Input type in Function block No. 21 in the Engineering mode.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized or changed when the display unit is changed.

● Input 2_Display unit

[Engineering Mode: Function block No. 22 (F_{n22})]

Parameter symbol	Data range	Factory set value
	0: °C 1: °F	Same as Input 1_Temperature unit



To show “Input 2_Display unit,” “Measured input 2” must be specified at the time of order and thermocouple or RTD must be selected at “Input 2_Input type” in Function block No. 22 in the Engineering mode.



Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode. The setting cannot be changed if Remote setting input and Control with PV select are set.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized or changed when the display unit is changed.

● Input 1_Decimal point position

[Engineering Mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1.PCdP	0: No decimal place 1: One decimal place 2: Two decimal place 3: Three decimal place 4: Four decimal place TC input: K, J, T, U, L: 0 to 1 Thermocouples other than those shown above: 0 (fixed) RTD input: 0 to 2 Voltage (V)/Current (I) input: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3 (When Control with PV select: Decimal point position setting of Input 1 and Input 2 is compared and the smaller will be used.)	Same as the decimal point position of the input range code specified at the time of order. For V/I inputs: 1



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized or automatically converted when the decimal point position is changed.

● Input 2_Decimal point position

[Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2.PCdP	0: No decimal place 1: One decimal place 2: Two decimal place 3: Three decimal place 4: Four decimal place TC input: K, J, T, U, L: 0 to 1 Thermocouples other than those shown above: 0 (fixed) RTD input: 0 to 2 Voltage (V)/Current (I) input: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3	Same as Input 1_Decimal point position



To show the “Input 2_Decimal point position,” “Measured input 2” must be specified at the time of order.



Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode. The setting cannot be changed if Remote setting input and Control with PV select are set.



When Control with PV select is set in “Select function for input 2” in Function block No. 58 in the Engineering mode, a smaller value (of Decimal point position setting for Input 1 and Input 2) will be used.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized or automatically converted when the decimal point position is changed.

● Input 1_Input range high

[Engineering Mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1.PGSH	(Input 1_Input range low + 1digit) to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.] Refer to the Input range table (P. 5-11) for the input range of each input type.	High limit value of the input range code specified at the time of order. For V/I inputs: 100.0



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input range high is changed.

● Input 2_Input range high

[Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2.PGSH	• TC/RTD inputs and Voltage (V)/Current (I) inputs (For other than Remote setting input): (Input 2_Input range low + 1digit) to Input 2_Maximum value of input range [Varies with the setting of the Decimal point position.] • Voltage (V)/Current (I) inputs (For Remote setting input): Input 2_Input range low to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.] Refer to the Input range table (P. 5-11) for the input range of each input type.	Same as Input 1_Input range high



To display Input 2_Input range high, “Measured input 2” or “Remote setting input” must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input range high is changed.

● Input 1_Input range low

[Engineering Mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1.PC5L	Input 1_Minimum value of input range to (Input 1_Input range high – 1digit) [Varies with the setting of the Decimal point position.] Refer to the Input range table (P. 5-11) for the input range of each input type.	Low limit value of the input range code specified at the time of order. For V/I inputs: 0.0



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input range low is changed.

● Input 2_Input range low

[Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2.PC5L	- TC/RTD inputs and Voltage (V)/Current (I) inputs (For other than Remote setting input): Input 2_Minimum value of input range to (Input 2_Input range high – 1digit) [Varies with the setting of the Decimal point position.] - Voltage (V)/Current (I) inputs (For Remote setting input): Input 1_Minimum value of input range to Input 2_Input range high [Varies with the setting of the Decimal point position.] Refer to the Input range table (P. 5-11) for the input range of each input type.	Same as Input 1_Input range low



To display Input 2_Input range low, “Measured input 2” or “Remote setting input” must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input range low is changed.

● Input data type

[Engineering Mode: Function block No. 21 (F_{n2} I)]

Parameter symbol	Data range	Factory set value
I_{Ndf}	0: Number of measured value digits: 5 Number of RKC communication digits: 7 Modbus: Double word PLC communication: Double word (System data: Single word) 1: Number of measured value digits: 4 Number of RKC communication digits: 6 * Modbus: Single word ** PLC communication: Single word * Set “2” to handle the data of REX-D and its equivalent models in RKC communication. ** The data of the FB series and its equivalent are included. When changing the Input data type from 0 to 1 (or 2) and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand. The unit of time depends on the Input data type. In case of Input data type 0 FZ400/900: hour/minute/second, hour/minute, minute/second FZ110: hour/minute, minute/second In case of Input data type 1 hour/minute, minute/second	Conforms to Input range code to specified at the time of ordering



Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are automatically converted when the Input data type is changed.

Input range table

The input range may vary with the Input data type.

The Input data types are as follows.

- Measured value (PV): 5 or 4 digits for the display
- RKC communication: 7 or 6 digits for the data
- Modbus: Double word or single word
- PLC communication: Double word or single word



The Input data type can be changed at “Input data type” in Function block No. 21 in the Engineering mode.



The input resolution may vary with the selected input range, unit, and decimal point position.

TC input

Input type	Decimal point position	In case of Input data type 0 Number of measured value digits: 5 Number of RKC communication digits: 7 Modbus: Double word PLC communication: Double word		In case of Input data type 1 Number of measured value digits: 4 Number of RKC communication digits: 6 Modbus: Single word PLC communication: Single word	
		°C	°F	°C	°F
K	No decimal place	–200 to +400 °C	–328 to +752 °F	–200 to +400 °C	–328 to +752 °F
		–200 to +1372 °C	–328 to +2502 °F	–200 to +1372 °C	–328 to +2502 °F
	One decimal place	–200.0 to +400.0 °C	–328.0 to +752.0 °F	–199.9 to +400.0 °C	–199.9 to +752.0 °F
		–200.0 to +1372.0 °C	–328.0 to +2502.0 °F	–199.9 to +999.9 °C	–199.9 to +999.9 °F
J	No decimal place	–200 to +400 °C	–328 to +752 °F	–200 to +400 °C	–328 to +752 °F
		–200 to +1200 °C	–328 to +2192 °F	–200 to +1200 °C	–328 to +2192 °F
	One decimal place	–200.0 to +400.0 °C	–328.0 to +752.0 °F	–199.9 to +400.0 °C	–199.9 to +752.0 °F
		–200.0 to +1200.0 °C	–328.0 to +2192.0 °F	–199.9 to +999.9 °C	–199.9 to +999.9 °F
T	No decimal place	–200 to +400 °C	–328 to +752 °F	–200 to +400 °C	–328 to +752 °F
	One decimal place	–200.0 to +400.0 °C	–328.0 to +752.0 °F	–199.9 to +400.0 °C	–199.9 to +752.0 °F
S	No decimal place	–50 to +1768 °C	–58 to +3214 °F	–50 to +1768 °C	–58 to +3214 °F
R	No decimal place	–50 to +1768 °C	–58 to +3214 °F	–50 to +1768 °C	–58 to +3214 °F
E	No decimal place	–200 to +1000 °C	–328 to +1832 °F	–200 to +1000 °C	–328 to +1832 °F
B	No decimal place	0 to 1800 °C	0 to 3272 °F	0 to 1800 °C	0 to 3272 °F
N	No decimal place	0 to 1300 °C	0 to 2372 °F	0 to 1300 °C	0 to 2372 °F
PL II	No decimal place	0 to 1390 °C	0 to 2534 °F	0 to 1390 °C	0 to 2534 °F
W5Re/W26Re	No decimal place	0 to 2300 °C	0 to 4200 °F	0 to 2300 °C	0 to 4200 °F
U	No decimal place	–200 to +600 °C	–328 to +1112 °F	–200 to +600 °C	–328 to +1112 °F
	One decimal place	–200.0 to +600.0 °C	–328.0 to +1112.0 °F	–199.9 to +600.0 °C	–199.9 to +999.9 °F
L	No decimal place	0 to 900 °C	0 to 1652 °F	0 to 900 °C	0 to 1652 °F
	One decimal place	0.0 to 900.0 °C	0.0 to 1652.0 °F	0.0 to 999.9 °C	0.0 to 999.9 °F
PR40-20	No decimal place	0 to 1800 °C	0 to 3200 °F	0 to 1800 °C	0 to 3200 °F



If there is no decimal point, there is no difference in the input range by Input data type.



Thermcouple inputs K, J, T, U, L are settable to one decimal place.



5. INPUT FUNCTION

● RTD input

Input type	Decimal point position	In case of Input data type 0 Number of measured value digits: 5 Number of RKC communication digits: 7 Modbus: Double word PLC communication: Double word		In case of Input data type 1 Number of measured value digits: 4 Number of RKC communication digits: 6 Modbus: Single word PLC communication: Single word	
		°C	°F	°C	°F
Pt100	No decimal place	–200 to +850 °C	–328 to +1562 °F	–200 to +850 °C	–328 to +1562 °F
		–100 to +100 °C	–148 to +212 °F	–100 to +100 °C	–148 to +212 °F
		0 to 50 °C	32 to 122 °F	0 to 50 °C	32 to 122 °F
	One decimal place	–200.0 to +850.0 °C	–328.0 to +1562.0 °F	–199.9 to +850.0 °C	–199.9 to +999.9 °F
		–100.0 to +100.0 °C	–148.0 to +212.0 °F	–100.0 to +100.0 °C	–148.0 to +212.0 °F
		0.0 to 50.0 °C	32.0 to 122.0 °F	0.0 to 50.0 °C	32.0 to 122.0 °F
JPt100	No decimal place	–200 to +649 °C	–328 to +1184 °F	–200 to +649 °C	–328 to +1184 °F
		–100 to +100 °C	–148 to +212 °F	–100 to +100 °C	–148 to +212 °F
		0 to 50 °C	32 to 122 °F	0 to 50 °C	32 to 122 °F
	One decimal place	–200.0 to +649.0 °C	–328.0 to +1184.0 °F	–199.9 to +649.0 °C	–199.9 to +999.9 °F
		–100.0 to +100.0 °C	–148.0 to +212.0 °F	–100.0 to +100.0 °C	–148.0 to +212.0 °F
		0.0 to 50.0 °C	32.0 to 122.0 °F	0.0 to 50.0 °C	32.0 to 122.0 °F
	Two decimal place	–100.00 to +100.00 °C	–148.00 to +212.00 °F	–19.99 to +99.99 °C	–19.99 to +99.99 °F
		0.00 to 50.00 °C	32.00 to 122.00 °F	0.00 to 50.00 °C	32.00 to 99.99 °F



If there is no decimal point, there is no difference in the input range by Input data type.

● Voltage/Current input

Input type	Decimal point position	In case of Input data type 0 Number of measured value digits: 5 Number of RKC communication digits: 7 Modbus: Double word PLC communication: Double word		In case of Input data type 1 Number of measured value digits: 4 Number of RKC communication digits: 6 Modbus: Single word PLC communication: Single word	
Voltage/Current	No decimal place	–19999 to +99999		–1999 to +9999	
	One decimal place	–1999.9 to +9999.9		–199.9 to +999.9	
	Two decimal place	–199.99 to +999.99		–19.99 to +99.99	
	Three decimal place	–19.999 to +99.999		–1.999 to +9.999	
	Four decimal place	–1.9999 to +9.9999			

Input range code table (can be specified when ordering)



The Input range code table is a list of input range codes so that a user can specify the input range at the time of ordering. Even if the input range has been specified when ordered, the input range can be changed later within the measured range.

● TC Input

Type	Code	Range	Note
K	K01	0 to 200 °C	4
	K02	0 to 400 °C	4
	K03	0 to 600 °C	4
	K04	0 to 800 °C	4
	K06	0 to 1200 °C	4
	K07	0 to 1372 °C	4
	K08	−199.9 to +300.0 °C	4
	K09	0.0 to 400.0 °C	4
	K10	0.0 to 800.0 °C	4
	K14	0 to 300 °C	4
	K41	−200 to +1372 °C	4
	K42	−200.0 to +1372.0 °C	5
	KA1	0 to 800 °F	4
	KA2	0 to 1600 °F	4
	KA3	0 to 2502 °F	4
J	J01	0 to 200 °C	4
	J02	0 to 400 °C	4
	J03	0 to 600 °C	4
	J04	0 to 800 °C	4
	J08	0.0 to 400.0 °C	4
	J29	−200.0 to +1200.0 °C	5

Type	Code	Range	Note
J	JA1	0 to 800 °F	4
	JA3	0 to 2192 °F	4
	JA6	0 to 400 °F	4
T	T01	−199.9 to +400.0 °C	4
	T02	−199.9 to +100.0 °C	4
	T03	−100.0 to +200.0 °C	4
	T19	−200.0 to +400.0 °C	5
R	R01	0 to 1600 °C	4
	R07	−50 to +1768 °C	4
S	S06	−50 to +1768 °C	4
B	B03	0 to 1800 °C	4
E	E01	0 to 800 °C	4
N	N02	0 to 1300 °C	4
W5Re/ W26Re	W03	0 to 2300 °C	4
PL II	A01	0 to 1300 °C	4
U	U01	−199.9 to +600.0 °C	4
L	L04	0.0 to 900.0 °C	4
PR40-20	F02	0 to 1800 °C	5
	FA2	0 to 3200 °F	5

● RTD input

Type	Code	Range	Note
Pt100	D01	−199.9 to +649.0 °C	4
	D04	−100.0 to +100.0 °C	4
	D05	−100.0 to +200.0 °C	4
	D06	0.0 to 50.0 °C	4
	D07	0.0 to 100.0 °C	4
	D08	0.0 to 200.0 °C	4
	D09	0.0 to 300.0 °C	4
	D10	0.0 to 500.0 °C	4
	D12	−199.9 to +600.0 °C	4

Type	Code	Range	Note
Pt100	D21	−200.0 to +200.0 °C	5
	D27	0.00 to 50.00 °C	4
	D34	−100.00 to +100.00 °C	5
	D35	−200.0 to +850.0 °C	5
	DA1	−199.9 to +999.9 °F	4
	DA9	0.0 to 500.0 °F	4
	DA9	0.0 to 500.0 °F	4
JPt100	P08	0.0 to 200.0 °C	4
	P29	−100.00 to +100.00 °C	5
	P30	−200.0 to +640.0 °C	5

● Voltage/Current input

Type	Code	Range	Note
Voltage/ Current	101	0 to 10 mV DC	5
	201	0 to 100 mV DC	5
	301	0 to 1 V DC	5
	401	0 to 5 V DC	5
	501	0 to 10 V DC	5

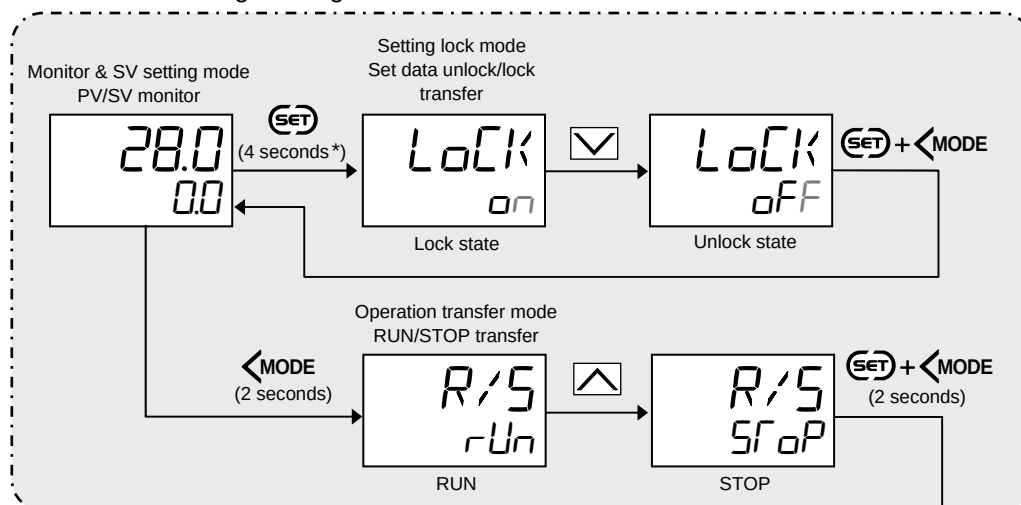
Type	Code	Range	Note
Voltage/ Current	601	1 to 5 V DC	5
	701	0 to 20 mA DC	5
	801	4 to 20 mA DC	5
	904	−10 to +10 V DC	5
	905	−5 to +5 V DC	5

Note The number of displayed digits of the measured value.

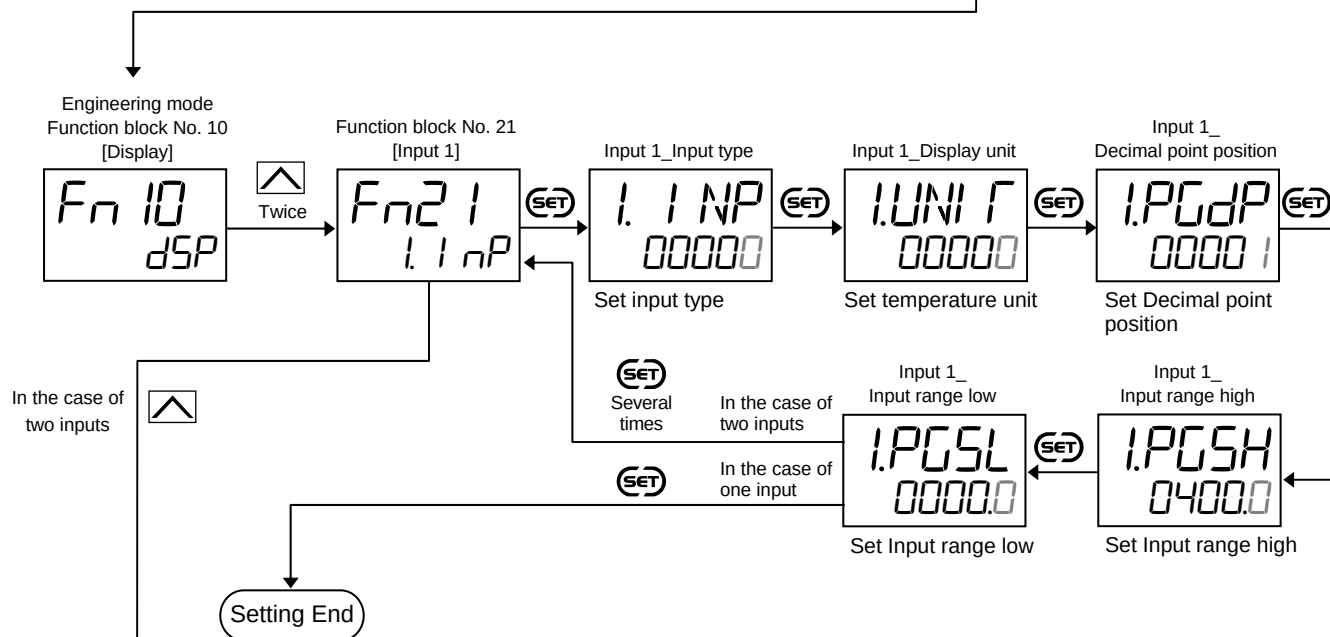
In case of RKC communication, if the displayed data is 4 digits, it is handled as 6-digit data. If the displayed data is 5 digits, it is handled as 7-digit data. In case of Modbus communication, the 4-digit display is handled as a “single word” and the 5-digit display is handled as a “double word”.

Setting procedure

To enter the Engineering mode



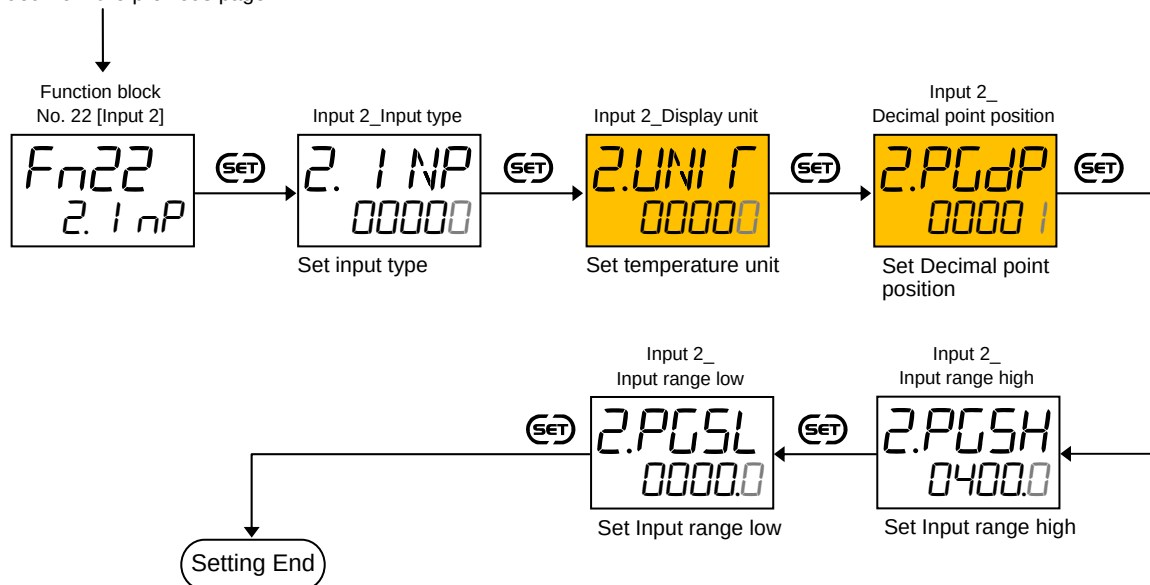
* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

Continued on the next page.

Continued from the previous page.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.



5.2 Switching Functions Using Digital Inputs (DI)

With the use of Digital input (DI), switching between the following functions is available.

- RUN/STOP transfer
- Auto/Manual transfer
- Select function for input 2 transfer * (Remote/Local transfer, Cascade mode transfer, PV select transfer or 2-loop control/Differential temperature control)

* For FZ400/900, the function selected at Select function for Input 2 is switchable.

For FZ110, switching between remote and local only is available.

- Interlock release
- Peak/Bottom holds release
- Selection of Autotuning (AT)
- Set data Unlock/Lock
- Direct/Reverse action
- Memory area

■ Number of Digital input (DI)

FZ400/900: Maximum 6 points (None, 4, or 6)

FZ110: Maximum 3 points (None, 4, or 6)

■ Functional setting of Digital input (DI)

Set the desired function at each Digital input (DI).

Setting	DI1	DI2	DI3	DI4	DI5	DI6
0	No function	No function	No function	No function	No function	No function
1	RUN/STOP	RUN/STOP	RUN/STOP	RUN/STOP	RUN/STOP	RUN/STOP
2	AUTO/MAN (1/2)	AUTO/MAN (1/2)	AUTO/MAN (1/2)	AUTO/MAN (1/2)	AUTO/MAN (1/2)	AUTO/MAN (1/2)
3	AUTO/MAN (1)	AUTO/MAN (1)	AUTO/MAN (1)	AUTO/MAN (1)	AUTO/MAN (1)	AUTO/MAN (1)
4	AUTO/MAN (2)	AUTO/MAN (2)	AUTO/MAN (2)	AUTO/MAN (2)	AUTO/MAN (2)	AUTO/MAN (2)
5	REM/LOC	REM/LOC	REM/LOC	REM/LOC	REM/LOC	REM/LOC
6	Interlock release	Interlock release	Interlock release	Interlock release	Interlock release	Interlock release
7	Hold reset (1/2)	Hold reset (1/2)	Hold reset (1/2)	Hold reset (1/2)	Hold reset (1/2)	Hold reset (1/2)
8	Hold reset (1)	Hold reset (1)	Hold reset (1)	Hold reset (1)	Hold reset (1)	Hold reset (1)
9	Hold reset (2)	Hold reset (2)	Hold reset (2)	Hold reset (2)	Hold reset (2)	Hold reset (2)
10	AT ON/OFF (1/2)	AT ON/OFF (1/2)	AT ON/OFF (1/2)	AT ON/OFF (1/2)	AT ON/OFF (1/2)	AT ON/OFF (1/2)
11	AT ON/OFF (1)	AT ON/OFF (1)	AT ON/OFF (1)	AT ON/OFF (1)	AT ON/OFF (1)	AT ON/OFF (1)
12	AT ON/OFF (2)	AT ON/OFF (2)	AT ON/OFF (2)	AT ON/OFF (2)	AT ON/OFF (2)	AT ON/OFF (2)
13	Unlock/Lock	Unlock/Lock	Unlock/Lock	Unlock/Lock	Unlock/Lock	Unlock/Lock
14	Direct/Reverse action	Direct/Reverse action	Direct/Reverse action	Direct/Reverse action	Direct/Reverse action	Direct/Reverse action
15	2 areas					
16	8 areas without SET					
17	8 areas with SET					
18	16 areas without SET					
19	16 areas with SET					
20	Area jump					

 : The Setting range of DI2 to DI6 is from 0 to 14. Values 15 or larger cannot be set.

 : When any of 16, 17, 18, and 19 is set for DI1, DI2 to DI5 (which are crossed out with ) are used for switching the Memory area and not settable.

Continued on the next page.



Continued from the previous page.

[Explanation of functional setting]

RUN/STOP:	RUN/STOP transfer
AUTO/MAN (1/2):	Auto/Manual transfer (Common to Input 1/Input 2)
AUTO/MAN (1):	Auto/Manual transfer (Input 1 only)
AUTO/MAN (2):	Auto/Manual transfer (Input 2 only) ¹
REM/LOC:	Remote/Local transfer *
	(Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control)
	* For FZ400/900, the function selected at Select function for input 2 is switchable. For FZ110, switching between remote and local only is available.
Interlock release:	Release of Interlock
Hold reset (1/2):	Release of Peak or Bottom hold value (Common to Input 1/Input 2)
Hold reset (1):	Release of Peak or Bottom hold value (Input 1 only)
Hold reset (2):	Release of Peak or Bottom hold value (Input 2 only) ¹
AT ON/OFF (1/2):	Autotuning (AT) ON/OFF (Common to Input 1/Input 2)
AT ON/OFF (1):	Autotuning (AT) ON/OFF (Input 1 only)
AT ON/OFF (2):	Autotuning (AT) ON/OFF (Input 2 only) ¹
Unlock/Lock:	Set data unlock/lock
Direct/Reverse action:	Switching between direct and reverse actions (Common to Input 1/Input 2) ²
2 areas:	Memory area transfer 2 points (without area set signal)
8 areas without SET:	Memory area transfer 8 points (without area set signal) ³
	DI2 and DI3 are not settable in this setting.
8 areas with SET:	Memory area transfer 8 points (with area set signal) ⁴
	DI2, DI3 and DI4 are not settable in this setting.
16 areas without SET:	Memory area transfer 16 points (without area set signal) ⁴
	DI2, DI3 and DI4 are not settable in this setting.
16 areas with SET:	Memory area transfer 16 points (with area set signal) ⁵
	DI2, DI3, DI4 and DI5 are not settable in this setting.
Area jump:	Move to the linked area No.
	(If area is not specified, the jump destination is the current area No. + 1)

¹ Effective if two inputs are available (FZ400/900 only)

² Effective if setting of control action of Input 1 or Input 2 is any of 0, 1, 5, and 6.

³ Effective if three or more Digital inputs (DI) are available

⁴ Effective if four or more Digital inputs (DI) are available (FZ400/900 only)

⁵ Effective if six or more Digital inputs (DI) are available (FZ400/900 only)

■ Open/Close action of Digital Input (DI)

● RUN/STOP transfer, Auto/Manual transfer, Remote/Local transfer, Set data unlock/lock transfer and Direct/Reverse action transfer

Functions are selected as follows using the open/close action of the contact.

Function		Contact close	Contact open
RUN/STOP transfer		RUN	STOP
Auto/Manual transfer		Auto mode	Manual mode
Remote/Local transfer ¹	Remote/Local transfer	Remoto mode	Local mode
	PV select transfer ²	Input 2	Input 1
	2-loop control/Differential temperature control	Differential temperature control	2-loop control
	Cascade mode transfer (Slave single)	Cascade control	Slave single control
	Cascade mode transfer (Master single)	Cascade control	Master single control
Set data unlock/lock transfer		Lock	Unlock
Direct/Reverse action transfer		Direct action	Reverse action

¹ Only one of the functions is available (Remote/Local only for FZ110)

² When [1: Switch by signal] is selected at Selection of PV select trigger (in Function block No. 58 in the Engineering mode)



Switching between Direct/Reverse action is available, only while the instrument is at STOP. Switching is not available during RUN. Setting the contact at RUN beforehand will perform switching when the instrument enters the STOP mode.

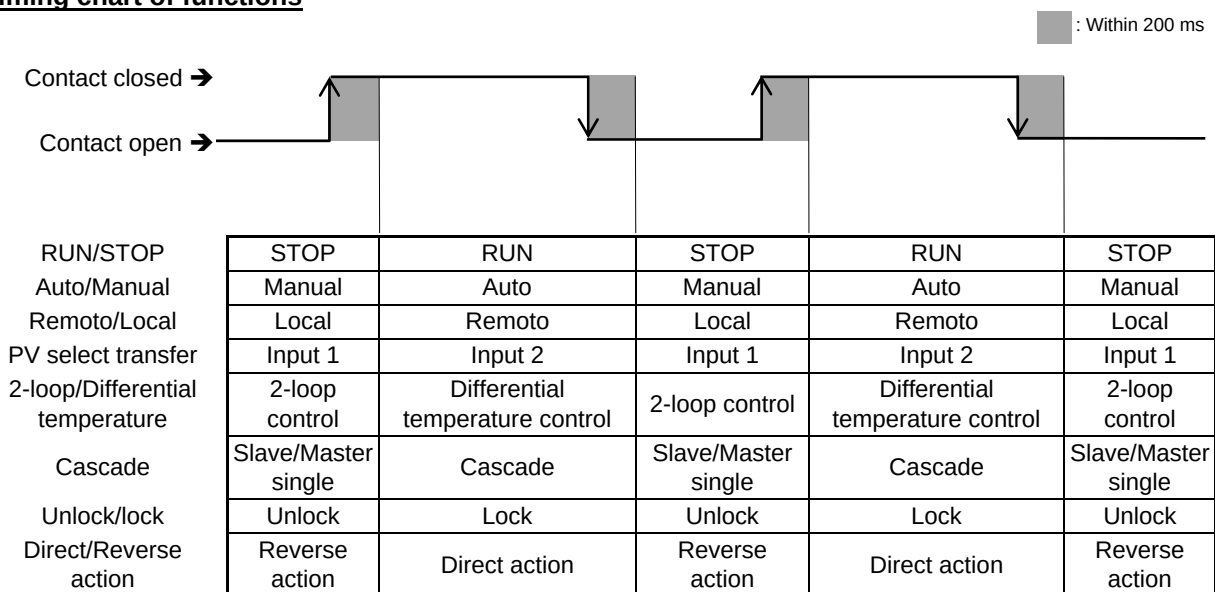
If “Input 1_Control action” or “Input 2_Control action” is set to “0: Brilliant II PID control (direct action)” or “1: Brilliant II PID control (reverse action),” PID action is switched between reverse and direction actions. In the case of “5: Brilliant II Position proportioning PID control (reverse action)” or “6: Brilliant II Position proportioning PID control (direct action),” Position proportioning PID action is switched between reverse and direction actions.



The above open/close action can be reversed (reversing the functions of open and close).

This setting can be done in DI logic invert (Function block No. 23 in the Engineering mode).

Timing chart of functions



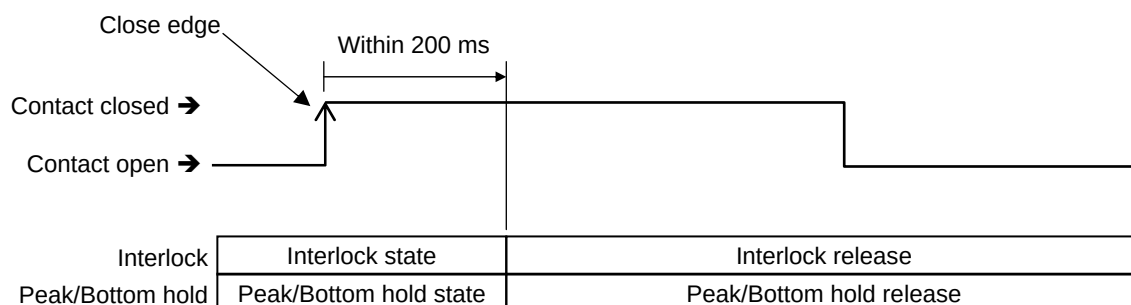
NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.

● Interlock release, Peak/Bottom hold release

Through the detection of close edge (rising edge), Interlock state and Peak (or Bottom) hold values are released.

Timing chart for releasing interlock, peak and bottom hold



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.

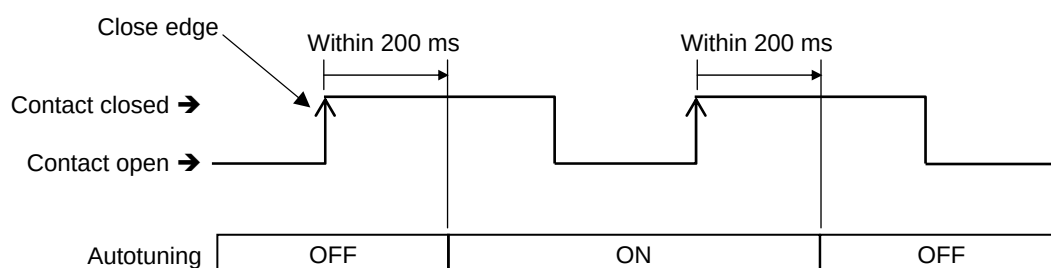
● Autotuning (AT) ON/OFF

Through the detection of the close edge, Autotuning (AT) ON/OFF is switched.

If Input 1 and Input 2 are common, priority is given to the AT start. (Refer to the table below)

Status before AT on/off switching		Status after AT on/off switching	
Input 1	Input 2	Input 1	Input 2
in PID control	in PID control	AT start	AT start
during AT	in PID control	AT continues	AT start
in PID control	during AT	AT start	AT continues
during AT	during AT	PID control	PID control

ON/OFF timing chart of Autotuning (AT)



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.



● Memory area transfer

Selection of Memory area No. can be obtained through such contact status as shown below.

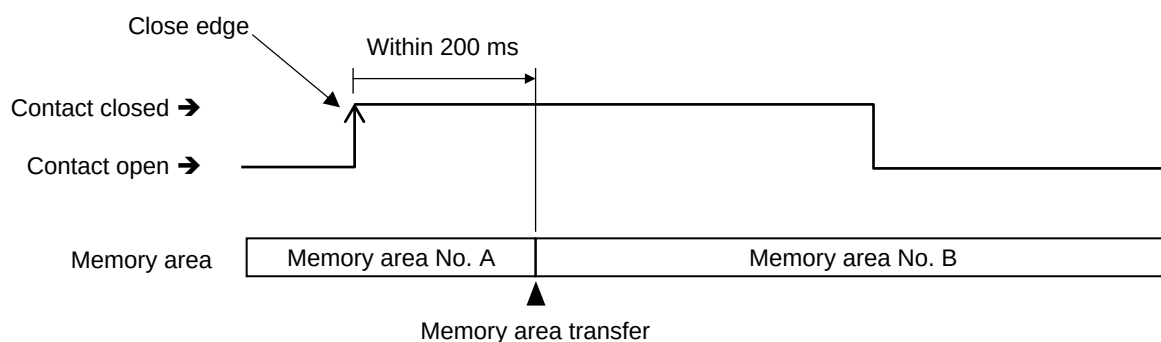
Memory area No.	DI1	DI2	DI3	DI4
1	—	—	—	—
2	x	—	—	—
3	—	x	—	—
4	x	x	—	—
5	—	—	x	—
6	x	—	x	—
7	—	x	x	—
8	x	x	x	—
9	—	—	—	x
10	x	—	—	x
11	—	x	—	x
12	x	x	—	x
13	—	—	x	x
14	x	—	x	x
15	—	x	x	x
16	x	x	x	x

—: Open
x: Closed

 : Areas used by DI for 2 areas.
  : Areas used by DI for 8 areas.
   : Areas used by DI for 16 areas.

Memory area transfer timing

- With SET signal · First, change the contact status to a desired No. referring to the above table, and use a Close edge (Rising edge) of the area SET signal.
The area SET signal contact is: DI4 for 8 memory areas and DI5 for 16 memory areas.



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.

- Without SET signal · First select the memory area using contacts, then wait for 0.5 to 5.0 seconds (set in “Area switching time (without area set signal)” [Engineering mode, Function block No. 23]).



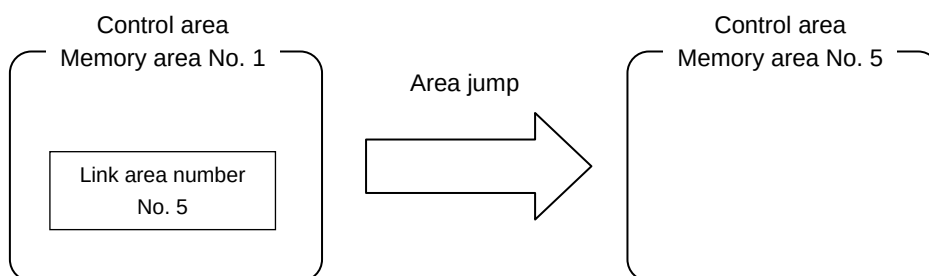
To change the Memory area without using the SET signal, “External mode” must be set at Control area Local/External transfer in the Operation transfer mode.

● Area jump

The memory area will be switched to the area set in the “Link area number” in the Parameter setting mode after the Close edge or Open edge has been detected. If the “Link area number” is not specified, the area number (which is the current number * + 1) will be selected.

* In case the “Link area number” is not specified and the current control area No. is 16, the area will not be changed.

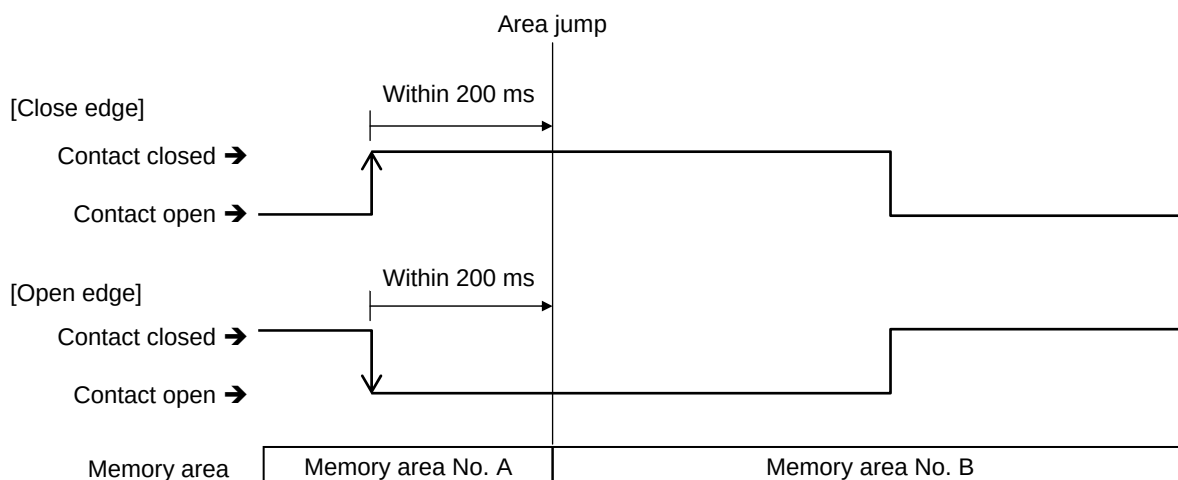
Example: If the current control area is “Memory area No. 1” and the “Link area number” (set in area No. 1) is “No. 5,” the memory area will be changed to No. 5 from No. 1 after the Area jump.



To do the Area jump

“Digital input 1 (DI1) Close edge” or “Digital input 1 (DI1) Open edge,” or both of these must be selected at Select Trigger type for Memory area transfer in the Parameter setting mode.

Timing chart of Area jump



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.



If “Event 1 to 4” are selected at the Select Trigger type for Memory area transfer in the Parameter setting mode of the memory area, the area jump will be conducted in case the preset event happens.



■ Relation between Digital Input (DI) and Setting via front keys (or through communication)

● RUN/STOP transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	Priority to STOP
RUN	RUN	RUN	
	STOP	STOP	
STOP	RUN		
	STOP		

● Auto/Manual transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	
Auto mode	Auto mode	Auto mode	Priority to manual mode
	Manual mode	Manual mode	
Manual mode	Auto mode		
	Manual mode		

● Remote/Local transfer

Remote/Local transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	Priority to Local mode
Remoto mode	Remoto mode	Remoto mode	
	Local mode	Local mode	
Local mode	Remoto mode		
	Local mode		

PV select transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	
Input 2	Input 2	Input 2	Priority to Input 1
	Input 1	Input 1	
Input 1	Input 2		
	Input 1		

2-loop control/Differential temperature control transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	Priority to 2-loop control
Differential temperature control	Differential temperature control	Differential temperature control	
	2-loop control	2-loop control	
2-loop control	Differential temperature control		
	2-loop control		

Cascade mode transfer (Slave/Master single control)

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	
Cascade control	Cascade control	Cascade control	Priority to Slave/Master single control
	Slave/Master single control	Slave/Master single control	
Slave/Master single control	Cascade control		
	Slave/Master single control		

● Set data unlock/lock transfer

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Unlock state	Unlock state	Unlock state
	Lock state	Lock state
Lock state	Unlock state	
	Lock state	

Priority is given to lock status



Functions like “Interlock release,” “Peak hold/Bottom hold release,” “Autotuning on/off,” “Memory area transfer (with SET signal),” and “Area jump” basically conform to the operation via front keys, through communication, or via digital inputs.

■ Parameter setting

● DI1 function selection

[Engineering mode: Function block No. 23 (F_{n23})]

Parameter symbol	Data range	Factory set value
$d1\ SL\ 1$	0: No function 1: RUN/STOP transfer 2: Auto/Manual transfer (Common to Input 1 and 2) 3: Input 1_Auto/Manual transfer 4: Input 2_Auto/Manual transfer ¹ 5: Remote/Local transfer ² (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 6: Interlock release 7: Hold reset (Common to Input 1 and 2) 8: Input 1_Hold reset 9: Input 2_Hold reset ¹ 10: Autotuning (AT) (Common to Input 1 and 2) 11: Input 1_Autotuning (AT) 12: Input 2_Autotuning (AT) ¹ 13: Set data unlock/lock transfer 14: Direct/Reverse action transfer 15: Memory area transfer (2 points, without area set signal) 16: Memory area transfer (8 points, without area set signal) ³ 17: Memory area transfer (8 points, with area set signal) ⁴ 18: Memory area transfer (16 points, without area set signal) ⁴ 19: Memory area transfer (16 points, with area set signal) ⁵ 20: Area jump	Based on Model code

¹ Effective if two inputs are available (FZ400/900 only)

² For FZ400/900, the function selected at Select function for input 2 is switchable.
For FZ110, switching between remote and local is only available.

³ Effective if three or more Digital inputs (DI) are available

⁴ Effective if four or more Digital inputs (DI) are available (FZ400/900 only)

⁵ Effective if six or more Digital inputs (DI) are available (FZ400/900 only)



To display “DI1 function selection,” Digital input must be specified at the time of order.



● DI2 function selection

[Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
DI SL2	0: No function 1: RUN/STOP transfer 2: Auto/Manual transfer (Common to Input 1 and 2) 3: Input 1_Auto/Manual transfer 4: Input 2_Auto/Manual transfer ¹ 5: Remote/Local transfer ² (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 6: Interlock release 7: Hold reset (Common to Input 1 and 2) 8: Input 1_Hold reset 9: Input 2_Hold reset ¹ 10: Autotuning (AT) (Common to Input 1 and 2) 11: Input 1_Autotuning (AT) 12: Input 2_Autotuning (AT) ¹ 13: Set data unlock/lock transfer 14: Direct/Reverse action transfer	Based on Model code

¹ Effective if two inputs are available (FZ400/900 only)

² For FZ400/900, the function selected at Select function for input 2 is switchable.

For FZ110, switching between remote and local is only available.



To display “DI2 function selection,” Digital input must be specified at the time of order.

For FZ110: Displayed when three Digital inputs (DI) are supplied.

● DI3 function selection

[Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
DI SL3	Same as DI2 function selection	Based on Model code



To display “DI3 function selection,” Digital input must be specified at the time of order.

For FZ110: Displayed when three Digital inputs (DI) are supplied.

● DI4 function selection

[Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
DI SL4	Same as DI2 function selection	Based on Model code



To display “DI4 function selection,” Digital input must be specified at the time of order.

(FZ400/900 only)

● DI5 function selection

[Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
di 5L5	Same as DI2 function selection	Based on Model code



To display “DI5 Function selection,” Digital inputs (6 points) must be specified at the time of order.
(FZ400/900 only)

● DI6 function selection

[Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
di 5L6	Same as DI2 function selection	Based on Model code



To display “DI6 Function selection,” Digital inputs (6 points) must be specified at the time of order.
(FZ400/900 only)

● DI logic invert

[Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
di 1 NV	0 to 31 0: No logic invert +1: RUN/STOP transfer +2: Auto/Manual transfer +4: Remote/Local transfer * (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +8: Set data unlock/lock transfer +16: Direct/Reverse action transfer To select two or more functions, sum each value.	0

* For FZ400/900, the function selected at Select function for input 2 is switchable.

For FZ110, switching between remote and local is only available.



To display “DI logic invert,” Digital input must be specified at the time of order.

● Area switching time (without area set signal)

[Engineering mode: Function block No. 23 (Fn23)]

Parameter symbol	Data range	Factory set value
di 71 M	1 to 5 seconds	2



To display “Area switching time (without area set signal),” Digital input must be specified at the time of order.



“Area switching time (without area set signal)” becomes valid when any one of 15, 16, and 18 is set at “DI1 function selection”



- **Control area Local/External transfer**
[Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
L/E	L _o _l : Local mode E _x _t : External mode	L _o _l



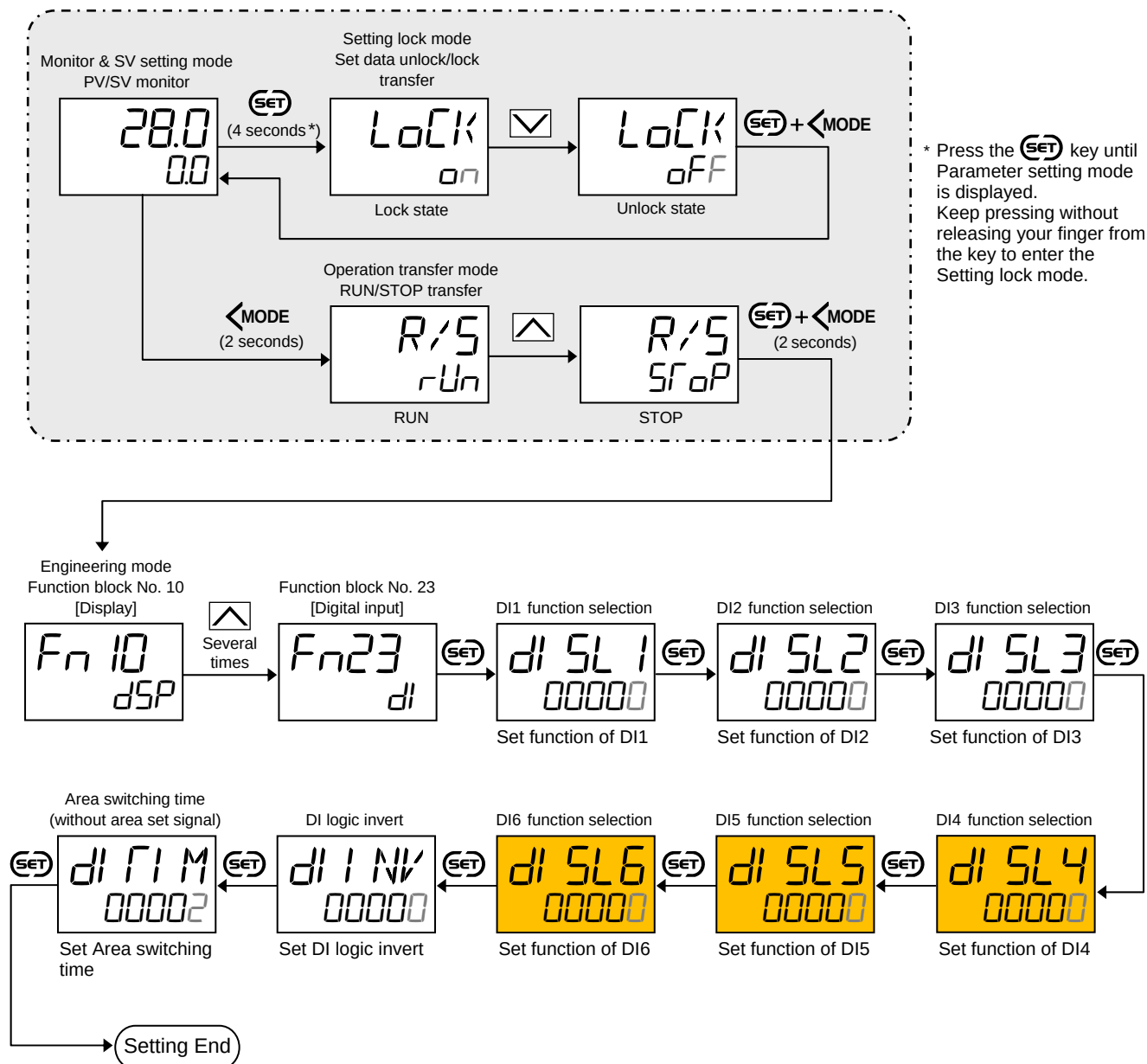
To display “Control area Local/External transfer,” any one of 15, 16 and 18 must be set at “DI1 function selection.”



If “External mode” is set at “Control area Local/External transfer,” control area cannot be switched via key operations.

Setting procedure

To enter the Engineering mode



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

5.3 Correcting Input

PV bias can be used for Input correction. 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.

■ Description of function

● PV bias

PV bias adds bias to the Measured value (PV).

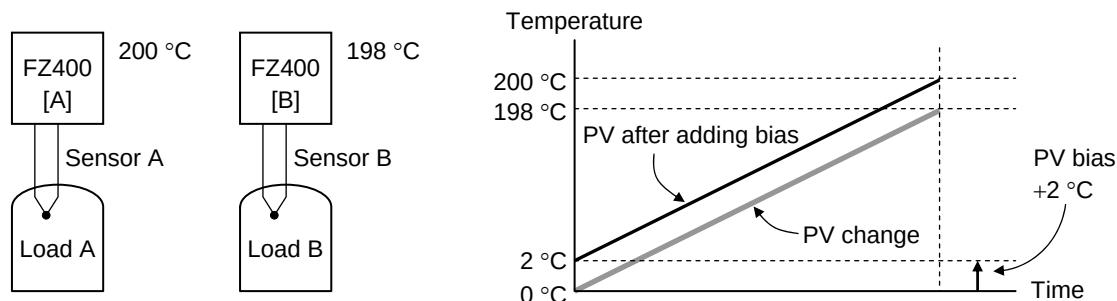
Setting example of PV bias:

When measuring the same type of load by using different sensors, the Measured value (PV) will be displayed differently based on the features of sensors:

FZ400 [A]: 200 °C FZ400 [B]: 198 °C

To correct the Measure value (PV) of FZ400 [B], add bias of +2 °C by PV bias:

Displayed value = Measured value (PV) + PV bias = 198 °C + 2 °C = 200 °C



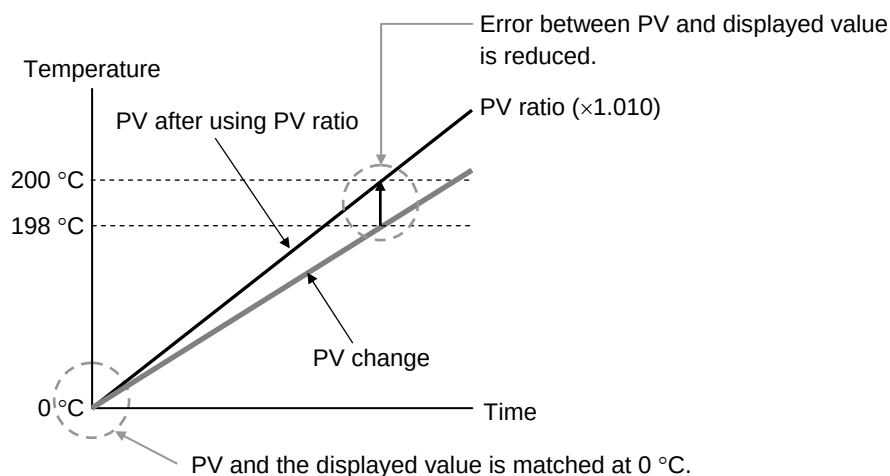
● PV ratio

PV ratio is a multiplier to be applied to the Measured value (PV).

Setting example of PV ratio:

PV ratio can be used to display 200 °C by adding 2 °C when the actual Measured value (PV) is 198 °C but the displayed value remains 0 °C when the actual PV is 0 °C. (The displayed value changes from 0 °C to 2 °C by PV bias setting.)

Displayed value = Measured value (PV) × PV ratio = 198 °C × 1.010 = 199.98 °C



● When setting PV bias and PV ratio at the same time

[Example]

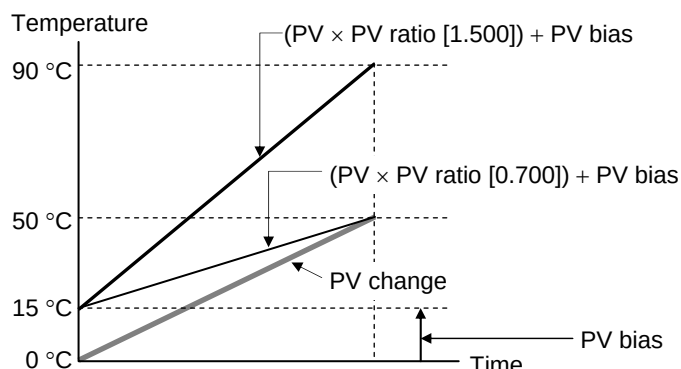
When PV bias = 15 °C and
Measured value (PV) = 50 °C

If PV ratio = 0.700

$$\begin{aligned}\text{Displayed value} &= 50 \times 0.700 + 15 \\ &= 50 \text{ °C}\end{aligned}$$

PV ratio = 1.500

$$\begin{aligned}\text{Displayed value} &= 50 \times 1.500 + 15 \\ &= 90 \text{ °C}\end{aligned}$$



■ Parameter setting

● Input 1_PV bias

[Setup Setting Mode: Setting group No. 21 (5n2 I)]

Parameter symbol	Data range	Factory set value
1. <i>Pb</i>	– (Input 1_Input span) to + (Input 1_Input span) (When Control with PV select: – (PV select input span) to + (PV select input span)) Varies with the setting of the Decimal point position.	0

● Input 2_PV bias (RS bias)

[Setup Setting Mode: Setting group No. 22 (5n22)]

Parameter symbol	Data range	Factory set value
2. <i>Pb</i>	Input 2_PV bias – (Input 2_Input span) to + (Input 2_Input span) RS bias – (Input 1_Input span) to + (Input 1_Input span) Varies with the setting of the Decimal point position.	0



To display Input 2_PV bias, “Measured input 2” or “Remote setting input” must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.



If Remote setting input is supplied, it is displayed as RS bias.



Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.

● Input 1_PV ratio

[Setup Setting Mode: Setting group No. 21 (5n2 I)]

Parameter symbol	Data range	Factory set value
1. <i>PR</i>	0.500 to 1.500	1.000

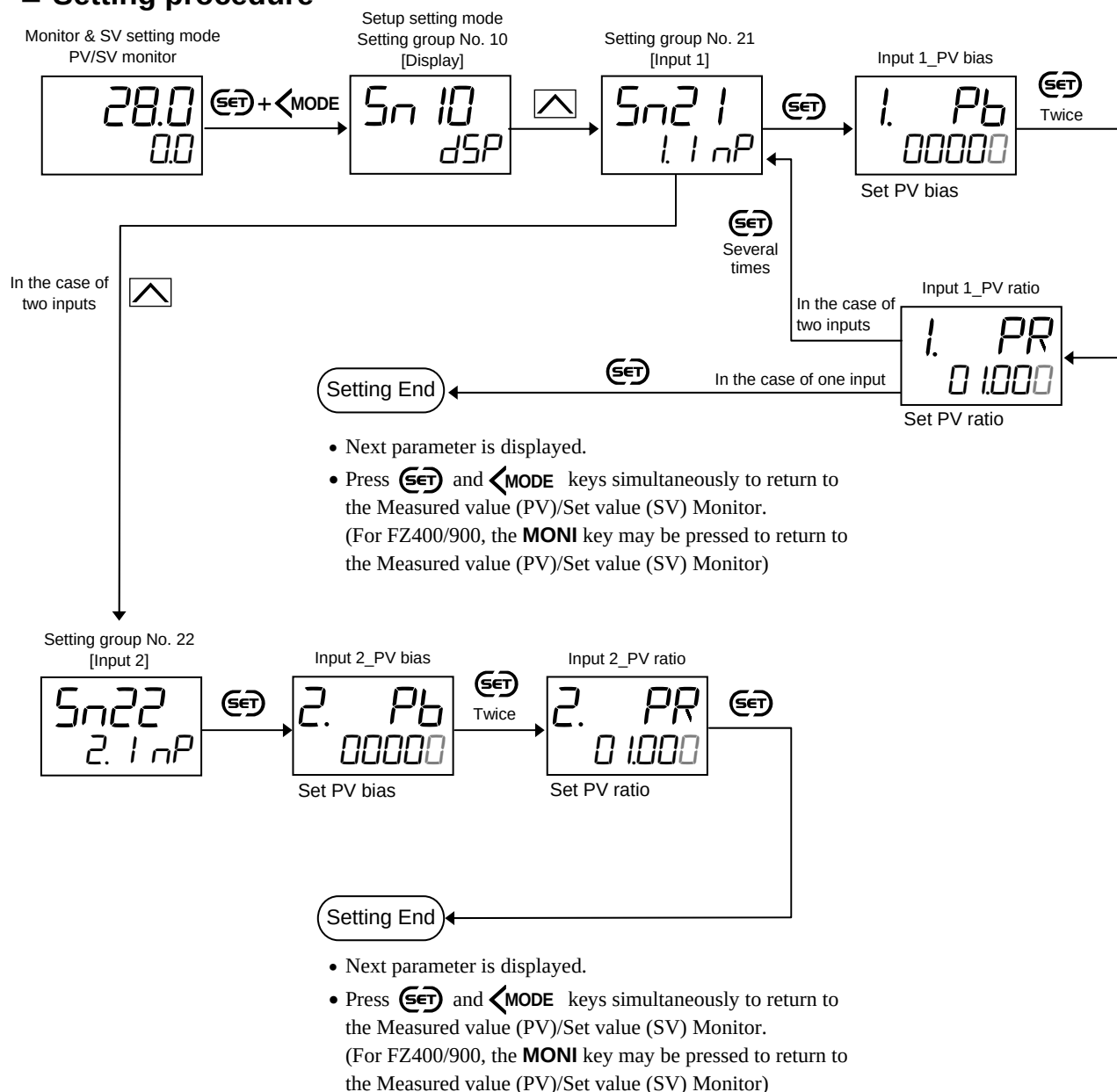
- **Input 2_PV ratio**

[Setup Setting Mode: Setting group No. 22 (5n22)]

Parameter symbol	Data range	Factory set value
2. PR	Input 2_PV ratio 0.500 to 1.500 RS ratio 0.001 to 9.999	1.000

-  To display Input 2_PV ratio, “Measured input 2” or “Remote setting input” must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.
-  If Remote setting input is supplied, it is displayed as PV ratio.
-  Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.

■ Setting procedure

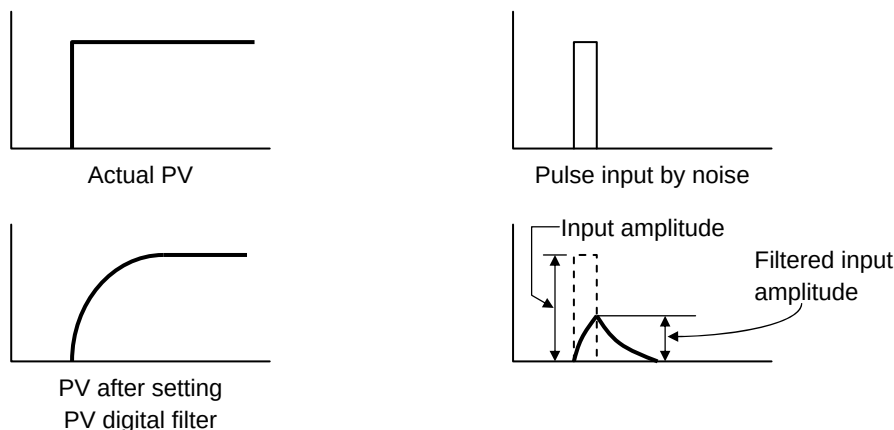


5.4 Preventing the Input Flicker

To prevent the input flicker, PV digital filter with the first-order lag calculation is provided.

■ Description of function

PV digital filter is software designed to reduce variance of PV caused by noise. Effect of Input noise can be reduced by setting time constant of PV digital filter based on the controlled object requirement and its level of noise. Setting a value too small leads to a poor result of PV digital filter; just as an input response will be poor when setting a value too large.



■ Parameter setting

● Input 1_PV digital filter

[Setup Setting Mode: Setting group No. 21 (5n2 1)]

Parameter symbol	Data range	Factory set value
1. df	0.0 to 100.0 seconds 0.0: Filter OFF	0.0

● Input 2_PV digital filter (RS digital filter)

[Setup Setting Mode: Setting group No. 22 (5n22)]

Parameter symbol	Data range	Factory set value
2. df	0.0 to 100.0 seconds 0.0: Filter OFF	0.0



To display Input 2_PV digital filter, “Measured input 2” or “Remote setting input” must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.

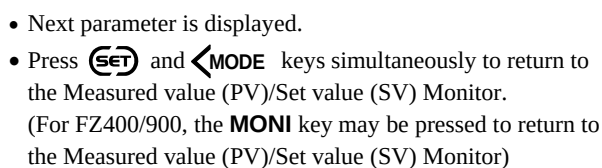


If Remote setting input is supplied, it is displayed as RS digital filter.



Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.

Monitor & SV setting mode
PV/SV monitor



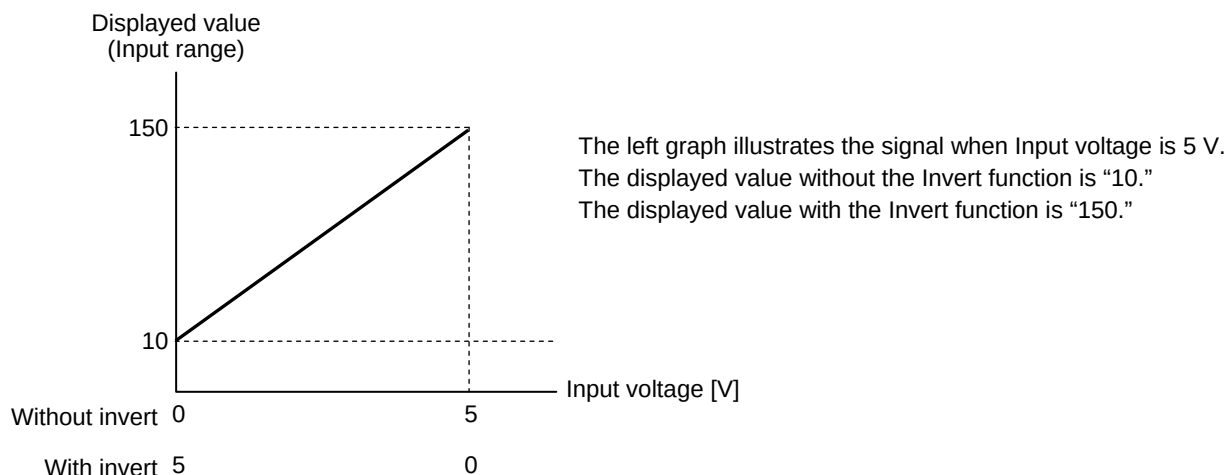
5.5 Inverting the Input

If the instrument is a current/voltage input type, the proportional relation between the input current (voltage) and the displayed value can be inverted.

■ Description of function

Reverse setting (Input range high < Input range low) of Input range high and low is not available on the instrument. However, with the Input invert function, the display relation to the input can be inverted.

Example: with/without invert function for voltage input 0 to 5 V



■ Parameter setting

● Input 1_Inverting input

[Engineering mode: Function block No. 21 (F_{n21})]

Parameter symbol	Data range	Factory set value
I, I, NV	0: Unused 1: Used	0



To show "Input 1_Inverting input," current or voltage must be selected at Input 1_Input type in Function block No. 21 in the Engineering mode.

● Input 2_Inverting input

[Engineering mode: Function block No. 22 (F_{n22})]

Parameter symbol	Data range	Factory set value
$2, I, NV$	0: Unused 1: Used	0



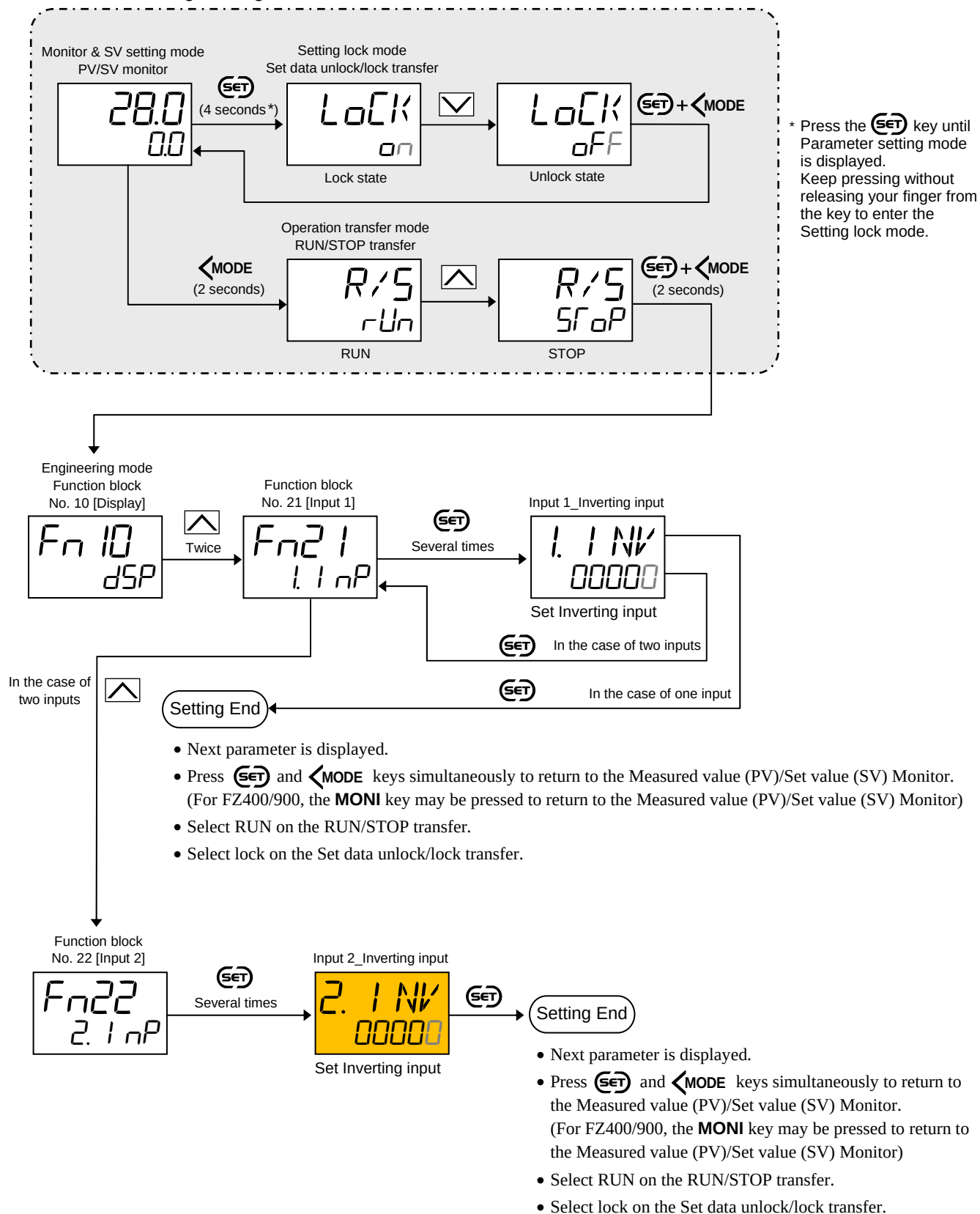
To show "Input 2_Inverting input," Measured input 2 must be specified at the time of order and voltage or current must be specified at "Input 2_Input type" in Function block No. 22 in the Engineering mode.



Not displayed if "Select function for input 2" is set in Function block No. 58 in the Engineering mode to "No function" or "Remote setting input."

Setting procedure

To enter the Engineering mode



5.6 Extracting Square Root of Input

Square root extraction can control flow by sending the output signal directly from a differential pressure type flow transmitter to instrument. By setting PV low input cut-off, Square root extraction will not be performed for the Measured value below the set value of PV low input cut-off.

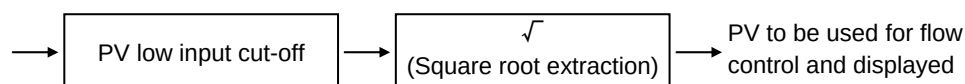
■ Description of function

● Square root extraction

When using a differential pressure type flow transmitter, the Measured value (PV) is computed by Square root extraction.

$$\text{Equation: Measured value (PV)} = \sqrt{\text{Input value}} \times \text{PV ratio} + \text{PV bias}$$

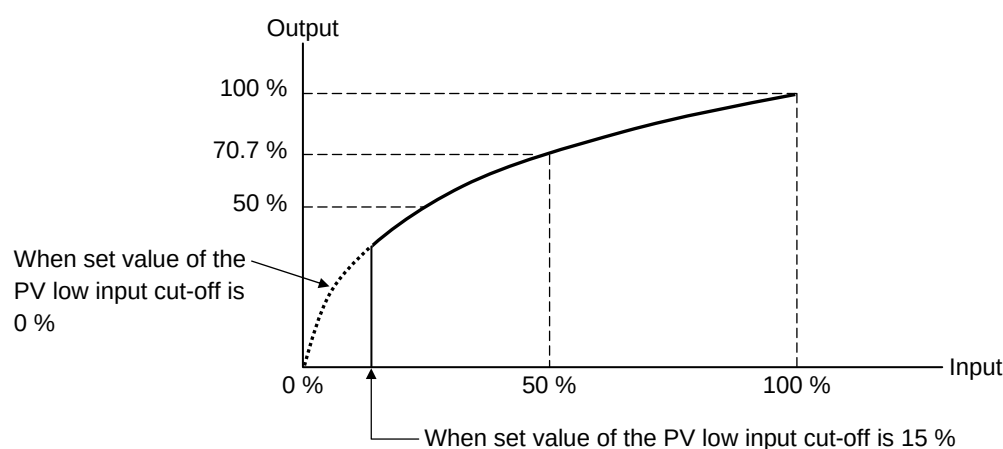
* Output from differential pressure type flow transmitter



● PV low input cut-off

The result of square root extraction become “0” when the Measured value (PV) drops below the set value of the PV low input cut-off. Output is not produced when the result of square root extraction is zero (0).

When input signal square root extraction is used for in 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 compute control output in order to prevent control disturbance caused by input variation at Low measured value range.



■ Parameter setting

● Input 1_Square root extraction

[Engineering mode: Function block No. 21 (Fn2 I)]

Parameter symbol	Data range	Factory set value
1. SQR	0: Unused 1: Used	0



To show “Input 1_Square root extraction,” current or voltage must be selected at Input 1_Input type in Function block No. 21 in the Engineering mode.

● Input 2_Square root extraction

[Engineering mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2. SQR	0: Unused 1: Used	0



To show “Input 2_Square root extraction,” Measured input 2 must be specified at the time of order and voltage or current must be specified at “Input 2_Input type” in Function block No. 22 in the Engineering mode.



Not displayed if “Select function for input 2” is set in Function block No. 58 in the Engineering mode to “No function” or “Remote setting input.”

● Input 1_PV low input cut-off

[Setup Setting Mode: Setting group No. 21 (Sn21)]

Parameter symbol	Data range	Factory set value
1. PLC	0.00 to 25.00 % of Input 1_Input span (When Control with PV select: 0.00 to 25.00 % of PV select input span)	0.00



To display “Input 1_PV low input cut-off,” input type is Voltage/Current input, AND “Input 1_Square root extraction” in Function block No. 21 in the Engineering mode must be set to “Used.”

● Input 2_PV low input cut-off

[Setup Setting Mode: Setting group No. 22 (Sn22)]

Parameter symbol	Data range	Factory set value
2. PLC	0.00 to 25.00 % of Input 2_Input span	0.00



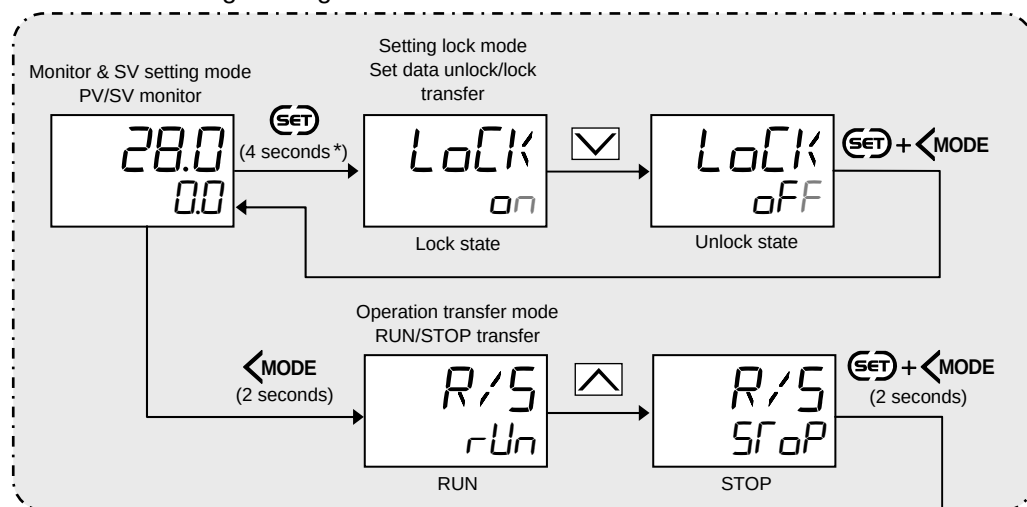
To display “Input 2_PV low input cut-off,” specify “Measured input 2” at the time of order, AND input type is Voltage/Current input, AND “Input 2_Square root extraction” in Function block No. 22 in the Engineering mode must be set to “Used.”



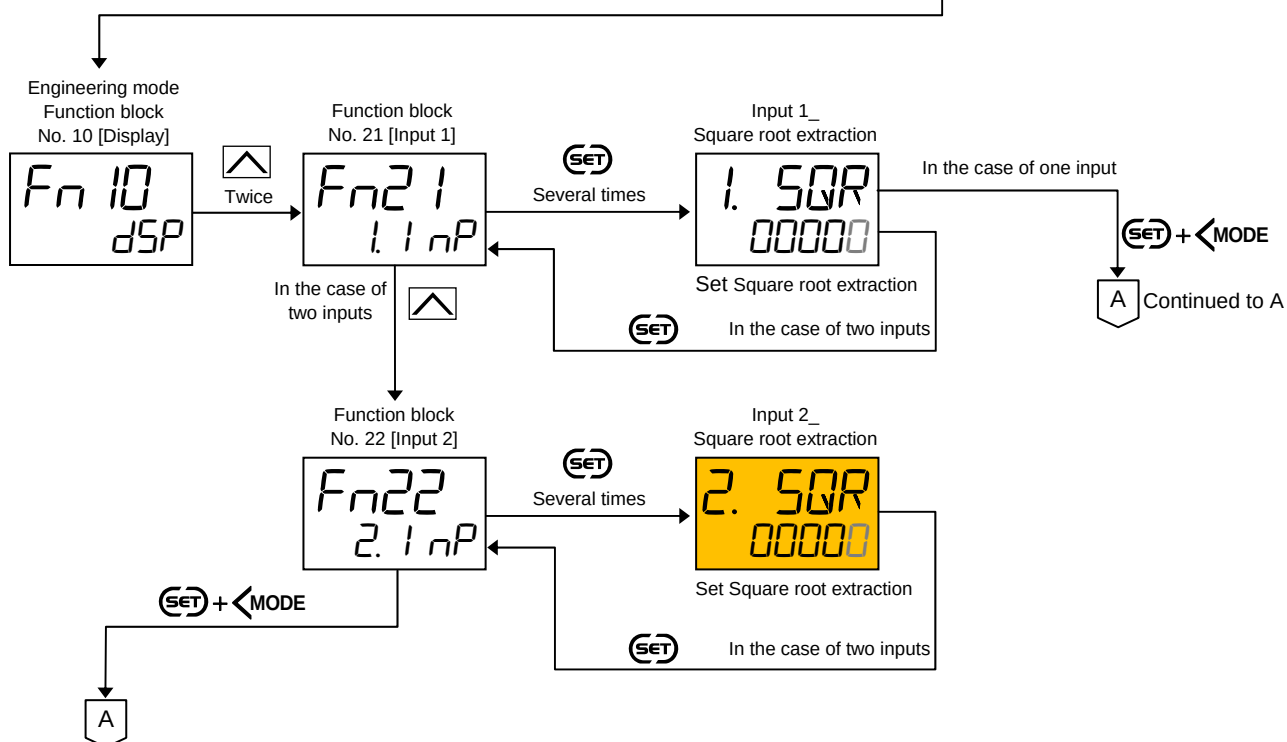
Not displayed if “Select function for input 2” is set in Function block No. 58 in the Engineering mode to “No function” or “Remote setting input.”

Setting procedure

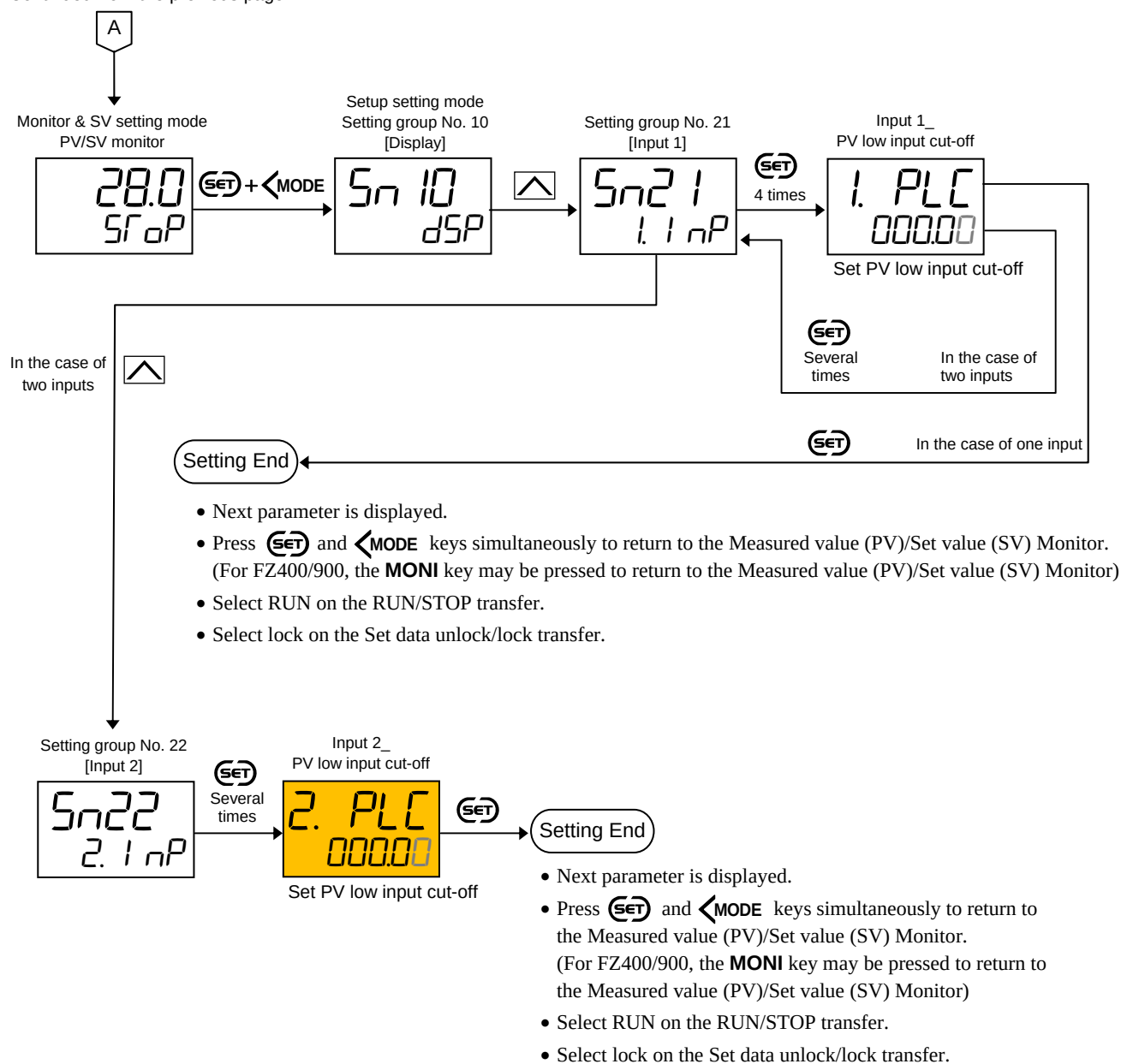
To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



Continued from the previous page.



5.7 Changing Error Handling at Input Error

The measures for input errors can be selected from Input burnout direction, Input error determination point, Manipulated output value at Input error, PV flashing display at input error, and Input error status output.

■ Description of function

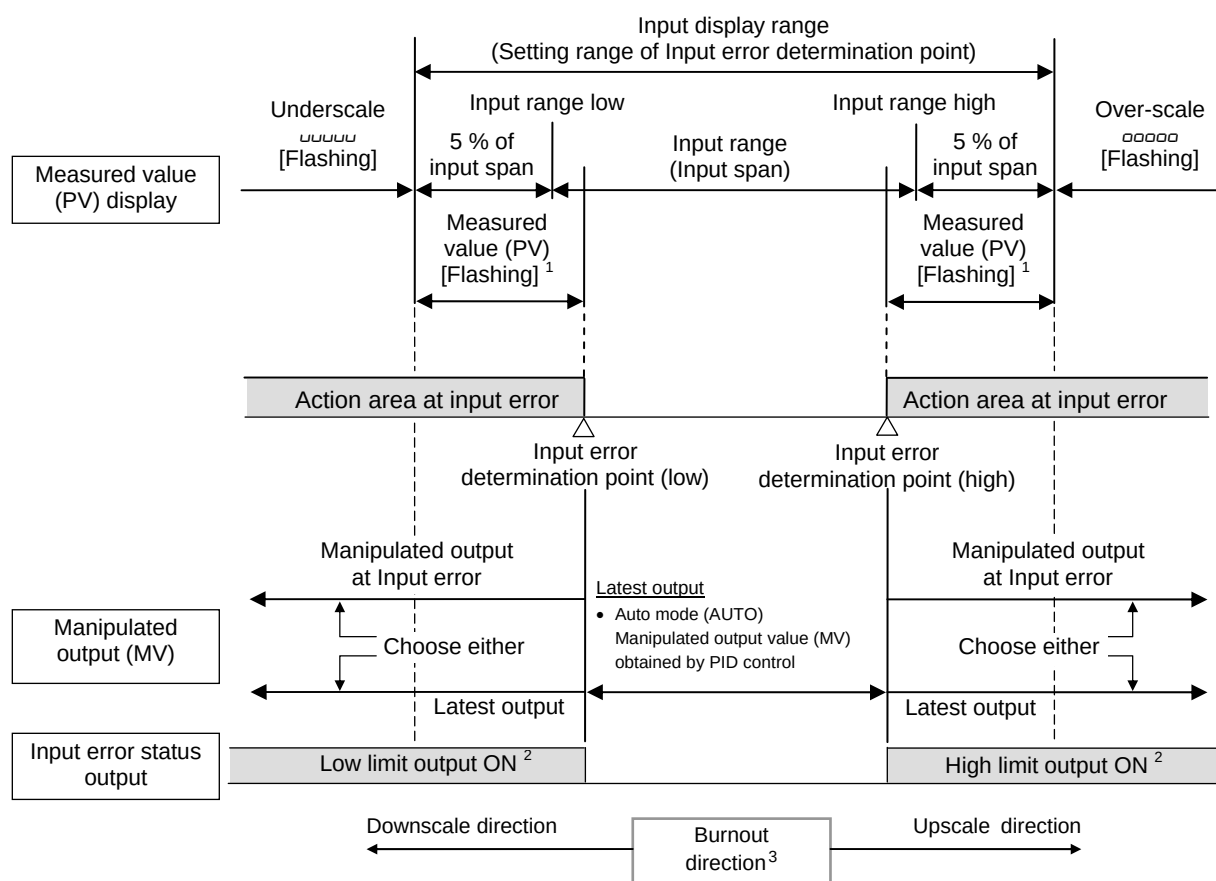
If the measured value (PV) exceeds the Input error determination point (high or low), the action predefined at “Action (high and low) input error” will be taken. Input error status signal can be output from OUT1 to OUT3 and DO1 to DO4.



NOTE

In manual mode and control stop mode, action and output will not be taken for input errors.

● Input error determination point is set within the input range



¹ Flashing can be suppressed by setting “PV flashing display at input error” (Function block No. 10 in the Engineering mode).

² For Input error status output, refer to ● Details of OUT1 to 3 as well as DO1 to 4 logic calculation selection (P. 6-4).

³ Setting Burnout direction is valid for thermocouple input and low voltage input (0 to 10 mV DC, 0 to 100 mV DC). Actions of other input types are fixed as follows.
RTD input: Upscale
High voltage/Current inputs: Downscale (Indicates value near 0)

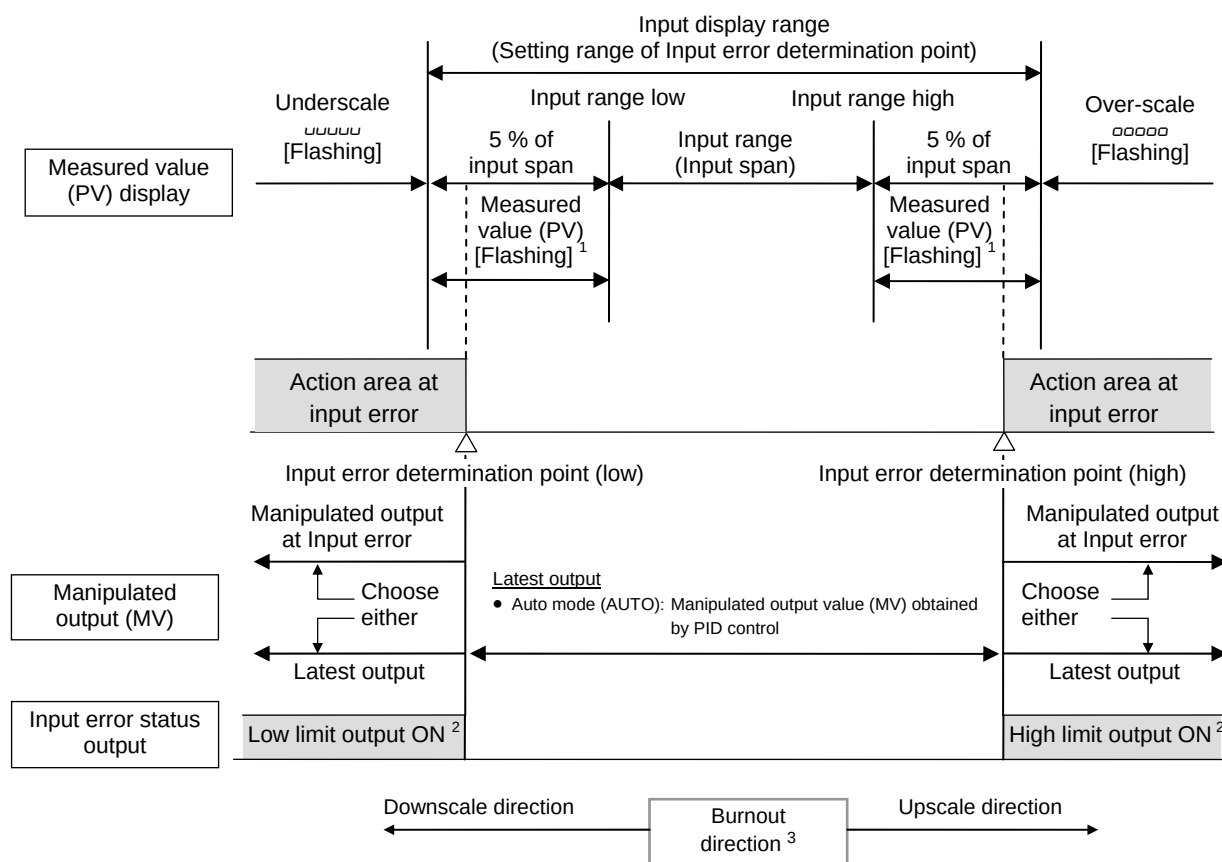


Refer to the **Input range table (P. 5-11)** for the input range of each input.



For details of Input error status output, refer to **6.1 Changing Output Assignment (P. 6-2)**.

● Input error determination point is set outside the input range



¹ Flashing can be suppressed by setting "PV flashing display at input error" (Function block No. 10 in the Engineering mode).

² For Input error status output, refer to ● **Details of OUT1 to 3 as well as DO1 to 4 logic calculation selection (P. 6-4)**.

³ Setting Burnout direction is valid for thermocouple input and low voltage input (0 to 10 mV DC, 0 to 100 mV DC). Actions of other input types are fixed as follows.
RTD input: Upscale
High voltage/Current inputs: Downscale (Indicates value near 0)



Refer to the **Input range table (P. 5-11)** for the input range of each input.



For details of Input error status output, refer to **6.1 Changing Output Assignment (P. 6-2)**.



In the case of control with dual inputs, the action at input error is conducted independently on each of Input 1 and Input 2. However, exceptional cases are shown below in which Action at input error may be slightly different.

● Cascade control

Switching is possible between Cascade control and Master single control or Cascade control and Slave single control. Action at input error of each case is as follows.

	Cascade control	Master single control	Slave single control
Input error determination	- Input 1 is determined at Input 1_Input error determination point. - Input 2 is determined at Input 2_Input error determination point. Whichever is triggered by input error.	Input 1 is determined at Input 1_Input error determination point.	Input 2 is determined at Input 2_Input error determination point.
Action at input error	Action selected for Input 1_Action input error.	Action selected for Input 1_Action input error.	Action selected for Input 1_Action input error.
Manipulated output value at input error	Input 1_Manipulated output value at input error	Input 1_Manipulated output value at input error	Input 1_Manipulated output value at input error

[Action at input error for cascade control]

The settings of Action at input error high and low are conflicting each other and when both Input 1 and Input 2 go to an input error state.

Input 1_Action input error	Input 2_Action input error	Control action
1: Manipulated output value at input error (Manual mode)	2: Manipulated output value at input error (Auto mode)	Input 1_Manipulated output value at input error" is output in Manual mode
2: Manipulated output value at input error (Auto mode)	1: Manipulated output value at input error (Manual mode)	"Input 1_Manipulated output value at input error" is output in Auto mode
0: Control continues	1: Manipulated output value at input error (Manual mode)	Input 1_Manipulated output value at input error" is output in Manual mode
1: Manipulated output value at input error (Manual mode)	0: Control continues	Input 1_Manipulated output value at input error" is output in Manual mode
0: Control continues	2: Manipulated output value at input error (Auto mode)	"Input 1_Manipulated output value at input error" is output in Auto mode
2: Manipulated output value at input error (Auto mode)	0: Control continues	"Input 1_Manipulated output value at input error" is output in Auto mode

● 2-loop control/Differential temperature control

	Input 1 is abnormal	Input 2 is abnormal
Input error determination	Input 1 is determined at Input 1_Input error determination point.	Input 2 is determined at Input 2_Input error determination point.
Action at input error	Action selected for Input 1_Action input error.	Input 1 side: "Input 1_Manipulated output value at input error" is output [fixed] Input 2 side: Action selected for Input 2_Action input error.
Manipulated output value at input error	Input 1_Manipulated output value at input error	Input 1_Manipulated output value at input error Input 2_Manipulated output value at input error

● Input circuit error alarm

	Input 1 is abnormal	Input 2 is abnormal
Input error determination	Input 1 is determined at Input 1_Input error determination point.	Input 2 is determined at Input 2_Input error determination point.
Action at input error	Action selected for Input 1_Action input error.	Even if Input 2 is in input error, Action at input error will not be taken. *
Manipulated output value at input error	Input 1_Manipulated output value at input error	

* If (Input 2 – Input 1) exceeds the Input circuit error alarm set value, Action at input error is the action defined in Input 1_Action input error.

● Control with PV select

	Input 1 is abnormal	Input 2 is abnormal
Input error determination	Input 1 is determined at Input 1_Input error determination point.	Input 2 is determined at Input 2_Input error determination point.
Action at input error	When the Input 1 is used: Action selected for Input 1_Action input error. When the Input 2 is used: No Action at input error	When the Input 1 is used: No Action at input error When the Input 2 is used: Action selected for Input 1_Action input error.
Manipulated output value at input error	Input 1_Manipulated output value at input error	Input 1_Manipulated output value at input error

■ Parameter setting

● PV flashing display at input error

[Engineering mode: Function block No. 10 (F_{n10})]

Parameter symbol	Data range	Factory set value
$d5oP$	0: Flashing display 1: Non-flashing display	0

● Input 1_Input error determination point (high)

[Engineering mode: Function block No. 21 (F_{n21})]

Parameter symbol	Data range	Factory set value
$1. P_{oV}$	Input 1_Input error determination point (low) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	Input 1_Input range high + (Input 1_5 % of input span)

● Input 1_Input error determination point (low)

[Engineering mode: Function block No. 21 (F_{n21})]

Parameter symbol	Data range	Factory set value
$1. P_{UN}$	Input 1_Input range low – (Input 1_5 % of input span) * to Input 1_Input error determination point (high) Varies with the setting of the Decimal point position. * When Input type of Input 1 is RTD, low limit value is about 2 Ohms. (Pt100: –245.5 °C [–409.8 °F], JPt100: –237.6 °C [–395.7 °F])	Input 1_Input range low – (Input 1_5 % of input span)

● Input 2_Input error determination point (high)

[Engineering mode: Function block No. 22 (F_{n22})]

Parameter symbol	Data range	Factory set value
$2. P_{oV}$	Input 2_Input error determination point (low) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	Input 2_Input range high + (Input 2_5 % of input span)



To show the “Input 2_Input error determination point (high),” “Measured input 2” must be specified at the time of order.



Not displayed when “No function” or “Remote setting input” is selected in “Select function for input 2” (Function block No. 58 in Engineering mode).

● Input 2_Input error determination point (low) [Engineering mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2. PUN	Input 2_Input range low – (Input 2_5 % of input span) * to Input 2_Input error determination point (high) Varies with the setting of the Decimal point position. * When Input type of Input 2 is RTD, low limit value is about 2 Ohms. (Pt100: –245.5 °C [–409.8 °F] , JPt100: –237.6 °C [–395.7 °F])	Input 2_Input range low – (Input 2_5 % of input span)



To show the “Input 2_Input error determination point (low),” “Measured input 2” must be specified at the time of order.



Not displayed when “No function” or “Remote setting input” is selected in “Select function for input 2” (Function block No. 58 in Engineering mode).

● Input 1_Burnout direction [Engineering mode: Function block No. 21 (Fn21)]

Parameter symbol	Data range	Factory set value
1. bo5	0: Upscale 1: Downscale	0



To show “Input 1_Burnout direction,” thermocouple or voltage (low) [0 to 100 mV DC, 0 to 10 mV DC] must be selected at Input 1_Input type in Function block No. 21 in the Engineering mode.

● Input 2_Burnout direction [Engineering mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2. bo5	0: Upscale 1: Downscale	0



To show “Input 2_Burnout direction,” “Measured input 2” must be specified at the time of order and thermocouple or low voltage (0 to 100 mV DC, 0 to 10 mV DC) must be selected at “Input 2_Input type” in Function block No. 22 in the Engineering mode.



Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.

● Input 1_Action (high) input error [Engineering mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1.AoVE	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2

● Input 1_Action (low) input error

[Engineering mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1.AUNE	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2

● Input 2_Action (high) input error

[Engineering mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2.AOVE	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2



To show “Input 2_Action (high) input error,” “Measured input 2” must be specified at the time of order, and “Select function for input 2” (Function block No. 58 in the Engineering mode) must be set to “2-loop control/Differential temperature input” must be set up.

● Input 2_Action (low) input error

[Engineering mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2.AUNE	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Input 1_Manipulated output value at input error is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Input 1_Manipulated output value at input error of is output. When the error is recovered, the operation mode is switched to the PID control.	2



To show “Input 2_Action (low) input error,” “Measured input 2” must be specified at the time of order, and “Select function for input 2” (Function block No. 58 in the Engineering mode) must be set to “2-loop control/Differential temperature input” must be set up.

● Input 1_Manipulated output value at input error

[Engineering mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1.PSM	PID control, Position proportioning PID control: –5.0 to +105.0 % Heat/Cool PID control: –105.0 to +105.0 %	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0



For Heat/Cool PID control, output is produced from the heat side if the setting is positive (+) and output is produced from the cool side if the setting is negative (–).

● Input 2_Manipulated output value at input error [Engineering mode: Function block No. 52 (Fn52)]

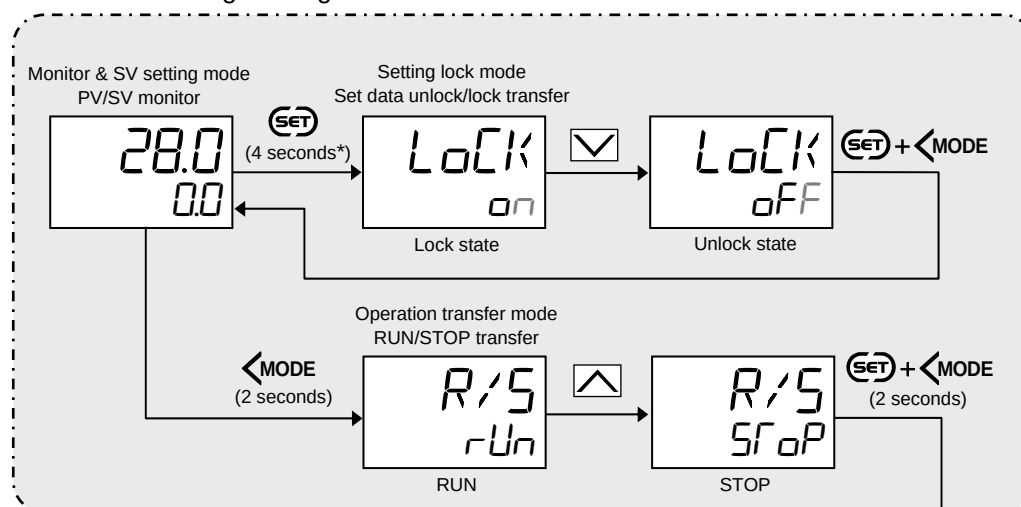
Parameter symbol	Data range	Factory set value
2. PSM	-5.0 to +105.0 %	-5.0



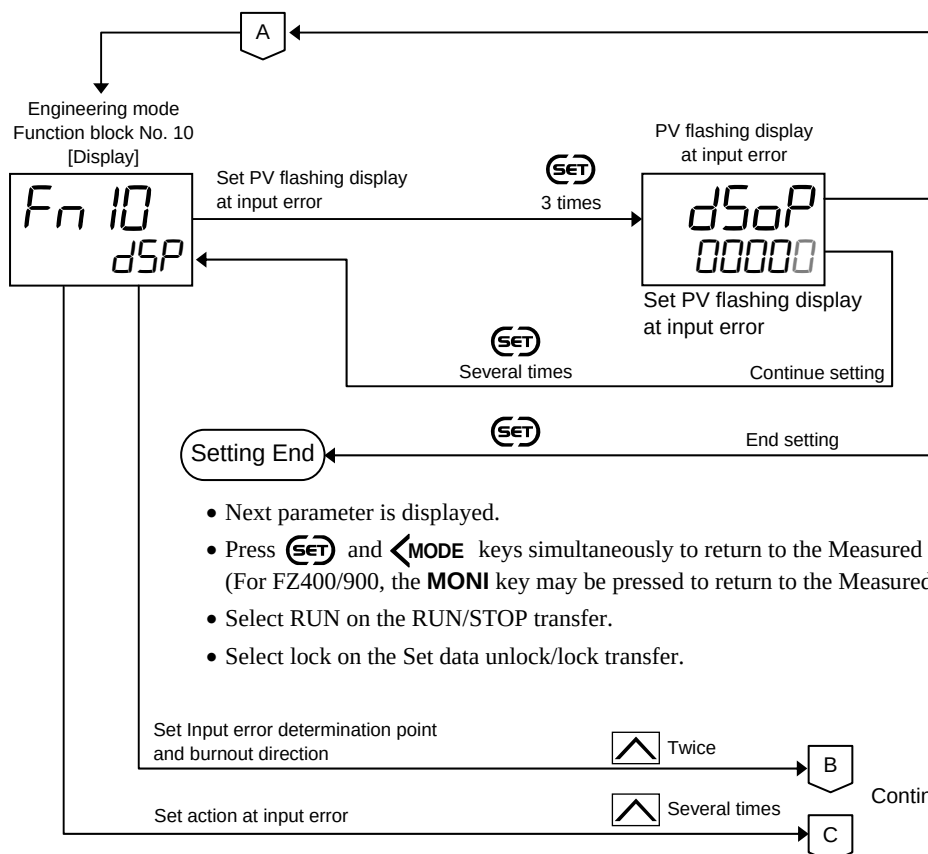
To show “Input 2_Manipulated output value at input error,” “Measured input 2” must be specified at the time of order, and “Select function for input 2” (Function block No. 58 in the Engineering mode) must be set to “2-loop control/Differential temperature input” must be set up.

■ Setting procedure

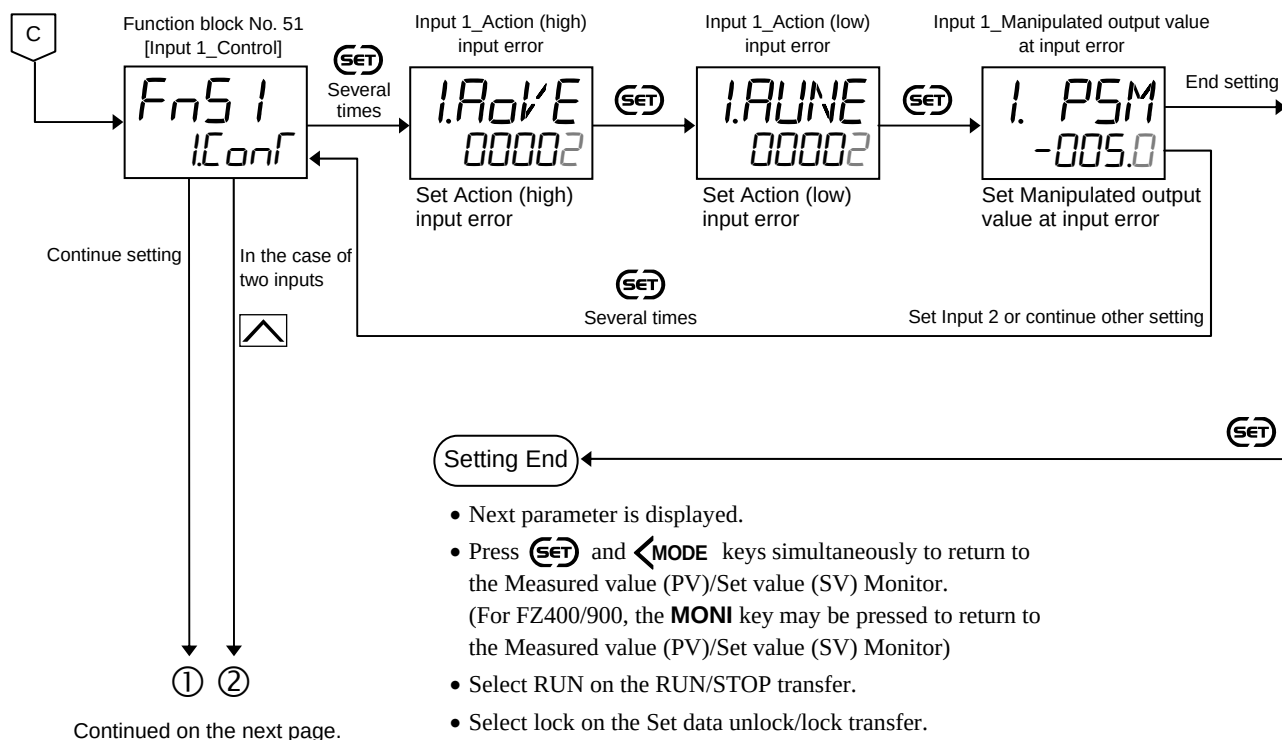
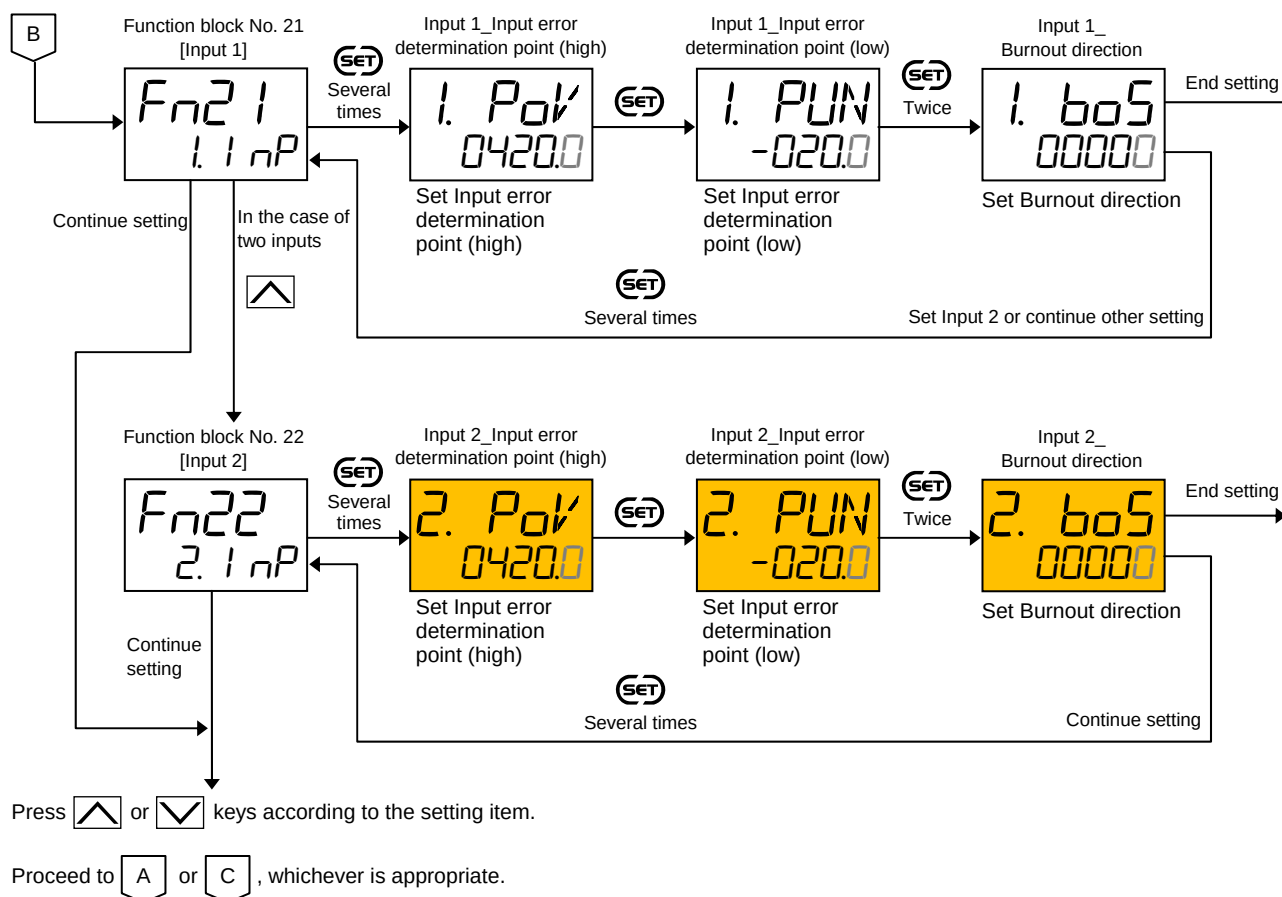
To enter the Engineering mode



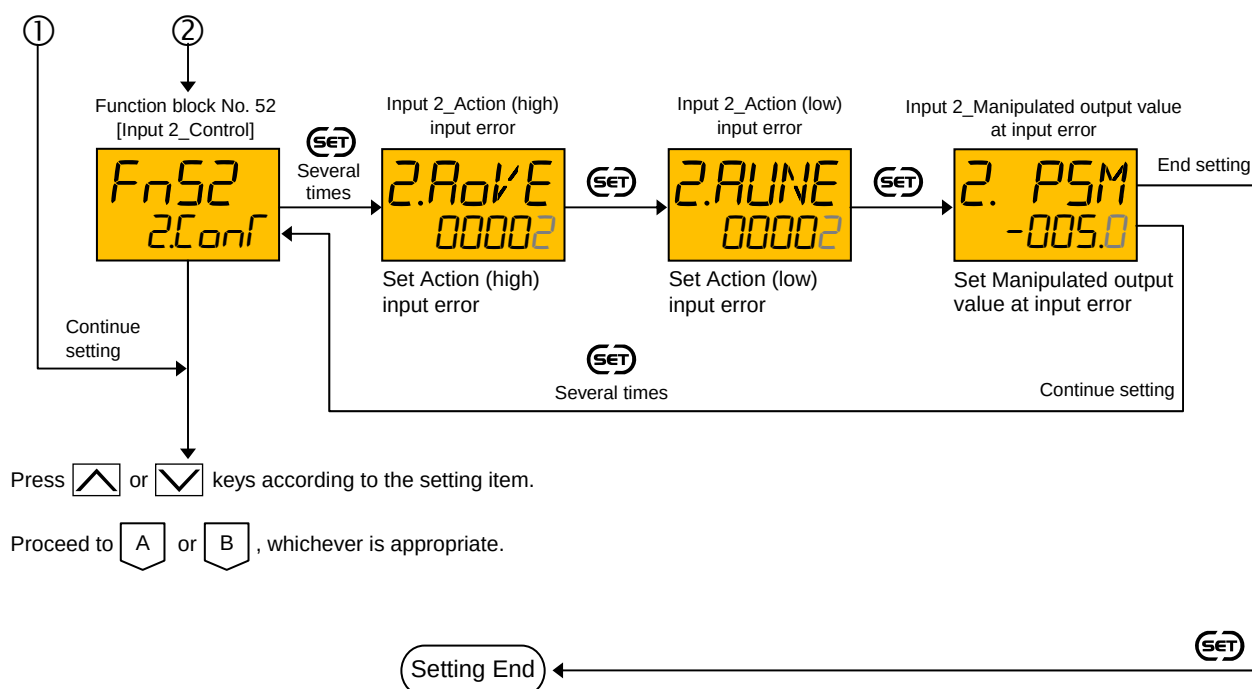
* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



Continued on the next page.



Continued from the previous page.



- Next parameter is displayed.
- Press and keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

5.8 Using Dual Input Function

This instrument has an optional dual input function which can be configured as follows.

- **Remote setting input function**

The instrument uses an input signal from Input 2 as a remote signal and sets it to the Input 1_Set value (SV). Remote setting input can be supplied on any of FZ110/400/900 if it is specified at the time of order.

 Refer to **8.10 Using Remote Setting Input (P. 8-61)** for more details.

- **2-loop control function**

The instrument performs two independent control using Input 1 and 2. To have this function, “Measured input 2” must be specified at the time of order. Available only on FZ400/900.

The 2-loop control can be configured to Differential temperature control, and vice versa.

 Refer to **8.11 Executing 2-Loop Control [FZ400/900] (P. 8-67)** for more details of 2-loop control.

- **Differential temperature control function**

With this function, temperature control of Input 1 is performed by setting a temperature difference between Input 2 and Input 1. To have this function, “Measured input 2” must be specified at the time of order. Available only on FZ400/900.

The 2-loop control can be configured to Differential temperature control, and vice versa.

 Refer to **8.12 Executing Differential Temperature Control [FZ400/900] (P. 8-70)** for details.

- **Control with PV select**

This function uses two inputs and allows the sensors to be switched from one to another depending on the temperature of the controlled object (high or low temperatures). To have this function, “Measured input 2” must be specified at the time of order. Available only on FZ400/900.

 For Control with PV select, refer to **8.13 Executing Control with PV Select [FZ400/900] (P. 8-75)**.

- **Cascade control**

Cascade control is available where Input 1 is used as a Master and Input 2 as a Slave.

To have this function, “Measured input 2” must be specified at the time of order. Available only on FZ400/900.

Cascade control is available in two control modes; “Slave single control or Cascade control” and “Master single control or Cascade control.”

 For the Cascade control, refer to **8.14 Executing Cascade Control [FZ400/900] (P. 8-84)**.

- **Input circuit error alarm function**

The instrument uses two inputs to detect an error from the difference in input between the two. To have this function, “Measured input 2” must be specified at the time of order. Available only on FZ400/900.

 For more details, refer to **7.7 Preventing Control with Input Errors (Input Circuit Error Alarm) [FZ400/900] (P. 7-46)**.

■ Parameter setting

● Select function for input 2

[Engineering mode: Function block No. 58 (F_n58)]

Parameter symbol	Data range	Factory set value
r2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm *This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	• FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 • FZ110: 1



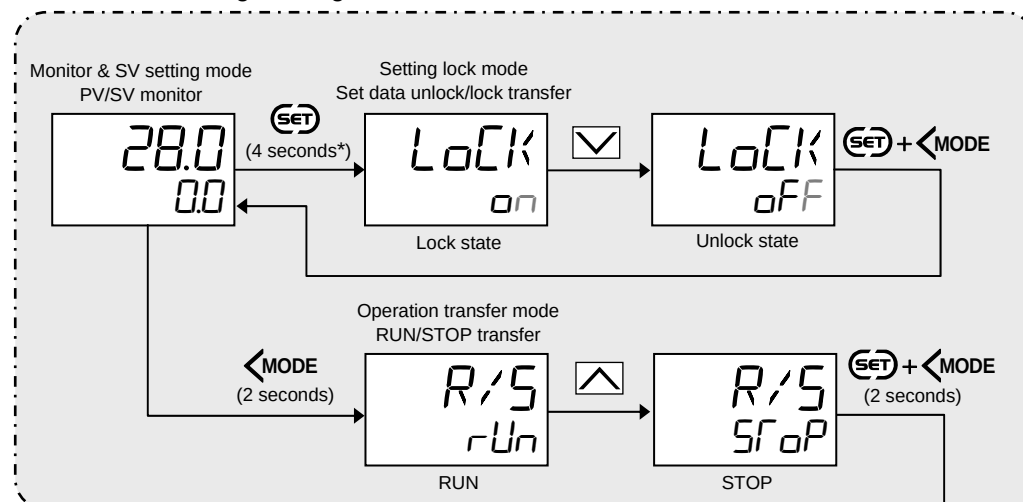
To display “Select function for input 2,” “Remote setting input” or “Measured input 2” must be specified at the time of order.



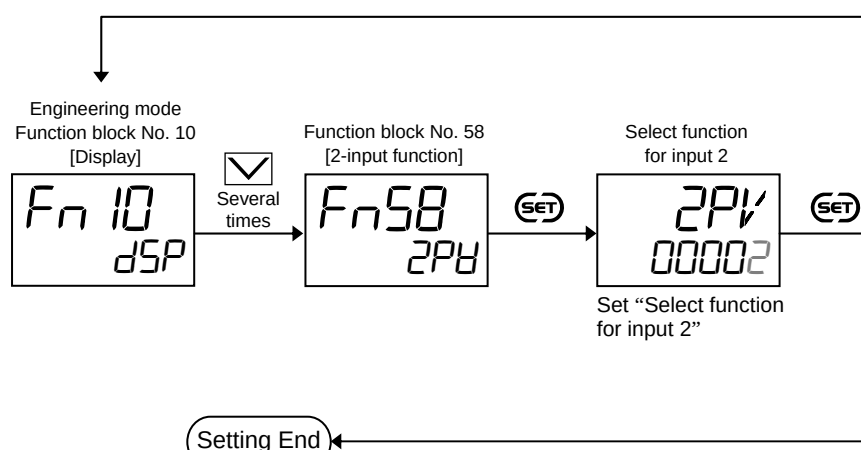
Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized or changed when the Select function for input 2 is changed.

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.



OUTPUT FUNCTION

6

This chapter describes output related functions, setting contents and setting procedure based on the key words related to outputs.

6.1 Changing Output Assignment [Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output].....	6-2
6.2 Changing Output Type of OUT3	6-12
6.3 Using Retransmission Output	6-14
6.4 Changing Proportional Cycle Time	6-20
6.5 Changing Energizing/De-energizing Output	6-24
6.6 Limiting Output.....	6-26
6.7 Suppressing Sudden Change in Output (Output Change Rate Limiter).....	6-29
6.8 Suppressing Sudden Change in Output (Balanceless Bumpless)	6-33
6.9 Changing the Output Action While in Control Stop Mode	6-39
6.10 Monitoring Manipulated Output Value	6-42

6.1 Changing Output Assignment

[Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output]

FZ110/400/900 has such hardware outputs as shown below.

- FZ110: OUT1 to 3 (max. 3), DO1 to 2 (max. 2)
- FZ400/900: OUT1 to 3 (max. 3), DO1 to 4 (max. 4)

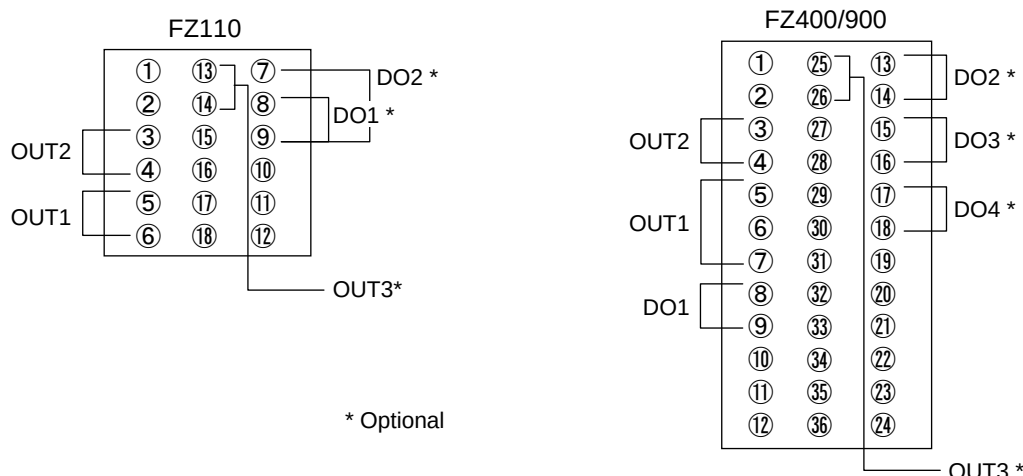
The following output signals are assigned to each output terminal.

- Control output (Settable only between OUT1 and OUT3)
- Retransmission output (Settable only between OUT1 and OUT3)
- Logic calculation output
[Event, Heater break alarm (HBA), Control loop break alarm (LBA), Input error status]
- Instrument Status Output
[RUN, Manual mode, Remote mode, Autotuning (AT), While Set value (SV) is changing, Communication monitoring result, FAIL]

■ Description of function

Output signals [Control Output, Retransmission Output, Logic Calculation Output, or Instrument Status Output] are assigned to the output terminals (OUT1 to 3, DO1 to 4).

● Position of output terminals



● Details of functions assigned to OUT1 to 3

Setting	Assigned functions
0	No assignment
1	Input 1 Control output [heat-side] or [open-side]
2	Input 1 Control output [cool-side] or [close-side]
3	Input 2 Control output
4	Retransmission output
5	Logic calculation output [Event, HBA, LBA, Input error status]
6	RUN state output
7	Input 1 Manual mode state output
8	Input 2 Manual mode state output
9	Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select)
10	Input 1 Autotuning (AT) state output
11	Input 2 Autotuning (AT) state output
12	Output while Set value of Input 1 is changing
13	Output while Set value of Input 2 is changing
14	Output of the communication monitoring result
15	FAIL output

Continued on the next page.

[Explanation of the setting]

- Input 1_Control output [heat-side] or [open-side]:
 Assignable to Input 1. If Heat/Cool PID control is selected for Input 1, this output is used as heating output. If Position proportioning PID control is selected, this output is used as an opening output.
- Input 1_Control output [cool-side] or [close-side]:
 This output is available if Heat/Cool PID control is selected for Input 1.
 If Heat/Cool PID control is selected, this output is used as a cooling output. If Position proportioning PID control is selected, this output is used as a closing output.
- Input 2_Control output
 Assignable to Input 2. This output is available if 2-loop control (including Differential temperature control) or Cascade control is selected for Select function for Input 2. (FZ400/900 only)
- Retransmission output:
 Retransmission output type needs to be specified later. Retransmission output scaling is also available.
 For more details of Retransmission output, refer to **6.3 Using Retransmission Output (P. 6-14)**.
- Logic calculation output [Event, HBA, LBA, Input error status]:
 Logic calculation needs to be specified separately. Multiple outputs can be output from a single output terminal as logical OR relation.
 Refer to the next page (P. 6-4) for Logic calculation selection.
- RUN state output:
 Output turns on while the instrument is in RUN mode.
- Input 1_Manual mode state output:
 Output turns on while the Input 1 is in Manual mode.
- Input 2_Manual mode state output:
 Output turns on while the Input 2 is in Manual mode. (FZ400/900 only)
- Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select)
 Output turns on while the instrument is in the remote mode, cascade control, differential temperature control, or when Input 2 of Control with PV select is used.
- Input 1_Autotuning (AT) state output:
 Output turns on while the Input 1 is in the Autotuning (AT).
- Input 2_Autotuning (AT) state output:
 Output turns on while the Input 2 is in the Autotuning (AT). (FZ400/900 only)
- Output while Set value of Input 1 is changing:
 Output turns on while the Input 1_Set value (SV) is changing due to Setting change rate limiter.
- Output while Set value of Input 2 is changing:
 Output turns on while the Input 2_Set value (SV) is changing due to Setting change rate limiter. (FZ400/900 only)
- Output of the communication monitoring result:
 Valid only when the communication function is supplied. Output turns on if improper communication continues for 10 seconds.
- FAIL output:
 Output turns on when the instrument is in FAIL state.
 When FAIL is selected, the output terminal is fixed to de-energizing, and the previous setting of energizing and de-energizing gets invalid.

● Details of functions assigned to DO1 to 4

Setting	Assigned functions
0	No assignment
1	Logic calculation output [Event, HBA, LBA, Input error status]
2	RUN state output
3	Input 1_Manual mode state output
4	Input 2_Manual mode state output
5	Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select)
6	Input 1_Autotuning (AT) state output
7	Input 2_Autotuning (AT) state output
8	Output while Set value of Input 1 is changing
9	Output while Set value of Input 2 is changing
10	Output of the communication monitoring result
11	FAIL output

[Explanation of the setting]

Refer to [Explanation of the setting] for OUT1 to 3

● Details of OUT1 to 3 as well as DO1 to 4 logic calculation selection

Multiple functions can be selected in the logic operation. The selected functions are *OR*-output.

To select multiple functions, add the numbers of the desired functions.

Setting	Assigned functions
0	No assignment
1	Event 1
2	Event 2
4	Event 3
8	Event 4
16	Heater break alarm 1 (HBA1)
32	Heater break alarm 2 (HBA2)
64	Control loop break alarm 1 (LBA1)
128	Control loop break alarm 2 (LBA2)
256	Input 1_Input error high
512	Input 1_Input error low
1024	Input 2_Input error high
2048	Input 2_Input error low

Example

To select Event 1 output, Heater break alarm 1 (HBA1) output and Input 1_Input error output high, set as follows.

- Event 1 = 1
- Heater break alarm 1 (HBA1) = 16
- Input 1_Input error high = 256

$$1 + 16 + 256 = 273$$

So, set 273

[Explanation of the setting]

- **Event:** Output turns on when the instrument is in the event state.
You also need to set Event assignment, Event type, Event hold action, Event differential gap, Event timer, and Event set value.
 For details of Event, refer to **7.1 Using Event Function (P. 7-2)**.
- **Heater break alarm (HBA):** Output turns on when the instrument is in Heater break alarm (HBA) state.
You also need to set CT assignment, HBA set value, and HBA delay time.
 For details of Heater break alarm (HBA), refer to **7.2 Using Heater Break Alarm (HBA) (P. 7-24)**.
- **Control loop break alarm (LBA):** Output turns on when the instrument is in Control loop break alarm (LBA) state.
You also need to set LBA time and LBA deadband.
 For details of Control loop break alarm (LBA), refer to **7.3 Using Control loop break alarm (LBA) (P. 7-36)**.
- **Input error high:** Output turns on when the Measured value (PV) exceeds the Input error determination point (high).
Under the conditions of a valid Input circuit error alarm, when the Measured value of Input 2 goes over the Set value of the Input circuit error alarm and the measured value of Input 1, the Input error high alarm of Input 1 will turn on.
- **Input errorlow:** Output turns on when the Measured value (PV) exceeds the Input error determination point (low).
Under the conditions of a valid Input circuit error alarm, when the Measured value of Input 2 falls below over the Set value of the Input circuit error alarm and the measured value of Input 1, the Input error low alarm of Input 1 will turn on.

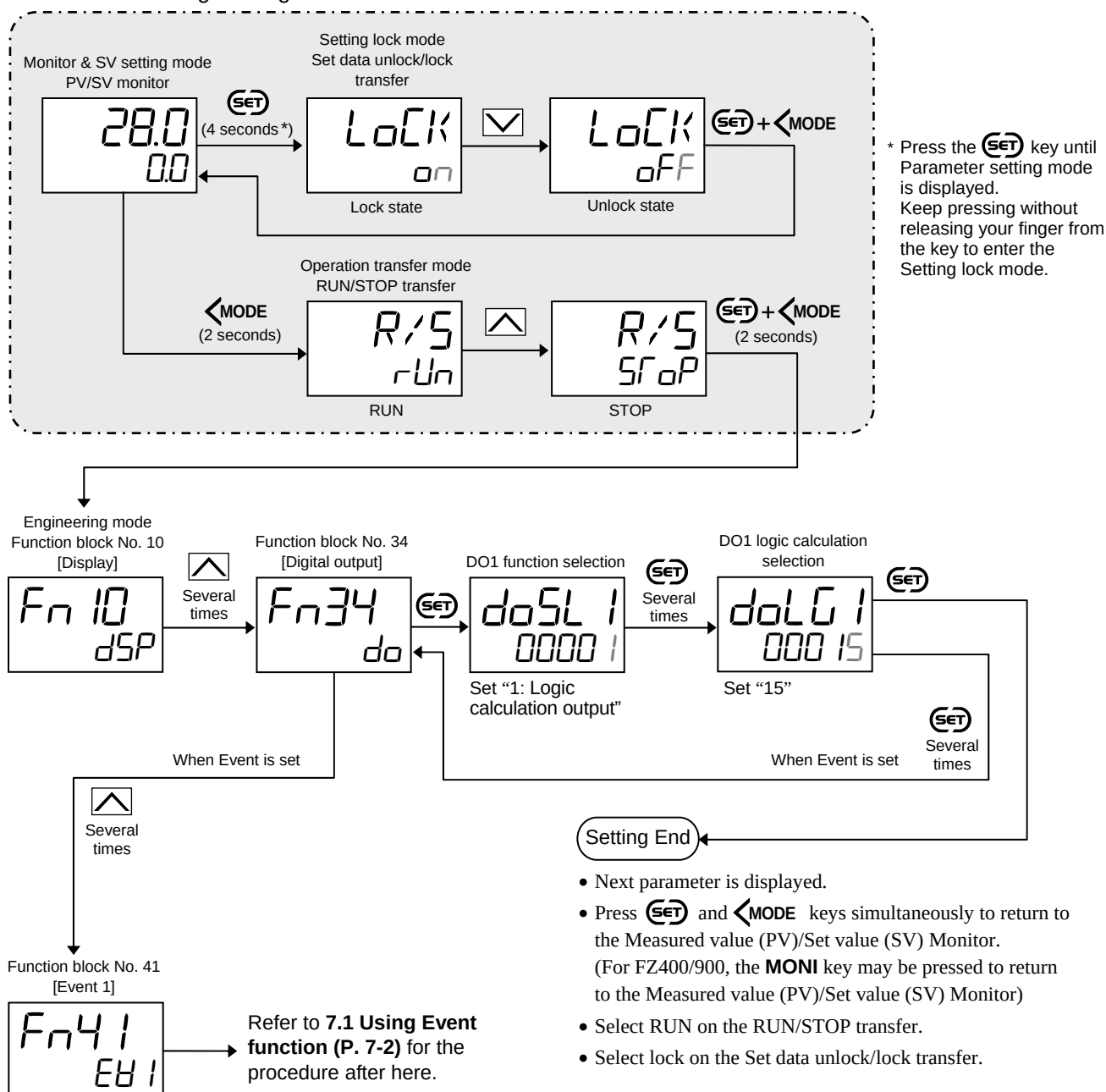
Setting example

To provide Event 1 to Event 4 from DO1 as a logic OR output.

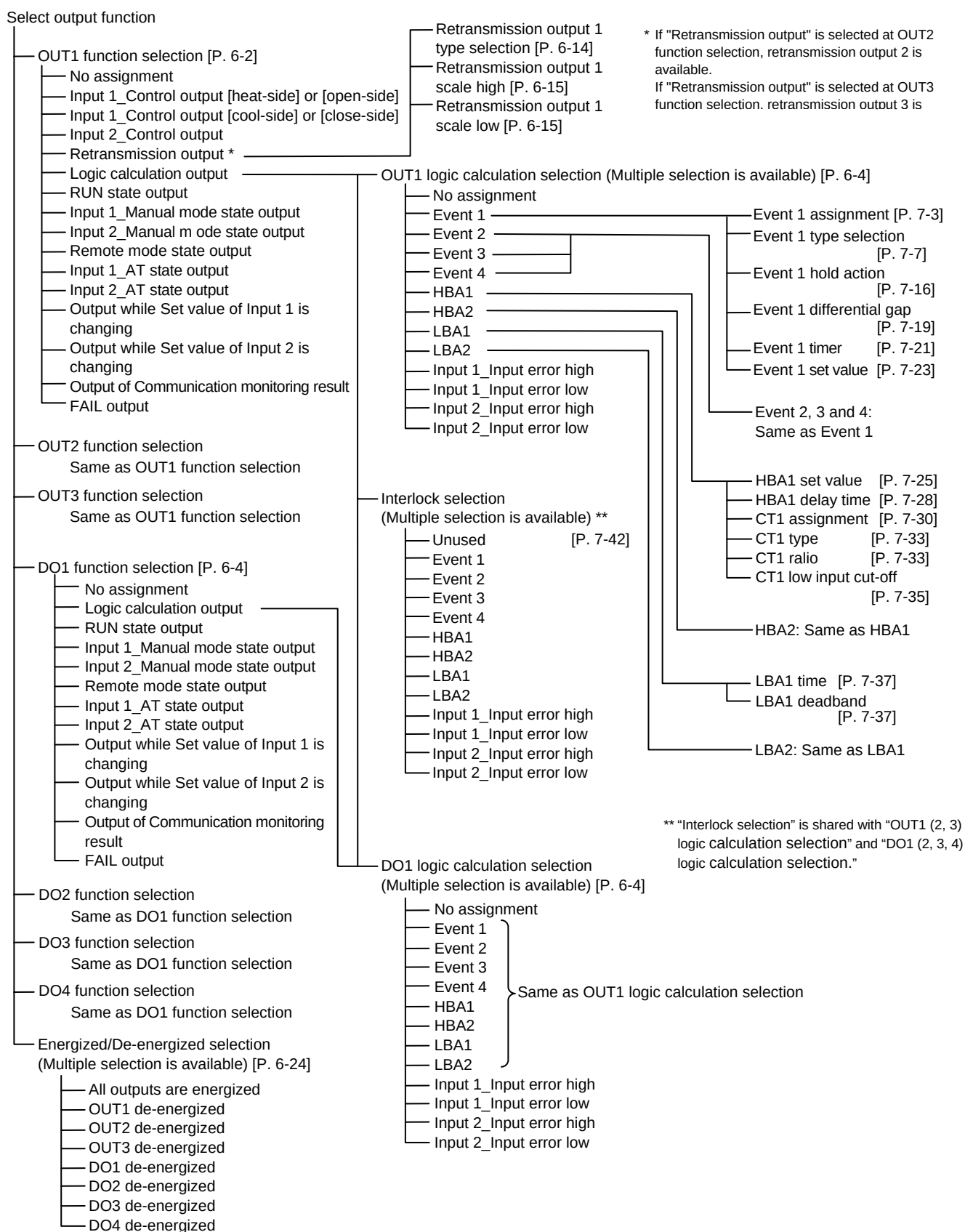
1. Select “1: Logic calculation output” in DO1 assignment.
2. Set “15” for DO1_logic calculation selection.
Enter “1” to output Event 1, “2” for Event 2, “4” for Event 3, and “8” for Event 4. Add the sum of these numbers (15), then the outputs of Event 1 to 4 are produced as a logical OR.

[Setup procedures]

To enter the Engineering mode



● Output function map



■ Parameter setting

● OUT1 function selection

[Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oSL1	0: No assignment 1: Input 1_Control output [heat-side] or [open-side] 2: Input 1_Control output [cool-side] or [close-side] 3: Input 2_Control output 4: Retransmission output 5: Logic calculation output (Event, HBA, LBA, Input error) 6: RUN state output 7: Input 1_Manual mode state output 8: Input 2_Manual mode state output 9: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 10: Input 1_Autotuning (AT) state output 11: Input 2_Autotuning (AT) state output 12: Output while Set value of Input 1 is changing 13: Output while Set value of Input 2 is changing 14: Output of the communication monitoring result 15: FAIL output	Based on Model code



To display “OUT1 function selection,” you need to specify the output type other than “None” at Output 1 (OUT1) at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the OUT1 function selection is changed.

● OUT2 function selection

[Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oSL2	Same as OUT1 function selection	Based on Model code



To display “OUT2 function selection,” you need to specify the output type other than “None” at Output 2 (OUT2) at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the OUT2 function selection is changed.

● OUT3 function selection

[Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oSL3	Same as OUT1 function selection	4



To display “OUT3 function selection,” you need to specify the output type OUT3 at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the OUT3 function selection is changed.

● DO1 function selection

[Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doSL1	0: No assignment 1: Logic calculation output (Event, HBA, LBA, Input error) 2: RUN state output 3: Input 1_Manual mode state output 4: Input 2_Manual mode state output 5: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 6: Input 1_Autotuning (AT) state output 7: Input 2_Autotuning (AT) state output 8: Output while Set value of Input 1 is changing 9: Output while Set value of Input 2 is changing 10: Output of the communication monitoring result 11: FAIL output	Based on Model code



To display “DO1 function selection,” you have to specify digital output (DO) for FZ110.

● DO2 function selection

[Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doSL2	Same as DO1 function selection	Based on Model code



To display “DO2 function selection,” you have to specify 4 digital outputs (DO) on FZ400/900 at the time of order. For FZ110, you have to specify 2 digital outputs (DO) at the time of order.

● DO3 function selection

[Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
doSL3	Same as DO1 function selection	Based on Model code



To display “DO3 function selection,” you have to specify 4 digital outputs (DO) at the time of order. (FZ400/900 only)

● DO4 function selection

[Engineering Mode: Function block No. 34 (Fn34)]

Parameter symbol	Data range	Factory set value
do5L4	Same as DO1 function selection	Based on Model code



To display “DO4 function selection,” you have to specify 4 digital outputs (DO) at the time of order. (FZ400/900 only)

● OUT1 logic calculation selection

[Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oL01	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0



To display “OUT1 logic calculation selection,” you need to specify the output type other than “None” at Output 1 (OUT1) at the time of order.

● OUT2 logic calculation selection

[Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oL02	Same as OUT1 logic calculation selection	Based on Model code



To display “OUT2 logic calculation selection,” you need to specify the output type other than “None” at Output 2 (OUT2) at the time of order.

● OUT3 logic calculation selection

[Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
oL03	Same as OUT1 logic calculation selection	0



To display “OUT3 logic calculation selection,” you need to specify the output type OUT3 at the time of order.

● DO1 logic calculation selection

[Engineering Mode: Function block No. 34 (F_n34)]

Parameter symbol	Data range	Factory set value
doL01	Same as OUT1 logic calculation selection (P. 6-9)	Based on Model code



To display “DO1 logic calculation selection,” you have to specify digital output (DO) for FZ110.

● DO2 logic calculation selection

[Engineering Mode: Function block No. 34 (F_n34)]

Parameter symbol	Data range	Factory set value
doL02	Same as OUT1 logic calculation selection (P. 6-9)	Based on Model code



To display “DO2 logic calculation selection,” you have to specify 4 digital outputs (DO) on FZ400/900 at the time of order. For FZ110, you have to specify 2 digital outputs (DO) at the time of order.

● DO3 logic calculation selection

[Engineering Mode: Function block No. 34 (F_n34)]

Parameter symbol	Data range	Factory set value
doL03	Same as OUT1 logic calculation selection (P. 6-9)	Based on Model code



To display “DO3 logic calculation selection,” you have to specify 4 digital outputs (DO) at the time of order. (FZ400/900 only)

● DO4 logic calculation selection

[Engineering Mode: Function block No. 34 (F_n34)]

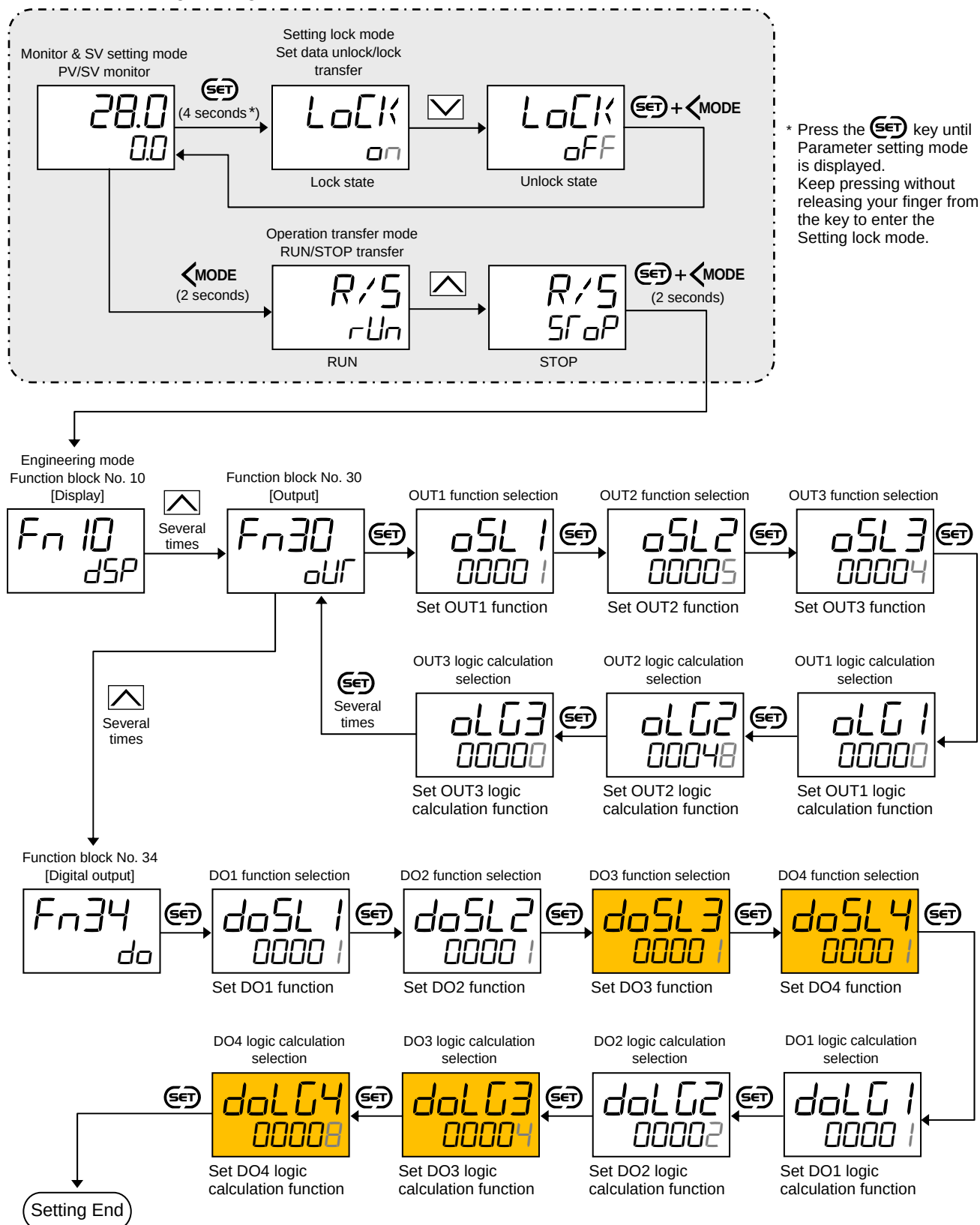
Parameter symbol	Data range	Factory set value
doL04	Same as OUT1 logic calculation selection (P. 6-9)	Based on Model code



To display “DO4 logic calculation selection,” you have to specify 4 digital outputs (DO) at the time of order. (FZ400/900 only)

Setting procedure

To enter the Engineering mode



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

6.2 Changing Output Type of OUT3

OUT3 (optional) is produced as a universal output. Output type can be changed even after the purchase.

■ Description of function

Output 3 (optional) may be selected from the following three types. The output can be modified without changing the hardware.

- Voltage pulse output (0/14 V DC)
- Current output (4 to 20 mA DC)
- Current output (0 to 20 mA DC)

■ Parameter setting

● Universal output type selection (OUT3)

[Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
UNI □	0: Voltage pulse output 1: Current output (4 to 20 mA DC) 2: Current output (0 to 20 mA DC)	1



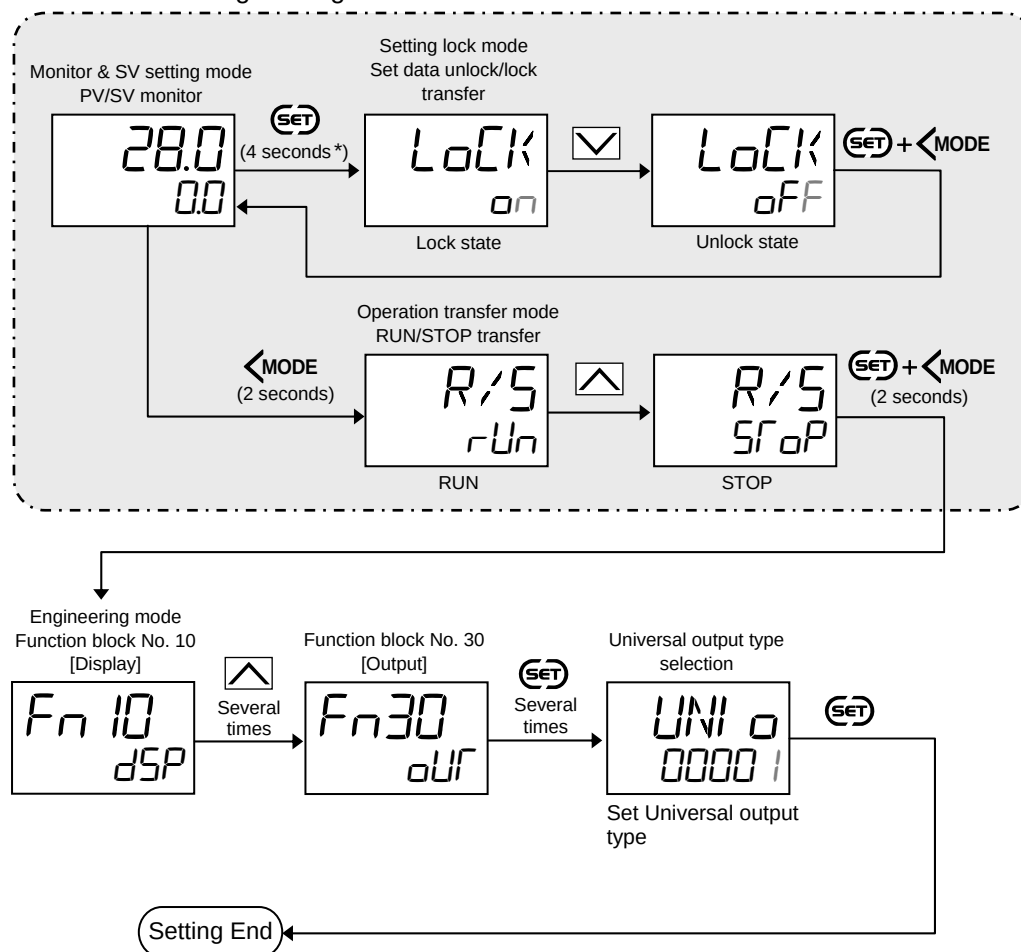
To display “Universal output type selection (OUT3),” you need to specify the output type OUT3 at the time of order.



Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized when the Universal output type selection (OUT3) is changed.

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

6.3 Using Retransmission Output

Retransmission output can be provided from OUT1 to 3. To use the Retransmission output, the output type must be current or continuous voltage output.

■ Description of function

To use the Retransmission output, select Retransmission output at OUT1 to 3 function selection.

If Retransmission output is selected at the OUT1 function selection, the output is provided as Retransmission output 1.

If Retransmission output is selected at the OUT2 function selection, the output is provided as Retransmission output 2.

If Retransmission output is selected at the OUT3 function selection, the output is provided as Retransmission output 3.

For details OUT1 to 3 function selection, refer to **6.1 Changing Output Assignment [Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output] (P. 6-2)**.

● Details of Retransmission output type

Setting	Assigned functions
0	No retransmission output
1	Input 1_Measured value (PV) Input 1_Measured value (PV) is output.
2	Input 1_Local SV Input 1_Set value (SV) is output. The local SV is the SV set. If the set value is changed, irrespective of the Setting change rate limiter whether or not it is set, the new set value will be used as soon as the value is changed.
3	Input 1_SV monitor value Input 1_Set value (SV) is output. The SV monitor value is the monitored value of the set value (SV). If a Setting change rate limiter is set, the set value starts changing according to the setting when the setting is changed.
4	Input 1_Deviation [Input 1_Measured value (PV) – Input 1_Set value (SV)] is output.
5	Input 1_Manipulated output value [heat-side] Input 1_Manipulated output value [heat-side] is output.
6	Input 1_Manipulated output value [cool-side] Input 1_Manipulated output value [cool-side] is output.
7	Input 2_Measured value (PV) ¹ Input 2_Measured value (PV) is output.
8	Input 2_Local SV ¹ Input 2_Set value (SV) is output. The local SV is the SV set. If the set value is changed, irrespective of the Setting change rate limiter whether or not it is set, the new set value will be used as soon as the value is changed.
9	Input 2_SV monitor value ¹ Input 2_Set value (SV) is output. The SV monitor value is the monitored value of the set value (SV). If a Setting change rate limiter is set, the set value starts changing according to the setting when the setting is changed.
10	Input 2_Deviation ¹ [Input 2_Measured value (PV) – Input 2_Set value (SV)] is output.
11	Input 2_Manipulated output value ¹ Input 2_Manipulated output value [heat-side] is output.
12	Remote setting input value ² Remote setting input value is output.
13	Current transformer 1 (CT1) input value ³ Current transformer 1 (CT1) input value is output.
14	Current transformer 2 (CT2) input value ⁴ Current transformer 2 (CT2) input value is output.
15	Measured value (PV) of differential temperature input ¹ Measured value (PV) of Differential temperature input [Input 1_Measured value (PV) – Input 2_Measured value (PV)] is output.

¹ Valid if “Measured input 2” is specified at the time of order. (FZ400/900 only)

² For FZ400/900: Valid when “Remote setting input” is selected at Select function for input 2.

For FZ110: Valid if Remote setting input is supplied.

³ Valid if Current transformer (CT) input is supplied.

⁴ Valid if two Current transformer (CT) input are supplied. (FZ400/900 only)



The output will be 0 % when the Retransmission output type not provided on the instrument is set.

- Scaling the Retransmission output

Set high and low limits for the Retransmission output. The scale range depends on the type of the selected Retransmission output.

No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value:

Input 1_Input range low to Input 1_Input range high
(When Control with PV select: PV select input range low to PV select input range high)
[Varies with the setting of the Decimal point position.]

Input 1_Deviation:

-(Input 1_Input span) to +(Input 1_Input span)
[Varies with the setting of the Decimal point position.]

Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value:

Input 2_Input range low to Input 2_Input range high
[Varies with the setting of the Decimal point position.]

Input 2_Deviation:

-(Input 2_Input span) to +(Input 2_Input span)
[Varies with the setting of the Decimal point position.]

Manipulated output value:

-5.0 to +105.0 %

Current transformer (CT) input value:

0.0 to 100.0 %

Measured value (PV) of differential temperature input:

-(Input 1_Input span) to +(Input 1_Input span)
[Varies with the setting of the Decimal point position.]

Parameter setting

Retransmission output 1 type

[Engineering Mode: Function block No. 31 (Fn3 I)]

Parameter symbol	Data range	Factory set value
R01	0: No retransmission output 1: Input 1_Measured value (PV) 2: Input 1_Local SV 3: Input 1_SV monitor value 4: Input 1_Deviation 5: Input 1_Manipulated output value [heat-side] 6: Input 1_Manipulated output value [cool-side] 7: Input 2_Measured value (PV) 8: Input 2_Local SV 9: Input 2_SV monitor value 10: Input 2_Deviation 11: Input 2_Manipulated output value 12: Remote setting input value 13: Current transformer 1 (CT1) input value 14: Current transformer 2 (CT2) input value 15: Measured value (PV) of differential temperature input	0



To display “Retransmission output 1 type,” Output type on OUT1 must be specified as Current output or Continuous voltage output at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Retransmission output 1 type is changed.

Retransmission output 1 scale high

[Engineering Mode: Function block No. 31 (Fn3 I)]

Parameter symbol	Data range	Factory set value
RHS1	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low to Input 1_Input range high [When Control with PV select: PV select input range low to PV select input range high] [Varies with the setting of the Decimal point position.] Input 1_Deviation: -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.] Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Deviation: -(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.] Manipulated output value: -5.0 to +105.0 % Current transformer (CT) input value: 0.0 to 100.0 % Measured value (PV) of differential temperature input: -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high [Control with PV select: PV select input range high] Input 1_Deviation: +(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range high Input 2_Deviation: +(Input 2_Input span) Manipulated output value, and Current transformer (CT) input value: 100.0 Measured value (PV) of differential temperature input: 100



To display “Retransmission output 1 scale high,” Output type on OUT1 must be specified as Current output or Continuous voltage output at the time of order.

● Retransmission output 1 scale low

[Engineering Mode: Function block No. 31 (Fn31)]

Parameter symbol	Data range	Factory set value
AL51	Same as Retransmission output 1 scale high (P. 6-16)	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low (Control with PV select: PV select input range low) Input 1_Deviation: -(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low Input 2_Deviation: -(Input 2_Input span) Manipulated output value, and Current transformer (CT) input value: 0.0 Measured value (PV) of differential temperature input: -100



To display “Retransmission output 1 scale low,” Output type on OUT1 must be specified as Current output or Continuous voltage output at the time of order.

● Retransmission output 2 type

[Engineering Mode: Function block No. 32 (Fn32)]

Parameter symbol	Data range	Factory set value
Ro2	Same as Retransmission output 1 (P. 6-16)	0



To display “Retransmission output 2 type,” Output type on OUT2 must be specified as Current output or Continuous voltage output at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Retransmission output 2 type is changed.

● Retransmission output 2 scale high

[Engineering Mode: Function block No. 32 (Fn32)]

Parameter symbol	Data range	Factory set value
RH52	Same as Retransmission output 1 scale high (P. 6-16)	Same as Retransmission output 1 scale high



To display “Retransmission output 2 scale high,” Output type on OUT2 must be specified as Current output or Continuous voltage output at the time of order.

● Retransmission output 2 scale low

[Engineering Mode: Function block No. 32 (Fn32)]

Parameter symbol	Data range	Factory set value
AL52	Same as Retransmission output 1 scale low (P. 6-17)	Same as Retransmission output 1 scale low



To display “Retransmission output 2 scale low,” Output type on OUT2 must be specified as Current output or Continuous voltage output at the time of order.

● Retransmission output 3 type

[Engineering Mode: Function block No. 33 (Fn33)]

Parameter symbol	Data range	Factory set value
Ro3	Same as Retransmission output 1 (P. 6-16)	1



To display “Retransmission output 3 type,” OUT3 must be specified at the time of order, and Current output must be set up in “Universal output type selection” in Function block No. 30 in Engineering mode.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Retransmission output 3 type is changed.

● Retransmission output 3 scale high

[Engineering Mode: Function block No. 33 (Fn33)]

Parameter symbol	Data range	Factory set value
AH53	Same as Retransmission output 1 scale high (P. 6-16)	Same as Retransmission output 1 scale high



To display “Retransmission output 3 scale high,” OUT3 must be specified at the time of order, and Current output must be set up in “Universal output type selection” in Function block No. 30 in Engineering mode.

● Retransmission output 3 scale low

[Engineering Mode: Function block No. 33 (Fn33)]

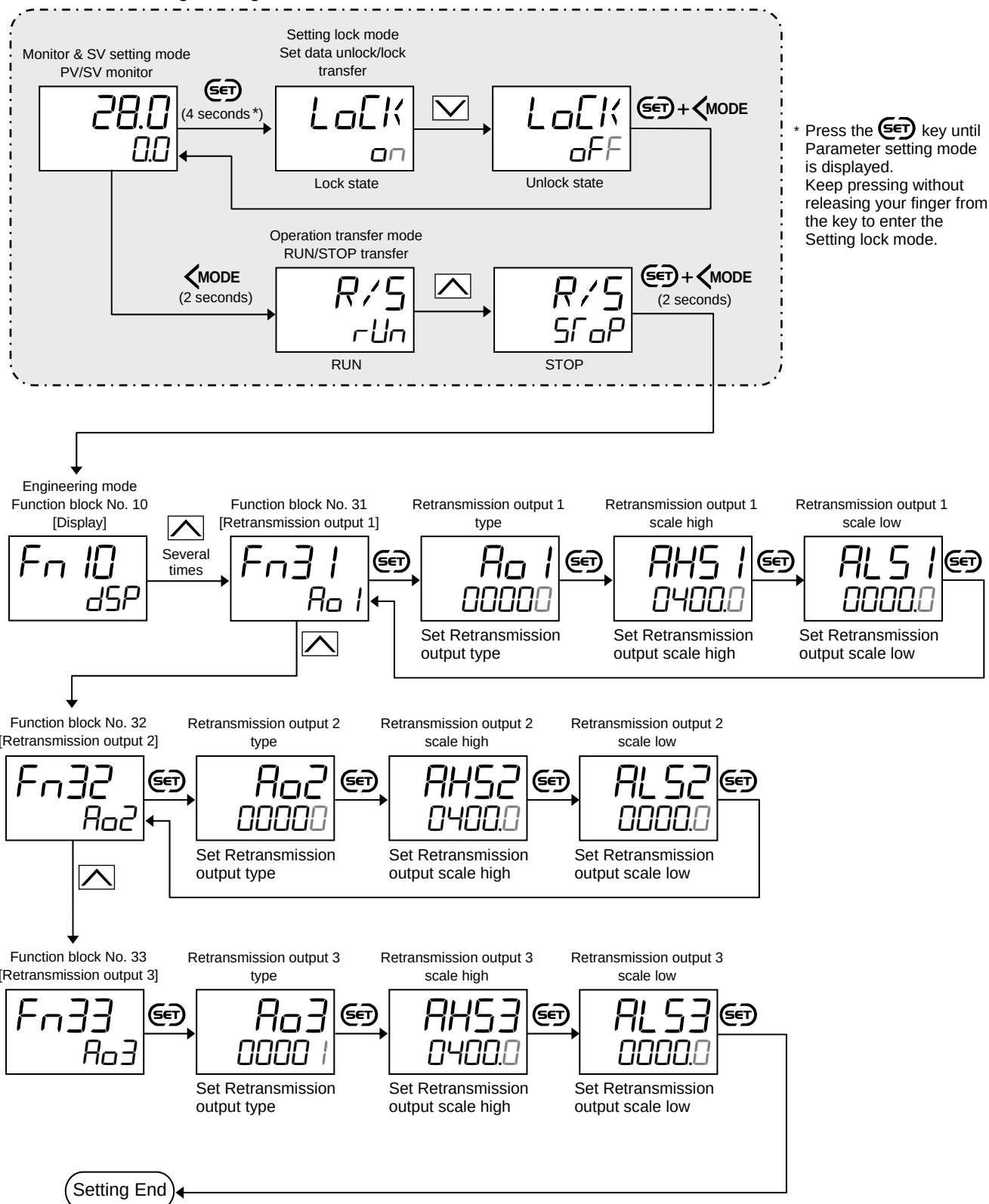
Parameter symbol	Data range	Factory set value
AL53	Same as Retransmission output 1 scale low (P. 6-17)	Same as Retransmission output 1 scale low



To display “Retransmission output 3 scale low,” OUT3 must be specified at the time of order, and Current output must be set up in “Universal output type selection” in Function block No. 30 in Engineering mode.

Setting procedure

To enter the Engineering mode



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

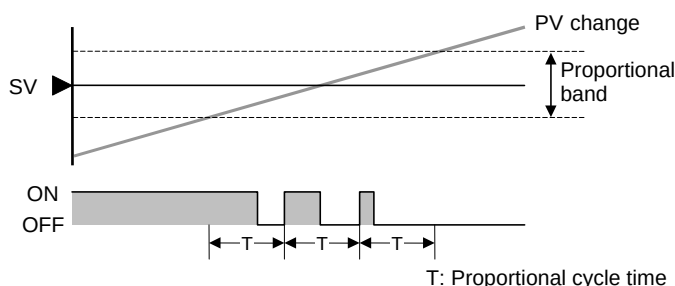
6.4 Changing Proportional Cycle Time

When time proportioning output (relay output, voltage pulse output or transistor output) is specified at the time of ordering, Proportional cycle time and Minimum ON/OFF time of proportional cycle can be changed.

■ Description of function

● Proportional cycle time

Manipulated output value turns ON and OFF in a certain cycle (Proportional cycle time) when the Measured value (PV) reaches within the Proportional band at Time proportioning action. More precise control can be achieved by shortening Proportional cycle time, however, the life of operating unit (Relay etc.) can be shortened based on the feature of the specific controlled object



● Minimum ON/OFF time of proportioning cycle

Minimum ON/OFF time of proportioning cycle can be used to compensate relay life by acquiring the minimum OF/OFF time.

Minimum ON time of proportioning cycle:

Manipulated output does not turn ON when the duration of the computed ON output is shorter than the Minimum ON time of proportioning cycle being set.

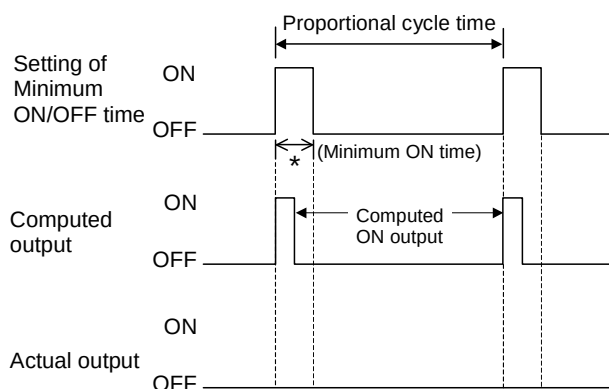
Manipulated output remains ON the same amount of time as the computed ON output when the computed ON output is longer than the Minimum ON time of proportioning cycle being set.
(Minimum ON time of proportioning cycle is valid when the computed ON output exceeds 0 %.)

Minimum OFF time of proportioning cycle:

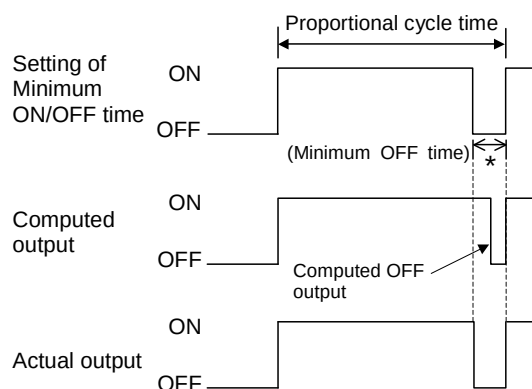
Manipulated output remains OFF the same amount of time as the Minimum OFF time set when the computed OFF output is shorter than the Minimum OFF time being set.

Manipulated output remains OFF the same amount of time as the computed OFF output when the computed OFF output is longer than the Minimum OFF time being set.
(Minimum OFF time of proportioning cycle is valid when the computed OFF output is below 100 %.)

When the computed ON output exceeds 0 %



When the computed OFF output is below 100 %



* When a long minimum ON/OFF time is required for the relay, set a time longer than that time.



Minimum ON/OFF time of proportioning cycle is not operative if the Proportioning cycle is set shorter than the Minimum ON/OFF time of proportioning cycle (Proportioning cycle < Minimum ON/OFF proportioning time).

■ Parameter setting

● OUT1 proportional cycle time

[Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
r1	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note

Note: In case OUT1 function selection is “Input 1_Control output [cool-side]” AND Input 1_Control action is “Heat/Cool PID control [air cooling] or [water cooling]”: 20.0, Other cases: 2.0



To display “OUT1 proportional cycle time,” Output type on OUT1 must be specified at the time of order as Relay contact output, Voltage pulse output, or Transistor output.

● OUT2 proportional cycle time

[Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
r2	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note

Note: In case OUT2 function selection is “Input 1_Control output [cool-side]” AND Input 1_Control action is “Heat/Cool PID control [air cooling] or [water cooling]”: 20.0, Other cases: 2.0



To display “OUT2 proportional cycle time,” Output type on OUT2 must be specified at the time of order as Relay contact output, Voltage pulse output, or Transistor output.

● OUT3 proportional cycle time

[Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
r3	0.1 to 100.0 seconds	Voltage pulse output: Note

Note: In case OUT3 function selection is “Input 1_Control output [cool-side]” AND Input 1_Control action is “Heat/Cool PID control [air cooling] or [water cooling]”: 20.0, Other cases: 2.0



To display “OUT3 proportional cycle time,” OUT3 must be specified at the time of order, and Voltage pulse output must be set up in “Universal output type selection” in Function block No. 30 in Engineering mode.

● OUT1 minimum ON/OFF time of proportional cycle

[Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
Mr1	0 to 1000 ms	0



To display “OUT1 minimum ON/OFF time of proportional cycle,” Output type on OUT1 must be specified at the time of order as Relay contact output, Voltage pulse output, or Transistor output.

- **OUT2 minimum ON/OFF time of proportional cycle**
[Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
MF2	0 to 1000 ms	0



To display “OUT2 minimum ON/OFF time of proportional cycle,” Output type on OUT2 must be specified at the time of order as Relay contact output, Voltage pulse output, or Transistor output.

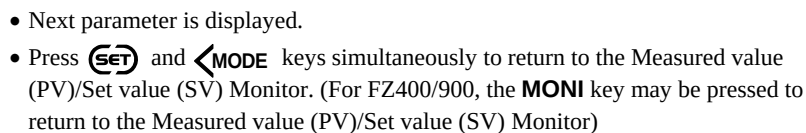
- **OUT3 minimum ON/OFF time of proportional cycle**
[Setup Setting Mode: Setting group No. 30 (5n30)]

Parameter symbol	Data range	Factory set value
MF3	0 to 1000 ms	0



To display “OUT3 minimum ON/OFF time of proportional cycle,” OUT3 must be specified at the time of order, and Voltage pulse output must be set up in “Universal output type selection” in Function block No. 30 in Engineering mode.

Monitor & SV setting mode
PV/SV monitor



6.5 Changing Energizing/De-energizing Output

Each output (OUT 1 to 3, DO1 to 4) can be individually set to energize or de-energize.



Setting energize/de-energize at Control output, Retransmission output, or Output terminal to which FAIL is assigned is ignored. (FAIL is fixed as de-energize)

■ Description of function

● Outputs selectable to energize or de-energize

Logic calculation output: Event, Heater break alarm (HBA), Control loop break alarm (LBA), Input error status

Instrument Status Output: RUN, Manual mode, Remote mode, Autotuning (AT), While Set value (SV) is changing, Communication monitoring result

● Explanation of energizing and de-energizing outputs

Output type		Output state	
		Status when the function assigned to the output is ON	Status when the function assigned to the output is OFF
Relay contact output	Energize	Contact close	Contact open
	De-energize	Contact open	Contact close
Voltage pulse output	Energize	ON	OFF
	De-energize	OFF	ON
Current output	Energize	Outputs the maximum output current (100 %)	Outputs the minimum output current (0 %)
	De-energize	Outputs the minimum output current (0 %)	Outputs the maximum output current (100 %)
Continuous voltage output	Energize	Outputs the maximum output current (100 %)	Outputs the minimum output current (0 %)
	De-energize	Outputs the minimum output current (0 %)	Outputs the maximum output current (100 %)
Transistor output	Energize	ON	OFF
	De-energize	OFF	ON

Example: Relay contact output

	Status when the function assigned to the output is ON			Status when the function assigned to the output is OFF	
	Energize	De-energize		Energize	De-energize
	Contact close 	Contact open 		Contact open 	Contact close

● Output state at STOP

Irrespective of setting Energize /De-energize, the output state at STOP is as follows.

If “Output action at control stop” (Function block No. 30 in Engineering mode) is set to continue the action, setting of Energize/De-energize remains valid.

Output type	Output state
Relay contact output	Contact open
Voltage pulse output	OFF
Current output	Outputs the minimum output current (0 %)
Continuous voltage output	Outputs the minimum output current (0 %)
Transistor output	OFF

Parameter setting

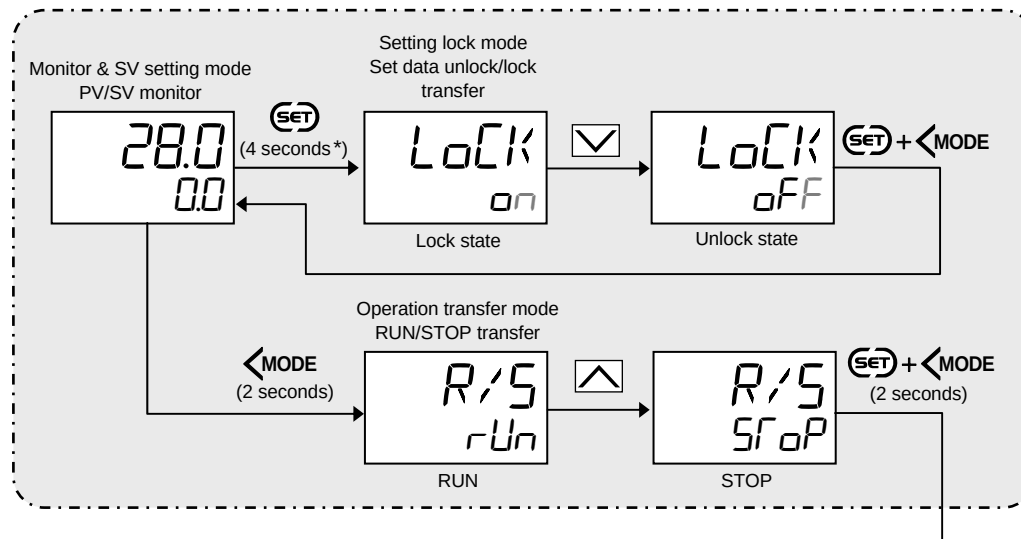
Energized/De-energized selection

[Engineering Mode: Function block No. 30 (Fn30)]

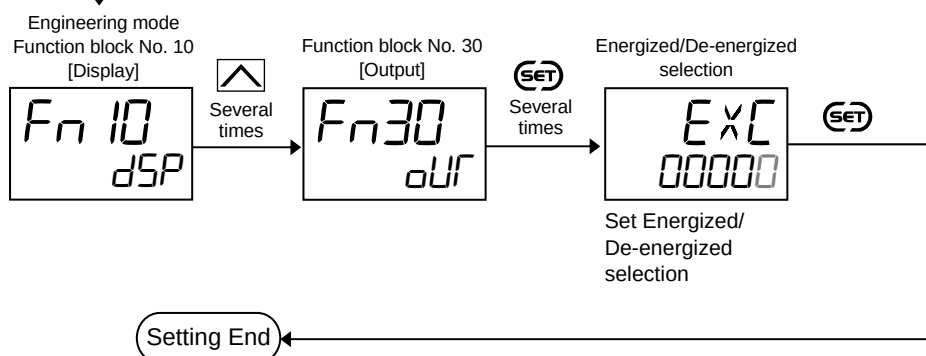
Parameter symbol	Data range	Factory set value
EXC	0 to 127 0: All outputs are energized +1: OUT1 de-energized +2: OUT2 de-energized +4: OUT3 de-energized +8: DO1 de-energized +16: DO2 de-energized +32: DO3 de-energized +64: DO4 de-energized To select two or more functions, sum each value.	0

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



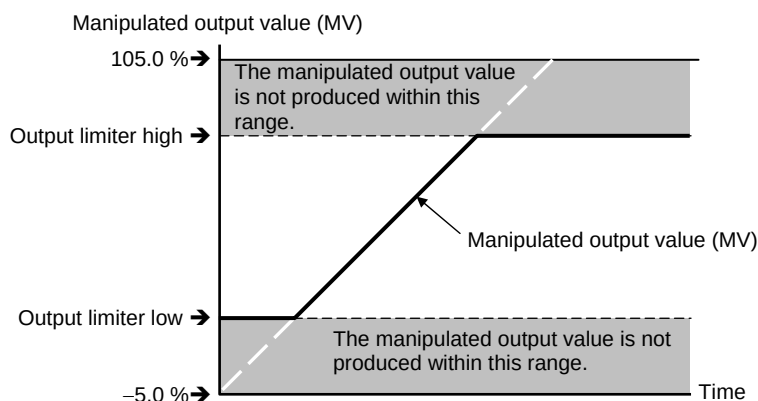
- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

6.6 Limiting Output

Use output limiter to limit the output.

■ Description of function

This is the function which restricts the high and low limits of Manipulated output values (MV).



Output limiter is also effective in ON/OFF control.

■ Parameter setting

● Input 1_Output limiter high [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. oLH	Input 1_Output limiter low [heat-side] to 105.0 %	105.0



Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 1_Output limiter high [heat-side] is changed.

● Input 1_Output limiter low [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. oLL	-5.0 % to Input 1_Output limiter high [heat-side]	-5.0



Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 1_Output limiter low [heat-side] is changed.

● Input 2_Output limiter high

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2. oLH	Input 2_Output limiter low to 105.0 %	105.0



To display “Input 2_Output limiter high,” specify “Measured input 2” at the time of order, AND “Select function for Input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 2_Output limiter high is changed.

● Input 2_Output limiter low

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2. oLL	–5.0 % to Input 2_Output limiter high	–5.0



To display “Input 2_Output limiter low,” specify “Measured input 2” at the time of order, AND “Select function for Input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 2_Output limiter low is changed.

● Input 1_Output limiter high [cool-side]

[Parameter Setting Mode: Parameter group No. 56 (P_{n56})]

Parameter symbol	Data range	Factory set value
1.oLHc	Input 1_Output limiter low [cool-side] to 105.0 %	105.0



To display “Input 1_Output limiter high [cool-side],” specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at “Input 1_Control action” (Function block No. 51 in Engineering mode).



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 1_Output limiter high [cool-side] is changed.

● Input 1_Output limiter low [cool-side]

[Parameter Setting Mode: Parameter group No. 56 (P_{n56})]

Parameter symbol	Data range	Factory set value
1.oLLc	–5.0 % to Input 1_Output limiter high [cool-side]	–5.0

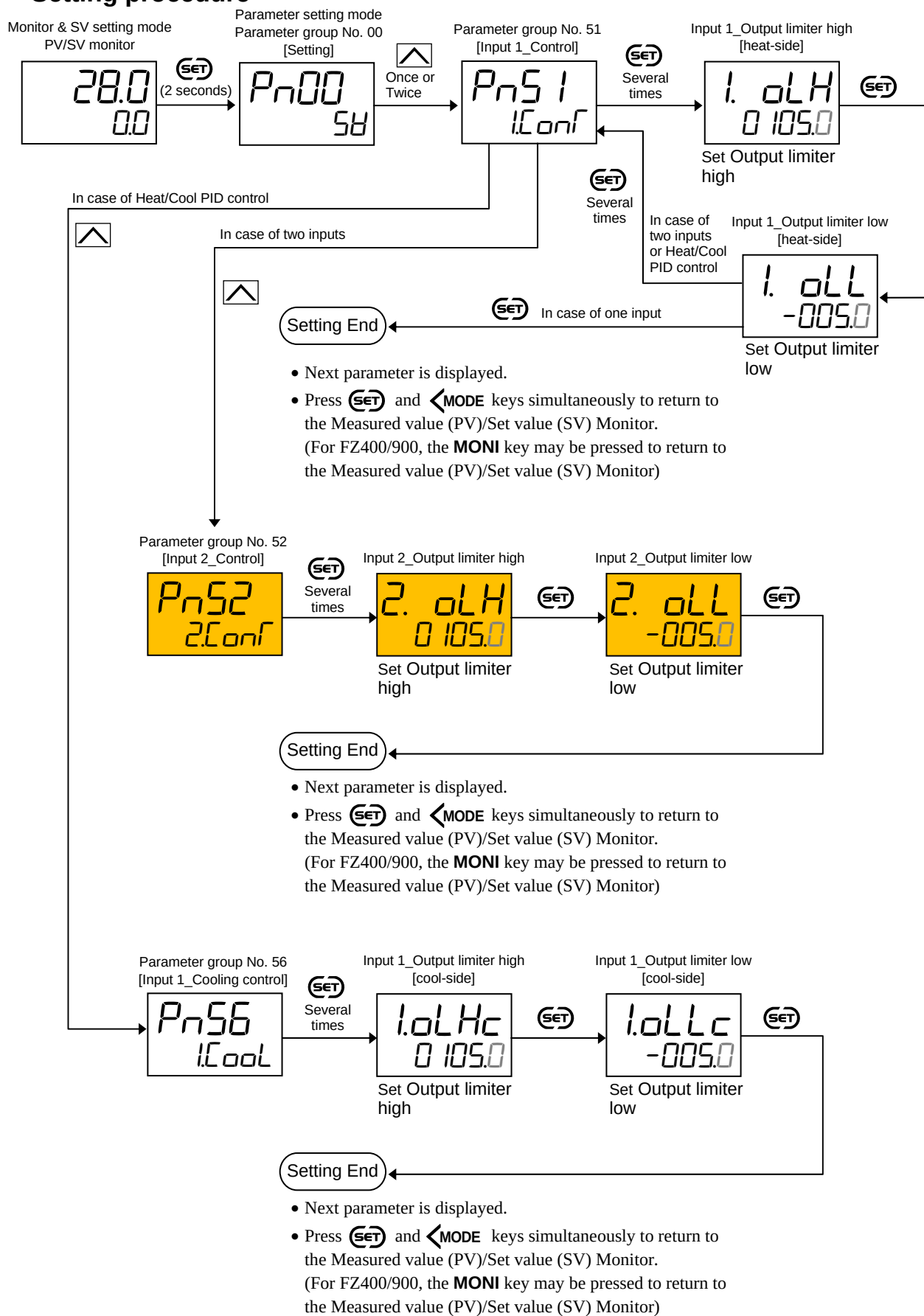


To display “Input 1_Output limiter low [cool-side],” specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at “Input 1_Control action” (Function block No. 51 in Engineering mode).



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 1_Output limiter low [cool-side] is changed.

Setting procedure



6.7 Suppressing Sudden Change in Output (Output Change Rate Limiter)

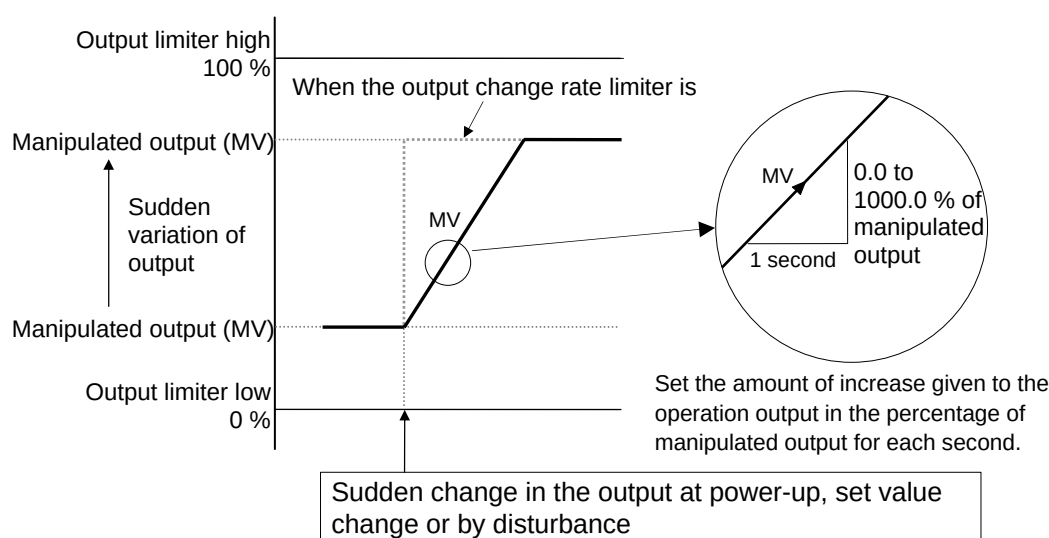
Output change rate limiter may be used to suppress sudden change in output at power on or at the time of set value change.

■ Description of function

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 may be also effective in Manual mode (including communication). Output change rate limiter also functions when output changes suddenly due to manipulated manual output at input error.



When the instrument recovers from power failure in Hot start 1, the Output change rate limiter starts from the value before the power failure.



The Output change rate limiter is deactivated when control is stopped (at STOP), when control action is an ON/OFF control or Position proportioning PID control.

■ Parameter setting

● Input 1_Output change rate limiter (up) [heat-side] [Engineering Mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1. oRU	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0



Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

● Input 1_Output change rate limiter (down) [heat-side] [Engineering Mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1. oRd	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0



Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

● Input 2_Output change rate limiter (up) [Engineering Mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2. oRU	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0



To display “Input 2_Output change rate limiter (up),” specify “Measured input 2” at the time of order, AND “Select function for Input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 2_Output change rate limiter (down) [Engineering Mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2. oRd	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0



To display “Input 2_Output change rate limiter (down),” specify “Measured input 2” at the time of order, AND “Select function for Input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● **Input 1_Output change rate limiter (up) [cool-side]**
[Engineering Mode: Function block No. 56 (Fn56)]

Parameter symbol	Data range	Factory set value
<i>l.oRuc</i>	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0



To display “Input 1_Output change rate limiter (up) [cool-side],” specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at “Input 1_Control action” (Function block No. 51 in Engineering mode).

● **Input 1_Output change rate limiter (down) [cool-side]**
[Engineering Mode: Function block No. 56 (Fn56)]

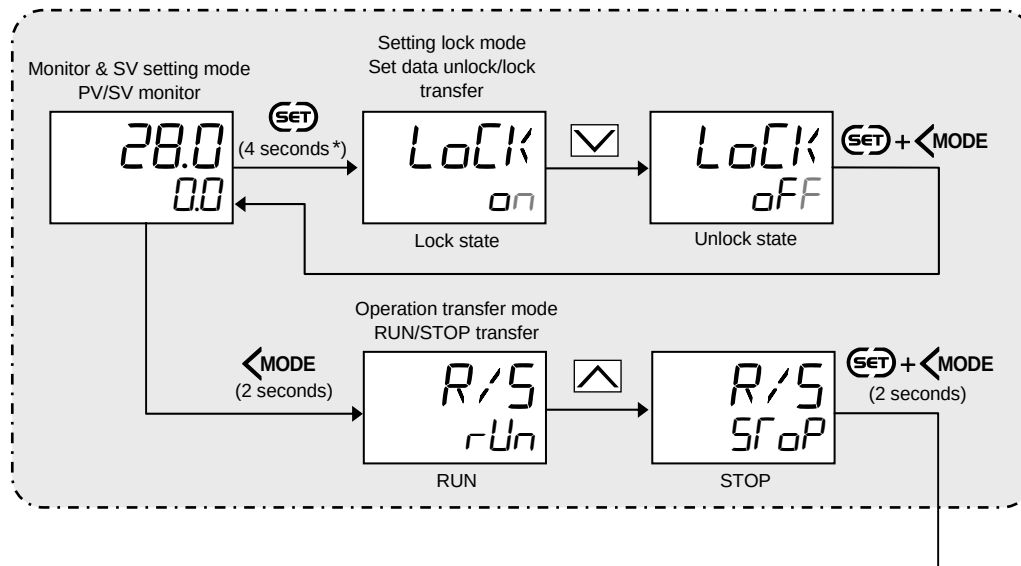
Parameter symbol	Data range	Factory set value
<i>l.oRdc</i>	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0



To display “Input 1_Output change rate limiter (down) [cool-side],” specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at “Input 1_Control action” (Function block No. 51 in Engineering mode).

■ **Setting procedure**

To enter the Engineering mode

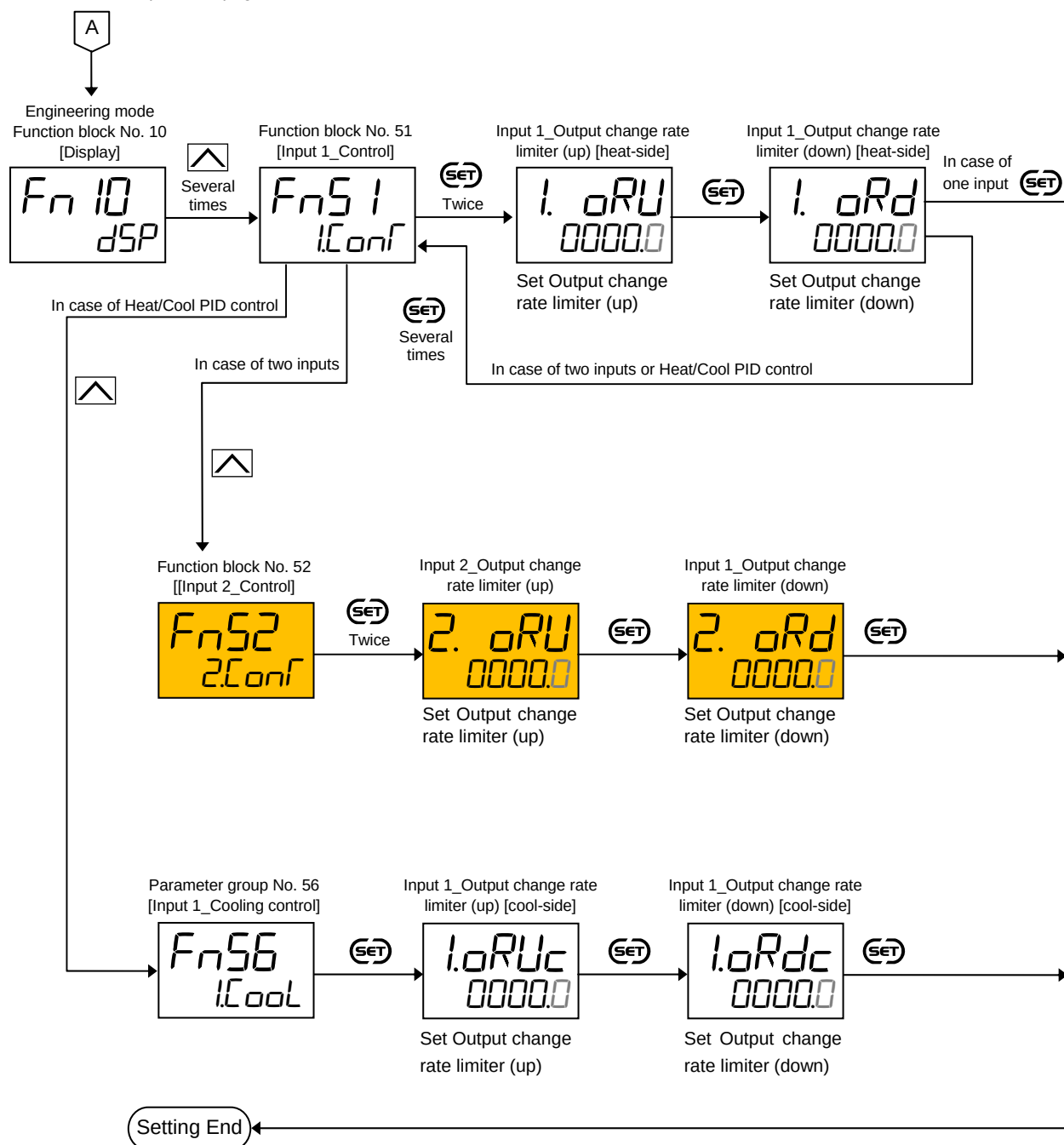


* Press the **[SET]** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



Continued on the next page.

Continued from the previous page.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

6.8 Suppressing Sudden Change in Output (Balanceless Bumpless)

Balanceless bumpless may be used to suppress sudden output change when the control is transferred from Auto mode to Manual mode (or Manual mode to Auto mode).

■ Description of function

Manipulated output value, when transferred from Auto mode to Manual mode, depends on the setting of “Manual manipulated output value selection.” Selection of “Use the most recent manipulated output value” (balanceless bumpless function) or “Use the Manual manipulated output value *” (bump action) can be selected in “Manual manipulated output value selection.”

* The Manual manipulated output value is the last manipulated output value in Manual mode before the mode is transferred from Auto mode to Manual mode.

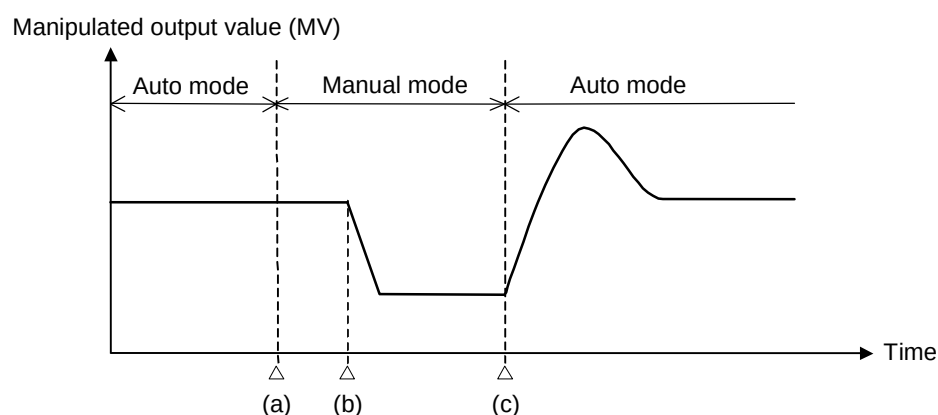
Note that the Manual manipulated output value can be preset in advance in the Setup setting mode before the mode is transferred to Manual mode.



When the mode is transferred from Manual mode to Auto mode, the balanceless bumpless function is always activated.

● Balanceless bumpless function

This function is used to prevent overload caused by the Manipulated output value (MV) suddenly changing when Auto mode is transferred to Manual mode and vice versa.



(a) Transfer from Auto mode to Manual mode.

However, when the mode is transferred to Manual mode, the Manipulated output value used in Auto mode will be used as the manual output value in Manual mode.

(b) The manipulated output value is changed (Manual mode function)

(c) Transfer from Manual mode to Auto mode.

When the mode is transferred to Auto mode, the controller starts PID control based on the MV used in Manual mode.

- Bumpless action associated with Auto/Manual transfer at the time of memory area selection

This instrument allows Auto/Manual transfer at the time of Memory area selection. Selection of balanceless bumpless action and bump action can be made at the time of Auto/Manual transfer.

[Parameters to set up]

- Auto/Manual transfer selection (Area)

This setting is used to select whether the mode should be transferred to Auto mode or Manual mode at the time of Memory area selection. This setting is also used to select balanceless bumpless action or bump action at the time of Auto/Manual transfer.

- Manipulated output value (Area)

This setting is used to set a manipulated output value when Bump action is selected at the time of Auto/Manual selection (area). This setting is used in Auto mode and Manual mode in common.



There are several ways to select a memory area.

Concerning the selection by key operation, refer to **10.3 Storing the Control Related Settings (Memory Area Function) (P. 10-10)** or **FZ110/FZ400/FZ900 Quick Operation Manual (IMR03A02-E□)**.

Concerning the selection by Digital input (DI), refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Concerning the selection by Memory area soak time, refer to **10.5 Executing Simple Program Operation (P. 10-18)** or **10.6 Executing Simple Sequence Operation (P. 10-26)**.



Bumpless/Bump action by “Auto/Manual transfer selection (Area)” has a priority over the Bumpless/Bump action by “Manual manipulated output value selection.”

Parameter setting

Manual manipulated output value selection

[Engineering Mode: Function block No. 50 (F_{n50})]

Parameter symbol	Data range	Factory set value
$MVFS$	0: The last manipulated output value (Balanceless bumpless function) 1: Manual manipulated output value	0

Input 1_Manual manipulated output value

[Setup Setting Mode: Setting group No. 51 (5_{n51})]

Parameter symbol	Data range	Factory set value
$1. MMV$	PID control, Position proportioning PID control: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side] Heat/Cool PID control: –(Input 1_Output limiter high [cool-side]) to +(Input 1_Output limiter high [heat-side])	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0

* Heat/Cool PID control has exceptional conditions as follows for the data range.

(1) Input 1_Output limiter high [cool-side] is $\leq 0.0\%$

- Input 1_Output limiter low [heat-side] is $\leq 0.0\%$: 0.0 % to +(Input 1_Output limiter high [heat-side])
- Input 1_Output limiter low [heat-side] is $> 0.0\%$: Input 1_Output limiter low [heat-side]
to Input 1_Output limiter high [heat-side]

(2) Input 1_Output limiter high [heat-side] is $\leq 0.0\%$

- Input 1_Output limiter low [cool-side] is $\leq 0.0\%$: –(Input 1_Output limiter high [cool-side]) to 0.0 %
- Input 1_Output limiter low [cool-side] is $> 0.0\%$: –(Input 1_Output limiter high [cool-side])
to –(Input 1_Output limiter low [cool-side])

(3) Fixed at 0.0% in the following cases:

Input 1_Output limiter high [cool-side] $\leq 0.0\%$, AND Input 1_Output limiter high [heat-side] $\leq 0.0\%$



Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.

Input 2_Manual manipulated output value

[Setup Setting Mode: Setting group No. 52 (5_{n52})]

Parameter symbol	Data range	Factory set value
$2. MMV$	Input 2_Output limiter low to Input 2_Output limiter high	–5.0



To display “Input 2_Manual manipulated output value,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

Input 1_Auto/Manual transfer selection (Area)

[Parameter Setting Mode: Parameter group No. 70 (P_{n70})]

Parameter symbol	Data range	Factory set value
$1.A/M.A$	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0

● Input 1_Manipulated output value (Area)

[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
1. MV.A	PID control, Position proportioning PID control: -5.0 to +105.0 % Heat/Cool PID control: -105.0 to +105.0 %	PID control, Position proportioning PID control: -5.0 Heat/Cool PID control:0.0

● Input 2_Auto/Manual transfer selection (Area)

[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2.A/M.A	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0



To display “Input 2_Auto/Manual transfer selection (Area),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 2_Manipulated output value (Area)

[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2. MV.A	-5.0 to +105.0 %	-5.0

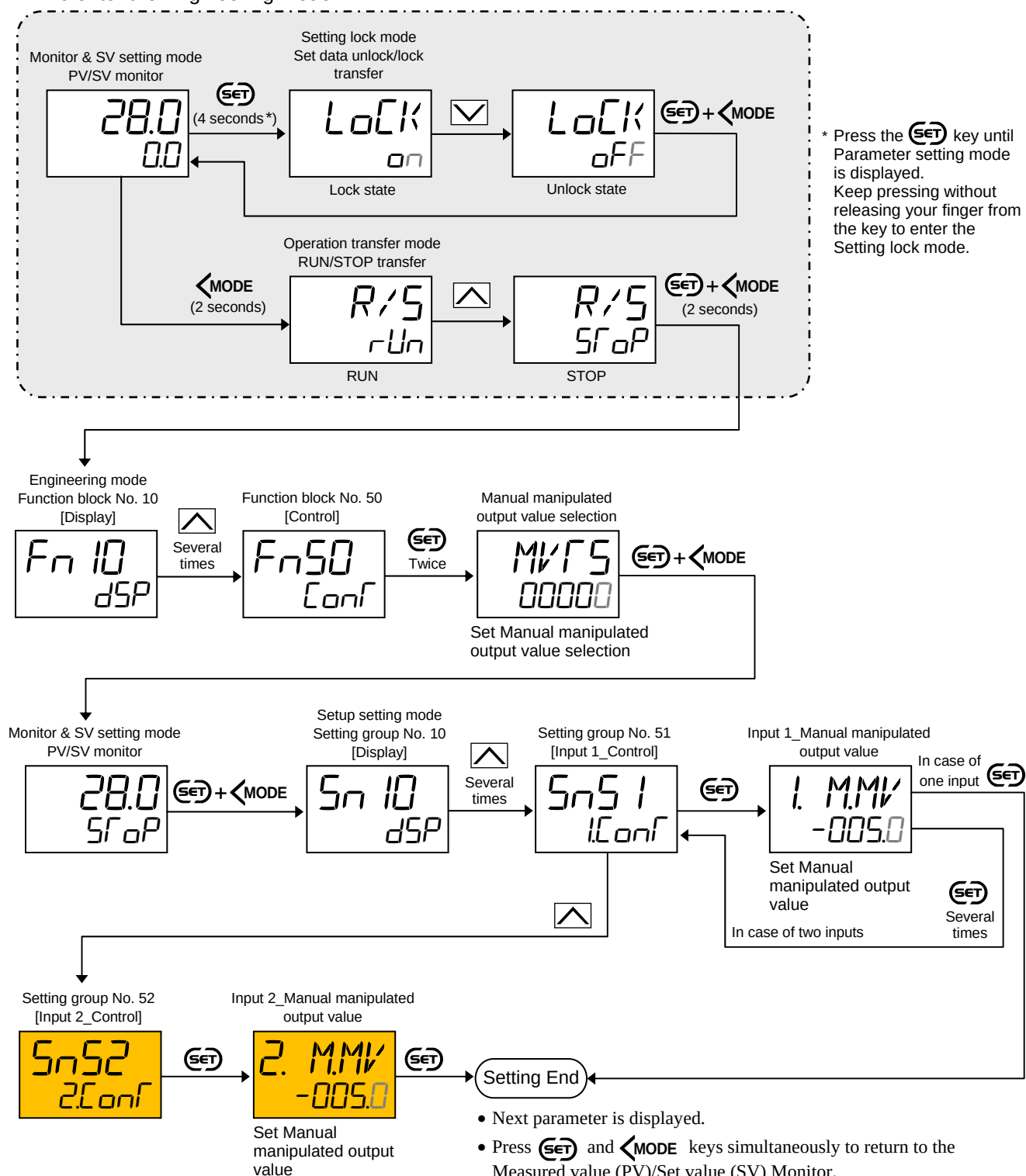


To display “Input 2_Manipulated output value (Area),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

Setting procedure

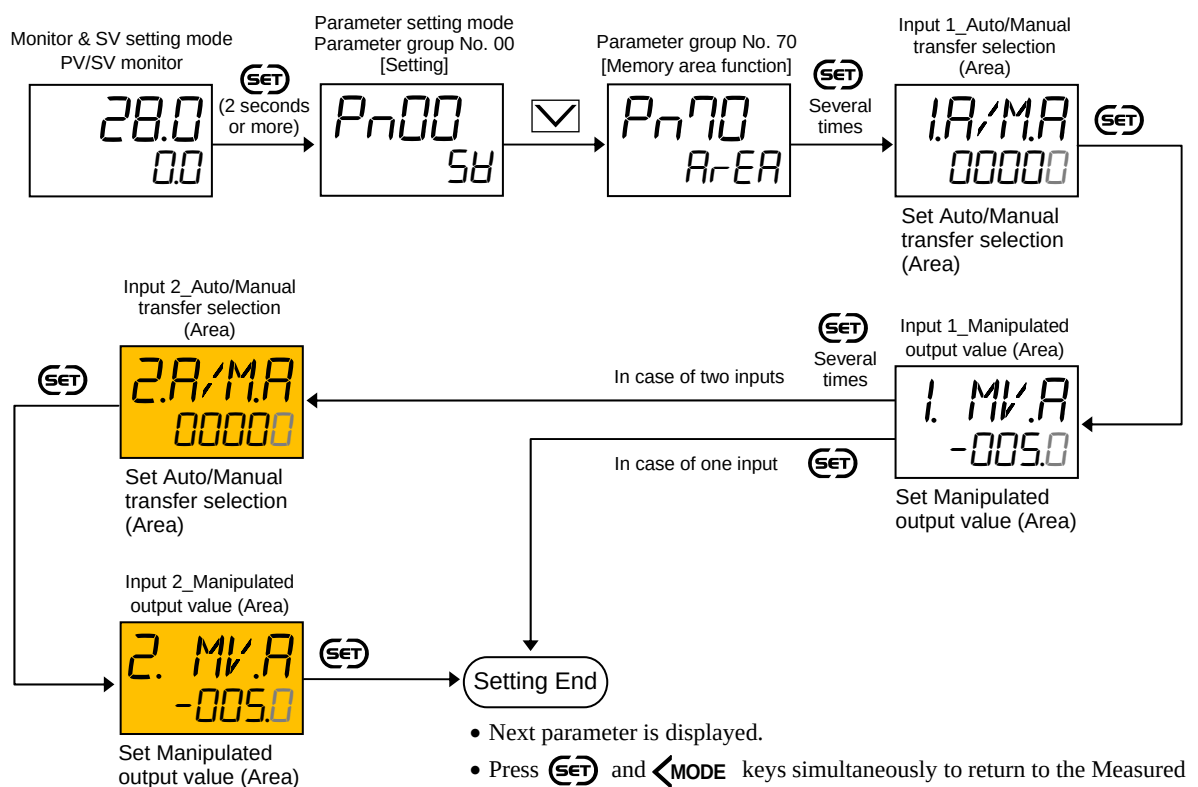
Setting “Manual manipulated output value selection” and “Manual manipulated output value”

To enter the Engineering mode



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

● Setting “Auto/Manual transfer selection (Area)” and “Manipulated output value (Area)”



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

6.9 Changing the Output Action While in Control Stop Mode

This instrument can continue supplying Retransmission output and Event outputs, or output Manipulated output value, even while Control is stopped.

■ Description of function

The following three types can be continued to output even while in control stop mode. Multi types can be selected.

- Retransmission output
- Logic calculation output [Event, Heater break alarm (HBA), Input error status]
- Instrument Status Output [Manual mode, Remote mode, While Set value (SV) is changing, Communication monitoring result]



Continued output types while in Control stop cannot be selected by the output.

For example, this combination is not available:

Event 1: Continue to output even while in Control stop. Event 2: Output to be stopped.

Selection can be made in the unit of Retransmission output, Logic operation output, Instrument status output.



Selecting “Logic calculation output: Action continues” as “Output action at control stop” will not include Control loop break alarm (LBA).

● Manipulated output value at STOP

Manipulated output value at STOP is a function to produce the preset manipulated output value at Control STOP. In the case of Heat/Cool PID control, Manipulated output value can be set on both sides of heating and cooling. Likewise, in case of a dual output type, manipulated output value can be set on both sides of Control output 1 and 2.

■ Parameter setting

● Output action at control stop

[Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
55	0 to 7 0: OFF +1: Logic calculation output: Action continues +2: Retransmission output: Action continues +4: Instrument status output: Action continues To select two or more functions, sum each value.	0

● Input 1_Manipulated output value at STOP [heat-side]

[Engineering Mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1. RMV	−5.0 to +105.0 %	−5.0

● Input 2_Manipulated output value at STOP [Engineering Mode: Function block No. 52 (Fn52)]

Parameter symbol	Data range	Factory set value
2. RMV	-5.0 to +105.0 %	-5.0



To display “Input 2_Manipulated output value at STOP,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_Manipulated output value at STOP [cool-side] [Engineering Mode: Function block No. 56 (Fn56)]

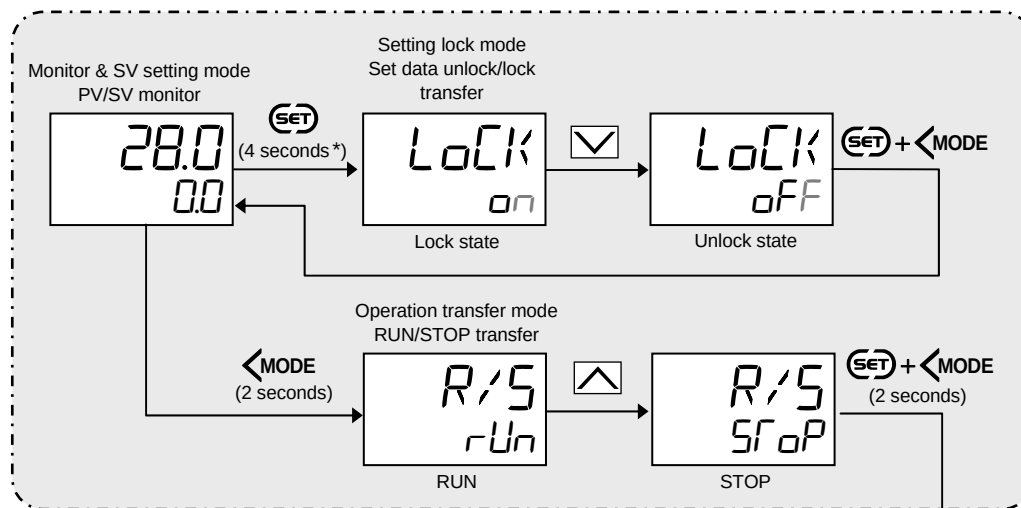
Parameter symbol	Data range	Factory set value
1. RMV c	-5.0 to +105.0 %	-5.0



To display “Input 1_Manipulated output value at STOP [cool-side],” specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at “Input 1_Control action” (Function block No. 51 in Engineering mode).

■ Setting procedure

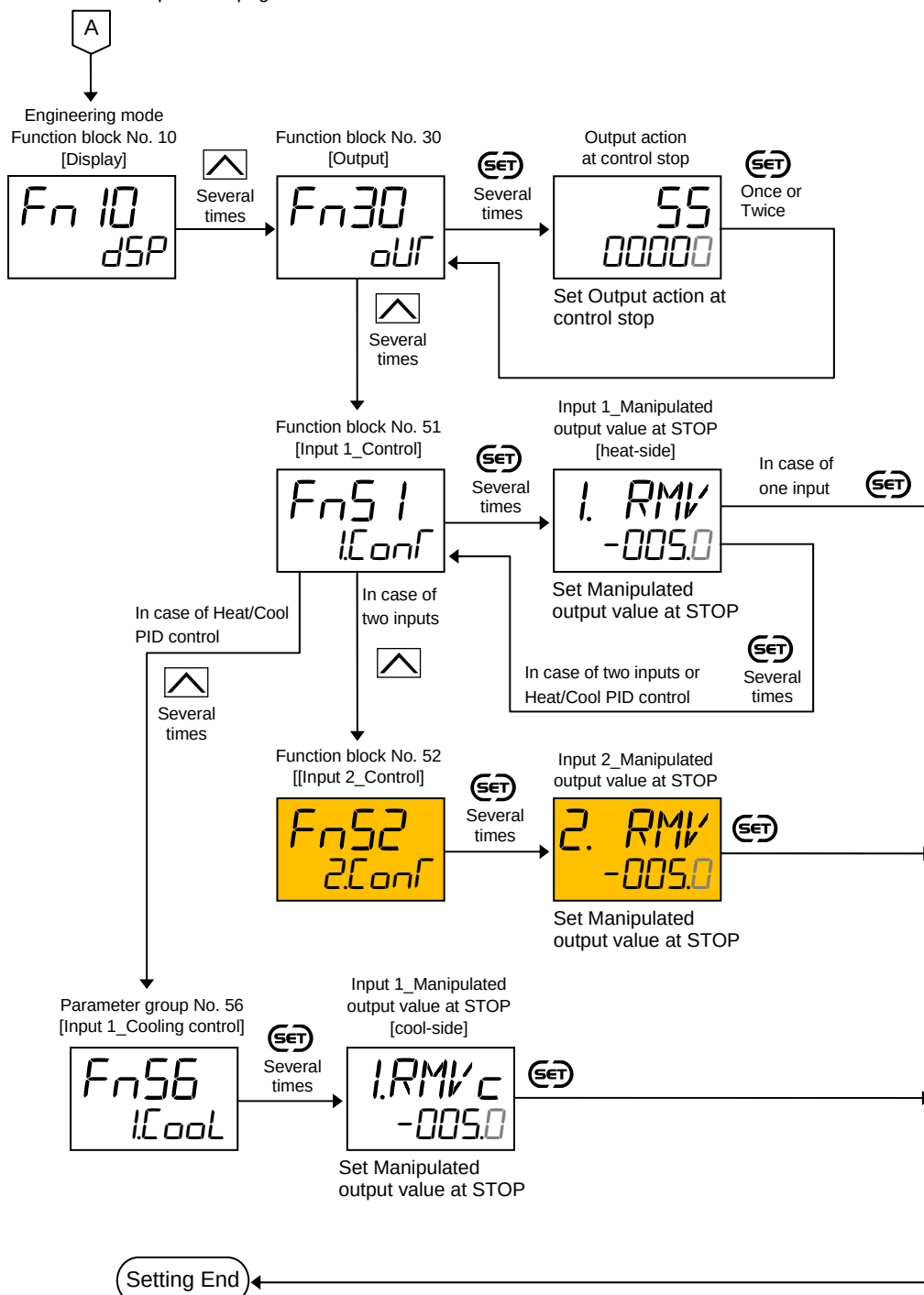
To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

Continued on the next page.

Continued from the previous page.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

6.10 Monitoring Manipulated Output Value

Manipulated output value can be monitored on this instrument.

■ Display contents

● Input 1_Manipulated output value monitor [heat-side] [Monitor & SV Setting Mode]

Parameter symbol	Data range	Factory set value
1. <i>MV</i>	-5.0 to +105.0 %	



Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.



Feedback resistance (FBR) input value is displayed when the Control action is a Position proportioning PID control with Feedback resistance (FBR) input.

● Input 1_Manipulated output value monitor [cool-side] [Monitor & SV Setting Mode]

Parameter symbol	Data range	Factory set value
1. <i>MV C</i>	-5.0 to +105.0 %	



To display “Input 1_Manipulated output value monitor [cool-side],” specify Heat/Cool PID control at the time of order, or select Heat/Cool PID control at “Input 1_Control action” (Function block No. 51 in Engineering mode).

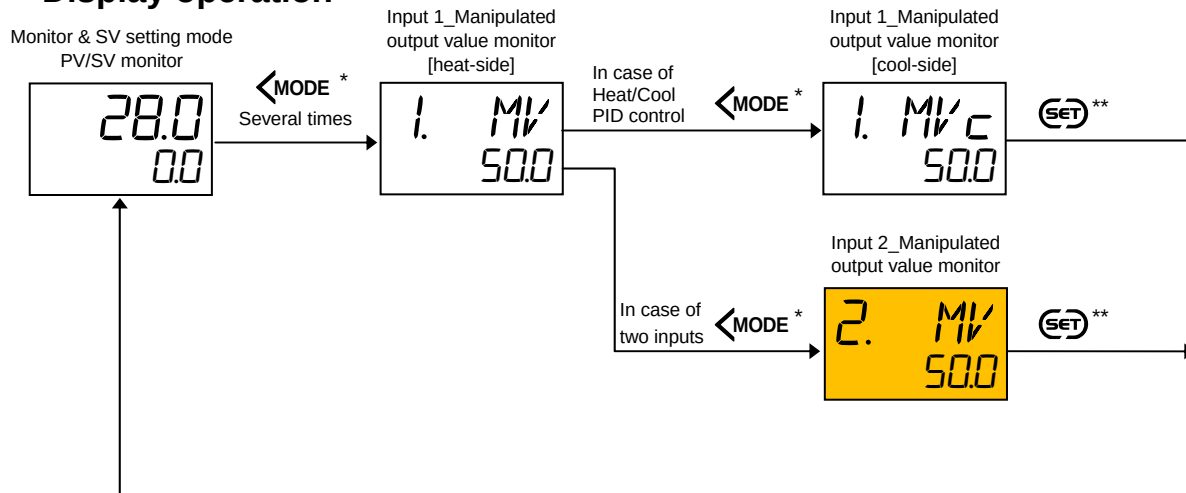
● Input 2_Manipulated output value monitor [Monitor & SV Setting Mode]

Parameter symbol	Data range	Factory set value
2. <i>MV</i>	-5.0 to +105.0 %	



To display “Input 2_Manipulated output value monitor,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

Display operation



* In case of a FZ400/900, **MONI** key may be used instead.

** In case of a FZ400/900, **R.SET** key may be used to return.



MEMO



EVENT FUNCTION

7

This chapter describes event related functions, setting contents and setting procedure based on the key words related to events.

7.1 Using Event Function	7-2
7.1.1 Changing input for event	7-3
7.1.2 Changing event type.....	7-7
7.1.3 Adding hold action to the event action.....	7-16
7.1.4 Setting a differential gap in event action.....	7-19
7.1.5 Preventing event from turning on due to a transient abnormal input.....	7-21
7.1.6 Changing event output assignment	7-23
7.1.7 Changing the event set value	7-23
7.2 Using Heater Break Alarm (HBA).....	7-24
7.2.1 Setting the Heater break alarm (HBA) set value	7-25
7.2.2 Preventing Heater break alarm (HBA) from turning on due to a transient abnormal input.....	7-28
7.2.3 Changing the output monitored by the Heater break alarm (HBA)....	7-30
7.2.4 Changing the Current transformer (CT) type.....	7-33
7.2.5 Forcing the CT input value to 0.0 A when the heater is OFF	7-35
7.3 Using Control Loop Break Alarm (LBA)	7-36
7.4 Checking Event ON State	7-40
7.5 Keeping the Event State (Interlock Function).....	7-42
7.6 Releasing the Event State (Interlock Release).....	7-44
7.7 Preventing Control with Input Errors (Input Circuit Error Alarm) [FZ400/900]	7-46

7.1 Using Event Function

■ Setting procedure for event function

Set event as follows:

Set the parameter
related to event output

Set the parameter related to Event output.

- OUT1 to 3 function selection
- DO1 to 4 function selection
- OUT1 to 3 logic calculation selection
- DO1 to 4 logic calculation selection
- Energized/De-energized selection
- Interlock selection
- Output action at control stop

For OUT1 to 3 function selection, DO1 to 4 function selection, OUT1 to 3 logic calculation selection and DO1 to 4 logic calculation selection, refer to **6.1 Changing Output Assignment (P. 6-2)**.

For Energized/De-energized selection, refer to **6.5 Changing Energizing/De-energizing Output (P. 6-24)**.

For Interlock function, refer to **7.5 Keeping the Event State (Interlock Function) (P. 7-42)** and **7.6 Releasing the Event State (Interlock Release) (P. 7-44)**.

For Output action at control stop, refer to **6.9 Changing the Output Action While in Control Stop Mode (P. 6-39)**.

Set the Event parameter

Set the following parameters:

- Event assignment
- Event type
- Event hold action
- Event differential gap
- Event timer

For event assignment, refer to **7.1.1 Changing input for event (P. 7-3)**.

For event type, refer to **7.1.2 Changing event type (P. 7-7)**.

For event hold action, refer to **7.1.3 Adding hold action to the event action (P. 7-16)**.

For event differential gap, refer to **7.1.4 Setting a differential gap in event action (P. 7-19)**.

For event timer, **7.1.5 Preventing event from turning on due to a transient abnormal input (P. 7-21)**.

Set the Event set value

Set the Event set value.

For event set value, refer to **7.1.7 Changing the event set value (P. 7-23)**.

7.1.1 Changing input for event

On this instrument input signal can be individually set for each event.

- Input 1
- Input 2
- Differential temperature input

■ Description of function

There are four action available for event; Deviation action, Input value action, Set value action, and Manipulated output value action.

Each event uses its own value.

● Deviation action

For Input 1: Deviation = Input 1_Measured value (PV) – Input 1_Set value (SV)

For Input 2: Deviation = Input 2_Measured value (PV) – Input 2_Set value (SV)

For Differential temperature input: Deviation = Measured value (PV) of differential temperature input – Set value (SV) of differential temperature input

● Input value action

For Input 1: Input value = Input 1_Measured value (PV)

For Input 2: Input value = Input 2_Measured value (PV)

For Differential temperature input: Input value = Measured value (PV) of differential temperature input

● Set value action

For Input 1: Set value = Input 1_Set value (SV)

For Input 2: Set value = Input 2_Set value (SV)

For Differential temperature input: Set value = Set value (SV) of differential temperature input

● Manipulated output value action

For Input 1: Manipulated output value = Input 1_Manipulated output value (MV)

For Input 2: Manipulated output value = Input 2_Manipulated output value (MV)

For Differential temperature input: Manipulated output value = Input 1_Manipulated output value (MV)

■ Parameter setting

● Event 1 assignment

[Engineering Mode: Function block No. 41 (Fn4 I)]

Parameter symbol	Data range	Factory set value
EVA1	1: Input 1 2: Input 2 3: Differential temperature input	1



To display “Event 1 assignment,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Event 1 assignment is changed.

● Event 2 assignment

[Engineering Mode: Function block No. 42 (Fn42)]

Parameter symbol	Data range	Factory set value
EV A2	1: Input 1 2: Input 2 3: Differential temperature input	1



To display “Event 2 assignment,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.



Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized when the Event 2 assignment is changed.

● Event 3 assignment

[Engineering Mode: Function block No. 43 (Fn43)]

Parameter symbol	Data range	Factory set value
EV A3	1: Input 1 2: Input 2 3: Differential temperature input	1



To display “Event 3 assignment,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.



Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized when the Event 3 assignment is changed.

● Event 4 assignment

[Engineering Mode: Function block No. 44 (Fn44)]

Parameter symbol	Data range	Factory set value
EV A4	1: Input 1 2: Input 2 3: Differential temperature input	1



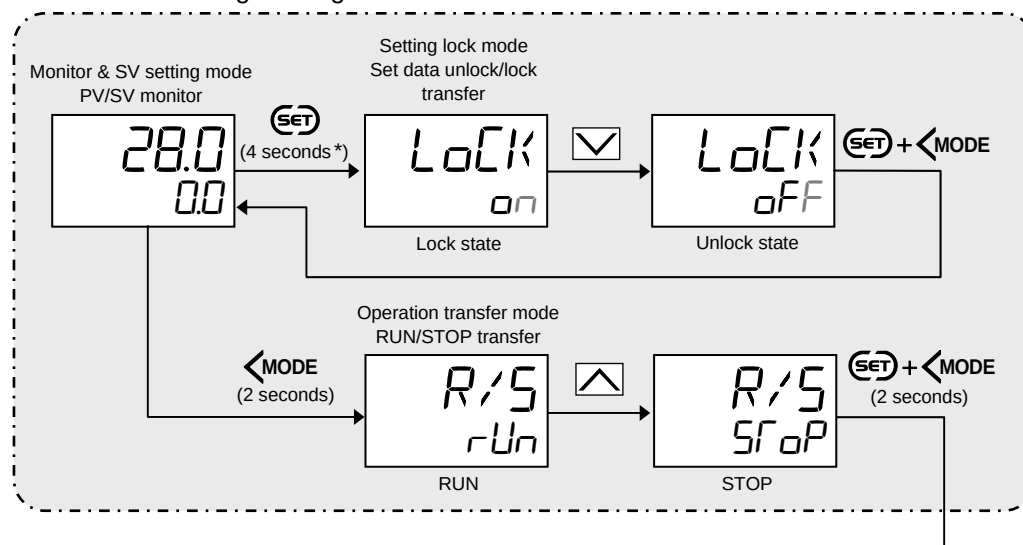
To display “Event 4 assignment,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.



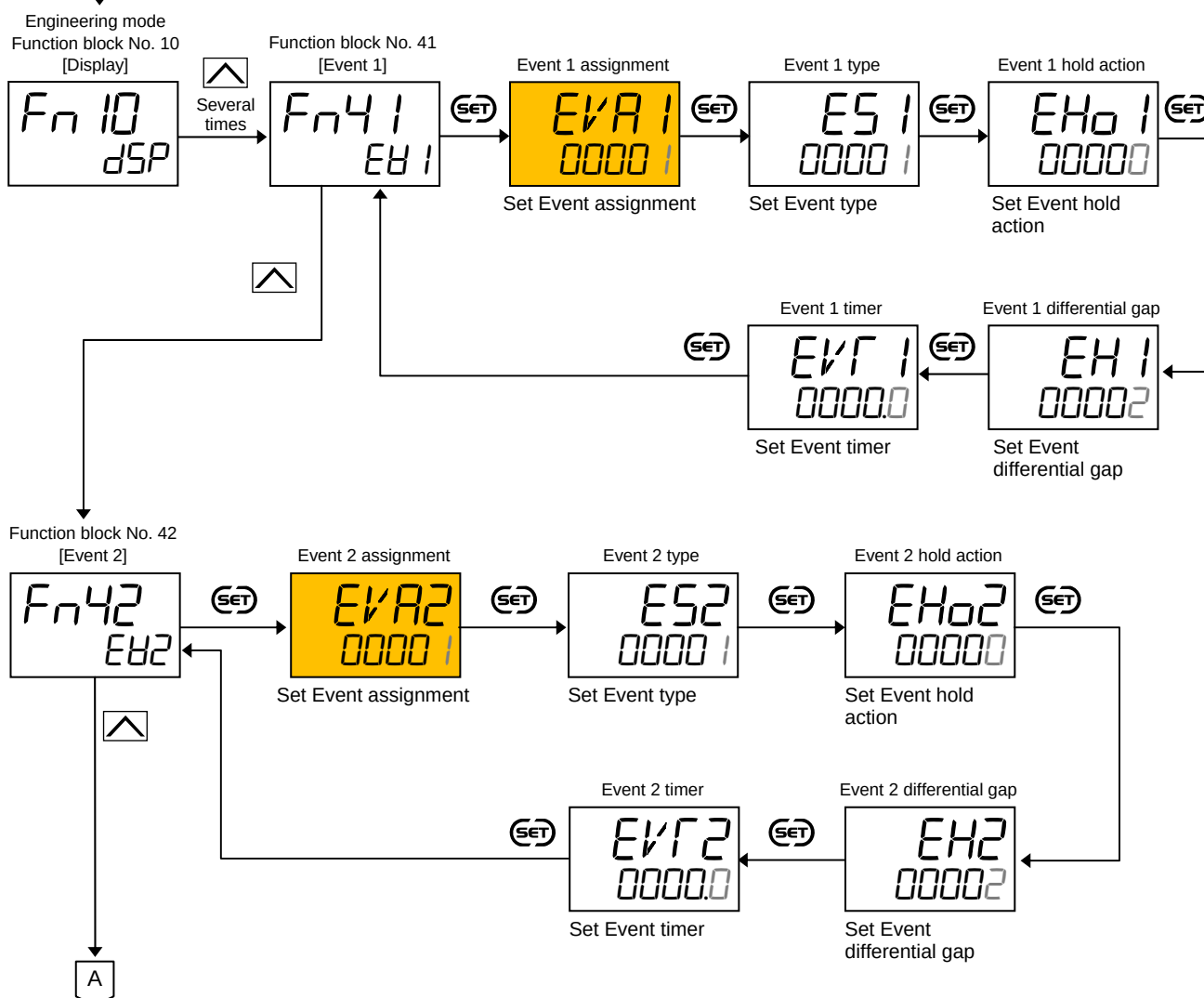
Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized when the Event 4 assignment is changed.

Setting procedure

To enter the Engineering mode

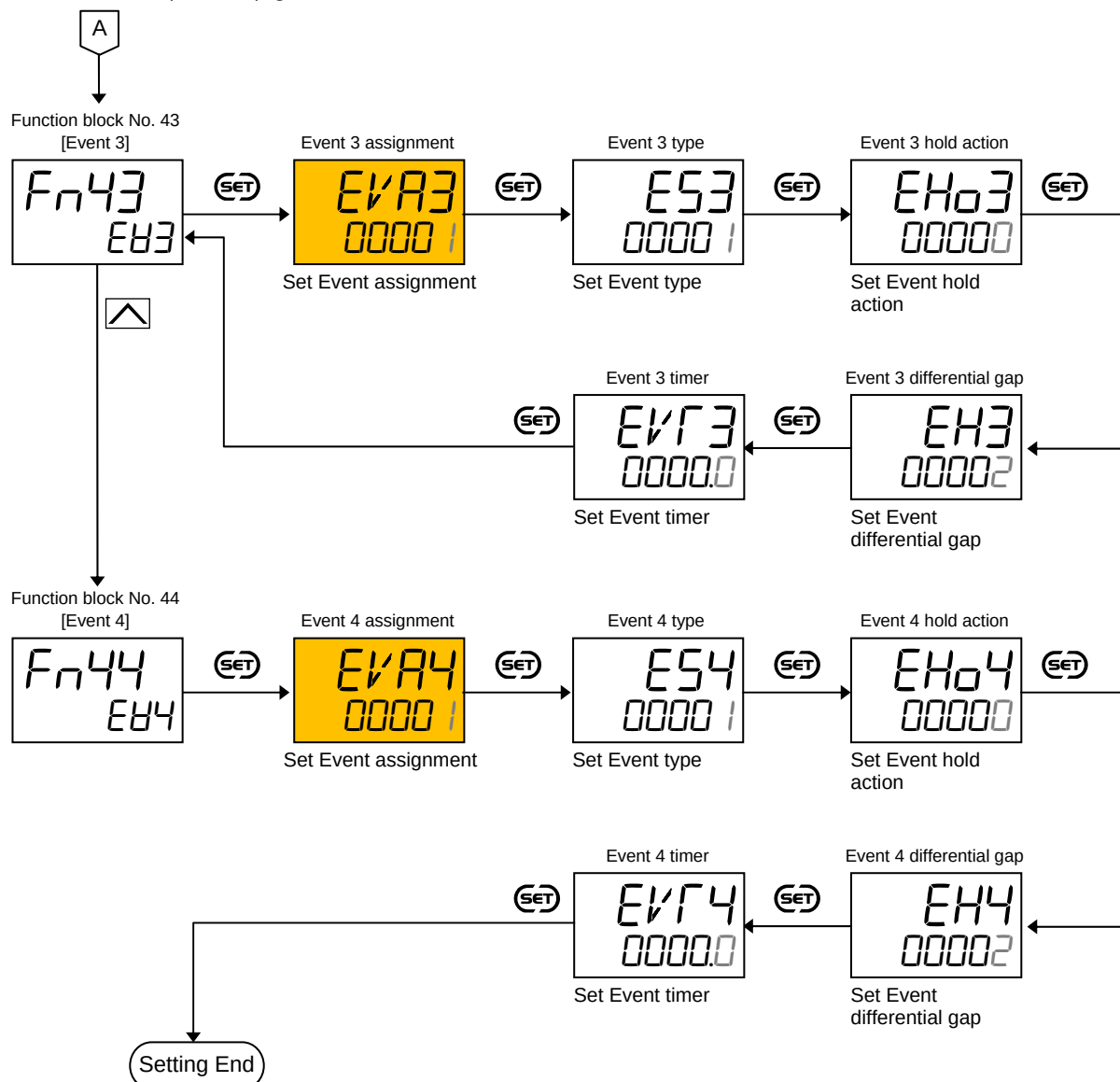


* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



Continued on the next page.

Continued from the previous page.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

7.1.2 Changing event type

There are 24 types of event in total.

● Event type

Set value	Event type	Initial setting code
0	None	N
1	Deviation high (Using SV monitor value) ¹	A, E (With hold action), Q (With re-hold action)
2	Deviation low (Using SV monitor value) ¹	B, F (With hold action), R (With re-hold action)
3	Deviation high/low (Using SV monitor value) ¹	C, G (With hold action), T (With re-hold action)
4	Band (Using SV monitor value) ¹	D
5	Deviation high/low (Using SV monitor value) [High/Low individual setting] ¹	X, Y (With hold action), Z (With re-hold action)
6	Band (Using SV monitor value) [High/Low individual setting] ¹	U
7	SV high (Using SV monitor value)	V
8	SV low (Using SV monitor value)	W
9	Process high ²	H, K (With hold action)
10	Process low ²	J, L (With hold action)
11	Deviation high (Using local SV) ¹	—
12	Deviation low (Using local SV) ¹	—
13	Deviation high/low (Using local SV) ¹	—
14	Band (Using local SV) ¹	—
15	Deviation high/low (Using local SV) [High/Low individual setting] ¹	—
16	Band (Using local SV) [High/Low individual setting] ¹	—
17	SV high (Using local SV)	—
18	SV low (Using local SV)	—
19	MV high [heat-side] ^{2,3}	1
20	MV low [heat-side] ^{2,3}	2
21	MV high [cool-side] ²	3
22	MV low [cool-side] ²	4
23	Process high/low [High/Low individual setting] ²	—
24	Process band [High/Low individual setting] ²	—

¹ Event hold and re-hold action is available.

² Event hold action is available.

³ The Manipulated output value (MV) corresponds to the Feedback resistance (FBR) input value when the Control action is a Position proportioning PID control with Feedback resistance (FBR) input.

Description of function

Deviation action

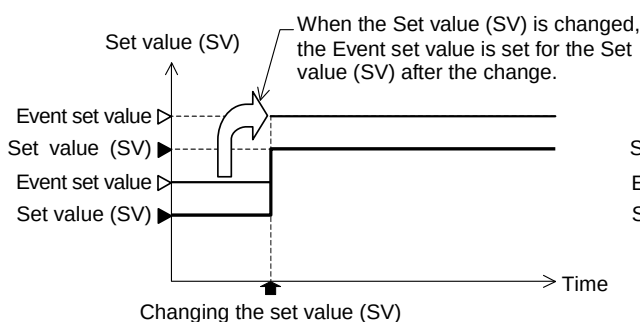
When the deviation ($PV - SV$) reaches the Event set value, event ON occurs.

SV monitor value type and local SV value type are available for Deviation action.

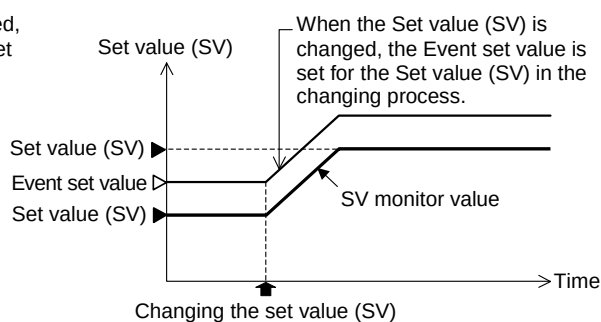
SV monitor value type	The Event set value is set for the SV monitor value. Setting change rate limiter adjusts the Event set value to follow the same change rate of SV monitor value. SV monitor value: SV monitor value is displayed in the Measured value (PV)/Set value (SV) monitor screen (Monitor & SV setting mode). When Setting change rate limiter is set, the Set value (SV) in the changing process is displayed.
Local SV type	The Event set value is set for the Set value (SV) [Local SV]. Local SV: Local SV is displayed in the Measured value (PV)/Set value (SV) screen (Monitor & SV setting mode).

SV monitor value type

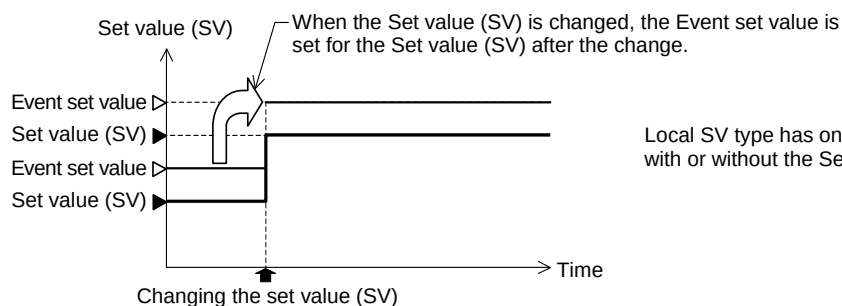
[When setting change rate limiter is not set.]



[When setting change rate limiter is set.]



Local SV type



Local SV type has only one type of action on change with or without the Setting change rate limiter.



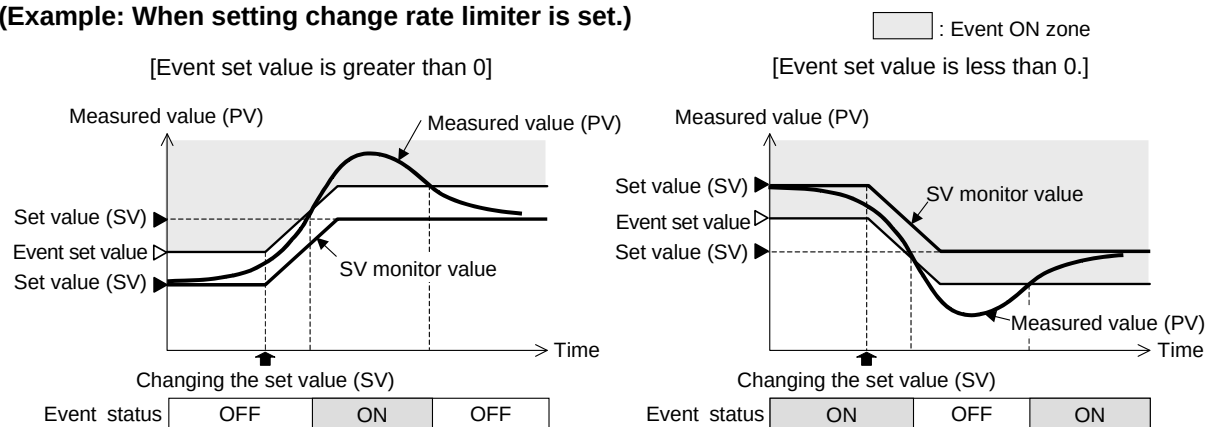
For the Setting change rate limiter, refer to **10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter) (P. 10-6)**.

Some examples of Deviation high are described in the following:

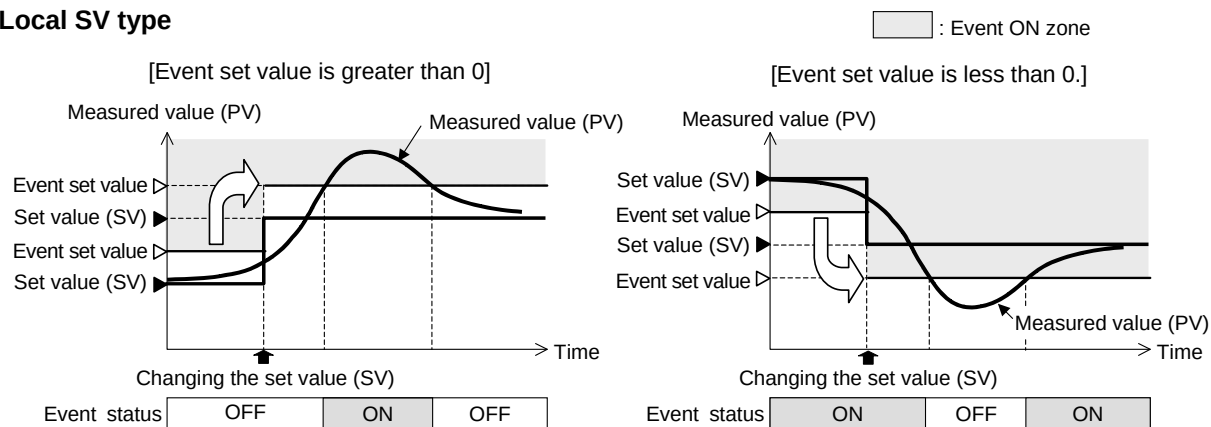
Deviation high: When the deviation ($PV - SV$) is more than the Event set value, the event ON occurs.

SV monitor value type

(Example: When setting change rate limiter is set.)



Local SV type



Event turns ON or OFF in accordance with the differential gap setting. For Event differential gap, refer to **7.1.4 Setting a differential gap in event action (P. 7-19)**.

Diagrams of the Deviation action type are shown in the following:

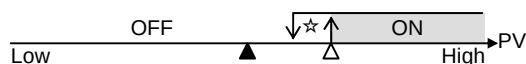
ON: Event action turned on

OFF: Event action turned off (▲ : Set value (SV) Δ : Event set value ☆ : Event differential gap)

Deviation high

When the deviation ($PV - SV$) is more than the Event set value, the event ON occurs.

(Event set value is greater than 0.)



(Event set value is less than 0.)



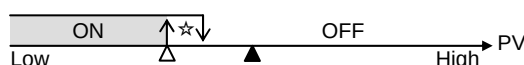
Deviation low

When the deviation ($PV - SV$) is less than the Event set value, the event ON occurs.

(Event set value is greater than 0.)



(Event set value is less than 0.)



Deviation high/low

Two types of Deviation high/low action are available.

Without high/low individual setting:

When the absolute deviation $|PV - SV|$ is more/less than the Event set values, the event ON occurs.

With high/low individual setting:

High action: When the deviation ($PV - SV$) is more than the Event set value [high], the event ON occurs.

Low action: When the deviation ($PV - SV$) is less than the Event set value [low], the event ON occurs.

(Without High/Low individual setting)



(With High/Low individual setting)



Band

Two types of Band action are available.

Without high/low individual setting:

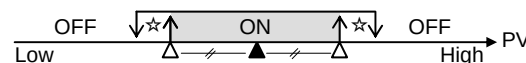
When the absolute deviation $|PV - SV|$ is within the Event set values, the event ON occurs.

With high/low individual setting:

High action: When the deviation ($PV - SV$) is less than the Event set value [high], the event ON occurs.

Low action: When the deviation ($PV - SV$) is more than the Event set value [low], the event ON occurs.

(Without High/Low individual setting)



(With High/Low individual setting)



● Set value action

When the Set value (SV) reaches the Event set value, event ON occurs.

SV monitor value type and local SV value type are available for Set value action.

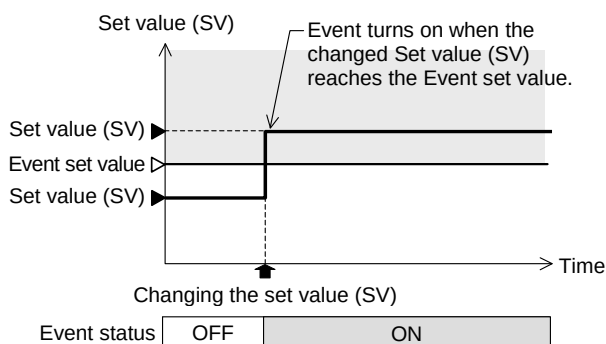
SV monitor value type	Event turns on when SV monitor value reaches Event set value. Setting change rate limiter turns on the event when the Set value (SV) in the changing process reaches Event set value. SV monitor value: SV monitor value is displayed in the Measured value (PV)/Set value (SV) monitor screen (Monitor display mode). When Setting change rate limiter is set, the Set value (SV) in the changing process is displayed.
Local SV type	Event turns on when Set value (SV) [Local SV] reaches Event set value. Local SV: Local SV is displayed in the Measured value (PV)/Set value (SV) screen (SV setting mode).

Some examples of SV high are described in the following:

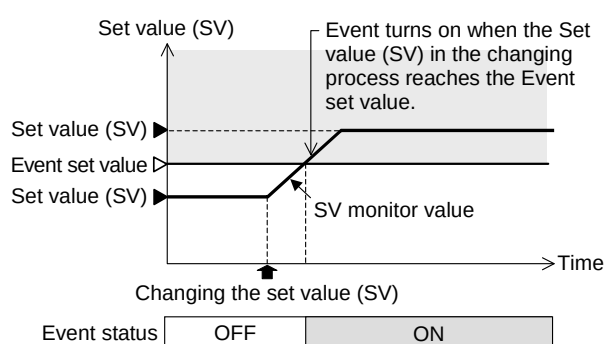
SV high: When the Set value (SV) is more than the Event set value, the event ON occurs.

SV monitor value type

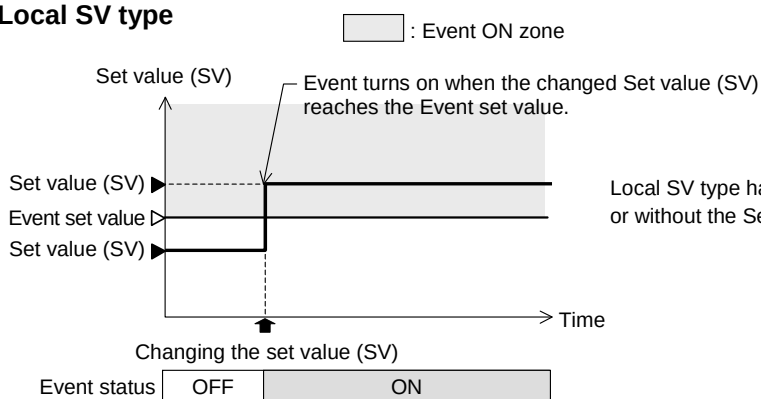
[When setting change rate limiter is not set.]



[When setting change rate limiter is set.]



Local SV type



Local SV type has only one type of action on a change with or without the Setting change rate limiter.

Event turns ON or OFF in accordance with the differential gap setting. For Event differential gap, refer to **7.1.4 Setting a differential gap in event action (P. 7-19)**.

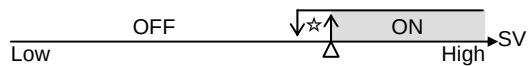
Diagrams of the Set value action type are shown in the following:

ON: Event action turned on

OFF: Event action turned off (▲ : Set value (SV) Δ : Event set value ☆ : Event differential gap)

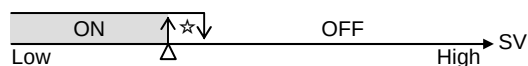
SV high

When the Set value (SV) is more than the Event set value, the event ON occurs.



SV low

When the Set value (SV) is less than the Event set value, the event ON occurs.



● Input value action

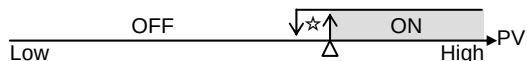
When the Measured value (PV) reaches the Event set value, event ON occurs.

ON: Event action turned on

OFF: Event action turned off (▲ : Set value (SV) Δ : Event set value ☆ : Event differential gap)

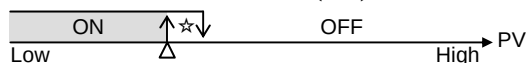
Process high

When the Measured value (PV) is more than the Event set value, the event ON occurs.



Process low

When the Measured value (PV) is less than the Event set value, the event ON occurs.



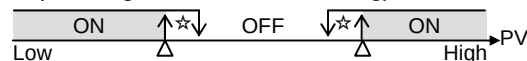
Process high/low

Process high/low action can be modified to high and low individual setting.

High action: When the Measured value (PV) is more than the Event set value [high], the event ON occurs.

Low action: When the Measured value (PV) is less than the Event set value [low], the event ON occurs.

(With High/Low individual setting)



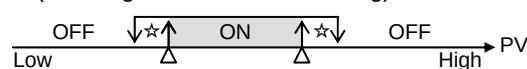
Process band

Process band action can be modified to high and low individual setting.

High action: When the Measured value (PV) is less than the Event set value [high], the event ON occurs.

Low action: When the Measured value (PV) is more than the Event set value [low], the event ON occurs.

(With High/Low individual setting)





● Manipulated output value action

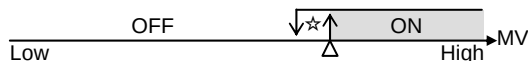
When a Manipulated output value (MV) reaches the Event set value, the event ON occurs.

ON: Event action turned on

OFF: Event action turned off (▲ : Set value (SV) Δ : Event set value ☆ : Event differential gap)

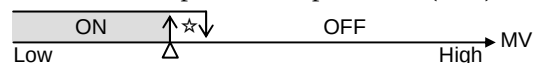
MV high

When the Manipulated output value (MV) is more than the Event set value, the event ON occurs.



MV low

When the Manipulated output value (MV) is less than the Event set value, the event ON occurs.



■ Parameter setting

● Event 1 type

[Engineering Mode: Function block No. 41 (Fn4 I)]

Parameter symbol	Data range	Factory set value
ES1	0: None 1: Deviation high (Using SV monitor value) ^a 2: Deviation low (Using SV monitor value) ^a 3: Deviation high/low (Using SV monitor value) ^a 4: Band (Using SV monitor value) ^a 5: Deviation high/low (Using SV monitor value) [High/Low individual setting] ^a 6: Band (Using SV monitor value) [High/Low individual setting] ^a 7: SV high (Using SV monitor value) 8: SV low (Using SV monitor value) 9: Process high ^b 10: Process low ^b 11: Deviation high (Using local SV) ^a 12: Deviation low (Using local SV) ^a 13: Deviation high/low (Using local SV) ^a 14: Band (Using local SV) ^a 15: Deviation high/low (Using local SV) [High/Low individual setting] ^a 16: Band (Using local SV) [High/Low individual setting] ^a 17: SV high (Using local SV) 18: SV low (Using local SV) 19: MV high [heat-side] ^{b, c} 20: MV low [heat-side] ^{b, c} 21: MV high [cool-side] ^b 22: MV low [cool-side] ^b 23: Process high/low [High/Low individual setting] ^b 24: Process band [High/Low individual setting] ^b ^a Event hold and re-hold action is available. ^b Event hold action is available. ^c When the instrument is specified as position proportioning PID control with feedback resistance, this item becomes Feedback resistance (FBR) input.	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Event 1 type is changed.

● Event 2 type

[Engineering Mode: Function block No. 42 (F_{n42})]

Parameter symbol	Data range	Factory set value
$E52$	Same as Event 1 type (P. 7-14)	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Event 2 type is changed.

● Event 3 type

[Engineering Mode: Function block No. 43 (F_{n43})]

Parameter symbol	Data range	Factory set value
$E53$	Same as Event 1 type (P. 7-14)	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Event 3 type is changed.

● Event 4 type

[Engineering Mode: Function block No. 44 (F_{n44})]

Parameter symbol	Data range	Factory set value
$E54$	Same as Event 1 type (P. 7-14)	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Event 4 type is changed.

■ Setting procedure

Refer to the operation on P. 7-5.

7.1.3 Adding hold action to the event action

This instrument can be added hold action or re-hold action to the Event action.



Some event actions may not be available with hold and re-hold actions. Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.



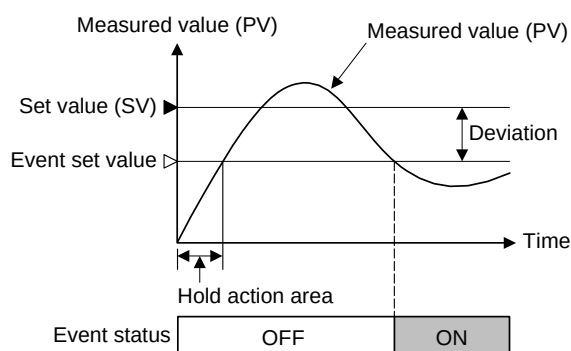
Refer to Setting of Event types (P.7-14) for those events that are available with hold or re-hold action.

■ Description of function

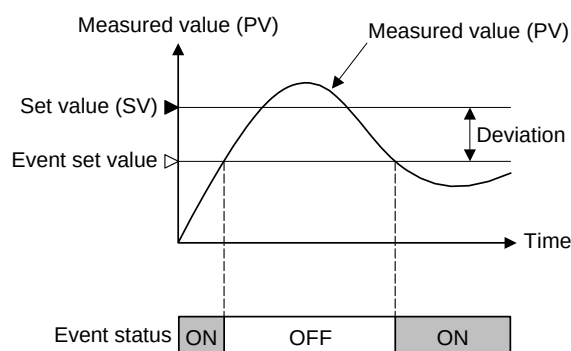
● Hold action

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]



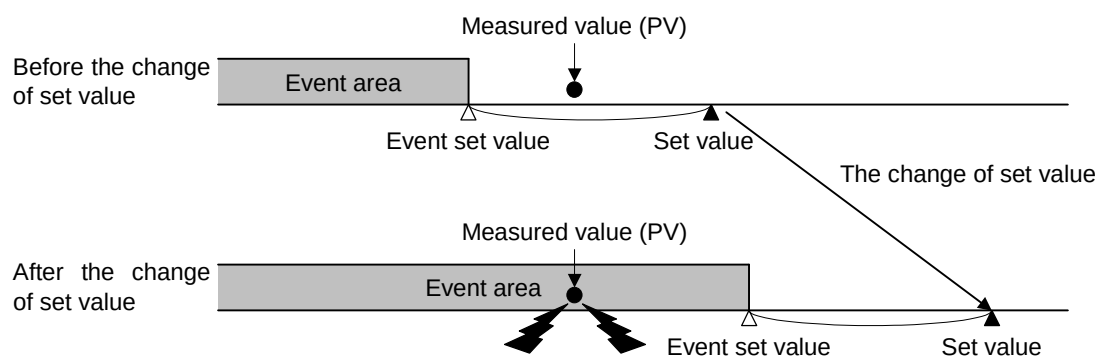
● Re-hold action

When Re-hold action is ON, the event action is also suppressed at the control set value (SV) change until the Measured value (PV) has entered the non-event range.

Action condition	Hold action	Re-hold action
When the power is turned on	Works	Works
When transferred from STOP (control STOP) to RUN (control RUN)	Works	Works
When the set value (SV) is changed	Does not work	Works

[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 (SV) change. The re-hold action suppresses the alarm output until the measured value has entered the non-event range again.



NOTE

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.



The re-hold action is invalid for any of the following.

- Setting of Setting change rate limiter is other than “0 (no function)”
- Remote mode
- Cascade control
- Differential temperature control

■ Parameter setting

● Event 1 hold action

[Engineering Mode: Function block No. 41 (Fn4 I)]

Parameter symbol	Data range	Factory set value
<i>EHo 1</i>	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0

**● Event 2 hold action****[Engineering Mode: Function block No. 42 (Fn42)]**

Parameter symbol	Data range	Factory set value
EHo2	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0

● Event 3 hold action**[Engineering Mode: Function block No. 43 (Fn43)]**

Parameter symbol	Data range	Factory set value
EHo3	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0

● Event 4 hold action**[Engineering Mode: Function block No. 44 (Fn44)]**

Parameter symbol	Data range	Factory set value
EHo4	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0

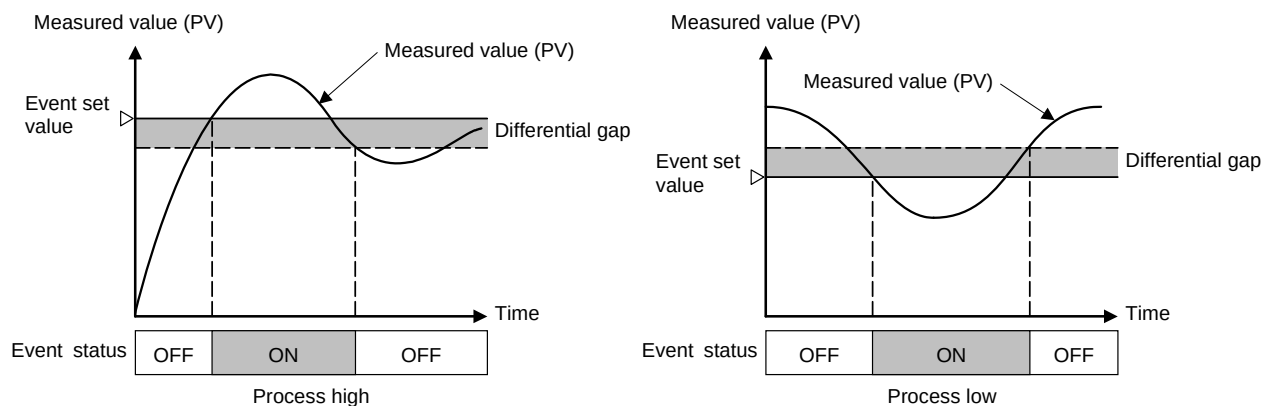
■ Setting procedure

Refer to the operation on P. 7-5.

7.1.4 Setting a differential gap in event action

■ Description of function

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



■ Parameter setting

● Event 1 differential gap

[Engineering Mode: Function block No. 41 (F_{n41})]

Parameter symbol	Data range	Factory set value
$EH1$	Deviation, Process and SV: • If event assignment is either Input 1 or Differential temperature. 0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) • If event assignment is Input 2 0 to Input 2_Input span [Varies with the setting of the Decimal point position.] MV: 0.0 to 110.0 %	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2

● Event 2 differential gap

[Engineering Mode: Function block No. 42 (F_{n42})]

Parameter symbol	Data range	Factory set value
$EH2$	Same as Event 1 differential gap (P. 7-19)	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2

**● Event 3 differential gap****[Engineering Mode: Function block No. 43 (F_{n43})]**

Parameter symbol	Data range	Factory set value
$EH3$	Same as Event 1 differential gap (P. 7-19)	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2

● Event 4 differential gap**[Engineering Mode: Function block No. 44 (F_{n44})]**

Parameter symbol	Data range	Factory set value
$EH4$	Same as Event 1 differential gap (P. 7-19)	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2

■ Setting procedure

Refer to the operation on P. 7-5.

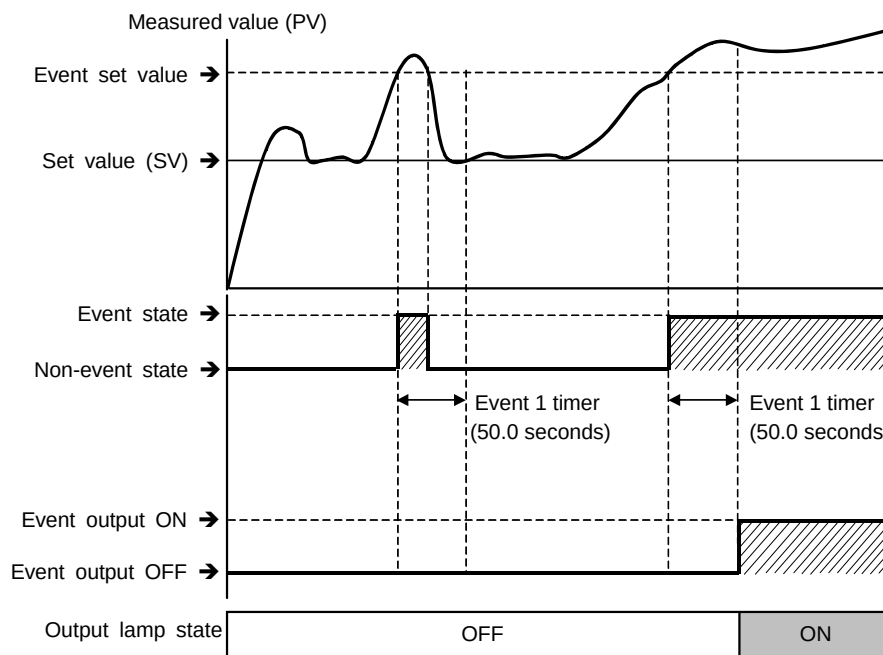
7.1.5 Preventing event from turning on due to a transient abnormal input

Event timer can be used to prevent event from turning on for the event state shorter than the set time.

■ Description of function

When an event condition becomes ON, the output is suppressed until the Event timer set time elapses. If the event output is still ON after time is up, the output will resume.

Example: When the setting of Event 1 timer is 50.0 seconds



The Event timer is also activated for the following reasons:

- When set to the event state simultaneously with power turned on
- When set to the event state simultaneously with control changed to RUN (control start) from STOP (control stop).



In the event wait state, no event output is turned on even after the Event timer preset time has elapsed.



The Event timer is reset for the following reasons:

- When power failure occurs while the Event timer is being activated
- When control is changed to STOP (control stop) from RUN (control start) while the Event timer is being activated
- Cancellation of Event state



■ Parameter setting

● Event 1 timer

[Engineering Mode: Function block No. 41 (Fn41)]

Parameter symbol	Data range	Factory set value
EVF1	0.0 to 600.0 seconds	0.0

● Event 2 timer

[Engineering Mode: Function block No. 42 (Fn42)]

Parameter symbol	Data range	Factory set value
EVF2	0.0 to 600.0 seconds	0.0

● Event 3 timer

[Engineering Mode: Function block No. 43 (Fn43)]

Parameter symbol	Data range	Factory set value
EVF3	0.0 to 600.0 seconds	0.0

● Event 4 timer

[Engineering Mode: Function block No. 44 (Fn44)]

Parameter symbol	Data range	Factory set value
EVF4	0.0 to 600.0 seconds	0.0

■ Setting procedure

Refer to the operation on P. 7-5.

7.1.6 Changing event output assignment

Event output assignment can be changed through OUT1 to 3 function selection, DO1 to 4 function selection, OUT1 to 3 logic calculation selection, and DO1 to 4 logic calculation selection.

Depending on the ordered specifications, there may be some restrictions in the event output assignment.



For Event output assignment, refer to **6.1 Changing Output Assignment [Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output] (P. 6-2)**.

7.1.7 Changing the event set value

The Event set value can be set in Parameter group No. 40 in the Parameter setting mode.

Since the Set value for Event 1 to 4 are included in the Memory area, up to 16 data can be stored per parameter.



For detailed operation on how to set Event set values, refer to **FZ110/FZ400/FZ900 Quick operation manual (IMR03A02-E□)** or **FZ110/FZ400/FZ900 Instruction Manual [Part 1: Hardware] (IMR03A04-E□)**.

Details of Memory area transfer can be found in **10.3 Storing the control related set values (Memory Area function) (P. 10-10)**.

7.2 Using Heater Break Alarm (HBA)

■ Setting procedure for Heater break alarm (HBA)

Set Heater break alarm (HBA) as follows:



7.2.1 Setting the Heater break alarm (HBA) set value

■ Description of function

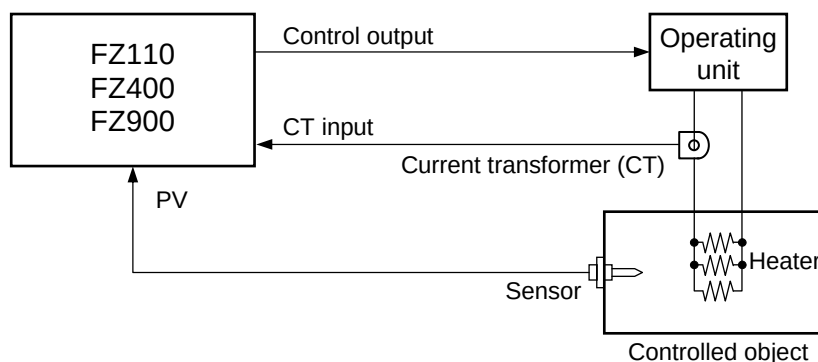
● Heater break alarm (HBA)

Heater break alarm (HBA) can only be used with time-proportional control output (relay or voltage pulse output).

The Heater break alarm (HBA) function monitors the current flowing through the load by a dedicated current transformer (CT), then compares the measured value with the Heater break alarm (HBA) set values, and detects a fault in the heating circuit.

The Heater break alarm (HBA) function is activated for the following cases:

- ① 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.
- ② 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.



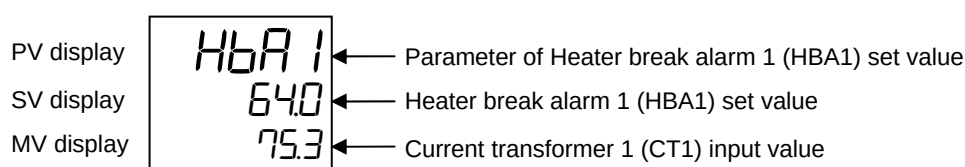
[Setting Heater Break Alarm]

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 if the power supply becomes unstable. When more than one heater is connected in parallel, the HBA set value may need to be increased to detect a single heater failure.

When a set value of Heater Break Alarm (HBA) is set on FZ400/900, the CT input value is displayed on the MV display and it may be helpful to set an alarm value.

[Display example]



When Heater break alarm 1 (HBA1) is set, the display shows the input value of the Current transformer 1 (CT1). When Heater break alarm 2 (HBA2) is set, the display shows the input value of the Current transformer 2 (CT2).



The data to be displayed on the MV display can be selected at “Show/Hide MV” in Function block 10 in Engineering mode. When the Heater break alarm (HBA) is displayed, the MV display shows the Current transformer (CT) input value.

■ Parameter setting

● Heater break alarm 1 (HBA1) set value

[Setup Setting Mode: Setting group No. 45 (5n45)]

Parameter symbol	Data range	Factory set value
HbA1	0.0 to 100.0 A 0.0: HBA function OFF	0.0



To display “Heater break alarm 1 (HBA1) set value,” must be specified “CT input” at the time of order.



This parameter is not displayed if “no assignment” is set at “CT1 assignment” in Function block 45 in Engineering mode. If the output type assigned at “CT1 assignment” is Current output or Continuous voltage output, this parameter will not be displayed.

● Heater break alarm 2 (HBA2) set value

[Setup Setting Mode: Setting group No. 46 (5n46)]

Parameter symbol	Data range	Factory set value
HbA2	0.0 to 100.0 A 0.0: HBA function OFF	0.0

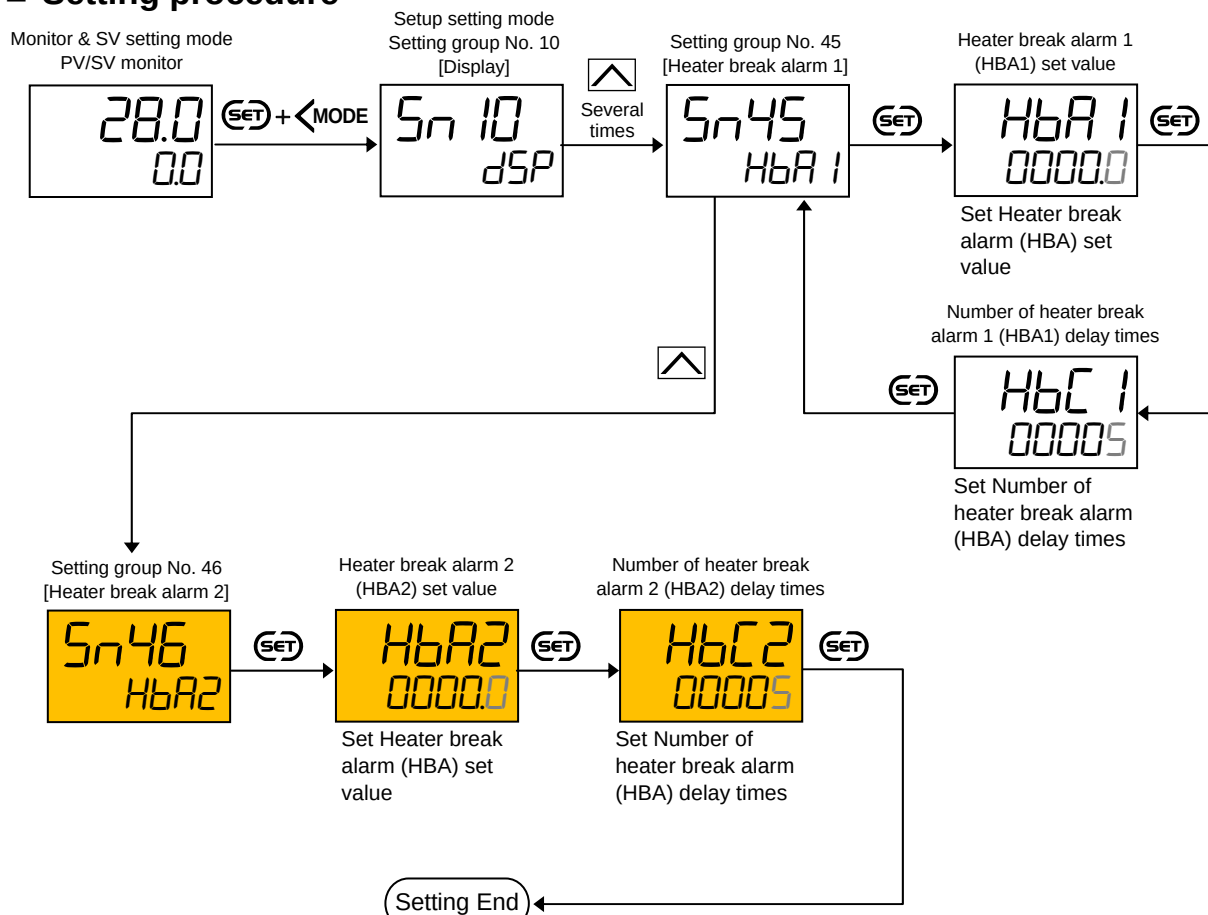


To display “Heater break alarm 2 (HBA2) set value,” must be specified “CT input” at the time of order. (When CT input is specified on FZ400/900, two CT inputs are supplied.)



This parameter is not displayed if “no assignment” is set at “CT2 assignment” in Function block 46 in Engineering mode. If the output type assigned at “CT2 assignment” is Current output or Continuous voltage output, this parameter will not be displayed.

Setting procedure



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

7.2.2 Preventing Heater break alarm (HBA) from turning on due to a transient abnormal input

There is a function called HBA delay time which suppresses the alarm when the Heater break alarm (HBA) state is less than the setting (the number of sampling).

■ Description of function

● Number of HBA delay times

This is a function to allow the Heater break alarm (HBA) to turn on if the Heater break alarm (HBA) ON condition continues beyond the setting (the number of sampling).

Heater break alarm (HBA) delay times = Number of HBA delay times × Sampling time *

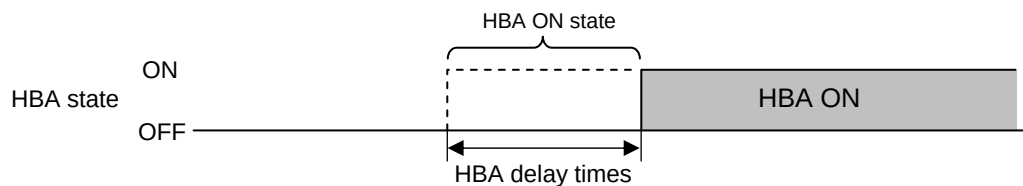
*The sampling cycle time is the shortest. It varies with the load factor (Output ON or OFF time).

Example:

Sampling cycle: 0.5 seconds

Number of HBA delay times: 5 times (Factory set value)

HBA delay times = 5 times × 0.5 seconds = 2 seconds



■ Parameter setting

● Number of heater break alarm 1 (HBA1) delay times

[Setup Setting Mode: Setting group No. 45 (5n45)]

Parameter symbol	Data range	Factory set value
HbC 1	0 to 255 times	5



To display “Number of heater break alarm 1 (HBA1) delay times,” must be specified “CT input” at the time of order.



This parameter is not displayed if “no assignment” is set at “CT1 assignment” in Function block 45 in Engineering mode. If the output type assigned at “CT1 assignment” is Current output or Continuous voltage output, this parameter will not be displayed.

● **Number of heater break alarm 2 (HBA2) delay times**
[Setup Setting Mode: Setting group No. 46 (5th46)]

Parameter symbol	Data range	Factory set value
HbC2	0 to 255 times	5



To display “Number of heater break alarm 2 (HBA2) delay times,” must be specified “CT input” at the time of order. (When CT input is specified on FZ400/900, two CT inputs are supplied.)



This parameter is not displayed if “no assignment” is set at “CT2 assignment” in Function block 46 in Engineering mode. If the output type assigned at “CT2 assignment” is Current output or Continuous voltage output, this parameter will not be displayed.

■ **Setting procedure**

Refer to the operation on P. 7-27.

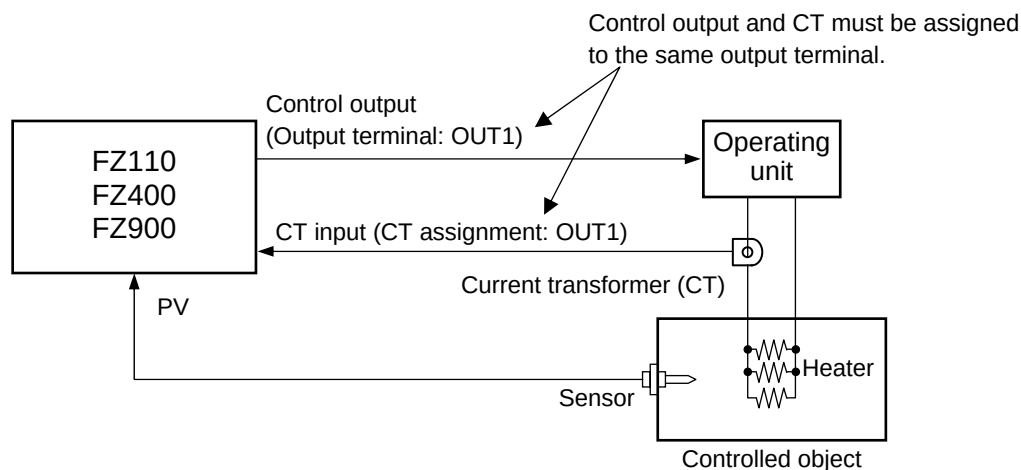
7.2.3 Changing the output monitored by the Heater break alarm (HBA)

Assignment of control output monitored by Current transformer (CT) used with Heater break alarm (HBA) can be changed.

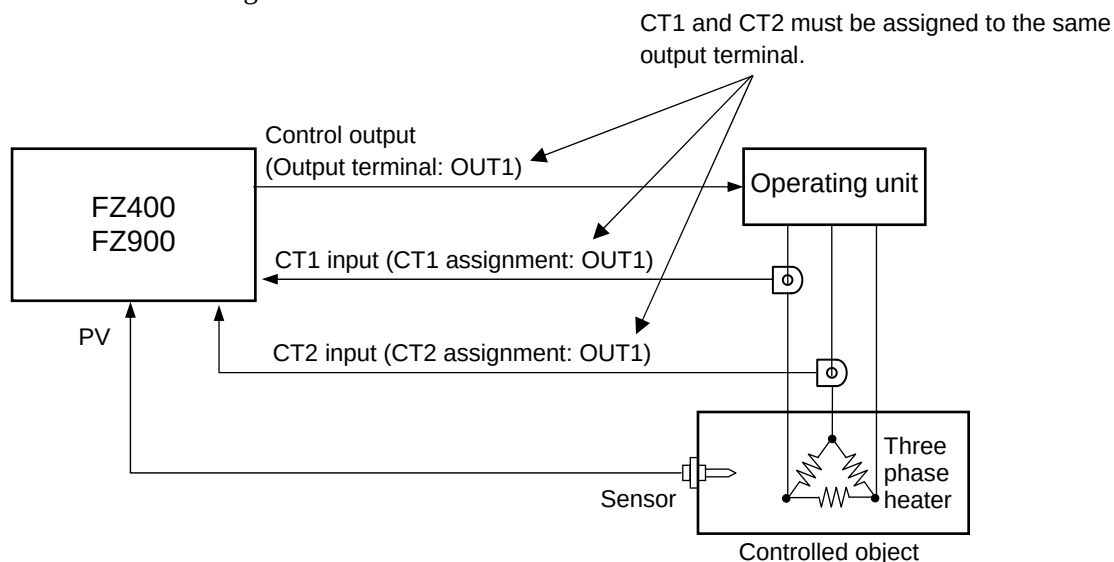
■ Description of function

● CT assignment

The Current transformer (CT) input used by the Heater break alarm (HBA) monitors the output from the output device controlled by the control output from the controller. If the output terminal of the control output from the instrument is changed, assignment of the CT needs to be changed accordingly.



When there are two CT inputs (only on FZ400/900), to detect a break in three phase heater, CT1 and CT2 must be assigned to the same terminal.



■ Parameter setting

● CT1 assignment

[Engineering Mode: Function block No. 45 (Fn45)]

Parameter symbol	Data range	Factory set value
CFR1	0: None 1: OUT1 2: OUT2 3: OUT3	1



To display “CT1 assignment,” must be specified “CT input” at the time of order.

● CT2 assignment

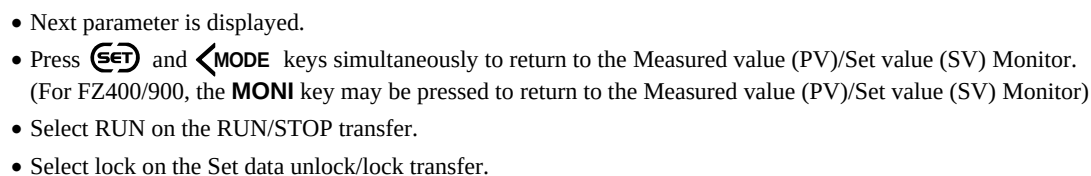
[Engineering Mode: Function block No. 46 (Fn46)]

Parameter symbol	Data range	Factory set value
CFR2	0: None 1: OUT1 2: OUT2 3: OUT3	Based on Model code



To display “CT2 assignment,” must be specified “CT input” at the time of order.
(When CT input is specified on FZ400/900, two CT inputs are supplied.)

To enter the Engineering mode



7.2.4 Changing the Current transformer (CT) type

When a Current transformer (CT) type is changed, change the CT type on the instrument.

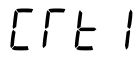
Input range of Current transformer (CT)

- CTL-6-P-N: 0 to 30 A
- CTL-12-S56-10L-N: 0 to 100A
- CTL-6-P-Z: 0 to 10 A

■ Parameter setting

● CT1 type

[Engineering Mode: Function block No. 45 (F_{n45})]

Parameter symbol	Data range	Factory set value
	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code



To display “CT1 type,” must be specified “CT input” at the time of order.



After “CT1 type” is changed, the value of “CT1 ratio” is initialized and set to an appropriate CT type.

CT ratio value

- CTL-6-P-N: 800
- CTL-12-S56-10L-N: 1000
- CTL-6-P-Z: 800



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the CT1 type is changed.

● CT1 ratio

[Engineering Mode: Function block No. 45 (F_{n45})]

Parameter symbol	Data range	Factory set value
	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000



To display “CT1 ratio,” must be specified “CT input” at the time of order.

● CT2 type

[Engineering Mode: Function block No. 46 (Fn46)]

Parameter symbol	Data range	Factory set value
CT2	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code



To display “CT2 type,” must be specified “CT input” at the time of order.
(When CT input is specified on FZ400/900, two CT inputs are supplied.)



After “CT2 type” is changed, the value of “CT2 ratio” is initialized and set to an appropriate CT type.

CT ratio value • CTL-6-P-N: 800
• CTL-12-S56-10L-N: 1000
• CTL-6-P-Z: 800



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the CT2 type is changed.

● CT2 ratio

[Engineering Mode: Function block No. 46 (Fn46)]

Parameter symbol	Data range	Factory set value
CT2	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000



To display “CT2 type,” must be specified “CT input” at the time of order.
(When CT input is specified on FZ400/900, two CT inputs are supplied.)

■ Setting procedure

Refer to the operation on P. 7-32.

7.2.5 Forcing the CT input value to 0.0 A when the heater is OFF

If the Current transformer (CT) input value exceeds 0.0 A while the heater is off, the input value of the Current transformer (CT) can be forced to 0.0 A.

■ Description of function

● CT low input cut-off

The CT input value may exceed 0.0 A while the heater is OFF (control output is OFF). In such a case CT low input cut-off may be used. This is a function to force the CT input which is below the set value to 0.0 A.



Note that Heater break alarm (HBA) may not work properly if setting such as follows is made when the CT low input cut-off function is used.

CT low input cut-off set value > Heater break alarm (HBA) set value

[Example] CT low input cut-off set value: 1.0 A and Heater break alarm (HBA) set value: 0.5 A

- If the CT input value is 0.8 A when the control output is ON, the CT input value becomes 0.0 A, causing the Heater break alarm (HBA) to turn on.
→ Actually the CT input value is larger than the HBA set value and the HBA is OFF.
- If the CT input value is 0.8 A when the control output is OFF, the CT input value becomes 0.0 A, causing the Heater break alarm (HBA) to turn off.
→ Actually the CT input value is larger than the HBA set value and the HBA is ON.

If current larger than the CT low input cut-off set value is given, HBA functions properly.

■ Parameter setting

● CT1 low input cut-off

[Engineering Mode: Function block No. 45 (Fn45)]

Parameter symbol	Data range	Factory set value
CLC1	0.0 to 1.0 A	0.0



To display “CT1 low input cut-off,” must be specified “CT input” at the time of order.

● CT2 low input cut-off

[Engineering Mode: Function block No. 46 (Fn46)]

Parameter symbol	Data range	Factory set value
CLC2	0.0 to 1.0 A	0.0



To display “CT2 low input cut-off,” must be specified “CT input” at the time of order.
(When CT input is specified on FZ400/900, two CT inputs are supplied.)

■ Setting procedure

Refer to the operation on P. 7-32.

7.3 Using Control Loop Break Alarm (LBA)

■ Setting procedure for Control loop break alarm (LBA)

Set Control loop break alarm (LBA) as follows:

Set the parameter
related to LBA output

Set the parameter related to LBA output.

- OUT1 to 3 function selection
- DO1 to 4 function selection
- OUT1 to 3 logic calculation selection
- DO1 to 4 logic calculation selection
- Energized/De-energized selection
- Interlock selection
- Output action at control stop

For OUT1 to 3 function selection, DO1 to 4 function selection, OUT1 to 3 logic calculation selection and DO1 to 4 logic calculation selection, refer to **6.1 Changing Output Assignment (P. 6-2)**.

For Energized/De-energized selection, refer to **6.5 Changing Energizing/De-energizing Output (P. 6-24)**.

For Interlock function, refer to **7.5 Keeping the Event State (Interlock Function) (P. 7-42)** and **7.6 Releasing the Event State (Interlock Release) (P. 7-44)**.

For Output action at control stop, refer to **6.9 Changing the Output Action While in Control Stop Mode (P. 6-39)**.

Set LBA time and LBD

Set the following parameters:

- Control loop break alarm (LBA) time
- LBA deadband (LBD)

For the parameter description, refer to **■ Description of function (P. 7-37)**.

For the data range of parameter, refer to **■ Parameter setting (P. 7-38)**.

Description of function

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: TC/RTD input: 2 °C [°F] (fixed)

Voltage /Current input: 0.2 % of input span (fixed)

● Heating control

		When the output reaches 0 % (low limit with output limit function)	When the output exceeds 100 % (high limit with output limit function)
LBA occurring condition	For reverse action	When the LBA time has passed and the Measured value (PV) has not fallen below the alarm determination range, the alarm will be turned on.	When the LBA time has passed and the Measured value (PV) has not risen beyond the alarm determination range, the alarm will be turned on.
	For direct action	When the LBA time has passed and the Measured value (PV) has not risen beyond the alarm determination range, the alarm will be turned on.	When the LBA time has passed and the Measured value (PV) has not fallen below the alarm determination range, the alarm will be turned on.

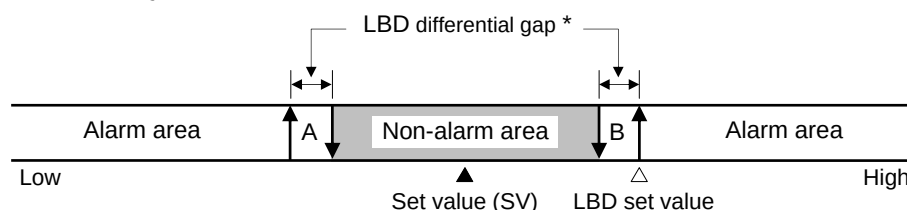
● Heat/Cool control

		When the heat-side output exceeds 100 % (high limit with heat-side output limit function) and the cool-side output reaches 0 % (A) *	When the heat-side output reaches 0 % and the cool-side output exceeds 100 % (high limit with cool-side output limit function) (B) *
LBA occurring condition		When the LBA time has passed and the Measured value (PV) has not risen beyond the alarm determination range, the alarm will be turned on.	When the LBA time has passed and the Measured value (PV) has not fallen below the alarm determination range, the alarm will be turned on.

* If conditions of (A) and (B) are both met, priority is given to (A).

● LBA deadband (LBD)

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



* TC/RTD input: 0.8 °C [°F] (fixed)
Voltage/Current input: 0.8 % of input span (fixed)

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



LBA function is not available:

- when displaying Input type and Input range after turning ON the power.
- during Autotuning (AT).
- in the STOP mode.
- when Control loop break alarm (LBA) time is “0.”
- when Feedback resistance (FBR) is not supplied on the Position proportioning PID control.



If the Control loop break alarm (LBA) setting time does not match the controlled object requirements, the Control loop break alarm (LBA) setting time should be lengthened. If setting time is not correct, the Control loop break alarm (LBA) will malfunction by turning on or off at inappropriate times or not turning on at all.



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 (LBD).



If the Autotuning (AT) is used, the Control loop break alarm (LBA) time is automatically set twice as large as the integral time. The Control loop break alarm (LBA) time will not change even if the integral time is changed.



If the Control loop break alarm (LBA) function detects an error occurring in the control loop, but cannot specify the location, the control loop should be checked. The Control loop break alarm (LBA) function does not detect the location which causes alarm status. If Control loop break alarm (LBA) alarm is ON, check each device or wiring in the control loop.

■ Parameter setting

● Input 1_Control loop break alarm (LBA) time

[Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. LbA	0 to 7200 seconds 0: No function	Output assignment is entered in the initial setting code: • The assigned output has LBA output: 480 • The assigned output has no LBA output: 0 Output assignment is not entered in the initial setting code: 0

● Input 2_Control loop break alarm (LBA) time

[Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. LbA	0 to 7200 seconds 0: No function	Output assignment is entered in the initial setting code: • The assigned output has LBA output: 480 • The assigned output has no LBA output: 0 Output assignment is not entered in the initial setting code: 0



To display “Input 2_Control loop break alarm (LBA) time,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 1_LBA deadband (LBD)

[Parameter Setting Mode: Parameter group No. 51 (Pn51)]

Parameter symbol	Data range	Factory set value
1. Lbd	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	0

● Input 2_LBA deadband (LBD)

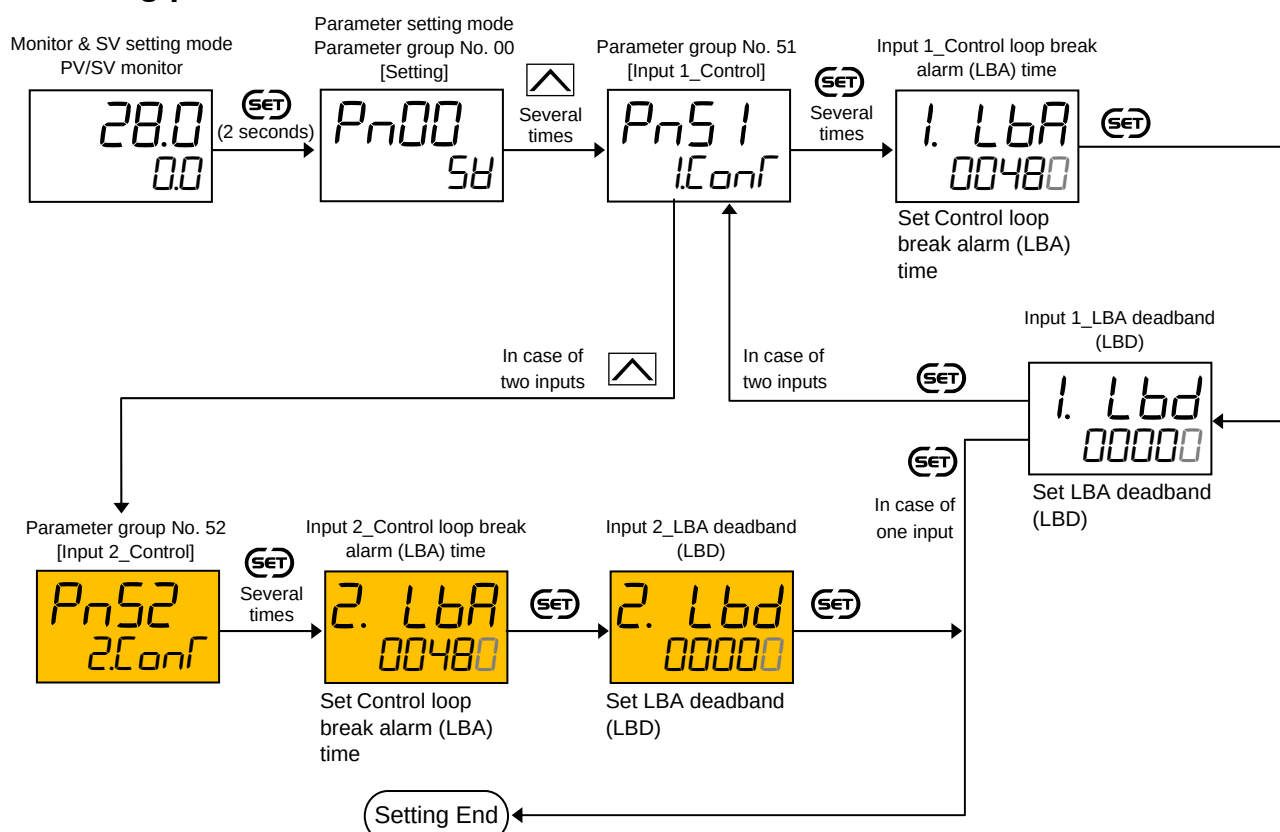
[Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. Lbd	0 to Input 2_Input span [Varies with the setting of the Decimal point position.]	0



To display “Input 2_LBA deadband (LBD),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

■ Setting procedure



- Next parameter is displayed.
- Press (SET) and <MODE> keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the MONI key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

7.4 Checking Event ON State

The event ON state can be checked with the ALM lamp or on the Comprehensive event state screen in the Monitor & SV setting mode.

■ Display contents

● ALM lamp

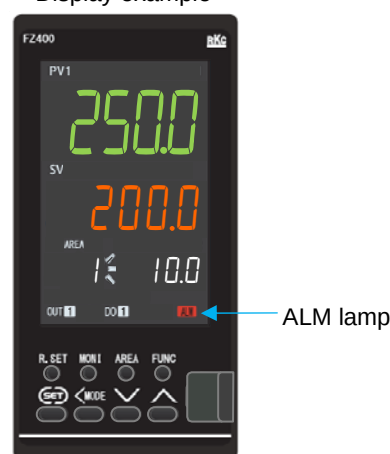
When the event is in the ON state, the ALM lamp turns on. However, the instrument has only one ALM lamp which is turned on using the *OR* relation of the related functions. Combination of the states can be freely available.

The setting can be done at ALM lamp lighting condition (Function block 10 in Engineering mode)

[Events that illuminate the lamp]

- Event 1
- Event 2
- Event 3
- Event 4
- Heater break alarm 1 (HBA1)
- Heater break alarm 2 (HBA2)
- Control loop break alarm 1 (LBA1)
- Control loop break alarm 2 (LBA2)
- Input 1_Input error high
- Input 1_Input error low
- Input 2_Input error high
- Input 2_Input error low

Display example



● ALM lamp lighting condition

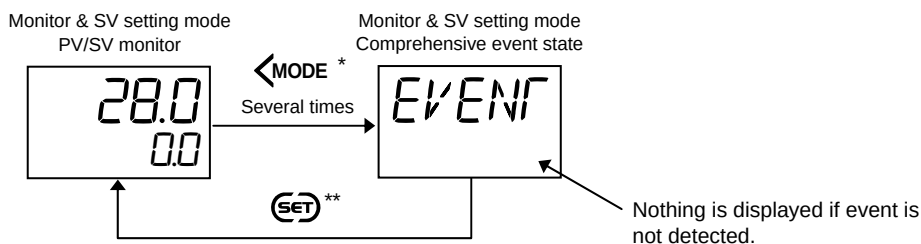
[Engineering Mode: Function block No. 10 (*F_n ID*)]

Parameter symbol	Data range	Factory set value
<i>ALC</i>	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	255

● Comprehensive event state [Monitor & SV Setting Mode]

Parameter symbol	Data range	Factory set value
EVENT	When an event occurs, the character of the occurring event is displayed on the Set value (SV) display unit. If two or more events occur at the same time, the relevant characters are displayed alternately every 0.5 seconds. <i>EV1</i>: Event 1 <i>EV2</i>: Event 2 <i>EV3</i>: Event 3 <i>EV4</i>: Event 4 <i>HbA1</i>: Heater break alarm 1 (HBA1) <i>HbA2</i>: Heater break alarm 2 (HBA2) <i>LbA1</i>: Control loop break alarm 1 (LBA1) <i>LbA2</i>: Control loop break alarm 2 (LBA2) <i>I n1.UP</i>: Input 1_Input error high <i>I n1.dn</i>: Input 1_Input error low <i>I n2.UP</i>: Input 2_Input error high <i>I n2.dn</i>: Input 2_Input error low	—

■ Display operation



* In case of a FZ400/900, **MONI** key may be used instead.

** In case of a FZ400/900, **R.SET** key may be used to return.

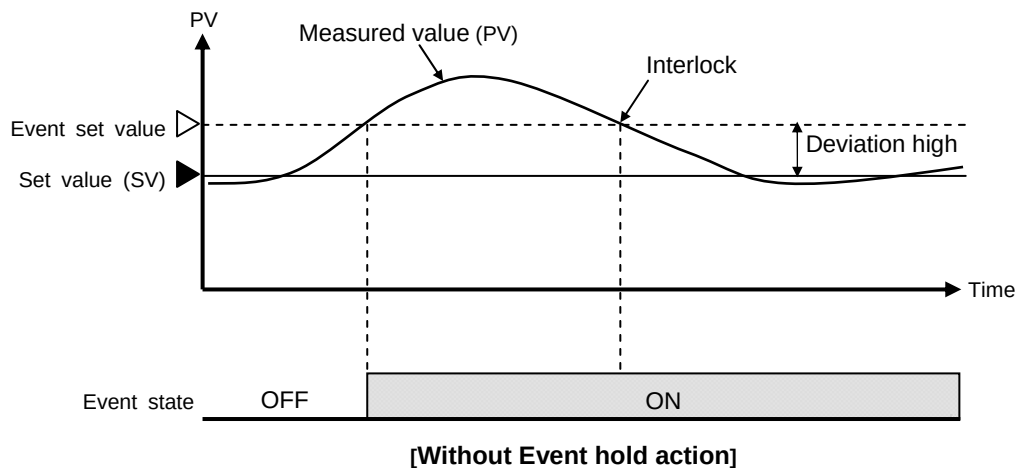
7.5 Keeping the Event State (Interlock Function)

■ Description of function

The Event interlock function holds the event state (including the HBA, the LBA and the input error) even if the Measured value (PV) is out of the event zone after it enters the event zone once.

Interlock can be set for the Event, Heater break alarm (HBA), Control loop break alarm (LBA) and Input error.

Example: When the Event interlock function is used for Deviation high



For the interlock release, refer to 7.6 Releasing the Event State (Interlock Release) (P. 7-44).

■ Parameter setting

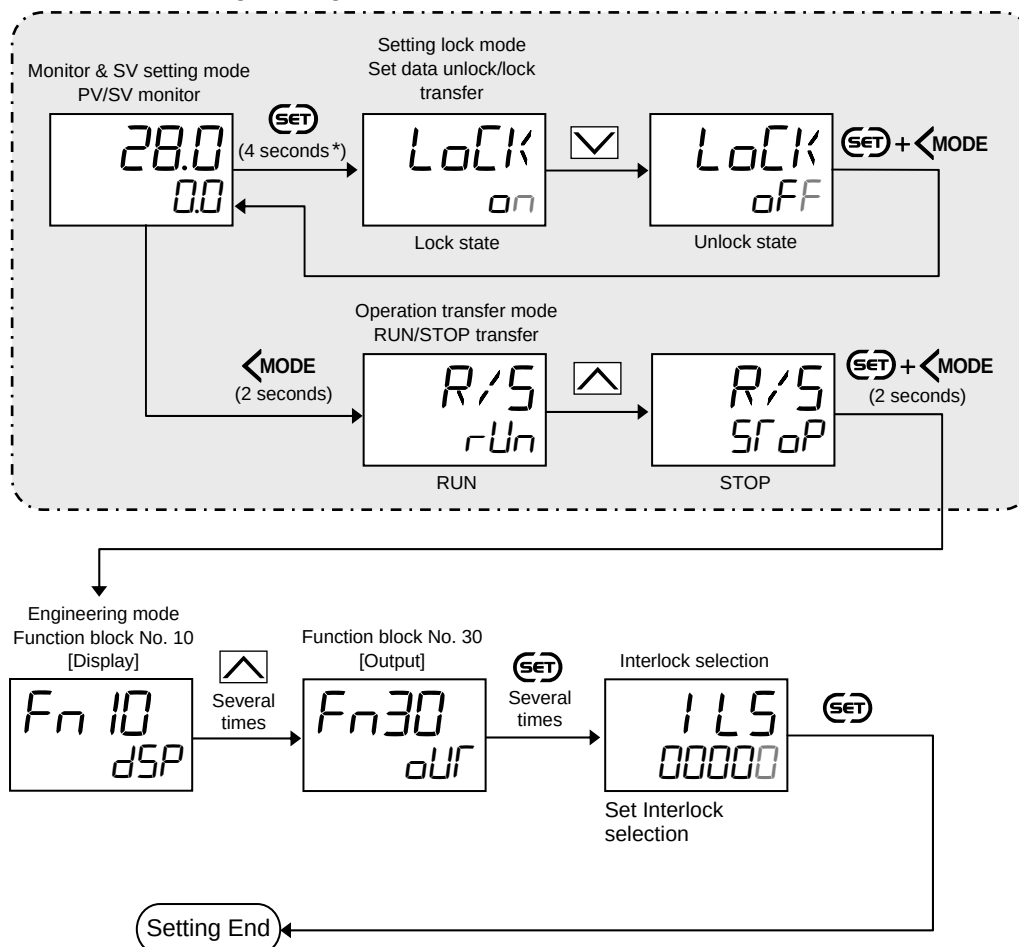
● Interlock selection

[Engineering Mode: Function block No. 30 (Fn30)]

Parameter symbol	Data range	Factory set value
1 L5	0 to 4095 0: Unused +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

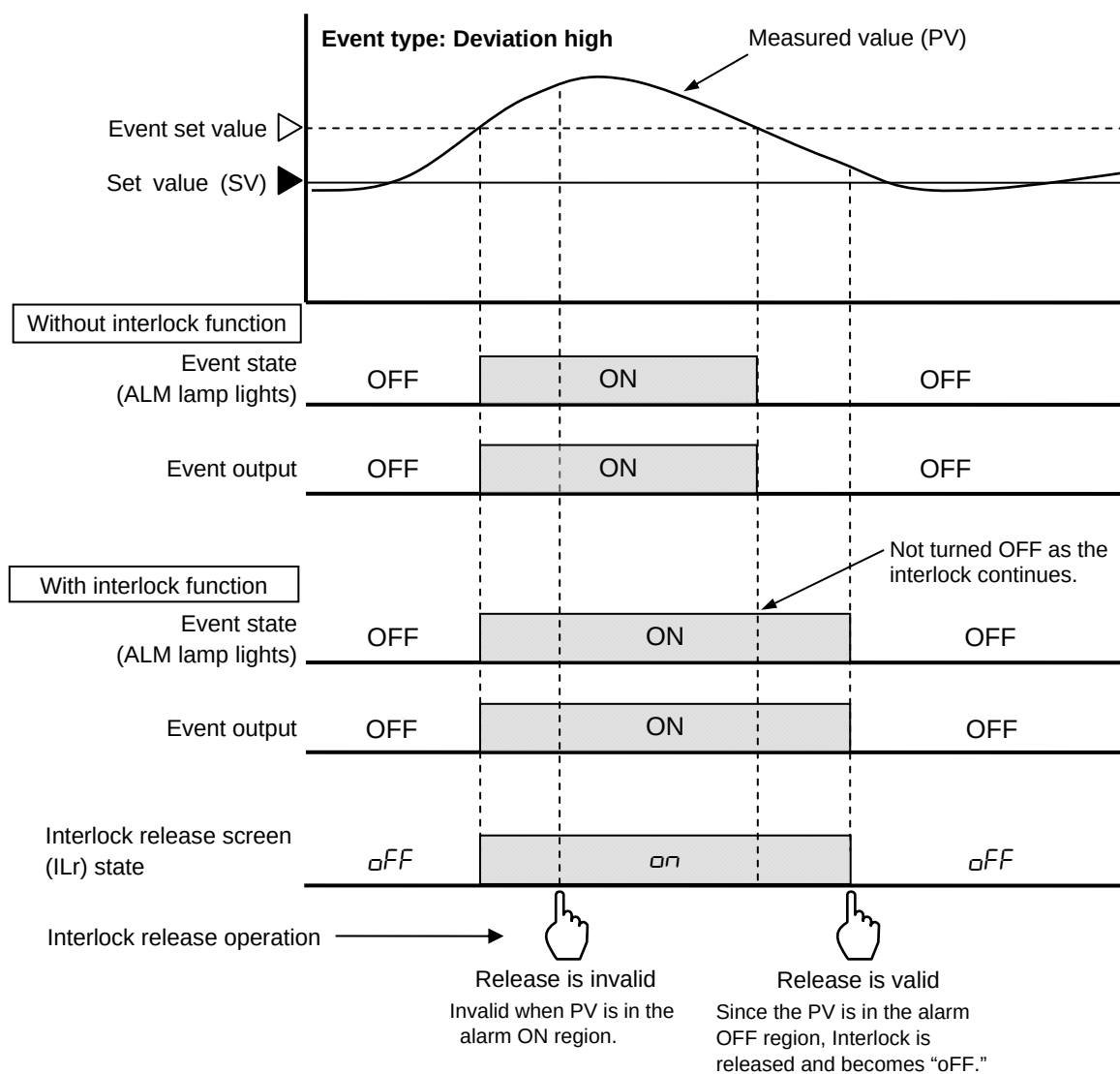
7.6 Releasing the Event State (Interlock Release)

■ Description of function

The Event interlock function holds the event state (including the HBA, the LBA and the input error) even if the Measured value (PV) is out of the event zone after it enters the event zone once.

The Interlock may be released by Digital input (DI) and Communication (optional) as well as key operation.

The following picture shows how to release the interlock.



The Interlock release has an influence to all events, Heater break alarm (HBA), Control loop break alarm (LBA) and input error that are in the interlock state and releases such events at one time whose interlock release conditions are met.



For Interlock release through Digital input (DI), refer to **5.2 Switching Functions Using Digital Inputs (DI)** (P. 5-16).



For Interlock release through Communication, refer to **FZ110/FZ400/FZ900 Instruction Manual [Host Communication]** (IMR03A07-E□).

■ Parameter setting

● Interlock release

[Monitor & SV Setting Mode]

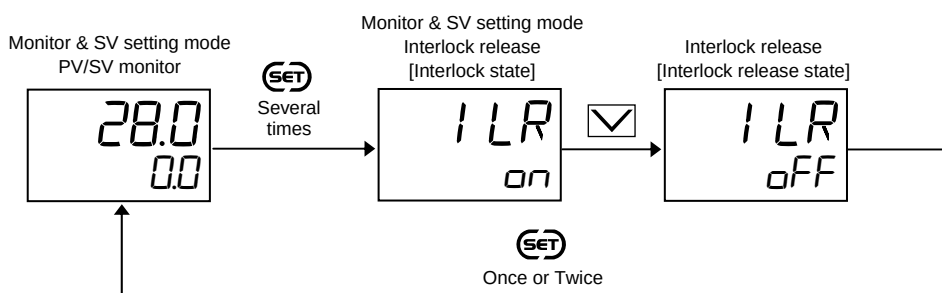
Parameter symbol	Data range	Factory set value
ILR	oFF: Interlock release oN: Interlock state	oFF



To display “Interlock release,” must be set the Interlock selection (Function block No. 30 in Engineering mode) other than “Unused.”

■ Setting procedure

After the Interlock is set, the Interlock release screen shows “oN” automatically.

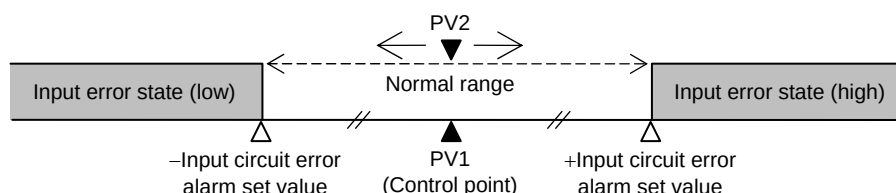


7.7 Preventing Control with Input Errors (Input Circuit Error Alarm) [FZ400/900]

■ Description of function

Input circuit error alarm uses two inputs (dual input function) and detects errors in the input circuit from the difference between two inputs. (FZ400/900 only)

When the difference between Input 1_Measured input (PV1) and Input 2_Measured input (PV2 – PV1) exceeds Input circuit error alarm set value, it is considered to be an input error and “Input error state” starts.

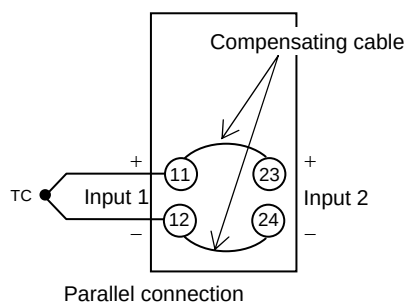


Determination of input errors

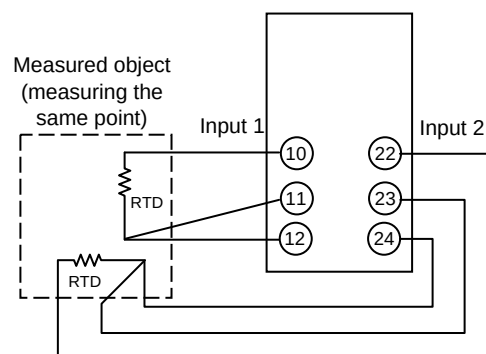
- $(PV1 + \text{Input circuit error alarm set value}) < PV2 \cdots$ Input error of Input 1 (high)
- $(PV1 - \text{Input circuit error alarm set value}) > PV2 \cdots$ Input error of Input 1 (low)

[Wiring example]

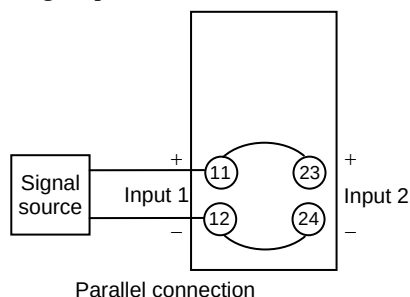
- TC input



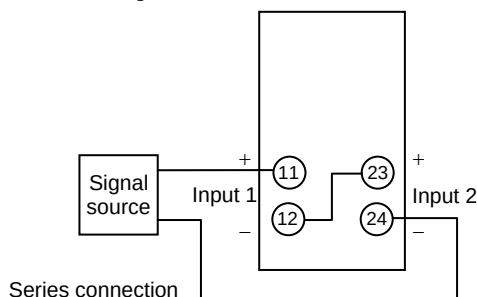
- RTD input



- Voltage input



- Current input



Different input type can be specified for Input 1 and Input 2. Note that action may be different on each input.

- To output “Input 1_Input error high/low,” output assignment must be set in advance. For details of output assignment, refer to **6.1 Changing Output Assignment [Control Output, Retransmission Output, Logic Calculation (Event) Output, Instrument Status Output] (P. 6-2)**.
- Irrespective of Input circuit error alarm setting, “Input 1_Input error high/low” conducts normal Input error alarm action. For detailed operation at Input error action, refer to **5.7 Changing Error Handling at Input Error (P. 5-39)**.
- Before using the Input circuit error alarm, check for errors in measured values between Input 1 and Input 2 which should be removed in advance using PV bias.
- The Input circuit error alarm function uses two inputs, but control using Input 2 is not available. However, lighting the ALM lamp and providing state output from Digital output (DO) are possible.

■ Parameter setting

● Select function for input 2

[Engineering Mode: Function block No. 58 (F_{n58})]

Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm *This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	• FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 • FZ110: 1

- To select “Input circuit error alarm” in “Select function for input 2,” “Measured input 2” must be ordered.
- Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized when the Select function for input 2 is changed.

● Input circuit error alarm set value

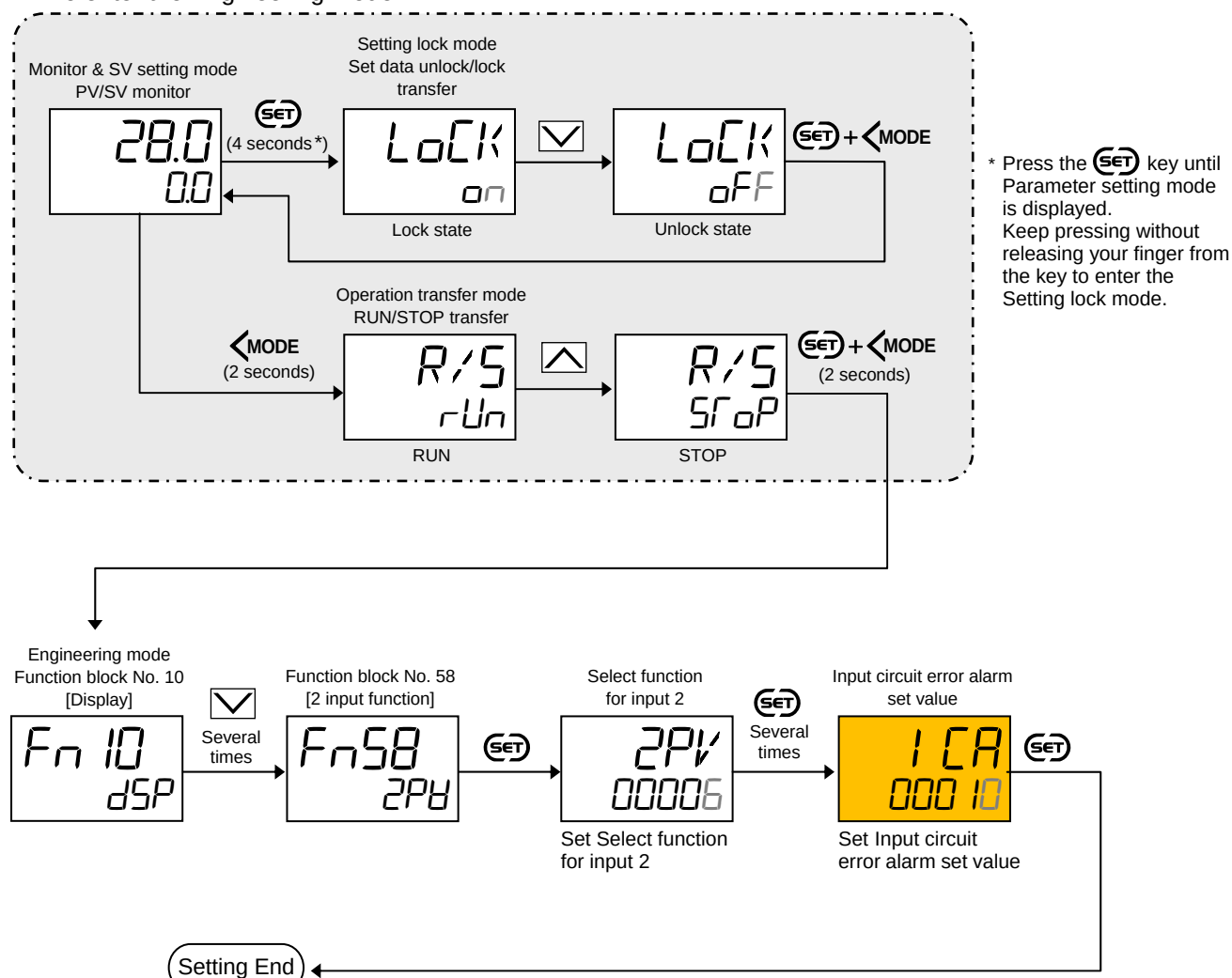
[Engineering Mode: Function block No. 58 (F_{n58})]

Parameter symbol	Data range	Factory set value
ICA	0 to Input 1_Input span 0: No function [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 10 V/I inputs: 5 % of Input 1_Input span

- To display “Input circuit error alarm set value,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Input circuit error alarm.

Setting procedure

To enter the Engineering mode



Setting End

- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.



CONTROL FUNCTION

8

This chapter describes control related functions, setting contents and setting procedure based on the key words related to controls.

8.1 Running/Stopping Control (RUN/STOP Transfer)	8-2
8.2 Changing Control Action.....	8-5
8.3 Setting PID Values Automatically (Autotuning)	8-11
8.4 Setting PID Values Automatically (Startup tuning).....	8-18
8.5 Setting PID Values Manually.....	8-24
8.6 Controlling with ON/OFF Action.....	8-31
8.7 Controlling with Heat/Cool Control.....	8-36
8.8 Controlling with Position Proportioning Control.....	8-44
8.9 Controlling with Manual Control.....	8-56
8.10 Using Remote Setting Input	8-61
8.11 Executing 2-Loop Control [FZ400/900]	8-67
8.12 Executing Differential Temperature Control [FZ400/900]	8-70
8.13 Executing Control with PV Select [FZ400/900]	8-75
8.14 Executing Cascade Control [FZ400/900]	8-84
8.15 Controlling with Level PID	8-98
8.16 Eliminating Offset Inherent to Proportioning Control (Manual Reset)	8-108
8.17 Continuing Stable Control after the Operation Transfer (SV Tracking)	8-110
8.18 Suppressing Overshoot.....	8-116
8.19 Changing the Action at Power ON (Hot/Cold Start).....	8-124

8.1 Running/Stopping Control (RUN/STOP Transfer)

The RUN/STOP transfer can be made by Digital input (DI) or Communication (optional) other than the key operation.

The factory set value is RUN. As soon as the controller is powered on, control is started.

● State of this instrument when set to STOP mode

STOP display		Displays the STOP symbol “ STOP ” on the SV, PV or MV * displays. (Factory set value: SV displays) * FZ400/900 only
Control output	PID control	“Input 1_Manipulated output value at STOP [heat-side]” is output. (Factory set value: −5.0 %) “Input 2_Manipulated output value at STOP” * is output. (Factory set value: −5.0 %) * In the case of 2-loop control/Differential temperature control
	Heat/Cool PID control	Heat-side: “Input 1_Manipulated output value at STOP [heat-side]” is output. (Factory set value: −5.0 %) Cool-side: “Input 1_Manipulated output value at STOP [cool-side]” is output. (Factory set value: −5.0 %)
	Position proportioning PID control	Conform to the set value of the Valve action at STOP. When there is Feedback resistance (FBR) input: “Input 1_Manipulated output value at STOP [heat-side]” is output.
Logic calculation output		According to the setting contents of Output action at STOP (Factory set value: OFF)
Retransmission output		
Instrument status output		
Autotuning or Startup tuning		AT canceled (PID constants are not updated.)

For STOP display selection, refer to **9.4 Changing the Display Position of STOP during the Control Stop (P. 9-20)**.

For Action selection at STOP mode, refer to **6.9 Changing the Output Action While in Control Stop Mode (P. 10-46)**.

● State of this instrument when set to RUN mode

Operation when transferred to RUN from STOP is in accordance with the Hot/Cold start selection setting.

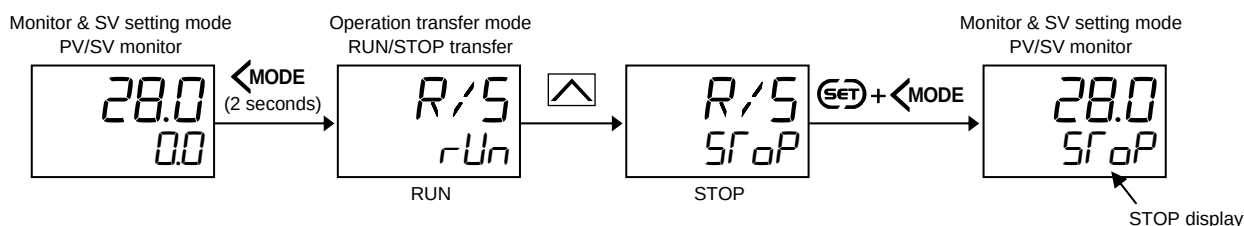
For the Hot/Cold start, refer to **8.19 Changing the Action at Power ON (Hot/Cold Start) (P. 8-124)**.

For the details of the RUN/STOP switching by communication (optional), refer to the **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR03A07-E□)**.

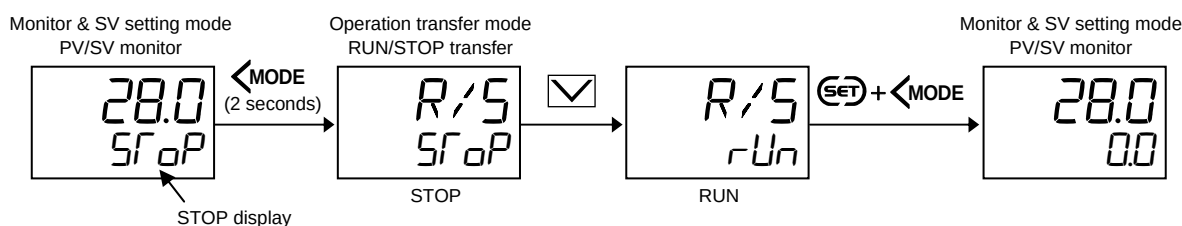
Setting procedure

Selection by front key operation

Changing the mode from RUN to STOP



Changing the mode from STOP to RUN

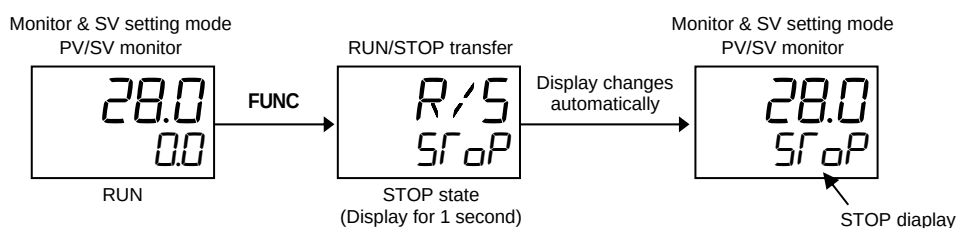


Changing the mode with the direct key (FZ400/900 only)

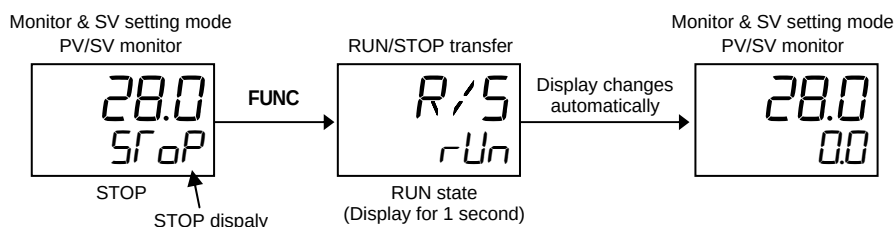
Assigning the “RUN/STOP transfer” function to the FUNC key facilitates the RUN/STOP switching. RUN/STOP transfer function is assigned to the FUNC key at the time of shipment for immediate use. Each time FUNC key is pressed, RUN and STOP are toggled.

- For the “FUNC key assignment,” refer to **10.8 Accessing some functions directly (FUNC key) (P. 10-35)**.

Changing the mode from RUN to STOP



Changing the mode from STOP to RUN



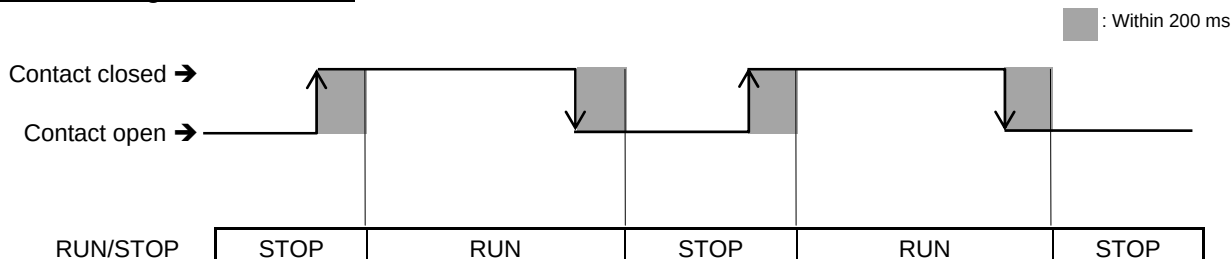
- Selection of key action is possible from “Press once” and “Press and hold” to enable the switching. For details, refer to **10.8 Accessing some functions directly (FUNC key) (P. 10-35)**.

● Switching the mode with Digital Input (DI)

To switch the RUN/STOP using the Digital Input (DI), use “DI function selection” (Function block No. 23 in the Engineering mode).

- For the Digital input (DI) assignment, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Transfer timing of RUN/STOP



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.



The above switching action can be inverted (The functions at contact close and contact open can be swapped). This setting can be done at “DI logic invert.” For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● RUN/STOP transfer state

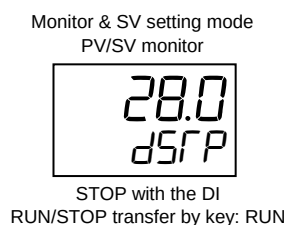
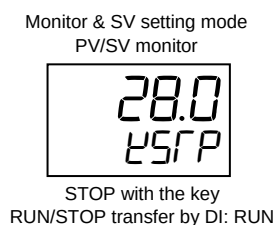
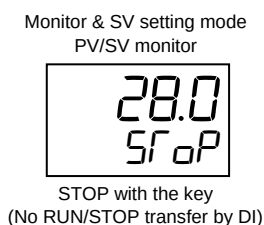
The table below shows the actual RUN/STOP modes and displays under different combinations of settings by Key operation, Communication, and Digital input (DI).

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status	STOP display
RUN	RUN	RUN	—
	STOP	STOP	d5rP
STOP	RUN		5rP
	STOP		5rP *

Priority to STOP

* The instrument without RUN/STOP switching by DI will have the same display.

STOP character display



The display position of STOP can be changed. For details, refer to **9.4 Changing the Display Position of STOP during the Control Stop (P. 9-20)**.

8.2 Changing Control Action

Refer to the following 8 types of control action:

- PID control (direct action)
- PID control (reverse action)
- ON/OFF action
- Heat/Cool PID control (water cooling)
- Heat/Cool PID control (air cooling)
- Heat/Cool PID control (Cooling linear type)
- Position proportioning PID control (direct action)
- Position proportioning PID control (reverse action)

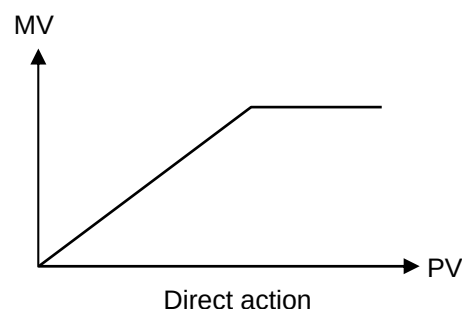


When the control mode is set to Cascade control which uses two measured inputs, the selectable control action is limited to “PID control (direct action),” “PID control (reverse action),” or “ON/OFF action.”

■ PID control (direct action)

The Manipulated output value (MV) increases as the Measured value (PV) increases.

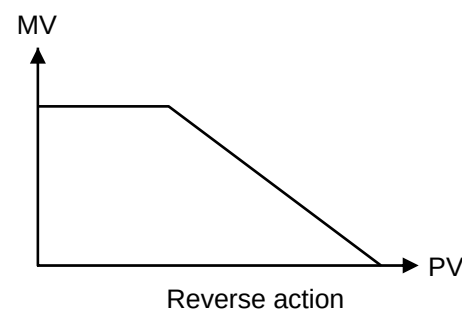
This action is used generally for cooling control.



■ PID control (reverse action)

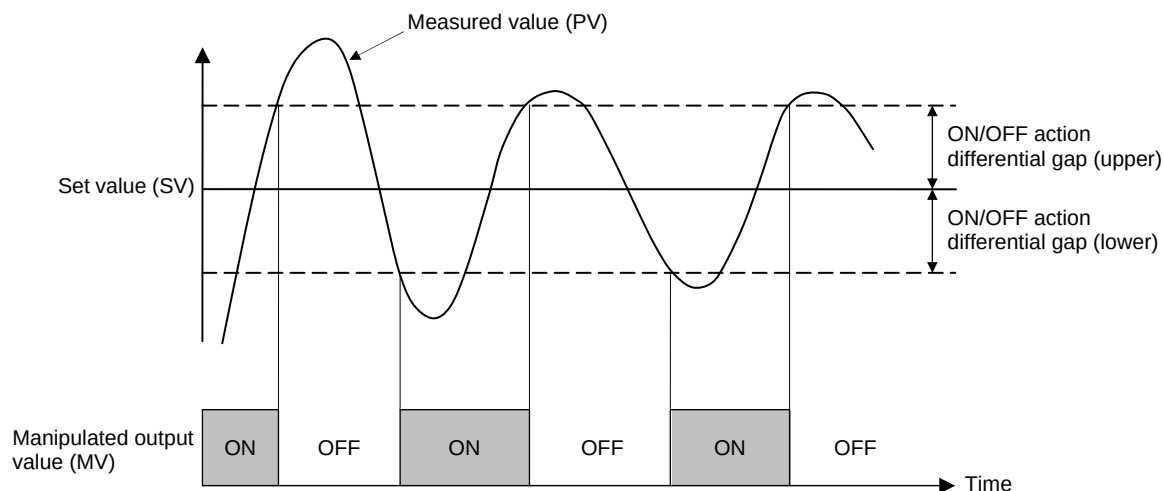
The Manipulated output value (MV) decreases as the Measured value (PV) increases.

This action is used generally for heating control.



■ ON/OFF action

ON/OFF control is possible when the Proportional band [heat-side] is set to 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.



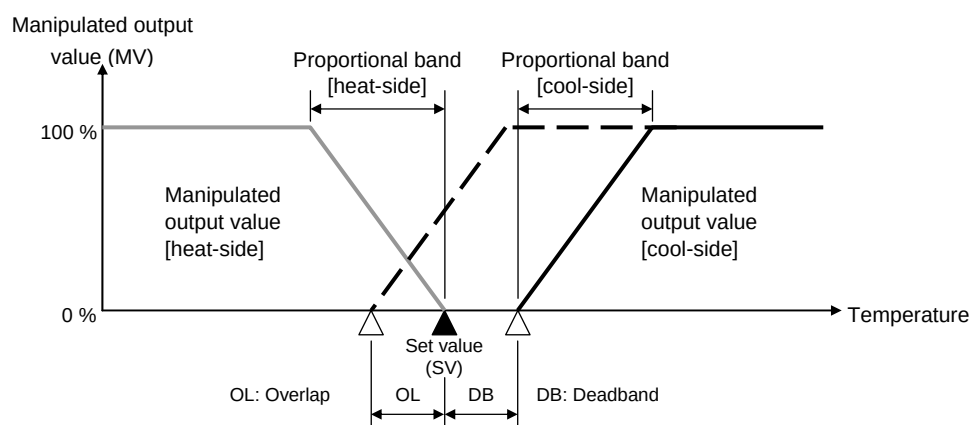
For ON/OFF action, refer to **8.6 Controlling with ON/OFF Action (P. 8-31)**.

■ Heat/Cool PID control

In Heat/Cool control, only one controller enables heating and cooling control.

Water cooling/Air cooling: The algorithm assuming plastic molding machine Heat/Cool control is employed. Even in equipment provided with a cooling mechanism having nonlinear characteristics, it responds quickly to attain the characteristic responding to the set value with small overshooting.

Cooling linear type: The algorithm assuming applications without nonlinear cooling capability is employed.

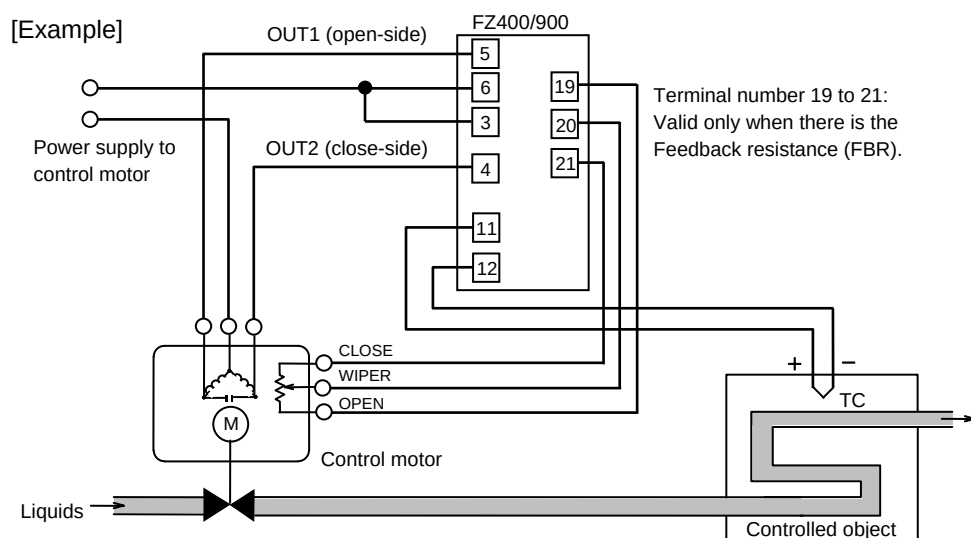


For Heat/Cool PID control, refer to **8.7 Controlling with Heat/Cool Action (P. 8-36)**.

■ Position proportioning PID control

Position proportioning PID control converts the control output value of the controller into the corresponding signal to control a motor driven valve (control motor) and then performs temperature control of a controlled object by regulating fluid flow.

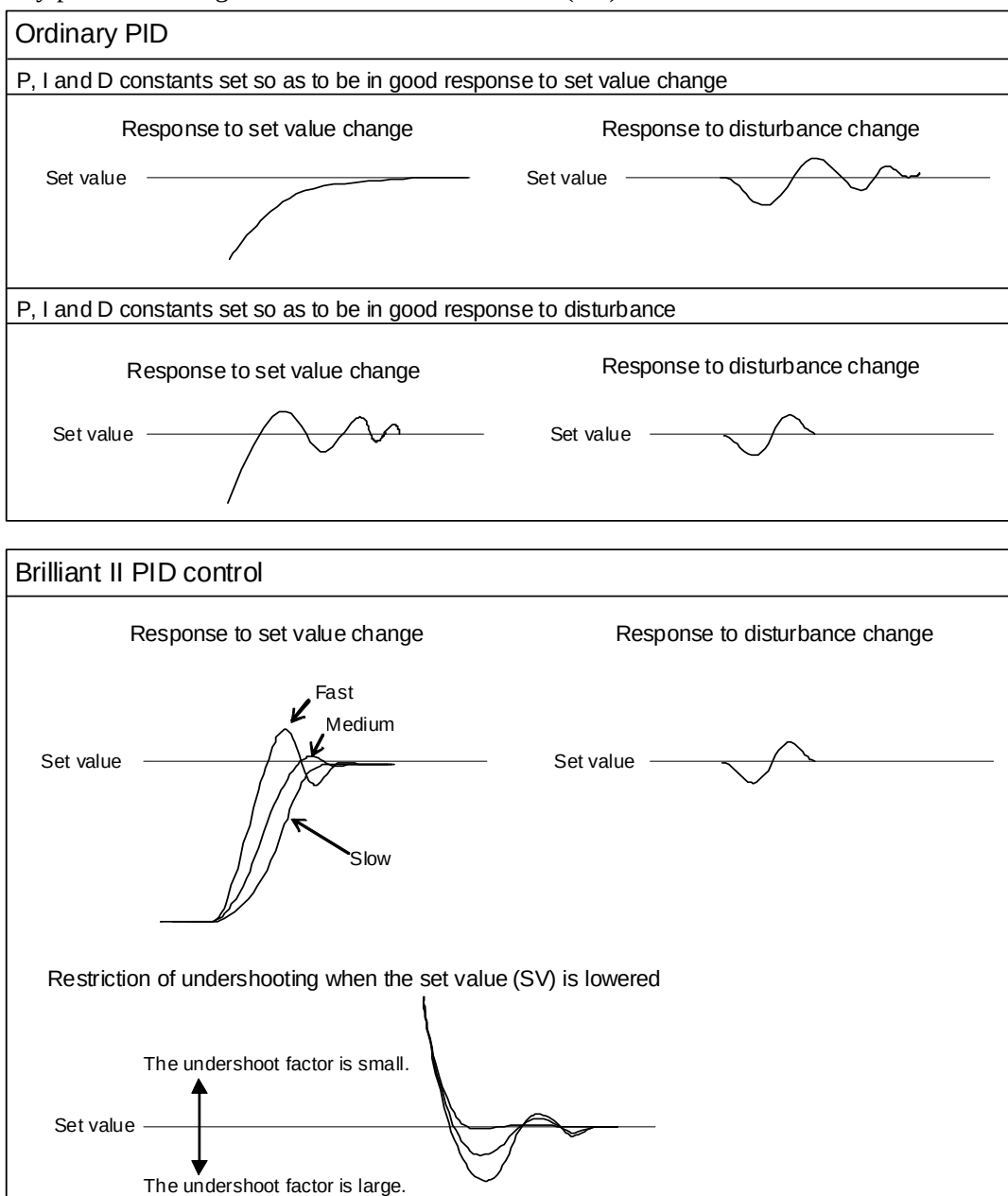
In Position proportioning PID control of this controller, it is possible to select the presence or absence of Feedback resistance (FBR) input which monitors the degree of valve position (Specify when ordering). In addition, the direct action or reverse action can be selected.



For Position proportioning PID control, refer to **8.8 Controlling with Position Proportioning Control (P. 8-44)**.

■ Brilliant II PID control

PID control is a control method of achieving stabilized control result by setting P (Proportional band), I (Integral time) and D (Derivative time) constants, and is widely used. However, with this PID control, if P, I and D values are set to focus on “better response to control set value change,” “response to external disturbance” deteriorates. In contrast, if PID values are set to focus on “better response to external disturbance,” “response to control set value change” deteriorates. In brilliant II PID control a form of “Response to setting” can be selected from among **Fast**, **Medium** and **Slow** with PID constants remaining unchanged so as to be in good “Response to disturbances.” In addition, the controller is provided with the function which restricts the amount of undershooting caused by the cooling nonlinear characteristic possessed by plastic molding machines when the Set value (SV) is lowered in Heat/Cool PID control.



■ Parameter setting

● Input 1_Control action

[Engineering Mode: Function block No. 51 (F_{n51})]

Parameter symbol	Data range	Factory set value
1. 05	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling linear type] 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action) For cascade control, only 0 or 1 is selectable.	Control action specified at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Input 1_Control action is changed.

● Input 2_Control action

[Engineering Mode: Function block No. 52 (F_{n52})]

Parameter symbol	Data range	Factory set value
2. 05	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action)	Same as Input 1_Control action



To display “Input 2_Control action,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Input 2_Control action is changed.

● Input 1_Control response parameter

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
1. RPF	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2

● Input 2_Control response parameter

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

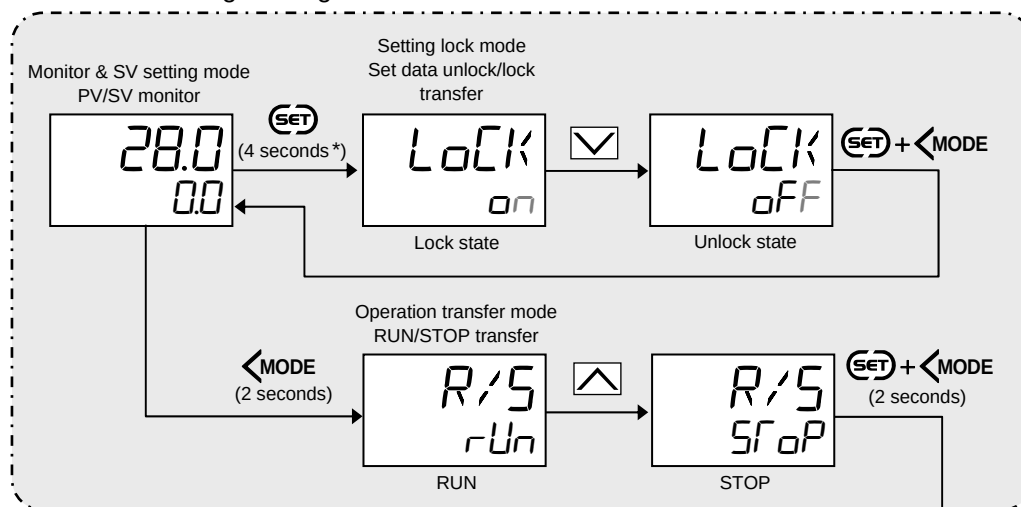
Parameter symbol	Data range	Factory set value
2. RPF	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	0



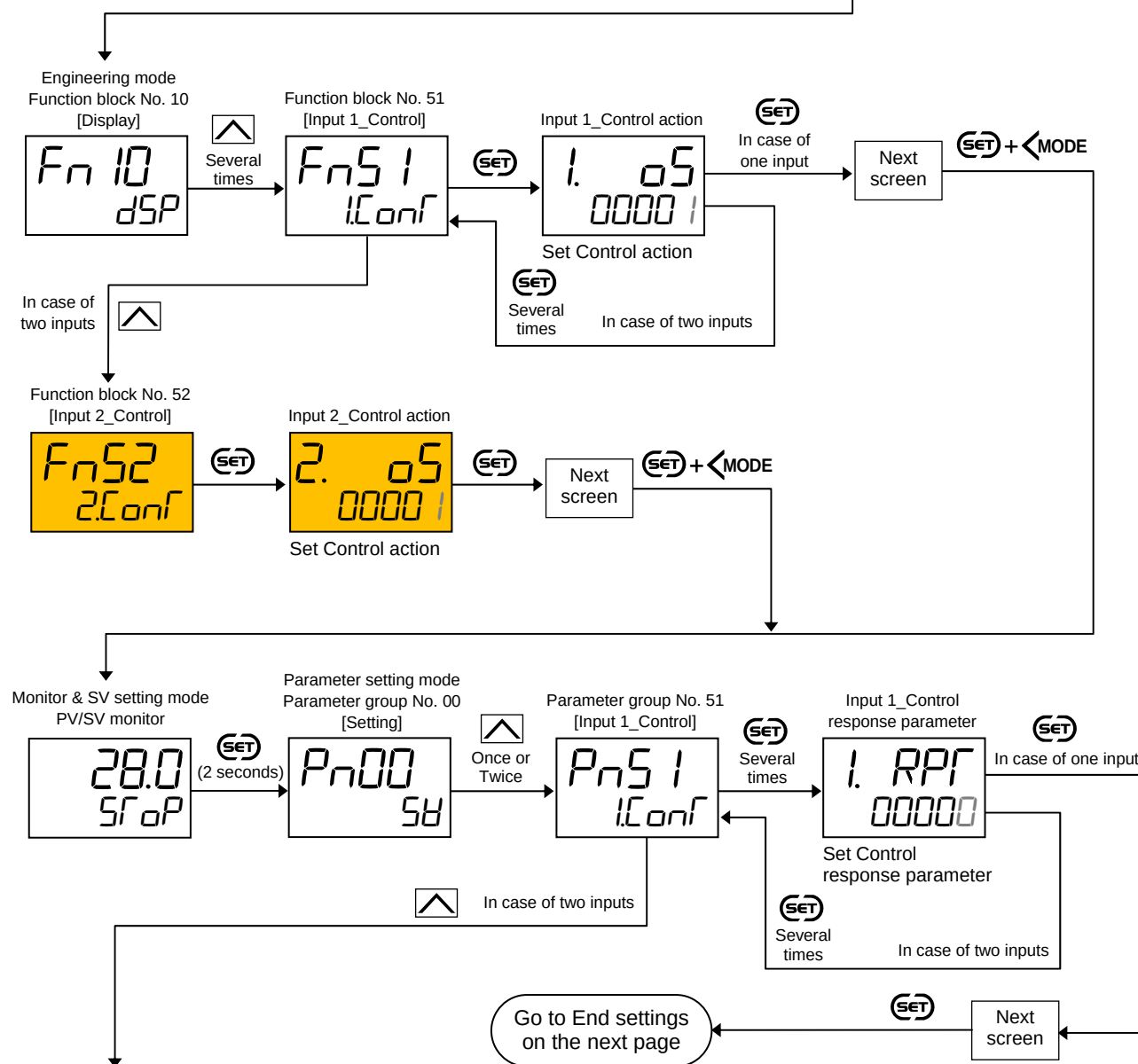
To display “Input 2_Control response parameter,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

Setting procedure

To enter the Engineering mode

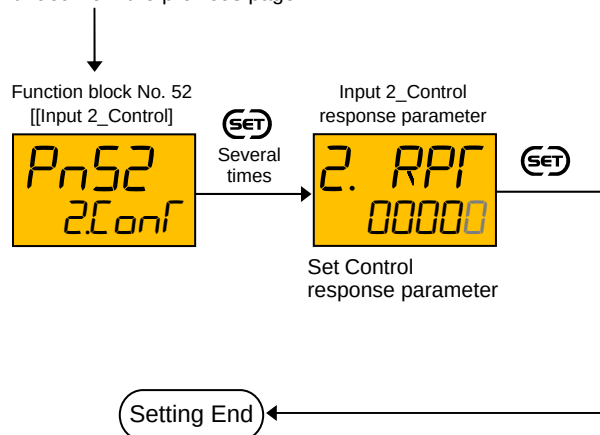


* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



Continued on the next page.

Continued from the previous page.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

8.3 Setting PID Values Automatically (Autotuning)

The Autotuning (AT) automatically measures, computes and sets the optimum PID values. The Autotuning (AT) can be used for PID control (Direct action/Reverse action) and Heat/Cool PID control.

 For the details of Autotuning (AT) during the Cascade control, refer to **8.14 Executing Cascade Control [FZ400/900] (P. 8-84)**.

■ Description of function

● Parameters computed by Input 1_Autotuning (AT)

- Input 1_Proportional band [heat-side]
- Input 1_Integral time [heat-side]
- Input 1_Derivative time [heat-side]
- Input 1_Proportional band [cool-side] (Only for Heat/Cool PID control)
- Input 1_Integral time [cool-side] (Only for Heat/Cool PID control)
- Input 1_Derivative time [cool-side] (Only for Heat/Cool PID control)
- Input 1_Control loop break alarm (LBA) time (The LBA time is automatically set to twice the value of the Integral time)

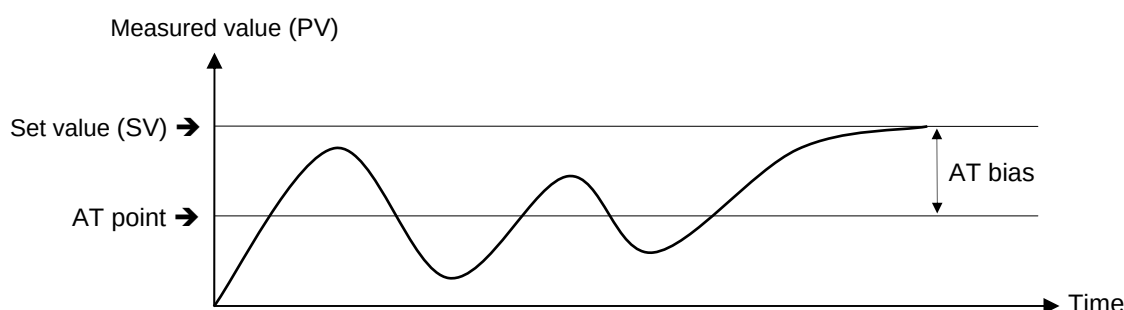
● Parameters computed by Input 2_Autotuning (AT)

- Input 2_Proportional band
- Input 2_Integral time
- Input 2_Derivative time
- Input 2_Control loop break alarm (LBA) time (The LBA time is automatically set to twice the value of the Integral time)

● AT bias

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 compute 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.



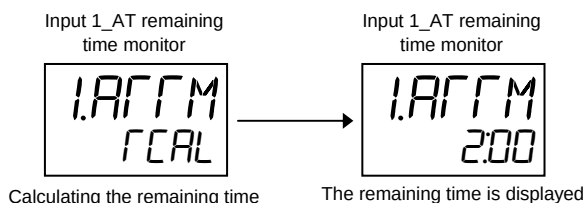
- **AT remaining time monitor**

Displays the remaining time until the Autotuning (AT) is completed.

(Display range: 0 hours 00 minutes to 48 hours 00 minutes)

The SV display shows “*FLRL*” from the start of Autotuning (AT) till the display of the remaining time. Once the remaining time is displayed, the time is reduced every minute.

[Example]



The “AT remaining time monitor” is a predictive value and may not be accurate.

- **AT/ST status monitor**

Displays the execution status of the Autotuning (AT).

- Displays “1” during the Autotuning (AT).
- Displays “0” when the Autotuning (AT) is completed.
- When the Autotuning (AT) is aborted, the display shows -1 up to -4 depending on the reason of the abort.
 - 1: Aborted. Setting changed.
 - When the set value (SV) is changed.
 - When the AT bias is changed.
 - When the PV bias, PV ratio, or PV digital filter is changed.
 - When the Output limiter high or low is changed.
 - When the Autotuning (AT) is changed to PID control.
 - When the instrument is switched to STOP by RUN/STOP transfer.
 - When the instrument is switched to Manual mode using Auto/Manual transfer.
 - When the instrument is switched to Remote mode using Remote/Local transfer.
 - When the instrument is switched to Cascade/Single.
 - When the memory area is changed.
 - 2: Aborted. Abnormal input.
 - When the Measured value (PV) has entered the Input error range.

[Input error range: Input error determination point high ≥ Measured value (PV),
 Input error determination point low ≤ Measured value (PV)]
 - When the Feedback resistance (FBR) input is broken
 - 3: Aborted. Timeout.

Output state has not been changed (ON to OFF, OFF to ON) for more than two hours.
 - 4: Aborted. Abnormal calculated values.

Error in the calculation of the values in Cascade control and Control with PV select.

- **Caution for using the Autotuning (AT)**

- When a temperature change (UP and/or Down) is 1 °C or less per minute during Autotuning (AT), Autotuning (AT) may not be finished normally. In that case, adjust the PID values manually. Manual setting of PID values may also be necessary if the set value is around the ambient temperature or is close to the maximum temperature achieved by the load.
- When the Output change rate limiter is used, you may not be able to obtain appropriate PID constants by Autotuning (AT).



For the manual setting of PID values, refer to **8.5 Setting PID Values Manually (P. 8-24)**.

● Requirements for Autotuning (AT) start

Start the Autotuning (AT) when all following conditions are satisfied:

To start Autotuning (AT), go to Operation transfer mode.

Operation state	RUN/STOP transfer	RUN
	Auto/Manual transfer	Auto mode
	Remote/Local transfer	Local mode
	Autotuning (AT) setting	PID control (State before starting AT)
Parameter setting	PID control of Input 1 or Position proportioning PID control	Input 1_Output limiter high [heat-side] > 0 % Input 1_Output limiter low [heat-side] < 100 %
	PID control of Input 2	Input 2_Output limiter high > 0 % Input 2_Output limiter low < 100 %
	Heat/Cool PID control	Input 1_Output limiter high [heat-side] > 0 % Input 1_Output limiter low [heat-side] < 100 % Input 1_Output limiter high [cool-side] > 0 % Input 1_Output limiter low [cool-side] < 100 %
Input value state	The Measured value (PV) is not inside the Input error range. [Input error range: Input error determination point (high) ≥ Measured value (PV), Input error determination point (low) ≤ Measured value (PV)]	

● Requirements for Autotuning (AT) cancellation

The Autotuning (AT) is immediately aborted and PID control starts when an error is detected in “AT/ST status monitor.” The PID values will be the same as before the Autotuning (AT) was activated.



For details, refer to “AT/ST status monitor” on the previous page.

The Autotuning (AT) may be aborted in the following cases except for the conditions in “AT/ST status monitor.”

- When the instrument is in FAIL state.
- When the power supply is disconnected.

■ Parameter setting

● Input 1_Autotuning (AT) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
1. <i>ATU</i>	<i>OFF</i> : PID control <i>ON</i> : Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to “ <i>OFF</i> .”	<i>OFF</i>

● Input 2_Autotuning (AT) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
2. <i>ATU</i>	<i>OFF</i> : PID control <i>ON</i> : Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to “ <i>OFF</i> .”	<i>OFF</i>



To display “Input 2_Autotuning (AT),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_AT bias [Setup Setting Mode: Setting group No. 53 (5n53)]

Parameter symbol	Data range	Factory set value
1. <i>ATb</i>	-(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: -(PV select input span) to +(PV select input span)) [Varies with the setting of the Decimal point position.]	0

● Input 1_AT bias [Setup Setting Mode: Setting group No. 54 (5n54)]

Parameter symbol	Data range	Factory set value
2. <i>ATb</i>	-(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	0



To display “Input 2_AT bias,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_AT remaining time monitor [Setup Setting Mode: Setting group No. 53 (5n53)]

Parameter symbol	Data range	Factory set value
1. <i>ATRM</i>	0 hours 00 minutes to 48 hours 00 minutes	—

● Input 2_AT remaining time monitor

[Setup Setting Mode: Setting group No. 54 (5_n54)]

Parameter symbol	Data range	Factory set value
2.ATRM	0 hours 00 minutes to 48 hours 00 minutes	—



To display “Input 2_AT remaining time monitor,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_AT/ST status monitor

[Setup Setting Mode: Setting group No. 53 (5_n53)]

Parameter symbol	Data range	Factory set value
1.AT/ST	0: AT/ST complete 1: AT running now 2: ST running now -1: Aborted. Setting changed. -2: Aborted. Abnormal input. -3: Aborted. Timeout. -4: Aborted. Abnormal calculated values.	—

● Input 2_AT/ST status monitor

[Setup Setting Mode: Setting group No. 54 (5_n54)]

Parameter symbol	Data range	Factory set value
2.AT/ST	0: AT/ST complete 1: AT running now 2: ST running now -1: Aborted. Setting changed. -2: Aborted. Abnormal input. -3: Aborted. Timeout. -4: Aborted. Abnormal calculated values.	—

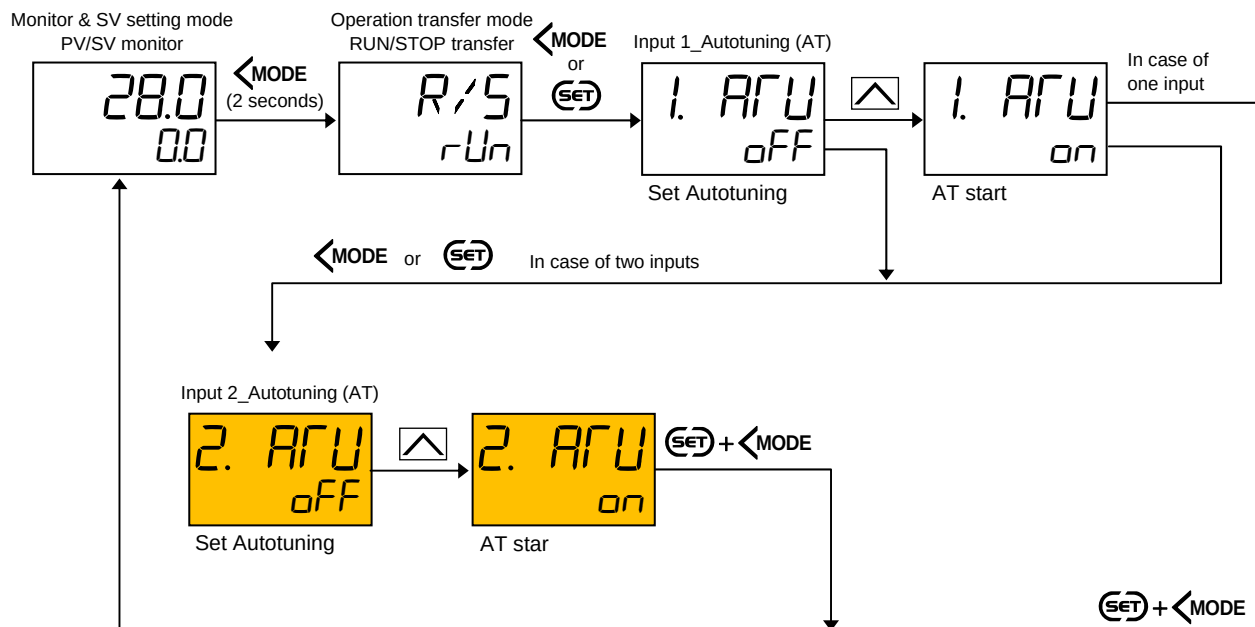


To display “Input 2_AT/ST status monitor,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

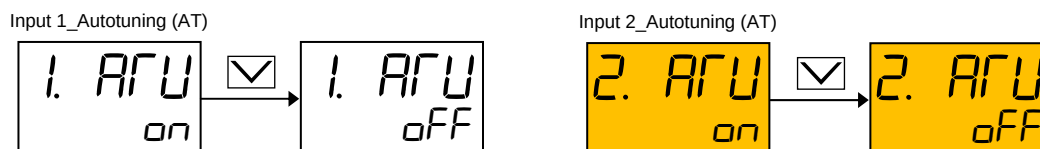
Setting procedure

Start the Autotuning (AT)

Before start AT, refer to **●Requirements for Autotuning (AT) start (P. 8-13)**. Make sure that all required conditions to start AT are satisfied.



Aborting the Autotuning (AT)



During Autotuning (AT), the AT lamp blinks.



When the Autotuning (AT) is finished, the control will automatically return to “oFF: PID control” and the AT lamp turns off.

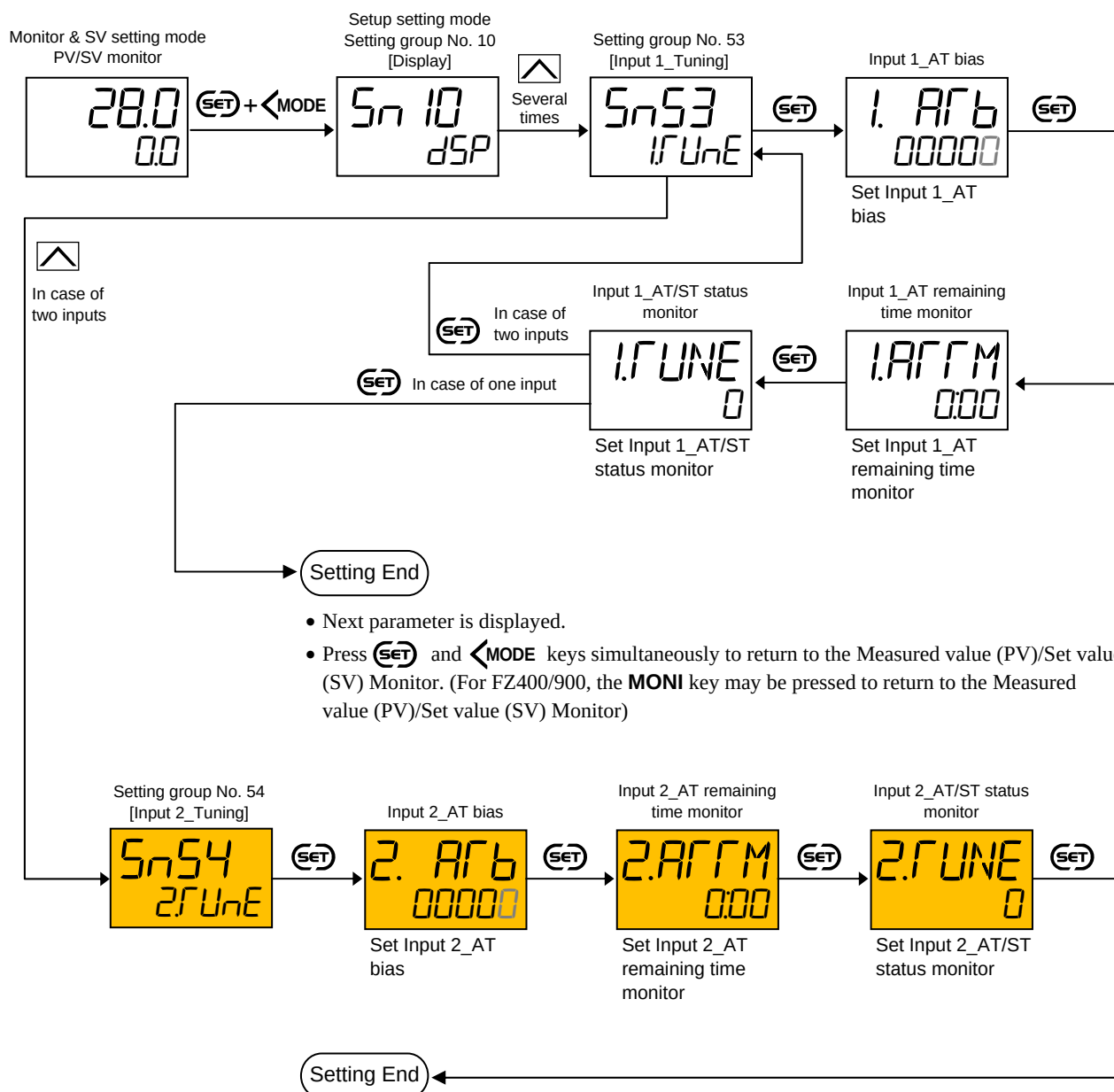


The Autotuning (AT) can be started by Digital input (DI). Refer to “**5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**” for more information on assigning Digital input (DI).



The Autotuning (AT) can be started on FZ400/900 by a key operation of the direct key (FUNC key). For details, refer to **10.8 Accessing some functions directly (FUNC key) (P. 10-35)**.

● Setting AT bias. Check the AT remaining time and AT/ST status.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

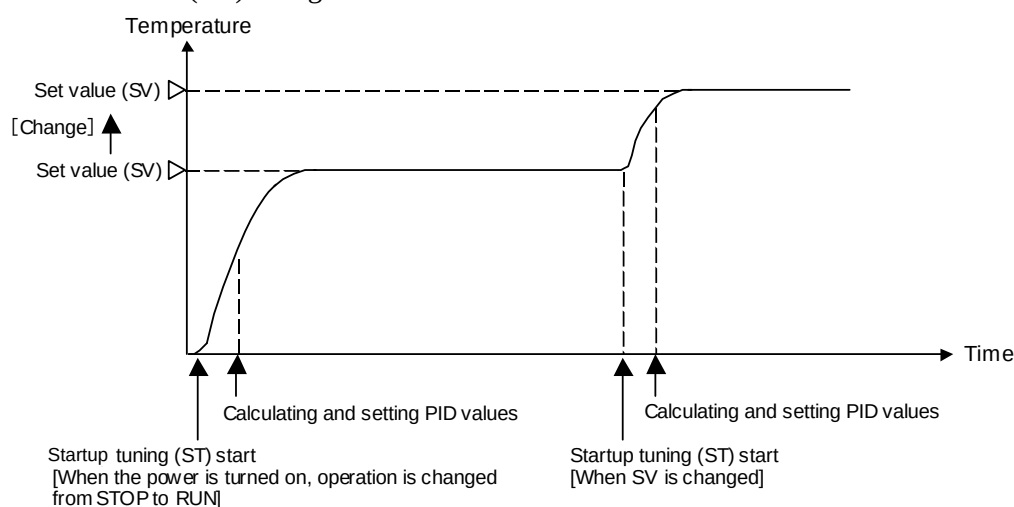
- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

8.4 Setting PID Values Automatically (Startup tuning)

Startup tuning (ST) is a function which automatically computes and sets the PID values (Proportional band: heat-side only) and Control loop break alarm (LBA) time from the response characteristics of the controlled system at power ON, transfer from STOP to RUN, and Set value (SV) change.

■ Description of function

- As simple autotuning, the PID values can be found in a short time without disturbing controllability for controlled systems with slow response at power ON. At the same time, Control loop break alarm (LBA) is calculated (about twice of the Integral time).
- For controlled systems which require different PID values for each temperature setting, the PID values can be found for each Set value (SV) change.



- The setting items related to Startup tuning (ST) are shown below. Set them according to the application used.

Setting item	Details		Setting mode
Start condition	0 (Factory set value)	When the power is turned on, operation is changed from STOP to RUN, or the Set value (SV) is changed.	Engineering mode
	1	When the power is turned on or operation is changed from STOP to RUN.	
	2	When the Set value (SV) is changed.	
Execution method	OFF (Factory set value)	ST unused	Operation transfer mode
	on1	Execute once	
	on2	Execute always	



When the Startup tuning (ST) function is activated in Heat/Cool PID control, only heat-side PID values are calculated and changed. The Startup tuning (ST) is not available when the temperature is downward. (PID values for cooling cannot be calculated)



The Startup tuning (ST) is not available in case of Position proportioning PID control.



If the Startup tuning (ST) is started when the ST start condition is at power on or switching from STOP to RUN, the control will start with Hot start 2 even if the setting is Hot start 1. For Hot/Cold start setting, refer to **8.19 Changing the Action at Power ON (Hot/Cold Start) (P. 8-124)**.

● AT/ST status monitor

Displays the execution status of the Startup tuning (ST).

- Displays “2” during the Startup tuning (ST).
- Displays “0” when the Startup tuning (ST) is completed.
- When the Startup tuning (ST) is aborted, the display shows –1 up to –4 depending on the reason of the abort.
 - 1: Aborted. Setting changed.
 - When the Startup tuning (ST) is disabled (σFF : ST unused).
 - When the PV bias, PV ratio, or PV digital filter is changed.
 - When the Output limiter high or low is changed.
 - When the instrument is switched to STOP by RUN/STOP transfer.
 - When the instrument is switched to Manual mode using Auto/Manual transfer.
 - When the instrument is switched to Remote mode using Remote/Local transfer.
 - When the setting of the Level PID action selection is “2: Switching by the Measured value (PV).”
 - 2: Aborted. Abnormal input.

When the Measured value (PV) has entered the Input error range.

[Input error range: Input error determination point high $\geq$ Measured value (PV),
Input error determination point low $\leq$ Measured value (PV)]
 - 3: Aborted. Timeout.

When the Startup tuning (ST) will not end approximately 100 minutes after it has been started.
 - 4: Aborted. Abnormal calculated values.
 - When the input was switched by Control with PV select.
 - Internal error of the Startup tuning (ST), etc.

● Caution for using the Startup tuning (ST)

- For Startup tuning (ST) at power ON or transfer from STOP to RUN, always set the heater power to ON simultaneously with the start of tuning or before the start of tuning.
- Start Startup tuning (ST) in the state in which the temperature differential of the Measured value (PV) and Set value (SV) at the start of Startup tuning (ST) is twice the Proportional band, or greater.
- If in Heat/Cool PID control, start activating the Startup tuning (ST) function under the condition of “Set value (SV) > Measured value (PV).” Only the PID values on the heat-side are automatically calculated but no PID values on the cool-side are changed. The PID values on the cooling side can be obtained by the Autotuning (AT).
- When the manipulated output value may be limited by the Output limiter setting, the optimum PID values may not be calculated by Startup tuning (ST).
- When setting the Output change rate limiter, the optimum PID values may not be computed by Startup tuning (ST).
- When setting the Setting change rate limiter, the optimum PID values are not obtained even when Startup tuning (ST) is executed at Set value (SV) change.
- When the Startup tuning (ST) is started at power on, priority is given to the Startup tuning (ST) and the Proactive function will not start.



● Requirements for Startup tuning (ST) start

Start the Startup tuning (ST) when all following conditions are satisfied:

Operation state	RUN/STOP transfer	RUN
	Auto/Manual transfer	Auto mode
	Remote/Local transfer	Local mode
	Autotuning (AT) setting	PID control
Parameter setting	Startup tuning (ST) is set to ON (Execute once, Execute always)	
	Output limiter high $\geq 0.1\%$, Output limiter low $\leq 99.9\%$ [Heat/Cool PID control type: Output limiter high (heat-side) $\geq 0.1\%$]	
	The Level PID action selection is done by other than "Switching by the Measured value (PV)."	
Input value state	The Measured value (PV) is not underscale or over-scale.	
	Input error determination point (high) $\geq$ Input value $\geq$ Input error determination point (low)	
	At Startup tuning (ST) at Set value (SV) change, the Measured value (PV) shall be stabilized.	
	Set value (SV) $>$ Measured value (PV) [Heat/Cool PID control]	
Output value state	At startup, output is changed and saturated at the Output limiter high or the Output limiter low [Heat/Cool PID control type: Output limiter high (heat-side)].	

● Requirements for Startup tuning (ST) cancellation

The Startup tuning (ST) will be immediately aborted if any in the cancel condition in the AT/ST status monitor is met. The PID values will be the same as before the Startup tuning (ST) was activated.



For details, refer to "AT/ST status monitor" on the previous page.

The Startup tuning (ST) may be aborted in the following cases except for the conditions in "AT/ST status monitor."

- Autotuning (AT) has been started.
- When the instrument is in FAIL state.
- When the power supply is disconnected.

■ Parameter setting

● Input 1_Startup tuning (ST) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
1. STU	OFF: ST unused ON 1: Execute once * ON 2: Execute always * When the ST is finished, the control will automatically return to "OFF."	OFF



To display "Input 1_Startup tuning (ST)," you need to specify the control type other than "Position proportioning PID control" at the time of order.

● Input 2_Startup tuning (ST) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
2. STU	off: ST unused on 1: Execute once * on 2: Execute always * When the ST is finished, the control will automatically return to "off."	off



To display "Input 2_Startup tuning (ST)," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_AT/ST status monitor [Setup Setting Mode: Setting group No. 53 (5n53)]

Parameter symbol	Data range	Factory set value
1. TUNE	0: AT/ST complete 1: AT running now 2: ST running now -1: Aborted. Setting changed. -2: Aborted. Abnormal input. -3: Aborted. Timeout. -4: Aborted. Abnormal calculated values.	—

● Input 2_AT/ST status monitor [Setup Setting Mode: Setting group No. 54 (5n54)]

Parameter symbol	Data range	Factory set value
2. TUNE	0: AT/ST complete 1: AT running now 2: ST running now -1: Aborted. Setting changed. -2: Aborted. Abnormal input. -3: Aborted. Timeout. -4: Aborted. Abnormal calculated values.	—



To display "Input 2_AT/ST status monitor," specify "Measured input 2" at the time of order, AND "Select function for input 2" (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

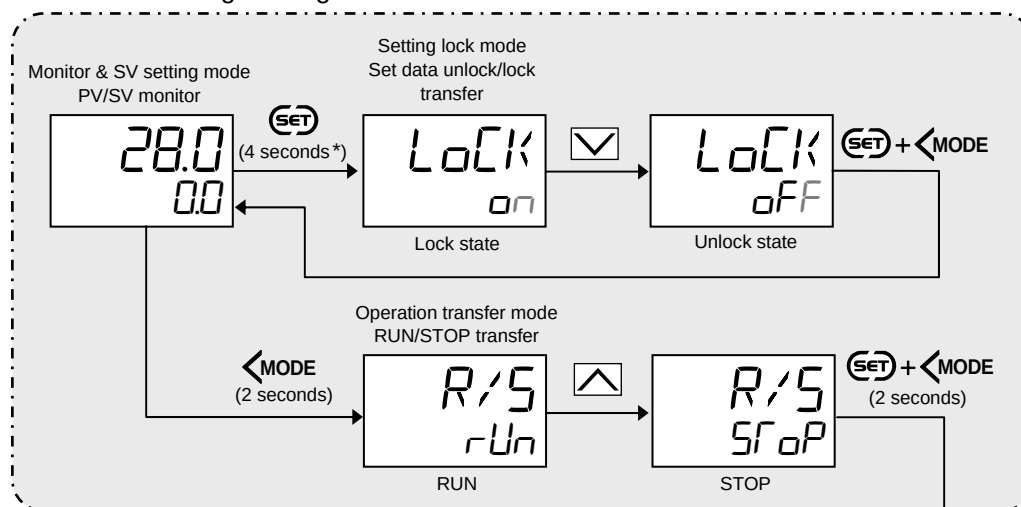
● ST start condition [Engineering Mode: Function block No. 50 (Fn50)]

Parameter symbol	Data range	Factory set value
STS	0: Activate the Startup tuning (ST) function when the power is turned on; when transferred from STOP to RUN; or when the Set value (SV) is changed. 1: Activate the Startup tuning (ST) function when the power is turned on; or when transferred from STOP to RUN. 2: Activate the Startup tuning (ST) function when the Set value (SV) is changed.	0

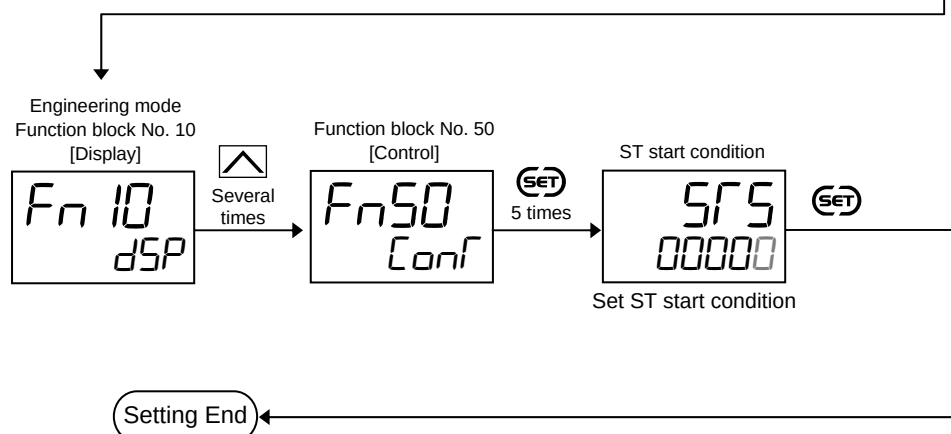
Setting procedure

Set the ST start condition

To enter the Engineering mode

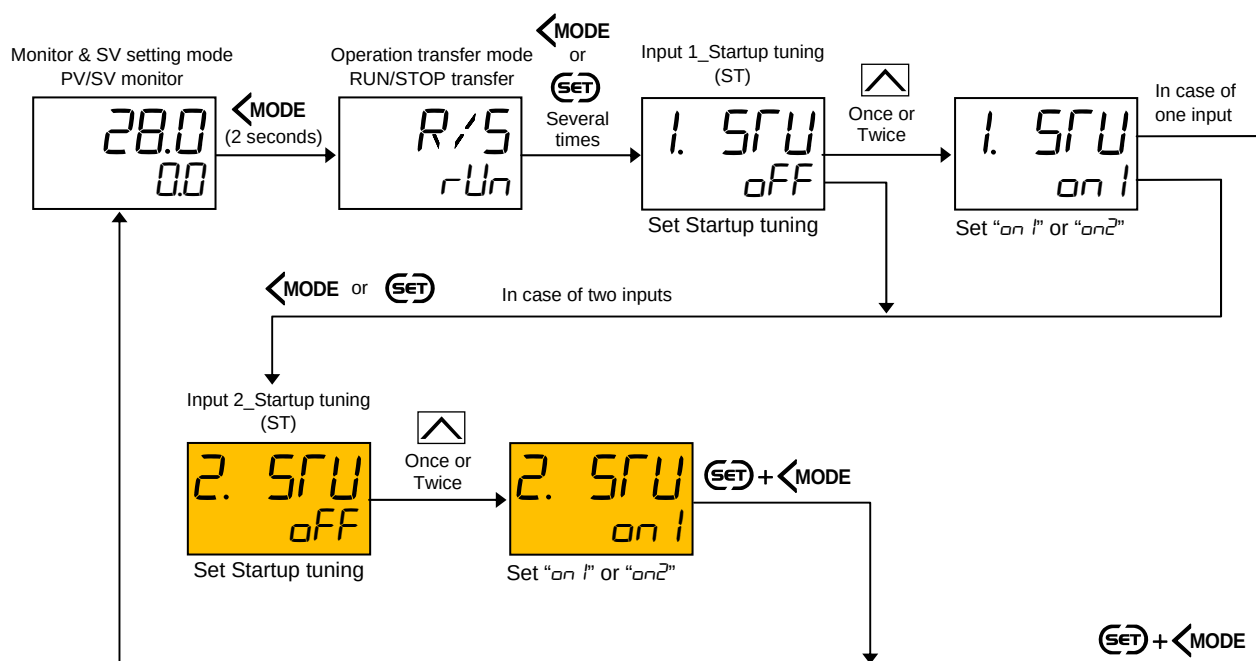


* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

● Set the Startup tuning (ST)



● Start the Startup tuning (ST)

Before start ST, refer to ● **Requirements for Startup tuning (AT) start (P. 8-20)**. Make sure that all required conditions to start ST are satisfied.

Startup tuning can be started in the following manner. (started in the manner that satisfies the starting condition)

- Power off the controller once and power on again.
- Stop the control once (STOP) and start the control again (RUN).
- Change the Set value (SV).



The AT lamp lights during the Startup tuning (ST).



After completion of the Startup tuning (ST), the AT lamp goes off.

When the Startup tuning setting is “on 1: Execute once,” the setting will go back to “off: ST unused.”

8.5 Setting PID Values Manually

To perform PID control, PID parameters shown below need to be set up. These PID parameters can be automatically set using Autotuning (AT) or Startup tuning (ST). Manual adjustment is also available.

- Proportional band (P)
- Integral time (I)
- Derivative time (D)

For Autotuning (AT) function, refer to **8.3 Setting PID Values Automatically (Autotuning) (P. 8-11)**. For Startup tuning (ST) function, refer to **8.4 Setting PID Values Automatically (Startup tuning) (P. 8-18)**.

■ Description of function

Critical parameters of PID control such as Proportional action (Proportional band: P), Integral action (Integral time: I), and Derivative action (Derivative time: D) are explained below.

Note that this explanation is based on the reverse action (heating control). With the direct action (cooling control), the output increases as the measured value increases.

● Proportional action

In the ON/OFF control action, the manipulated output is turned on and off repeatedly, resulting in oscillatory control.

To eliminate this oscillation, control is performed by producing Manipulated output value (MV) proportional to the deviation between the Set value (SV) and the Measured value (PV).

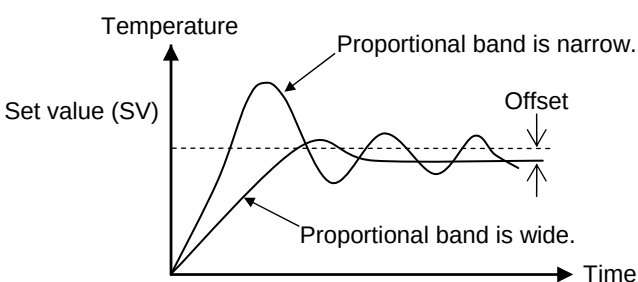
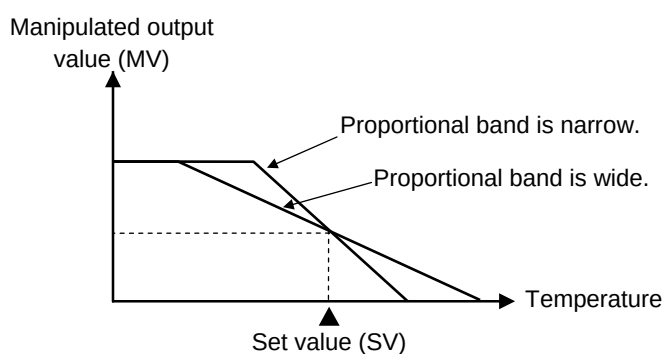
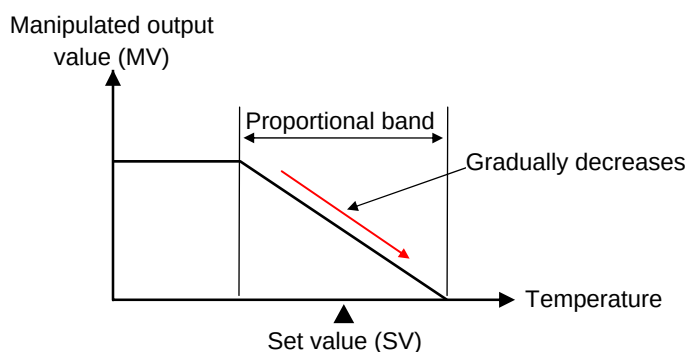
Technically a zone called “Proportional band” is established around the Set value (SV) and when the Measured value (PV) enters the proportional band, the Manipulated output value (MV) is gradually reduced.

The measured value (PV) stabilizes within the Proportional band at the equilibrium point, but in many cases the stabilized temperature does not match the Set value (SV).

This deviation between the Set value (SV) and the stabilized temperature is called “Offset.”

With a narrower proportional band the control result becomes closer to that of the ON/OFF control (oscillatory).

With a wider proportional band the output is gradually reduced to stabilize quicker, however, often with a larger offset.



For ON/OFF action, refer to **8.6 Controlling with ON/OFF Action (P. 8-31)**.

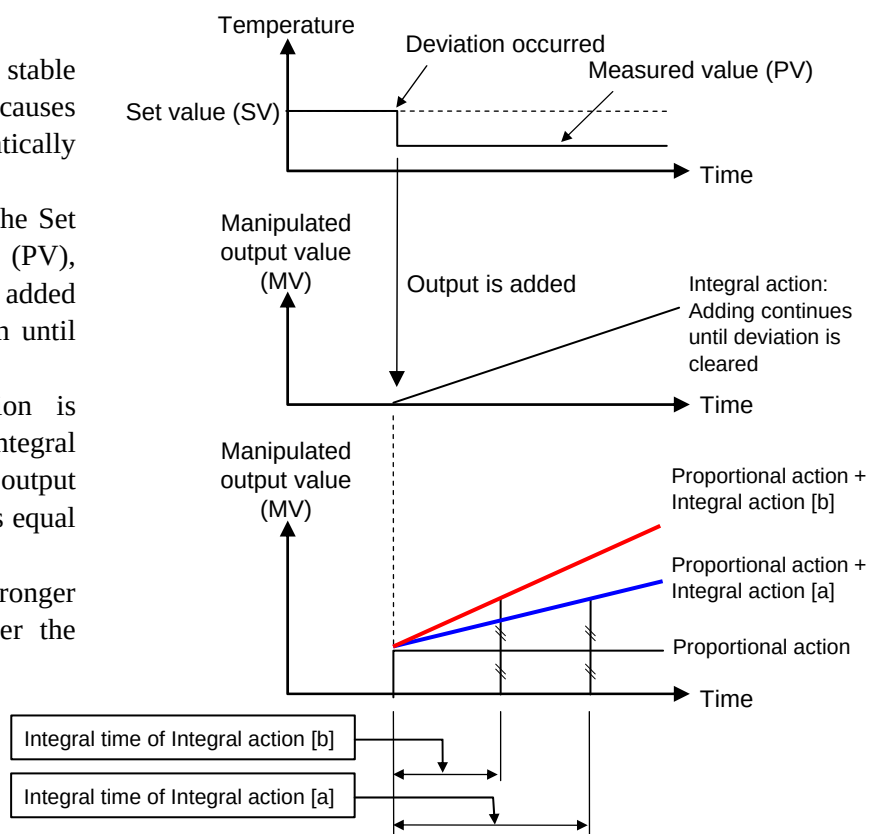
● Integral action

Proportional action provides more stable control than ON/OFF control, but causes offset. This offset can be automatically corrected by Integral action.

As long as deviation exists between the Set value (SV) and the Measured value (PV), the Manipulated output value (MV) is added according to the size of the deviation until no deviation exists.

The strength of the Integral action is expressed in the Integral time. The Integral time is the time till the Manipulated output value (MV) by the Integral action gets equal to that by the Proportional action.

The shorter the Integral time, the stronger the integral effect is, and the longer the weaker.

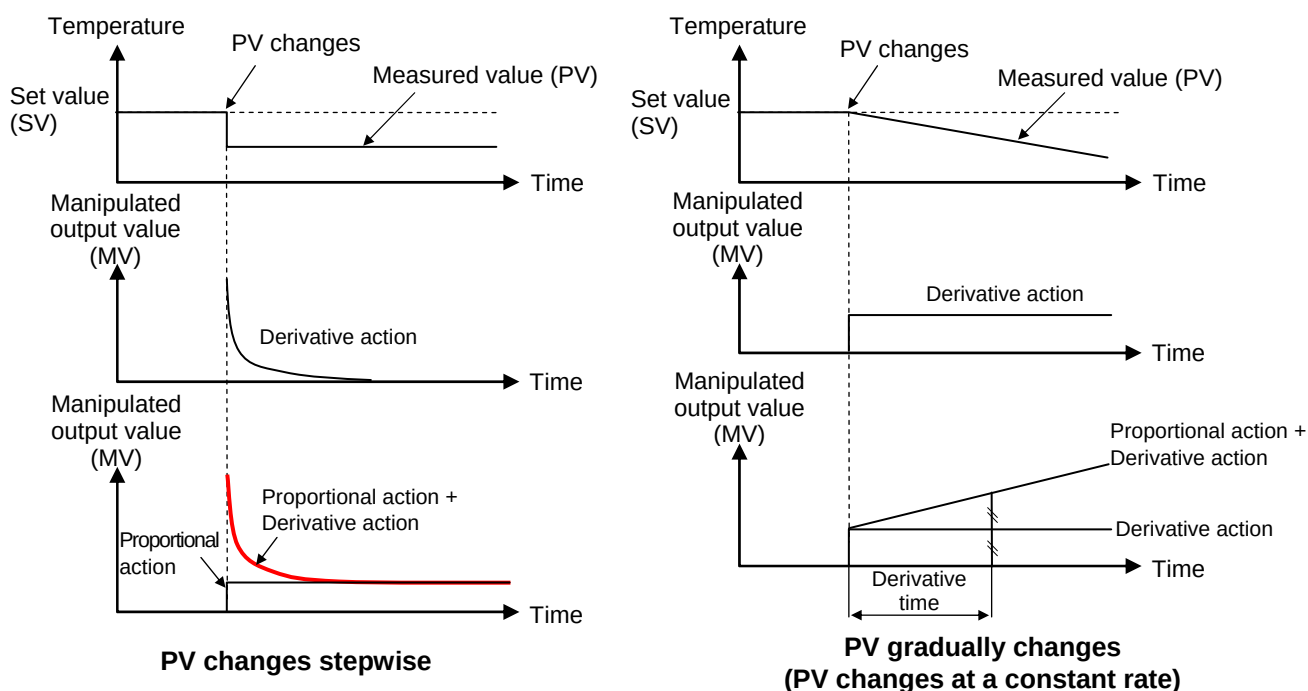


● Derivative action

The Derivative action allows the Manipulated output value (MV) proportional to the changing rate (speed) of the Measured value (PV) to be produced to prevent a fluctuation of the Measured value (PV) before it happens. The strength of the Derivative action is expressed in the Derivative time. The Derivative time is the time until the Manipulated output value (MV) by the Proportional action gets equal to the Manipulated output value (MV) by the Derivative action when the Measured value (PV) changes at a constant rate.

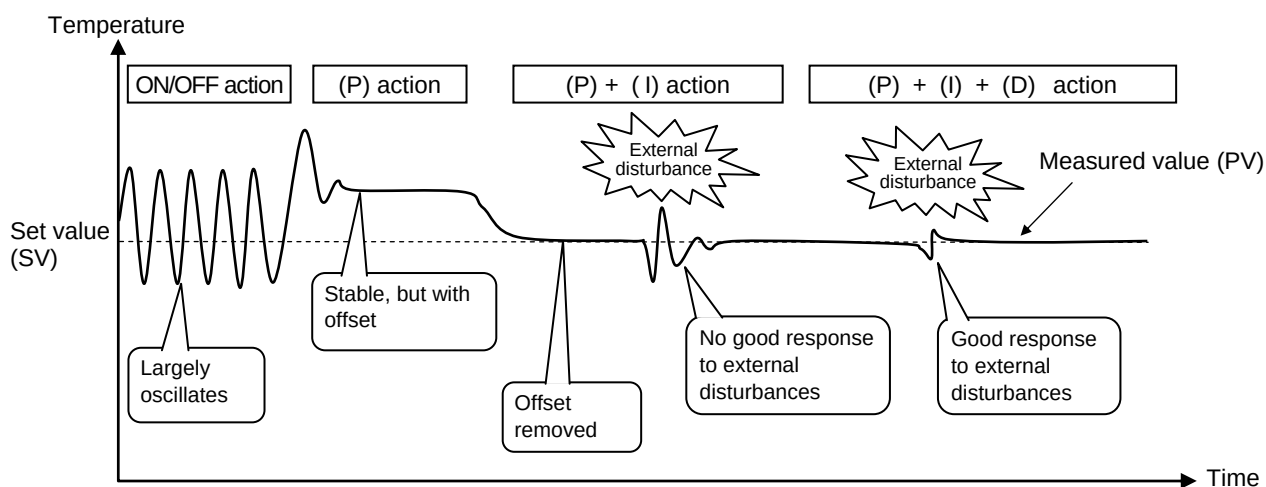
The longer the Derivative time is, the stronger the Derivative effect is, and the shorter the weaker.

The Derivative effect, if set too strong, produces large Manipulated output (MV) against a small change of the Measured value (PV), thus causing hunting and resulting in unstable control.



● Outline of effect of PID

The following figure shows control behaviors under various control actions; ON/OFF control, proportional control (P), Proportional + Integral action (PI action), and Proportional + Integral + Derivative actions (PID control).



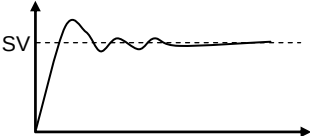
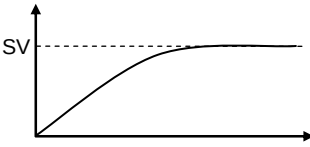
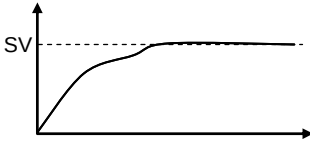
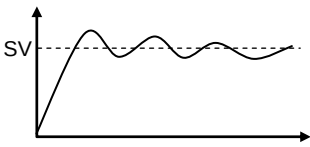
● Adjusting PID parameters (Applications controlled with PID control)

In some applications PID values calculated and obtained through Autotuning (AT) and Startup tuning (ST) may not be appropriate. In such a case the PID values need to be adjusted manually.

Attempt this adjustment referring to the following.



The sample here shows a general tendency. Control results depend on the controlled object and combinations of control constants.

	Made larger (wider, longer)	Made smaller (narrower, shorter)
Proportional band (P) adjusted	Overshoot may occur, but temperature reaches the Set value (SV) faster. Setting the value too small may result in hunting (oscillation of Manipulated output (MV)). 	Overshoot is suppressed, but it takes time until the temperature stabilizes. 
Integral time (I) and Derivative time (D) adjusted	Overshoot, undershoot and hunting are suppressed. Setting the value too long may need longer time till the Set value (SV) is reached. 	Starts up quickly. Setting the value too short may cause overshoot, undershoot or hunting. 

■ Parameter setting

● Input 1_Proportional band [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
$1. \quad P$	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

● Input 2_Proportional band

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
$2. \quad P$	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0



To display “Input 2_Proportional band,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 1_Proportional band [cool-side]

[Parameter Setting Mode: Parameter group No. 56 (P_{n56})]

Parameter symbol	Data range	Factory set value
$1. \quad P_c$	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.1 to 1000.0 % of PV select input span)	TC/RTD inputs: 30 V/I inputs: 3.0



To display “Input 1_Proportional band [cool-side],” you need to specify “Heat/Cool PID control” at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Integral time [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
I I	PID control or Heat/Cool PID control: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control: 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240



To display “Input 1_Integral time [heat-side],” you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 2_Integral time

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2 I	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240



To display “Input 2_Integral time,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band in the same memory area.

● Input 1_Integral time [cool-side]

[Parameter Setting Mode: Parameter group No. 56 (P_{n56})]

Parameter symbol	Data range	Factory set value
I I C	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240



To display “Input 1_Integral time [cool-side],” you need to specify “Heat/Cool PID control” at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Derivative time [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
I d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60



To display “Input 1_Derivative time [heat-side],” you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 2_Derivative time

[Parameter Setting Mode: Parameter group No. 52 (Pn52)]

Parameter symbol	Data range	Factory set value
2. d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60



To display “Input 2_Derivative time,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band in the same memory area.

● Input 1_Derivative time [cool-side]

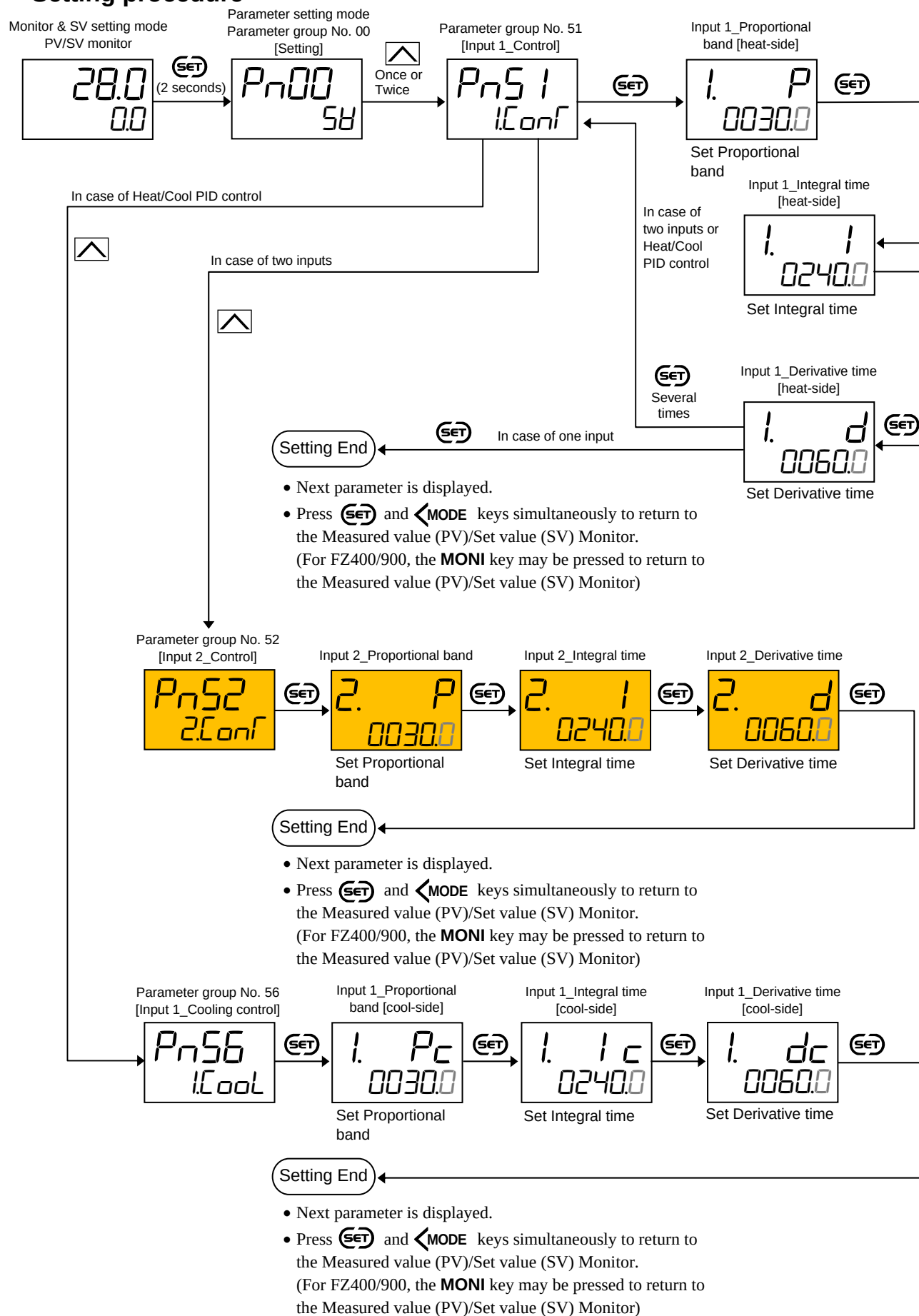
[Parameter Setting Mode: Parameter group No. 56 (Pn56)]

Parameter symbol	Data range	Factory set value
1. dc	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60



To display “Input 1_Derivative time [cool-side],” you need to specify “Heat/Cool PID control” at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

Setting procedure



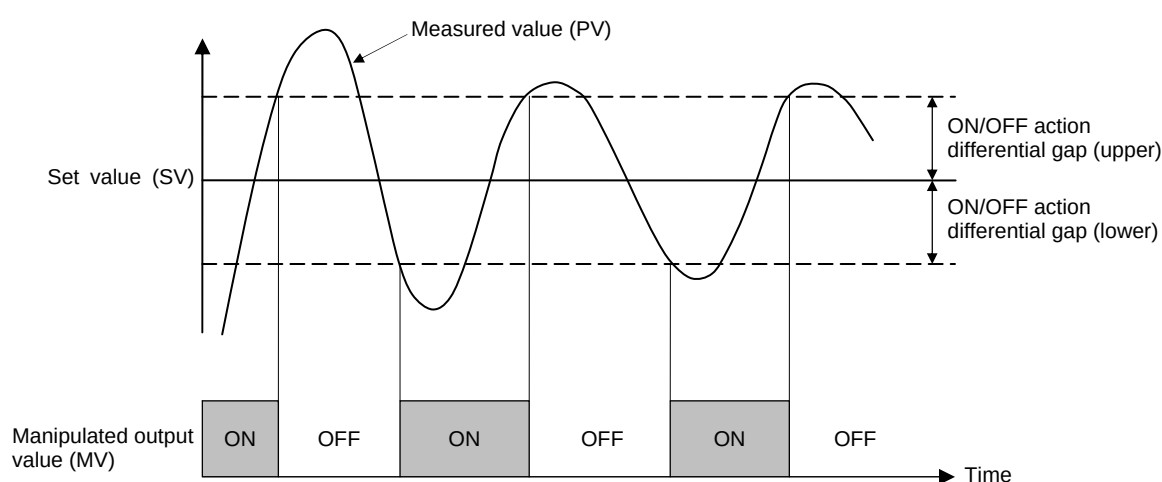
8.6 Controlling with ON/OFF Action

In ON/OFF control, the Manipulated output value (MV) is turned on or off depending on the Measured value (PV) whether it is above or below the Set value (SV).

■ Description of function

When the Measured value (PV) is above the Set value (SV), the Manipulated output value (MV) is turned OFF, and when the Measured value (PV) is below the Set value (SV), the Manipulated output value (MV) is turned ON. **To use the ON/OFF control, set the Proportional band [heat-side] to “0.”**

In the ON/OFF control the output is turned on and off around the Set value (SV) and the output may be turned on and off too frequently for a small change of temperature. This is called “chattering” and may reduce the life of the output relay. To prevent this, ON/OFF differential gap should be properly set.



This explanation applies to “Reverse action” (heating control).



The value of the ON/OFF action differential gap is a deviation from the Set value (SV). This gap can be set individually above and below the Set value (SV). For example, in case of a Reverse action (heating control), assuming that the Set value (SV) is 100 °C with a ON/OFF action differential gap (upper) of 5 °C, the Manipulated output value (MV) turns off at 105 °C.



In case of ON/OFF action, the Output changing rate limiter is deactivated.

● Cooling control with ON/OFF action

The process of Input 1 can be controlled with the ON/OFF action for the Cooling side (direct action) by setting zero to the Input 1_Proportional band [heat-side] after “0: PID control (direct action)” is set at “Input 1_Control action” in Function block No. 51 in the Engineering mode.

The process of Input 2 can be controlled with the ON/OFF action for the Cooling side (direct action) by setting zero to the Input 2_Proportional band after “0: PID control (direct action)” is set at “Input 2_Control action” in Function block No. 52 in the Engineering mode.

The action is the same as above, but the ON/OFF position of the Manipulated output value (MV) becomes opposite. The ON/OFF action differential gap can be set similarly.

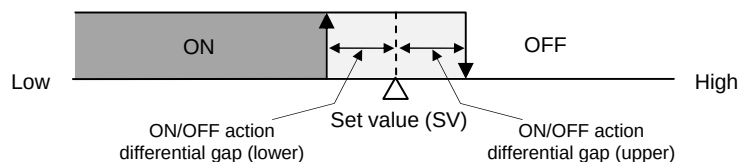
● Heat/Cool control with ON/OFF action

Go to “Input 1_Control action,” Function block No.51 in the Engineering mode.

Select any one from “2: Heat/Cool PID control [water cooling],” “3: Heat/Cool PID control [air cooling],” or “4: Heat/Cool PID control [Cooling linear type]” and set “0” at the Input 1_Proportional band [heat-side].

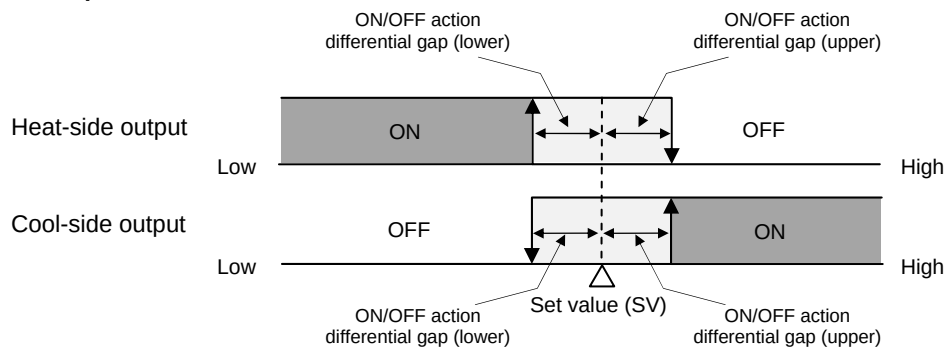
Then, the controller starts Heat/Cool control with ON/OFF action.

Manipulated output for ON/OFF action [at Heating control]

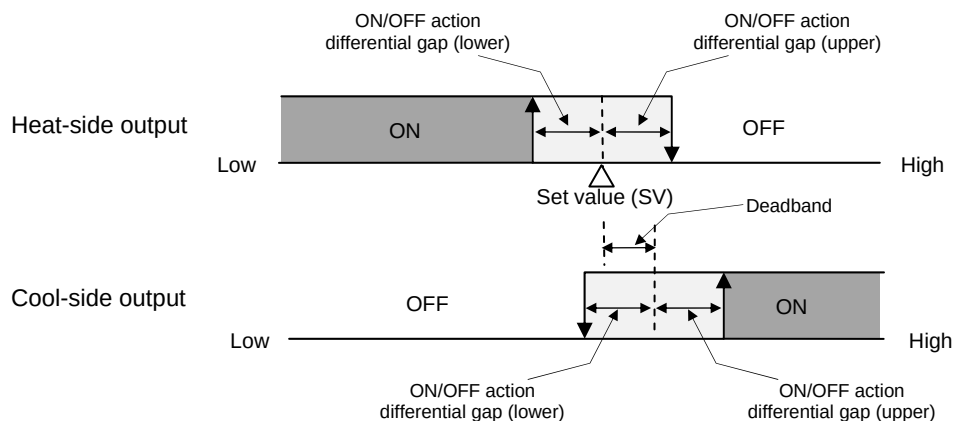


Manipulated output for ON/OFF action [at Heat/Cool control]

● Overlap/Deadband = 0



● Overlap/Deadband > 0



■ Parameter setting

● Input 1_Proportional band [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
1. P	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

● Input 2_Proportional band

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2. P	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0



To display “Input 2_Proportional band,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 1_ON/OFF action differential gap (upper)

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
1. oHH	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1



To display “Input 1_ON/OFF action differential gap (upper),” zero (“0”) must be entered at Input 1_Proportional band [heat-side].”

● Input 1_ON/OFF action differential gap (lower)

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
1. oHL	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1



To display “Input 1_ON/OFF action differential gap (lower),” zero (“0”) must be entered at Input 1_Proportional band [heat-side].”

● Input 2_ON/OFF action differential gap (upper)

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2. oHH	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1



To display “Input 2_ON/OFF action differential gap (upper),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. You also need to enter zero (“0”) at the Input 2_Proportional band.

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

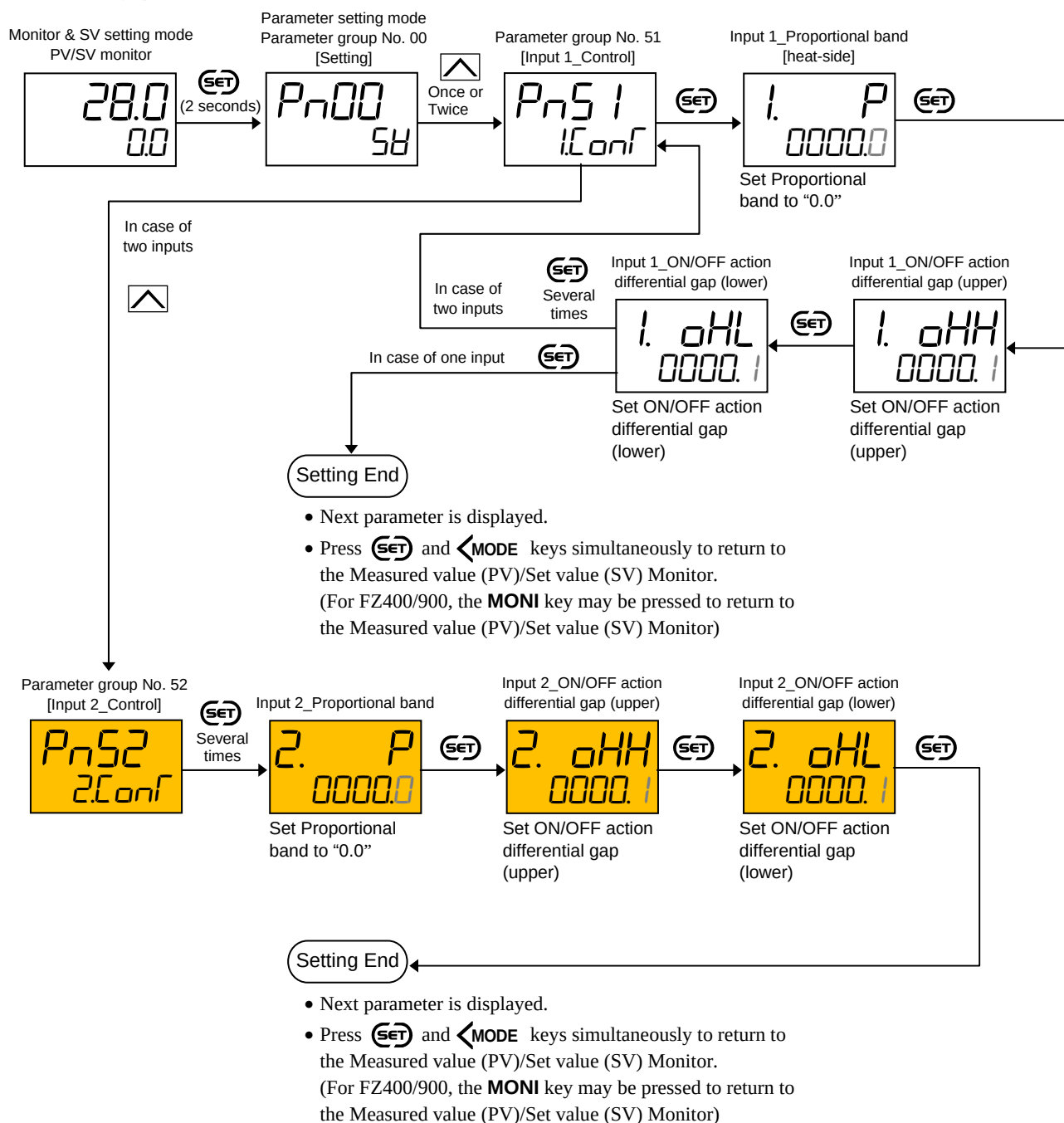
[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2. oHL	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1



To display “Input 2_ON/OFF action differential gap (lower),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. You also need to enter zero (“0”) at the Input 2_Proportional band.

Setting procedure



8.7 Controlling with Heat/Cool Control

With Heat/Cool PID control method, heat-side and cool-side can be controlled by a controller. For example, this is effective when cooling control is required in extruder cylinder temperature control.

■ Description of function

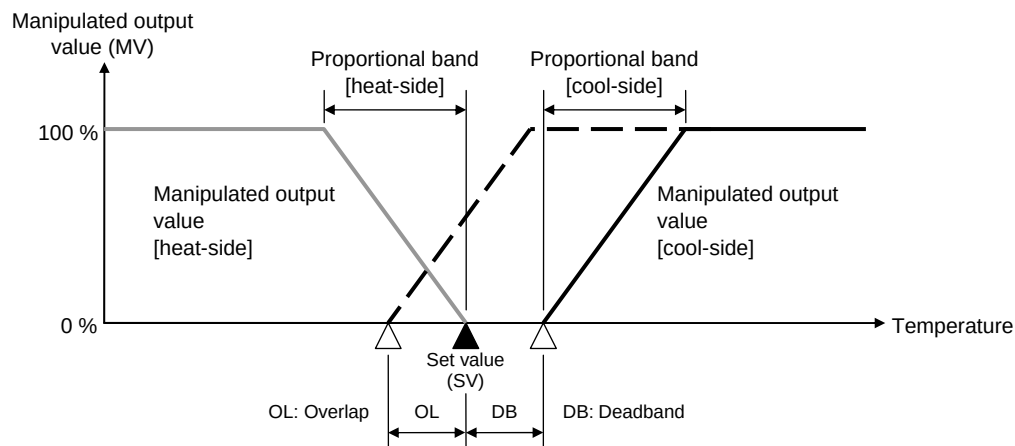
● Cool control type

The control on the heat-side is the same as the standard PID control. The control on the cool-side can be selected from a few types according to the controlled object.

- Water cooling/Air cooling: The algorithm assuming plastic molding machine Heat/Cool control is employed. Even in equipment provided with a cooling mechanism having nonlinear characteristics, it responds quickly to attain the characteristic responding to the set value with small overshooting.
- Cooling linear type: The algorithm assuming applications without nonlinear cooling capability is employed.

● Overlap/Deadband

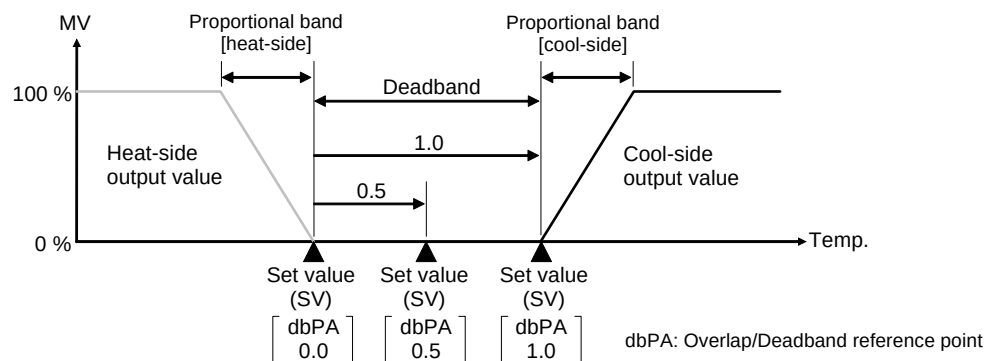
Heat/Cool PID control has a proportional band individually on each side of the heating and the cooling. With the Set value (SV) as a reference point, setting the Overlap/Deadband below the Set value (SV) [setting on the negative side] generates an overlap of the heating and the cooling proportional bands. Setting this parameter above the Set value (SV) [setting on the positive side] generates a deadband.



[Overlap/Deadband reference point]

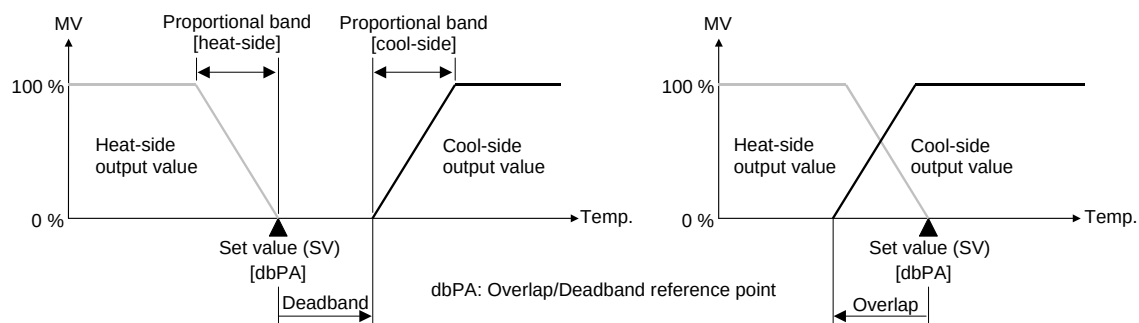
Each Set value (SV) for the Heat/Cool PID control becomes the Overlap/Deadband reference point.

- When setting 0.0, Overlap/Deadband reference point is at 0 % of the output at Proportional band [heat-side].
- When setting 0.5, Overlap/Deadband reference point is at the midpoint of the Overlap/Deadband.
- When setting 1.0, Overlap/Deadband reference point is at 0 % of the output at Proportional band [cool-side].

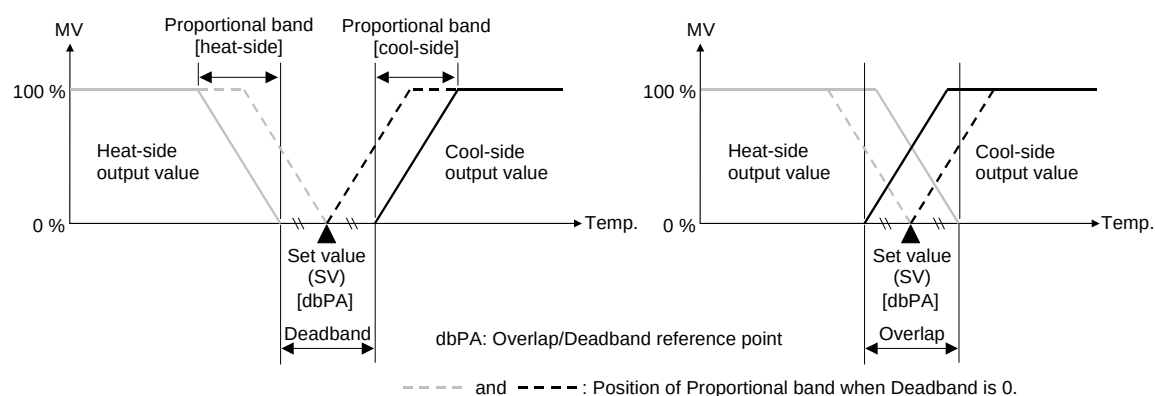


Example: Difference in Overlap/Deadband reference point

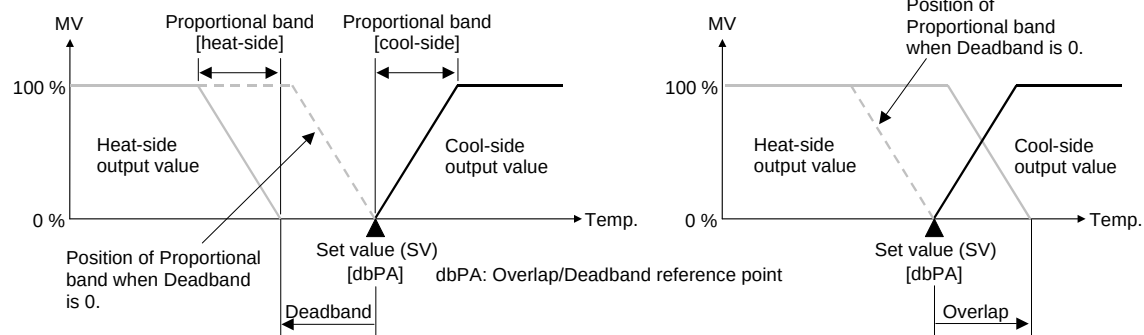
[Overlap/Deadband reference point: 0.0]



[Overlap/Deadband reference point: 0.5]



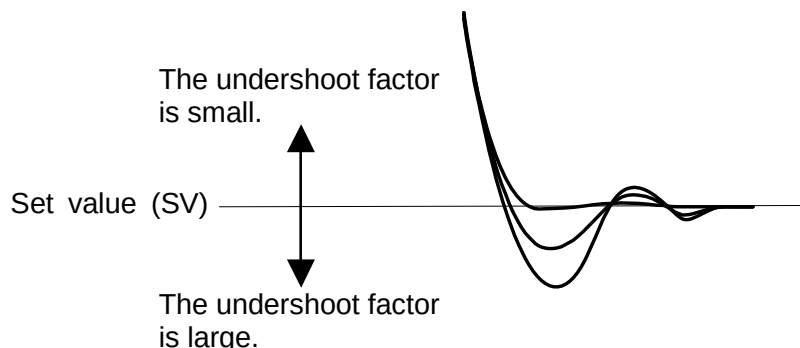
[Overlap/Deadband reference point: 1.0]



To change Deadband when the Overlap/Deadband reference point is 0.5, the Proportional band on heat-side and cool-side shift equidistantly to the midpoint of the Overlap/Deadband.

● Undershoot suppression factor

The Undershoot suppression function suppresses the undershoot that occurs when the Set value (SV) is lowered due to the special cooling characteristic (cooling nonlinear characteristic) of plastic molding machines. The undershoot suppression effect increases as a smaller value is set for the Undershoot suppression factor.



NOTE

If the Undershoot suppression factor is set too small, the undershoot function acts excessively and prevents the Measured value (PV) from reaching the Set value (SV). As a result, the PV stabilizes at an offset or approaches the set value very slowly, preventing normal control. In this event, change the setting for the Undershoot suppression factor to a slightly higher value.

■ Parameter setting

● Input 1_Proportional band [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (P_{n5} I)]

Parameter symbol	Data range	Factory set value
$I.$ P	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

● Input 1_Proportional band [cool-side]

[Parameter Setting Mode: Parameter group No. 56 (P_{n56})]

Parameter symbol	Data range	Factory set value
I. P_c	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.1 to 1000.0 % of PV select input span)	TC/RTD inputs: 30 V/I inputs: 3.0



To display “Input 1_Proportional band [cool-side],” you need to specify “Heat/Cool PID control” at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Integral time [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
I. I	PID control or Heat/Cool PID control: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control: 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240



To display “Input 1_Integral time [heat-side],” you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Integral time [cool-side]

[Parameter Setting Mode: Parameter group No. 56 (P_{n56})]

Parameter symbol	Data range	Factory set value
I. I_c	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240



To display “Input 1_Integral time [cool-side],” you need to specify “Heat/Cool PID control” at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.



● Input 1_Derivative time [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
$I.$ d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60



To display “Input 1_Derivative time [heat-side],” you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Derivative time [cool-side]

[Parameter Setting Mode: Parameter group No. 56 (P_{n56})]

Parameter symbol	Data range	Factory set value
$I.$ dc	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60



To display “Input 1_Derivative time [cool-side],” you need to specify “Heat/Cool PID control” at the time of order, AND to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Overlap/Deadband

[Parameter Setting Mode: Parameter group No. 56 (P_{n56})]

Parameter symbol	Data range	Factory set value
$I.$ db	TC/RTD inputs: –(Input 1_Input span)to +(Input 1_Input span) (When Control with PV select: –(PV select input span) to +(PV select input span)) (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: –100.0 to +100.0 % of Input 1_Input span (When Control with PV select: –100.0 to +100.0 % of PV select input span) Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0



To display “Input 1_Overlap/Deadband,” you need to specify “Heat/Cool PID control” at the time of order, or “Input 1_Control action” (Function block No. 51 in Engineering mode) must be set to Heat/Cool PID control.

● Input 1_Control action

[Engineering Mode: Function block No. 51 (Fn51)]

Parameter symbol	Data range	Factory set value
1. 05	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling linear type] 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action) For cascade control, only 0 or 1 is selectable.	Control action specified at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Input 1_Control action is changed.

● Undershoot suppression factor

[Engineering Mode: Function block No. 56 (Fn56)]

Parameter symbol	Data range	Factory set value
US	0.000 to 1.000	Water cooling: 0.100 Air cooling: 0.250 Cooling linear: 1.000



To display “Undershoot suppression factor,” you need to specify “Heat/Cool PID control” at the time of order, or “Input 1_Control action” (Function block No. 51 in Engineering mode) must be set to Heat/Cool PID control.

● Overlap/Deadband reference point

[Engineering Mode: Function block No. 56 (Fn56)]

Parameter symbol	Data range	Factory set value
dbPR	0.0 to 1.0	0.0

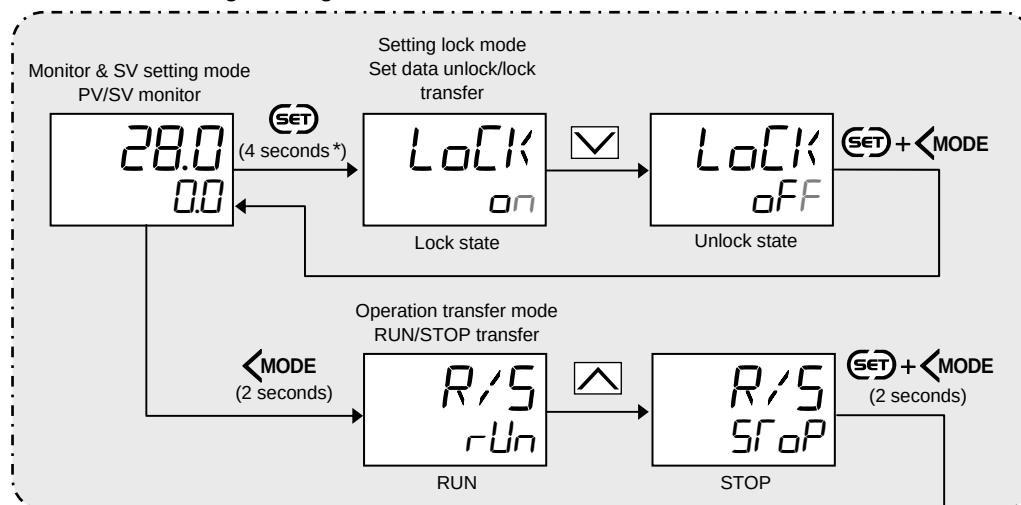


To display “Overlap/Deadband reference point,” you need to specify “Heat/Cool PID control” at the time of order, or “Input 1_Control action” (Function block No. 51 in Engineering mode) must be set to Heat/Cool PID control.

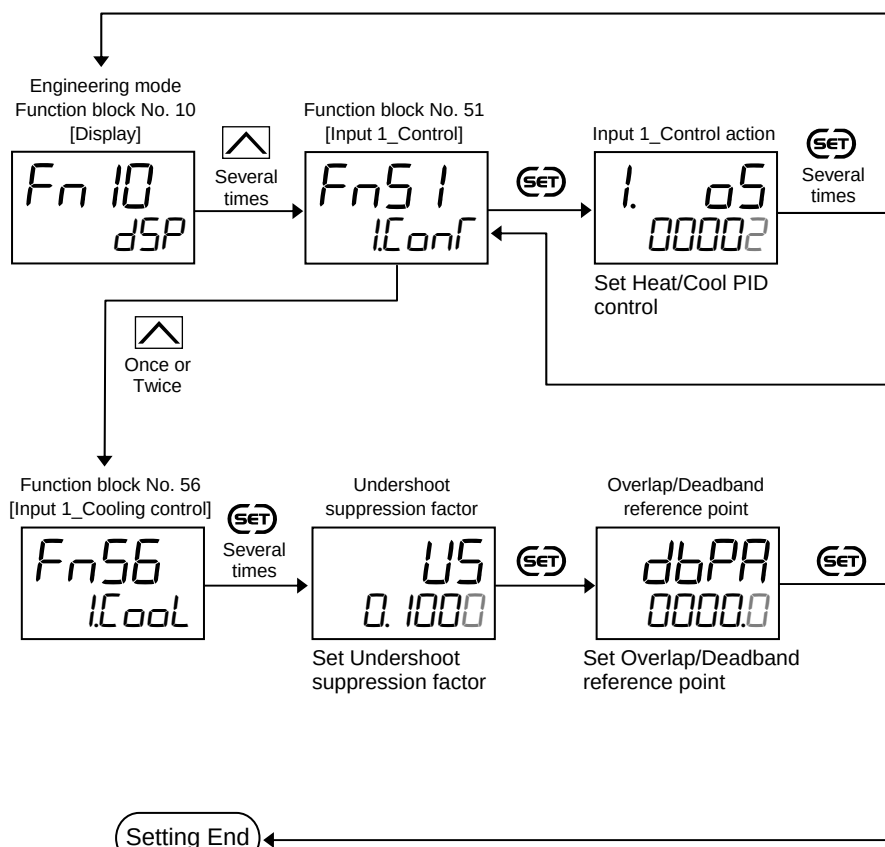
Setting procedure

Selecting Heat/Cool PID control

To enter the Engineering mode

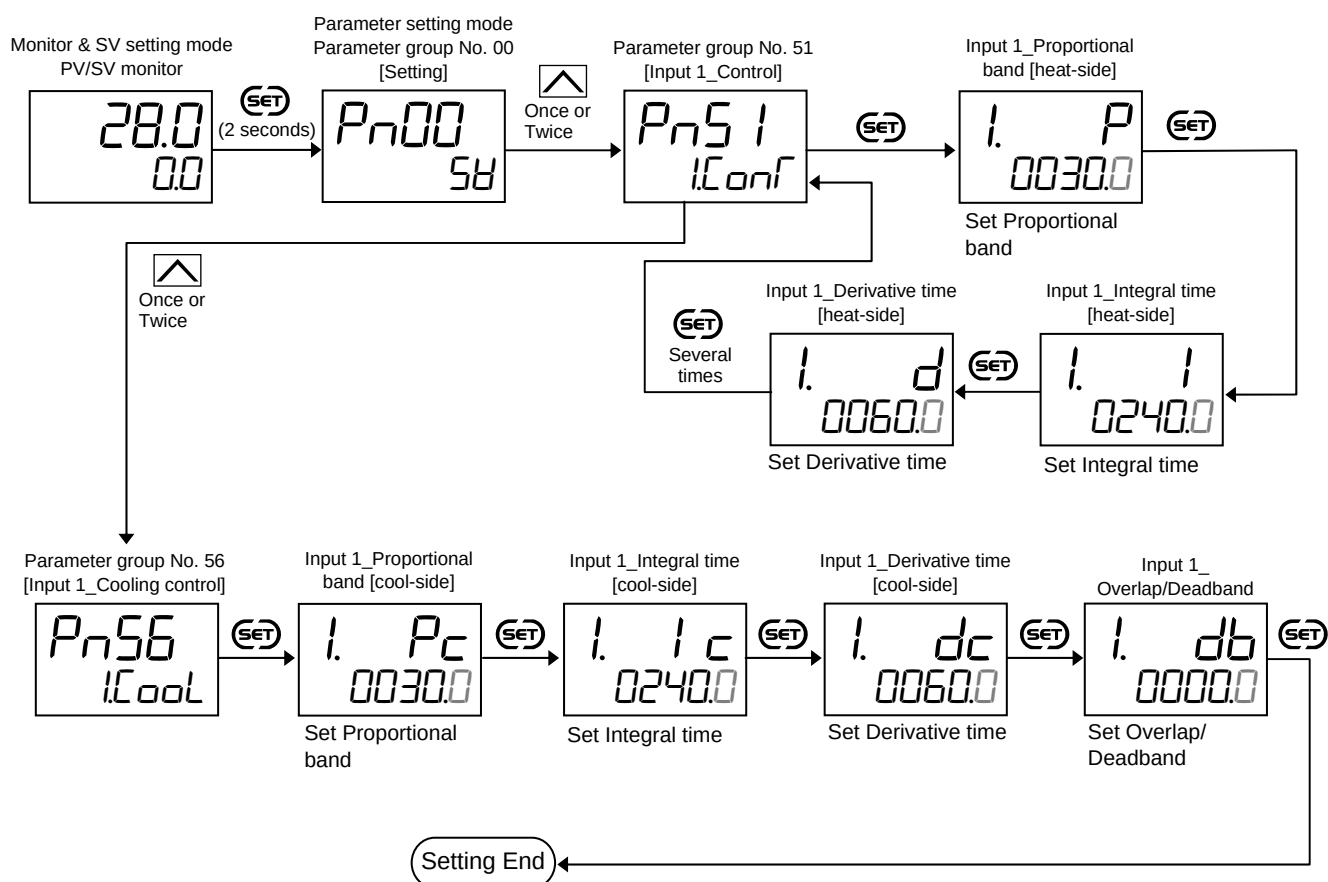


* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

● Setting parameters for Heat/Cool PID control



- Next parameter is displayed.
- Press (SET) and <MODE> keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the MONI key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)



The Parameters in Heat/Cool PID control can be calculated also in Autotuning (AT).
(Overlap/Deadband is excluded)

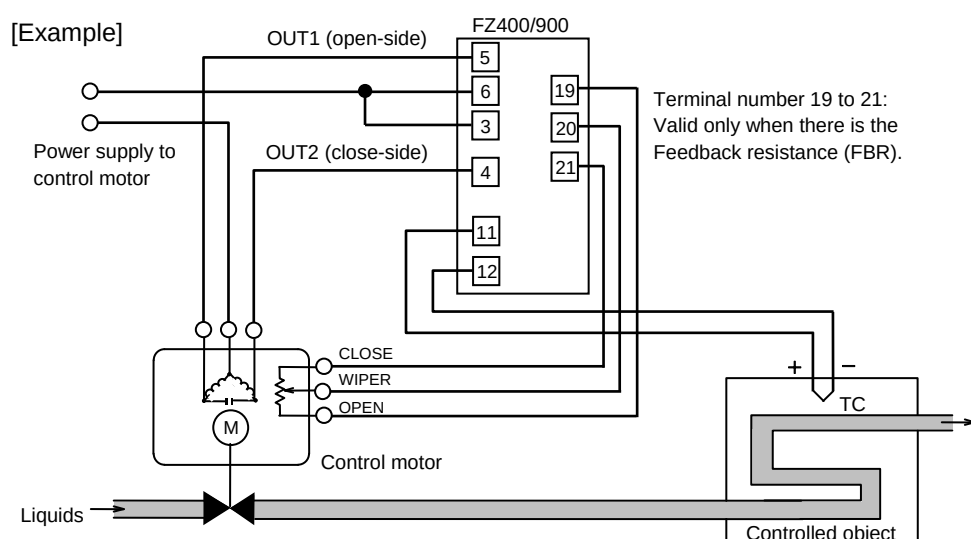
For Autotuning (AT), refer to **8.3 Setting PID Values Automatically (Autotuning) (P. 8-11)**.

8.8 Controlling with Position Proportioning Control

Position proportioning PID control converts the control output value of the controller into the corresponding signal to control a motor driven valve (control motor) and then performs temperature control of a controlled object by regulating fluid flow.

■ Description of function

In Position proportioning PID control of this controller, it is possible to select the presence or absence of Feedback resistance (FBR) input which monitors the degree of valve position (available only on FZ400/900). In addition, the direct action or reverse action can be selected.



The details of setting differ depending on the presence or absence of Feedback resistance (FBR) input.

- When the Feedback resistance (FBR) is provided (available only on FZ400/900):
 - High/Low limit of valve position (limit value of FBR input) can be set.
[Output limiter high, Output limiter low]
 - The valve position can be manually changed. [Manipulated output value (MV) setting in Manual mode]
 - The feedback adjustment is necessary. [Feedback adjustment preparation]
 - Action taken when Feedback resistance (FBR) input breaks can be selected.
[Action at Feedback resistance (FBR) input error]
 - The close-side (or open-side) output remains ON when the valve position is fully closed (or opened).
[Action at saturated output]
- When the Feedback resistance (FBR) is not provided:
 - Control motor operation can be restricted by the Integrated output limiter. [Integrated output limiter]
 - The UP/DOWN key is used to output opening or closing signal in Manual mode.
 - UP key (open-side): While the UP key is being pressed, open-side output (OUT1) is output continuously. Releasing the UP key turns off the output on the open-side to hold the opened state at that time.
 - DOWN key (close-side): While the DOWN key is being pressed, close-side output (OUT2) is output continuously. Releasing the DOWN key turns off the output on the closed-side to hold the opened state at that time.



For manual operation of Position proportioning PID control, refer to **8.9 Controlling with Manual Control (P. 8-56)**.

Parameter Valid/Invalid depending on the presence or absence of FBR input (×: Valid, —: Invalid)

Applicable parameters	When the Feedback resistance (FBR) input is provided	When the Feedback resistance (FBR) input is not provided
Input 1_Manipulated output value at STOP [heat-side] (<i>l. RMV</i>) Engineering mode [Function block No. 51 (<i>Fn5 h</i>)]	×	—
Input 1_Output limiter high (<i>l. oLH</i>) Input 1_Output limiter low (<i>l. oLL</i>) Parameter setting mode [Parameter group No. 51 (<i>Pn5 h</i>)]	×	—
Open/Close output neutral zone (<i>Ydb</i>) * Setup setting mode [Setting group No. 55 (<i>Sn55</i>)]	×	×
Open/Close output differential gap (<i>YHS</i>) * Setup setting mode [Setting group No. 55 (<i>Sn55</i>)]	×	×
Action at feedback resistance (FBR) input error (<i>YbR</i>) Engineering mode [Function block No. 55 (<i>Fn55</i>)]	×	—
Feedback adjustment (<i>PoS</i>) Engineering mode [Function block No. 55 (<i>Fn55</i>)]	×	—
Control motor time (<i>MoT</i>) * Engineering mode [Function block No. 55 (<i>Fn55</i>)]	×	×
Integrated output limiter (<i>oLR</i>) Engineering mode [Function block No. 55 (<i>Fn55</i>)]	—	×
Valve action at STOP (<i>VRL</i>) * Engineering mode [Function block No. 55 (<i>Fn55</i>)]	×	×
Action at saturated output (<i>YASo</i>) Engineering mode [Function block No. 55 (<i>Fn55</i>)]	×	—

* Always set this item regardless of the presence or absence of opening Feedback resistance (FBR) input.



Position proportioning PID control can be performed if two output points are selected when ordering. If Current output or Continuous voltage output is specified, the Position proportioning PID control cannot be selected. [Output value: -5.0 % (fixed)]

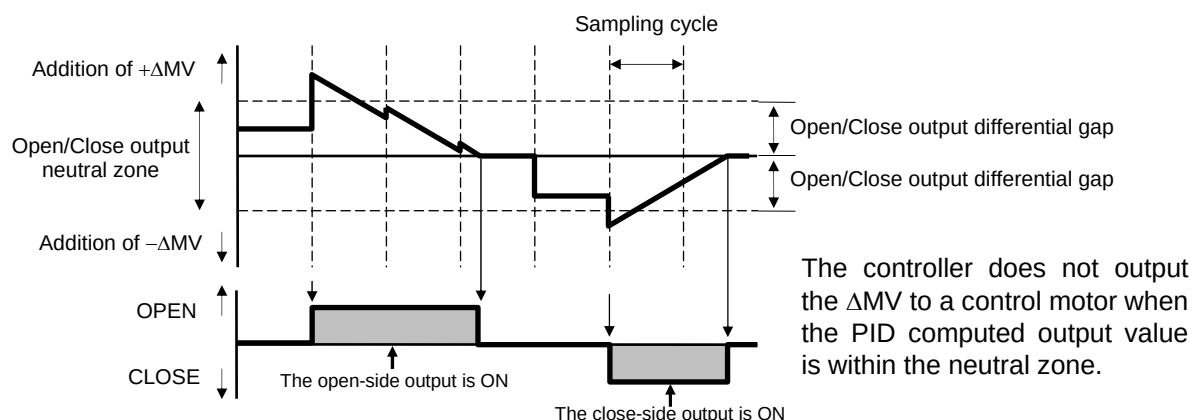


When the control action is the Position proportioning PID control, the Startup tuning (ST) is not availed. Proportional cycle time and Output change rate limiter are also invalid.

● Open/Close output neutral zone

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

[Example] If the Open/Close output differential gap is set to 1/2 (a half) of the Open/Close output neutral zone (Factory set value)



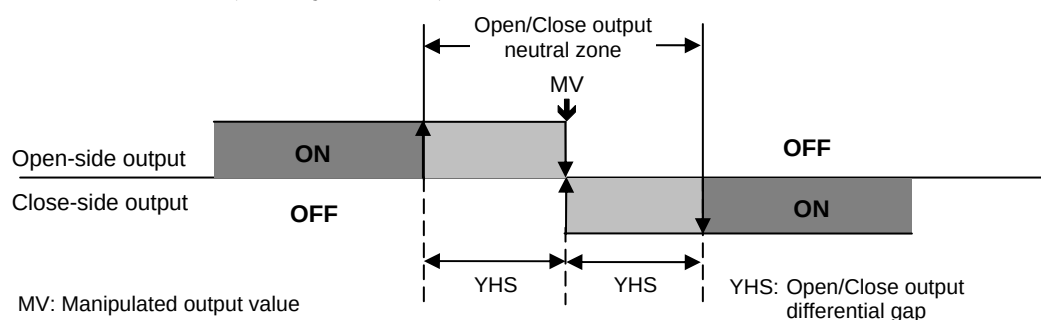
● Open/Close output differential gap

Setting Open/Close output differential gap is useful in preventing the Manipulated output (MV) for Open/Close side from turning on and off all the time due to the fluctuation of the Feedback resistance input.

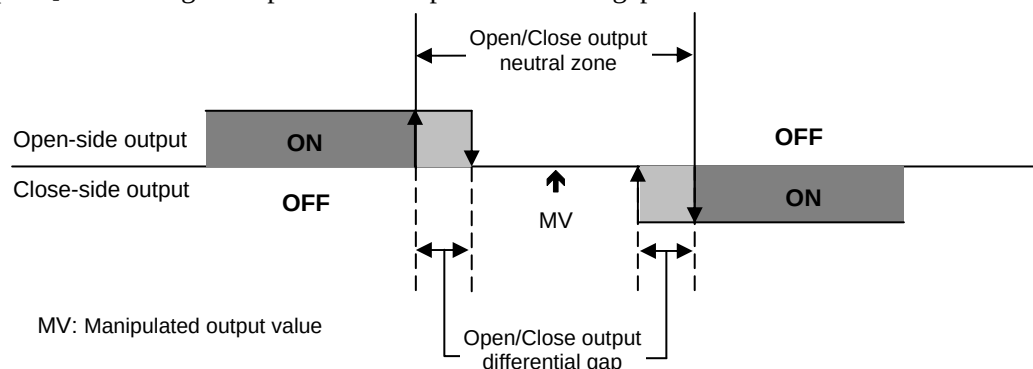


Changing the value of the Open/Close output neutral zone will make the Open/Close output differential gap 1/2 (a half) of the Open/Close output neutral zone.

[Example 1] If the Open/Close output differential gap is set to 1/2 (a half) of the Open/Close output neutral zone (Factory set value)



[Example 2] Narrowing the Open/Close output differential gap



● Feedback adjustment

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.

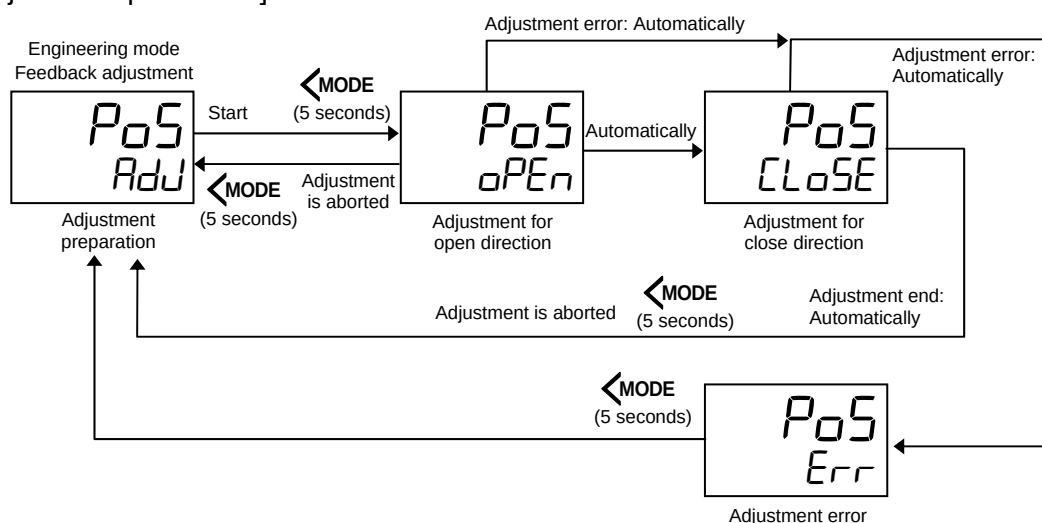
Always make sure that the wiring is correct and the control motor operates normally before the adjustment.



If opening adjustment is performed, the control motor time is automatically computed.

If the calculated value is 5 seconds or shorter, the Control motor time will be set to the low limit value (5 seconds). If the calculated value is 1000 seconds or more, it is handled as an error and the set value will not be updated.

[Adjustment procedure]



● Control motor time

This is the time required until the control motor is fully opened from its fully closed state.

If opening adjustment is performed, the control motor time is automatically computed. If the calculated value is 5 seconds or shorter, the Control motor time will be set to the low limit value (5 seconds). If the calculated value is 1000 seconds or more, it is handled as an error and the set value will not be updated.

● Integrated output limiter

This is a restricted value when the output on the open or closed side is integrated. If the output on the open (or closed) side is output in succession, it is integrated and if the result reaches the Integrated output limiter value, the output on the open (or closed) side is turned off. In addition, if the output on the open (or closed) side is reversed, the integrated value is reset.

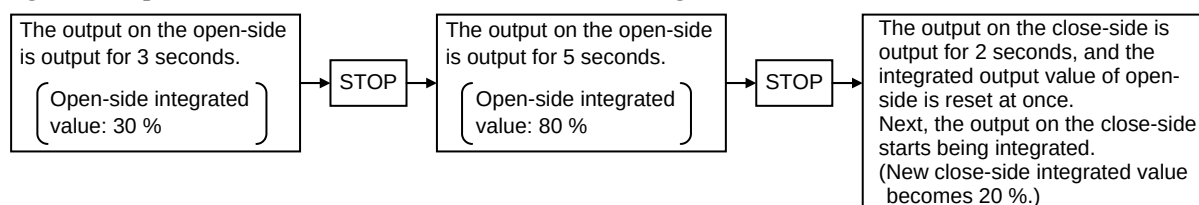


The Integrated output limiter is invalid when the Feedback resistance (FBR) input was used.

This setting is invalid in the Manual mode.

[Setting example]

If control is started at the fully closed state when the control motor time is set at 10 seconds and the Integrated output limiter value is set at 100 %, the following results.





● Action at feedback resistance (FBR) input error

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

Data range 0: Action depending on the value action at STOP
1: Control action continued

● Valve action at STOP

Select the valve action when Feedback resistance (FBR) input is disabled or “0 (Action depending on the value action setting at STOP)” is set for the action when a Feedback resistance (FBR) input break occurs.

Data range 0: Close-side output OFF, Open-side output OFF
1: Close-side output ON, Open-side output OFF
2: Close-side output OFF, Open-side output ON

● Action at saturated output

Set to maintain ON state for the close-side (or open-side) output when the valve position is fully closed (or opened).

[When the Action at saturated output is invalid]

The close-side output turns OFF when the valve position is fully closed (FBR input value ≤ 0 %).

The open-side output turns OFF when the valve position is fully opened (FBR input value ≥ 100 %).

[When the Action at saturated output is valid]

The close-side output remains ON when the valve position is fully closed (FBR input value ≤ 0 %).

The open-side output remains ON when the valve position is fully opened (FBR input value ≥ 100 %).



NOTE

To validate the Action at saturated output, make sure to use valve with limit switch.



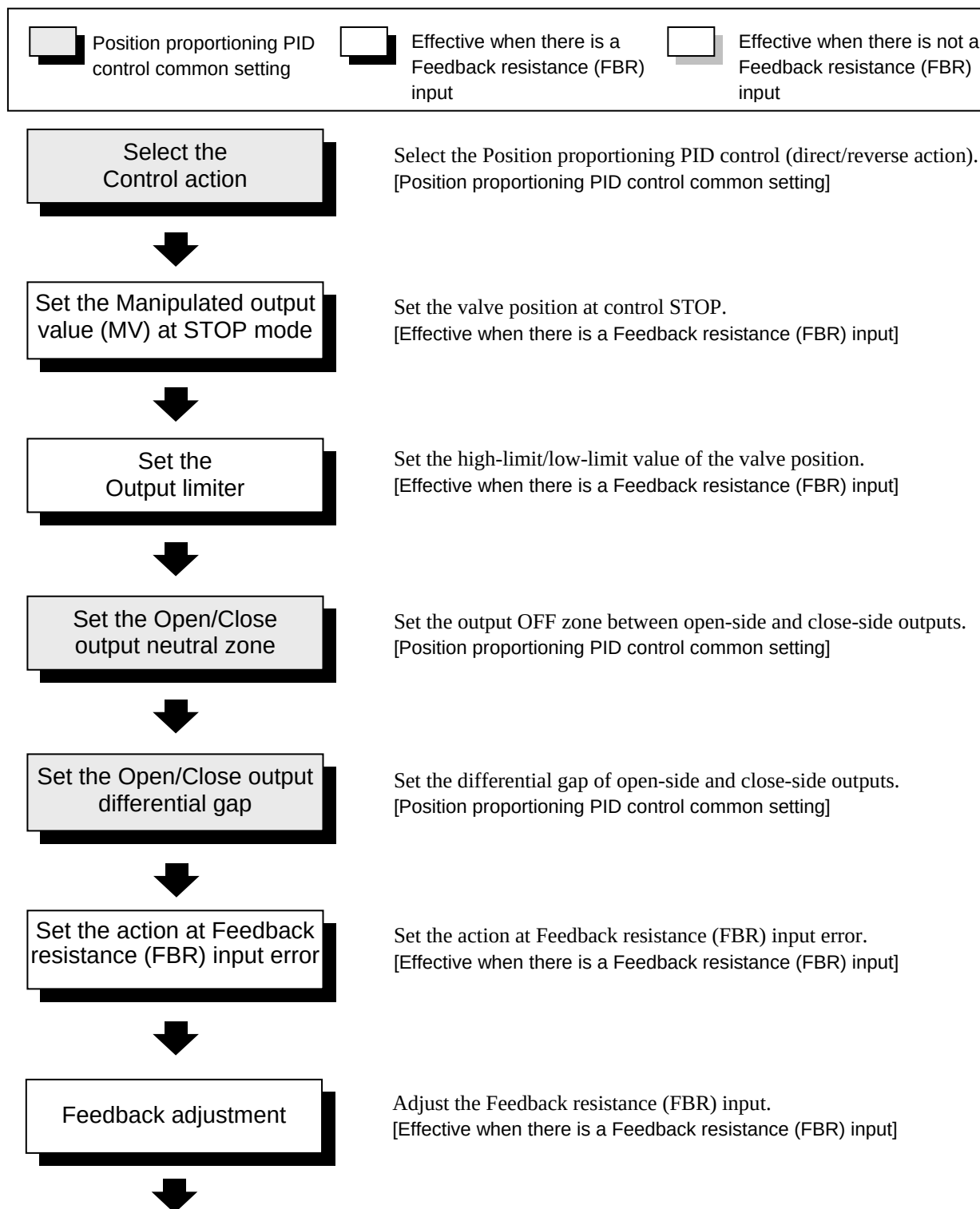
Refer to the Action at Feedback resistance (FBR) input error for the valve action when the FBR input is broken.



The Action at saturated output is invalid when the value of Output limiter high or Output limiter low is between 0.1 % and 99.9 %.

● Setting flowchart

This section describes the Position proportioning PID control dedicated setting items and the setting items which are effective when there is or is not a Feedback resistance (FBR) input. The following setting items are all set in the Engineering mode.



Continued on the next page.



Continued from the previous page.



Set the
Control motor time

Set the Control motor time required for rotation from the fully closed position to the fully opened position.
[Position proportioning PID control common setting]



Set the
Integrated output limiter

Set the Integrated output limiter which integrates the output and sets the output to OFF when the result reached the set value when an open-side (or close-side) output is outputted continuously.
[Effective when there is not a Feedback resistance (FBR) input]



Set the
Valve action at STOP

Set the action of open-side and close-side outputs at control STOP.
[Position proportioning PID control common setting]



Action at saturated output

Set to maintain ON state for the close-side (or open-side) output when the valve position is fully closed (or opened).
[Effective when there is a Feedback resistance (FBR) input]

■ Parameter setting

● Input 1_Control action

[Engineering Mode: Function block No. 51 (*F_n5* I)]

Parameter symbol	Data range	Factory set value
<i>I. 05</i>	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling linear type] 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action) For cascade control, only 0 or 1 is selectable.	Control action specified at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized when the Input 1_Control action is changed.

● Input 1_Manipulated output value at STOP [heat-side]

[Engineering Mode: Function block No. 51 (*F_n5* I)]

Parameter symbol	Data range	Factory set value
<i>I. RMV</i>	–5.0 to +105.0 %	–5.0

● Input 1_Output limiter high [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (*P_n5* I)]

Parameter symbol	Data range	Factory set value
<i>I. 0LH</i>	Input 1_Output limiter low [heat-side] to 105.0 %	105.0



Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 1_Output limiter high [heat-side] is changed.

● Input 1_Output limiter low [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (*P_n5* I)]

Parameter symbol	Data range	Factory set value
<i>I. 0LL</i>	–5.0 % to Input 1_Output limiter high [heat-side]	–5.0



Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 1_Output limiter low [heat-side] is changed.

● Open/Close output neutral zone

[Setup Setting Mode: Setting group No. 55 (5n55)]

Parameter symbol	Data range	Factory set value
Ydb	0.1 to 10.0 % of output	2.0



To display the “Open/Close output neutral zone,” you need to set the parameters for the Position proportioning PID control at “Input 1_Control action” in Function block No. 51 in the Engineering mode.



Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized when the Open/Close output neutral zone is changed.

● Open/Close output differential gap

[Setup Setting Mode: Setting group No. 55 (5n55)]

Parameter symbol	Data range	Factory set value
YH5	0.1 to 5.0 % of output	1.0



To display the “Open/Close output differential gap,” you need to set the parameters for the Position proportioning PID control at “Input 1_Control action” in Function block No. 51 in the Engineering mode.

● Action at feedback resistance (FBR) input error

[Engineering Mode: Function block No. 55 (Fn55)]

Parameter symbol	Data range	Factory set value
YbR	0: Action depending on the value action at STOP 1: Control action continued	0



To display “Action at feedback resistance (FBR) input error,” specify “Feedback resistance (FBR) input” at the time of order, AND “Input 1_Control action” (Function block No. 51 in Engineering mode) must be set Position proportioning PID control.

● Feedback adjustment

[Engineering Mode: Function block No. 55 (Fn55)]

Parameter symbol	Data range	Factory set value
Pos	When the <MODE key is pressed and held for 5 seconds, Feedback adjustment is automatically started. <i>Adj</i> : Adjustment end <i>oPEn</i> : During adjustment on the open-side <i>CLoSE</i> : During adjustment on the close-side <i>Err</i> : Adjustment error	<i>Adj</i>



To display “Feedback adjustment,” specify “Feedback resistance (FBR) input” at the time of order, AND “Input 1_Control action” (Function block No. 51 in Engineering mode) must be set Position proportioning PID control.

● Control motor time

[Engineering Mode: Function block No. 55 (Fn55)]

Parameter symbol	Data range	Factory set value
<i>MOT</i>	5 to 1000 seconds	10



To display the “Control motor time,” you need to set the parameters for the Position proportioning PID control at “Input 1_Control action” in Function block No. 51 in the Engineering mode.

● Integrated output limiter

[Engineering Mode: Function block No. 55 (Fn55)]

Parameter symbol	Data range	Factory set value
<i>OLA</i>	0.0 to 200.0 % of control motor time 0.0: OFF	150.0



To display the “Integrated output limiter,” you need to set the parameters for the Position proportioning PID control at “Input 1_Control action” in Function block No. 51 in the Engineering mode.

● Valve action at STOP

[Engineering Mode: Function block No. 55 (Fn55)]

Parameter symbol	Data range	Factory set value
<i>VAL</i>	0: Close-side output OFF, Open-side output OFF 1: Close-side output ON, Open-side output OFF 2: Close-side output OFF, Open-side output ON	0



To display the “Valve action at STOP,” you need to set the parameters for the Position proportioning PID control at “Input 1_Control action” in Function block No. 51 in the Engineering mode.

● Action at saturated output

[Engineering Mode: Function block No. 55 (Fn55)]

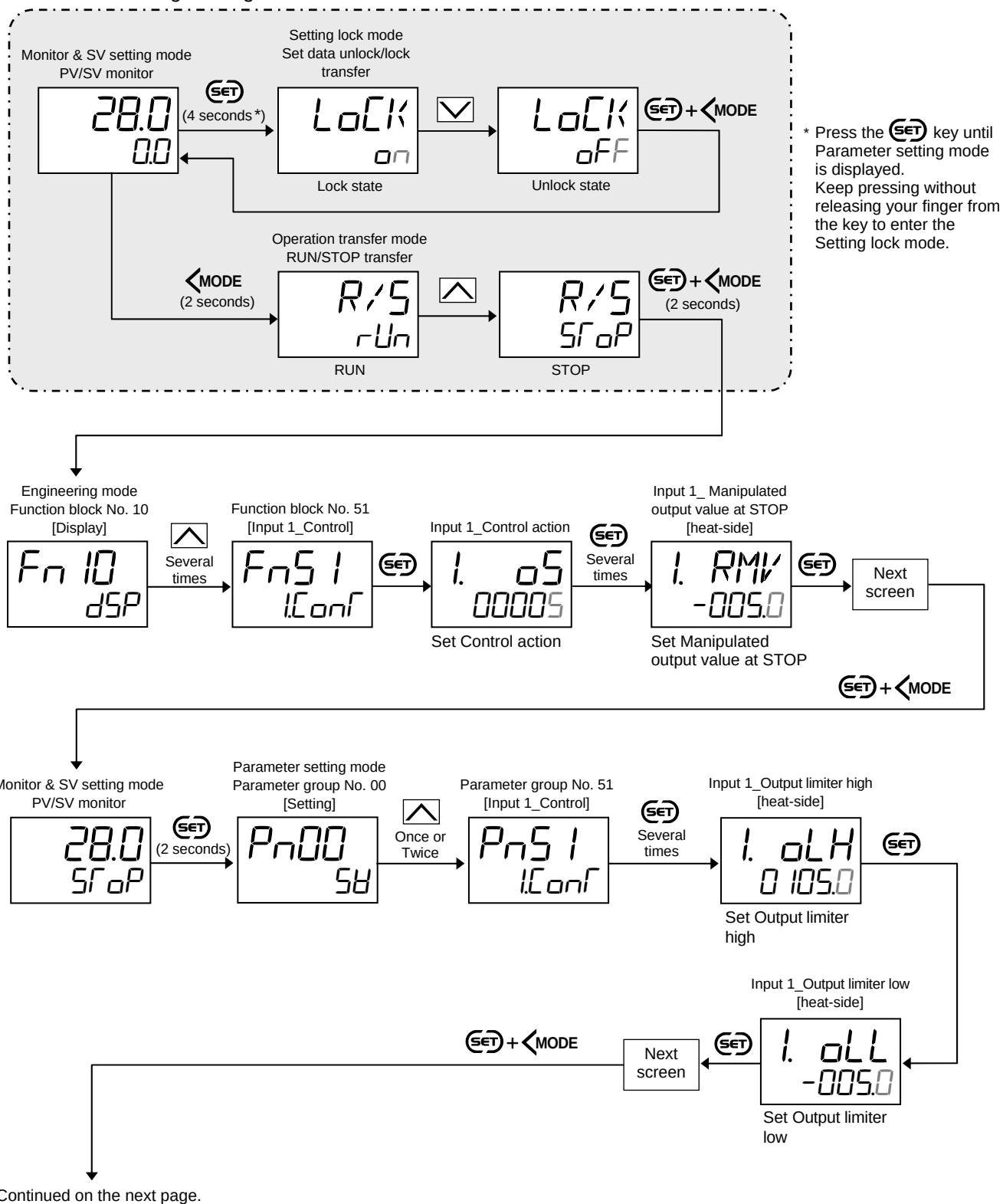
Parameter symbol	Data range	Factory set value
<i>YASO</i>	0: Invalid (The close-side [or open-side] output turns to OFF when the valve position is fully closed [or opened]). 1: Valid (The close-side [or open-side] output remains ON state when the valve position is fully closed [or opened]).	0



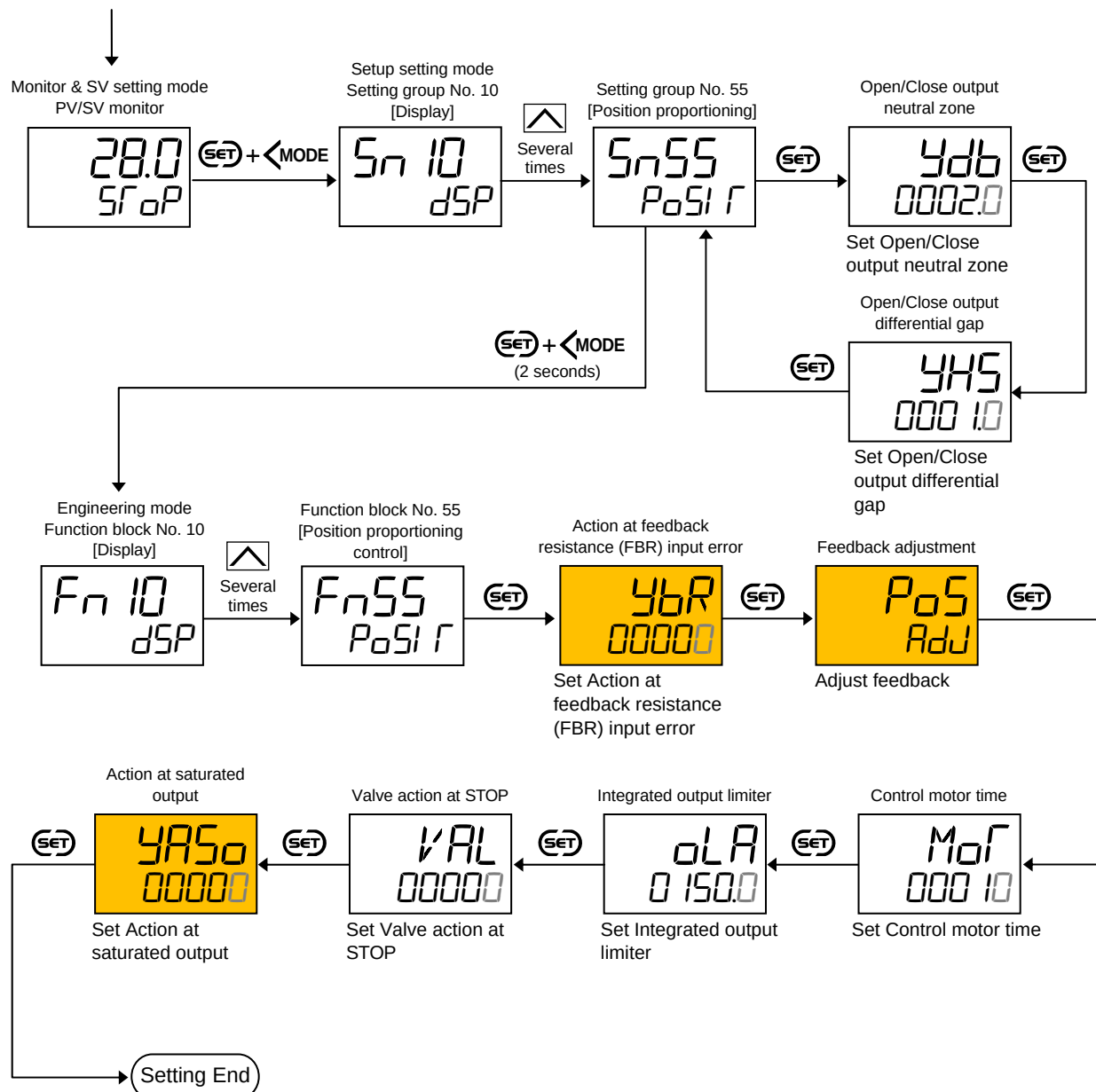
To display “Action at saturated output,” specify “Feedback resistance (FBR) input” at the time of order, AND “Input 1_Control action” (Function block No. 51 in Engineering mode) must be set Position proportioning PID control.

Setting procedure

To enter the Engineering mode



Continued from the previous page.



- Next parameter is displayed.
- Press (SET) and <MODE> keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the MONI key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

8.9 Controlling with Manual Control

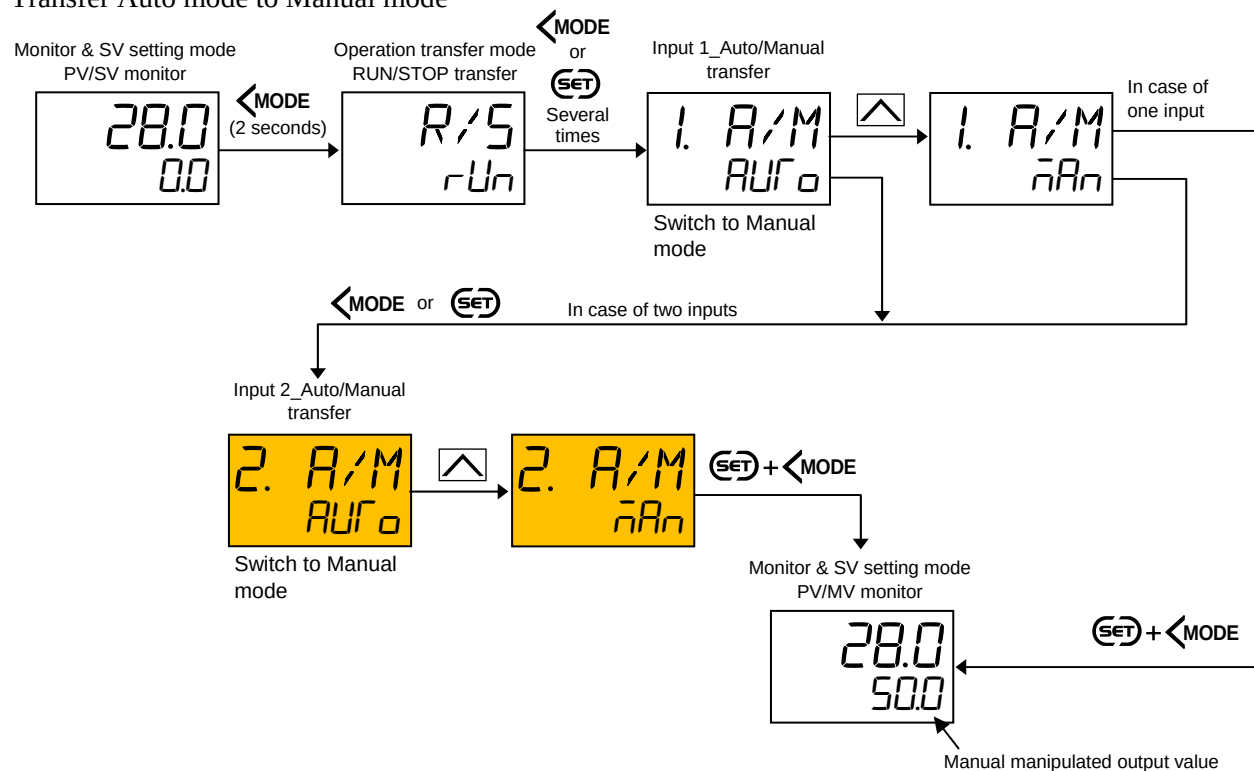
To conduct the Manual control, you need to select the Manual mode using the Auto/Manual transfer.
The Auto/Manual transfer can be made by a key operation, Digital input (DI) or communication (optional).

- For the detail of the Auto/Manual transfer through communication, refer to **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR02A07-E□)**.
- For the detail of the Manipulated output value (balanceless bumpless) associated with the Auto/Manual transfer, refer to **6.8 Suppressing Sudden Change in Output (Balanceless Bumpless) (P. 6-33)**.

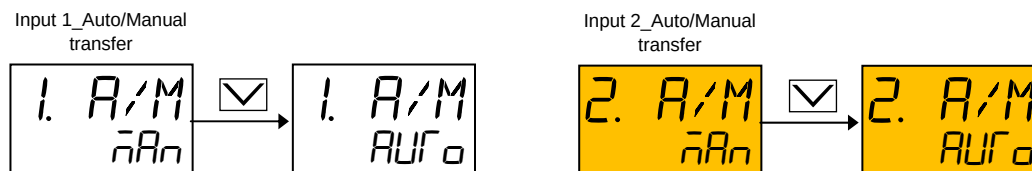
■ Setting procedure

● Selection by front key operation

Transfer Auto mode to Manual mode



Transfer Manual mode to Auto mode



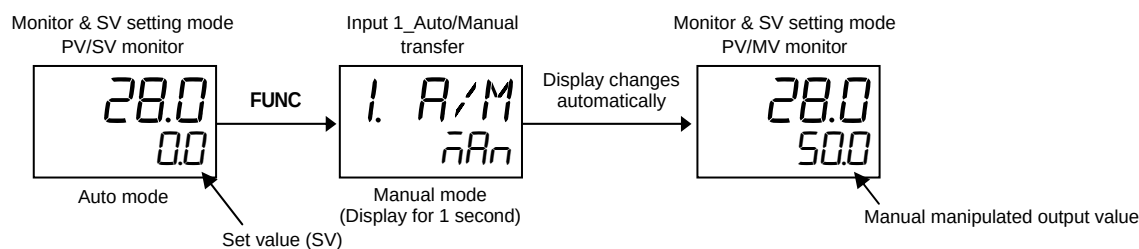
During the manual mode, the Manual (MAN) mode lamp is lit.
Refer to P. 8-59 for the Display position of the lamp.

● Changing the mode with the direct key (FZ400/900 only)

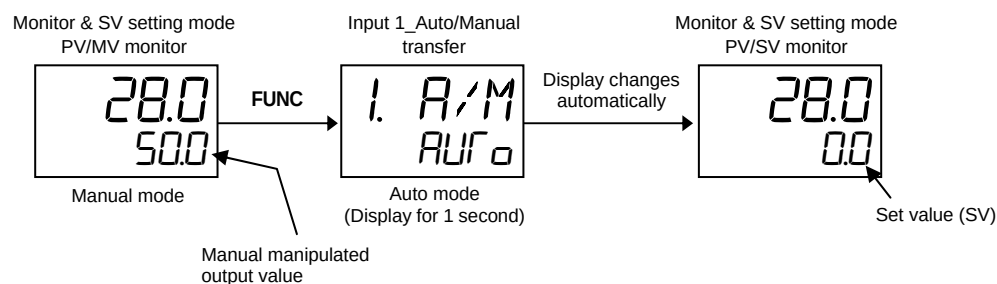
Assigning the “Auto/Manual transfer” function to the FUNC key facilitates the Auto/Manual switching. Each time FUNC key is pressed, Auto mode and Manual mode are toggled.

For the “FUNC key assignment,” refer to **10.8 Accessing some functions directly (FUNC key) (P. 10-35)**.

Transfer Auto mode to Manual mode (Input 1_Auto/Manual transfer)



Transfer Manual mode to Auto mode (Input 1_Auto/Manual transfer)



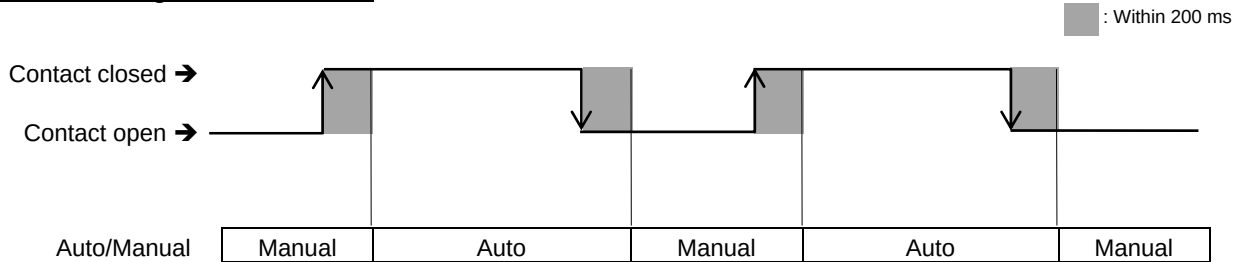
Selection of key action is possible from “Press once” and “Press and hold” to enable the switching. For details, refer to **10.8 Accessing some functions directly (FUNC key) (P. 10-35)**.

● Switching the mode with Digital Input (DI)

To switch the Auto/Manual using the Digital Input (DI), use “DI function selection” (Function block No. 23 in the Engineering mode).

- For the Digital input (DI) assignment, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Transfer timing of Auto/Manual



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.



The above switching action can be inverted (The functions at contact close and contact open can be swapped). This setting can be done at “DI logic invert.” For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● Auto/Manual transfer state

The table below shows the actual Auto/Manual modes and displays under different combinations of settings by Key operation, Communication, and Digital input (DI).

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Auto mode	Auto mode	Auto mode
	Manual mode	Manual mode
Manual mode	Auto mode	
	Manual mode	

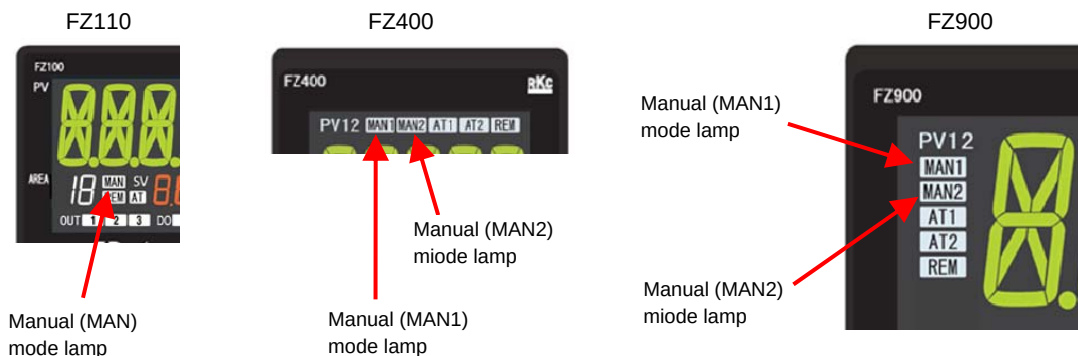
Priority to Manual mode

● Setting Manipulated output value in Manual mode

In the Manual mode, the Manipulated output value (MV) can be manually set.

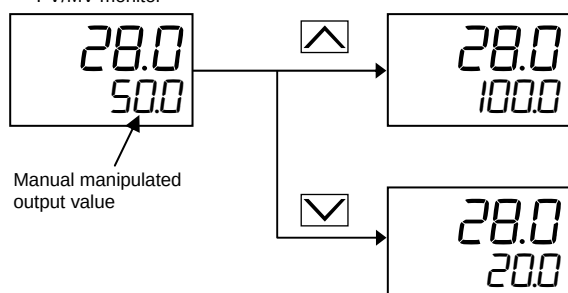
Make sure the Manual mode lamp is on (the instrument is in the manual mode) before starting the operation.

[Position of the Manual mode lamp]



[Adjusting the output]

Monitor & SV setting mode
PV/MV monitor



- ▲ key: Increase the Manipulated output value (MV).
- ▼ key: Decrease the Manipulated output value (MV).
- Press and hold the ▲ key or ▼ key makes numeric value change faster.

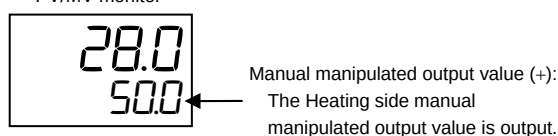


For Heat/Cool PID control:

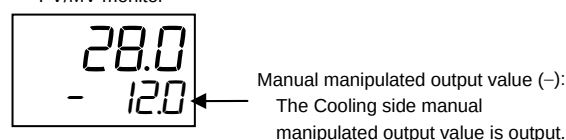
When the Manual manipulated output is positive (+), the Heating side manual manipulated output value is output. When the Manual manipulated output is negative (-), the Cooling side manual manipulated output value is output.

When the Overlap is set on the instrument, the internally calculated value is output in the overlap range.

Monitor & SV setting mode
PV/MV monitor



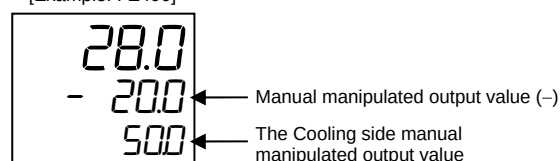
Monitor & SV setting mode
PV/MV monitor



When the Manipulated output value is selected on FZ400/900, priority is given to the display of the Heating side manual manipulated output value.

When the Manual manipulated output value enters the negative range, the output is transferred to the Cooling side manual manipulated output value.

[Example: FZ400]

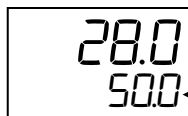




For Position proportioning PID control:

- When there is a Feedback resistance (FBR) input, the valve position can be set by or key. When Feedback resistance (FBR) input is disconnected, the input display of the Feedback resistance (FBR) goes off.

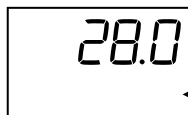
Monitor & SV setting mode
PV/MV monitor



Valve position display (Feedback resistance input value)
(This display goes off at the time of FBR input break)

- When there is no Feedback resistance (FBR) input, the output becomes ON while the key [Open-side output] or key [Close-side output] is pressed and the output becomes OFF when your finger is removed from the key. MV is hidden.

Monitor & SV setting mode
PV/MV monitor



Nothing is displayed here.
When the MV display is set to the Manipulated output value on FZ400/900, nothing is displayed on the MV display.

When the Open-side output is on, the output lamp assigned to the Open-side output will light on.
When the Close-side output is on, the output lamp assigned to the Close-side output will light on.

Parameter setting

Input 1_Auto/Manual transfer [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
1. <i>A/M</i>	<i>A</i> : Auto mode <i>M</i> : Manual mode	<i>A</i>

Input 2_Auto/Manual transfer [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
2. <i>A/M</i>	<i>A</i> : Auto mode <i>M</i> : Manual mode	<i>A</i>



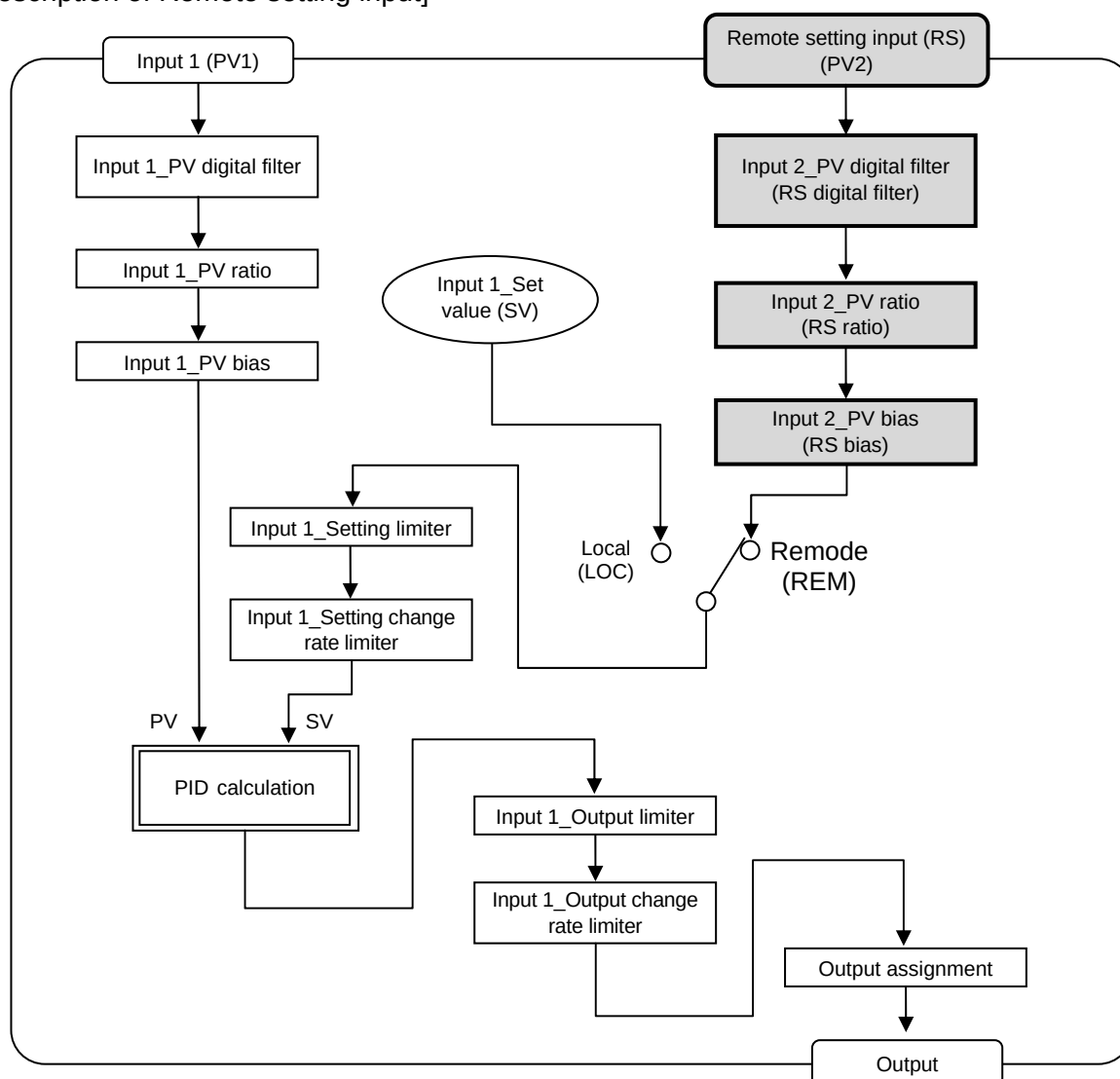
To display “Auto/Manual transfer,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

The Remote setting input uses the external signal (Input 2) as the Input 1_set value (SV). To use the Remote setting input, the mode must be switched to the Remote mode with the Remote/Local transfer. The Remote/Local transfer can be made by a key operation, Digital input (DI) or Communication (optional).

Concerning FZ110, “Remote settingt input” must be specified at the time of order.

 For the detail of the Remote/Local transfer through communication, refer to **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR02A07-E□)**.

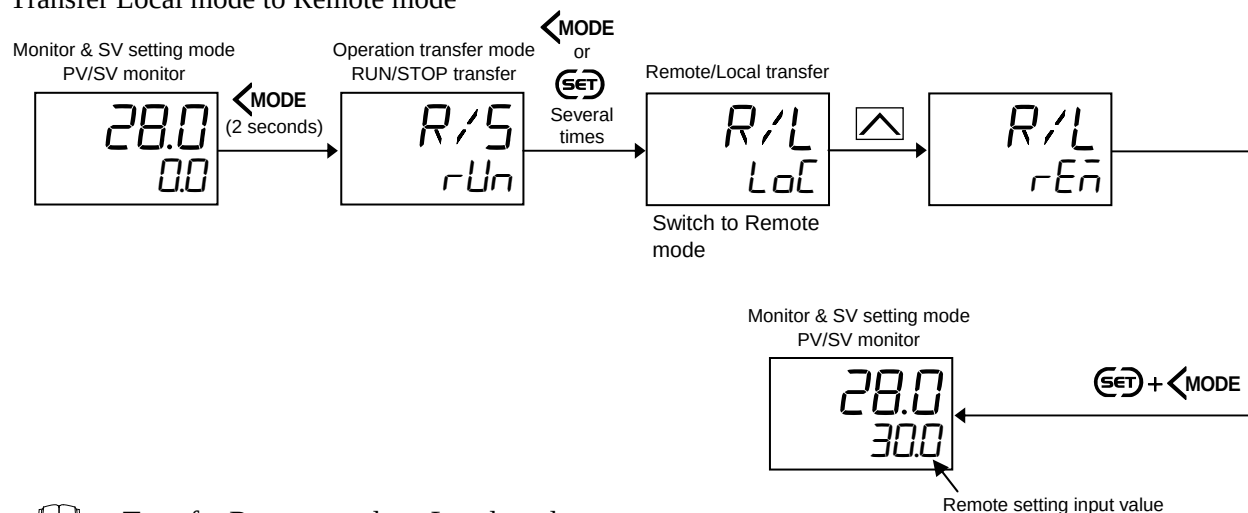
[Description of Remote setting input]



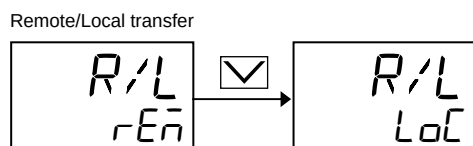
Mode transfer

Selection by front key operation

Transfer Local mode to Remote mode

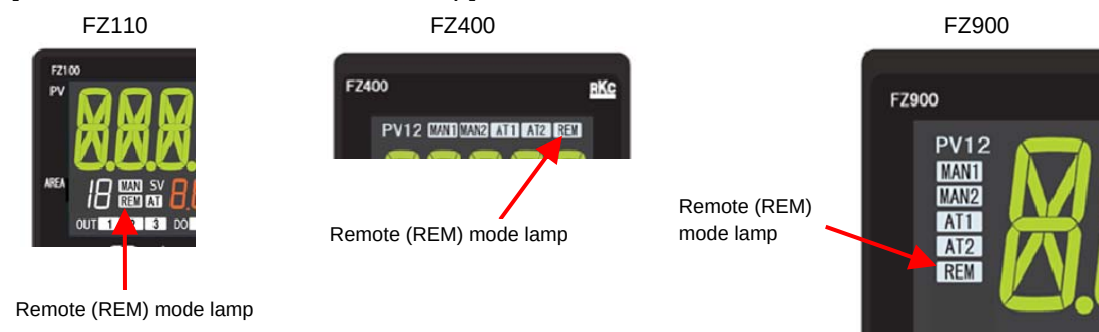


Transfer Remote mode to Local mode



During the Remote mode, the Remote (REM) mode lamp lights on.

[Position of the Remote mode lamp]



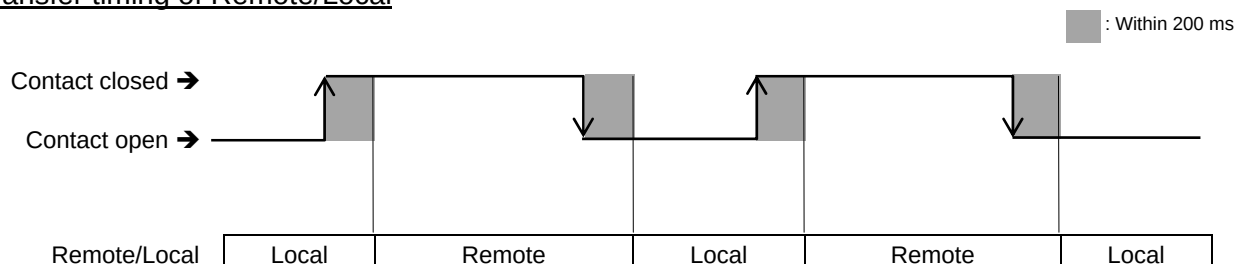
For FZ400/900, the FUNC key may be configured to switch between Remote and Local.
For details, refer to **10.8 Accessing some functions directly (FUNC key) (P. 10-35)**.

● Switching the mode with Digital Input (DI)

To switch the Remote/Local using the Digital Input (DI), use “DI function selection” (Function block No. 23 in the Engineering mode).

- For the Digital input (DI) assignment, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Transfer timing of Remote/Local



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.



The above switching action can be inverted (The functions at contact close and contact open can be swapped). This setting can be done at “DI logic invert.” For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● Remote/Local transfer state

The table below shows the actual Remote/Local modes and displays under different combinations of settings by Key operation, Communication, and Digital input (DI).

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Remote mode	Remote mode	Remote mode
	Local mode	Local mode
Local mode	Remote mode	
	Local mode	

Priority to Local mode

■ Parameter setting

● Remote/Local transfer

[Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When “Remote setting input” is selected at Select function for input 2 Lo: Local mode Re: Remote mode	Lo



To display “Remote/Local transfer” (on FZ400/900), you need to specify the “Remote setting input” at the time of order, or configure the “Measured input 2” (that must be also specified at the time order) to the Remote setting input at “Select function for input 2” in Function block No. 58 in the Engineering mode.

Concerning FZ110, “Remote setting input” must be specified at the time of order.

● Input 2_Input type

[Engineering Mode: Function block No. 22 (Fn22)]

Parameter symbol	Data range	Factory set value
2.1NP	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PL II 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input –10 to +10 V DC 22: Voltage input –5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC ● When Measured input 2 is selected for FZ400/900: 0 to 24 * ● When Remote setting input is selected for FZ400/900: 15 to 24 ● When Remote setting input is selected for FZ110: 15 to 22	Same as Input 1_Input type When Remote setting input is specified at the time of order, but the input type is not specified: 17

* When the “Measured input 2” is specified at the time of order, the Remote setting input type is selectable from TC and RTD by selecting the Remote setting input at “Select function for input 2.” **When the Remote setting input is set to TC or RTD, set “1: Downscale” at the “Input 2_Burnout direction” in Function block No. 22 in the Engineering mode for safety reason.**



To display Input 2_Input type, “Measured input 2” or “Remote setting input” must be specified on FZ400/900 at the time of order. For FZ110, Remote setting input must be specified at the time of order.



Input 2_Input type is not displayed if “No function” is selected at Select function for input 2 in Function block No. 58 in the Engineering mode.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized or changed when the input type is changed.

● Select function for input 2

[Engineering mode: Function block No. 58 (F_n5 θ)]

Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm *This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	• FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 • FZ110: 1



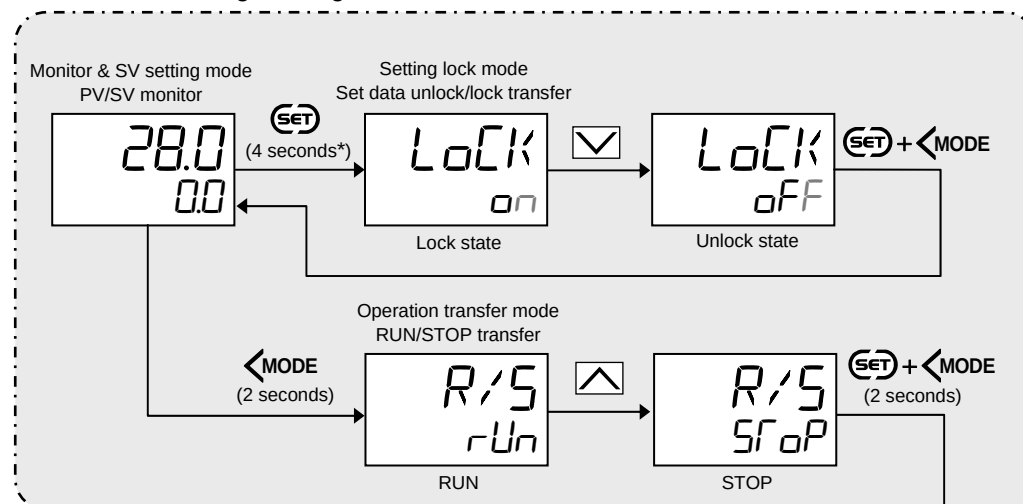
To display “Select function for input 2,” “Remote setting input” or “Measured input 2” must be specified at the time of order.



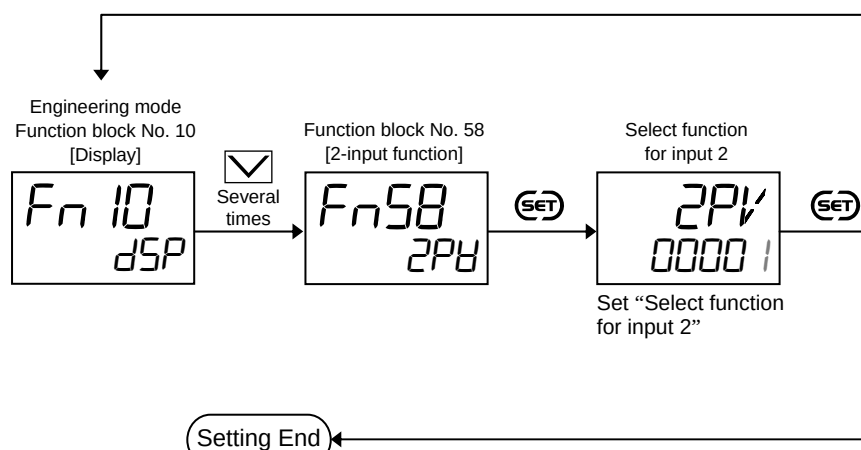
Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized or changed when the Select function for input 2 is changed.

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

8.11 Executing 2-loop control [FZ400/900]

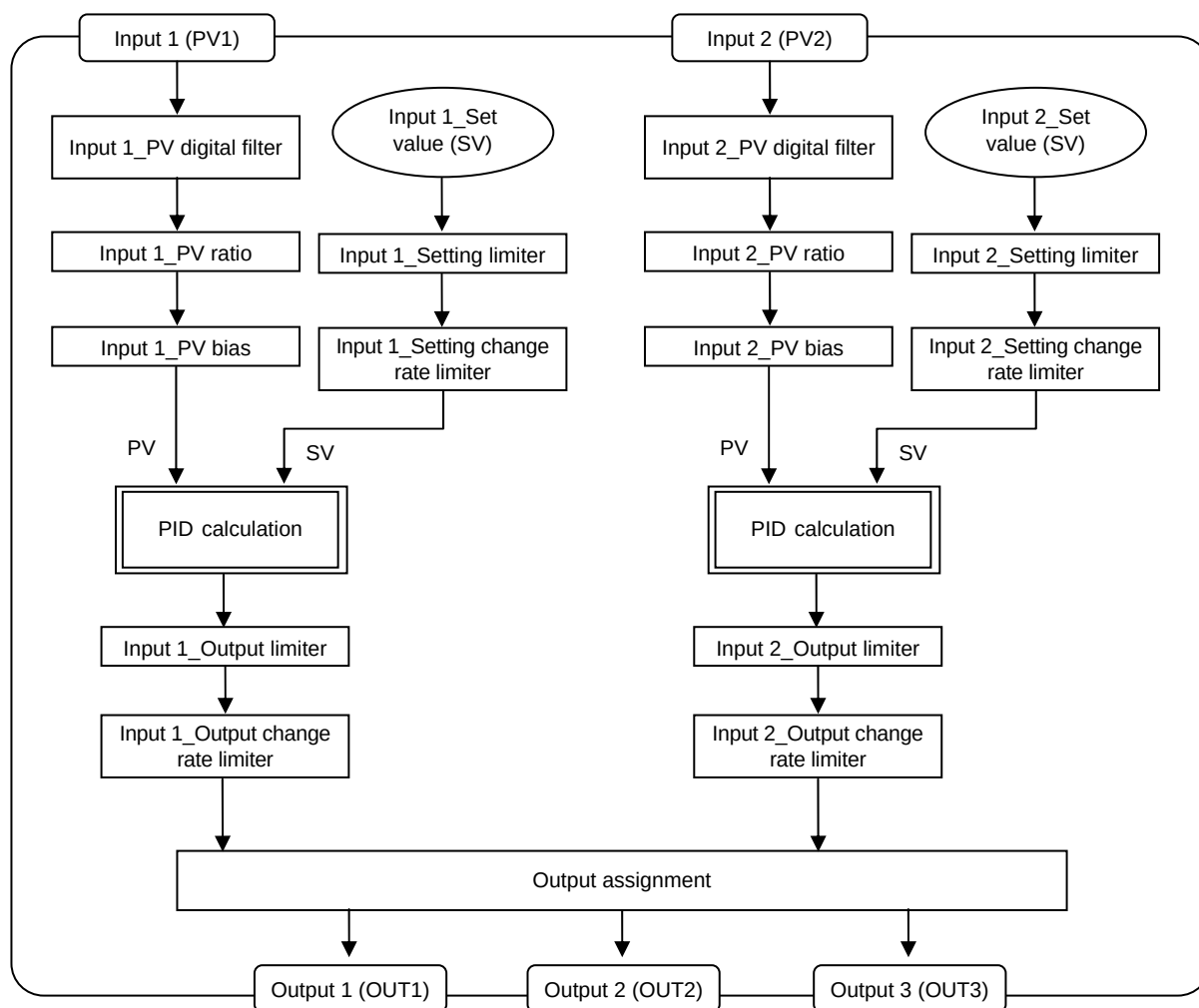
When two inputs are supplied on the FZ400/900, independent dual loop control can be performed on Input 1 and Input 2.

■ Description of function

The 2-loop control enables two single loop control on a single instrument.

Input 1 and Input 2 are independent from each other and setting must be done separately on each channel.

[Description of 2-loop control]

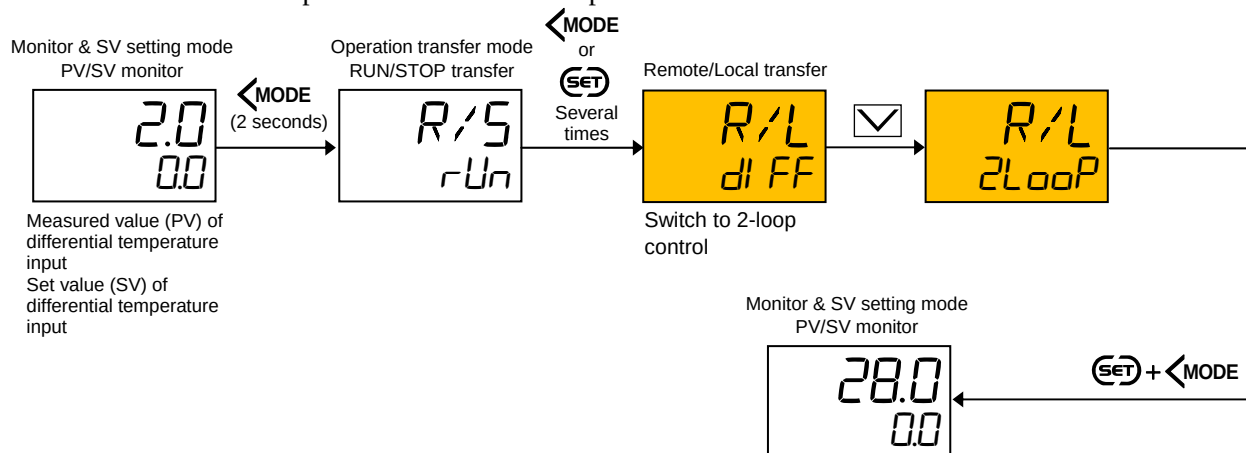


The 2-loop control and the Differential temperature control are switchable. For the detail of the Differential temperature control, refer to **8.12 Executing Differential temperature control [FZ400/900] (P. 8-70)**.

Mode transfer

Selection by front key operation

Transfer Differential temperature control to 2-loop control

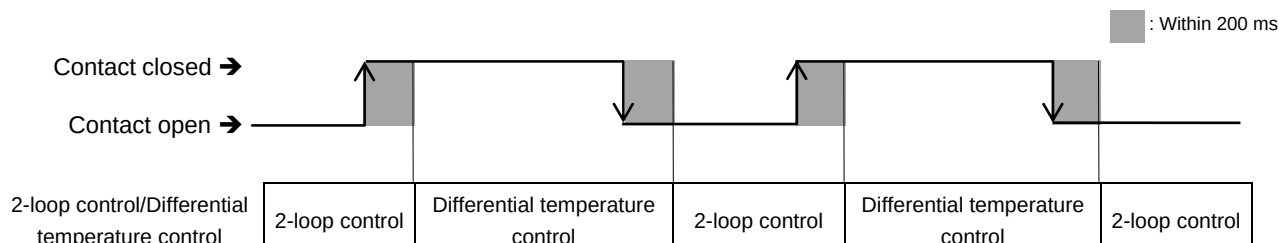


Switching the mode with Digital Input (DI)

To switch the Remote/Local (2-loop control/ Differential temperature control) using the Digital Input (DI), use “DI function selection” (Function block No. 23 in the Engineering mode).

- For the Digital input (DI) assignment, refer to **5.2 Switching Functions Using Digital Inputs (DI)** (P. 5-16).

Transfer timing of Remote/Local(2-loop control/ Differential temperature control)



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.



The above switching action can be inverted (The functions at contact close and contact open can be swapped). This setting can be done at “DI logic invert.” For details, refer to **5.2 Switching Functions Using Digital Inputs (DI)** (P. 5-16).

Remote/Local transfer (2-loop control/ Differential temperature control) state

The table below shows the actual 2-loop control/ Differential temperature control status and displays under different combinations of settings by Key operation, Communication, and Digital input (DI).

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Differential temperature control	Differential temperature control	Differential temperature control
	2-loop control	2-loop control
2-loop control	Differential temperature control	
	2-loop control	

Priority to 2-loop control

■ Parameter setting

● Remote/Local transfer (2-loop control/ Differential temperature control) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When “2-loop control/Differential temperature control” is selected at Select function for input 2 2Loop: 2-loop control dIFF: Differential temperature control	2Loop



To display “Remote/Local transfer” (2-loop control/Differential temperature control), specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Select function for input 2 [Engineering mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm *This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	• FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 • FZ110: 1



To display “Select function for input 2,” “Remote setting input” or “Measured input 2” must be specified at the time of order.



Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized or changed when the Select function for input 2 is changed.



For the detail of Select function for input 2, refer to P. 8-66.

8.12 Executing Differential temperature control [FZ400/900]

Input 1 is controlled by setting a temperature difference between Input 1 and Input 2.

■ Description of function

Differential temperature control is conducted, while Input 1 is used as Control temperature and Input 2 is used as Reference temperature.

Temperature difference is set on Input 1 against Input 2, and the Input 1 is controlled so that the set temperature difference could be obtained. As the input 2 can also be controlled, the differential temperature control is possible while keeping the reference temperature constant.

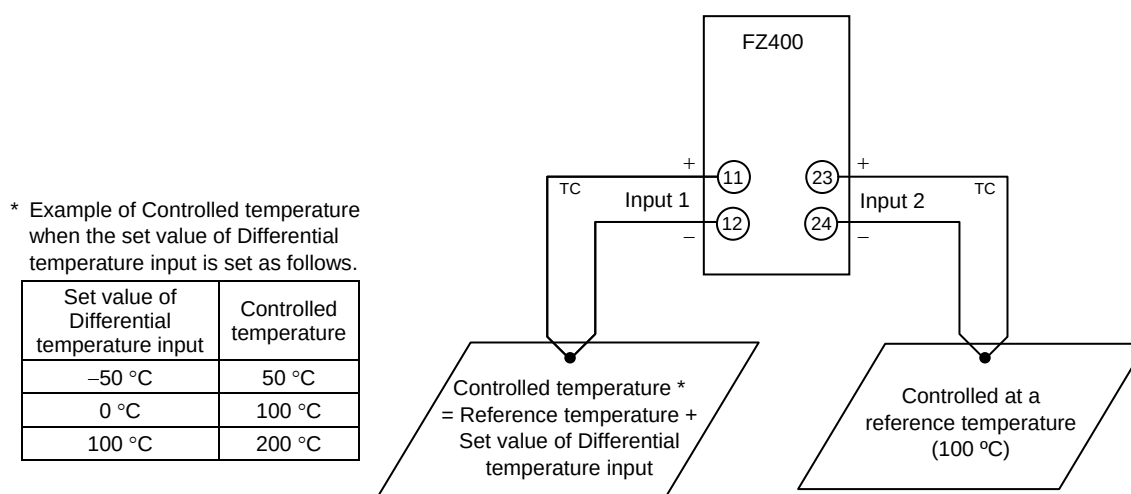
This function is available only on FZ400/900.



In case of Differential temperature control, the Input 1_Set value (SV) is not used for control. The Input 1_Monitor Set value (SV)* of is used in actual control.

* Input 1_Monitor Set value (SV) = Controlled temperature
= Input 2_Measured value (PV) [Reference temperature] + Set value of Differential temperature input

[Example] Control is done with the Reference temperature (PV of Input 2) at 100 °C, and the Input 1 is controlled by the Differential temperature.



The sensor type used on Input 1 and Input 2 can be different respectively.

[Setting items]

- Remote/Local transfer (2-loop control/ Differential temperature control) [Operation transfer mode]
Transfer to Differential temperature control
- Input 2_Set value (SV) [Parameter setting mode: Parameter group No. 00]:
Setting Reference temperature
- Set value of Differential temperature input [Parameter setting mode: Parameter group No. 00]:
Setting Differential temperature
- Select function for input 2 [Engineering mode: Function block No. 58]:
Select 2-loop control/Differential temperature control
- Other items required for controlling Input 1 and Input 2 (e.g. setting PID values)



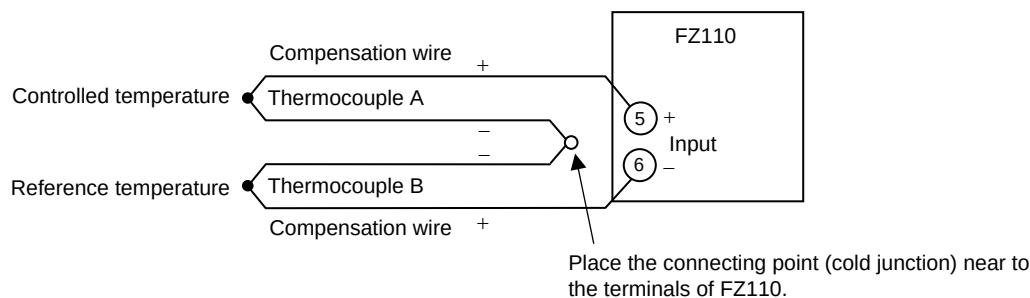
The 2-loop control and the Differential temperature control are switchable. For the detail of the 2-loop control, refer to **8.11 Executing 2-loop control [FZ400/900] (P. 8-67)**.



Differential temperature control can be conducted even if the instrument has only one input. Wiring as follows may be an example of Differential temperature control. In this case, Reference temperature cannot be controlled. Prepare a sample (another controller) if the Reference temperature also needs to be controlled.

In case of the Differential temperature control with this wiring, such a setting as Remote/Local transfer (2-loop control/Differential temperature control) is not required. Control is conducted by a single loop.

[Wiring example]



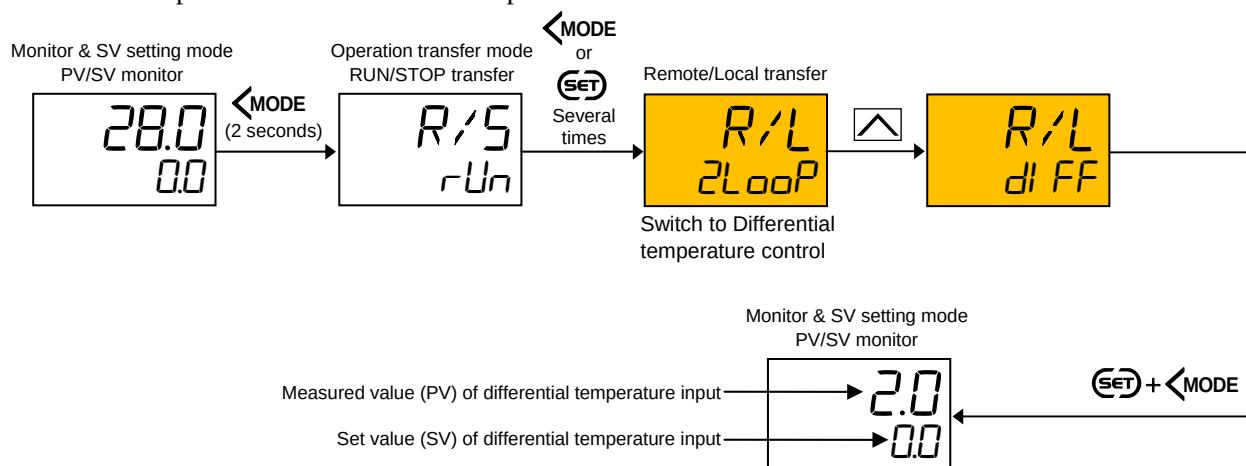
Prerequisites for control

- Both thermocouples must be of the same type.
- Setting of Temperature compensation calculation should be “0: No Temperature compensation calculation”
In the above example, the setting of “Input 1_Temperature compensation calculation” (Function block No. 21 in the Engineering mode) should be “0: No Temperature compensation calculation”

Mode transfer

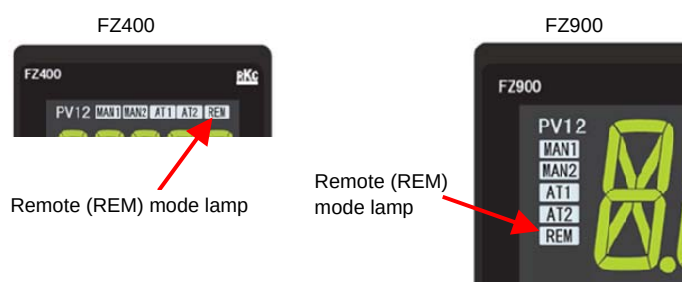
Selection by front key operation

Transfer 2-loop control to Differential temperature control



During the Differential temperature control, the Remote (REM) mode lamp lights on.

[Position of the Remote mode lamp]





For FZ400/900, the FUNC key may be configured to switch between 2-loop control and Differential temperature control. For details, refer to **10.8 Accessing some functions directly (FUNC key) (P. 10-35)**.



Mode transfer by other than the front key should be referred to **8.11 Executing 2-loop control [FZ400/900] (P. 8-67)**.

■ Parameter setting

● Remote/Local transfer (2-loop control/ Differential temperature control) [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When “2-loop control/Differential temperature control” is selected at Select function for input 2 2Loop: 2-loop control d/FF: Differential temperature control	2Loop



To display “Remote/Local transfer” (2-loop control/Differential temperature control), specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 2_Set value (SV)

[Parameter Setting Mode: Parameter group No. 00 (Pn00)]

Parameter symbol	Data range	Factory set value
2. SV	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	0



To display “Input 2_Set value (SV),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Set value (SV) of differential temperature input

[Parameter Setting Mode: Parameter group No. 00 (Pn00)]

Parameter symbol	Data range	Factory set value
dSV	-(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	0



To display “Set value (SV) of differential temperature input,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, and Remote/Local transfer must be select Differential temperature control.

● Select function for input 2

[Engineering mode: Function block No. 58 (F_n5 θ)]

Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm *This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	• FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 • FZ110: 1



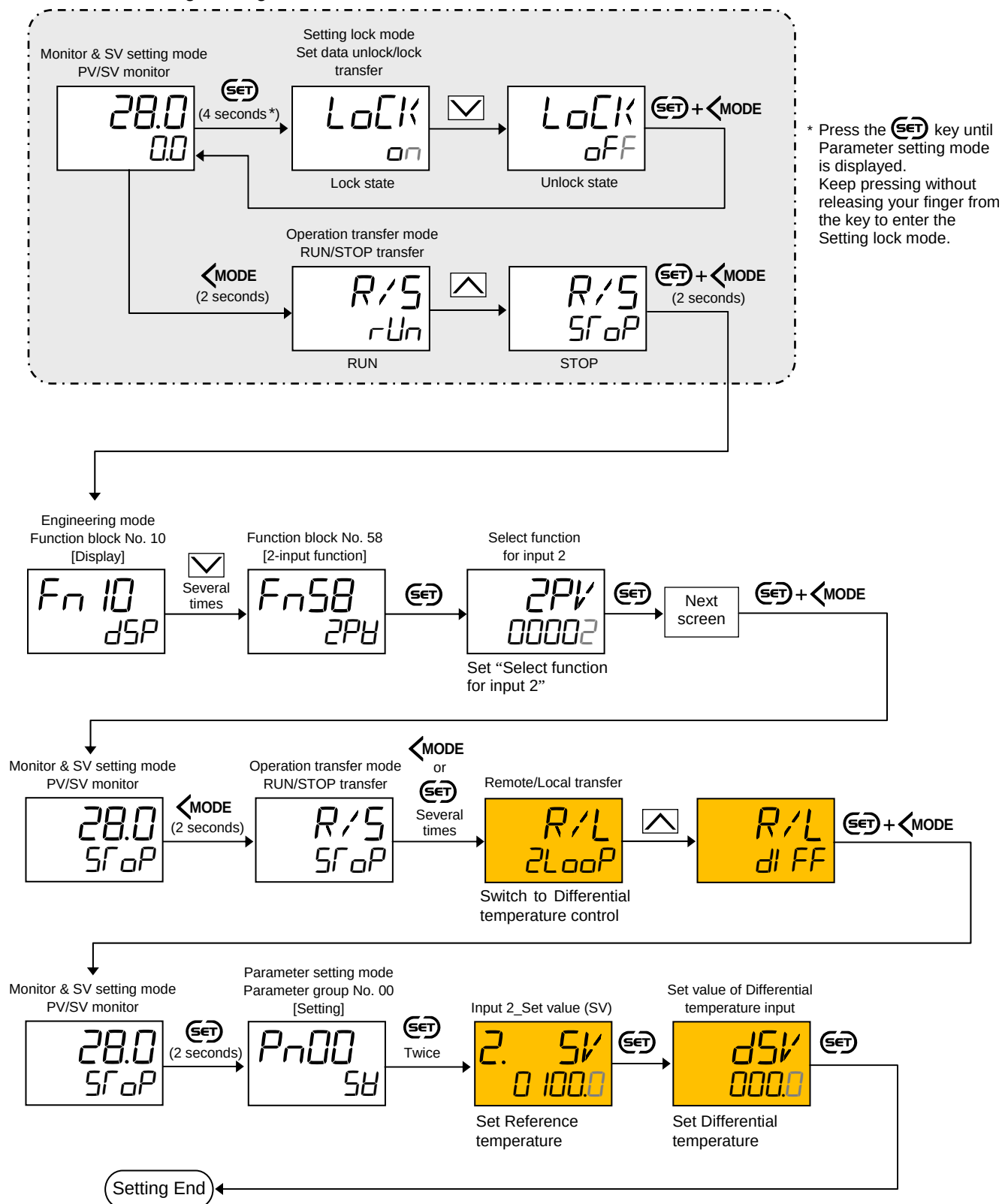
To display “Select function for input 2,” “Remote setting input” or “Measured input 2” must be specified at the time of order.



Refer to “**4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)**” for the parameters that are initialized or changed when the Select function for input 2 is changed.

Setting procedure

To enter the Engineering mode



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

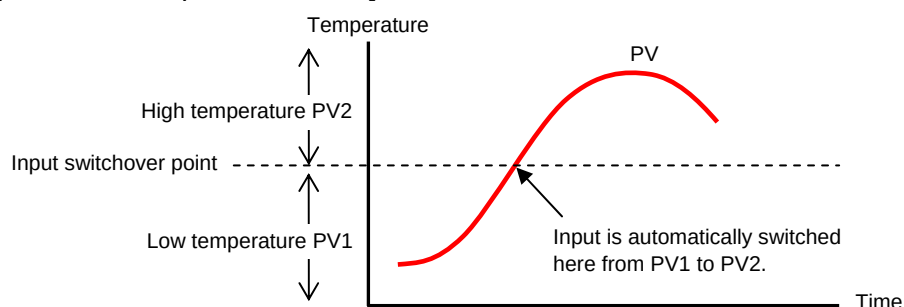
8.13 Executing Control with PV select [FZ400/900]

The Control with PV select is a function to control by switching between two inputs for high and low temperature ranges when two different sensors are used in the single controlled object.

■ Description of function

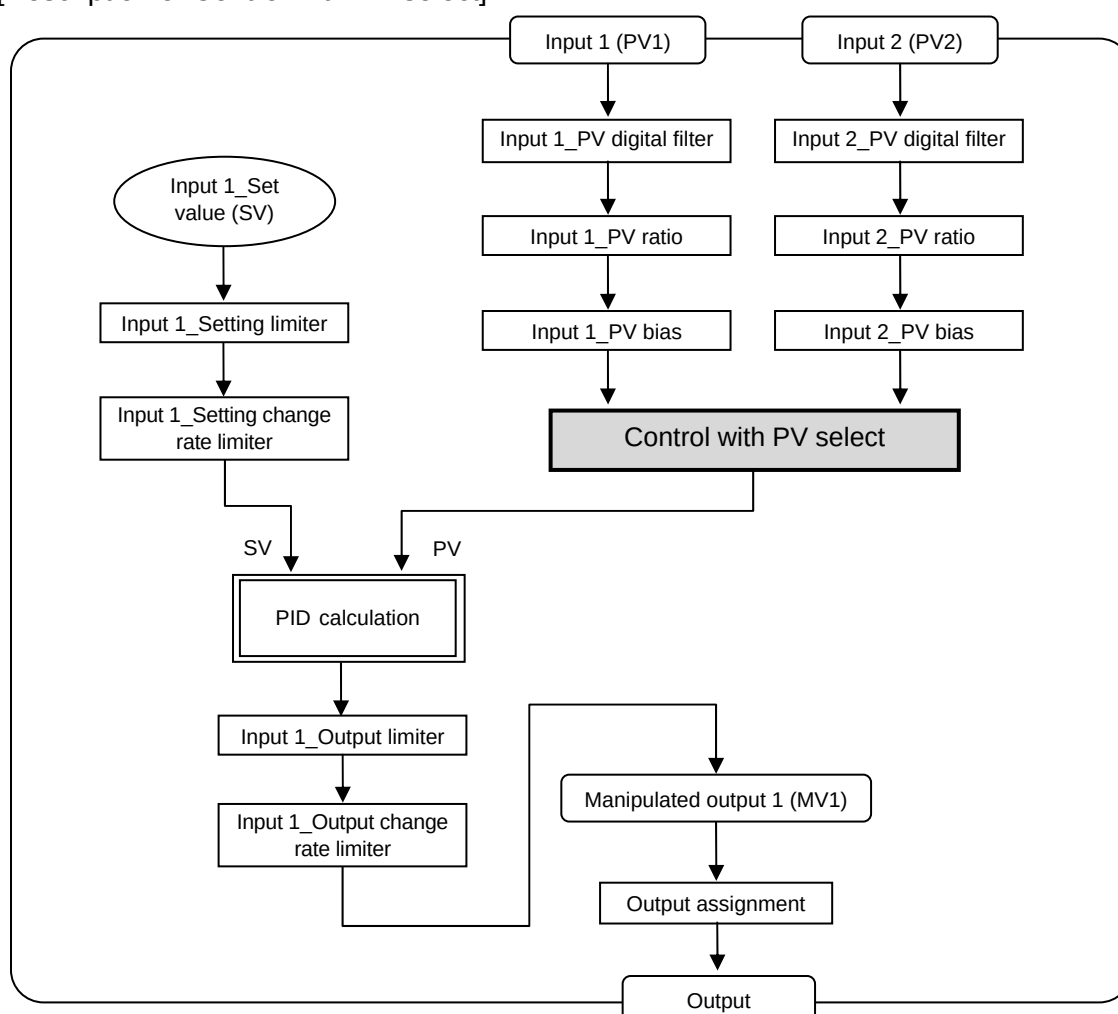
In the Control with PV select, two inputs are used by switching between them: Input 1 (for low temperature range as PV1) and Input 2 (for high temperature range as PV2). Parameters on the Input 1 are used for control computation. Output is also provided on the Input 1 side as Manipulated output 1 (MV1).

[Pictorial explanation of Input switchover]



There are two ways to switch between Input 1 (PV1) and Input 2 (PV2): Switch using the set value and switch by using signal (key operation, digital input, and communication).

[Description of Control with PV select]



● Switching by Set value

The set value (PV select transfer level) is set and used as a trigger for switching between Input 1 (PV1) and Input 2 (PV2). When this set value is exceeded, the present input is transferred to the other.

When the PV select transfer time is set, the transfer action takes place in the set period correcting the input.

[Direction of input switchover]

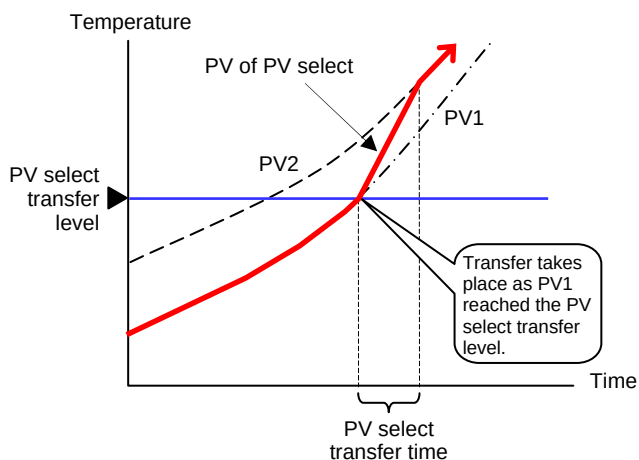
At temperature rise: PV1 to PV2

At temperature fall: PV2 to PV1

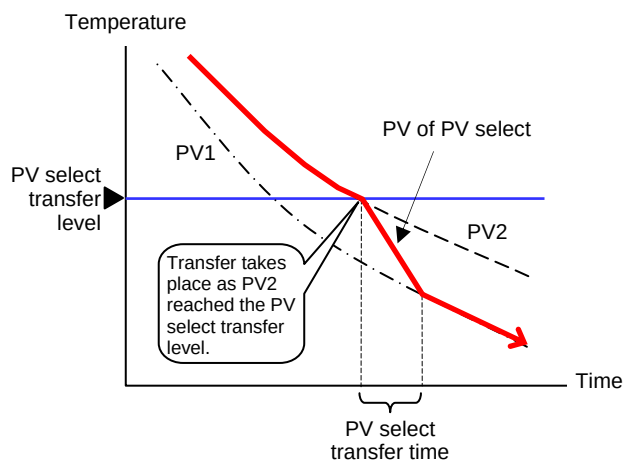
● When PV1 < PV2

When the PV select transfer time is set

<At temperature rise>



<At temperature fall>



Legend

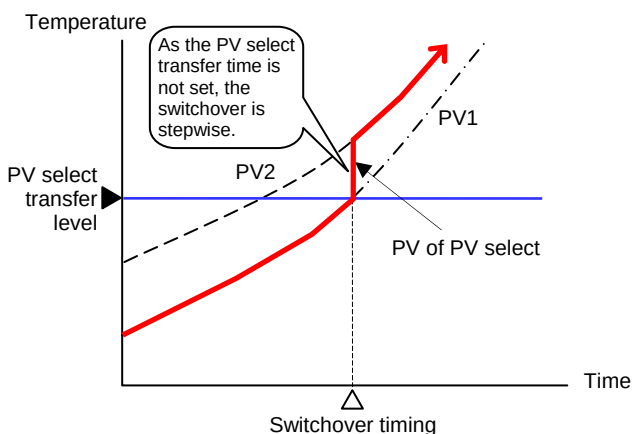
--- : Input 1 (PV1)

--- : Input 2 (PV2)

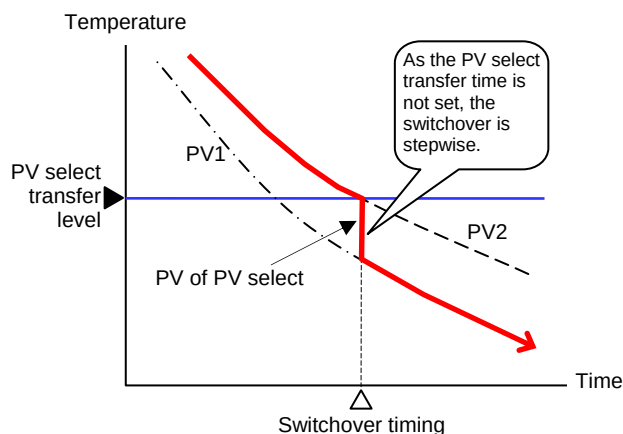
— : PV select Measured value (PV)

When the PV select transfer time is not set (Set value: 0.0)

<At temperature rise>



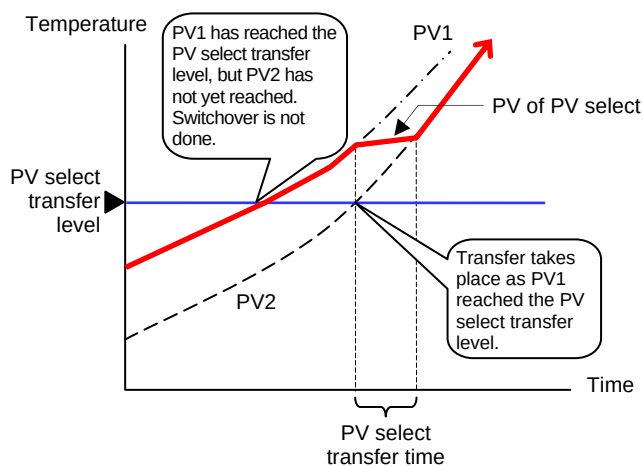
<At temperature fall>



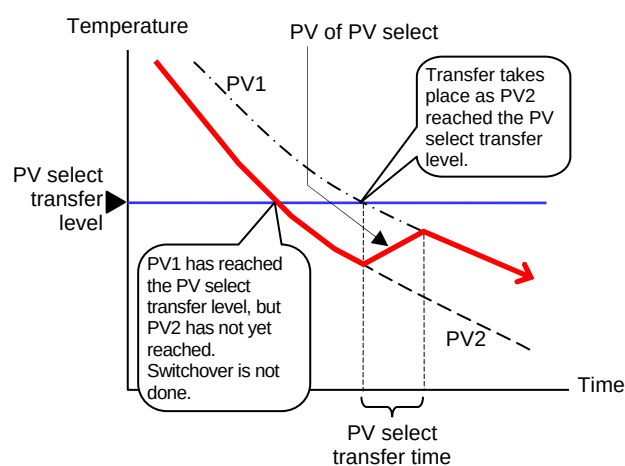
• When $PV1 > PV2$

When the PV select transfer time is set

<At temperature rise>

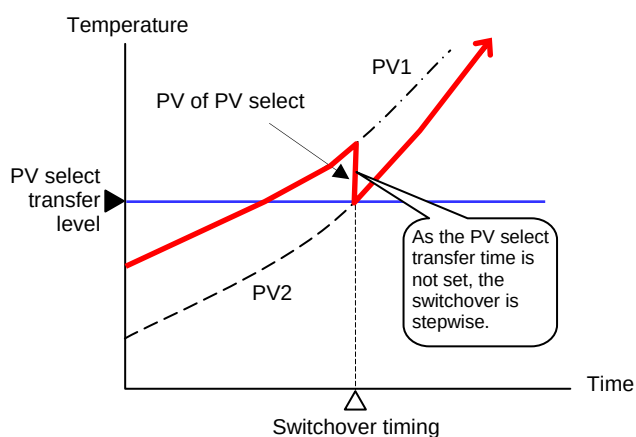


<At temperature fall>

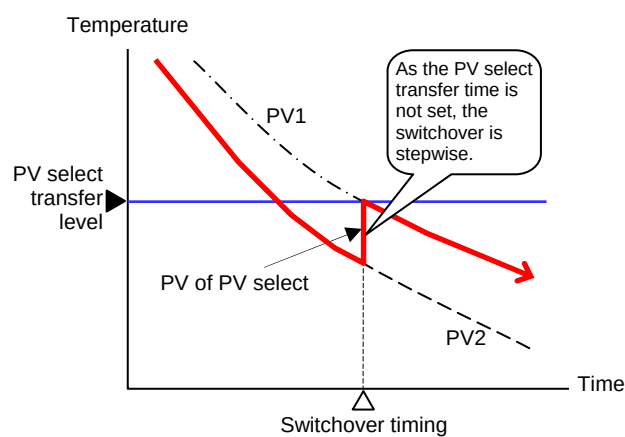


When the PV select transfer time is not set (Set value: 0.0)

<At temperature rise>



<At temperature fall>



● Switchover by signal (key operation, digital input, and communication)

The switchover between Input 1 (PV1) and Input 2 (PV2) is done by using key operation, digital input or communication.

When the PV select transfer time is set, the transfer action takes place in the set period correcting the input.



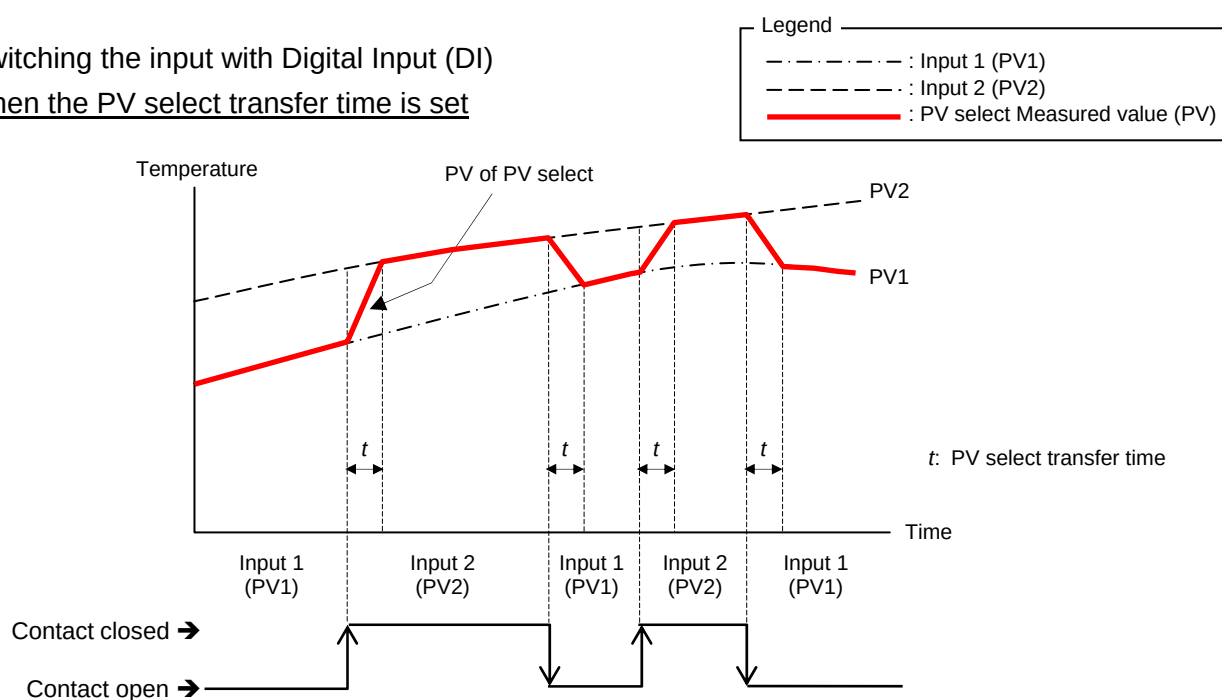
In the case of switchover by the signal (key operation, digital input, or communication), there are no restrictions on the switchover direction of the inputs whether the temperature is on the rise or on the decline.



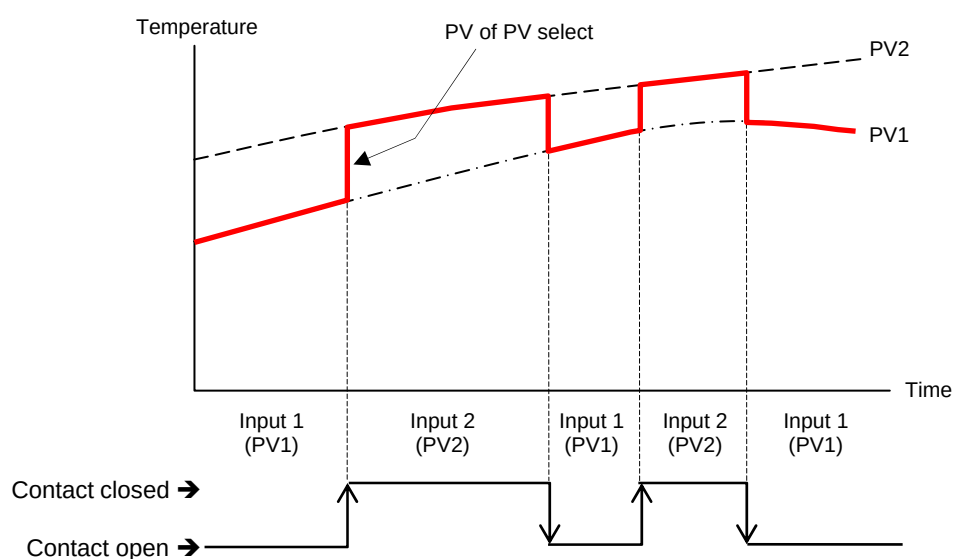
For the detail of the input switchover through communication, refer to **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR02A07-E□)**.

● Switching the input with Digital Input (DI)

When the PV select transfer time is set

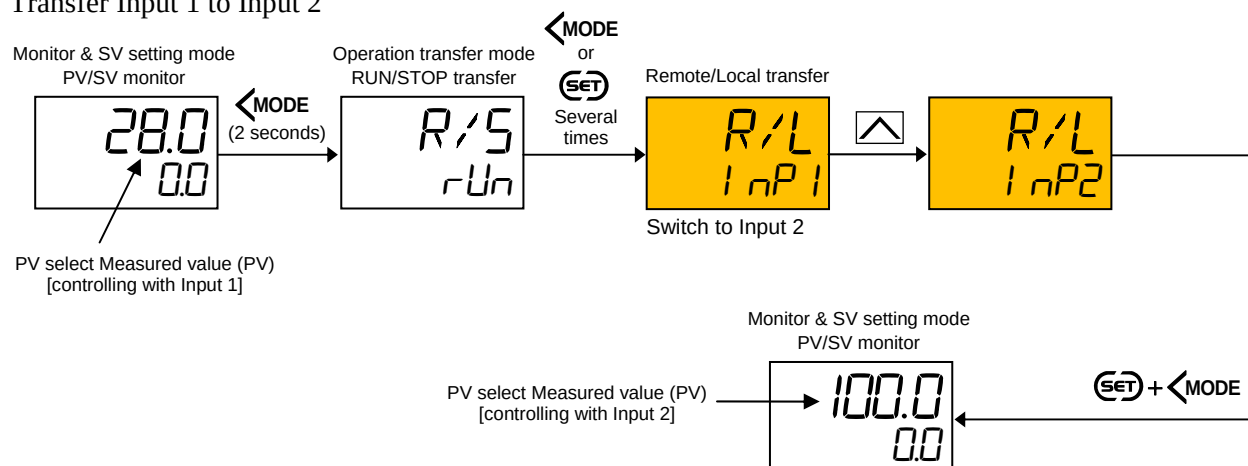


When the PV select transfer time is not set (Set value: 0.0)

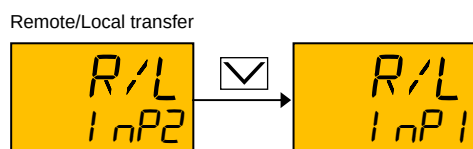


• Selection by front key operation

Transfer Input 1 to Input 2



Transfer Input 2 to Input 1

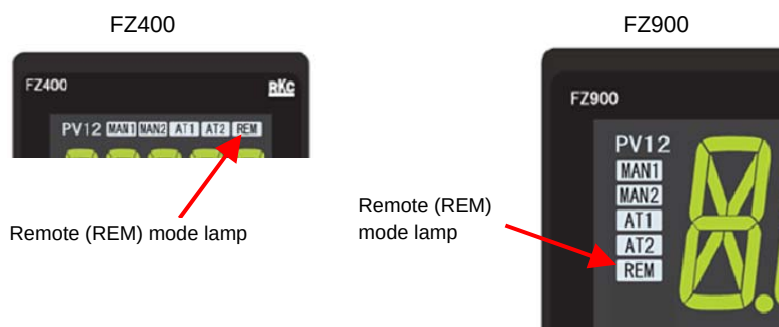


During the switchover by the set value (PV select transfer level), Remote/Local transfer (PV switchover) is not possible, but the transfer status can be checked on the Remote/Local transfer (PV switchover) screen to see if the control is done by Input 1 or Input 2.



The Remote (REM) mode lamp lights on when the “Input 2 is used” as the Measured value (PV) of the PV select and “when Input 1 is switched to Input 2.” When “Input 1 is used” and “when Input 2 is switched to Input 1,” the Remote (REM) mode lamp goes off.

[Position of the Remote mode lamp]



For FZ400/900, the FUNC key may be configured to switch between Input 1 and Input 2. For details, refer to **10.8 Accessing some functions directly (FUNC key) (P. 10-35)**.



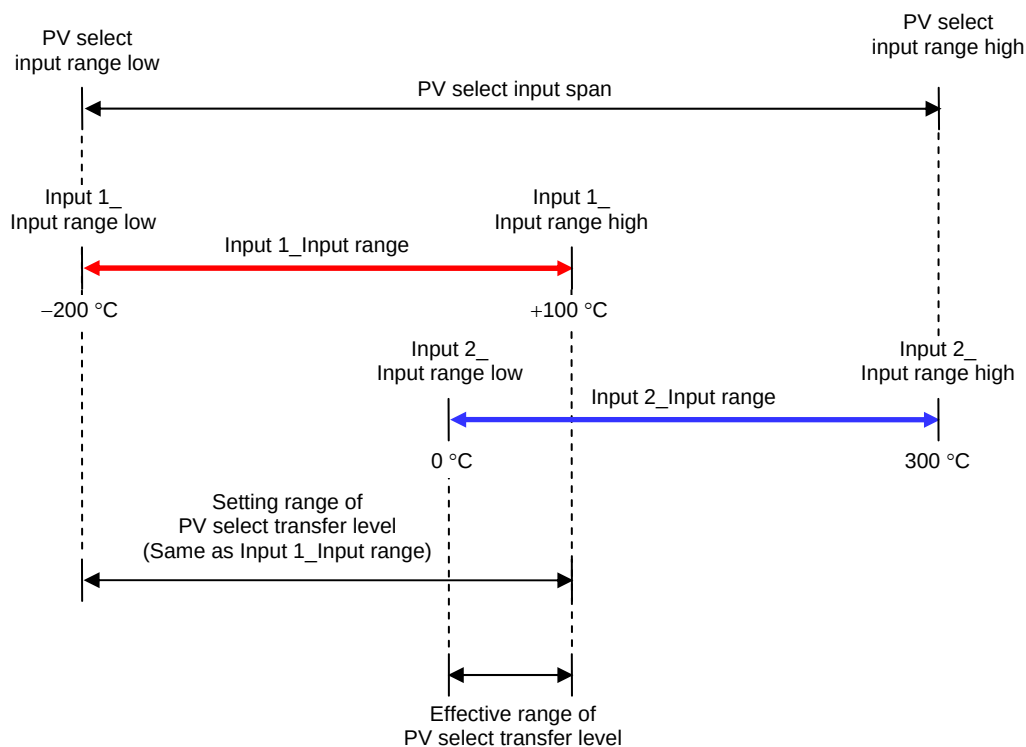
Input range and input span of the PV select

The “PV select input span,” the “PV select input range high” and the “PV select input range low” mean “Input span,” “Input range high” and “Input range low” at the time of Control with PV select respectively.

The setting range is as follows.

- PV select input range high: Input range high of Input 1 and Input 2, whichever is larger
- PV select input range low: Input range low of Input 1 and Input 2, whichever is smaller
- PV select input span: PV select input range low up to PV select input range high

[Example] When there is a relation as follows between the Input range of Input 1 and Input 2.



In the above example, the effective range of the PV select transfer level is 0 to 100 °C. This means that the action when the PV select transfer level is set somewhere between -200 °C and 0 °C is equal to the action of the 0 °C setting.



When the input is transferred after the start of the Startup tuning (ST), the ST will be aborted. In the case of Autotuning (AT), if the input is transferred after the output has been transferred, the AT will be aborted.



When either one of Input 1 (PV1) or Input 2 (PV2) is disconnected, the PV select transfer time will be invalid.

Parameter setting

Remote/Local transfer (Control with PV select)

[Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When “Control with PV select” is selected at Select function for input 2 I nP1: Input 1 I nP2: Input 2	I nP1



To display “Remote/Local transfer” (Control with PV select), specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Control with PV select.



When “Switching by level” is selected at “Selection of PV select trigger,” the parameter becomes display only.

PV select transfer level

[Setup Setting Mode: Setting group No. 58 (5n5B)]

Parameter symbol	Data range	Factory set value
2PV.LV	Input 1_Input range low to Input 1_Input range high [Varies with the setting of the Decimal point position.]	Input 1_Input range high



To display “PV select transfer level,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Control with PV select.

PV select transfer time

[Setup Setting Mode: Setting group No. 58 (5n5B)]

Parameter symbol	Data range	Factory set value
2PV.TM	0.0 to 100.0 seconds	0.0



To display “PV select transfer time,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Control with PV select.

● Select function for input 2

[Engineering mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm *This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	• FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 • FZ110: 1



To display “Select function for input 2,” “Remote setting input” or “Measured input 2” must be specified at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized or changed when the Select function for input 2 is changed.

● Selection of PV select trigger

[Engineering mode: Function block No. 58 (Fn58)]

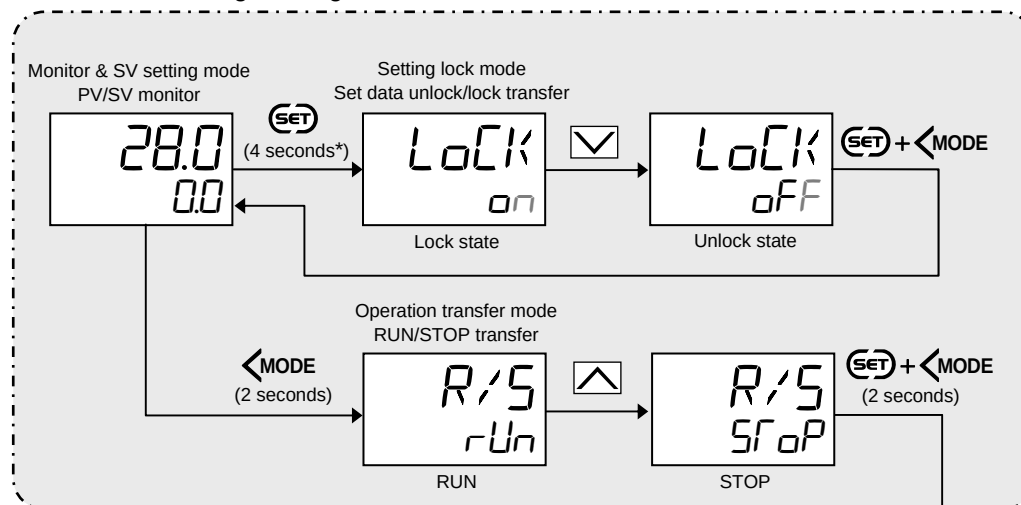
Parameter symbol	Data range	Factory set value
2PV.TG	0: Switching by level 1: Switching by signal (Key, DI and Communication)	0



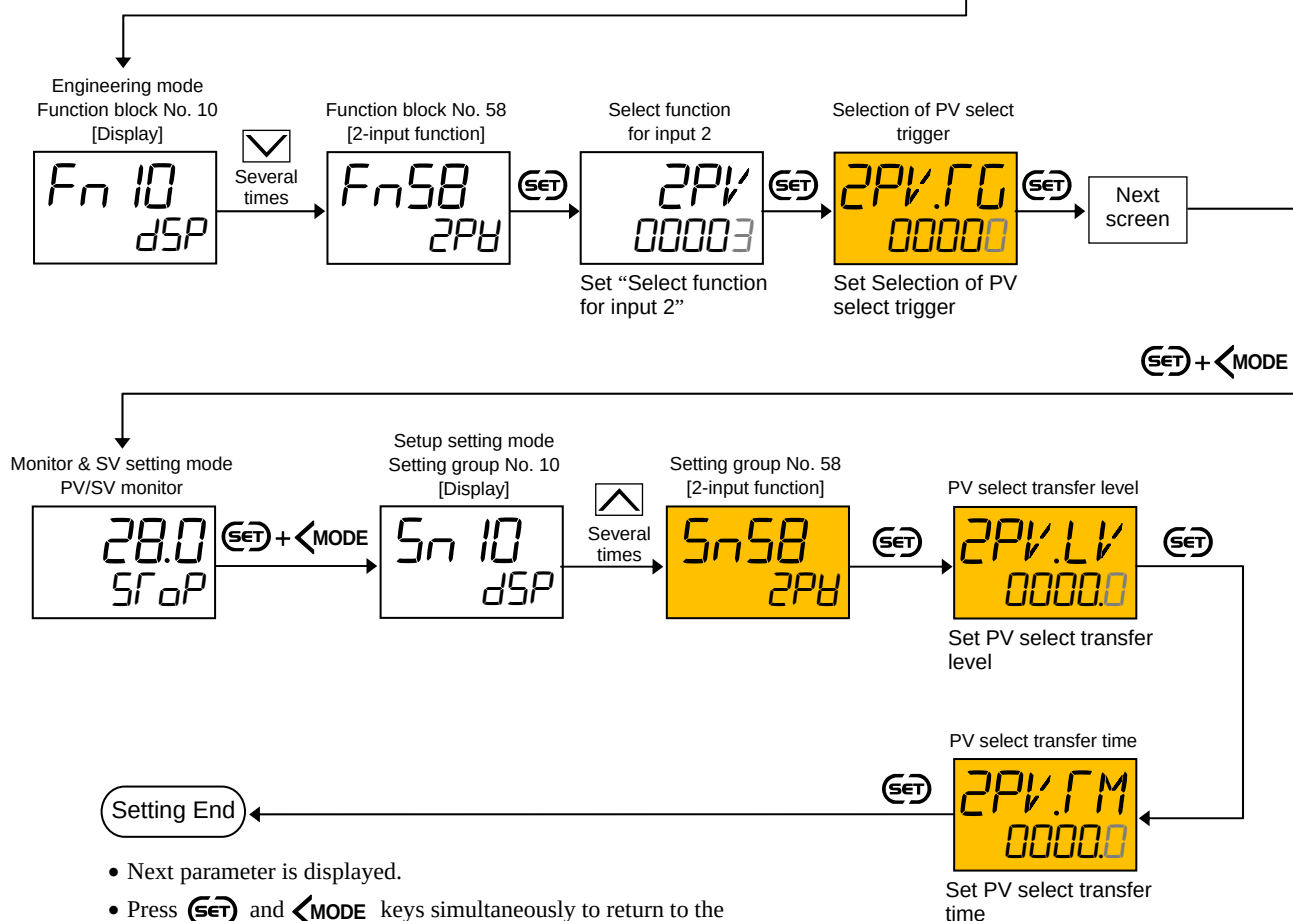
To display “Selection of PV select trigger,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Control with PV select.

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

8.14 Executing Cascade Control [FZ400/900]

During the Cascade control, the temperature of the controlled object is monitored by the Master, and depending on the deviation between the target value (set value) and the actual temperature, the set value of the Slave is adjusted. The controlled object is controlled by the Slave to bring the temperature of the controlled object to the target value.

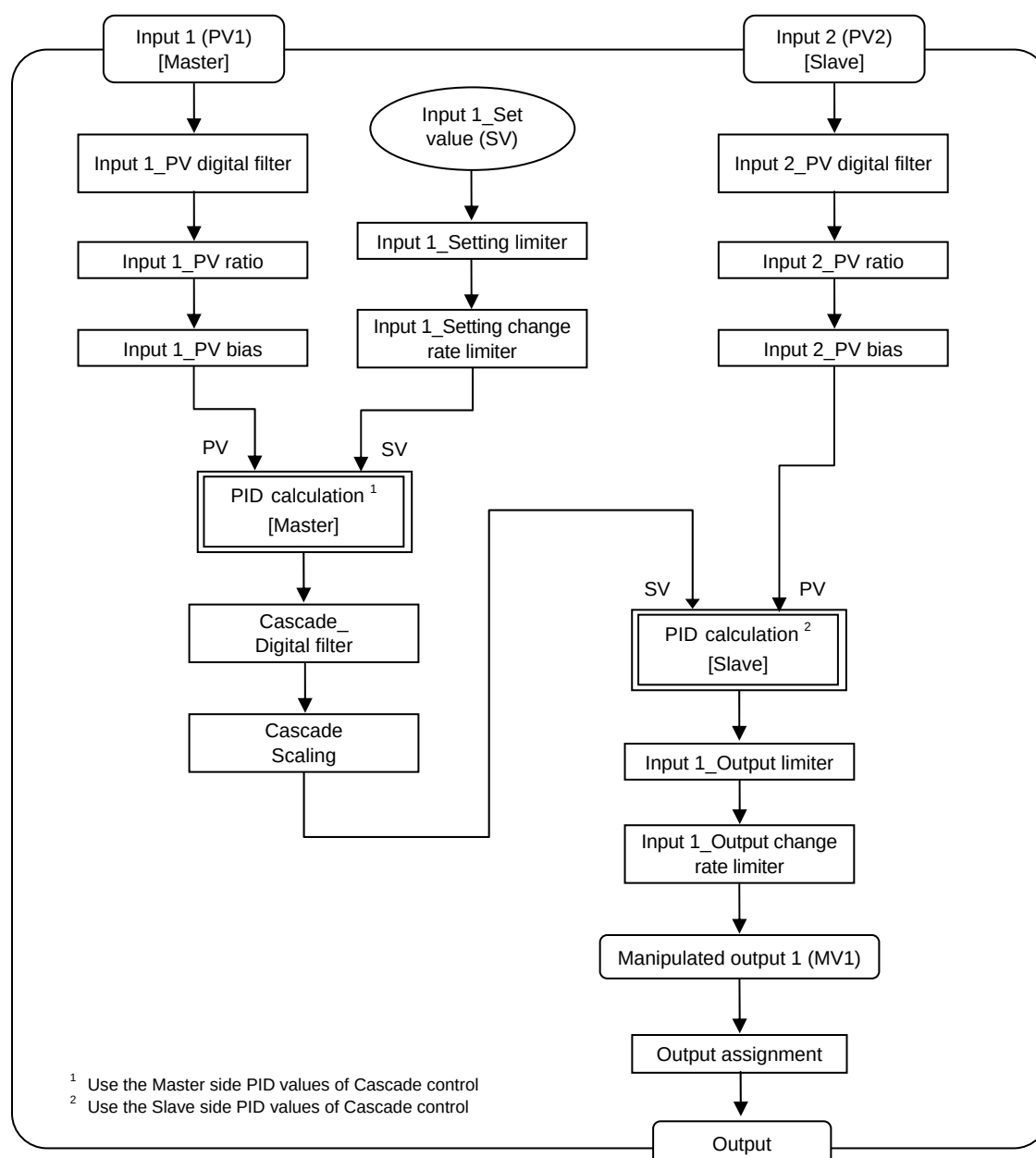
On the FZ400/900, Input 1 can be assigned to the Master and Input 2 to the Slave respectively to conduct Cascade control on a single instrument. The use of Autotuning (AT) exclusively designed for the Cascade control allows the PID values of both the Master and the Slave to be calculated.

■ Description of function

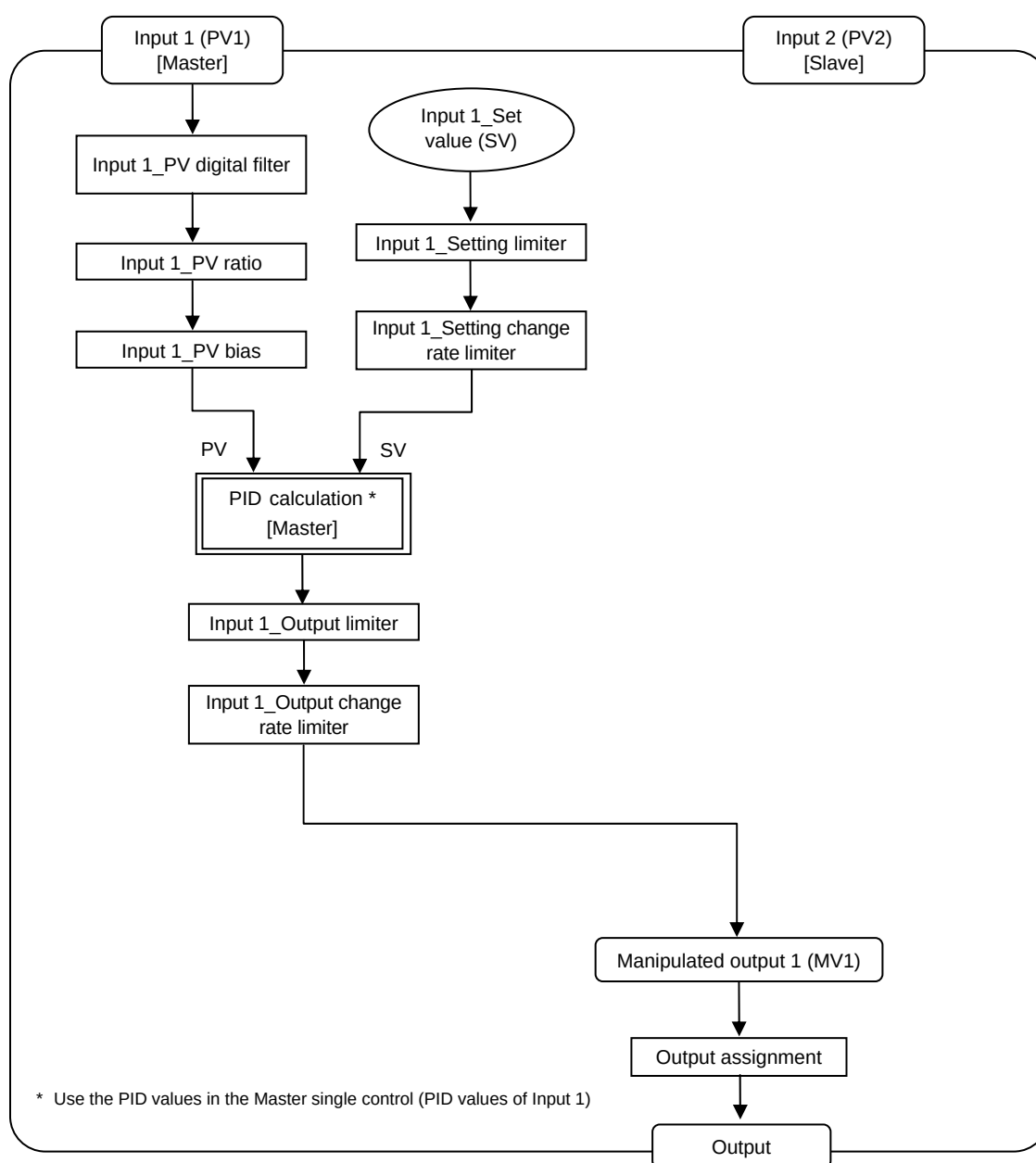
The Cascade control has two types; One is to switch between “Cascade control” and “Master single control” and the other is to switch between “Cascade control” and “Slave single control.”

The internal processing of the control is described below.

[Description of Cascade control]

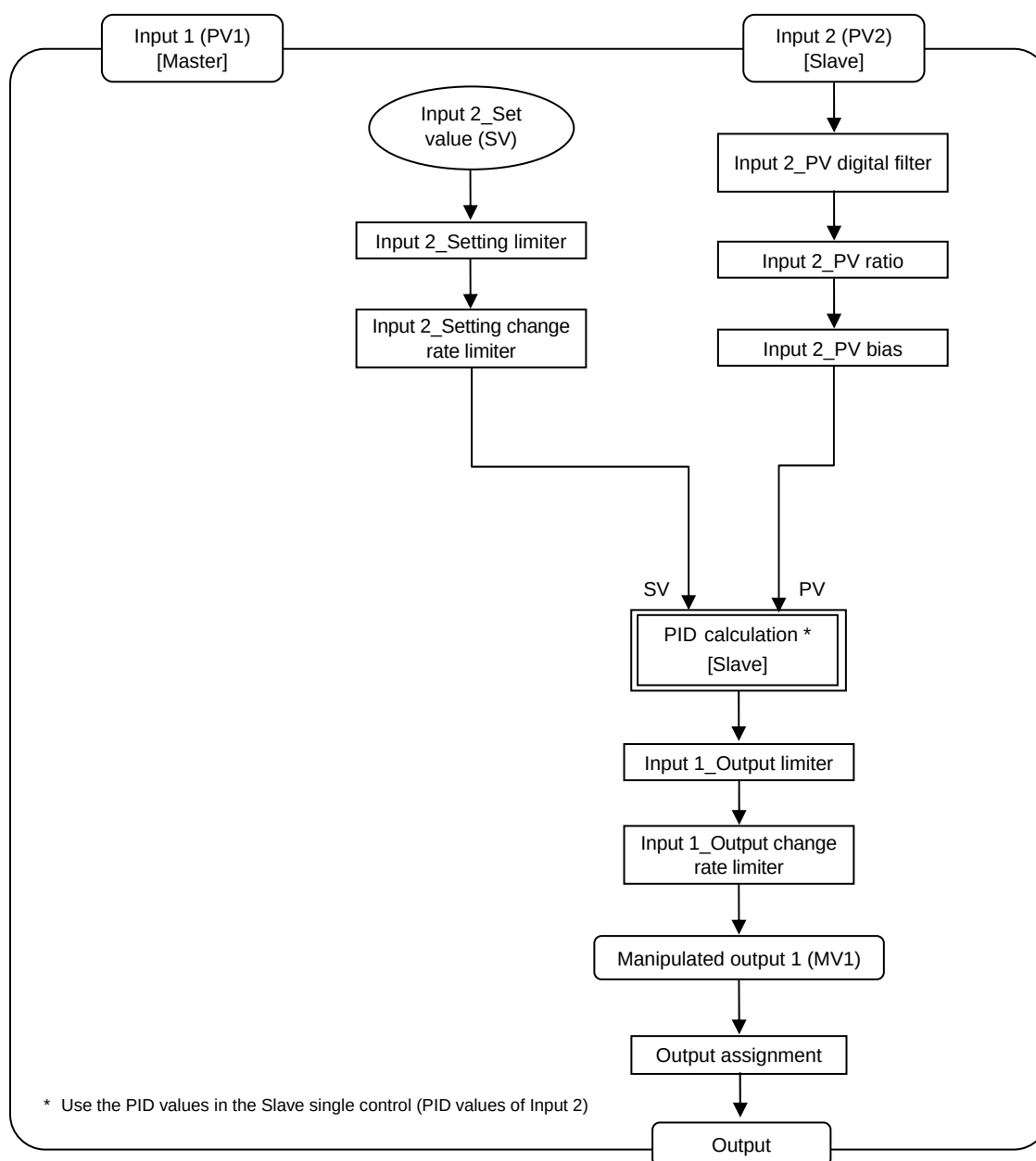


[Description of Master single control]



To switch between “Cascade control” and “Master single control,” you need to set the Cascade control (Master single ↔ Cascade) at “Select function for input 2” in Function block No. 58 in the Engineering mode.

[Description of Slave single control]



To switch between “Cascade control” and “Slave single control,” you need to set the Cascade control (Slave single ↔ Cascade) at “Select function for input 2” in Function block No. 58 in the Engineering mode.

● Autotuning (AT) at Cascade control

During the Cascade control, four types of PID values can be calculated with the use of the Autotuning (AT) exclusively developed for the Cascade control.

● Types of PID values

Types of PID values	Calculated values
Master side PID values of Cascade control	Cascade_Proportional band (master-side), Cascade_Integral time (master-side), Cascade_Derivative time (master-side)
Slave side PID values of Cascade control	Cascade_Proportional band (slave-side), Cascade_Integral time (slave-side), Cascade_Derivative time (slave-side)
PID values in Master single control (PID values of Input 1)	Input 1_Proportional band, Input 1_Integral time, Input 1_Derivative time
PID values in Slave single control (PID values of Input 2)	Input 2_Proportional band, Input 2_Integral time, Input 2_Derivative time

● Cascade_AT mode

There are two types of Autotuning (AT) for the Cascade control; Easy adjustment and Load factor adjustment.

Easy adjustment: Autotuning (AT) is executed once. Control reference level* is not calculated.

Load factor adjustment: Autotuning (AT) is executed twice. Control reference level* is calculated.

* Control reference level is the data used for PID value calculation for Cascade control.

In the case of TC input/RTD input, there is no need of calculating the Control reference level and the Autotuning (AT) in the Easy adjustment can be used.

In the case of Voltage/Current inputs, the Control reference level must be calculated and the Autotuning (AT) in the Load factor adjustment must be used.

● PID values calculated by AT in different control modes

Control	Cascade AT mode		Types of PID values				Control reference level	
	Master-side	Slave-side	Master-side PID values of Cascade control	Slave-side PID values of Cascade control	PID values in Master single control	PID values in Slave single control	Master-side	Slave-side
Cascade control	Easy adjustment (AT once)	Easy adjustment (AT once)	×	×	×	×	—	—
	Easy adjustment (AT once)	Load factor adjustment (AT twice)	×	×	×	×	—	×
	Load factor adjustment (AT twice)	Easy adjustment (AT once)	×	×	×	×	×	—
	Load factor adjustment (AT twice)	Load factor adjustment (AT twice)	×	×	×	×	×	×
Master single control	Easy adjustment (AT once)	Note	×	—	×	—	—	—
	Load factor adjustment (AT twice)	Note	×	—	×	—	×	—
Slave single control	Note	Easy adjustment (AT once)	—	×	—	×	—	—
	Note	Load factor adjustment (AT twice)	—	×	—	×	—	×

Note: Setting is ignored.

× : Calculated

— : Not calculated



When executing the Autotuning (AT) of the Cascade control, always use “Input 1_Autotuning (AT)” in the Operation transfer mode.

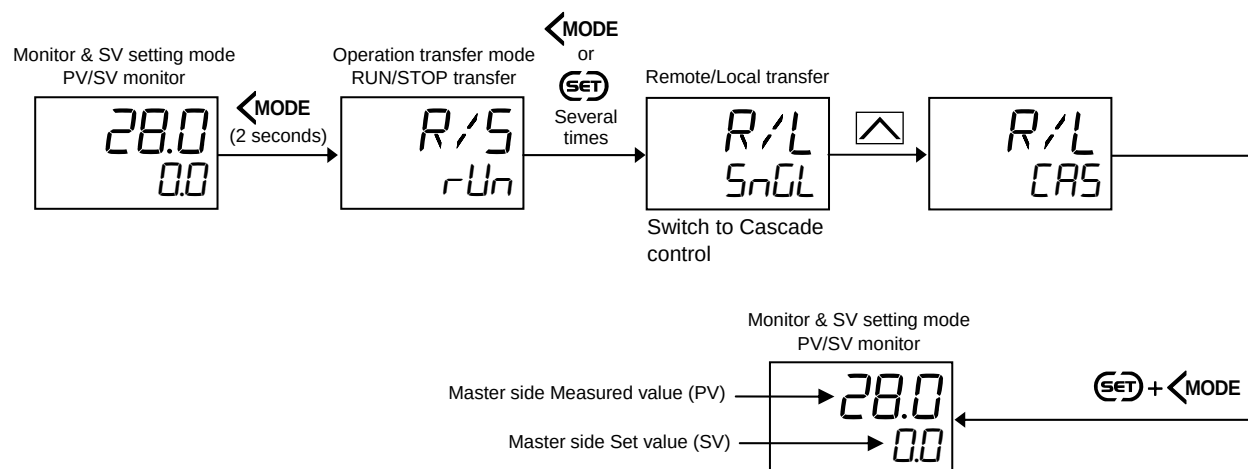


When executing the Autotuning (AT) for the Cascade control, make sure that the set values (SV) of the Master and the Slave are properly set.

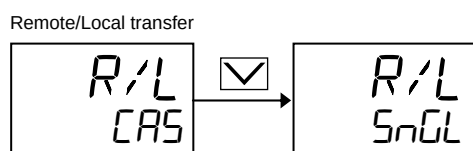
■ Switching between Cascade and Single

● Selection by front key operation

Single control (Master single or Slave single) → Cascade control

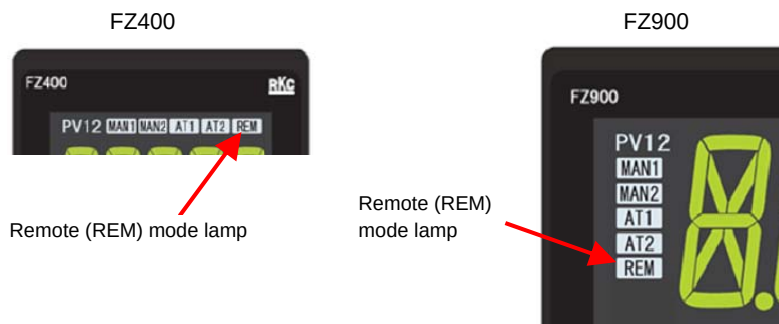


Cascade control → Single control (Master single or Slave single)



During the Cascade control mode, the Remote (REM) mode lamp lights on.

[Position of the Remote mode lamp]



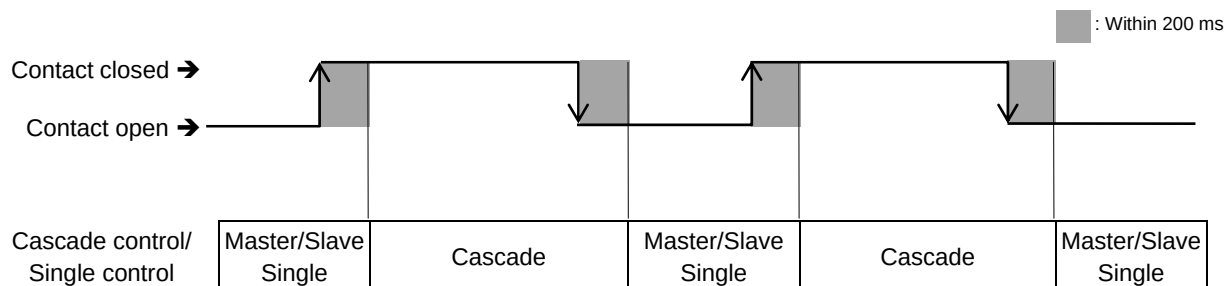
For FZ400/900, the FUNC key may be configured to switch between Cascade control and Single control. For details, refer to **10.8 Accessing some functions directly (FUNC key) (P. 10-35)**.

● Switching the mode with Digital Input (DI)

To switch the Remote/Local (Cascade control) using the Digital Input (DI), use “DI function selection” (Function block No. 23 in the Engineering mode).

- For the Digital input (DI) assignment, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

Transfer timing of Remote/Local (Cascade control/Single control)



NOTE

After the contact is transferred, it takes “Within 200 ms” until the action of this instrument is actually selected.

- The above switching action can be inverted (The functions at contact close and contact open can be swapped). This setting can be done at “DI logic invert.” For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● Remote/Local transfer (Cascade control) state

The table below shows the actual Cascade control/Single control status and displays under different combinations of settings by Key operation, Communication, and Digital input (DI).

Setting via front keys or through communication	Setting via Digital Input (DI)	Instrument status
Cascade control	Cascade control	Cascade control
	Single control (Master/Slave)	Single control (Master/Slave)
Single control (Master/Slave)	Cascade control	
	Single control (Master/Slave)	

Priority to Single control

■ Parameter setting

● Remote/Local transfer (Cascade control)

[Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
<i>R/L</i>	When “Cascade control” is selected at Select function for input 2 <i>SnGL</i> : Single control (Master single or Slave single) <i>CAS</i> : Cascade control	<i>SnGL</i>



To display “Remote/Local transfer” (Cascade control), specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Input 1_Proportional band [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (*Pn51*)]

Parameter symbol	Data range	Factory set value
<i>I.</i> <i>P</i>	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

● Input 1_Integral time [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (*Pn51*)]

Parameter symbol	Data range	Factory set value
<i>I.</i> <i>I</i>	PID control or Heat/Cool PID control: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control: 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240



To display “Input 1_Integral time [heat-side],” you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 1_Derivative time [heat-side]

[Parameter Setting Mode: Parameter group No. 51 (*Pn51*)]

Parameter symbol	Data range	Factory set value
<i>I.</i> <i>d</i>	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60



To display “Input 1_Derivative time [heat-side],” you need to enter a value other than 0 in the Input 1_Proportional band [heat-side] in the same memory area.

● Input 2_Proportional band

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2. P	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0



To display “Input 2_Proportional band,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 2_Integral time

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2. I	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240



To display “Input 2_Integral time,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band in the same memory area.

● Input 2_Derivative time

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2. D	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60



To display “Input 2_Derivative time,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band in the same memory area.

- **Cascade_Proportional band (master-side)**
[Setup Setting Mode: Setting group No. 58 (5n5θ)]

Parameter symbol	Data range	Factory set value
MAS.P	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span	TC/RTD inputs: 30 V/I inputs: 3.0



To display “Cascade_Proportional band (master-side),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

- **Cascade_Integral time (master-side)**
[Setup Setting Mode: Setting group No. 58 (5n5θ)]

Parameter symbol	Data range	Factory set value
MAS.I	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240



To display “Cascade_Integral time (master-side),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

- **Cascade_Derivative time (master-side)**
[Setup Setting Mode: Setting group No. 58 (5n5θ)]

Parameter symbol	Data range	Factory set value
MAS.d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60



To display “Cascade_Derivative time (master-side),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

- **Cascade_Proportional band (slave-side)**
[Setup Setting Mode: Setting group No. 58 (5n5θ)]

Parameter symbol	Data range	Factory set value
SLV.P	TC/RTD inputs: 1 (0.1, 0.01) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 2_Input span	TC/RTD inputs: 30 V/I inputs: 3.0



To display “Cascade_Proportional band (slave-side),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Integral time (slaver-side)

[Setup Setting Mode: Setting group No. 58 (5n5θ)]

Parameter symbol	Data range	Factory set value
SLV.I	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240



To display “Cascade_Integral time (slave-side),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Derivative time (slave-side)

[Setup Setting Mode: Setting group No. 58 (5n5θ)]

Parameter symbol	Data range	Factory set value
SLV.d	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60



To display “Cascade_Derivative time (slave-side),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Digital filter

[Setup Setting Mode: Setting group No. 58 (5n5θ)]

Parameter symbol	Data range	Factory set value
C.DF	0.0 to 100.0 seconds 0.0: Filter OFF	10.0



To display “Cascade_Digital filter,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Scale high

[Setup Setting Mode: Setting group No. 58 (5n5θ)]

Parameter symbol	Data range	Factory set value
C.SCH	Cascade_Scale low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	Input 2_Setting limiter high



To display “Cascade_Scale high,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_Scale low

[Setup Setting Mode: Setting group No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
C.SCL	Input 2_Setting limiter low to Cascade_Scale high [Varies with the setting of the Decimal point position.]	Input 2_Setting limiter low



To display “Cascade_Scale low,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Select function for input 2

[Engineering mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
2PV	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm *This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	• FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 • FZ110: 1



To display “Select function for input 2,” “Remote setting input” or “Measured input 2” must be specified at the time of order.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are initialized or changed when the Select function for input 2 is changed.

● Cascade_AT mode (master-side)

[Engineering mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
MAS.AF	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1



To display “Cascade_AT mode (master-side),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

● Cascade_AT mode (slave-side)

[Engineering mode: Function block No. 58 (Fn58)]

Parameter symbol	Data range	Factory set value
SLV.AF	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1

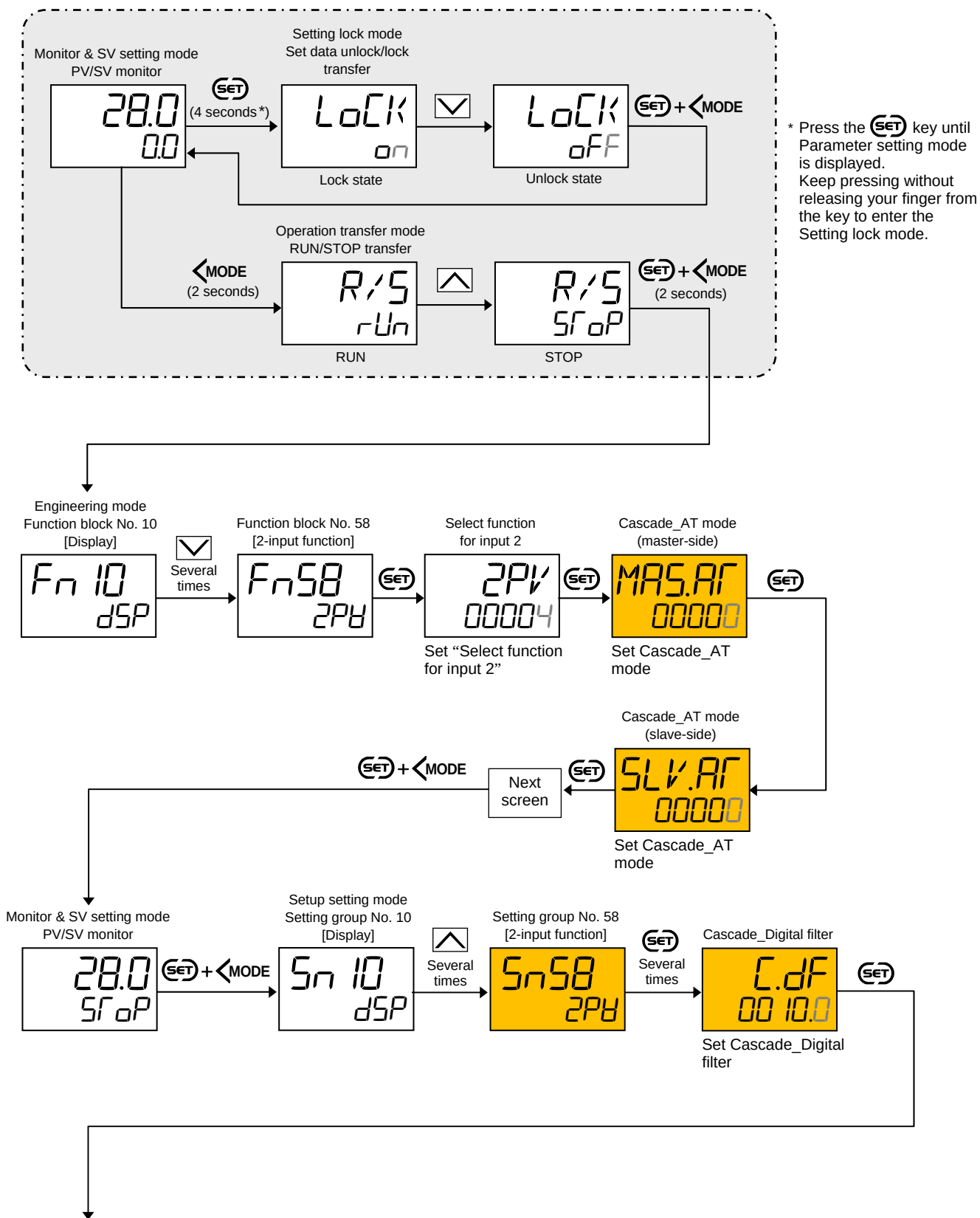


To display “Cascade_AT mode (slave-side),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control.

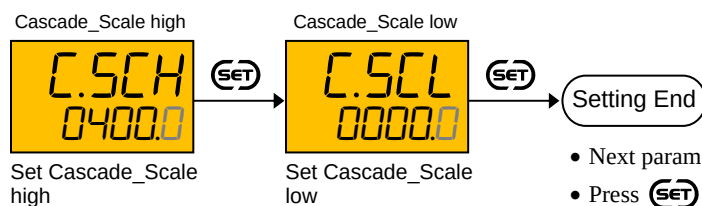
Setting procedure

Calculating the PID values for Cascade control (Slave single ↔ Cascade) using AT

Cascade control related setting

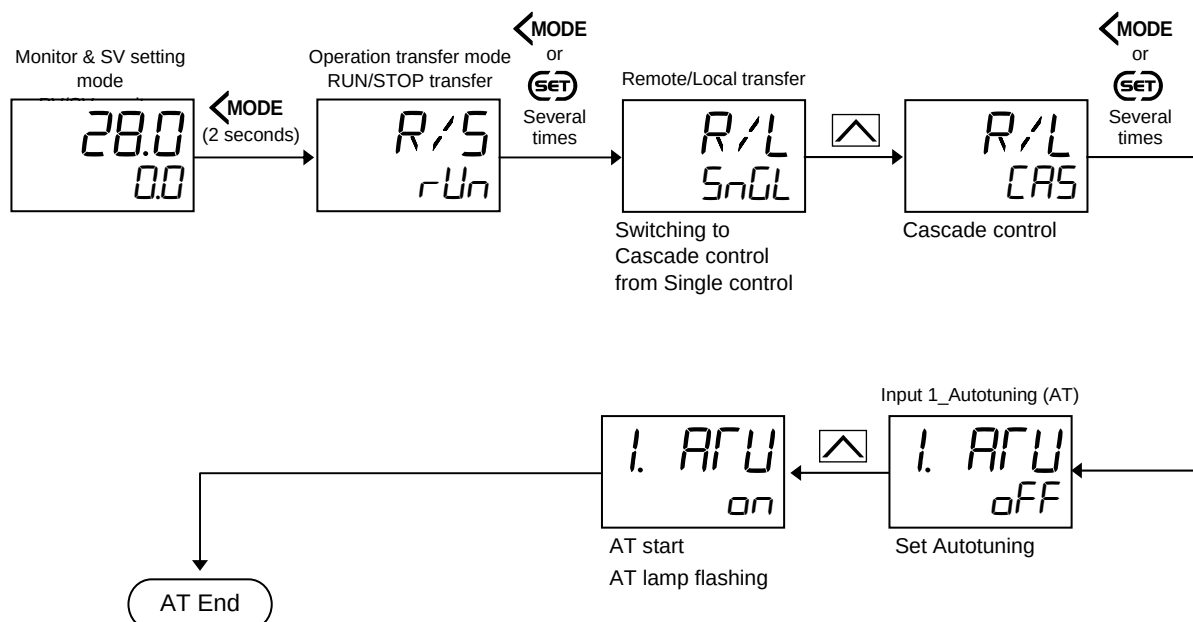


Continued from the previous page.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

● Switching to Cascade control and executing AT



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

PID values in Slave single control

Monitor & SV setting mode
PV/SV monitor

28.0
0.0

(SET) (2 seconds)

Parameter setting mode
Parameter group No. 00
[Setting]

Pn00
SH

Once or Twice

Parameter group No. 51
[Input 1_Control]

Pn51
I.Conf

(SET)

Input 1_Proportional band [heat-side]

1. P
0030.0

(SET)

Check Proportional band

Input 1_Derivative time [heat-side]

1. d
0060.0

(SET) Several times

Check Derivative time

Input 1_Integral time [heat-side]

1. I
0240.0

(SET)

Check Integral time

Input 2_Proportional band

2. P
0030.0

(SET)

Check Proportional band

Input 2_Integral time

2. I
0240.0

(SET)

Check Integral time

Input 2_Derivative time

2. d
0060.0

(SET)

Check Derivative time

Next screen

(SET) + <MODE>

Master-side PID values of Cascade control

Monitor & SV setting mode
PV/SV monitor

28.0
0.0

(SET) + <MODE>

Setup setting mode
Setting group No. 10
[Display]

Sn10
dSP

Several times

Setting group No. 58
[2-input function]

Sn58
2PH

(SET)

Cascade_Proportional band (master-side)

MAS.P
0030.0

(SET)

Check Proportional band

Cascade_Integral time (master-side)

MAS.I
0240.0

(SET)

Check Integral time

Cascade_Derivative time (master-side)

MAS.d
0060.0

(SET)

Check Derivative time

Cascade_Proportional band (slave-side)

SLV.P
0030.0

(SET)

Check Proportional band

Cascade_Integral time (slave-side)

SLV.I
0240.0

(SET)

Check Integral time

Cascade_Derivative time (slave-side)

SLV.d
0060.0

(SET)

Checking End

- Next parameter is displayed.
- Press (SET) and <MODE> keys simultaneously to return to the Measured value

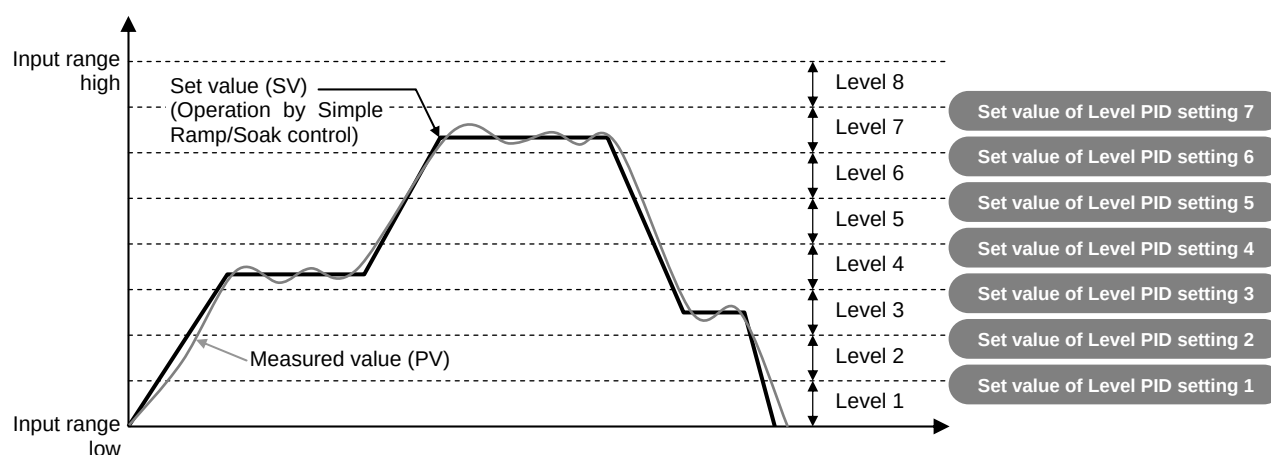
- 8-97

8.15 Controlling with Level PID

Level PID function is used to set the following parameters for control to each divided level of the input range (up to 8 levels): PID values, Control response parameters, Output limiter high/low, Control loop break alarm (LBA) time and LBA deadband.

■ Description of function

- Set the values such as PID values of each level to the Memory area 1 to 8 (PID memory group 1 to 8).
- The input range can be divided based on the setting for the parameters of Level PID setting 1 to Level PID setting 7.
- The value selected in the Level PID action selection [SV or PV] is checked and determined in which level of the PID it is, and the control is done using the PID values from the Memory area appropriate to the level.
- Different levels can be set at Input 1 and Input 2.



● Memory area to be used for level

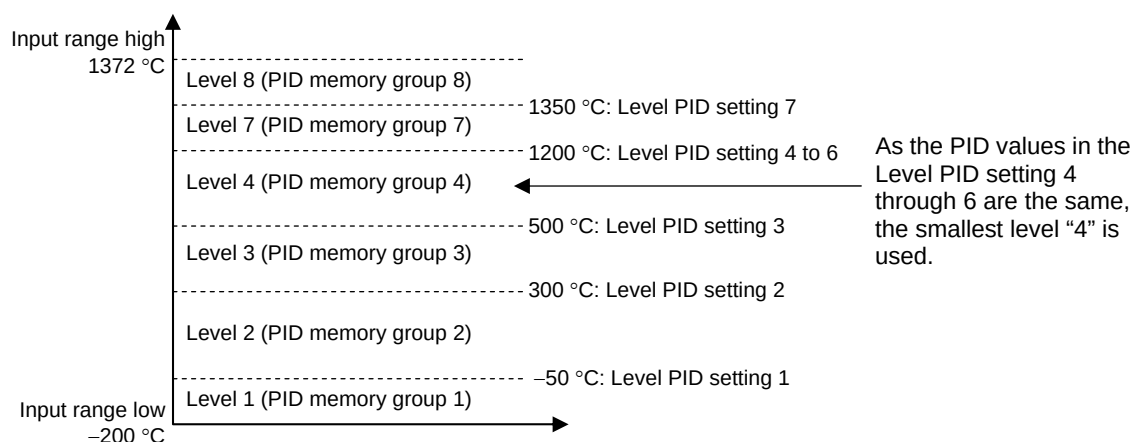
The memory area used at each level will be selected after comparison between the Level PID setting and the value [Set value (SV) or Measured value (PV)] selected in the Level PID action selection

Level	PID memory group	Description	Memory area
Level 8	PID memory group 8	Level PIDsetting 7 < Set value (SV) or Measured value (PV) ≤ Input rang high	Memory area 8
Level 7	PID memory group 7	Level PIDsetting 6 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 7	Memory area 7
Level 6	PID memory group 6	Level PIDsetting 5 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 6	Memory area 6
Level 5	PID memory group 5	Level PIDsetting 4 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 5	Memory area 5
Level 4	PID memory group 4	Level PIDsetting 3 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 4	Memory area 4
Level 3	PID memory group 3	Level PIDsetting 2 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 3	Memory area 3
Level 2	PID memory group 2	Level PIDsetting 1 < Set value (SV) or Measured value (PV) ≤ Level PIDsetting 2	Memory area 2
Level 1	PID memory group 1	Input range low ≤ Set value (SV) or Measured value (PV) ≤ Level PIDsetting 1	Memory area 1



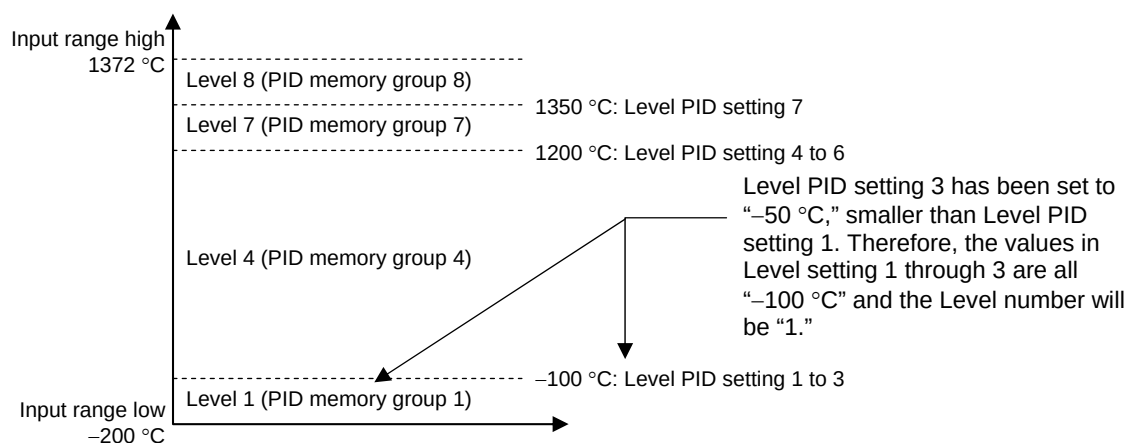
- When two or more levels have the same setting, the values with a smaller level number will be valid and used.

[Example 1] Values in Level PID setting 4 through 6 are the same.



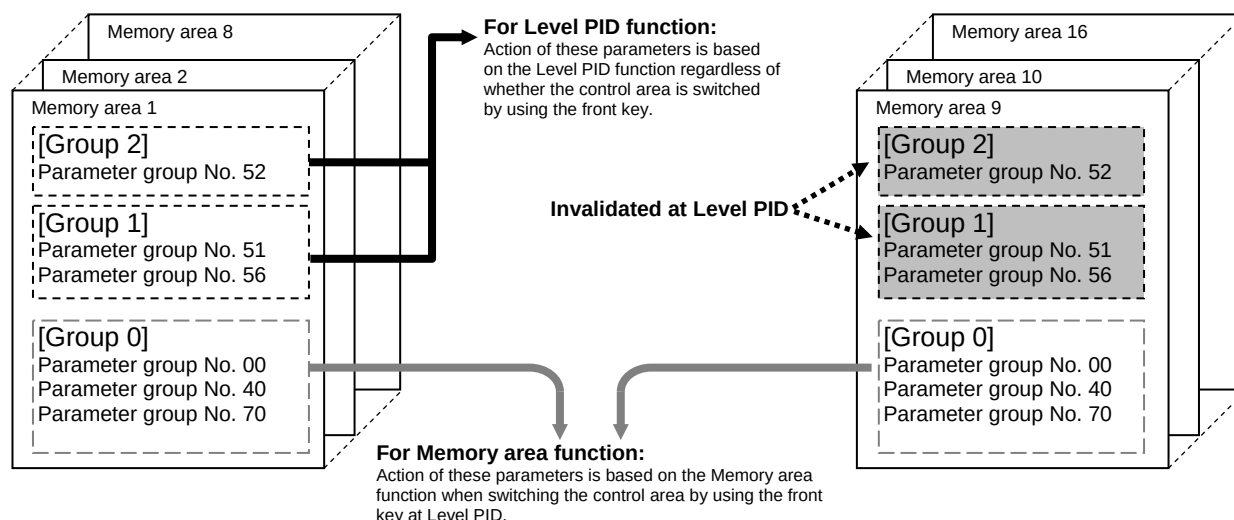
- If the Level PID setting is set ignoring the order of the level Nos., the Level PID values in the set range will be the same and the smallest level number is used. (See Example 2)

[Example 2] Level PID setting 3 in Example 1 has been changed to -100 °C.



● Parameters of Memory area at Level PID

When using Level PID, parameters of Memory area are separated to be used for the Level PID function and the regular Memory area function.



Parameters of Memory area (at Level PID)

Parameters in each group

Parameters for Memory area function (Memory area 1 to 16)

[Group 0]

Parameter group No. 00

- Input 1_Set value (SV)
- Input 2_Set value (SV)
- Set value (SV) of differential temperature input

Parameter group No. 40

- Event 1 set value (EV1)
- Event 1 set value (EV1') [high]
- Event 1 set value (EV1') [low]
- Event 2 set value (EV2)
- Event 2 set value (EV2') [high]
- Event 2 set value (EV2') [low]
- Event 3 set value (EV3)
- Event 3 set value (EV3') [high]
- Event 3 set value (EV3') [low]
- Event 4 set value (EV4)
- Event 4 set value (EV4') [high]
- Event 4 set value (EV4') [low]

Parameter group No. 70

- Select Trigger type for Memory area transfer
- Area soak time
- Link area number
- Input 1_Setting change rate limiter (up)
- Input 1_Setting change rate limiter (down)
- Input 1_Auto/Manual transfer selection (Area)
- Input 1_Manipulated output value (Area)
- Input 2_Setting change rate limiter (up)
- Input 2_Setting change rate limiter (down)
- Input 2_Auto/Manual transfer selection (Area)
- Input 2_Manipulated output value (Area)
- Remote/Local transfer selection (Area)

Parameters for Level PID function (Memory area 1 to 8)

[Group 1]

Parameter group No. 51

- Input 1_Proportional band [heat-side]
- Input 1_Integral time [heat-side]
- Input 1_Derivative time [heat-side]
- Input 1_Control response parameter
- Input 1_Proactive intensity
- Input 1_Manual reset
- Input 1_FF amount
- Input 1_Output limiter high [heat-side]
- Input 1_Output limiter low [heat-side]
- Input 1_Control loop break alarm (LBA) time
- Input 1_LBA deadband (LBD)

Parameter group No. 56

- Input 1_Proportional band [cool-side]
- Input 1_Integral time [cool-side]
- Input 1_Derivative time [cool-side]
- Input 1_Overlap/Deadband
- Input 1_Output limiter high [cool-side]
- Input 1_Output limiter low [cool-side]

[Group 2]

Parameter group No. 52

- Input 2_Proportional band
- Input 2_Integral time
- Input 2_Derivative time
- Input 2_Control response parameter
- Input 2_Proactive intensity
- Input 2_Manual reset
- Input 2_FF amount
- Input 2_Output limiter high
- Input 2_Output limiter low
- Input 2_Control loop break alarm (LBA) time
- Input 2_LBA deadband (LBD)

During the Level PID, Memory areas 9 through 16 are not used (invalid).



These parameters are all in the Parameter setting mode, However, “ON/OFF action differential gap (upper)” and “ON/OFF action differential gap (lower)” are excluded.

●Parameters for Level PID function

In Memory areas 1 through 8, the parameters in [Group 1] and [Group 2] are used as parameters for Level PID. Setting in Memory areas 9 through 16 will be ignored.

Memory area number for the control area can be changed by the front key, communication, Digital input (DI), Simple ramp/soak function or Simple sequence function; however, the parameters for Level PID function of the changed Memory area are invalidated.

The value selected in the Level PID action selection [SV or PV] is checked and determined in which level of the PID it is, and the control is done using the PID values from the Memory area appropriate to the level.



Refer to P. 8-100 for parameters in each group.



To use regular Memory area function

Input 1_Level PID action selection (Function block No. 51 in the Engineering mode) and Input 2_Level PID action selection (Function block No. 52 in the Engineering mode) can be used as a regular Memory area function in the case of “Switching by Memory area number” (Factory set value).

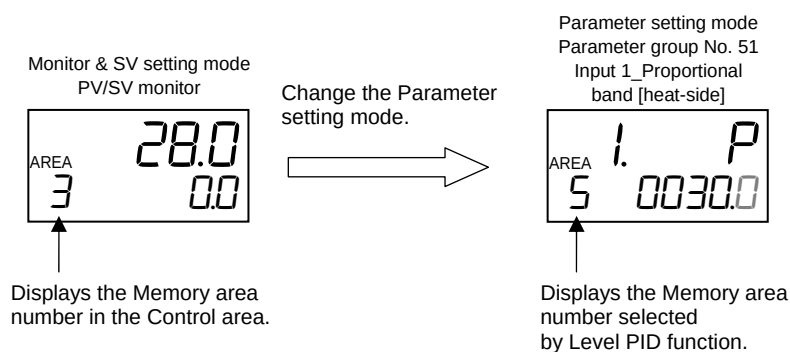


Memory area display at Level PID

PID values used for control are changed by the Level PID, but the control area is not influenced. This means that the Memory area No. on the PV/SV monitor screen in the Monitor & SV setting mode remains unchanged.

To check the Memory area No. actually used by the Level PID, locate the parameter used in the Level PID in the Parameter setting mode. Then, the actual Memory No. will be displayed. (See the example below)

[Example] In this example, Area 3 is displayed on the instrument (as a control area). Parameter “P” is displayed to show the Memory area No. actually used by the Level PID.



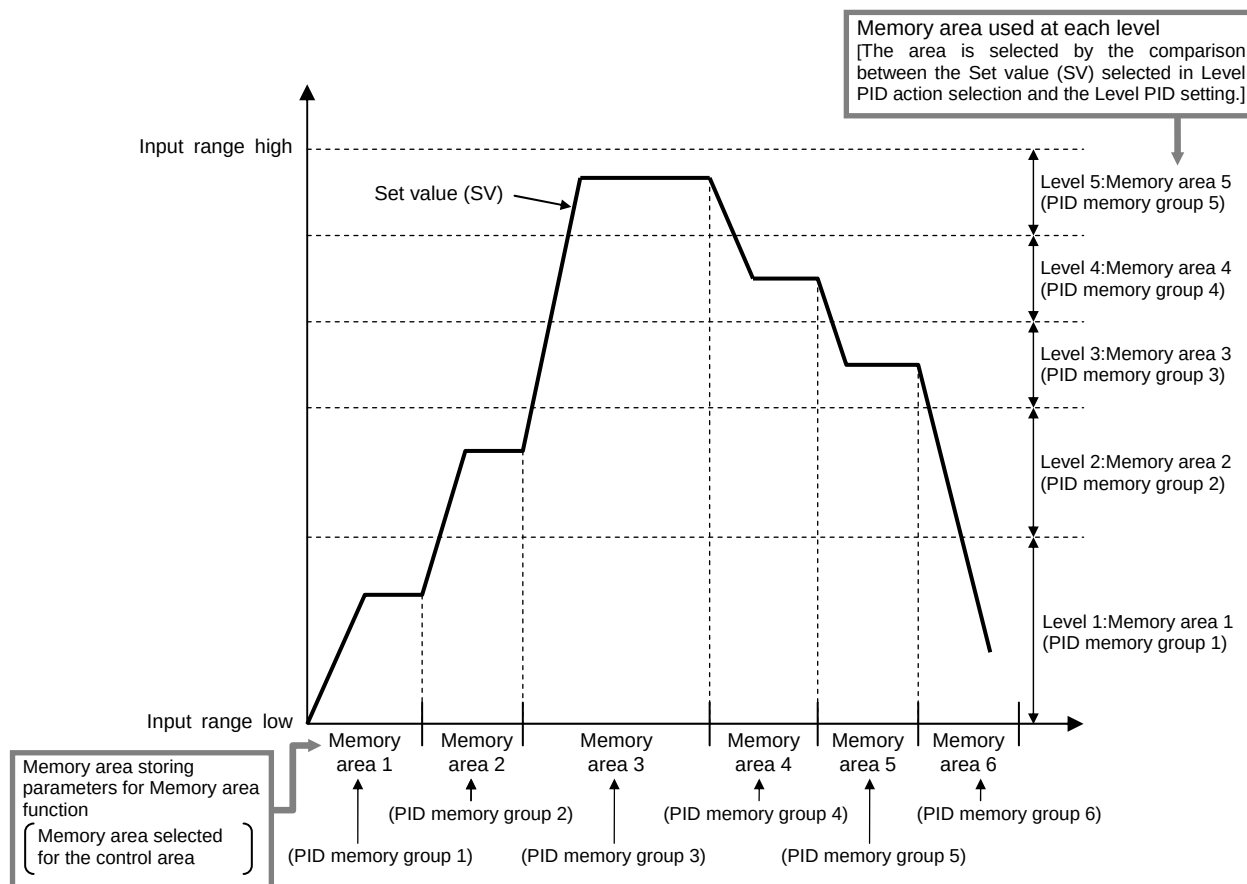
●Parameters for Memory area function

In Memory areas 1 through 16, parameters in [Group 0] can be used for the regular Memory area function. The parameters for the changed Memory area are validated by switching the Memory areas of the control area by the front key, communication, Digital input (DI), Simple ramp/soak function or Simple sequence function.



For details of the parameters in Group 0, refer to P. 8-100.

- Example of action of the Memory area when setting simple ramp/soak program at Level PID
[When “1: Switching by Set value (SV) (Level PID action)” is selected in Level PID action selection]



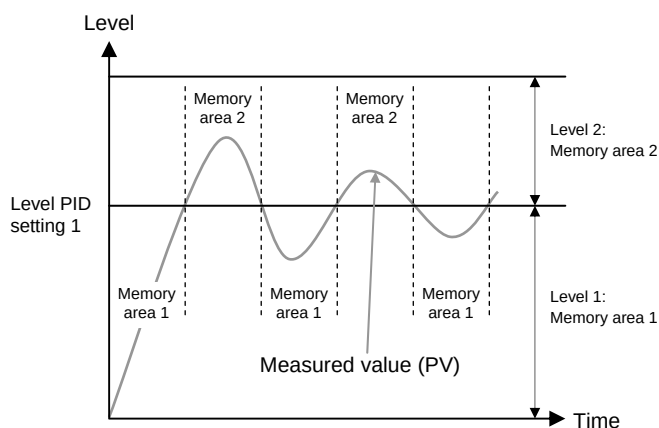
● Level PID differential gap

When setting “Switch by Measured value (PV)” to Level PID action:

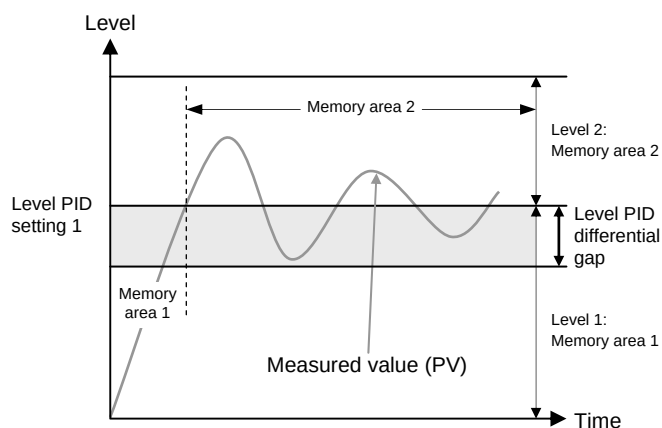
The Memory areas storing the parameters for Level PID function may switch frequently by the fluctuation of the input when the Measured value (PV) is close to the Level PID set value.

Setting Level PID differential gap prevents memory areas from switching too frequently.

When Level PID differential gap is not set



When Level PID differential gap is set



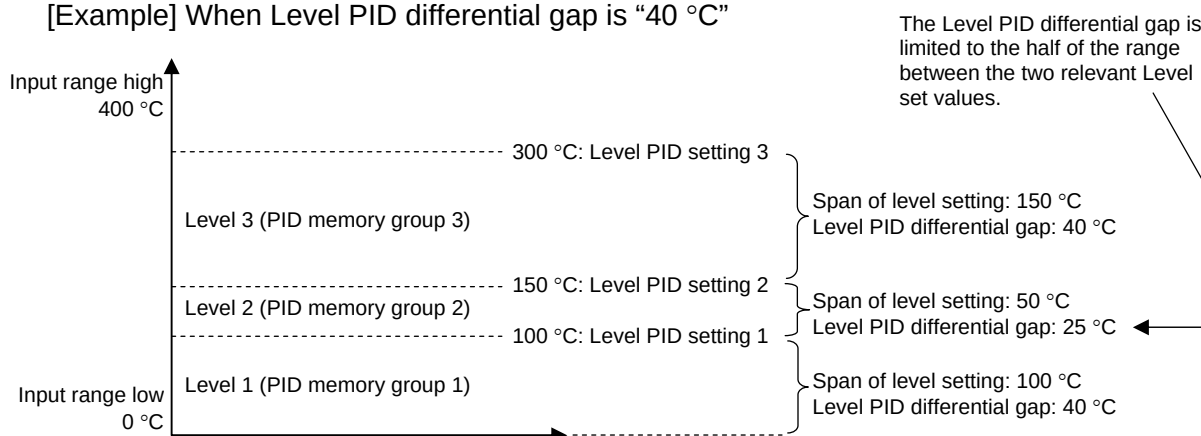
When setting “Switch by Set value (SV)” to Level PID action:

The setting of Level PID differential gap is validated; however, it is recommended to set “0.0” to Level PID differential gap.



When the setting of the Level PID differential gap is set larger than the half of the range between two continuous Level set values, the Level PID differential gap is forcibly limited to the half of the range between the two relevant Level set values.

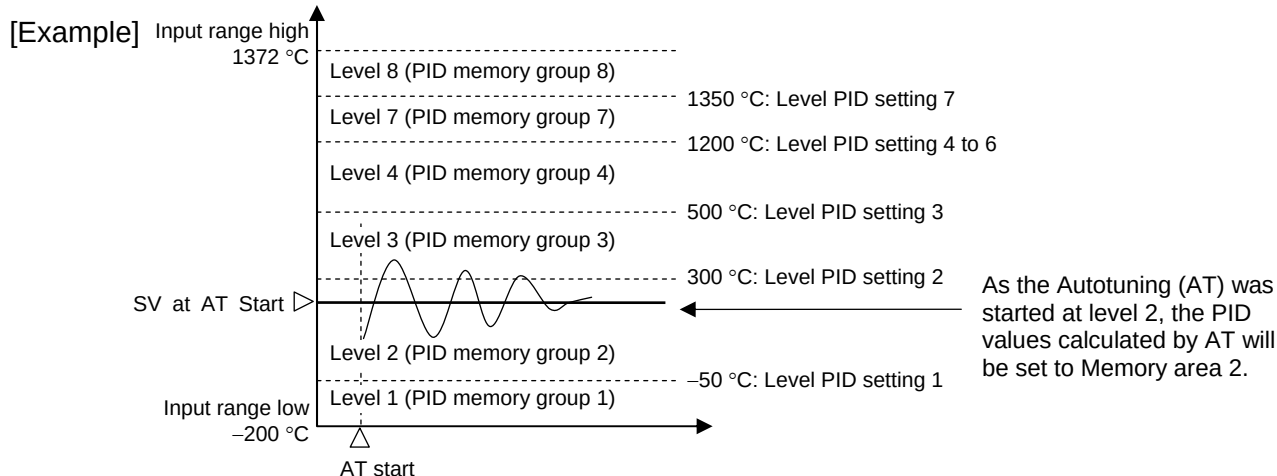
[Example] When Level PID differential gap is “40 °C”



● Autotuning (AT) at Level PID

Autotuning (AT) can be started even while Level PID function is used whether or not the Level PID action selection is “Switching by SV” or “Switching by PV”. Autotuning (AT) will be executed at the Set value (SV) when it is initiated.

The calculated PID values are stored in the memory area which has the Set value (SV) at the time of the Autotuning (AT) start.



● Level PID at Differential temperature control

When the Level PID action selection is “Switching by Set value (SV)”:

Level PID is done at the Input 1_Monitor Set value (SV)*.

* Input 1_Monitor Set value (SV) = Input 2_Measured value (PV) + Set value of Differential temperature input

When the Level PID action selection is “Switching by Measured value (PV)”:

Level PID is done at the Measured value (PV) Input 1.



The Level PID will not work at the Set value (SV) or Measured value (PV) of the Differential temperature input.

Parameter setting

Input 1_Level PID setting 1 to Input 1_Level PID setting 7

[Setup Setting Mode: Setting group No. 51 (5n5 l)]

Parameter symbol	Data range	Factory set value
1.LEV 1	Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) [Varies with the setting of the Decimal point position.] Input 1_Level PID settings 1 to 7 always maintain the following relation. (Input 1_Level PID setting 1) ≤ (Input 1_Level PID setting 2) ≤ (Input 1_Level PID setting 3) ≤ (Input 1_Level PID setting 4) ≤ (Input 1_Level PID setting 5) ≤ (Input 1_Level PID setting 6) ≤ (Input 1_Level PID setting 7)	Input 1_Input range high (Control with PV select: PV select input range high)
1.LEV 2		
1.LEV 3		
1.LEV 4		
1.LEV 5		
1.LEV 6		
1.LEV 7		



To display the “Input 1_Level PID setting 1 through 7,” set switchover by the Set value (SV) or the Measured value (PV) at “Input 1_Level PID action selection” in Function block No. 51 in the Engineering mode AND set an item other than Cascade control at “Select function for input 2” in Function block No. 58 in the Engineering mode.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Level PID setting is changed.

Input 2_Level PID setting 1 to Input 2_Level PID setting 7

[Setup Setting Mode: Setting group No. 52 (5n52)]

Parameter symbol	Data range	Factory set value
2.LEV 1	Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Level PID settings 1 to 7 always maintain the following relation. (Input 2_Level PID setting 1) ≤ (Input 2_Level PID setting 2) ≤ (Input 2_Level PID setting 3) ≤ (Input 2_Level PID setting 4) ≤ (Input 2_Level PID setting 5) ≤ (Input 2_Level PID setting 6) ≤ (Input 2_Level PID setting 7)	Input 2_Input range high
2.LEV 2		
2.LEV 3		
2.LEV 4		
2.LEV 5		
2.LEV 6		
2.LEV 7		



To display “Input 2_Level PID setting 1 to 7,” specify “Measured input 2” at the time of order, AND “Input 2_Level PID action selection” (Function block No. 58 in Engineering mode) select to “Switching by Set value (SV)” or “Switching by Measured value (PV),” AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Level PID setting is changed.

● Input 1_Level PID action selection

[Engineering mode: Function block No. 51 (F_{n51})]

Parameter symbol	Data range	Factory set value
1.LPID	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0



To display “Input 1_Level PID action selection,” set an item other than Cascade control at “Select function for input 2” in Function block No. 58 in the Engineering mode.

● Input 2_Level PID action selection

[Engineering mode: Function block No. 52 (F_{n52})]

Parameter symbol	Data range	Factory set value
2.LPID	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0



To display “Input 2_Level PID action selection,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 1_Level PID differential gap

[Engineering mode: Function block No. 51 (F_{n51})]

Parameter symbol	Data range	Factory set value
1.LHS	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2



To display “Input 1_Level PID differential gap,” set an item other than Cascade control at “Select function for input 2” in Function block No. 58 in the Engineering mode.

● Input 2_Level PID differential gap

[Engineering mode: Function block No. 52 (F_{n52})]

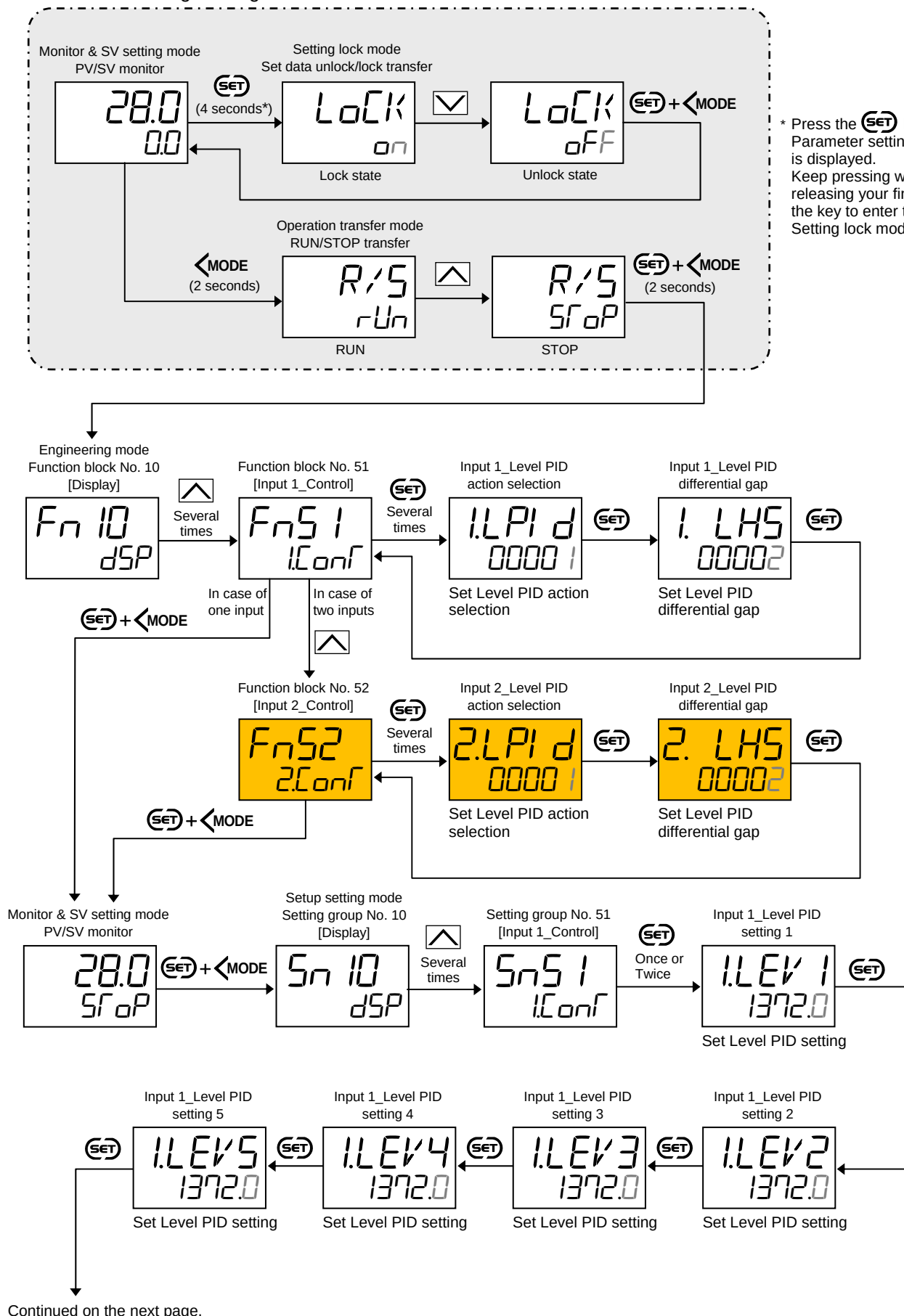
Parameter symbol	Data range	Factory set value
2.LHS	0 to Input 2_Input span [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2



To display “Input 2_Level PID differential gap,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

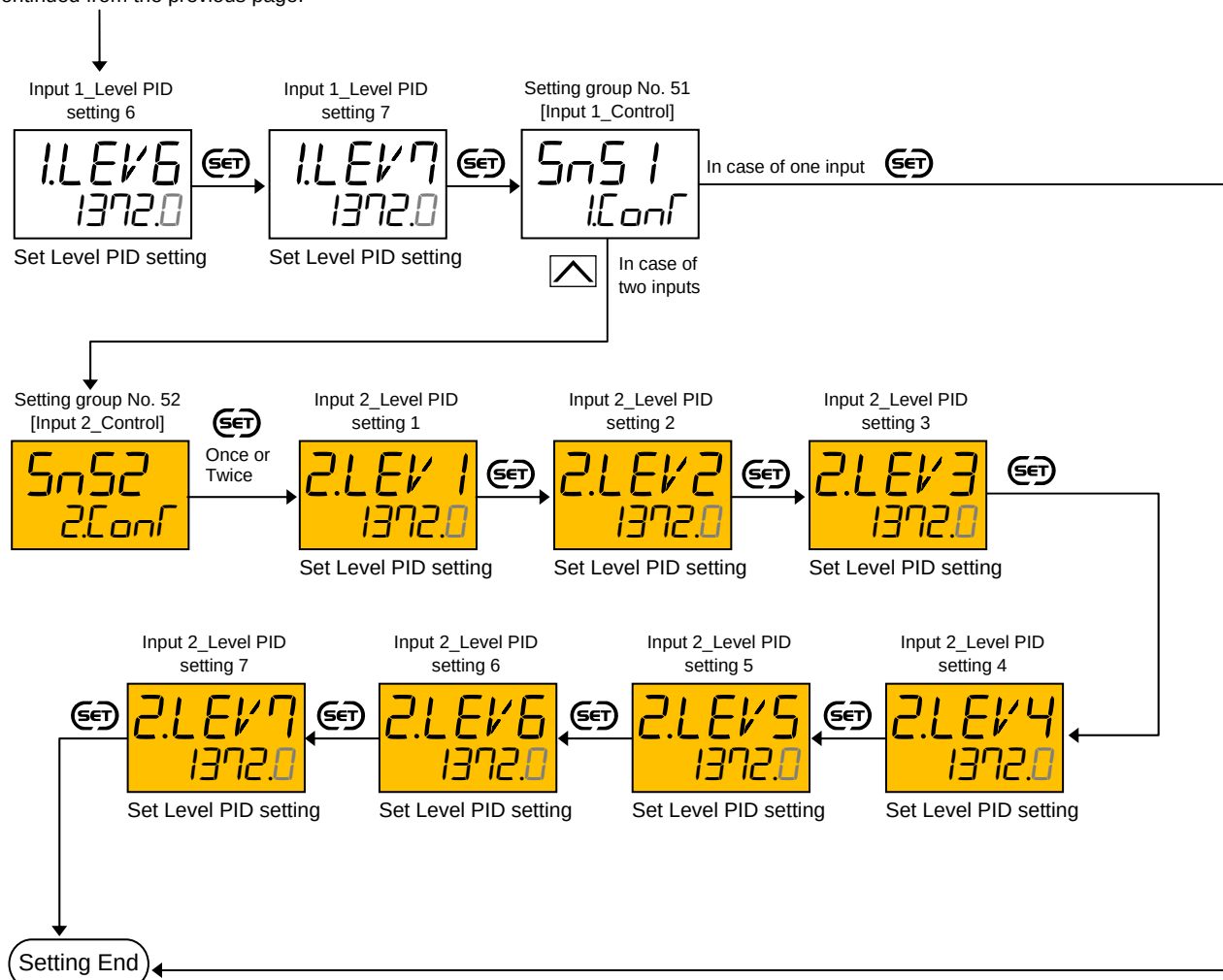
Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

Continued from the previous page.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

8.16 Eliminating Offset Inherent to Proportioning Control (Manual Reset)

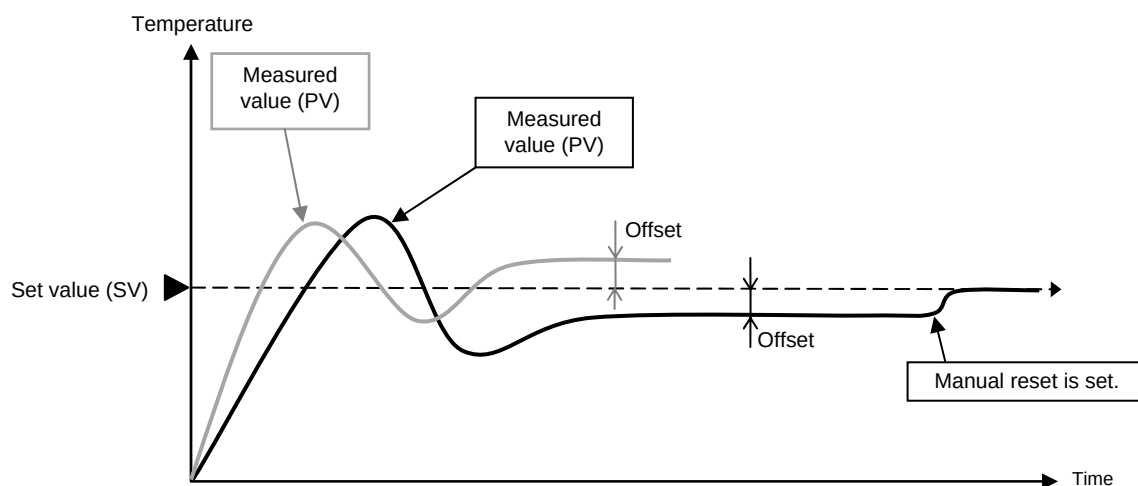
In order to eliminate the offset occurring in Proportional (P) control, the Manipulated output value is manually corrected.

■ Description of function

This is the function used to manually correct the offset when in Proportional (P) control or PD control. If the Manual reset value varies, the Manipulated output value also changes.

Offset means the deviation of the actual when the Manipulated output value becomes stabilized (stable state).

- When the Manual reset is set to the plus (+) side
The Manipulated output value under the stable condition increases by the Manual reset value.
- When the Manual reset is set to the minus (–) side
The Manipulated output value * under the stable condition decreases by the Manual reset value.



Manual reset is available when the Integral time is 0 (0.0, 0.00).

■ Parameter setting

● Input 1_Manual reset

[Parameter Setting Mode: Parameter group No. 51 (*Pn51*)]

Parameter symbol	Data range	Factory set value
I. MR	–100.0 to +100.0 %	0.0



To display “Input 1_Manual reset,” set “0” (zero) to the “Input 1_Integral time [heat-side].”

● Input 2_Manual reset

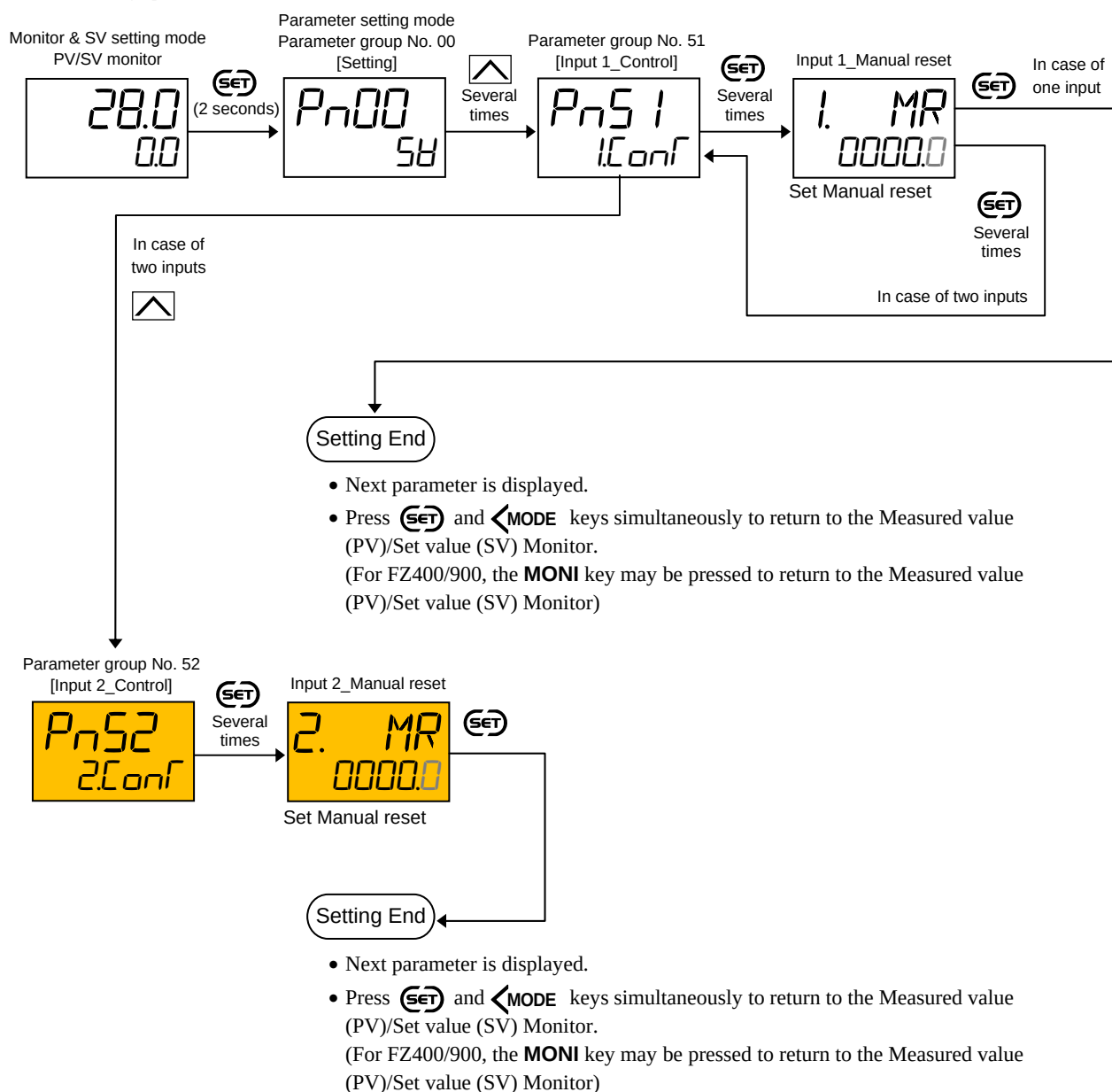
[Parameter Setting Mode: Parameter group No. 52 (P_n52)]

Parameter symbol	Data range	Factory set value
2. MR	−100.0 to +100.0 %	0.0



To display “Input 2_Manual reset,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control. Additionally, you also need to set “0” (zero) to the “Input 1_Integral time.”

■ Setting procedure



8.17 Continuing Stable Control after the Operation Transfer (SV Tracking)

This function is used to follow (keep tracking of) the other set value in another mode (control) that was used before the change of the set value. This is useful to suppress a sudden change of the set value when the operation mode is changed.

■ Description of function

The SV tracking can be selected at the time of switching between Remote/Local and Auto/Manual. The functions can be selected independently or together.

● SV tracking at the time of Remote/Local transfer

The SV tracking at the time of Remote/Local transfer may be effective in such switching actions.

- Switching between Remote and Local mode
- Switching between 2-loop control and Differential temperature control
- Switching between Cascade control and Slave single control

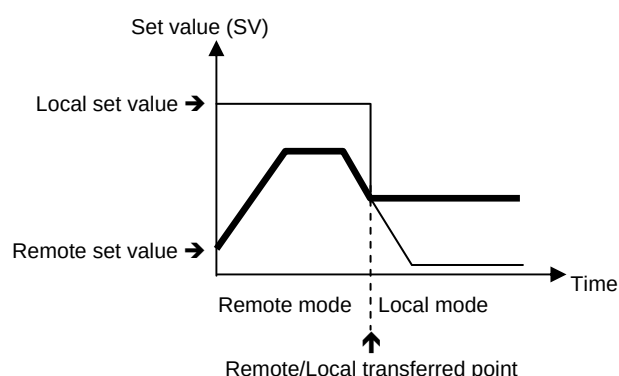
Switching between Remote and Local mode

When the operation mode is switched from Remote to Local mode, the Local set value follows the Remote set value just before the switching (tracking).

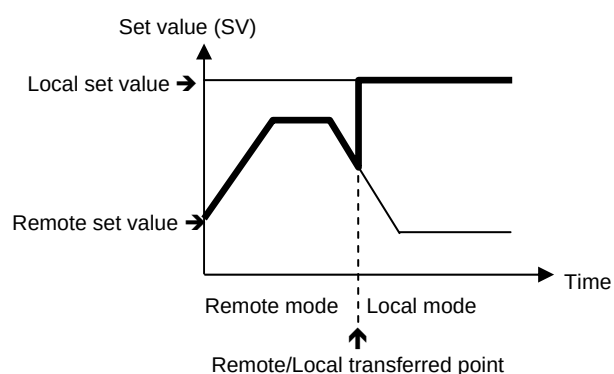
[Change of set values when switched from Remote to Local mode]

Operation mode:	Remote mode	→	Local mode
Set value used	Set value (SV) = Remote set value		Set value (SV) = Local set value
SV tracking used	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

< SV tracking used >



< SV tracking unused >



The SV tracking does not function at the time of switching from Local mode to Remote mode.

Switching between 2-loop control and Differential temperature control

When the Differential temperature control is switched to 2-loop control, the Input 1_Set value (SV) follows the Input 1_set value monitor [PV just before the switching + Set value of Differential temperature control]



In case of Differential temperature control, the Input 1_Set value (SV) is not used for control. The Input 1_Monitor Set value (SV)* of is used in actual control.

* Input 1_Monitor Set value (SV) = Controlled temperature

= Input 2_Measured value (PV) [Reference temperature] + Set value of Differential temperature input

[Change of set values when switched from Differential temperature control to 2-loop control]

Control:	Differential temperature control	2-loop control
Set value used (Input 1)	Input 1_Set value monitor	Input 1_Set value (SV)
SV tracking used	Input 1_Set value (SV) = Input 1_Set value (SV) Input 1_Set value monitor = Input 2_PV + Set value of Differential temperature input	Input 1_Set value (SV) = Input 2_PV just before the switching + Set value of Differential temperature input Input 1_Set value monitor = Input 2_PV + Set value of Differential temperature input
SV tracking unused	Input 1_Set value (SV) = Input 1_Set value (SV) Input 1_Set value monitor = Input 2_PV + Set value of Differential temperature input	Input 1_Set value (SV) = Input 1_Set value (SV) Input 1_Set value monitor = Input 1_Set value (SV)



The SV tracking does not function at the time of switching from 2-loop control to Differential temperature control.

Switching between Cascade control and Slave single control

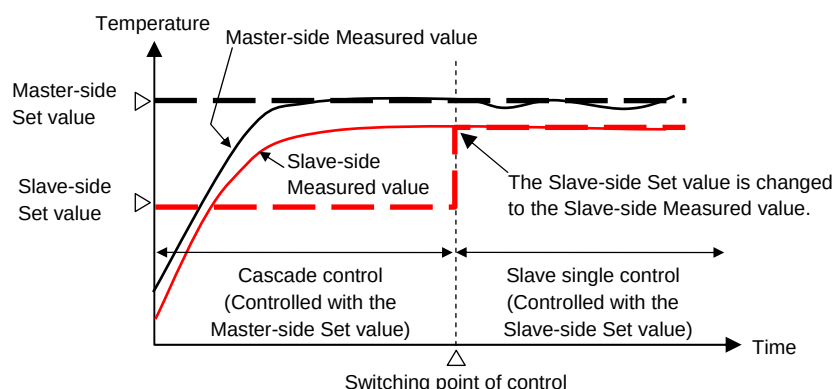
- When the Cascade control is switched to the Slave single control, the set value of Input 2 (slave-side) follows the Input 2_Measured value (PV) just before the switching
- When the Slave single control is switched to the Cascade control, the set value of Input 1 (master-side) follows the Input 1_Measured value (PV) just before the switching

[Change of set values when switched from Cascade control to Slave single control]

Control:	Cascade control	Slave single control
SV tracking used	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Set value according to the Manipulated output of Input 1 (master-side)	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Measured value of Input 2 (slave-side) just before the switching
SV tracking unused	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Set value according to the Manipulated output of Input 1 (master-side)	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Input 2_Set value (slave-side)

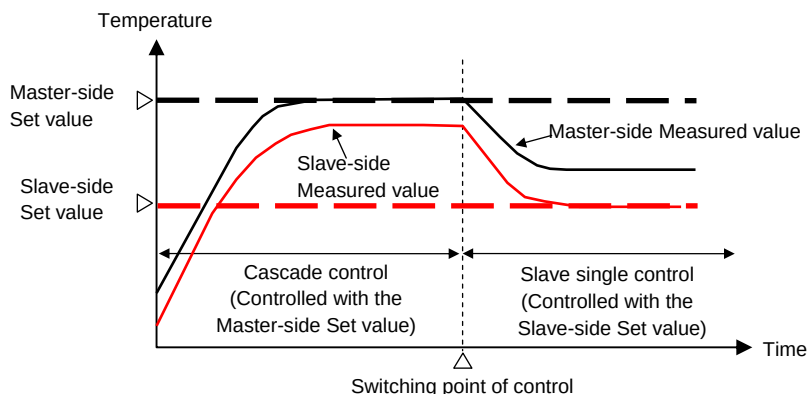
< SV tracking used >

When the Cascade control is switched to the Slave single control, the Slave-side set value tracks the Slave-side measured value, switching without fluctuation can be achieved.



< SV tracking unused >

When the Cascade control is switched to the Slave-single control, if the Slave-side measured value and the Slave side set value are not the same, fluctuation of the PV is caused.

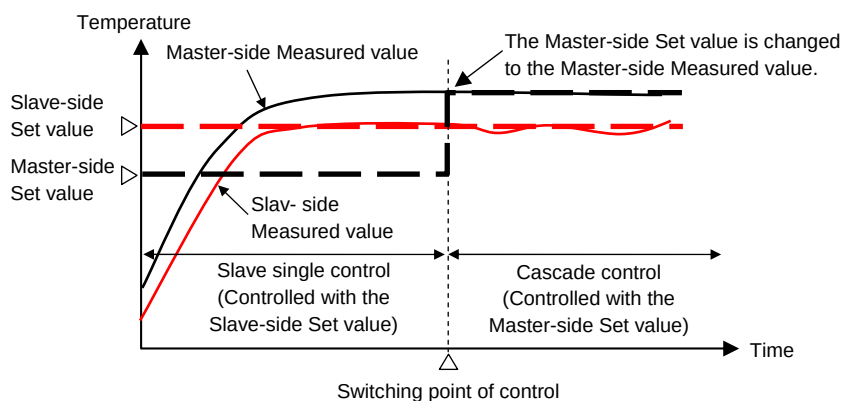


[Change of set values when switched from Slave single control to Cascade control]

Control:	Slave single control	Cascade control
SV tracking used	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Input 2_Set value (slave-side)	Input 1_Set value (master-side) = Measured value of Input 1 (master-side) just before the switching Input 2_Set value (slave-side) = Set value according to the Manipulated output of Input 1 (master-side)
SV tracking unused	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Input 2_Set value (slave-side)	Input 1_Set value (master-side) = Input 1_Set value (master-side) Input 2_Set value (slave-side) = Set value according to the Manipulated output of Input 1 (master-side)

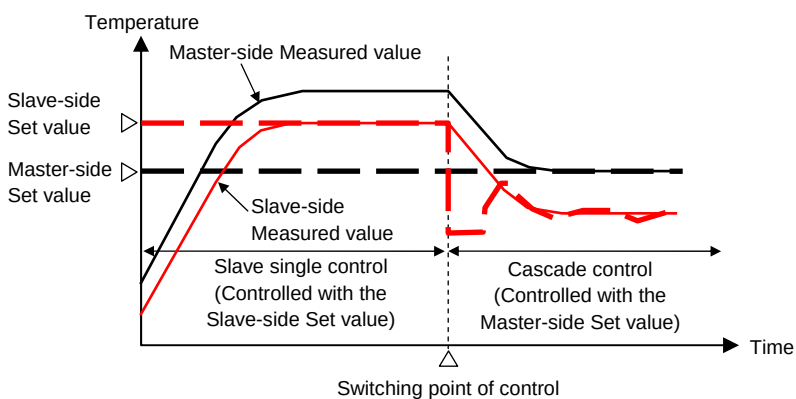
< SV tracking used >

When the Slave single control is switched to the Cascade control, the Master-side set value tracks the Master-side measured value, switching without fluctuation can be achieved.



< SV tracking unused >

When the Slave single control is switched to the Cascade control, if the Master-side set value and the Master-side measured value are not the same, fluctuation of the PV is caused.



● SV tracking at the time of Auto/Manual transfer

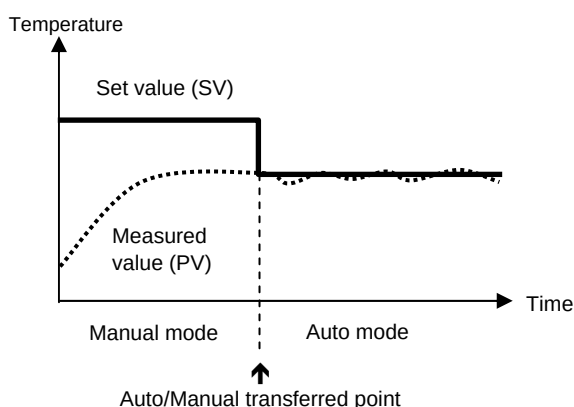
When the Manual mode is switched to the Auto mode, the Set value (SV) follows the Measured value (PV) just before the switching.

[Change of set values when switched from Manual mode to Auto mode]

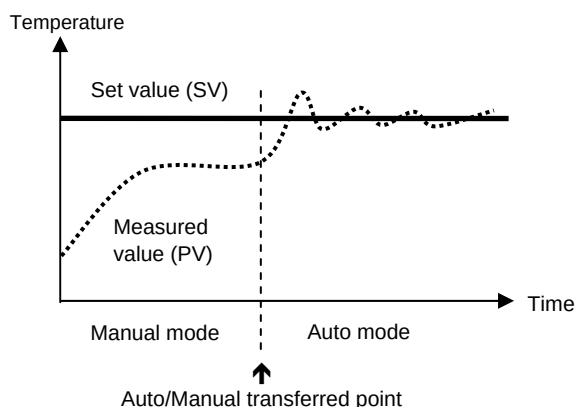
Operation mode:	Manual mode	Auto mode
SV tracking used	Set value (SV) = Set value (SV) Measured value (PV) = Measured value (PV)	Set value (SV) = Measured value (PV) just before the switching Measured value (PV) = Measured value (PV)
SV tracking unused	Set value (SV) = Set value (SV) Measured value (PV) = Measured value (PV)	Set value (SV) = Set value (SV) Measured value (PV) = Measured value (PV)

Input 1 and Input 2 is the same action.

< SV tracking used >



< SV tracking unused >



The SV tracking does not function at the time of switching from Auto mode to Manual mode.



SV tracking does not function at the time of Auto/Manual switching at the Differential temperature control.

■ Parameter setting

● Input 1_Auto/Manual transfer

[Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
1. A/M	$\overline{AUF}$: Auto mode $\overline{\bar{A}Pn}$: Manual mode	$\overline{AUF}$

● Input 2_Auto/Manual transfer

[Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
2. A/M	$\overline{AUF}$: Auto mode $\overline{\bar{A}Pn}$: Manual mode	$\overline{AUF}$



To display “Input 2_Auto/Manual transfer,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Remote/Local transfer [Operation Transfer Mode]

Parameter symbol	Data range	Factory set value
R/L	When “Remote setting input” is selected at Select function for input 2 LoC: Local mode rEn: Remote mode	LoC
	When “Cascade control” is selected at Select function for input 2 SnGL: Single control (Master single or Slave single) CRS: Cascade control	SnGL
	When “2-loop control/Differential temperature control” is selected at Select function for input 2 2LoCP: 2-loop control dIFF: Differential temperature control	2LoCP



To display “Remote/Local transfer” (on FZ400/900), you need to specify the “Remote setting input” at the time of order, or configure the “Measured input 2” (that must be also specified at the time order) to the Remote setting input at “Select function for input 2” in Function block No. 58 in the Engineering mode.

Concerning FZ110, “Remote settingt input” must be specified at the time of order.

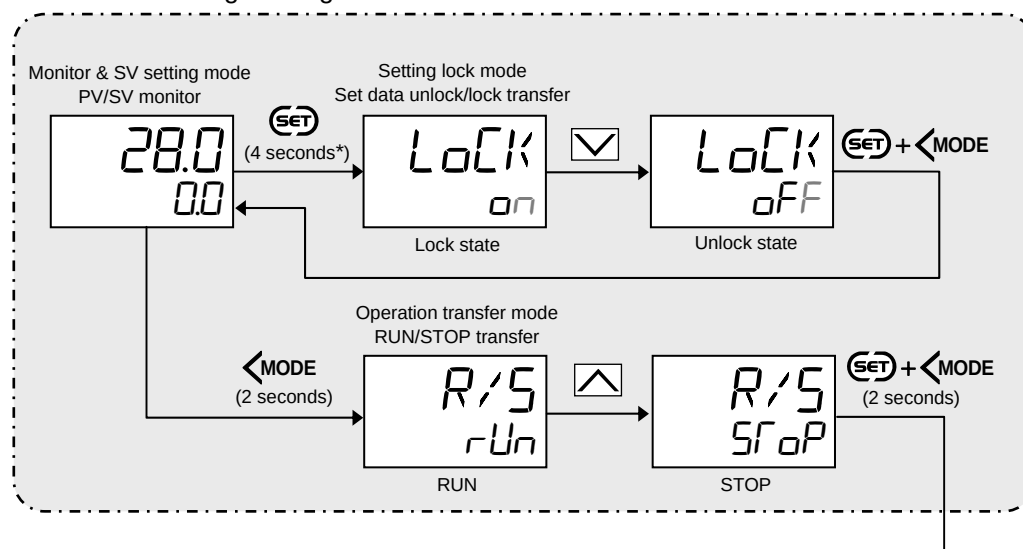
● SV tracking [Engineering Mode: Function block No. 50 (Fn50)]

Parameter symbol	Data range	Factory set value
TRK	0 to 3 0: No SV tracking function +1: SV tracking at transferring Remote/Local * * Including Cascade mode transfer, 2-loop control/ Differential temperature control transfer +2: SV tracking at transferring Auto/Manual To select two or more functions, sum each value.	1

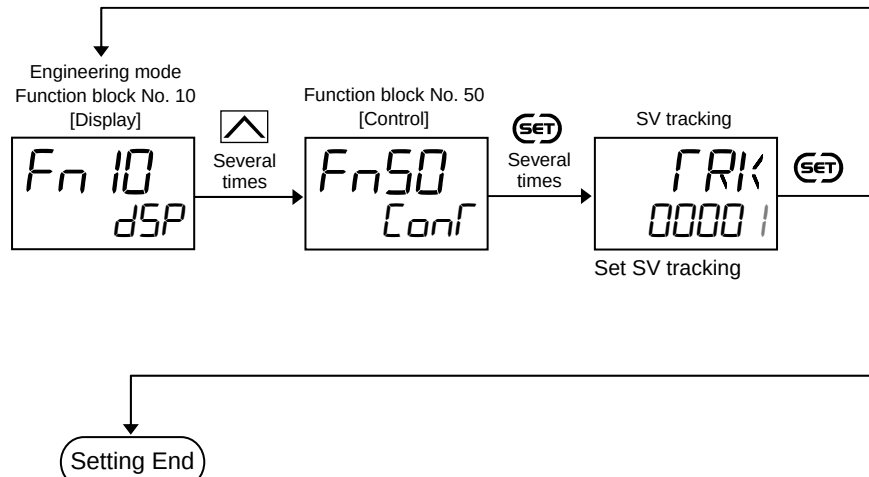
Setting procedure

SV tracking setting

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

For detailed operation of Auto/Manual switching, refer to **8.9 Controlling with Manual Control (P.8-56)**.

For detailed operation of Remote/Local switching, refer to **8.10 Using Remote Setting Input (P.8-61)**.

8.18 Suppressing Overshoot

Overshoot can be suppressed on this instrument at the time of startup (power on, control stop to start), Set value (SV) change, and external disturbances.

Overshoot during the transition from Ramp to Soak can be prevented, when the Setting change rate limiter is used.

■ Description of function

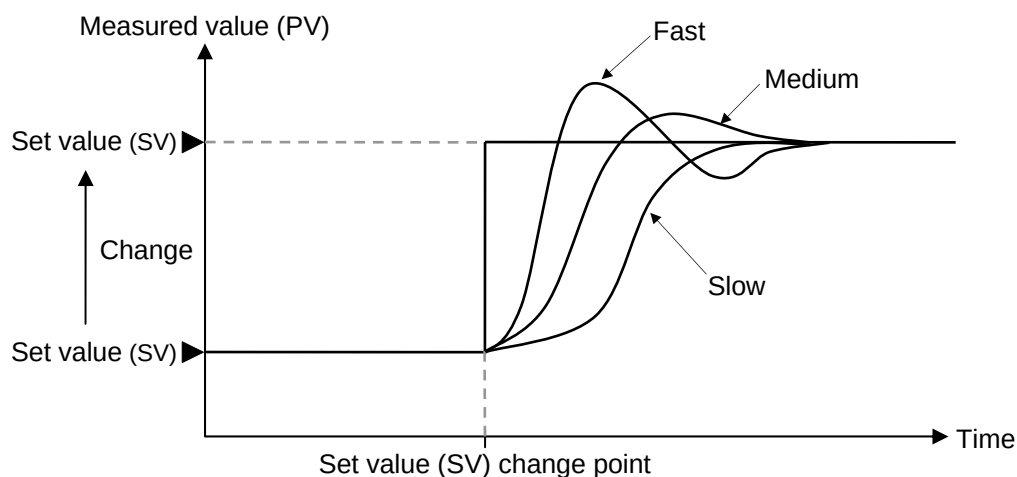
Overshoot suppressing function may include Control response parameter, Proactive intensity, Determination point of external disturbance and Bottom suppression function.

● Control response parameter

A response speed level at changing Set value (SV) at PID control can be selected from three levels (Slow, Medium and Fast) in the Control response parameter.

Select “Fast” to quicken the response of the controlled object to the change in segment level and Set value (SV). When the response speed level is “Fast,” overshoot will occur. To avoid overshoot, select “Slow.”

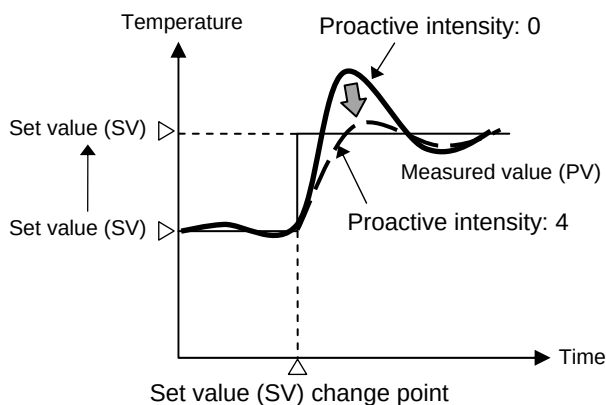
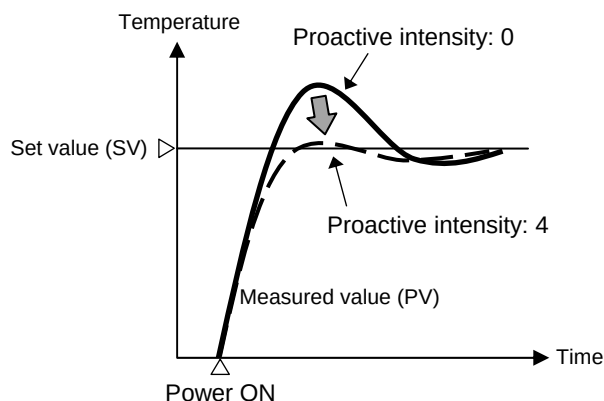
Fast	Selected when rise time needs to be shortened (operation needs to started fast). However in this case, slight overshooting may not be avoided.
Medium	Middle between “Fast” and “Slow.” Overshooting when set to “Medium” becomes less than that when set to “Fast.”
Slow	Selected when no overshooting is allowed. Used when material may be deteriorated if the temperature becomes higher that the set value.



● Proactive intensity, Determination point of external disturbance

Overshoot can be suppressed at startup (power on, control stop to start), Set value (SV) change, and external disturbances. Overshoot during the transition from Ramp to Soak can be prevented. The intensity ranges from 0 to 4 (5 scales).

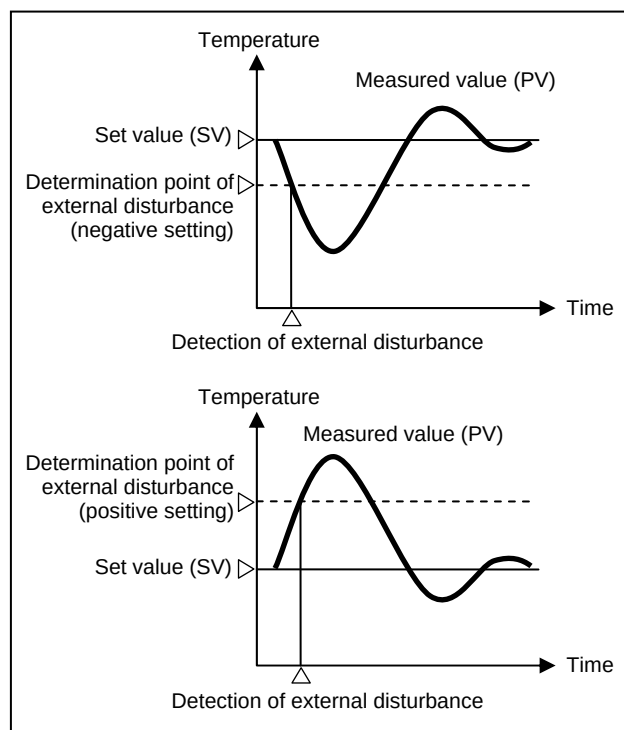
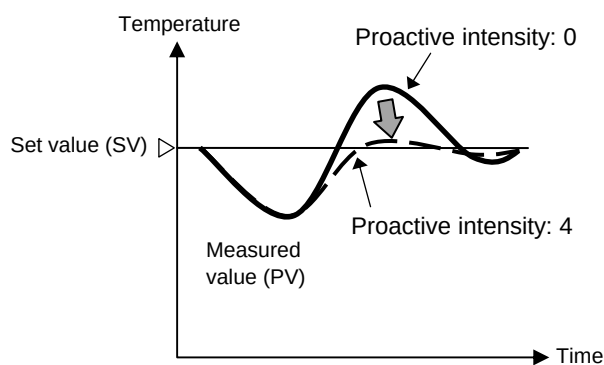
Startup (power on, control stop to start), Set value (SV) change



When external disturbance occurs

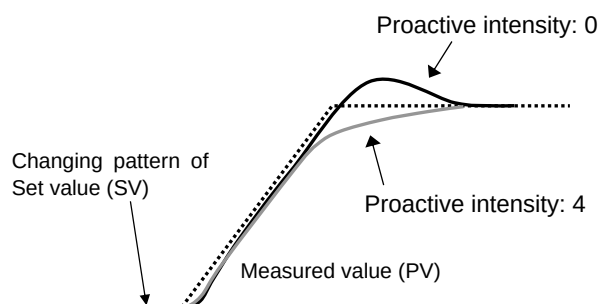
Overshoot can be suppressed when external disturbance occurs.

External disturbances are determined by the fluctuation between the stable state and Measured value (PV) of the external disturbance determination point or more which is then used as a trigger.



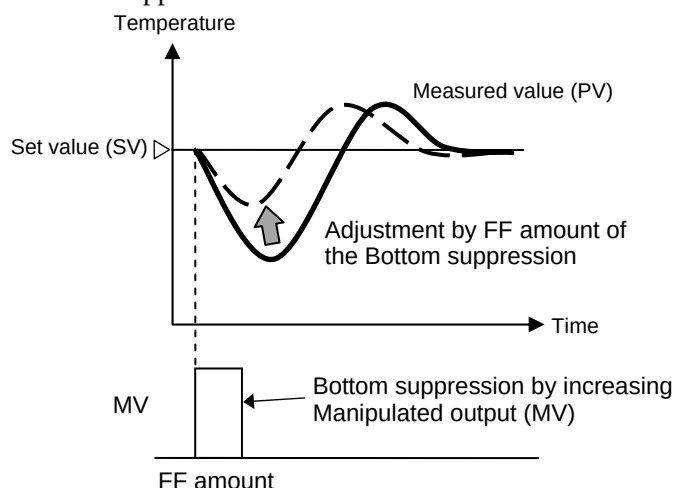
During Ramp control (Change of SV by Setting change rate limiter)

Overshoot can be suppressed when the temperature is in transition from the Rramp state to the Soak state.



● Bottom suppression function

When the input fluctuation by external disturbance is detected, the amount of FF (Feedforward) is added to the output value to suppress the Bottom.



[Setting items]

- FF amount: This can also be obtained automatically by Amount of FF which is added to detect external disturbance and Learning function
- FF amount learning :
FF amount can be calculated from external disturbance when detection of external disturbance is executed after selection of “Learn.” When setting is completed, the value will automatically return to “0: No learning.”
- Bottom suppression function:
Used to activate/deactivate the Bottom suppression function as well as a trigger function. There are two types of triggers; when the Determination point of external disturbance (FF amount is added by the level) is exceeded and Forced addition of FF amount. Trigger signal can be input through communication in the case of Forced addition of FF amount.

■ Parameter setting

● Input 1_Control response parameter

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
1. RPF	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2

● Input 2_Control response parameter

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2. RPF	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	0



To display “Input 2_Control response parameter,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 1_Proactive intensity

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
1.PACT	0 to 4 0: No function	2



To display “Input 1_Proactive intensity,” the Input 1_Proportional band [heat-side] and the Input 1_Integral time [heat-side] in the same memory area must be set to a value other than zero.

● Input 2_Proactive intensity

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2.PACT	0 to 4 0: No function	2



To display “Input 2_Proactive intensity,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band and the Input 2_Integral time in the same memory area.

● Input 1_FF amount

[Parameter Setting Mode: Parameter group No. 51 (P_{n51})]

Parameter symbol	Data range	Factory set value
1. FF	-100.0 to +100.0 %	0.0



To display “Input 1_FF amount,” 1 or 2 must be set at “Bottom suppression function” at Function block No. 57 in the Engineering mode, and the Input 1_Proportional band [heat-side] and the Input 1_Integral time [heat-side] in the same memory area must be set to a value other than zero.



Not displayed when the control action is Position proportioning PID control.

● Input 2_FF amount

[Parameter Setting Mode: Parameter group No. 52 (P_{n52})]

Parameter symbol	Data range	Factory set value
2. FF	-100.0 to +100.0 %	0.0



To display “Input 1_FF amount,” 1 or 2 must be set at “Bottom suppression function” at Function block No. 57 in the Engineering mode, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control. Additionally, you also need to enter a value other than 0 in the Input 2_Proportional band and the Input 2_Integral time in the same memory area.

● FF amount learning

[Setup Setting Mode: Setting group No. 57 (S_{n57})]

Parameter symbol	Data range	Factory set value
FF57	0 to 3 0: No learning +1: Learn Input 1 +2: Learn Input 2 To select two or more functions, sum each value.	0



To display “FF amount learning,” 1 or 2 must be set at “Bottom suppression function” at Function block No. 57 in the Engineering mode

● Input 1_Determination point of external disturbance

[Setup Setting Mode: Setting group No. 57 (S_{n57})]

Parameter symbol	Data range	Factory set value
1.E x du	-(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: -(PV select input span) to +(PV select input span)) [Varies with the setting of the Decimal point position.]	-1

● **Input 2_Determination point of external disturbance**
[Setup Setting Mode: Setting group No. 57 (5 α 57)]

Parameter symbol	Data range	Factory set value
2.E $\times$ dJ	-(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	-1



To display “Input 2_Determination point of external disturbance,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● **Bottom suppression function**
[Engineering Mode: Function block No. 57 (F α 57)]

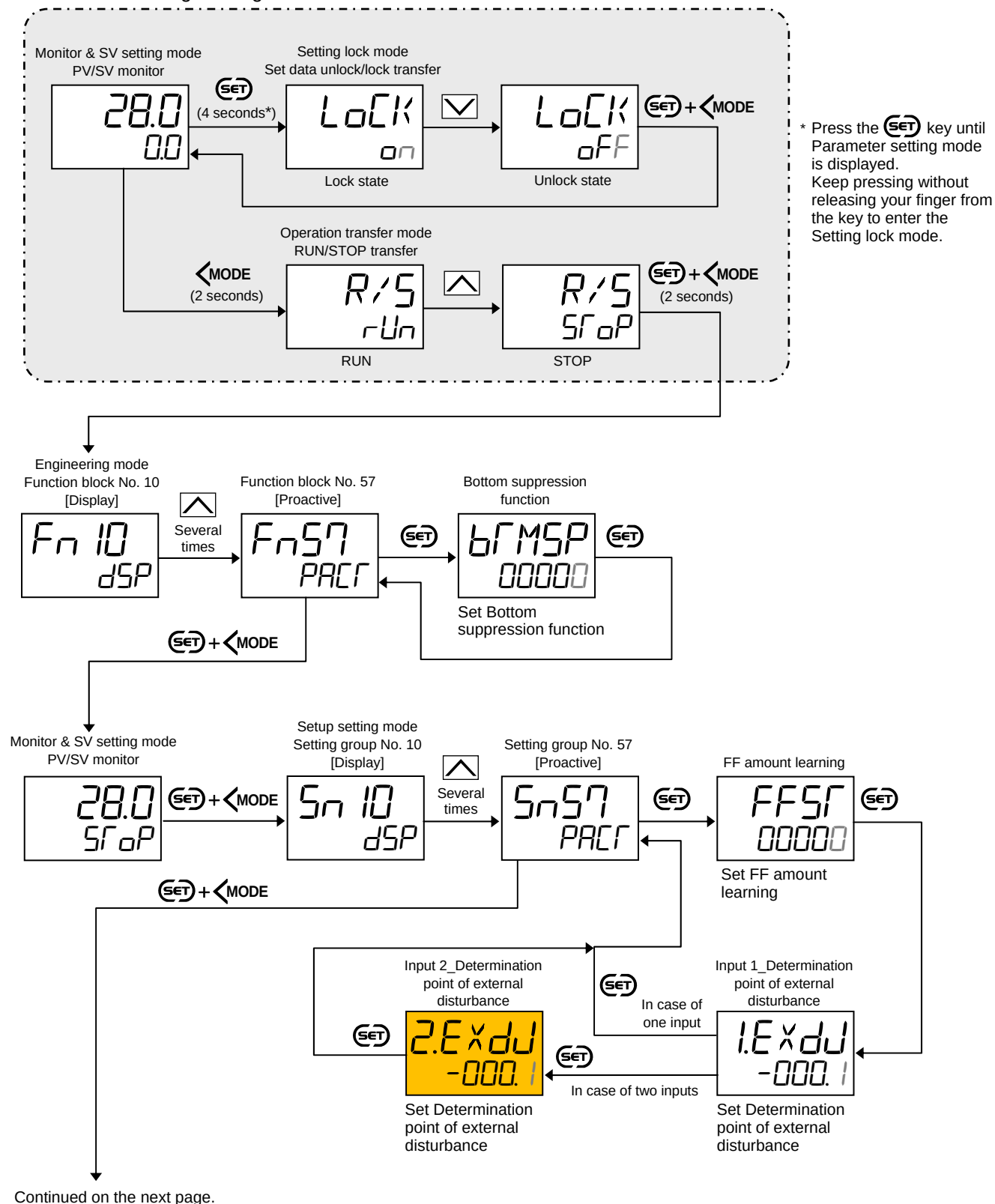
Parameter symbol	Data range	Factory set value
bFMSP	0: No function 1: FF amount is added by level 2: FF amount is forcibly added	0



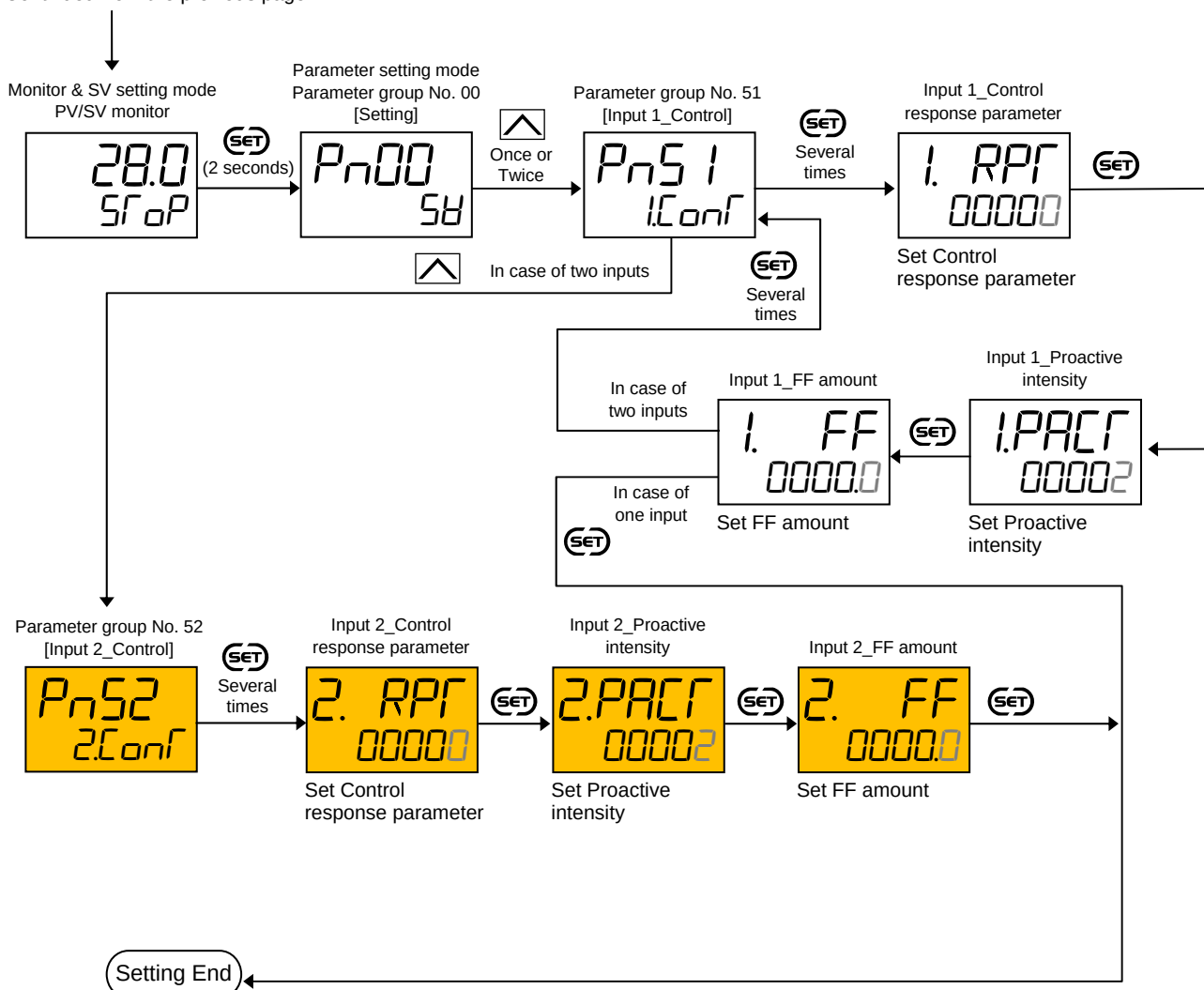
Not displayed when the control action is Position proportioning PID control.

■ Setting procedure

To enter the Engineering mode



Continued from the previous page.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

8.19 Changing the Action at Power ON (Hot/Cold Start)

When restarting following a power failure (power OFF from ON), the start action can be selected by the following parameters:

- Hot/Cold start
- Start determination point

■ Description of function

● Hot/Cold start

Recovery action from power failure can be selected from the following.

For PID control or Heat/Cool PID control

Action when power failure recovers	Operation mode when power failure recovers	Output value when power failure recovers	
Hot start 1	Same as that before power failure	Near the output value before power failure occurs	
Hot start 2	Same as that before power failure	Auto mode	Computed control output value ²
		Manual mode	Output limiter low
Cold start	Manual control mode	Output limiter low	
STOP start	Started in the Reset mode regardless of the Operation mode before power failure. ¹	Manipulated output value (MV) at STOP	

Factory set value: Hot start 1

¹ If changed to RUN from STOP by RUN/STOP transfer after start, set to the operation mode before power failure occurs.

² The result of control computation varies with the control response parameter.



If the Startup tuning (ST) function is executed or an automatic temperature rise is made just when the power is turned on or selection is made from STOP to RUN as one of the startup conditions, control starts at Hot start 2 even if set to Hot start 1 (factory set value).

For Position Proportioning PID control

Action when power failure recovers	Operation mode before power failure	Operation mode and Output value when power failure recovers			
		Without Feedback resistance (FBR) input	With Feedback resistance (FBR) input		
			Feedback resistance (FBR) connected	Feedback resistance (FBR) disconnected	
				Action at FBR disconnected: 0 *	Action at FBR disconnected: 1 *
Hot start 1	Auto mode	Operation mode: Same as that before power failure Output: Computed control output value	Operation mode: Same as that before power failure Output: Computed control output value	Operation mode: Same as that before power failure Output: In accordance with the setting of valve action at STOP	Operation mode: Same as that before power failure Output: Computed control output value
	Manual mode	Operation mode: Same as that before power failure Output: No output	Operation mode: Same as that before power failure Output: According to the result of control computation of Manipulated output value		Operation mode: Same as that before power failure Output: No output
Hot start 2	Auto mode	Operation mode: Same as that before power failure Output: Computed control output value	Operation mode: Same as that before power failure Output: Computed control output value	Operation mode: Same as that before power failure Output: In accordance with the setting of valve action at STOP	Operation mode: Same as that before power failure Output: Computed control output value
	Manual mode	Operation mode: Same as that before power failure Output: No output	Operation mode: Same as that before power failure Output: According to the result of control computation of Manipulated output value		Operation mode: Same as that before power failure Output: No output
Cold start		Operation mode: Manual mode Output: No output	Operation mode: Manual mode Output: According to the result of control computation of Output limiter low	Operation mode: Manual mode Output: In accordance with the setting of valve action at STOP	Operation mode: Manual mode Output: No output
STOP start		Operation mode: STOP Output: In accordance with the setting of valve action at STOP	Operation mode: STOP Output: According to the result of control computation of Manipulated output value at STOP	Operation mode: STOP Output: In accordance with the setting of valve action at STOP	

* Action at FBR disconnected

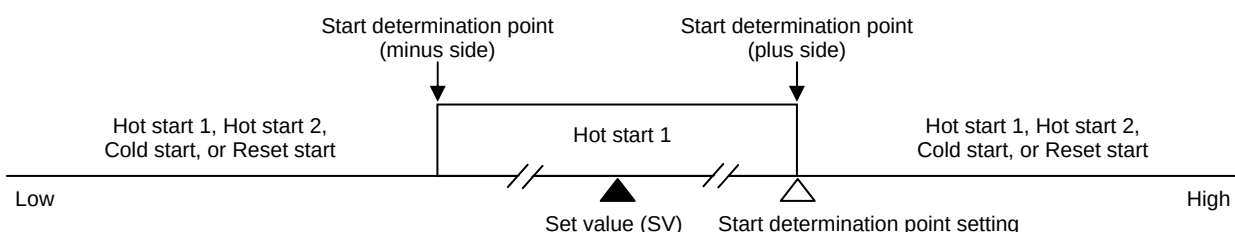
0: In accordance with the setting of valve action at STOP

1: Control action is continued

● Start determination point

Determination point of Hot start 1 is set. Determination point of start is a deviation setting from the set value (SV).

- The start state is determined according to the Measured value (PV) level [deviation from set value] at power recovery.
- When a Measured value (PV) is between the determination points on the + (plus) and – (minus) sides, always started from Hot start 1 when recovered.
- When a Measured value (PV) is out of the determination points or the Start determination point is set at “0,” operation starts from any start state selected by Hot/Cold start.



During Cascade control: Determined for Master side (Input 1) only.

In the case of Master single control and Slave single control, according to the setting of each input.



Action at power failure for 2-loop control is as follows:

- Hot start 1, Hot start 2, and Cold start

Control is started in a mode according to the determination point of start.

- STOP start

Starts in Hot start 1 when Input 1 or Input 2 stays within the determination point of start.

Starts in STOP start when both of Input 1 and Input 2 are outside the determination point of start.



■ Parameter setting

● Hot/Cold start

[Engineering Mode: Function block No. 50 (F_{n50})]

Parameter symbol	Data range	Factory set value
Pd	0: Hot start 1 1: Hot start 2 2: Cold start 3: STOP start	0

● Input 1_Start determination point

[Engineering Mode: Function block No. 51 (F_{n51})]

Parameter symbol	Data range	Factory set value
1. PdA	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of Input 1_Input span Control with PV select: 3 % of PV select input span

● Input 2_Start determination point

[Engineering Mode: Function block No. 52 (F_{n52})]

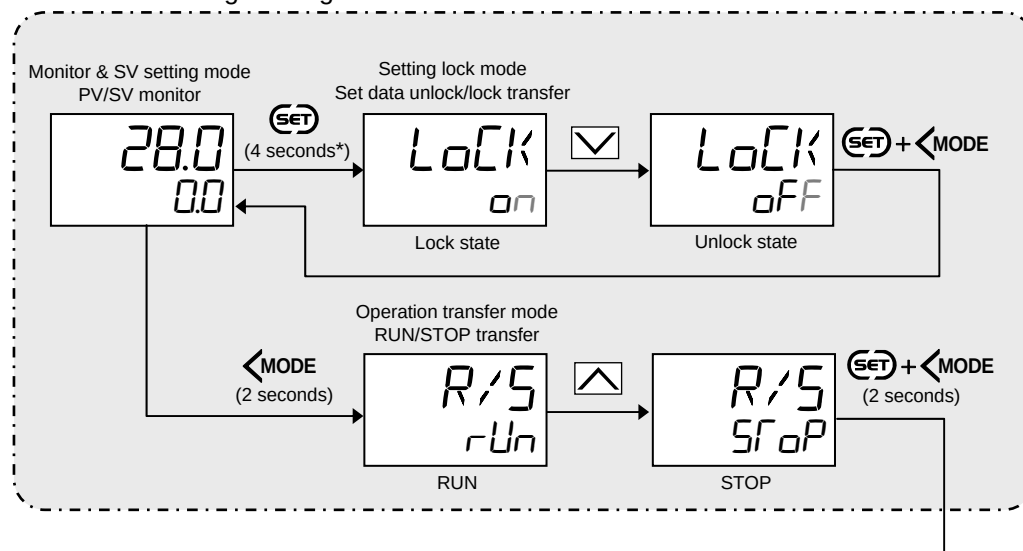
Parameter symbol	Data range	Factory set value
2. PdA	0 to Input 2_Input span 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of Input 2_Input span



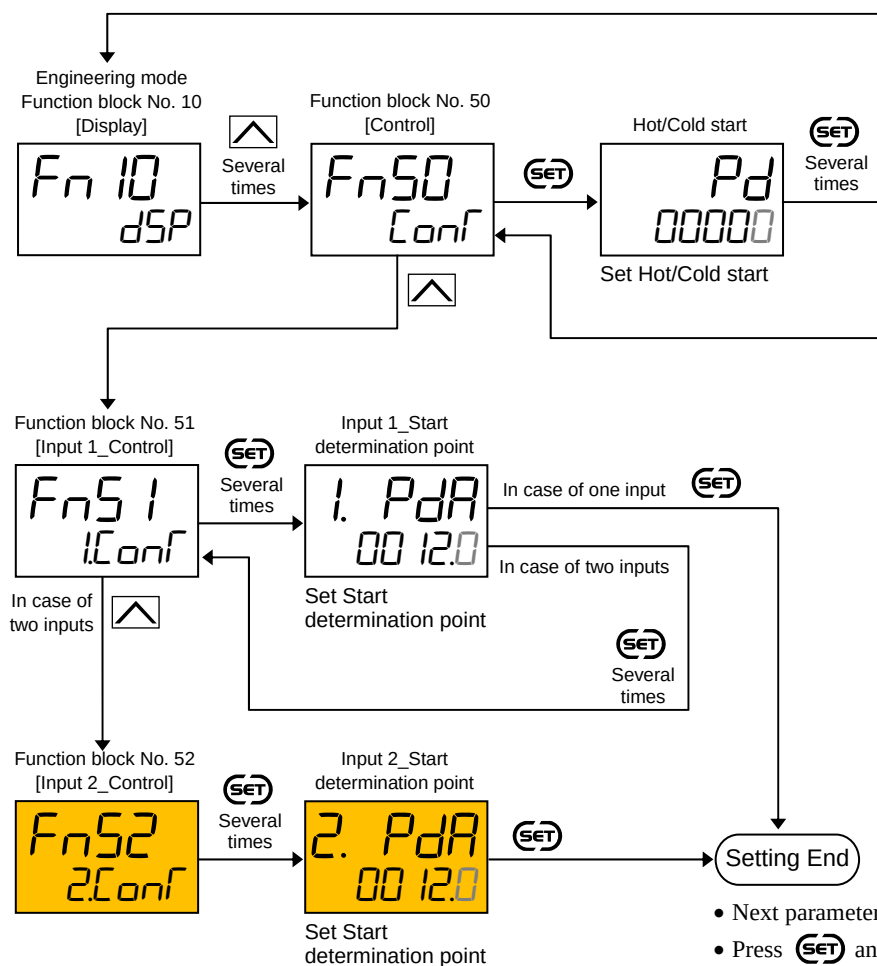
To display “Input 2_Start determination point,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



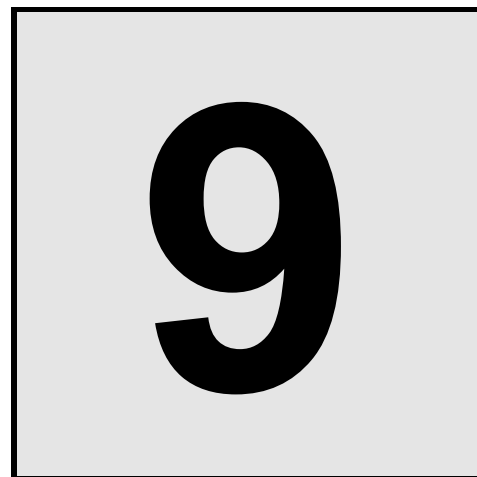
- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.



MEMO



DISPLAY RELATED FUNCTIONS



This chapter describes display related functions, setting contents and setting procedure based on the key words related to Display.

9.1 Grouping Necessary Screens (Parameter Select Function)	9-2
9.2 Hiding Unnecessary Screens.....	9-12
9.3 Hiding the Display of the Set Value (SV)	9-18
9.4 Changing the Display Position of STOP during the Control Stop..	9-20
9.5 Changing the ALM Lamp Lighting Condition	9-22
9.6 Changing the Display Contents of the MV Display [FZ400/900] ...	9-24
9.7 Checking Input Peak Value/Bottom Value	9-26
9.8 Suppressing the Display Flickering.....	9-30
9.9 Checking the Instrument Information	9-32

9.1 Grouping Necessary Screens (Parameter Select Function)

This instrument has a function that allows a user to specify desired screens to be displayed. This function is called “Parameter select function.” Up to 16 screens can be grouped together.

■ Description of function

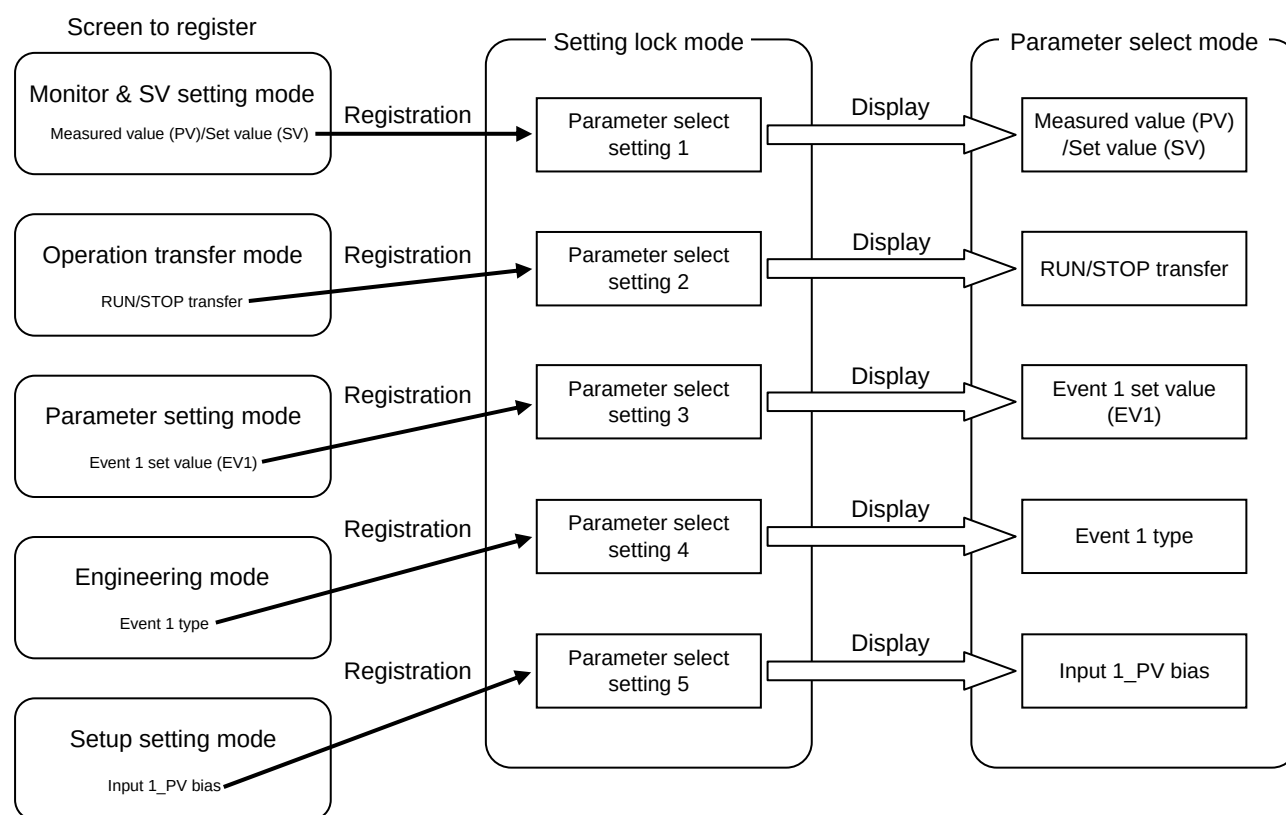
The Parameter select function allows grouping necessary screens into a single mode for display. Screens registered in the Setting lock mode are displayed in the Parameter select mode.

The screens displayed in this mode can be operated in the same manner as they are in the original mode.



With the Parameter select function, the Setting lock mode screen and the Function block No. 91 in the Engineering mode cannot be registered.

[How does Parameter select function work?]



[Example] When “Event 1 set value (EV1)” screen in the Parameter setting mode is registered in the Parameter select setting screen, this screen can be viewed in both the Parameter select mode and the Parameter setting mode.

• Set data lock

This function can be independently activated in each operation mode.

For example, when the parameters in the Parameter setting mode are locked, the same parameters in the Parameter select mode are settable.

There are two ways to register screens.

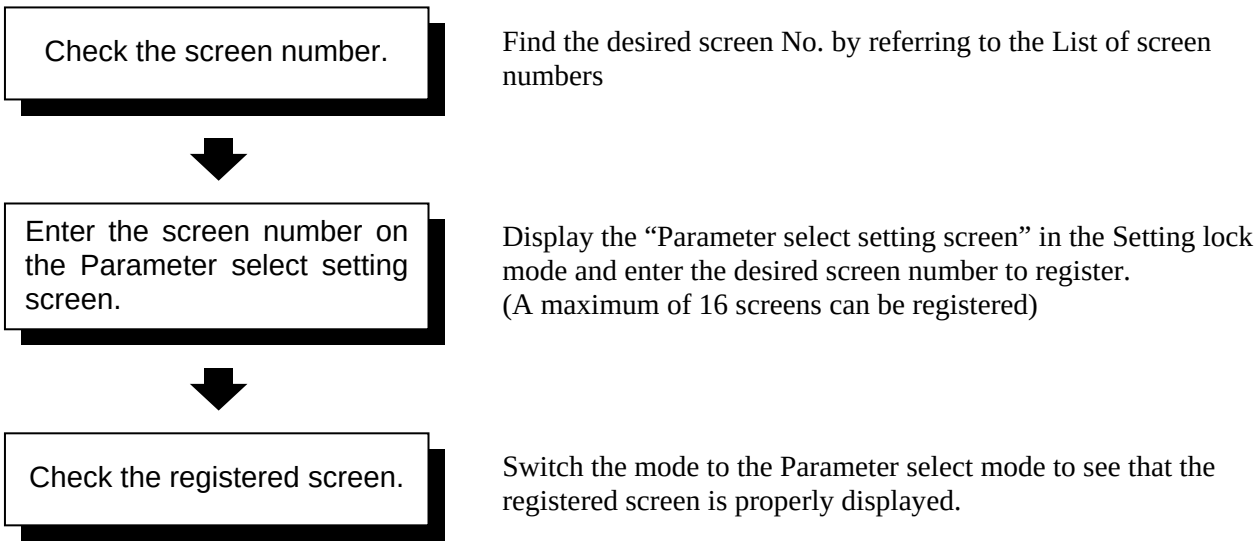
- Screen number entry: Enter the screen No. on the Parameter select setting screen.
- Direct registration: Display the desired screen and register it through key operations.

● Screen number entry

Enter the predefined screen number on the Parameter select setting screen in the Setting lock mode. The registered screens in the Parameter select mode will be displayed.

Refer to the **List of screen numbers (P. 9-9)** for details.

[To register screens]



[Registering screens and display (1)]

There are 16 Parameter select setting screens and these are freely settable. Unregistered screens, if any, will be skipped and screens are displayed in series in the Parameter select mode.

Setting lock mode: Parameter select setting screen (for registration)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	B	C					D	E						F	

: Registered screens : Unregistered screens (Set value = 0)

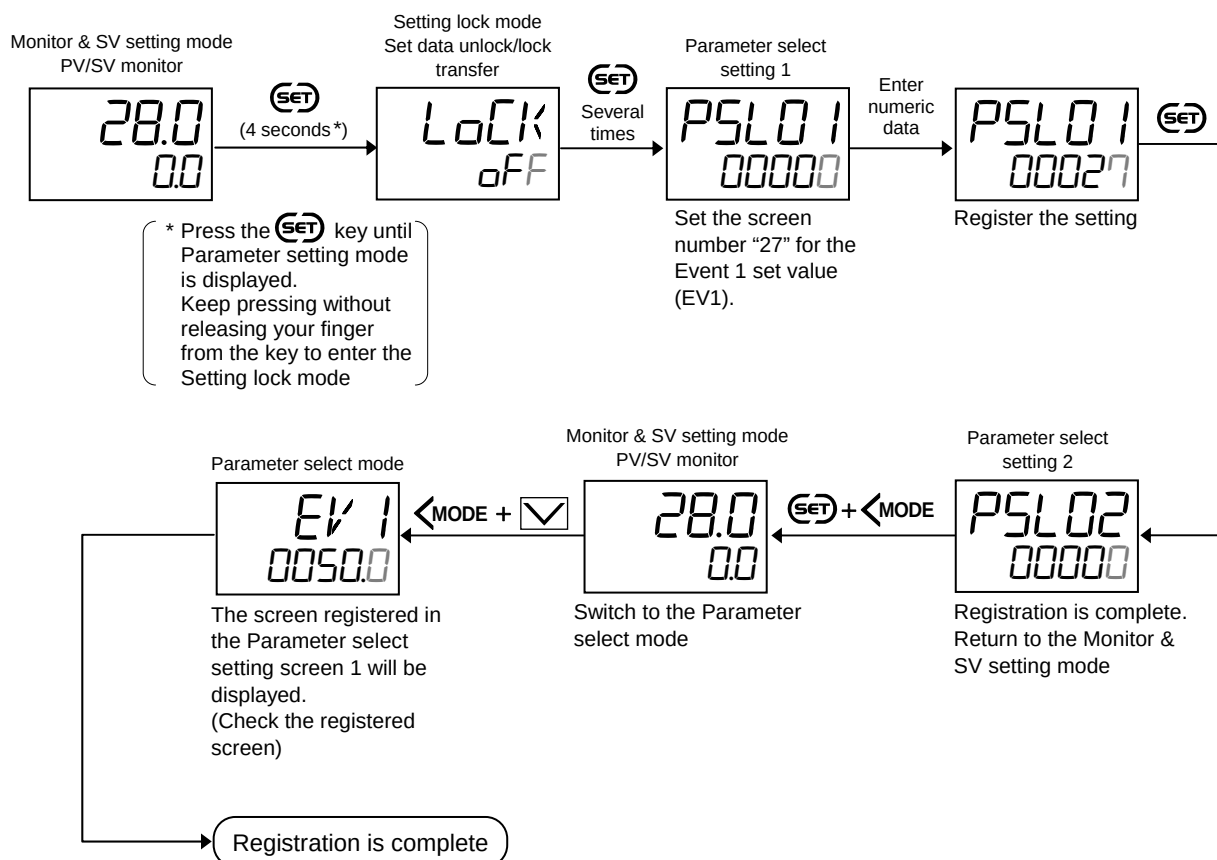
Parameter select mode: Displayed screens

A	B	C	D	E	F

Only registered screens are grouped for display.

[Entering screen No.]

In this example we will register “Event 1 set value (EV1)” in the Parameter setting mode.



● Direct registration

Activate the direct registration on the Parameter select direct registration screen in the Setting lock mode. Display the screen to register and press the and keys simultaneously. The screen will be registered on the Parameter select setting screen.

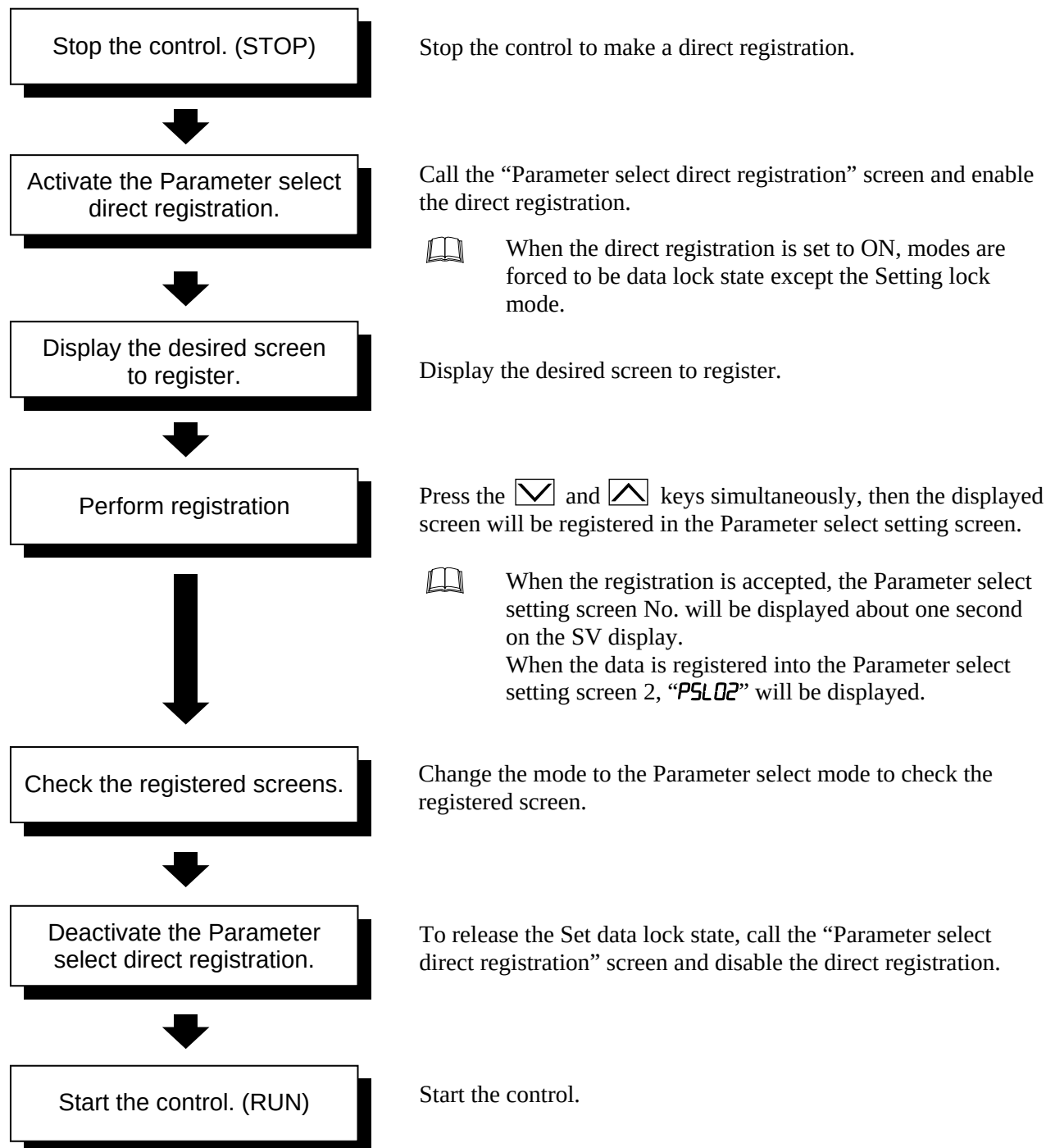


Control must be stopped before attempting the direct registration.



When the direct registration is activated on the Parameter select direct registration screen, all modes except for the Setting lock mode will be locked.

[To register screens]



**[Registering screens and display (2)]**

This example shows the case of the direct registration under the state of the “[Registered screen and display (1)]” (P. 9-3).

• When directly registered

Setting lock mode: Parameter select setting screen (for registration)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	B	C					D	E						F	G

 : Registered screens  : Unregistered screens (Set value = 0)

↑
Directly registered screen

Parameter select mode: Displayed screens

A	B	C	D	E	F	G

Only registered screens are grouped for display.



When attempting a direct registration, in case there is a registered screen in the Parameter select setting screen, the new screen will be added to after the registered screen. Even if there are unregistered screens, the new screen will be added to after the screen with the largest screen number of the Parameter select setting screen.

• Registering further screens

Setting lock mode: Parameter select setting screen (for registration)

A was removed from the registration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	B	C					D	E						F	G	H

 : Registered screens  : Unregistered screens (Set value = 0)

↑
Previously registered screen

↑
Newly added screen

Parameter select mode: Displayed screens

B	C	D	E	F	G	H

Only registered screens are grouped for display.



When the Parameter select setting 16 screens are registered, the latest direct registration is added to the position of No.16, and the data before that will be moved ahead to toward the direction of the smaller numbers. Consequently, the screen registered at the Parameter select setting 1 will be moved out and removed from the registration.

This is an example to make a direct registration of “Input 1_PV bias” in the Setting group 21 in the Setup setting mode under the state of the “[Registered screen and display (1)]” (P. 9-3).





■ Parameter setting

● Parameter select direct registration

[Setting Lock Mode]

Parameter symbol	Data range	Factory set value
<i>PSL.d</i>	<i>oFF</i> : Direct registration: OFF <i>oN</i> : Direct registration: ON	<i>oFF</i>



To allow “Parameter select direct registration,” Control must be stopped (STOP).



Set “*oN*: Direct registration ON” to ON. All except Setting lock mode will be forced to data locked. After the registration process is over, return the setting to *oFF*.



This setting returns to *oFF* when the power is turned off.

● Parameter select setting 1 to 16

[Setting Lock Mode]

Parameter symbol	Data range	Factory set value
<i>PSL01</i> <i>PSL16</i>	0: No registration 1 to 303 (Screen No.) For details, refer to List of screen numbers (P. 9-9) .	0

● List of screen numbers

No.	Name	Mode
1	Input 1_Measured value (PV) monitor ¹ Input 1_Set value (SV) monitor ²	Monitor & SV setting mode
2	Input 2_Measured value (PV) monitor Input 2_Set value (SV) monitor ^{3,4}	
3	Measured value (PV) of differential temperature input monitor Set value (SV) of differential temperature input (SV) monitor ²	
4	Input 1_Measured value (PV) Input 2_Measured value (PV)	
5	Remote setting input value monitor	
6	Input 1_Manipulated output value monitor [heat-side]	
7	Input 1_Manipulated output value monitor [cool-side] 7	
8	Input 2_Manipulated output value monitor	
9	Current transformer 1 (CT1) input value monitor	
10	Current transformer 2 (CT2) input value monitor	
11	Comprehensive event state	
12	Memory area soak time monitor	
13	Interlock release	
14	Memory area transfer	
15	RUN/STOP transfer	
16	Input 1_Autotuning (AT)	Operation transfer mode
17	Input 2_Autotuning (AT)	
18	Input 1_Startup tuning (ST)	
19	Input 2_Startup tuning (ST)	
20	Input 1_Auto/Manual transfer	
21	Input 2_Auto/Manual transfer	
22	Remote/Local transfer Cascade mode transfer PV select transfer 2-loop control/Differential temperature control transfer	
23	Control area Local/External transfer	
24	Input 1_Set value (SV)	Parameter setting mode Parameter group No. 00 (Pn00)
25	Input 2_Set value (SV)	
26	Set value (SV) of differential temperature input (SV)	
27	Event 1 set value (EV1) Event 1 set value (EV1) [high]	Parameter setting mode Parameter group No. 40 (Pn40)
28	Event 1 set value (EV1') [low]	
29	Event 2 set value (EV2) Event 2 set value (EV2) [high]	
30	Event 2 set value (EV2') [low]	
31	Event 3 set value (EV3) Event 3 set value (EV3) [high]	
32	Event 3 set value (EV3') [low]	
33	Event 4 set value (EV4) Event 4 set value (EV4) [high]	
34	Event 4 set value (EV4') [low]	
35	Input 1_Proportional band [heat-side]	Parameter setting mode Parameter group No. 51 (Pn51)
36	Input 1_Integral time [heat-side]	
37	Input 1_Derivative time [heat-side]	
38	Input 1_ON/OFF action differential gap (upper)	
39	Input 1_ON/OFF action differential gap (lower)	
40	Input 1_Control response parameter	
41	Input 1_Proactive intensity	

¹ Measured value (PV) of the PV select under the Control with PV select.

² Input 1_Manual manipulated output value when Input 1 is in Manual mode.

³ Input 1_Manual manipulated output value when the control is Cascade control in the Manual mode.

⁴ Input 2_Manual manipulated output value when the control is 2-loop control and when Input 2 is in Manual mode.

No.	Name	Mode
42	Input 1_Manual reset	Parameter setting mode Parameter group No. 51 (Pn51)
43	Input 1_FF amount	
44	Input 1_Output limiter high [heat-side]	
45	Input 1_Output limiter low [heat-side]	
46	Input 1_Control loop break alarm (LBA) time	
47	Input 1_LBA deadband (LBD)	Parameter setting mode Parameter group No. 52 (Pn52)
48	Input 2_Proportional band	
49	Input 2_Integral time	
50	Input 2_Derivative time	
51	Input 2_ON/OFF action differential gap (upper)	
52	Input 2_ON/OFF action differential gap (lower)	
53	Input 2_Control response parameter	
54	Input 2_Proactive intensity	
55	Input 2_Manual reset	
56	Input 2_FF amount	
57	Input 2_Output limiter high	Parameter setting mode Parameter group No. 56 (Pn56)
58	Input 2_Output limiter low	
59	Input 2_Control loop break alarm (LBA) time	
60	Input 2_LBA deadband (LBD)	
61	Input 1_Proportional band [cool-side]	
62	Input 1_Integral time [cool-side]	Parameter setting mode Parameter group No. 56 (Pn56)
63	Input 1_Derivative time [cool-side]	
64	Input 1_Overlap/Deadband	
65	Input 1_Output limiter high [cool-side]	
66	Input 1_Output limiter low [cool-side]	
67	Select Trigger type for Memory area transfer	
68	Area soak time	
69	Link area number	Parameter setting mode Parameter group No. 70 (Pn70)
70	Input 1_Setting change rate limiter (up)	
71	Input 1_Setting change rate limiter (down)	
72	Input 1_Auto/Manual transfer selection (Area)	
73	Input 1_Manipulated output value (Area)	
74	Input 2_Setting change rate limiter (up)	
75	Input 2_Setting change rate limiter (down)	
76	Input 2_Auto/Manual transfer selection (Area)	
77	Input 2_Manipulated output value (Area)	
78	Remote/Local transfer selection (Area)	
79	Display update cycle	Setup setting mode Setting group No. 10 (Sn10)
80	Input 1_PV bias	Setup setting mode Setting group No. 21 (Sn21)
81	Input 1_PV digital filter	
82	Input 1_PV ratio	
83	Input 1_PV low input cut-off	Setup setting mode Setting group No. 22 (Sn22)
84	Input 2_PV bias (RS bias)	
85	Input 2_PV digital filter (RS digital filter)	
86	Input 2_PV ratio (RS ratio)	
87	Input 2_PV low input cut-off	Setup setting mode Setting group No. 30 (Sn30)
88	OUT1 proportional cycle time	
89	OUT2 proportional cycle time	
90	OUT3 proportional cycle time	



9. DISPLAY RELATED FUNCTIONS

No.	Name	Mode
91	OUT1 minimum ON/OFF time of proportional cycle	Setup setting mode Setting group No. 30 (5n3D)
92	OUT2 minimum ON/OFF time of proportional cycle	
93	OUT3 minimum ON/OFF time of proportional cycle	
94	Heater break alarm 1 (HBA1) set value	Setup setting mode Setting group No. 45 (5n45)
95	Number of heater break alarm 1 (HBA1) delay times	
96	Heater break alarm 2 (HBA2) set value	Setup setting mode Setting group No. 46 (5n46)
97	Number of heater break alarm 2 (HBA2) delay times	
98	Input 1_Manual manipulated output value	Setup setting mode Setting group No. 51 (5n51)
99	Input 1_Level PID setting 1	
100	Input 1_Level PID setting 2	
101	Input 1_Level PID setting 3	
102	Input 1_Level PID setting 4	
103	Input 1_Level PID setting 5	
104	Input 1_Level PID setting 6	
105	Input 1_Level PID setting 7	
106	Input 2_Manual manipulated output value	Setup setting mode Setting group No. 52 (5n52)
107	Input 2_Level PID setting 1	
108	Input 2_Level PID setting 2	
109	Input 2_Level PID setting 3	
110	Input 2_Level PID setting 4	
111	Input 2_Level PID setting 5	
112	Input 2_Level PID setting 6	
113	Input 2_Level PID setting 7	
114	Input 1_AT bias	Setup setting mode Setting group No. 53 (5n53)
115	Input 1_AT remaining time monitor	
116	Input 1_AT/ST status monitor	
117	Input 2_AT bias	Setup setting mode Setting group No. 54 (5n54)
118	Input 2_AT remaining time monitor	
119	Input 2_AT/ST status monitor	
120	Open/Close output neutral zone	Setup setting mode Setting group No. 55 (5n55)
121	Open/Close output differential gap	
122	FF amount learning	Setup setting mode Setting group No. 57 (5n57)
123	Input 1_Determination point of external disturbance	
124	Input 2_Determination point of external disturbance	Setup setting mode Setting group No. 58 (5n58)
125	Cascade_Proportional band (master-side)	
126	Cascade_Integral time (master-side)	
127	Cascade_Derivative time (master-side)	
128	Cascade_Proportional band (slave-side)	
129	Cascade_Integral time (slave-side)	
130	Cascade_Derivative time (slave-side)	
131	Cascade_Digital filter	
132	Cascade_Scale high	
133	Cascade_Scale low	
134	PV select transfer level	Setup setting mode Setting group No. 91 (5n91)
135	PV select transfer time	
136	Input 1_Peak hold monitor	
137	Input 1_Bottom hold monitor	
138	Input 1_Hold reset	
139	Input 2_Peak hold monitor	Setup setting mode Setting group No. 91 (5n91)
140	Input 2_Bottom hold monitor	
141	Input 2_Hold reset	
142	STOP display selection	Engineering mode Function block No. 10 (Fn1D)
143	ALM lamp lighting condition	
144	PV flashing display at input error	

No.	Name	Mode
145	Show/Hide Input 1_SV	Engineering mode Function block No. 10 (Fn1D)
146	Show/Hide Input 2_SV	
147	Show/Hide Input 1_MV	
148	Show/Hide Input 2_MV	
149	Select hide items in Monitor mode	
150	Select hide items in Operation transfer mode	Engineering mode Function block No. 11 (Fn1I)
151	Data registration	
152	FUNC key assignment	
153	FUNC key operation selection	Engineering mode Function block No. 21 (Fn21)
154	Input 1_Input type	
155	Input 1_Display unit	
156	Input 1_Decimal point position	
157	Input 1_Input range high	
158	Input 1_Input range low	
159	Input 1_Input error determination point (high)	
160	Input 1_Input error determination point (low)	
161	Input 1_Temperature compensation calculation	
162	Input 1_Burnout direction	Engineering mode Function block No. 22 (Fn22)
163	Input 1_Square root extraction	
164	Input 1_Inverting input	
165	Input data type	
166	Input 2_Input type	
167	Input 2_Display unit	
168	Input 2_Decimal point position	
169	Input 2_Input range high	
170	Input 2_Input range low	
171	Input 2_Input error determination point (high)	
172	Input 2_Input error determination point (low)	Engineering mode Function block No. 23 (Fn23)
173	Input 2_Temperature compensation calculation	
174	Input 2_Burnout direction	
175	Input 2_Square root extraction	
176	Input 2_Inverting input	
177	DI1 function selection	
178	DI2 function selection	
179	DI3 function selection	
180	DI4 function selection	
181	DI5 function selection	
182	DI6 function selection	Engineering mode Function block No. 30 (Fn3D)
183	DI logic invert	
184	Area switching time (without area set signal)	
185	OUT1 function selection	
186	OUT2 function selection	
187	OUT3 function selection	
188	OUT1 logic calculation selection	
189	OUT2 logic calculation selection	
190	OUT3 logic calculation selection	
191	Energized/De-energized selection	
192	Interlock selection	Engineering mode Function block No. 31 (Fn3I)
193	Output action at control stop	
194	Universal output type selection (OUT3)	
195	Retransmission output 1 type	Engineering mode Function block No. 32 (Fn32)
196	Retransmission output 1 scale high	
197	Retransmission output 1 scale low	
198	Retransmission output 2 type	Engineering mode Function block No. 32 (Fn32)
199	Retransmission output 2 scale high	
200	Retransmission output 2 scale low	



No.	Name	Mode
201	Retransmission output 3 type	Engineering mode Function block No. 33 (<i>F_{n33}</i>)
202	Retransmission output 3 scale high	
203	Retransmission output 3 scale low	
204	DO1 function selection	Engineering mode Function block No. 34 (<i>F_{n34}</i>)
205	DO2 function selection	
206	DO3 function selection	
207	DO4 function selection	
208	DO1 logic calculation selection	
209	DO2 logic calculation selection	
210	DO3 logic calculation selection	
211	DO4 logic calculation selection	
212	Event 1 assignment	Engineering mode Function block No. 41 (<i>F_{n41}</i>)
213	Event 1 type	
214	Event 1 hold action	
215	Event 1 differential gap	
216	Event 1 timer	Engineering mode Function block No. 42 (<i>F_{n42}</i>)
217	Event 2 assignment	
218	Event 2 type	
219	Event 2 hold action	
220	Event 2 differential gap	Engineering mode Function block No. 43 (<i>F_{n43}</i>)
221	Event 2 timer	
222	Event 3 assignment	
223	Event 3 type	
224	Event 3 hold action	Engineering mode Function block No. 44 (<i>F_{n44}</i>)
225	Event 3 differential gap	
226	Event 3 timer	
227	Event 4 assignment	
228	Event 4 type	Engineering mode Function block No. 45 (<i>F_{n45}</i>)
229	Event 4 hold action	
230	Event 4 differential gap	
231	Event 4 timer	
232	CT1 assignment	Engineering mode Function block No. 46 (<i>F_{n46}</i>)
233	CT1 type	
234	CT1 ratio	
235	CT1 low input cut-off	
236	CT2 assignment	Engineering mode Function block No. 50 (<i>F_{n50}</i>)
237	CT2 type	
238	CT2 ratio	
239	CT2 low input cut-off	
240	Hot/Cold start	Engineering mode Function block No. 51 (<i>F_{n51}</i>)
241	Manual manipulated output value selection	
242	SV tracking	
243	Integral/Derivative time decimal point position	
244	ST start condition	Engineering mode Function block No. 52 (<i>F_{n52}</i>)
245	Input 1_Control action	
246	Input 1_Output change rate limiter (up) [heat-side]	
247	Input 1_Output change rate limiter (down) [heat-side]	
248	Input 1_Action (high) input error	
249	Input 1_Action (low) input error	
250	Input 1_Manipulated output value at input error	
251	Input 1_Manipulated output value at STOP [heat-side]	
252	Input 1_Start determination point	
253	Input 1_Level PID action selection	
254	Input 1_Level PID differential gap	

No.	Name	Mode
255	Input 2_Control action	Engineering mode Function block No. 52 (<i>F_{n52}</i>)
256	Input 2_Output change rate limiter (up)	
257	Input 2_Output change rate limiter (down)	
258	Input 2_Action (high) input error	
259	Input 2_Action (low) input error	
260	Input 2_Manipulated output value at input error	
261	Input 2_Manipulated output value at STOP	
262	Input 2_Start determination point	
263	Input 2_Level PID action selection	Engineering mode Function block No. 55 (<i>F_{n55}</i>)
264	Input 2_Level PID differential gap	
265	Action at feedback resistance (FBR) input error	
266	Feedback adjustment	
267	Control motor time	Engineering mode Function block No. 56 (<i>F_{n56}</i>)
268	Integrated output limiter	
269	Valve action at STOP	
270	Action at saturated output	
271	Input 1_Output change rate limiter (up) [cool-side]	Engineering mode Function block No. 57 (<i>F_{n57}</i>)
272	Input 1_Output change rate limiter (down) [cool-side]	
273	Input 1_Manipulated output value at STOP [cool-side]	
274	Undershoot suppression factor	
275	Overlap/Deadband reference point	Engineering mode Function block No. 58 (<i>F_{n58}</i>)
276	Bottom suppression function	
277	Select function for input 2	
278	Cascade_AT mode (master-side)	
279	Cascade_AT mode (slave-side)	Engineering mode Function block No. 60 (<i>F_{n60}</i>)
280	Selection of PV select trigger	
281	Input circuit error alarm set value	
282	Communication protocol	
283	Device address	Engineering mode Function block No. 62 (<i>F_{n62}</i>)
284	Communication speed	
285	Data bit configuration	
286	Interval time	
287	Communication response monitor	Engineering mode Function block No. 70 (<i>F_{n70}</i>)
288	Register type	
289	Register start number (High-order 4-bit)	
290	Register start number (Low-order 16-bit)	
291	Monitor item register bias	Engineering mode Function block No. 71 (<i>F_{n71}</i>)
292	Setting item register bias	
293	Instrument link recognition time	
294	PLC response waiting time	
295	PLC communication start time	Engineering mode Function block No. 72 (<i>F_{n72}</i>)
296	Slave register bias	
297	Number of recognizable devices	
298	Setting change rate limiter unit time	
299	Soak time unit	Engineering mode Function block No. 71 (<i>F_{n71}</i>)
300	Input 1_Setting limiter high	
301	Input 1_Setting limiter low	
302	Input 2_Setting limiter high	Engineering mode Function block No. 72 (<i>F_{n72}</i>)
303	Input 2_Setting limiter low	

9.2 Hiding Unnecessary Screens

On this instrument, a specified range of screens can be hidden.

Below are screens that can be hidden.

- Monitor screen in the Monitor & SV setting mode
- Screens in the Operation transfer mode
- Screens restricted by the Blind function

9.2.1 Hide the monitor screen in the Monitor & SV setting mode

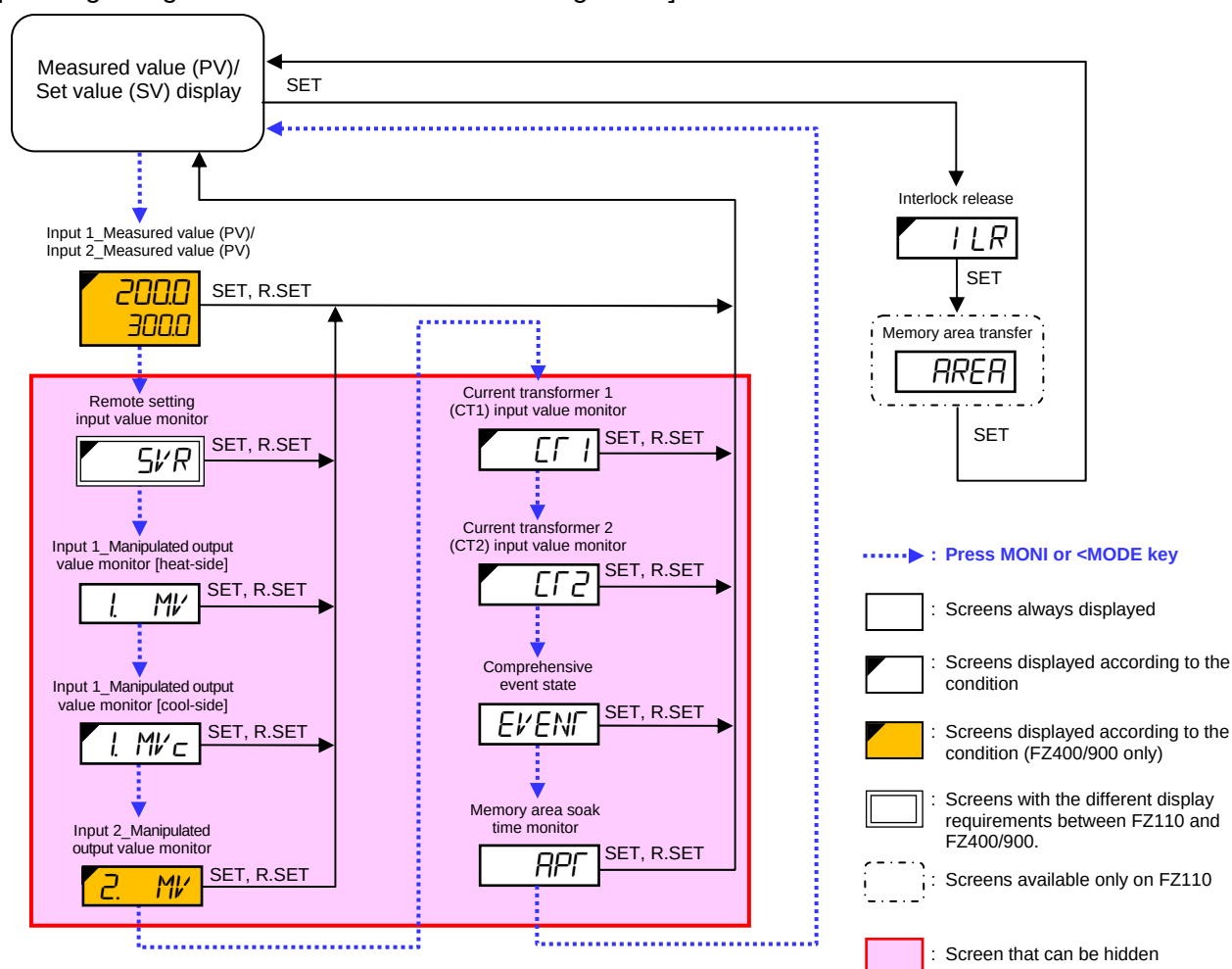
Show/Hide selection of the monitor screens in the Monitor & SV setting mode is available at “Select hide items in Monitor mode” in Function block No. 10 in the Engineering mode.

[Applicable screens]

- Remote setting input value monitor
- Manipulated output value (MV) monitor *:
 - Input 1_Manipulated output value monitor [heat-side], Input 1_Manipulated output value monitor [cool-side],
 - Input 2_Manipulated output value monitor
- Current transformer (CT) input value monitor *:
 - Current transformer 1 (CT1) input value monitor, Current transformer 2 (CT2) input value monitor

* Setting is done at “Manipulated output value (MV) monitor” and “Current transformer (CT) input value monitor.”

[Operating navigation in the Monitor & SV setting mode]



Parameter setting

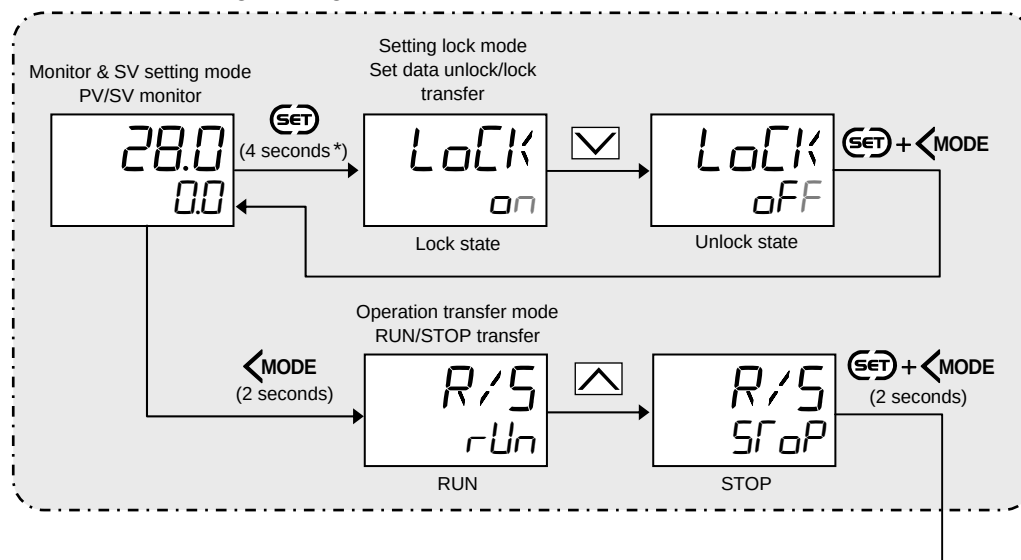
Select hide items in Monitor mode

[Engineering Mode: Function block No. 10 (Fn 10)]

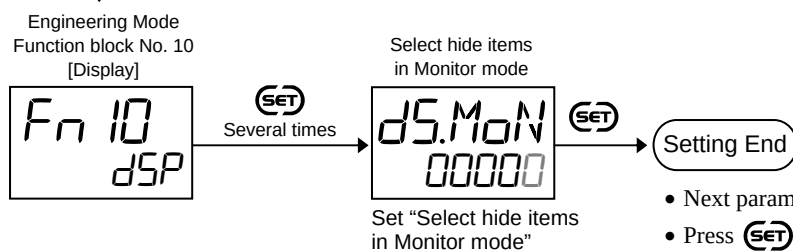
Parameter symbol	Data range	Factory set value
d5.MoN	0 to 31 0: Show all +1: Remote setting input value monitor +2: Manipulated output value (MV) monitor +4: Current transformer (CT) monitor +8: Comprehensive event state +16: Memory area soak time To select two or more functions, sum each value.	0

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.



9.2.2 Hiding screens in Operation transfer mode

Show/Hide selection of the screens in the Operation transfer mode is available at “Select hide items in Operation transfer mode” in Function block No. 10 in the Engineering mode.

[Applicable screens]

- RUN/STOP transfer
- Autotuning (AT) *: Input 1_Autotuning (AT), Input 2_Autotuning (AT)
- Startup tuning (ST) *: Input 1_Startup tuning (ST), Input 2_Startup tuning (ST)
- Auto/Manual transfer: Input 1_Auto/Manual transfer, Input 2_Auto/Manual transfer
- Remote/Local transfer
(Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control)
- Control area Local/External transfer

* Setting is done at “Autotuning (AT)” and “Startup tuning (ST).”

■ Parameter setting

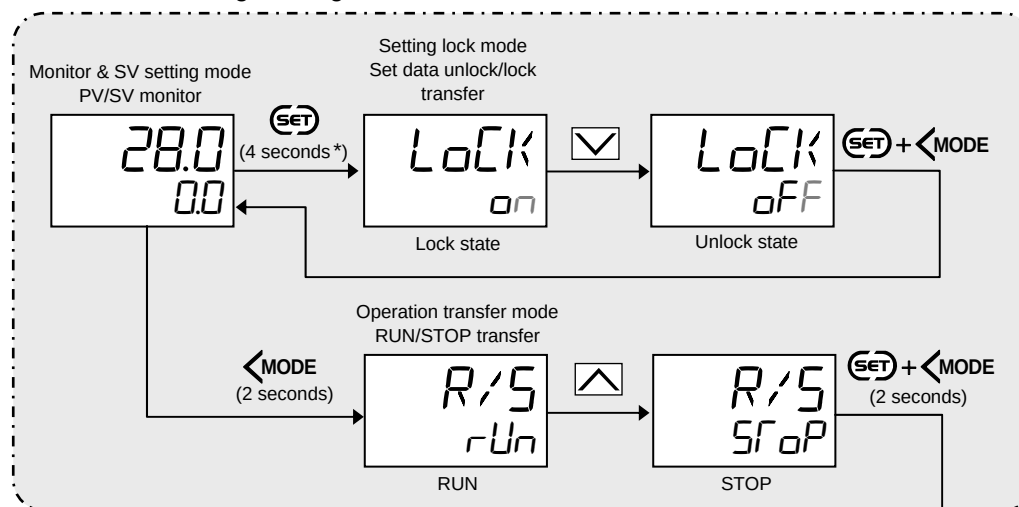
● Select hide items in Operation transfer mode

[Engineering Mode: Function block No. 10 (F_n ID)]

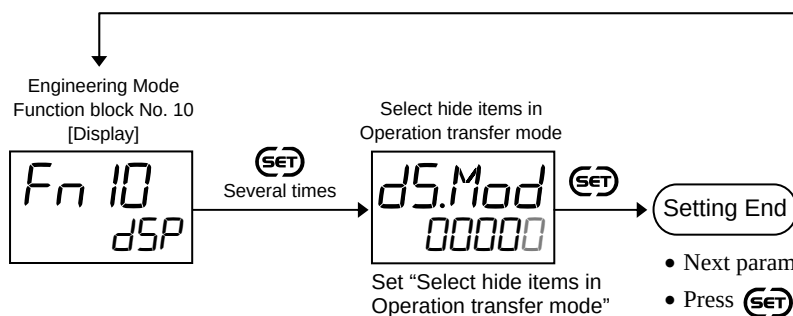
Parameter symbol	Data range	Factory set value
<i>ds.Mod</i>	0 to 63 0: Show all +1: RUN/STOP transfer +2: Autotuning (AT) +4: Startup tuning (ST) +8: Auto/Manual transfer +16: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +32: Control area Local/External transfer To select two or more functions, sum each value.	0

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

9.2.3 Hiding the screen using the Blind function

The Blind function is used to hide all screens except Parameter select mode, Setting lock mode, and Measured value (PV)/Set value (SV) monitor.

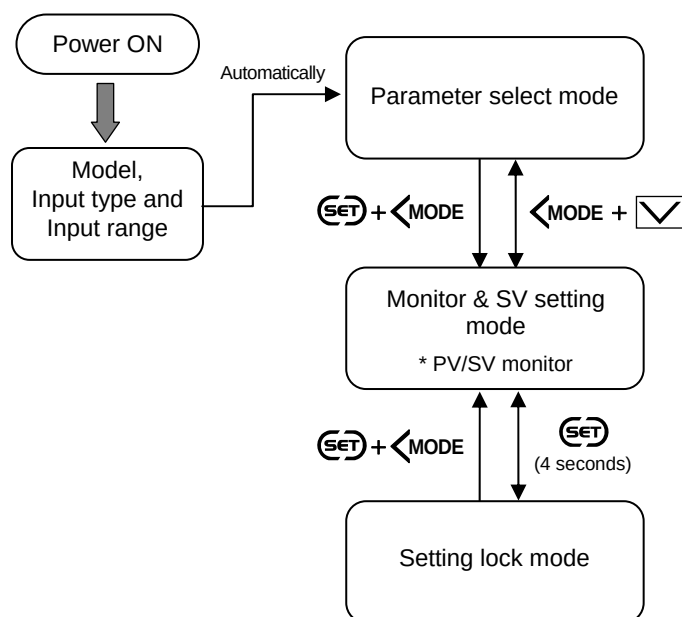
The Blind function can be set in the Setting lock mode.



When the Blind function is activated, the instrument displays the Parameter select mode after displaying the model and the input type/range at the time of power-up.

If all of the necessary screens are placed together in the Parameter select mode, there will be no need of switching screens to other modes.

[Operation flow when the Blind function is activated]



* The PV/SV monitor includes Set value (SV) setting and Manipulated output value (MV) setting.

Modes to be hidden

Operation transfer

Parameter setting mode

Setup setting mode

Engineering mode

Memory area transfer mode
(FZ400/900 only)

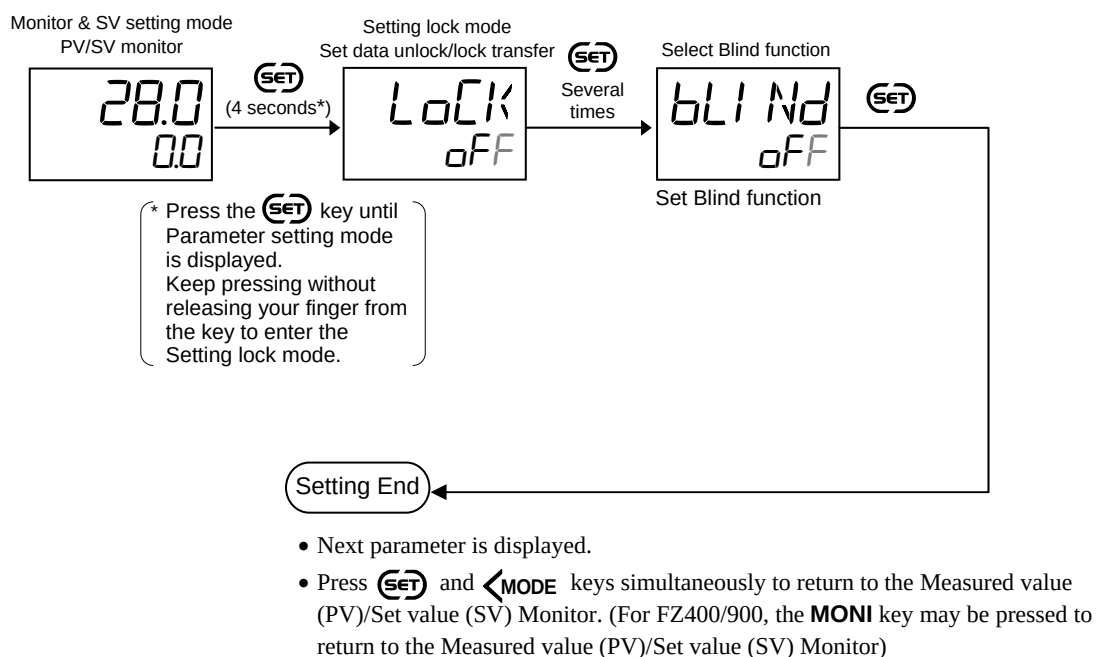
Parameter setting

Select Blind function

[Setting Lock Mode]

Parameter symbol	Data range	Factory set value
<i>blINd</i>	<i>oFF</i> : Blind function: OFF <i>oN</i> : Blind function: ON	<i>oFF</i>

Setting procedure



9.3 Hiding the Display of the Set Value (SV)

On the normal PV/SV monitor screen, the Set value (SV) is displayed on the set value (SV) display unit. This display can be turned OFF.

■ Description of function

Display of Set value (SV)

With Set value (SV) display



Without Set value (SV) display



Display off

This display can be turned OFF.
(Refer to P. 9-24)



In the above figure FZ400 is used for explanation, but the operation is the same for FZ110/900.

■ Parameter setting

● Show/Hide Input 1_SV

[Engineering Mode: Function block No. 10 (F_n ID)]

Parameter symbol	Data range	Factory set value
1.d5.5v	0: Hide Input 1_SV 1: Show Input 1_SV	1

● Show/Hide Input 2_SV

[Engineering Mode: Function block No. 10 (F_n ID)]

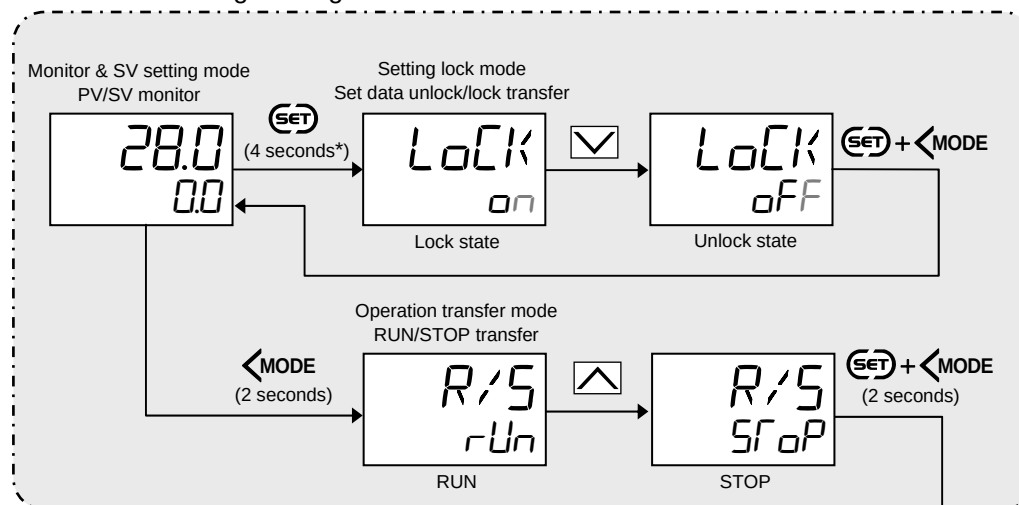
Parameter symbol	Data range	Factory set value
2.d5.5v	0: Hide Input 2_SV 1: Show Input 2_SV	1



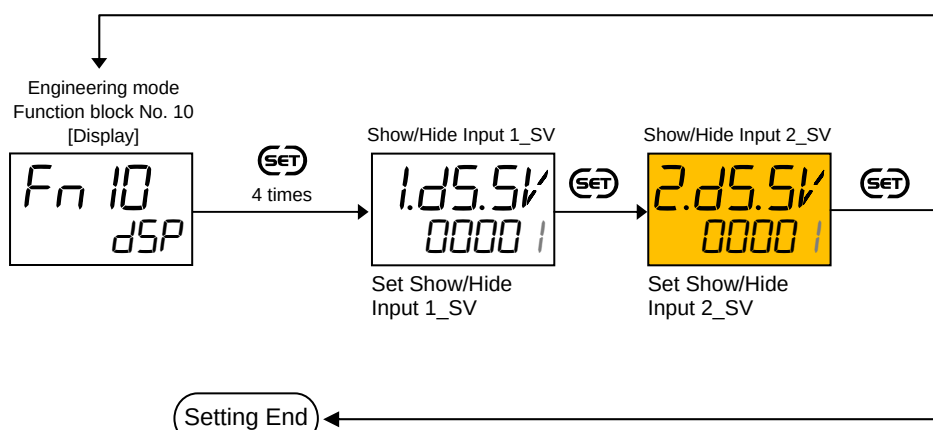
To display “Show/Hide Input 2_SV,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



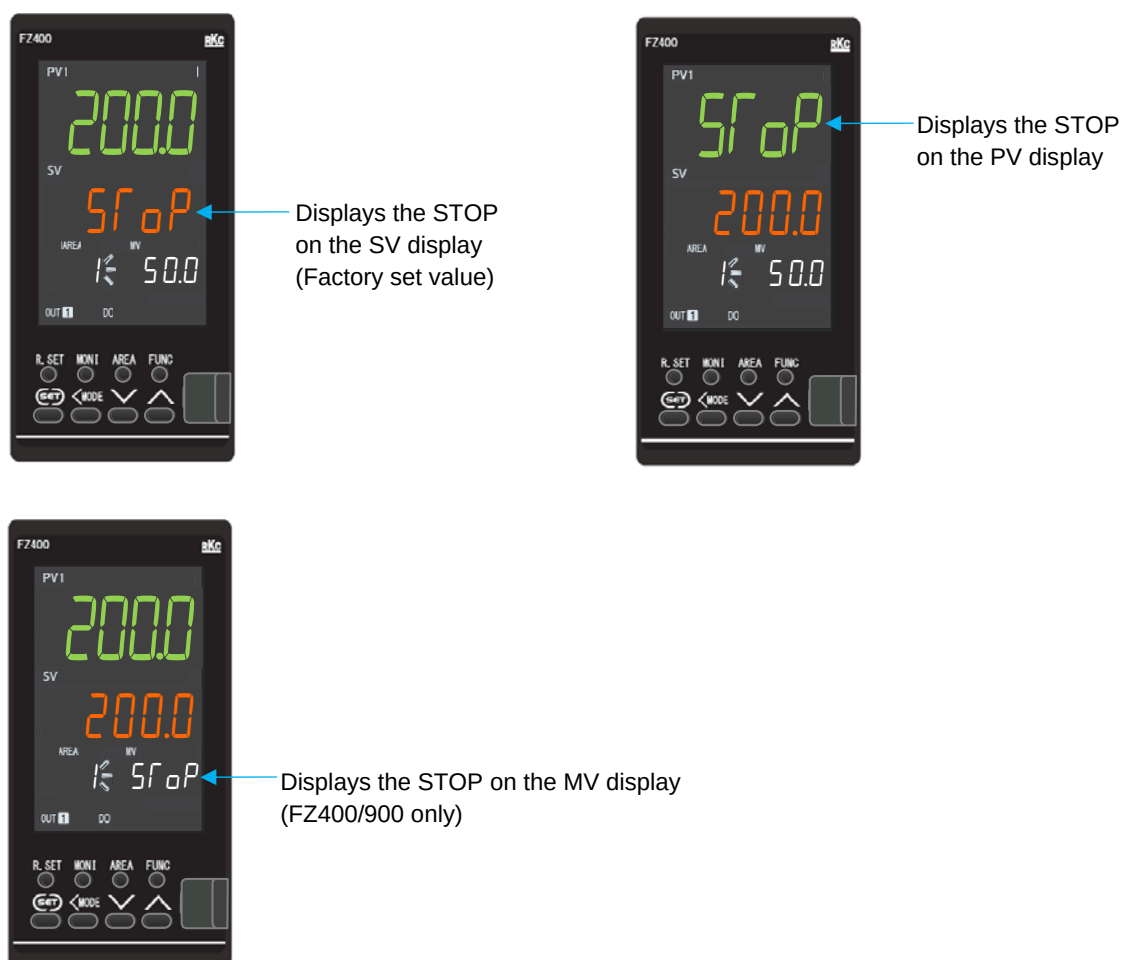
- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

9.4 Changing the Display Position of STOP during the Control Stop

The display position of “STOP” showing the control stop state can be changed.

■ Description of function

The position of the STOP display can be specified; Measured value (PV) display, Set value (SV) display, or Manipulated output value (MV) display.



In the above figure FZ400 is used for explanation, but the operation is the same for FZ110/900.

■ Parameter setting

● STOP display selection

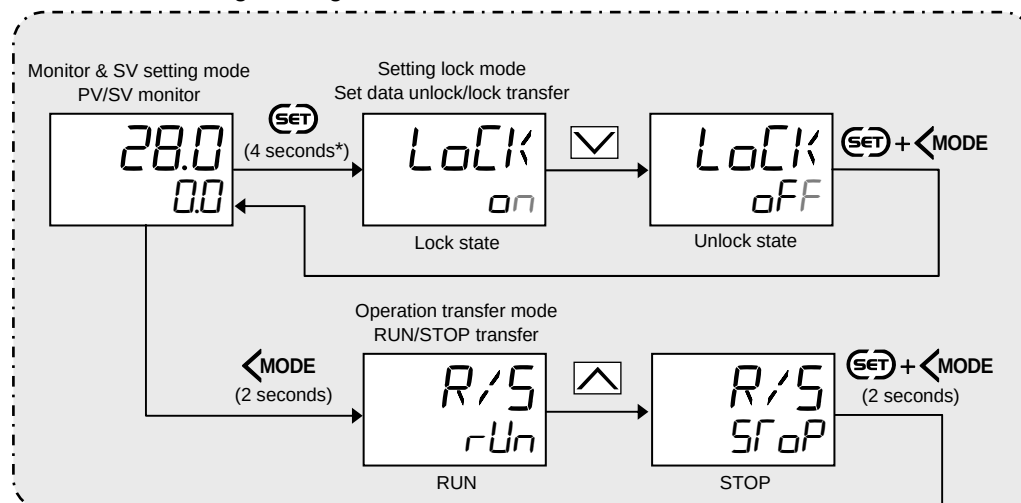
[Engineering Mode: Function block No. 10 ($F_n 10$)]

Parameter symbol	Data range	Factory set value
SPCH	0: Stop on PV display 1: Stop on SV display 2: Stop on MV display *	1

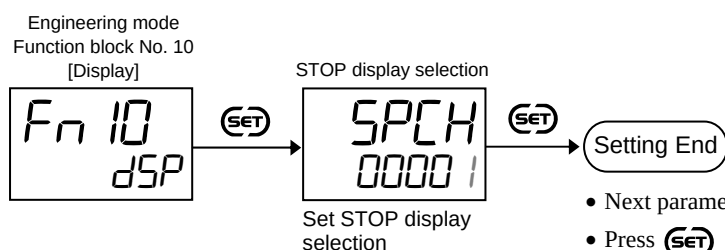
* Selectable only for FZ400/900.

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

9.5 Changing the ALM Lamp Lighting Condition

The light condition of the ALM lamp on the front panel can be changed.

■ Description of function

ALM lamps can be configured to light on the occurrence of the following events.

These are freely combinable.

If multiple events occur, *OR*-logic is used for display.

- Event 1
 - Event 2
 - Event 3
 - Event 4
 - Heater break alarm 1 (HBA1)
 - Heater break alarm 2 (HBA2)
 - Control loop break alarm 1 (LBA1)
 - Control loop break alarm 2 (LBA2)
 - Input 1_Input error high
 - Input 1_Input error low
 - Input 2_Input error high
 - Input 2_Input error low
- } Factory set ranges

Display example



■ Parameter setting

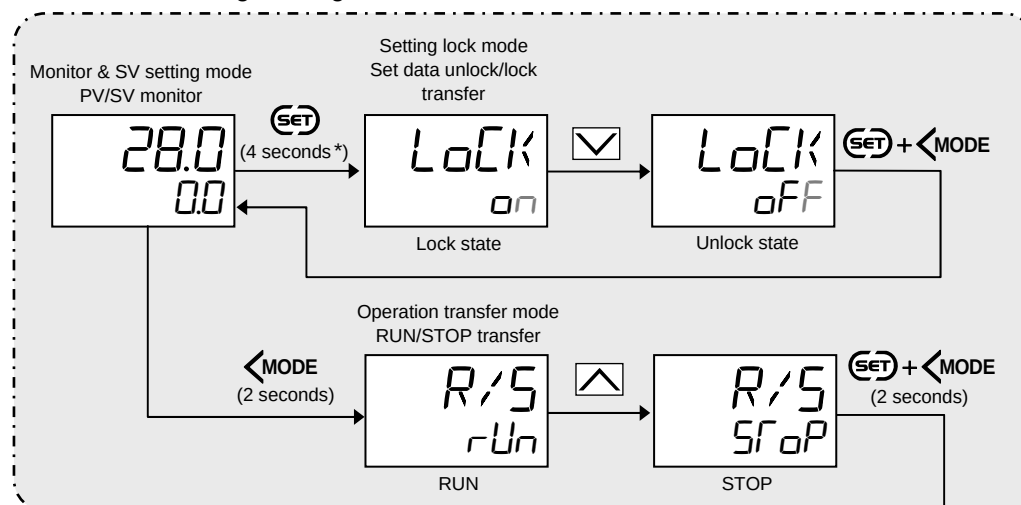
● ALM lamp lighting condition

[Engineering Mode: Function block No. 10 (F_n ID)]

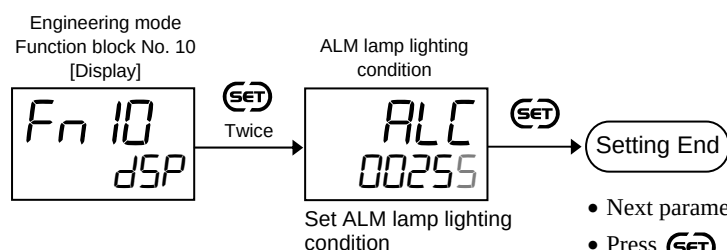
Parameter symbol	Data range	Factory set value
ALC	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	255

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

9.6 Changing the Display Contents of the MV Display [FZ400/900]

While the FZ400/900 is monitoring the Measured value (PV) and the Set value (SV), the MV display can be configured to change the display contents.

■ Description of function

The MV display on the FZ400/900 can display the following data.

- Manipulated output value (MV) ¹
- Memory area soak time
- Current transformer (CT) input value ²
- Hide

¹ Not displayed the Control action is a Position proportioning PID control without Feedback resistance (FBR) input. Feedback resistance (FBR) input value is displayed when the Control action is a Position proportioning PID controller with Feedback resistance (FBR) input.

This display goes off at the time of FBR input break.

² If the instrument has no current transformer (CT), the value will not be displayed even if this setting is selected.

Display example



Display of Show Memory area soak time

When the Soak time unit is set to “2,” the time is displayed as follows depending on the time to be displayed.

Time	Time unit	Lamp	Example (FZ900)	
2 hour or more	Hours: Minutes	H:M	H:M	2:06 (2 hours 6 minutes)
1 hour 00 minutes 00 seconds to 1 hour 59 minutes 59 seconds	Hours: Minutes: seconds	H:M:S	H:M:S	1:08:45 (1 hour 8 minutes 45 seconds)
0 minutes 00 seconds to 59 minutes 59 seconds	Minutes: seconds	M:S	M:S	37:09 (37 minutes 9 seconds)

■ Parameter setting

● Show/Hide Input 1_MV

[Engineering Mode: Function block No. 10 (Fn ID)]

Parameter symbol	Data range	Factory set value
1.d5.MV	0: Hide 1: Show Input 1_Manipulated output value (MV) 2: Show Memory area soak time * 3: Show Current transformer 1 (CT1) input value 4: Show Current transformer 2 (CT2) input value	1

* The time unit depends on the setting of Soak time unit (Function block No. 70 in the Engineering mode).

● Show/Hide Input 2_MV

[Engineering Mode: Function block No. 10 (Fn 10)]

Parameter symbol	Data range	Factory set value
2.d5.MV	0: Hide 1: Show Input 2_Manipulated output value (MV) 2: Show Memory area soak time * 3: Show Current transformer 1 (CT1) input value 4: Show Current transformer 2 (CT2) input value	1

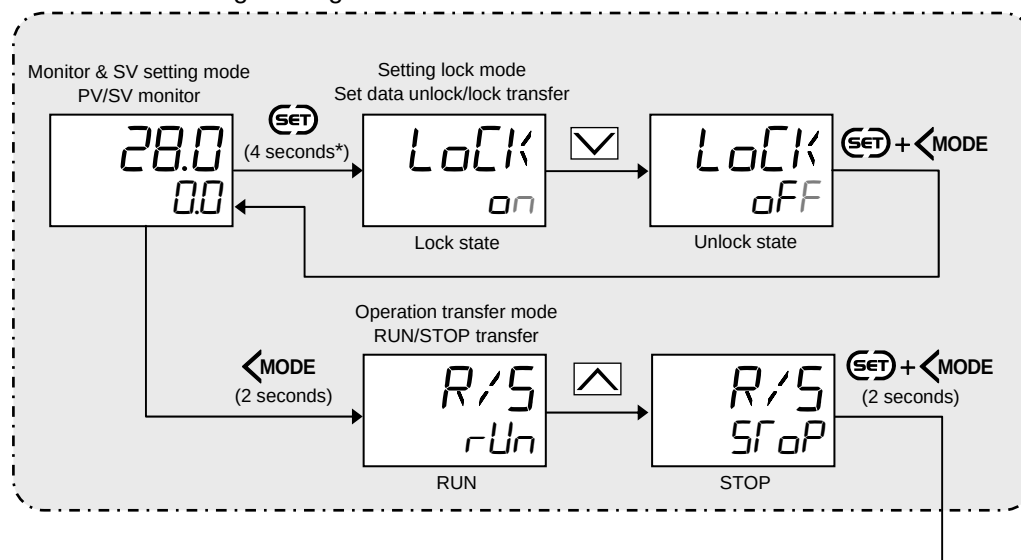
* The time unit depends on the setting of Soak time unit (Function block No. 70 in the Engineering mode).



To display “Show/Hide Input 2_MV,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

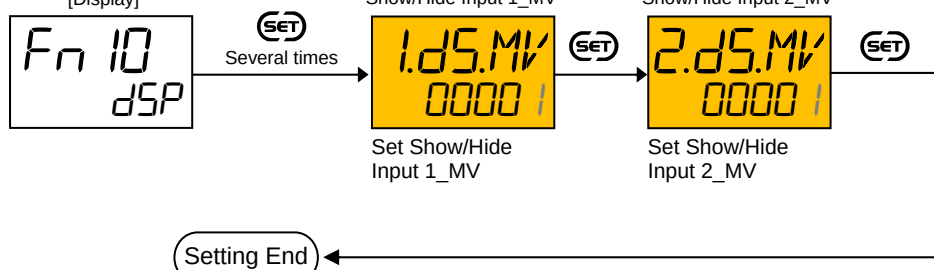
■ Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

Engineering mode
Function block No. 10
[Display]



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

9.7 Checking Input Peak Value/Bottom Value

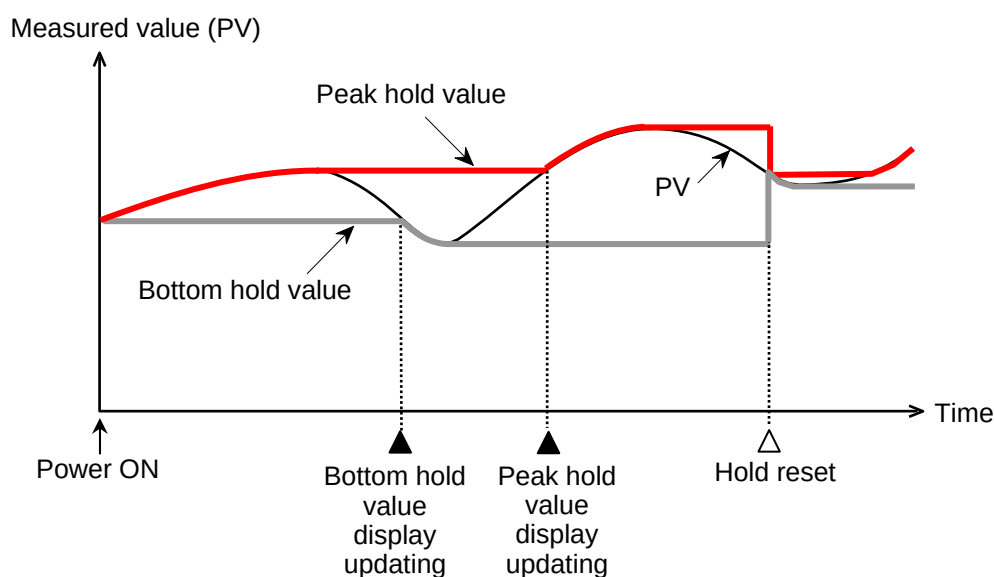
This instrument incorporates as standard the Peak/Bottom hold function which allows storing the peak (max) and the bottom (min) Measured values (PV).

■ Description of function

The peak hold/bottom hold function is used to store (hold) the peak (max) and the bottom (min) Measured values (PV). Each of these values is updated when the measured temperature becomes more (or less) than the value now being held.



The stored peak (max) and bottom (min) values can be reset on the Hold reset screen.



Peak/Bottom hold action description

■ Parameter setting

● Input 1_Peak hold monitor

[Setup Setting Mode: Setting group No. 91 (5n9 I)]

Parameter symbol	Data range	Factory set value
I.PHLD	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	—

● Input 2_Peak hold monitor

[Setup Setting Mode: Setting group No. 91 (5n9 l)]

Parameter symbol	Data range	Factory set value
2.PHLd	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	—



To display “Input 2_Peak hold monitor,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control, Control with PV select, 2-loop control/Differential temperature control, or Input circuit error alarm.

● Input 1_Bottom hold monitor

[Setup Setting Mode: Setting group No. 91 (5n9 l)]

Parameter symbol	Data range	Factory set value
1.bHLd	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	—

● Input 2_Bottom hold monitor

[Setup Setting Mode: Setting group No. 91 (5n9 l)]

Parameter symbol	Data range	Factory set value
2.bHLd	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	—



To display “Input 2_Bottom hold monitor,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control, Control with PV select, 2-loop control/Differential temperature control, or Input circuit error alarm.

● Input 1_Hold reset

[Setup Setting Mode: Setting group No. 91 (5n9 l)]

Parameter symbol	Data range	Factory set value
1.HLdR	HoLd: Hold rESEt: Reset Returns to Hold state automatically after reset.	HoLd



Note that the both of the peak and the bottom hold values are reset at a time by the hold reset operation.

**● Input 2_Hold reset****[Setup Setting Mode: Setting group No. 91 (5n9 I)]**

Parameter symbol	Data range	Factory set value
2.HLdR	HoLd: Hold rESEt: Reset Returns to Hold state automatically after reset.	HoLd

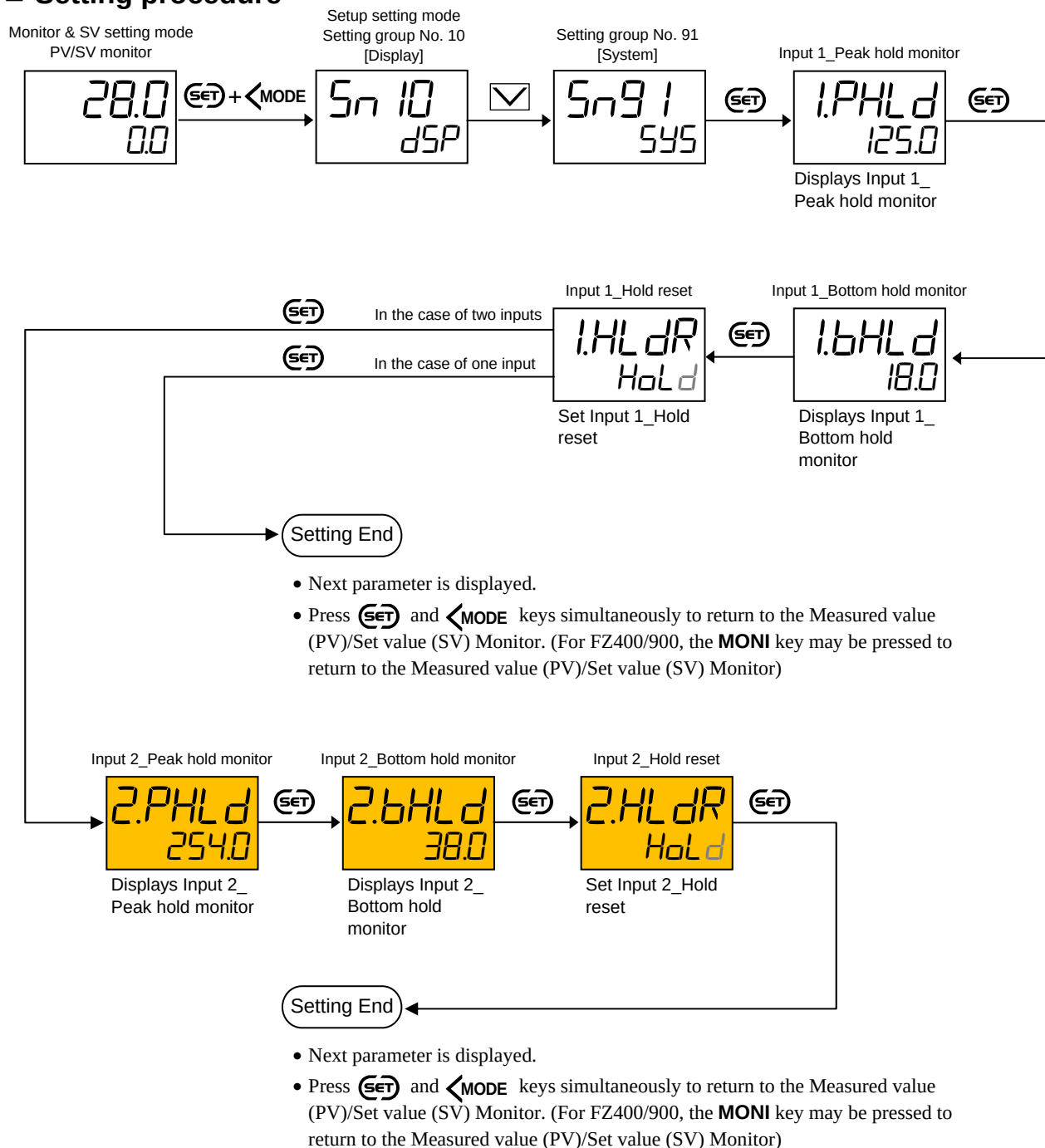


To display “Input 2_Hold reset,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to Cascade control, Control with PV select, 2-loop control/Differential temperature control, or Input circuit error alarm.



Note that the both of the peak and the bottom hold values are reset at a time by the hold reset operation.

Setting procedure



9.8 Suppressing the Display Flickering

The display flickering due to input changes in PV/SV monitor screen can be reduced by extending the display update cycle.

● Applicable screens

The PV/SV monitor screen which comes at the beginning in the Monitor & SV setting mode. When the instrument has two inputs, PV/SV on the Input 2 is also covered.



In the case of FZ400/900, the Manipulated output value (MV) displayed on the Manipulated output value (MV) display is also covered.

[1-loop control]

• Auto mode

Input 1_Measured value (PV)/
Input 1_Set value (SV)



• Manual mode

Input 1_Measured value (PV)/
Input 1_Manual manipulated output value (MV)



[2-loop control/Cascade control] (FZ400/900 only)

• Auto mode

Input 1_Measured value (PV)/
Input 1_Set value (SV)



Input 2_Measured value (PV)/
Input 2_Set value (SV)



• Manual mode

Input 1_Measured value (PV)/
Input 1_Manual manipulated output value (MV)



Input 2_Measured value (PV)/
Input 2_Manual manipulated output value (MV)



[Control with PV select] (FZ400/900 only)

• Auto mode

PV select Measured value (PV)/
Input 1_Set value (SV)



• Manual mode

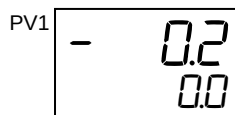
PV select Measured value (PV)/
Input 1_Manual manipulated output value (MV)



[Differential temperature control] (FZ400/900 only)

• Auto mode

Measured value (PV) of
differential temperature input/
Set value (SV) of differential
temperature input



Input 1_Measured value (PV)/
Input 1_Set value (SV)

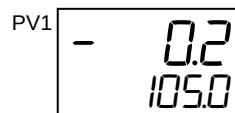


Input 2_Measured value (PV)/
Input 2_Set value (SV)



• Manual mode

Measured value (PV) of differential
temperature input/
Input 1_Manual manipulated output
value (MV)



Input 1_Measured value (PV)/
Input 1_Manual manipulated output value (MV)



Input 2_Measured value (PV)/
Input 2_Manual manipulated output value (MV)



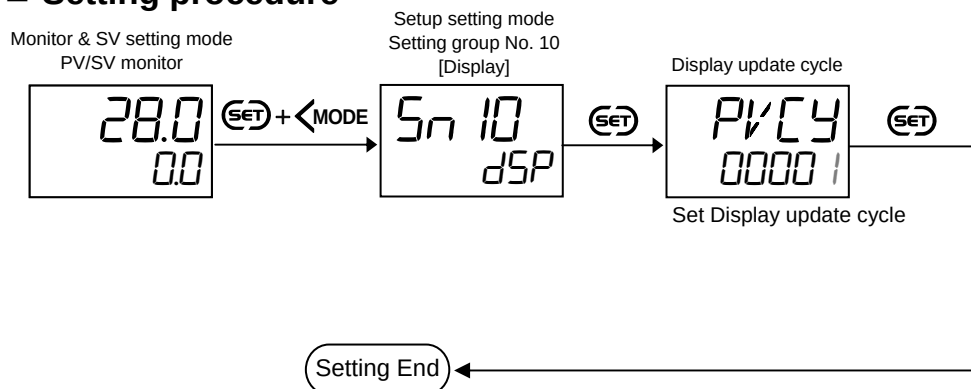
Parameter setting

Display update cycle

[Setup Setting Mode: Setting group No. 10 (Sn 10)]

Parameter symbol	Data range		Factory set value
PVCY	1: 50 ms	6: 300 ms	1
	2: 100 ms	7: 350 ms	
	3: 150 ms	8: 400 ms	
	4: 200 ms	9: 450 ms	
	5: 250 ms	10:500 ms	

Setting procedure



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

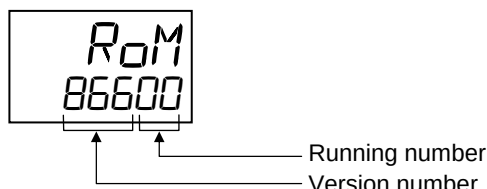
9.9 Checking the Instrument Information

When error occurs and when you contact us, you are requested to provide us with the information on the instrument model code and specification. You can check the ROM version, model code and serial number of the instrument on the instrument display. The Integrated operating time and the maximum ambient temperature (Peak hold monitor of the ambient temperature).

■ How to check

● ROM Version

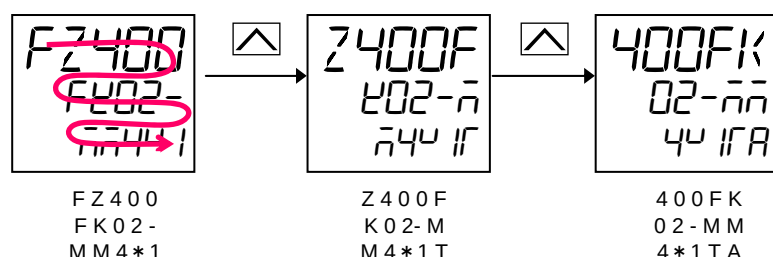
[Example]



● Model code monitor

Displays the model code of the instrument. As the Model code is too long to be displayed on a single screen, it can be scrolled left and right with and keys.

Example: Model code is FZ400FK02-MM4*1TA2NN/1



The model code scrolls from the PV display to the SV display continuously over two displays.

The Up key was pressed once.
The model code was scrolled one digit left.

The Up key was pressed once more.
The displayed characters were scrolled one more

FZ400 and FZ900 come with three display units; PV, SV, and MV are displayed. FZ110 only has PV and SV display only.

● Instrument number monitor

Displays the serial number of the instrument.



To read the displayed characters, refer to “Character Symbols” (P. i-2).



Alternatively, you can check the model code (MODEL), serial number (S/N) and suffix code (CODE) on the label on the side of the instrument if you are unable to check the information on the display.

● Integrated operating time

As soon as the instrument is powered, “1” is added. Thereafter, “1” is accumulated for each hour.

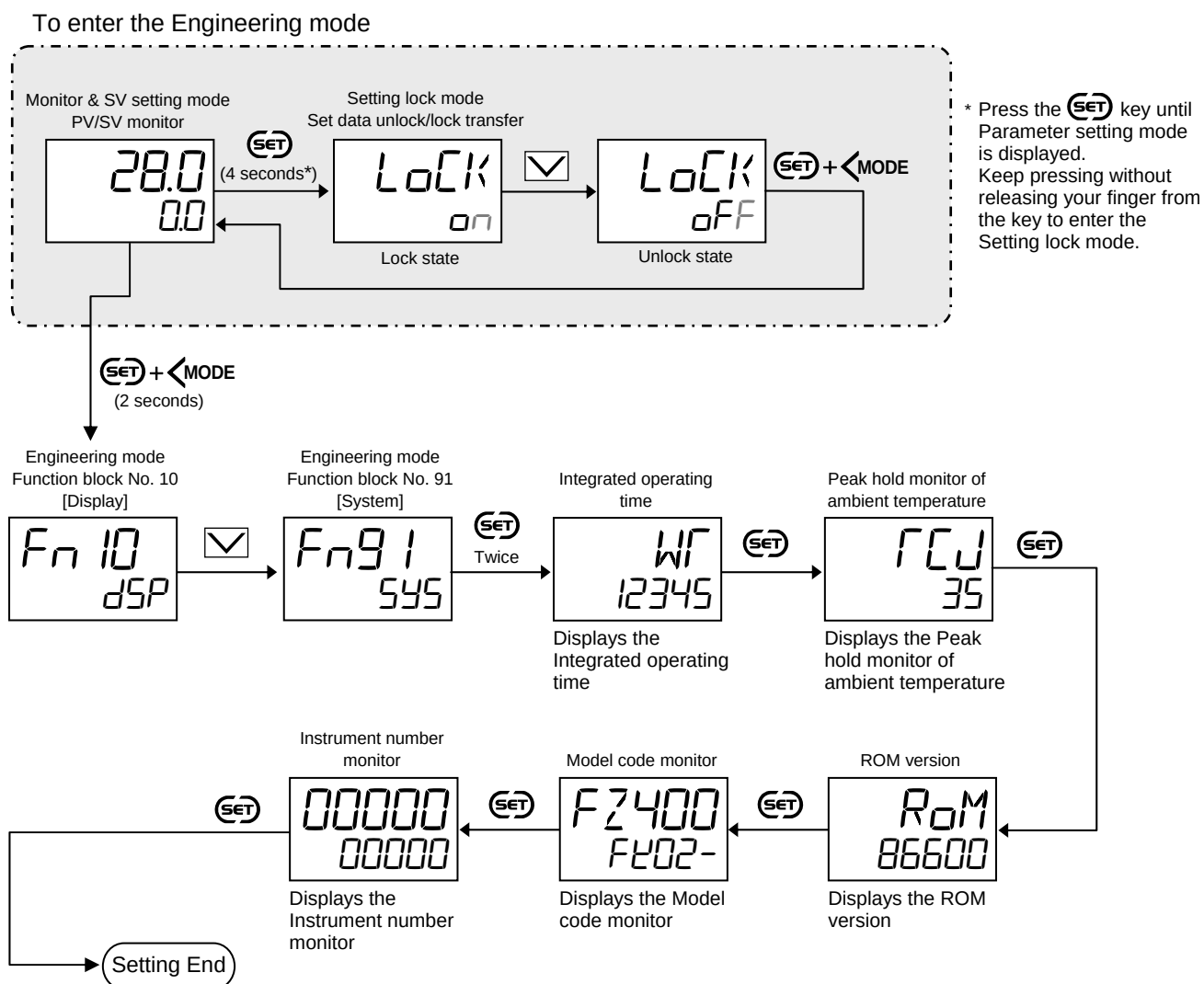
● Peak hold monitor of the ambient temperature

Temperature around the rear terminal is measured and the maximum value is stored.



The Integrated operating time and the maximum ambient temperature (Peak hold monitor of the ambient temperature) cannot be reset.

Operating procedure



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.



MEMO



SETTING AND KEY OPERATION

10

This chapter describes setting and key operation related functions, setting contents and setting procedure based on the keywords related to setting and key operation.

10.1 Limiting the Setting Range of Set Value (SV)	10-2
10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter)	10-6
10.3 Storing the Control Related Set Values (Memory Area Function)	10-10
10.4 Copying the Data in Memory Area to Set Other Areas	10-16
10.5 Running a Simple Ramp/Soak Control	10-18
10.6 Using a Simple Sequence Operation	10-26
10.7 Registering a Set Value (SV) Without Pressing the SET Key....	10-33
10.8 Accessing Some Functions Directly (FUNC Key) [FZ400/900]	10-35
10.9 Restricting Key Operation (Set Data Lock)	10-38
10.10 Initializing the Set Data	10-41

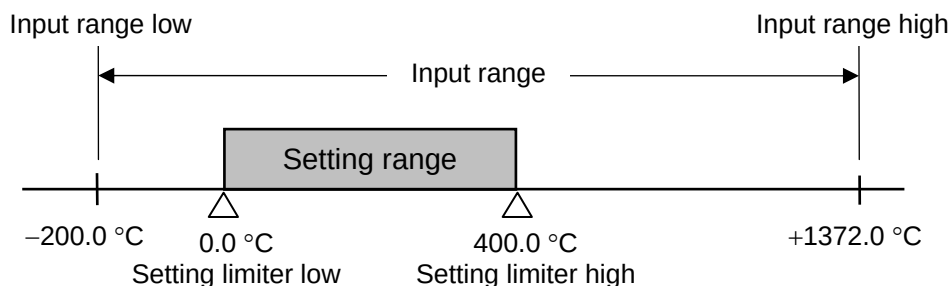
10.1 Limiting the Setting Range of Set Value (SV)

To limit the setting range of the Set value (SV), Setting limiter is used.

■ Description of function

Setting limiter is a function to limit the setting range of the Set value (SV) within the input range.

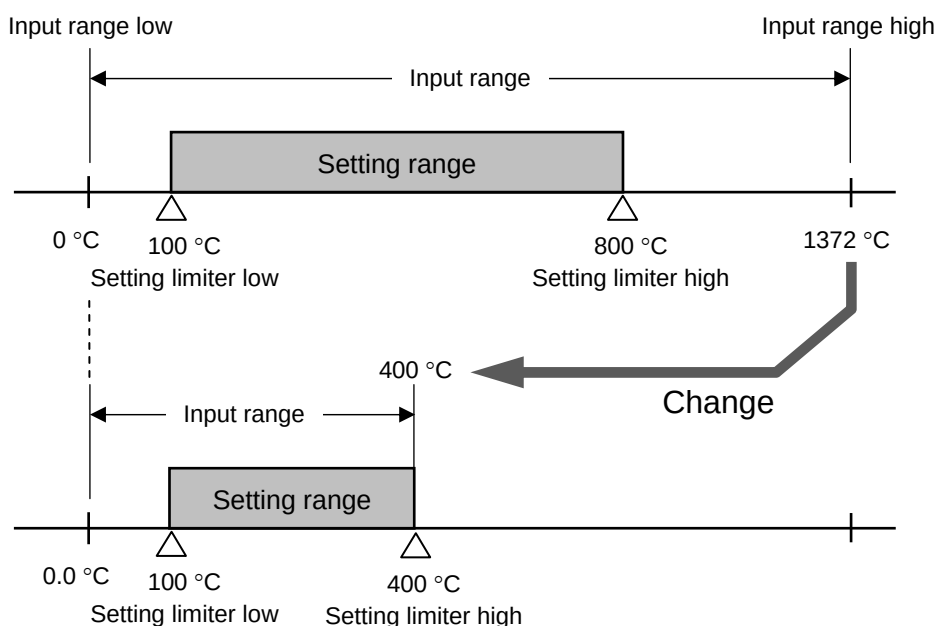
Example: The input range is from -200.0 to $+1372.0$ °C, the Setting limiter high is 400.0 °C, and the Setting limiter low is 0.0 °C.



When the input range is changed, the setting limiter may be also changed according to the changed setting.

[Example 1]

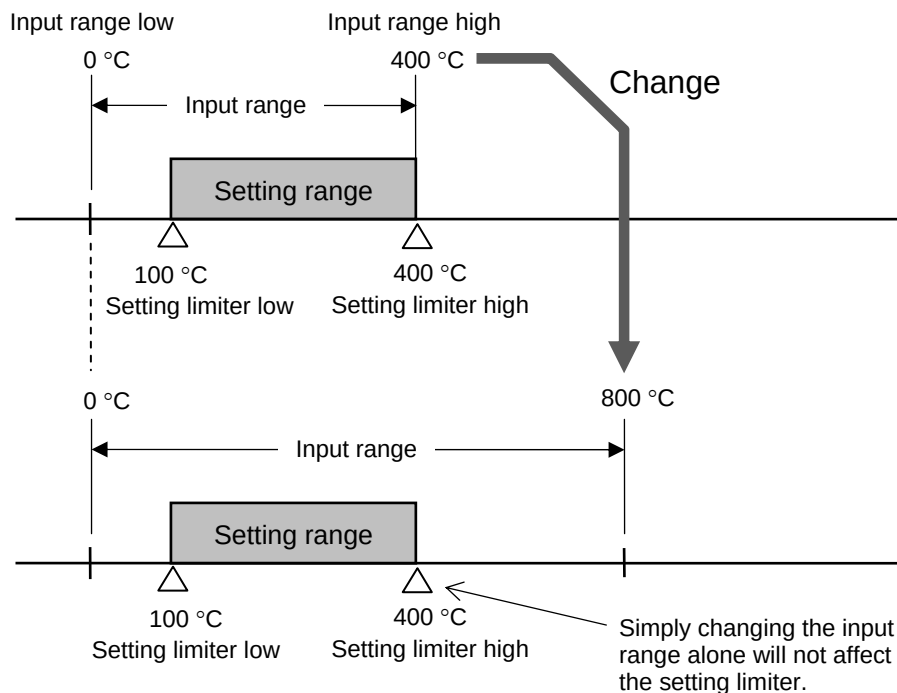
Input 1_Input range is 0 to 1372 °C, Input 1_Setting limiter high is 800 °C. Changing the Input 1_Input range high to 400 °C will change the Setting limiter high to 400 °C accordingly.



[Example 2]

When the Input 1_Input range is 0 to 400 °C and the Input 1_Setting limiter high is 400 °C, changing the Input 1_Input range high to 800 °C will not affect the setting limiter value. In this case the Input 1_Setting limiter high remains 400 °C.

When a wider setting range of the Set value (SV) is required according to the extended input range, change the setting limiter value accordingly.



■ Parameter setting

● Input 1_Setting limiter high

[Engineering Mode: Function block No. 71 (F_n 71 I)]

Parameter symbol	Data range	Factory set value
1. SLH	Input 1_Setting limiter low to Input 1_Input range high (When Control with PV select: Input 1_Setting limiter low to PV select input range high) Varies with the setting of the Decimal point position.	Input 1_Input range high (Control with PV select: PV select input range high)



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 1_Setting limiter high is changed.

● Input 2_Setting limiter high

[Engineering Mode: Function block No. 72 (Fn72)]

Parameter symbol	Data range	Factory set value
2. SLH	Input 2_Setting limiter low to Input 2_Input range high Varies with the setting of the Decimal point position.	Input 2_Input range high



To display “Input 2_Setting limiter high,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 2_Setting limiter high is changed.

● Input 1_Setting limiter low

[Engineering Mode: Function block No. 71 (Fn71)]

Parameter symbol	Data range	Factory set value
1. SLL	Input 1_Input range low to Input 1_Setting limiter high (When Control with PV select: PV select input range low to Input 1_Setting limiter high) Varies with the setting of the Decimal point position.	Input 1_Input range low (Control with PV select: PV select input range low)



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 1_Setting limiter low is changed.

● Input 2_Setting limiter low

[Engineering Mode: Function block No. 72 (Fn72)]

Parameter symbol	Data range	Factory set value
2. SLL	Input 2_Input range low to Input 2_Setting limiter high Varies with the setting of the Decimal point position.	Input 2_Input range low



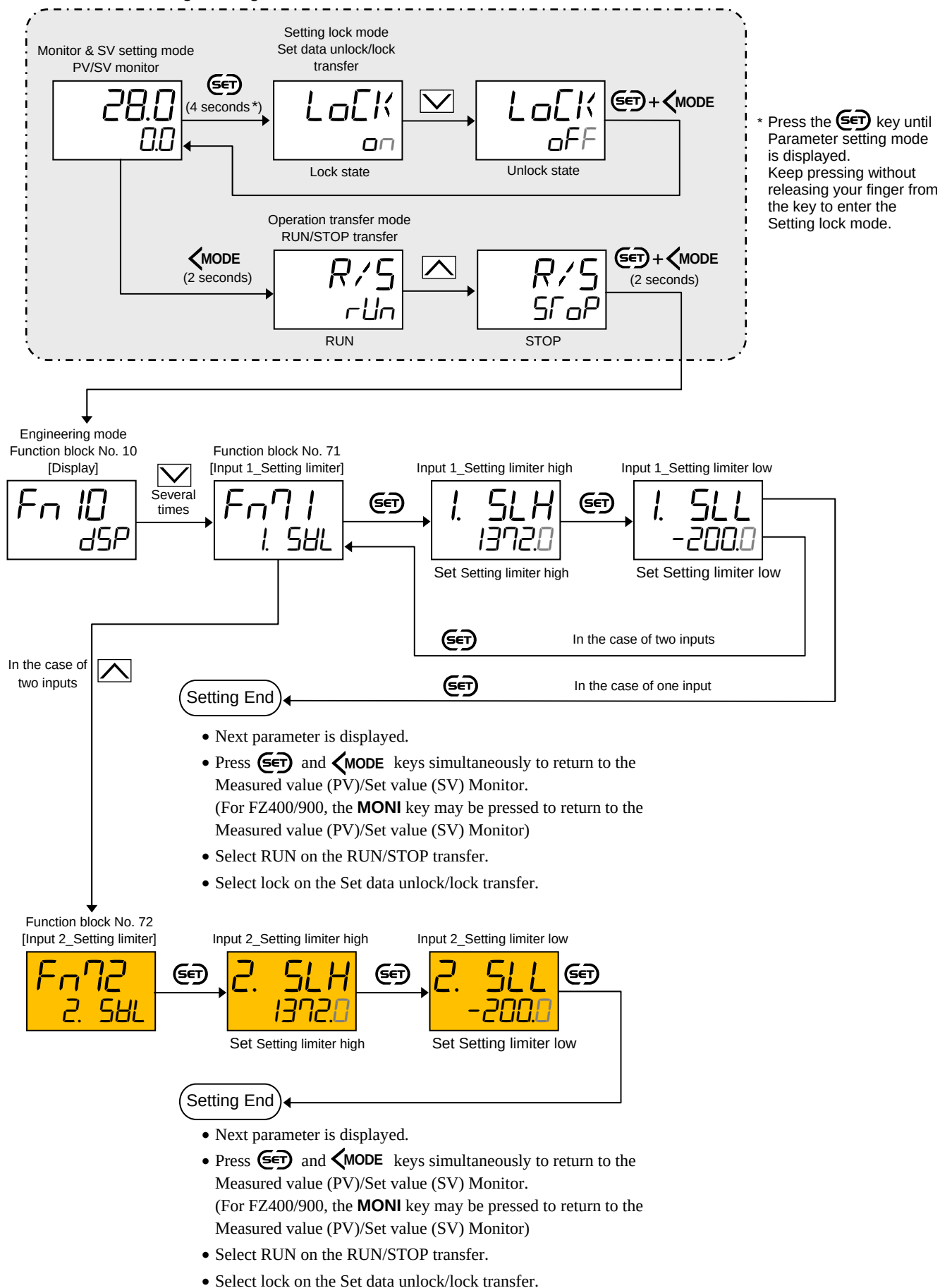
To display “Input 2_Setting limiter low,” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.



Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Input 2_Setting limiter low is changed.

Setting procedure

To enter the Engineering mode



10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter)

This function allows the Set value (SV) to change gradually, not rapidly or not at a time, when the Set value (SV) is changed.

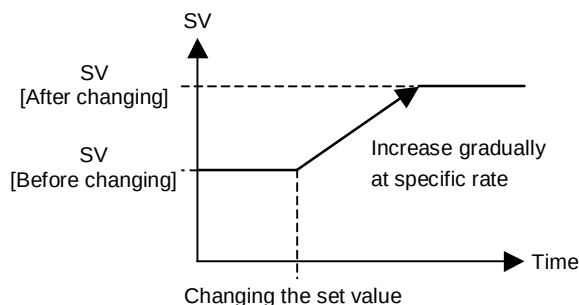
■ Description of function

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

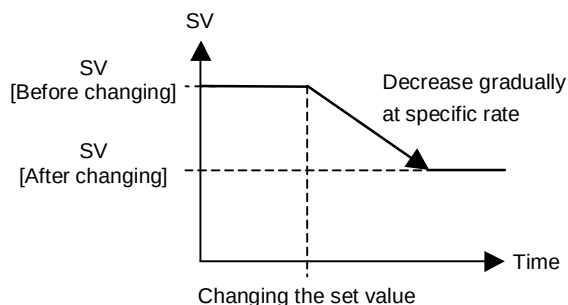
Setting the Setting change rate limiter unit time parameter and the Setting change rate limiter (up and down) will enable setting the changing rate (setting change rate limiter/unit time) of the Setting change rate limiter (up or down).

[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 Set value (SV) will also ramp up or ramp down by the function at power-on and operation mode change from STOP to RUN.



When the Set value (SV) is changed by the Memory area transfer function, the Setting change rate limiter functions from the Set value (SV) before the change (transfer) toward the set value after the change (transfer).



If the Autotuning (AT) function is activated while the Set value (SV) is ramping up or ramping down by the Setting change rate limiter, AT will start after the Set value (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.



When Setting change rate limiter is set to other than “OFF: No function (disabled)” and when the Event type is set to a SV monitor value, the Event re-hold function by the Set value (SV) change is invalid. However, the event using a local SV will have the Event re-hold function by the Set value (SV) change valid.



During the Remote mode, the Input 1_Setting change rate limiter will function to Remote setting input value.



During the Cascade control, the Input 2_Setting change rate limiter will be invalid (disabled).

■ Parameter setting

● Input 1_Setting change rate limiter (up)

[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
1.5V RU	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function Varies with the setting of the Decimal point position.	0

● Input 2_Setting change rate limiter (up)

[Parameter Setting Mode: Parameter groupNo. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2.5V RU	0 to Input 2_Input span 0: No function Varies with the setting of the Decimal point position.	0



To display “Input 2_Setting change rate limiter (up),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Input 1_Setting change rate limiter (down)

[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
1.5V Rd	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function Varies with the setting of the Decimal point position.	0

● Input 2_Setting change rate limiter (down)

[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2.5V Rd	0 to Input 2_Input span 0: No function Varies with the setting of the Decimal point position.	0



To display “Input 2_Setting change rate limiter (down),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control, or Cascade control.

● Setting change rate limiter unit time

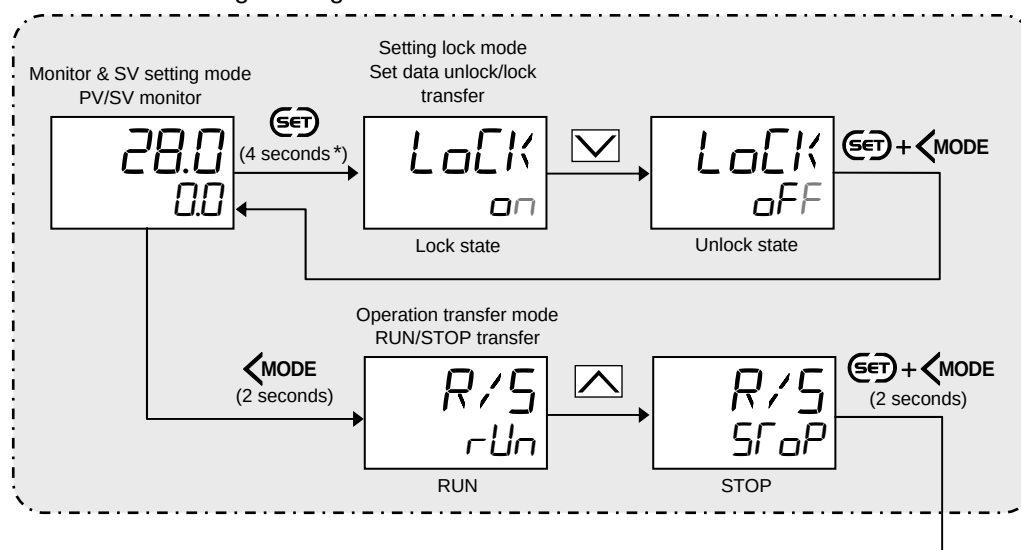
[Engineering Mode: Function block No. 70 (Fn70)]

Parameter symbol	Data range	Factory set value
SVRF	1 to 3600 seconds	60

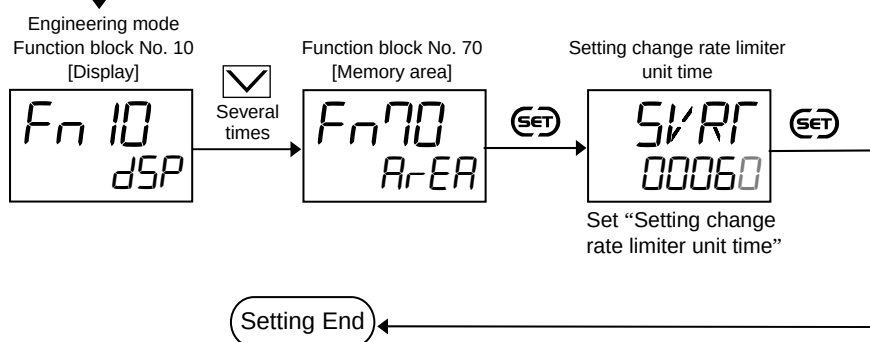
■ Setting procedure

● Set the Setting change rate limiter unit time parameter

To enter the Engineering mode

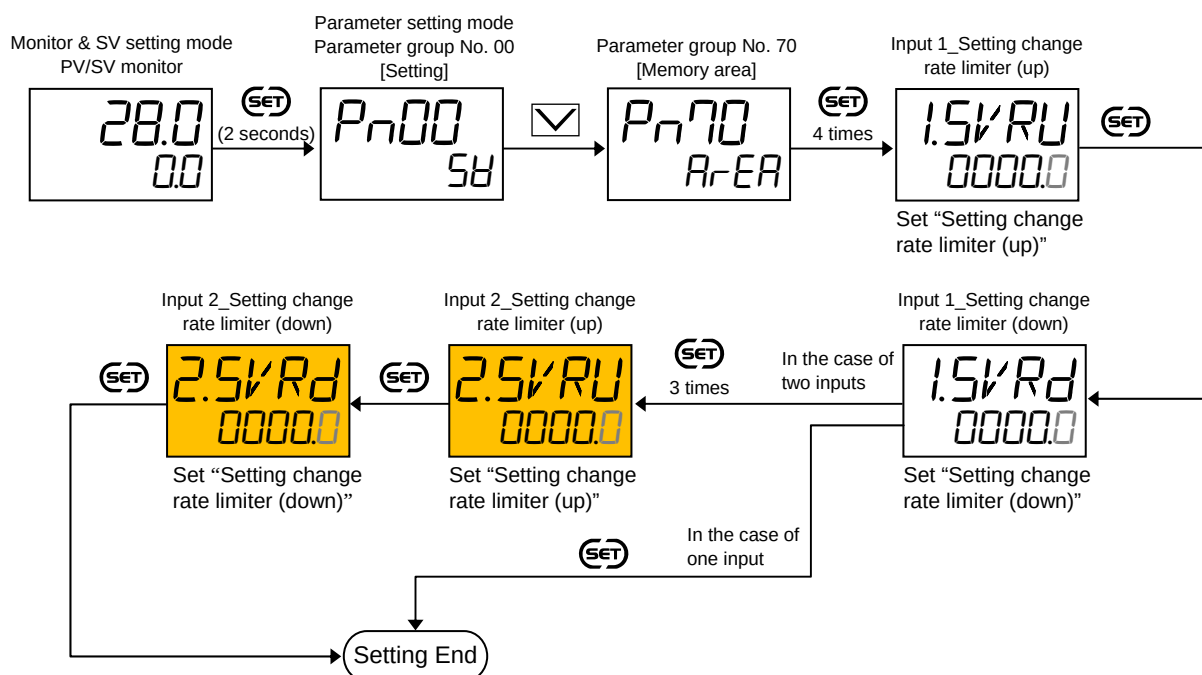


* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

● Set the Setting change rate limiter (up/down)



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)



10.3 Storing the Control Related Set Values (Memory Area Function)

This function allows PID related parameters such as a Set value (SV) to be stored as an area and up to 16 areas.

■ Description of function

The Memory area function is to store up to 16 areas of parameters such as a Set value (SV). Parameters that can be stored in an area are those inside the Parameter setting mode*.

One of the Areas is used for control, and the currently selected area is Control area.

Storing set values according to work processes in a location called “area” allows a necessary set of set values for the work process to be retrieved only by changing the area number.

* ON/OFF action differential gap (upper) and (lower) are excluded.

Parameters inside the Parameter setting mode are categorized into six groups by the setting contents. These parameters are categorized into three groups during the “Level PID” function.

● Memory area parameters of Parameter group No. 00 (P_{n00}) [Set value (SV)]

Input 1_Set value (SV)

Input 2_Set value (SV)

Set value (SV) of differential temperature input

● Memory area parameters of Parameter group No. 40 (P_{n40}) [Event]

Event 1 set value (EV1) or Event 1 set value (EV1) [high]

Event 1 set value (EV1') [low]

Event 2set value (EV2) or Event 2set value (EV2) [high]

Event 2set value (EV2') [low]

Event 3set value (EV3) or Event 3set value (EV3) [high]

Event 3set value (EV3') [low]

Event 4set value (EV4) or Event 4set value (EV4) [high]

Event 4set value (EV4') [low]

● Memory area parameters of Parameter group No. 51 (P_{n51}) [Input 1_Control]

Input 1_Proportional band [heat-side]

Input 1_Integral time [heat-side]

Input 1_Derivative time [heat-side]

Input 1_Control response parameter

Input 1_Proactive intensity

Input 1_Manual reset

Input 1_FF amount

Input 1_Output limiter high [heat-side]

Input 1_Output limiter low [heat-side]

Input 1_Control loop break alarm (LBA) time

Input 1_LBA deadband (LBD)

● Memory area parameters of Parameter group No. 52 (P_{n52}) [Input 2_Control]

Input 2_Proportional band

Input 2_Integral time

Input 2_Derivative time

Input 2_Control response parameter

Input 2_Proactive intensity

Input 2_Manual reset

Input 2_FF amount

Input 2_Output limiter high

Input 2_Output limiter low

Input 2_Control loop break alarm (LBA) time

Input 2_LBA deadband (LBD)

● Memory area parameters of Parameter group No. 56 (P_{n56}) [Input_1 Cooling control]

Input 1_Proportional band [cool-side]
 Input 1_Integral time [cool-side]
 Input 1_Derivative time [cool-side]
 Input 1_Overlap/Deadband
 Input 1_Output limiter high [cool-side]
 Input 1_Output limiter low [cool-side]

● Memory area parameters of Parameter group No. 70 (P_{n70}) [Memory area]

Select Trigger type for Memory area transfer	Input 1_Manipulated output value (Area)
Area soak time	Input 2_Setting change rate limiter (up)
Link area number	Input 2_Setting change rate limiter (down)
Input 1_Setting change rate limiter (up)	Input 2_Auto/Manual transfer selection (Area)
Input 1_Setting change rate limiter (down)	Input 2_Manipulated output value (Area)
Input 1_Auto/Manual transfer selection (Area)	Remote/Local transfer selection (Area)

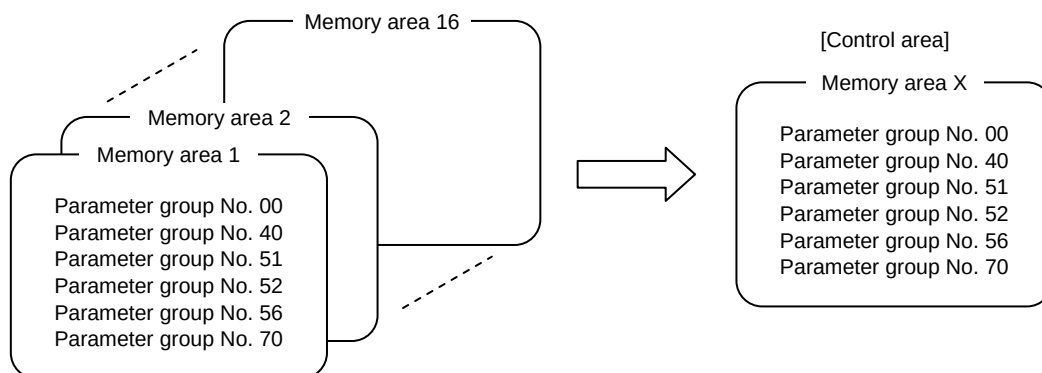
[Groups used during the Level PID]

- **Group 0:** Parameter group No. 00, No. 40 and No. 70
- **Group 1:** Parameter group No. 51, No. 56
- **Group 2:** Parameter group No. 52



For Level PID function, refer to **8.15. Controlling with Level PID (P. 8-98)**.

● Structural image of Memory area



The following four parameters are used in common in all Memory areas, and therefore are not included in the Memory area.

Parameter group No. 51: Input 1_ON/OFF action differential gap (upper)
 Input 1_ON/OFF action differential gap (lower)
 Parameter group No. 52: Input 2_ON/OFF action differential gap (upper)
 Input 2_ON/OFF action differential gap (lower)

■ Transferring the Control area

The Control area is displayed on the Memory area display during the monitor display state. (See the right picture)

Control area can be transferred by Key operations, Digital input, or communication. Memory area transfer by Memory Area Soak time is also possible.



For the communication, refer to the separate **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR03A07-E□)**.

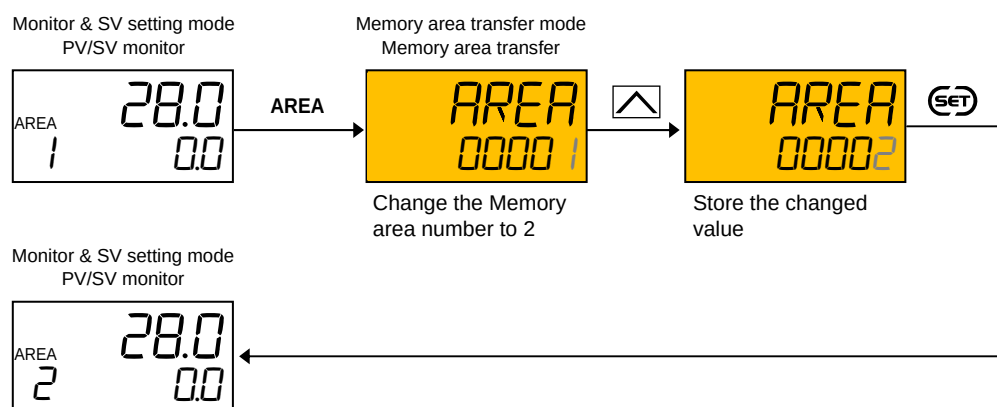
Example



● Selection by front key operation

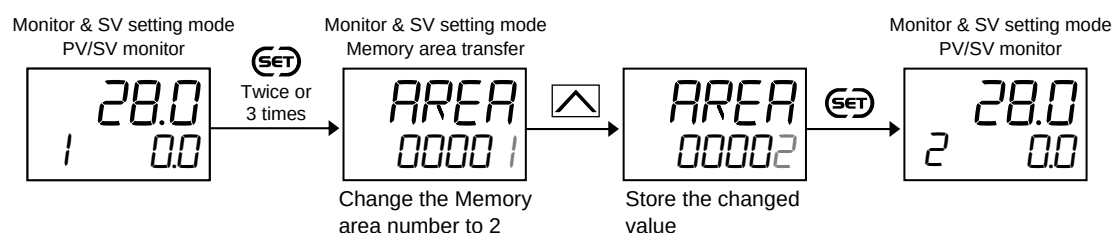
[FZ400/900]

Changing the Control area from 1 to 2



[FZ110]

Changing the Control area from 1 to 2



● Switching the Control area by Digital Input (DI)

To switch the control area by Digital input (DI), the instrument must have an option (Digital input). The memory area transfer must be set at DI1 function selection.

To change the Control area by Digital input (DI), two methods are offered; Transfer using the SET signal input and transfer without the SET signal.

- With a SET signal: After the Memory area has been selected by the DI, close the contact of the SET signal so that the Control area is transferred.
- Without a SET signal input:
After the Memory area has been selected by the DI, the Area will be automatically changed after the time period (0.5 to 5.0 seconds) set at “Area switching time (without area set signal)” in Function block No. 23 in the Engineering mode.



For details, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

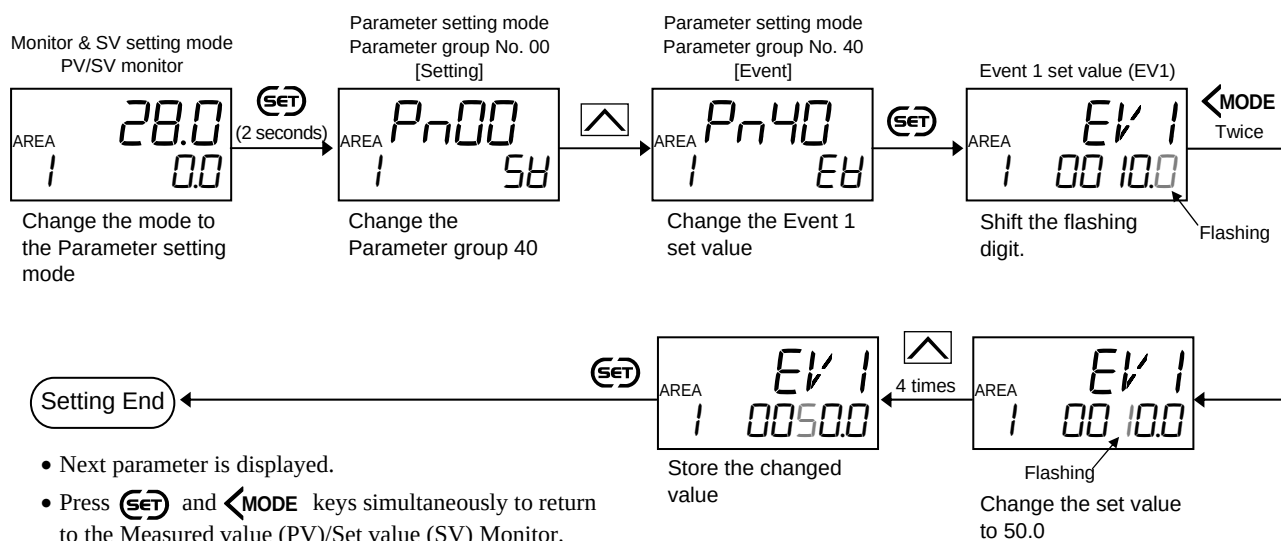
● Switching the Control area by Area soak time

Changing the Memory area by the Memory area soak time will need setting the Memory area No. to which the Memory area is switched.

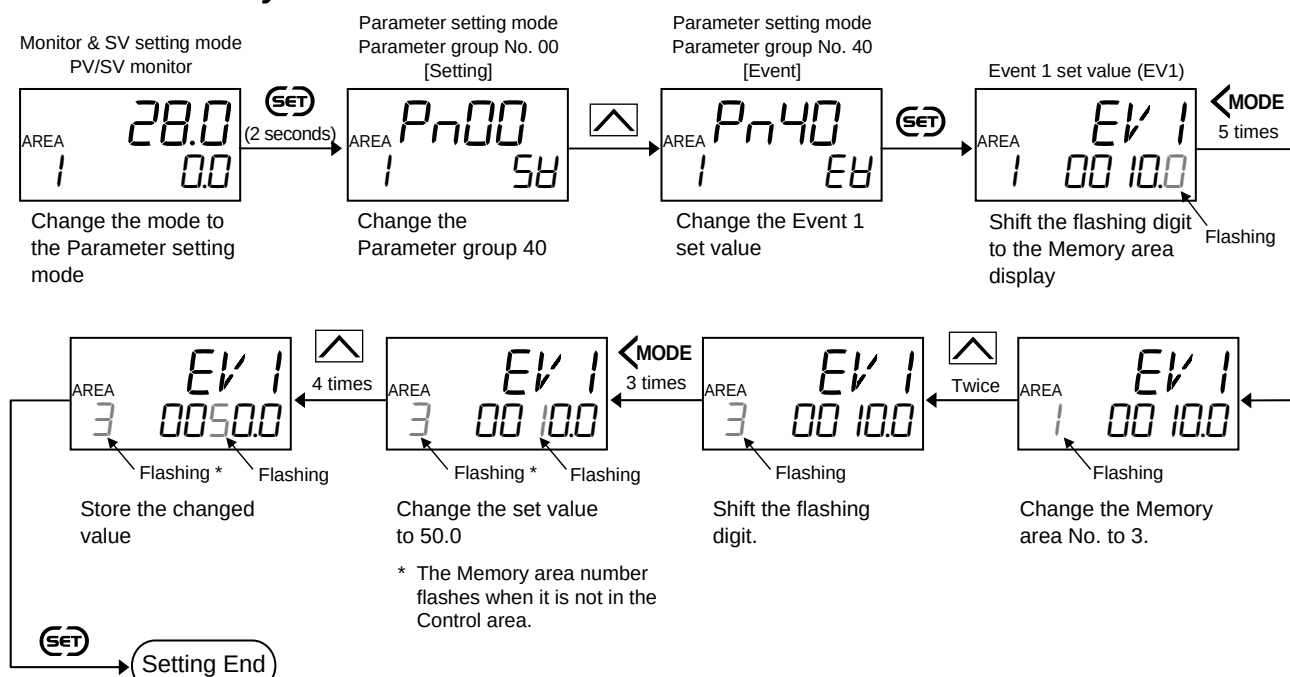
Refer to **10.5 Running a Simple Ramp/Soak Operation (P. 10-18)** or **10.6 Using a Simple Sequence Operation (P. 10-26)** for details.

■ Changing the data in the Memory area

● Change the Event 1 set value in the Control area (Memory area 1) from 10.0 to 50.0



● Change the Event 1 set value from 10.0 to 50.0 in Memory area 3 when the Control area is Memory area 1.



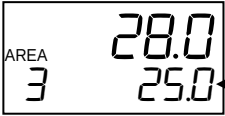
■ Memory area display

During the PV/SV monitor display, the Set value (SV) displayed on the SV display is the Set value (SV) in the Memory area No. now displayed on the Memory area display.

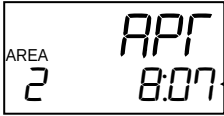
During the Monitor & SV setting mode display, the time displayed on the Memory area soak time is the time of the Memory area No. now displayed on the Memory area display.

[Example]

Monitor & SV setting mode
PV/SV monitor



Monitor & SV setting mode
Memory area soak time monitor



■ Parameter setting

● Memory area transfer

[Monitor & SV Setting Mode] (FZ110)

[Memory Area Transfer Mode] (FZ400/900)

Parameter symbol	Data range	Factory set value
AREA	1 to 16	1



For FZ400/900, when the “Area lock” setting is “Memory area is not adjustable when the setting data is locked”, this parameter will not be displayed.

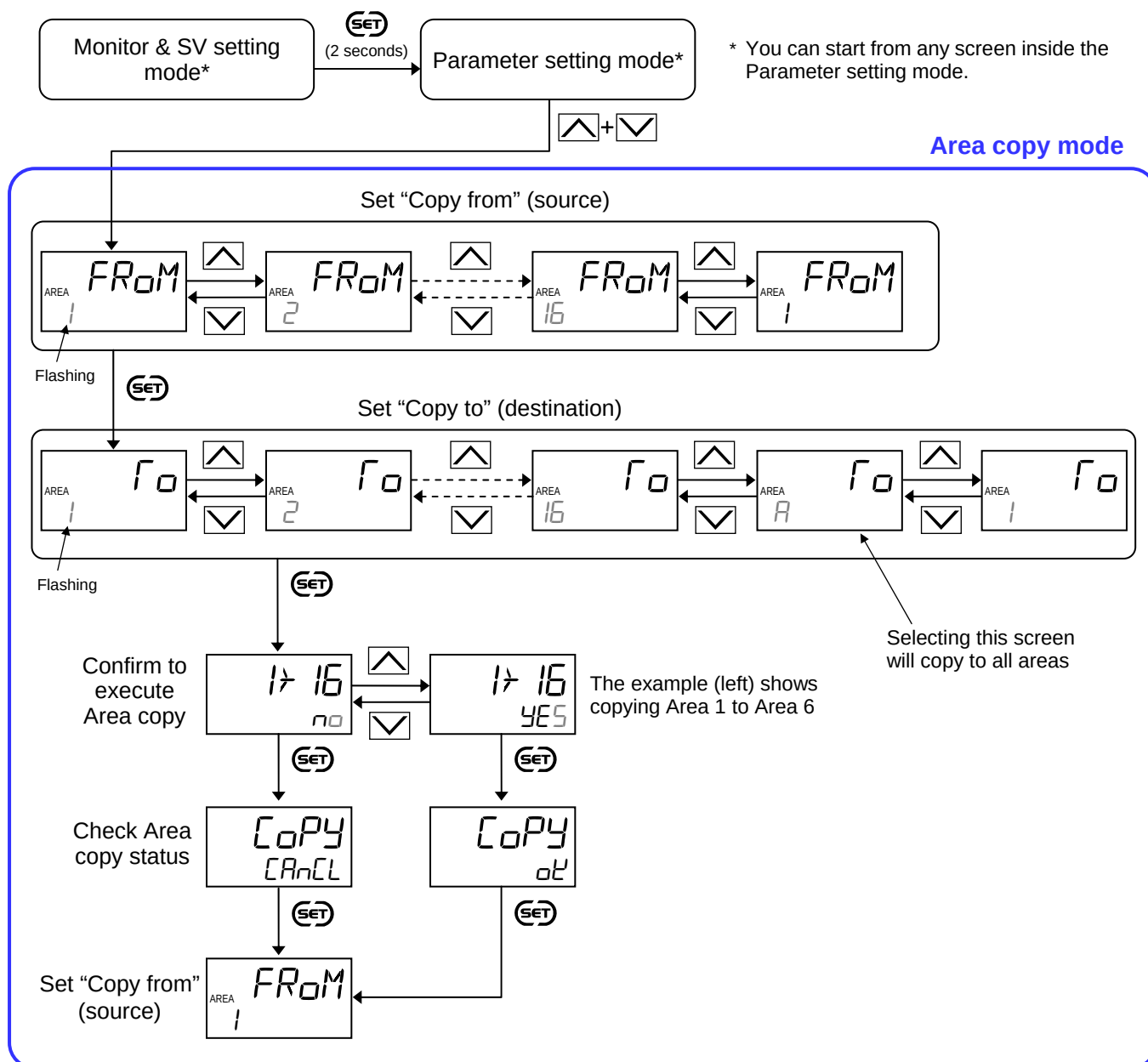


Refer to “4. PARAMETERS THAT ARE INITIALIZED/MODIFIED WHEN SETTING IS CHANGED (P. 4-1)” for the parameters that are automatically converted when the Memory area is changed.

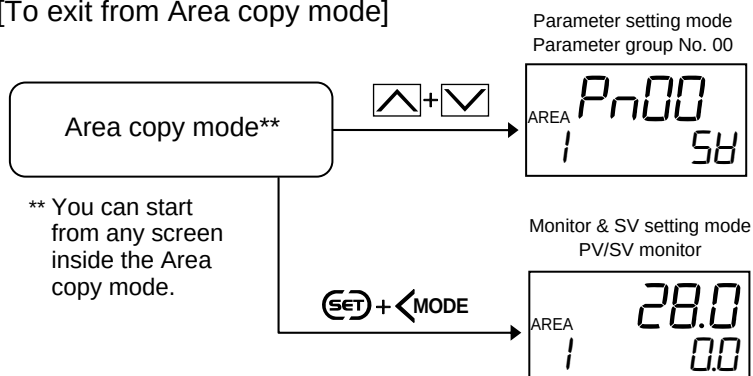
10.4 Copying the Data in Memory Area to Set Other Areas

Up to 16 Memory areas can be set, but it consumes time if Memory areas are set one after another. On this instrument, the data in the Memory area can be copied.

■ Screens for Area copy mode

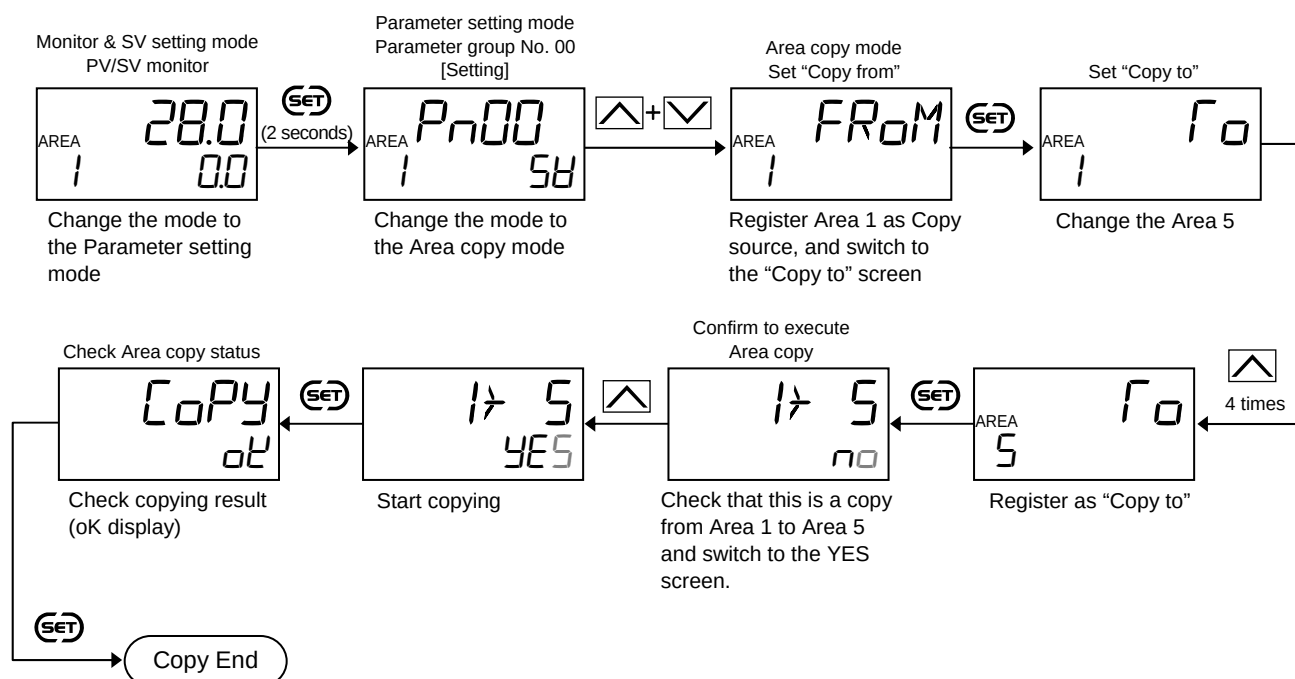


[To exit from Area copy mode]



[Example Area copy]

Copy the data in Memory Area 1 to Memory area 5



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

10.5 Running a Simple Ramp/Soak Control

On this instrument multiple Memory areas can be linked to run a simple ramp/soak control.

■ Description of function

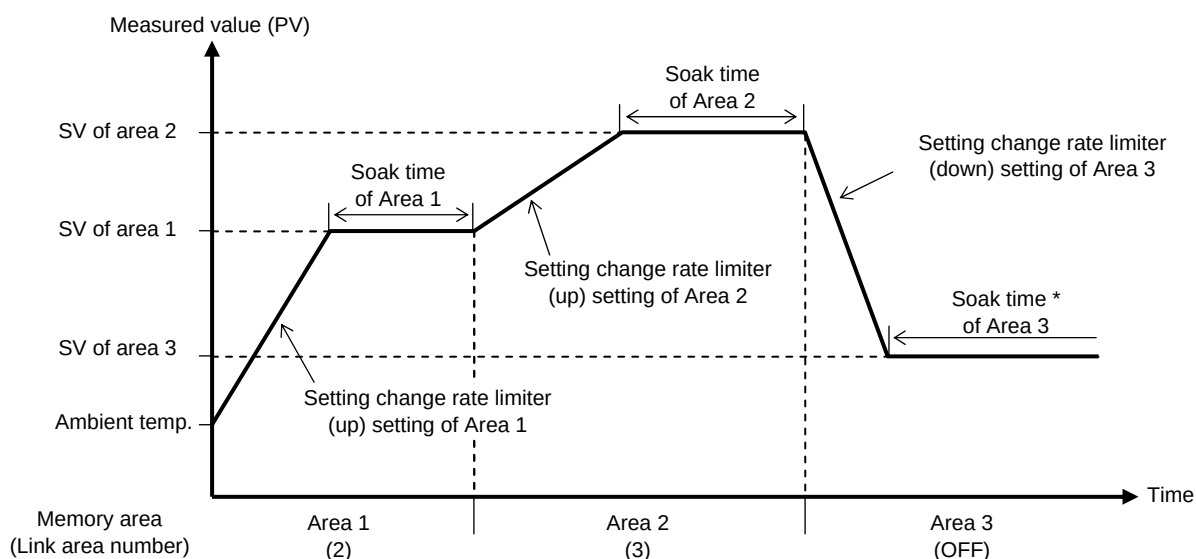
Simple Ramp/Soak control is possible by setting a Set value (SV), Setting change rate limiter (up/down), Area soak time, and Link area number in each memory area.

- Set value (SV): Sets the fixed set point control (control by fixed set value) desired value of each memory area.
- Setting change rate limiter: Sets the slope of the Set value (SV) which is raised or lowered at each unit time.
- Area soak time: Sets the fixed set point control time of each memory area.
- Link area number: Sets the memory area numbers for linking the corresponding memory areas.



Besides the above, the Setting change rate limiter unit time and Area soak time unit are set in the Engineering mode.

Example: Ramp/Soak control by linking Memory area 1 to 3



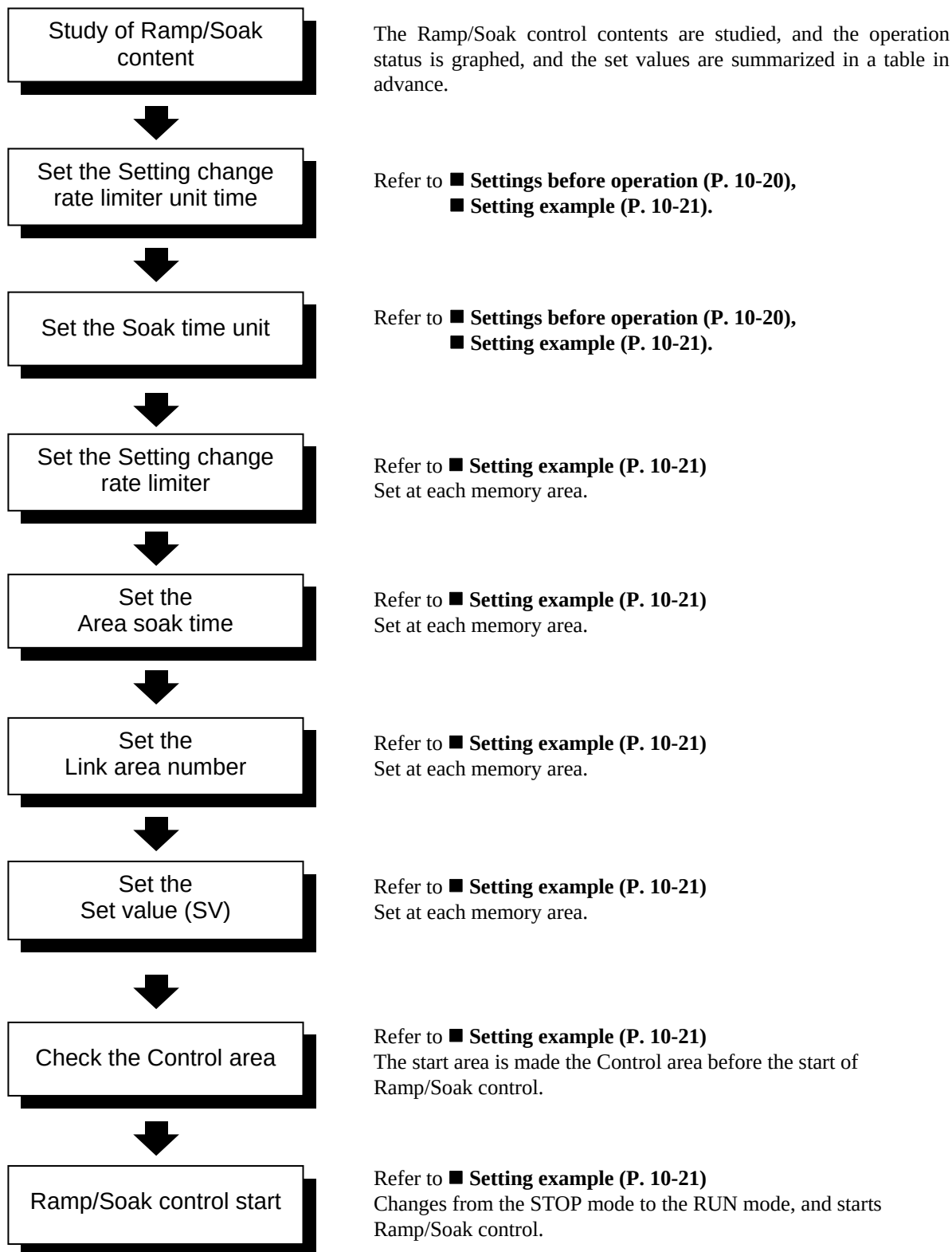
* As the area soak time for memory area linked last becomes invalid, the state of SV3 reached continues.



To check the elapsed time in each area, refer to the “Memory area soak time monitor” in the Monitor & SV setting mode.

For FZ400/900, Memory area soak time can be displayed on the MV display. Refer to **9.6 Changing the Display Contents of the MV Display [FZ400/900] (P. 9-24)**.

■ Operation flowchart

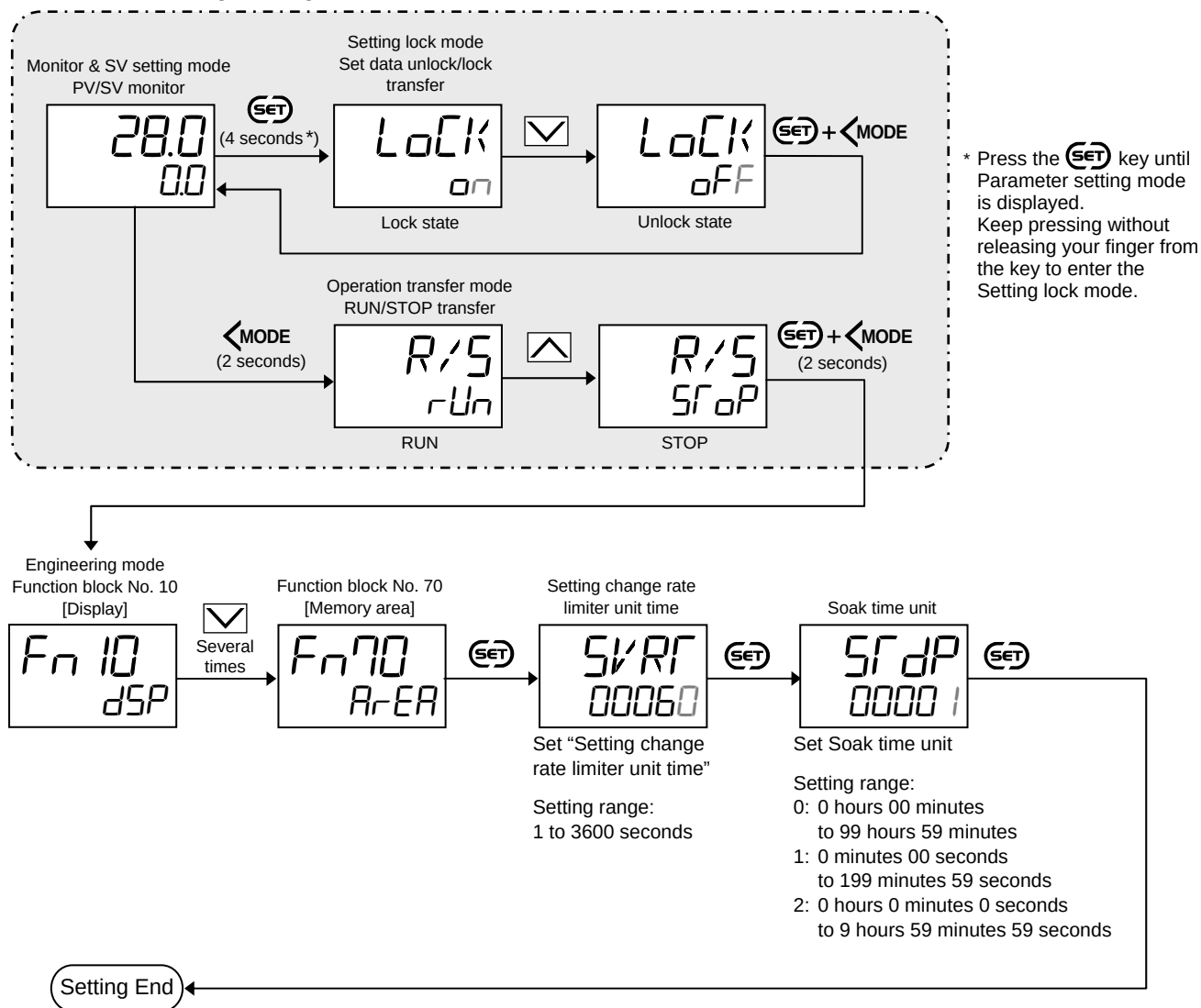


■ Settings before operation

When implementing Ramp/Soak control, it may be necessary to set the following items in advance.

- Setting change rate limiter unit time [Engineering mode: Function block No. 70 (Fn70)]
- Soak time unit [Engineering mode: Function block No. 70 (Fn70)]

To enter the Engineering mode

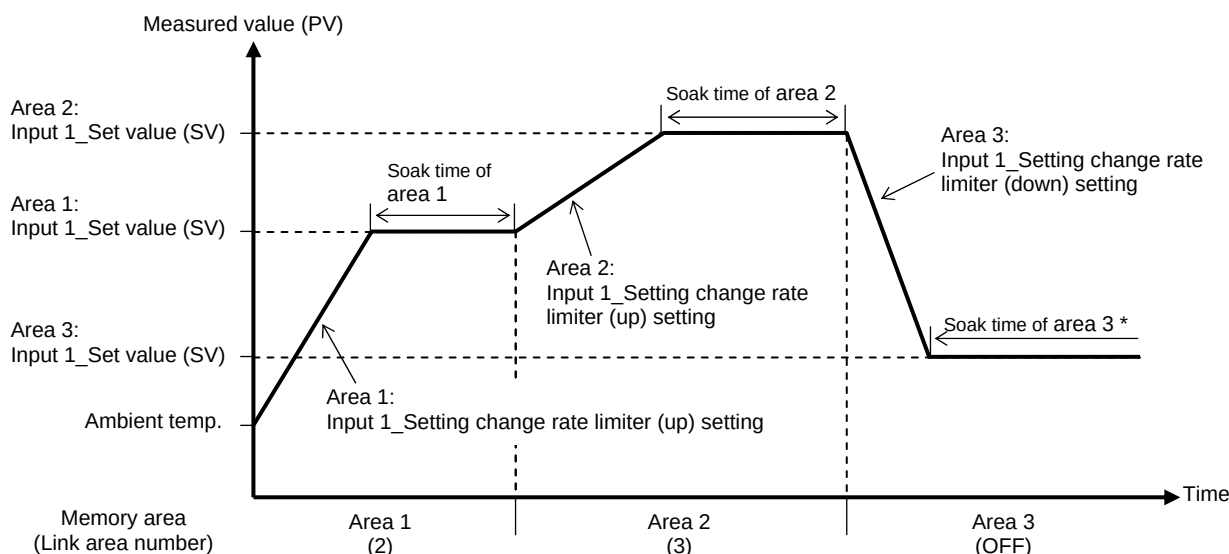


- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

Setting example

This section uses the following sample of Ramp/Soak control to describe the setting procedures.

[Example: Ramp/Soak control by linking Memory area 1 to 3]



	Area 1	Area 2	Area 3
Input 1_Set value (SV)	150.0 °C	200.0 °C	50.0 °C
Input 1_Setting change rate limiter (up)	4.0 °C/min. (60 sec.)	2.0 °C/ min. (60 sec.)	OFF
Input 1_Setting change rate limiter (down)	OFF	OFF	9.0 °C/min. (60 sec.)
Area soak time	30 minutes	40 minutes	0 minutes *
Link area number	2	3	OFF

* In this example, the Area soak time for memory area 3 is set. However, as the Area soak time for the memory area linked last becomes invalid, the state of SV3 reached continues.

Step 1:
Study the Ramp/Soak control content.

The Ramp/Soak control contents are studied and Ramp/Soak status is graphed and the set values of each memory area are summarized in a table as shown above.

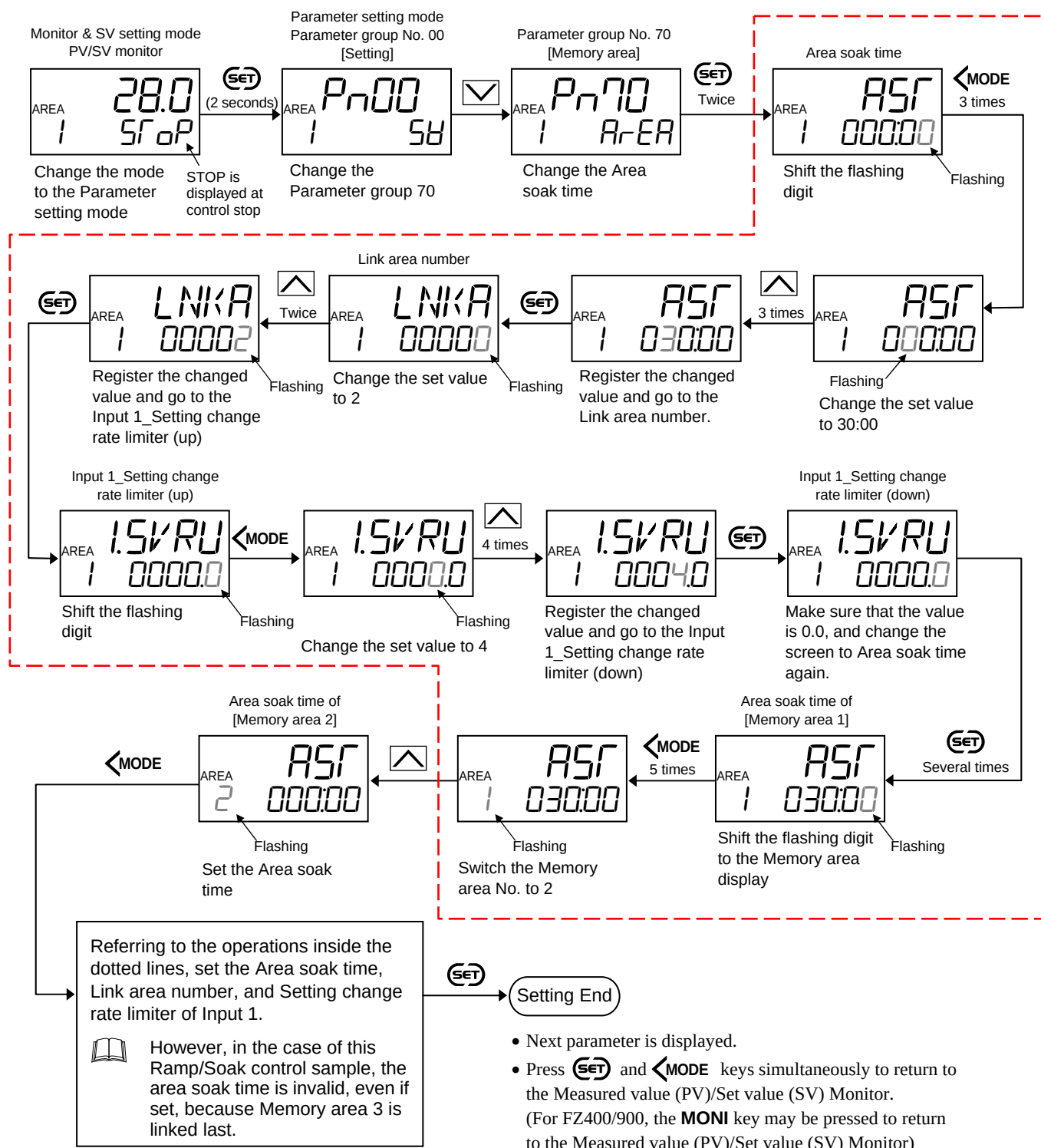
Step 2:
Set the Setting change rate limiter unit time and Soak time unit.

Refer to ■ **Settings before operation (P. 10-20)** and set the Setting change rate limiter unit time and Area soak time (In this example, the factory set values are used for both). Since control stops (STOP) at this time, go directly to the next step.

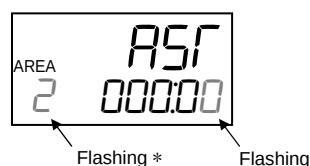
- Setting change rate limiter unit time: 60 seconds [factory set value]
- Soak time unit: 1 (0 minutes 00 seconds to 199 minutes 59 seconds)
[factory set value]

Step 3:

Set the Setting change rate limiter, Area soak time and Link area number to each of Memory area 1, 2 and 3.

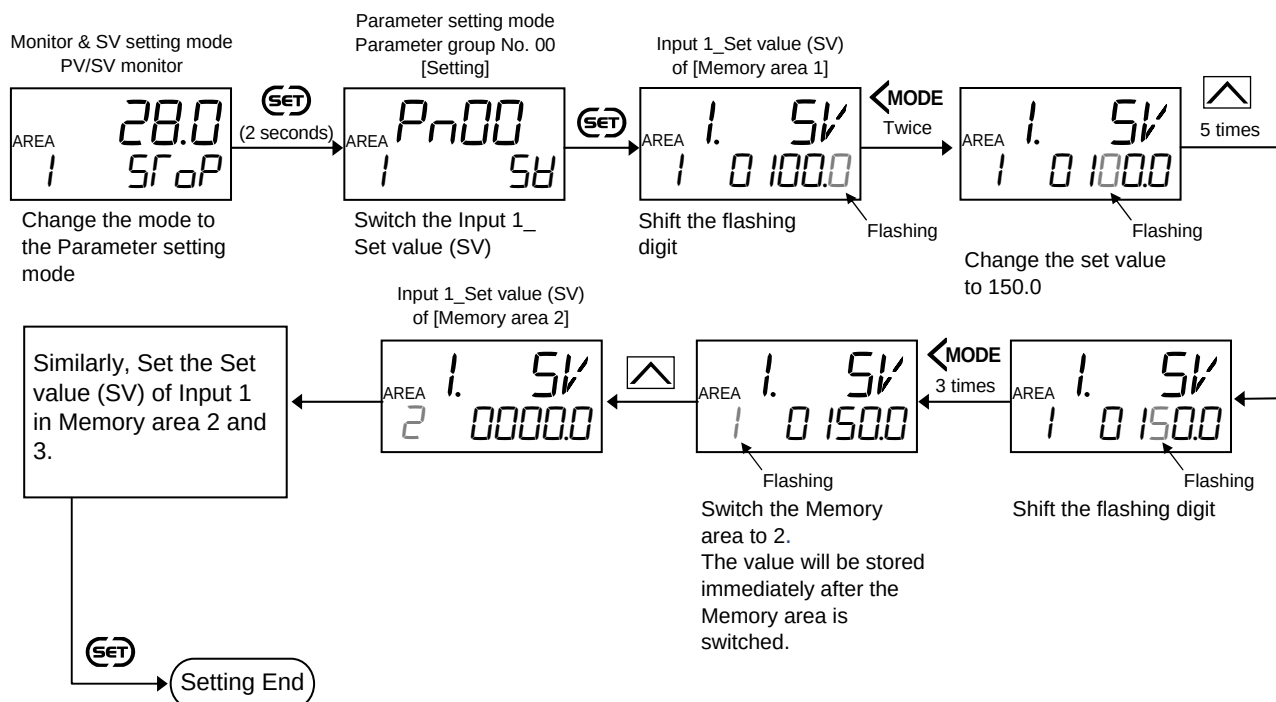


The Memory area number flashes when a Memory area other than that in the Control area is displayed.



(* Area other than Control area is displayed)

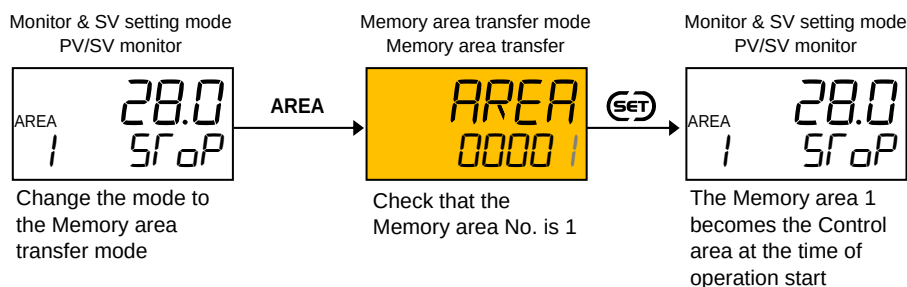
Step 4:
Set the SV to each of Memory area 1, 2 and 3.



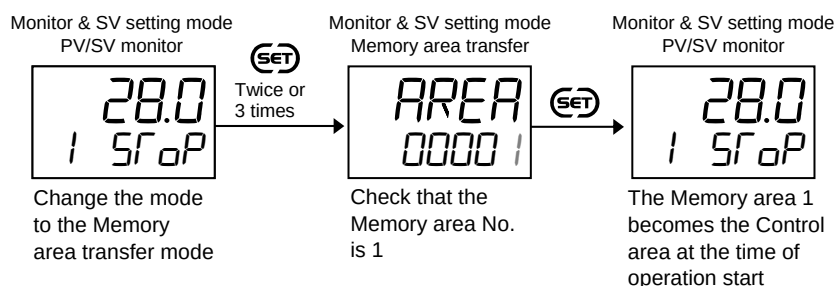
- Next parameter is displayed.
- Press **SET** and **◀MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

Step 5:
Check the control area number.

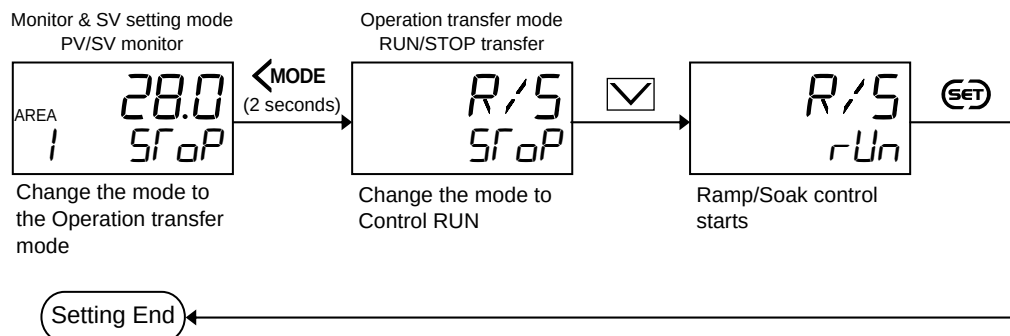
- **FZ400/900**



- **FZ110**



Step 6:
Change from STOP mode to RUN mode



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

Parameter setting

- For Setting change rate limiter (up/down) and Setting change rate limiter unit time, refer to **10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter) (P. 10-6)**.

Area soak time

[Parameter Setting Mode: Parameter group No. 70 (P_{n70})]

Parameter symbol	Data range	Factory set value
ASr	0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds * Settable only for FZ400/900 when the Input data type is 0. Data range of Area soak time can be selected on the Soak time unit.	0:00 (0 minutes 00 seconds)

- For Input data type, refer to **5.1 Changing Input (P. 5-2)**.

Link area number

[Parameter Setting Mode: Parameter group No. 70 (P_{n70})]

Parameter symbol	Data range	Factory set value
$LNKA$	0 to 16 0: No link	0

Soak time unit

[Engineering Mode: Function block No. 70 (F_{n70})]

Parameter symbol	Data range	Factory set value
$srDP$	0: 0 hours 00 minutes to 99 hours 59 minutes 1: 0 minutes 00 seconds to 199 minutes 59 seconds 2: 0 hours 00 minutes 00 seconds In case of Input data type 0: 0 to 2 In case of Input data type 1: 0 to 1	1

- For Input data type, refer to **5.1 Changing Input (P. 5-2)**.

10.6 Using a Simple Sequence Operation

On this instrument, multiple Memory areas can be linked to run a simple sequence operation in each Memory area.

■ Description of function

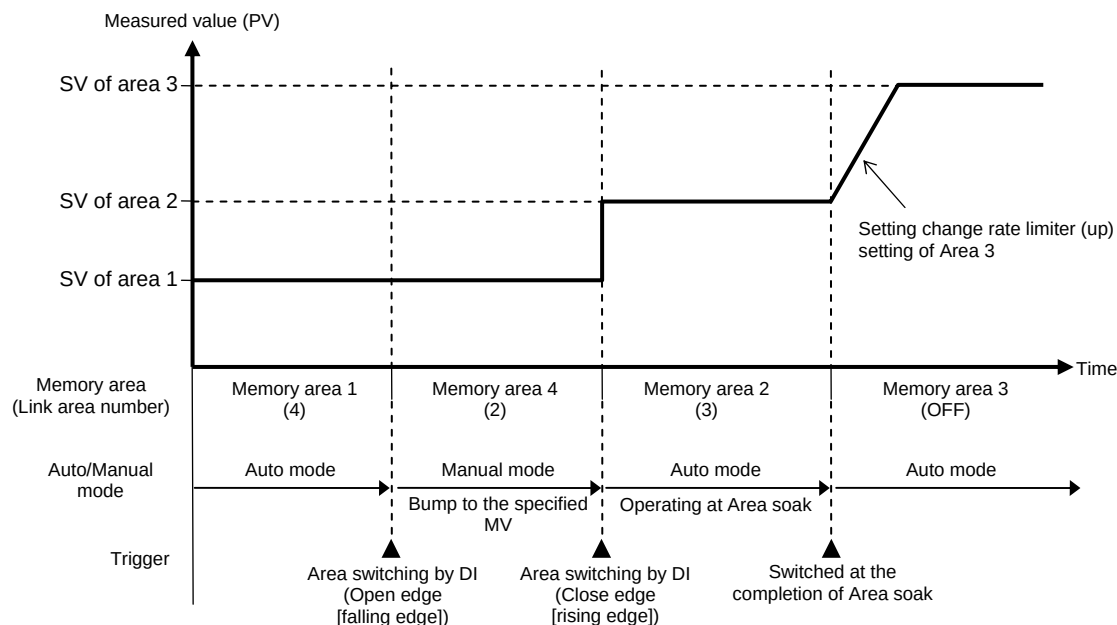
Simple sequence operation is possible by setting a Set value (SV), Setting change rate limiter (up/down), Select Trigger type for Memory area transfer, Area soak time, Link area number, Auto/Manual transfer selection (Area), Manipulated output value (Area), and Remote/Local transfer selection (Area) in each memory area.

- Set value (SV): Sets the fixed set point control (control by fixed set value) desired value of each memory area.
- Setting change rate limiter: Sets the slope of the Set value (SV) which is raised or lowered at each unit time.
- Select Trigger type for Memory area transfer: Select a trigger type to switch the Memory area.
- Area soak time: Sets the fixed set point control time of each memory area.
- Link area number: Sets the memory area numbers for linking the corresponding memory areas. Memory area will be switched by generated events or contact status of Digital input (DI). To use the generated events as a switching method, setting up the event function is required. To use the Digital input (DI) as a switching method, “Area jump” must be preset in the DI function selection.
 -  For the Event function, refer to **7.2 Using Heater Break Alarm (HBA) (P. 7-24)**. For the DI function selection, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.
- Auto/Manual transfer selection (Area): Select the operation mode (Auto mode or Manual mode) at the time of switching the memory area. A selection of “Bump” or “Bumpless” is available both in Auto and Manual modes.
 -  When the SV tracking function is selected at the time of switching from Manual to Auto mode, the Set value (SV) of the Memory area will be ignored.
 -  For more details of Bumpless action at the time of switching between Auto/Manual, refer to **6.8 Suppressing Sudden Change in Output (Balanceless Bumpless) (P. 6-33)**.
 -  For the SV tracking function, refer to **8.17 Continuing Stable Control after the Operation Transfer (SV Tracking) (P. 8-110)**.
- Manipulated output value (Area): When either “Auto mode (bump)” or “Manual mode (bump)” is selected in the Auto/Manual transfer selection (Area), the Manipulated output value just after the switching is complete needs to be set here.
- Remote/Local transfer selection (Area): Select the Operation mode at the time of Memory area switching. The operation mode depends on the action selected in Select function for input 2.
 - Remote setting input: Remote mode/Local mode switching
 - Cascade control: Cascade control/Single control switching
 - Control with PV select: Input 1/Input 2 switching
 - 2-loop control/Differential temperature control:
 - 2-loop control/Differential temperature control switching
 -  When the SV tracking function is selected at the time of the operation mode transfer, the operation mode follows the action set in the SV tracking.
 -  For the SV tracking function, refer to **8.17 Continuing Stable Control after the Operation Transfer (SV Tracking) (P. 8-110)**.



Besides the above, the Setting change rate limiter unit time and Area soak time unit are set in the Engineering mode

Example: Operating a simple sequence using Memory areas 1 through 4



● Description of operation

1. Memory area 1: Operation mode: Auto mode
Control target: Set value (SV) of Memory area 1
Area soak time: 0:00 (No function)
Link area number: 4
Memory area switching trigger: Open edge (falling edge) of Digital input (DI1)
2. Memory area 4: Operation mode: Switched from Auto mode to Manual mode
Control output: Bumps to the value specified by the Manipulated output value (Area)
Area soak time: 0:00 (No function)
Link area number: 2
Memory area switching trigger: Close edge (rising edge) of Digital input (DI1)
3. Memory area 2: Operation mode: Switched from Manual mode to Auto mode
Control target: Set value (SV) of Memory area 2
Area soak time: 10 minutes
Link area number: 3
Memory area switching trigger: 0 (No assignment)
Area is switched after the completion of the Area soak.
4. Memory area 3: Operation mode: Auto mode continues
Control target: After changing the Set value (SV) by the Setting change rate limiter, control is done using the Set value (SV) in Memory area 3.
Area soak time: In this example, the Area soak time for memory area 3 is set. However, as the Area soak time for the memory area linked last becomes invalid, the state of SV3 reached continues.
Link area number: 0 (No function)
Memory area switching trigger: 0 (No assignment)



When both of Area soak time and Select trigger type for memory area transfer are valid, the switching takes place based on the OR-logic.

■ Parameter setting

- For Setting change rate limiter (up/down) and Setting change rate limiter unit time, refer to **10.2 Eliminating a Sudden Set Value Change (Setting Change Rate Limiter) (P. 10-6)**.

● Select Trigger type for Memory area transfer

[Parameter Setting Mode: Parameter group No. 70 (P_{n70})]

Parameter symbol	Data range	Factory set value
TRCA	0 to 63 0: No assignment +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Digital input 1 (DI1) Close edge +32: Digital input 1 (DI1) Open edge To select two or more functions, sum each value.	0

- To use the generated events as a switching method, setting up the event function is required. To use the Digital input (DI) as a switching method, “Area jump” must be preset in the DI function selection. For the Event function, refer to **7.2 Using Heater Break Alarm (HBA) (P. 7-24)**. For the DI function selection, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.

● Area soak time

[Parameter Setting Mode: Parameter group No. 70 (P_{n70})]

Parameter symbol	Data range	Factory set value
AST	0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds * Settable only for FZ400/900 when the Input data type is 0. Data range of Area soak time can be selected on the Soak time unit.	0:00 (0 minutes 00 seconds)

- For Input data type, refer to **5.1 Changing Input (P. 5-2)**.

● Link area number

[Parameter Setting Mode: Parameter group No. 70 (P_{n70})]

Parameter symbol	Data range	Factory set value
LNKA	0 to 16 0: No link	0

● Input 1_Auto/Manual transfer selection (Area)

[Parameter Setting Mode: Parameter group No. 70 (P_{n70})]

Parameter symbol	Data range	Factory set value
IA/MA	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0

● Input 1_Manipulated output value (Area)

[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
1.MV.A	PID control, Position proportioning PID control: –5.0 to +105.0 % Heat/Cool PID control: –105.0 to +105.0 %	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0

● Input 2_Auto/Manual transfer selection (Area)

[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2.A/M.A	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0



To display “Input 2_Auto/Manual transfer selection (Area),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Input 2_Manipulated output value (Area)

[Parameter Setting Mode: Parameter group No. 70 (Pn70)]

Parameter symbol	Data range	Factory set value
2.MV.A	–5.0 to +105.0 %	–5.0



To display “Input 2_Manipulated output value (Area),” specify “Measured input 2” at the time of order, AND “Select function for input 2” (Function block No. 58 in Engineering mode) must be set to 2-loop control/Differential temperature control.

● Remote/Local transfer selection (Area)

[Parameter Setting Mode: Parameter group No. 70 (P_n70)]

Parameter symbol	Data range	Factory set value
R/LA	- When “Remote setting input” is selected at Select function for input 2 ¹ 0: No transfer 1: Local mode 2: Remote mode - When “Cascade control” is selected at Select function for input 2 ² 0: No transfer 1: Single control 2: Cascade control - When “Control with PV select” is selected at Select function for input 2 ³ 0: No transfer 1: Input 1 2: Input 2 - When “2-loop control/Differential temperature control” is selected at Select function for input 2 ⁴ 0: No transfer 1: 2-loop control 2: Differential temperature control	0

¹ For FZ400/900, this parameter is displayed when “Remote setting input” is selected in “Select function for input 2.”

For FZ110, this parameter is displayed when Remote setting input is supplied.

² Displayed when “Cascade control” is selected in “Select function for input 2.”

³ Displayed when “Control with PV select” is selected in “Select function for input 2.”

⁴ Displayed when “2-loop control/Differential temperature control” is selected in “Select function for input 2.”



To display “Remote/Local transfer selection (Area)”

- Proceed as follows for FZ400/900; Specify two inputs at the time of order, set Remote setting input, Cascade control, Control with PV select, or 2-loop control/Differential temperature control at “Select function for input 2” in Function block No. 58 in the Engineering mode.
- Proceed as follows for FZ110: Specify Remote setting input.

● Soak time unit

[Engineering Mode: Function block No. 70 (F_n70)]

Parameter symbol	Data range	Factory set value
STDP	0: 0 hours 00 minutes to 99 hours 59 minutes 1: 0 minutes 00 seconds to 199 minutes 59 seconds 2: 0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds In case of Input data type 0: 0 to 2 In case of Input data type 1: 0 or 1	1

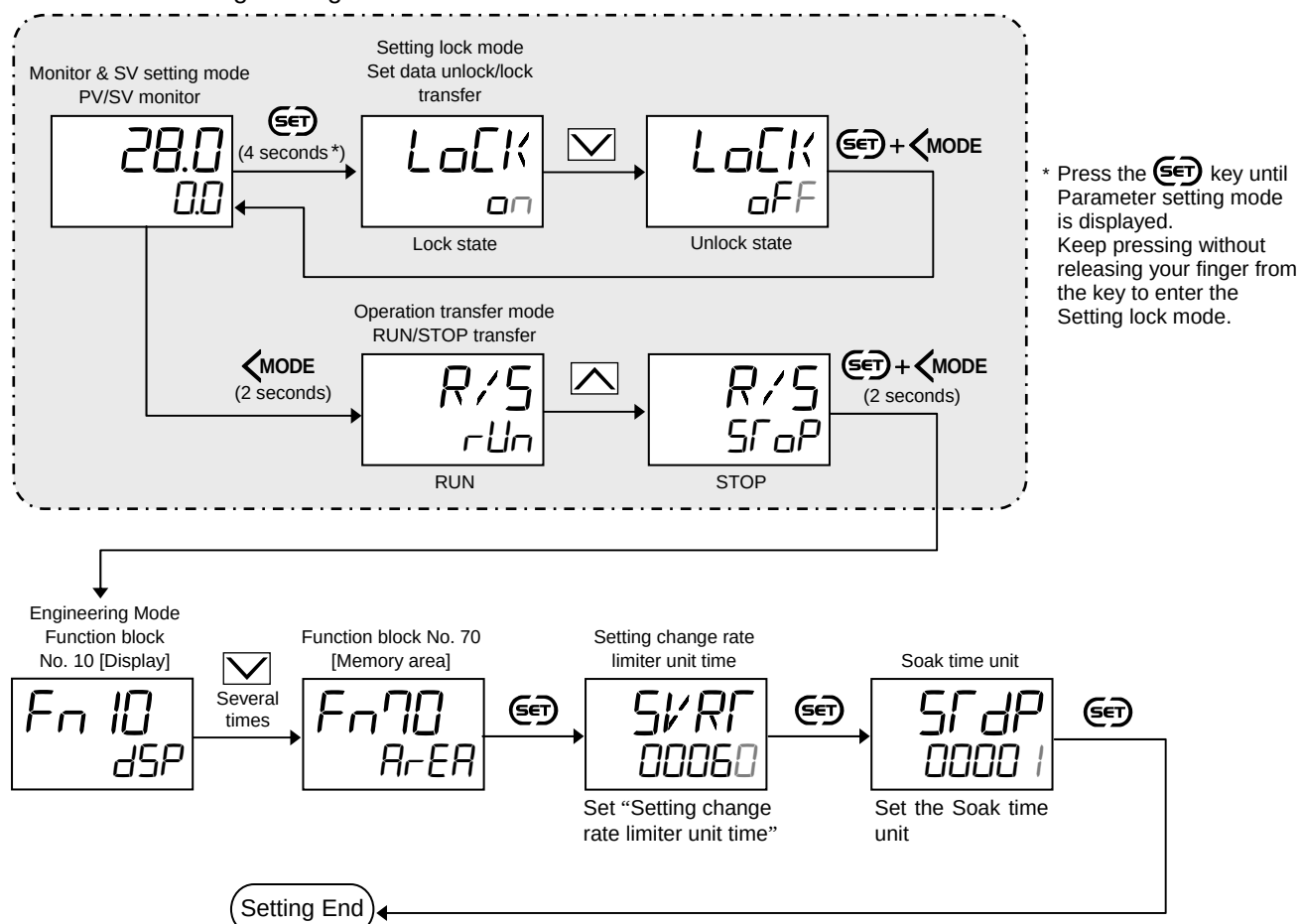


For Input data type, refer to 5.1 Changing Input (P. 5-2).

Setting procedure

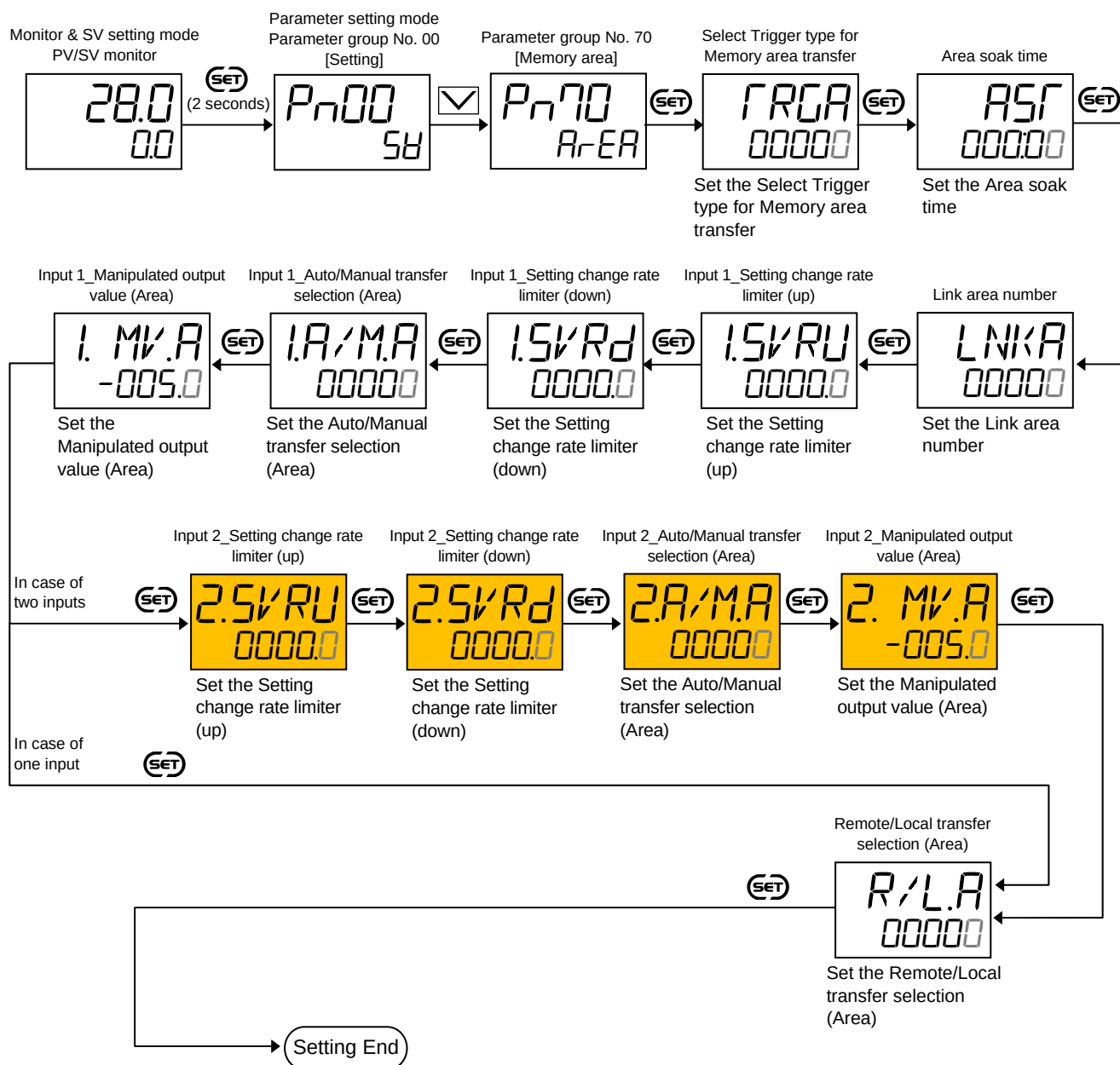
Set the Setting change rate limiter unit time parameter and Soak time unit

To enter the Engineering mode



- Next parameter is displayed.
- Press **(SET)** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

● Set the simple sequence related set items



- Next parameter is displayed.
- Press (SET) and <MODE> keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the MONI key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

10.7 Registering a Set Value (SV) Without Pressing the SET Key

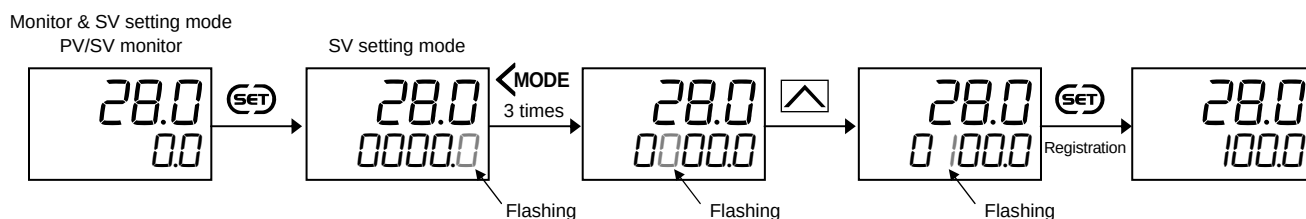
Basically the **SET** key must be pressed to register the data after changing the value of parameters.

There is another way of registering the Set value (SV) which takes in the changed data 2 seconds after the change.

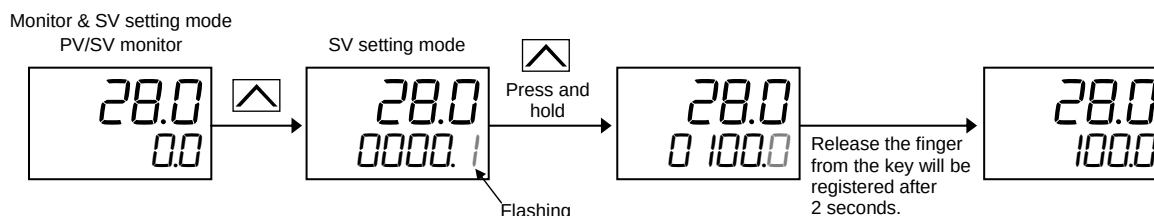
■ Description of function

[Example: Changing the Set value (SV) to 100.0]

- To register the value by pressing the SET key (SET key method)



- To register the value without pressing the SET key (Direct method)



- To set the Set value (SV) in the PV/SV monitor, press the or key.
- Keep pressing the or key to accelerate the speed of increase/decrease.
- In the above explanation, the value is changed by using the or key, but **MODE** key may be used to shift the blinking digit to change the value digit by digit.



To use a registration method without pressing the **SET** key, go to “Data registration” in Function Block No. 11 in the Engineering mode.



Registration without pressing the **SET** key is only applicable to the Set value (SV). Other parameters are not available in this method. Available mode is Monitor & SV setting mode only.

Parameter setting

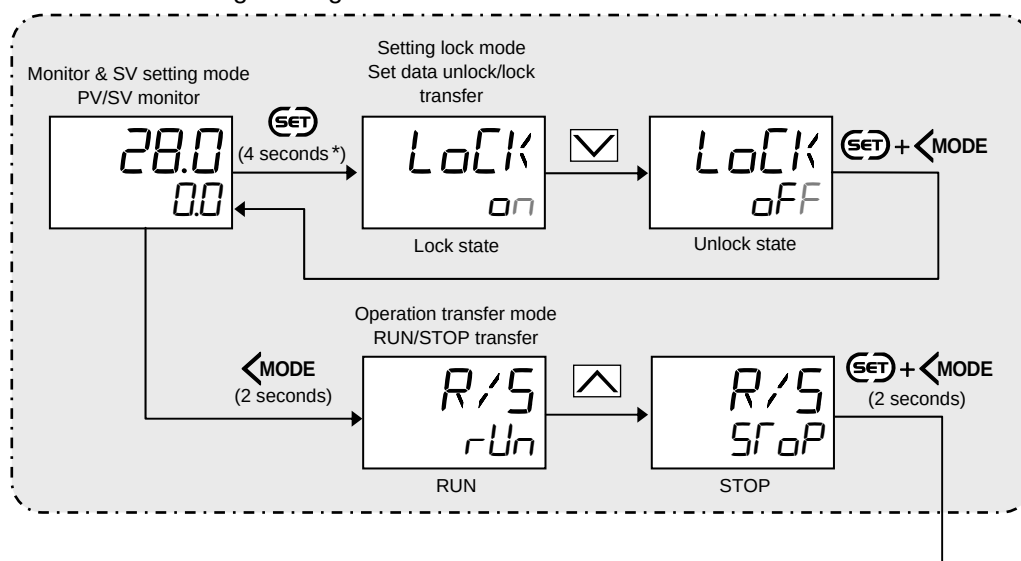
Data registration

[Engineering Mode: Function blockNo. 11 (Fn 11)]

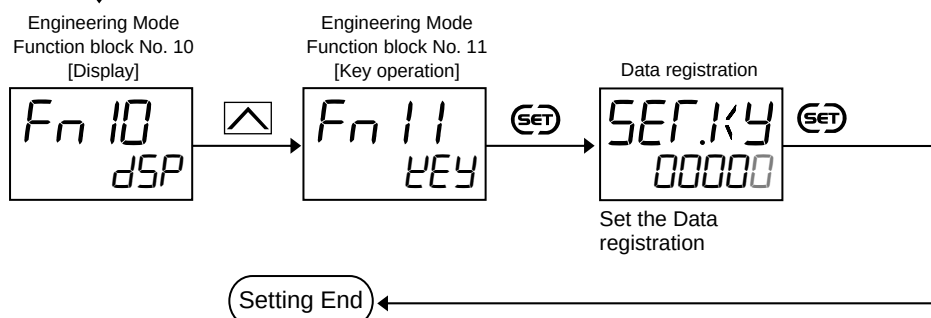
Parameter symbol	Data range	Factory set value
SEr.KY	0: SET key method Used to register the Set value (SV) using the SET key. 1: Direct registration Used to register the Set value (SV) without pressing the SET key.	0

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

10.8 Accessing Some Functions Directly (FUNC Key) [FZ400/900]

FZ400/900 has a FUNC key which allows a specified function to be assigned to it.

■ Description of function

Functions assignable to the FUNC key

- RUN/STOP transfer···A
- Autotuning (AT) (Common to Input 1 and 2)···B
- Input 1_Autotuning (AT)···B
- Input 2_Autotuning (AT)···B
- Auto/Manual transfer (Common to Input 1 and 2) ···A
- Input 1_Auto/Manual transfer···A
- Input 2_Auto/Manual transfer···A
- Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) ···A
- Control area Local/External transfer···A
- Interlock release···C
- Hold reset (Common to Input 1 and 2)···C
- Input 1_Hold reset···C
- Input 2_Hold reset···C
- Set data unlock/lock transfer···A
- Area jump···D

Explanation of key action

A: Mode is changed for every press of the key.

B: Function is turned on and off for every press of the key.

C: Function is released or reset by pressing the key.

D: Pressing the key switches the memory area to the preset area set in the Link area number in the Parameter setting mode. When the Link area number is not specified, a memory area with the number of the current control area number +1 will be used.



For details of each function, refer to **5.2 Switching Functions Using Digital Inputs (DI) (P. 5-16)**.



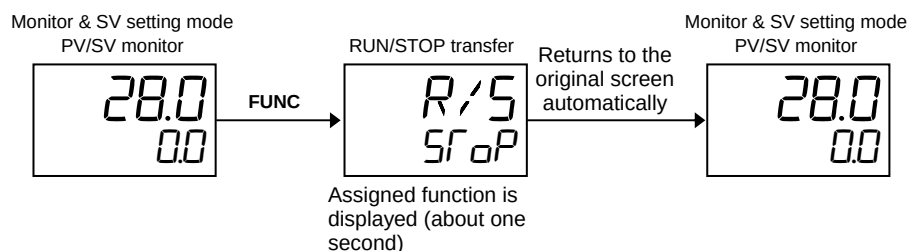
Selection of key action is possible from “Press once” and “Press and hold” to enable the switching.



The function assigned to the FUNC key is accessible even when the Set data lock is used.

● Displays when switched by the FUNC key

[Example] RUN/STOP switching is assigned to the FUNC key





■ Parameter setting

● FUNC key assignment

[Engineering Mode: Function block No. 11 (F_n / I)]

Parameter symbol	Data range	Factory set value
FNKEY	0: Unused 1: RUN/STOP transfer 2: Autotuning (AT) (Common to Input 1 and 2) 3: Input 1_Autotuning (AT) 4: Input 2_Autotuning (AT) 5: Auto/Manual transfer (Common to Input 1 and 2) 6: Input 1_Auto/Manual transfer 7: Input 2_Auto/Manual transfer 8: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 9: Control area Local/External transfer 10: Interlock release 11: Hold reset (Common to Input 1 and 2) 12: Input 1_Hold reset 13: Input 2_Hold reset 14: Set data unlock/lock transfer 15: Area jump	1

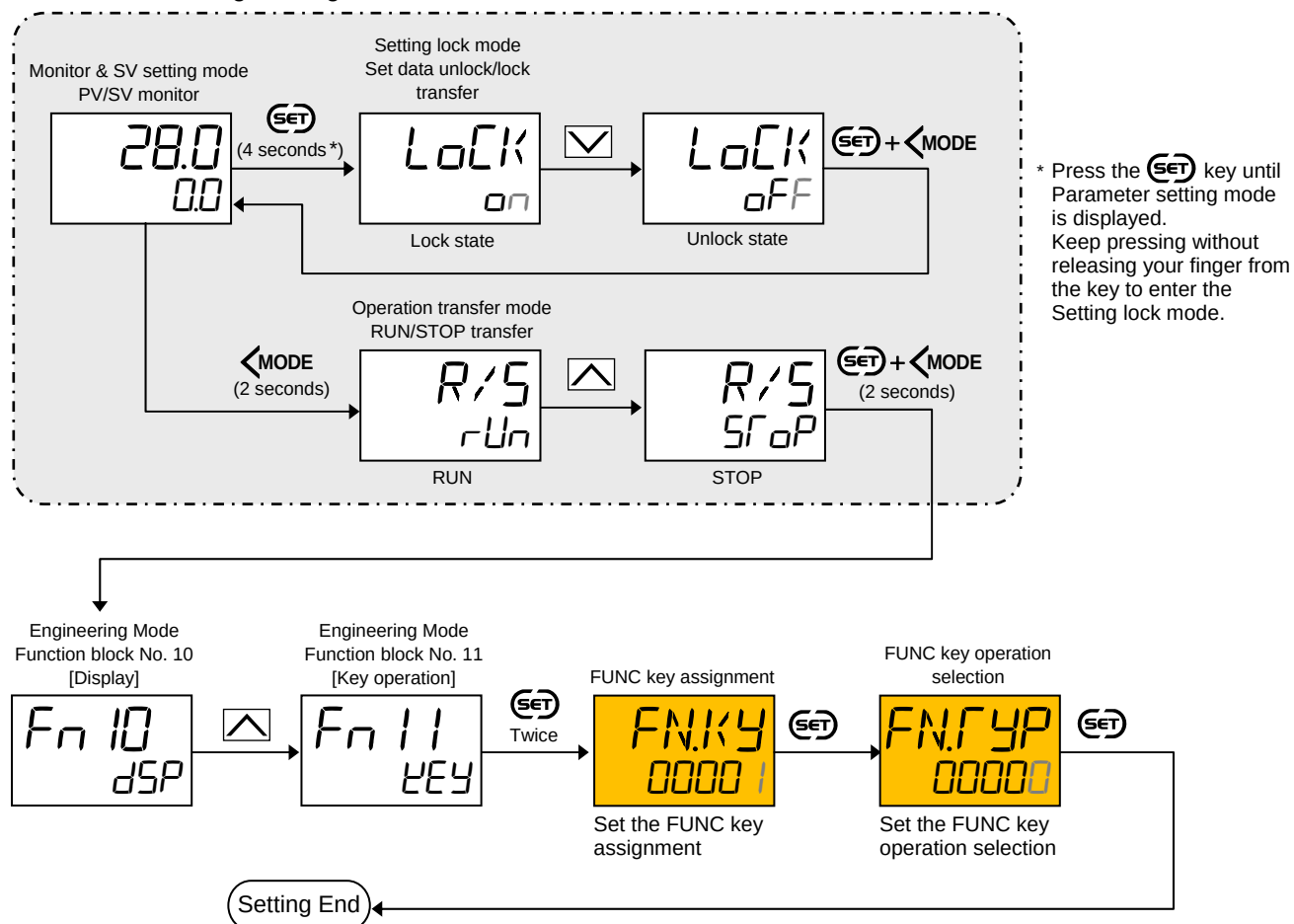
● FUNC key operation selection

[Engineering Mode: Function block No. 11 (F_n / I)]

Parameter symbol	Data range	Factory set value
FN.FYP	0: Press once The function set at "FUNC key assignment" is activated upon a press of the FUNC key. 1: Press and hold The function set at "FUNC key assignment" is activated by holding the FUNC key pressed.	0

Setting procedure

To enter the Engineering mode



- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

10.9 Restricting Key Operation (Set Data Lock)

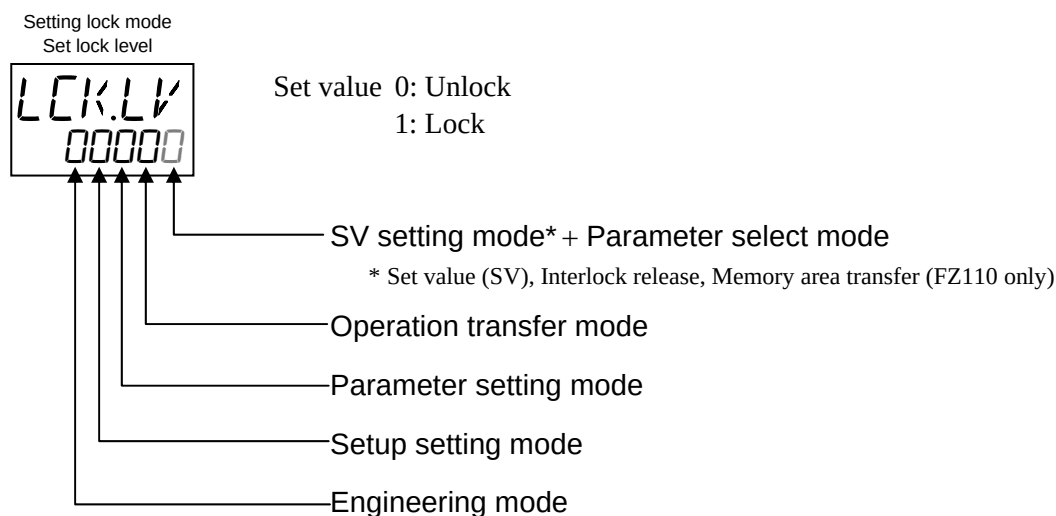
The Set data lock function limits access of unauthorized personnel to the parameters and prevents parameter change by mistake.

■ Description of function

The Set data lock function restricts changing values depending on the mode. The Area lock restricts switching the Memory areas.

● Set lock level

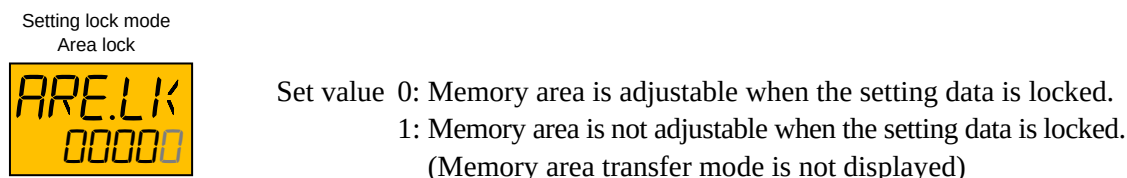
Select the mode to lock.



● Area lock (FZ400/900 only)

For FZ400/900: Select enable/disable Memory area switching

For FZ110: Locking Memory area switching is available by the Set lock level.



● Set data unlock/lock transfer

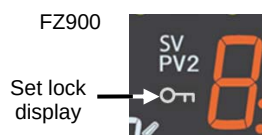
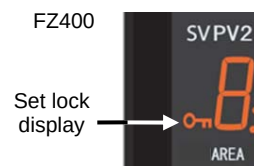
The parameter set with Set lock level and Area lock can be locked/unlocked.

Setting lock mode
Set data unlock/lock transfer



Set value oFF: Unlock state
(Settings can be changed)
oN: Lock state
(Settings cannot be changed)

On FZ400/900, the Set lock indicator lights on in the lock state.

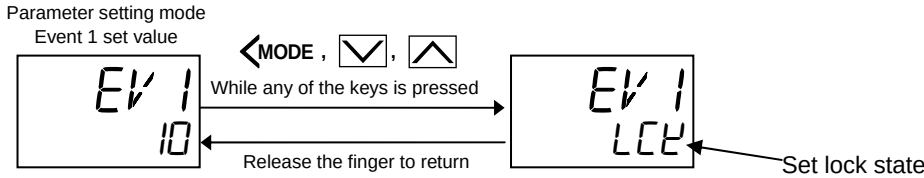


● When the set value was likely to be changed during the Set data lock state

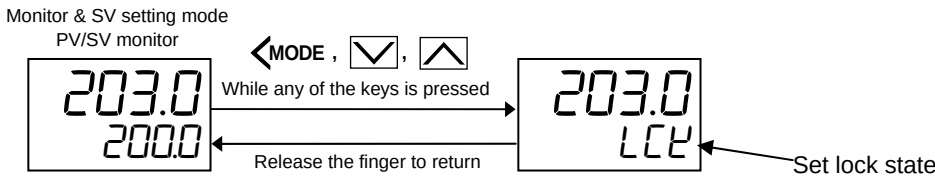
A character will be shown on the Set value (SV) display unit to show the lock mode when any of , or key is pressed.

The “LCE” is displayed only while the relevant key is pressed. Releasing the finger from the key will return the display to the original.

Example 1: “Event 1 set value” screen when the Parameter setting mode is locked.



Example 2: “PV/SV monitor” screen when the SV setting mode is locked
(Direct method is selected at Function block No. 11 in the Engineering mode)



Switching the Set data lock is available anytime irrespective of RUN or STOP state.



Parameter switching is available during the Set data lock state for checking the data. When the SV setting mode is locked, the Set value (SV) setting screen in the SV setting mode will not be displayed.



Even during the Set data lock state, setting through the communication (optional function) and selection of functions by the FUNC key is possible. It should be noted that when the parameters in the Engineering mode are changed, the instrument must be stopped (or stay in the STOP mode).

■ Parameter setting

● Set data unlock/lock transfer
[Setting Lock Mode]

Parameter symbol	Data range	Factory set value
LoCk	oFF: Unlock state oN: Lock state	oFF

● Set lock level

[Setting Lock Mode]

Parameter symbol	Data range	Factory set value
LCK.LV	Set Lock/Unlock at each digit. 	00000

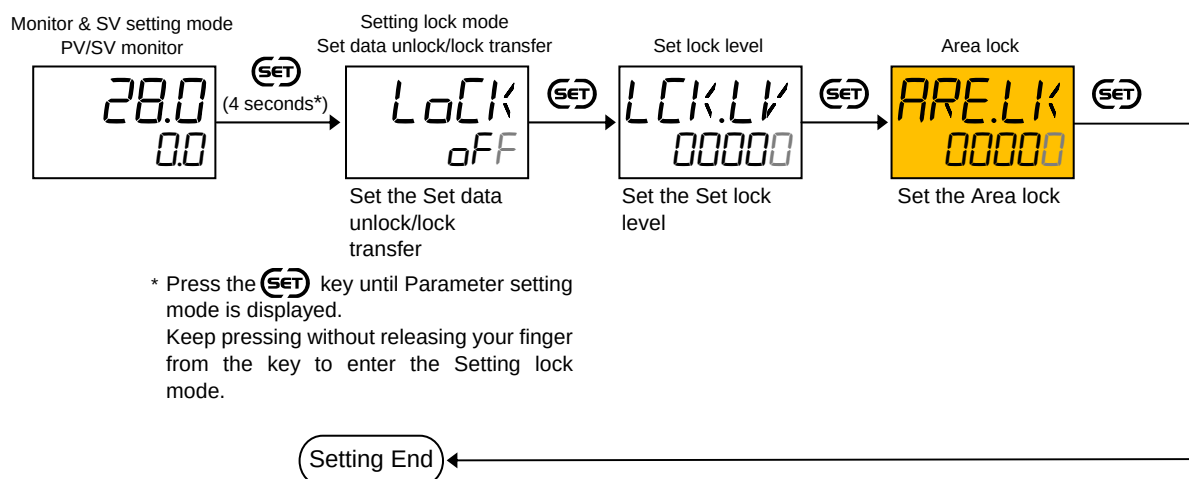
● Area lock

[Setting Lock Mode]

Parameter symbol	Data range	Factory set value
ARE.LK	0: Memory area is adjustable when the setting data is locked. 1: Memory area is not adjustable when the setting data is locked. (Memory area transfer mode is not displayed)	0

■ Setting procedure

Set data lock can be found in the Set data lock mode.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

10.10 Initializing the Set Data

The set values can be initialized when all the set values need to be reset.

■ Description of function

When the pass code is entered on the “Initialize” screen in Function block No. 91 in the Engineering mode, all the set values are initialized and reset to the factory set values.



This action initializes and erases all the set values set so far. Record your setting separately if necessary. **3. PARAMETER LIST (P. 3-1)** has a field for user set values which can be used for recording.

■ Parameter setting

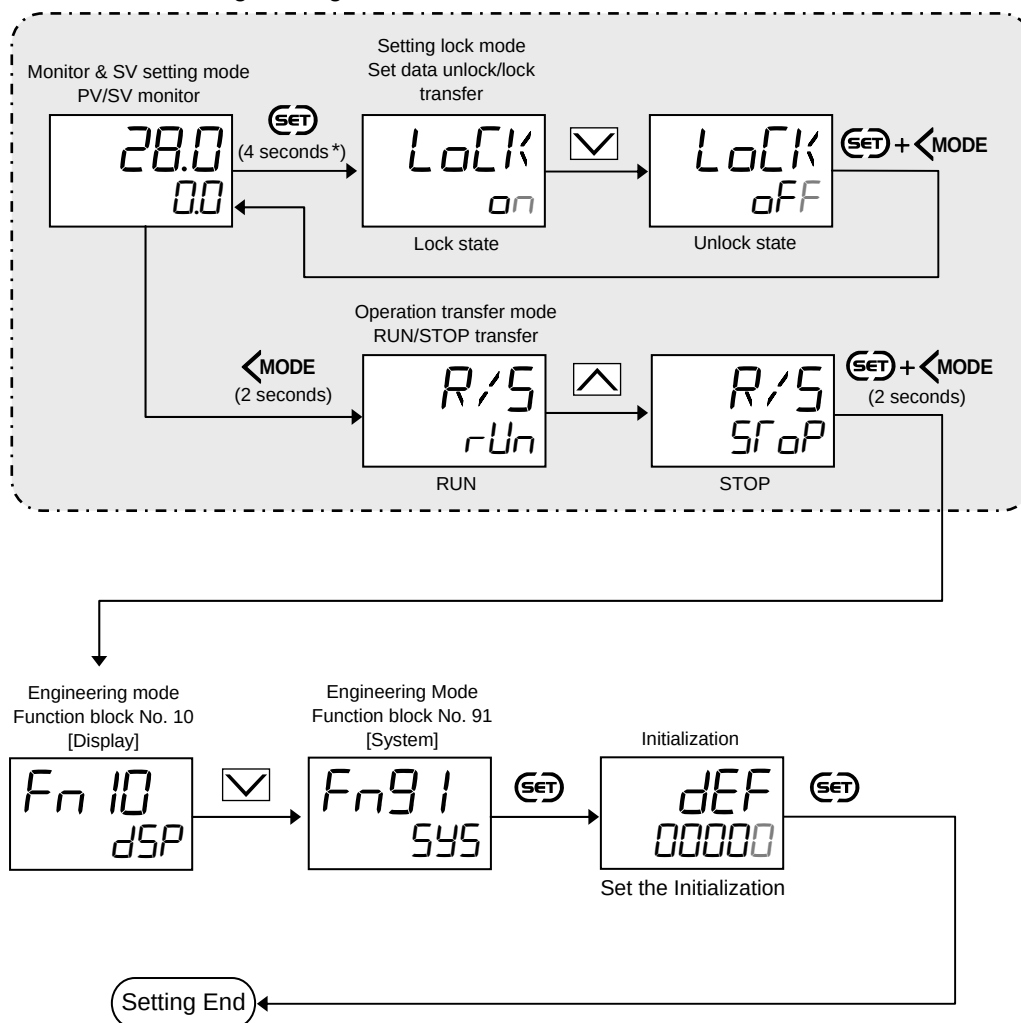
● Initialization

[Engineering Mode: Function block No. 91 (Fn91)]

Parameter symbol	Data range	Factory set value
DEF	1225: Start initialization Other values: Set values are maintained After the initialization, this instrument is restarted. This setting will automatically go back to zero.	0

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

- Next parameter is displayed.
- Press **SET** and **<MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.



INDEX [Alphabetical Order]

A

Action at feedback resistance (FBR) input error
2-19, 3-40, 8-52

Action at saturated output 2-19, 3-40, 8-53

Area lock 2-8, 3-7, 10-40

Area switching time (without area set signal)
2-16, 3-29, 5-25

AT

Input 1_AT bias 2-13, 3-19, 8-14

Input 2_AT bias 2-13, 3-20, 8-14

Input 1_AT remaining time monitor ... 2-13, 3-19, 8-14

Input 2_AT remaining time monitor ... 2-13, 3-20, 8-15

Input 1_AT/ST status monitor
2-13, 3-19, 8-15, 8-21

Input 2_AT/ST status monitor
2-13, 3-20, 8-15, 8-21

Input 1_Autotuning (AT) 2-7, 3-6, 8-14

Input 2_Autotuning (AT) 2-7, 3-6, 8-14

Auto/Manual

Input 1_Auto/Manual transfer ... 2-7, 3-6, 8-60, 8-113

Input 2_Auto/Manual transfer ... 2-7, 3-6, 8-60, 8-113

Input 1_Auto/Manual transfer selection (Area)
2-11, 3-14, 6-35, 10-28

Input 2_Auto/Manual transfer selection (Area)
2-11, 3-14, 6-36, 10-29

Autotuning

Input 1_Autotuning (AT) 2-7, 3-6, 8-14

Input 2_Autotuning (AT) 2-7, 3-6, 8-14

B

Bottom hold monitor

Input 1_Bottom hold monitor 2-14, 3-22, 9-27

Input 2_Bottom hold monitor 2-14, 3-22, 9-27

Bottom suppression function 2-19, 3-40

Burnout direction

Input 1_Burnout direction 2-15, 3-25, 5-43

Input 2_Burnout direction 2-15, 3-28, 5-43

C

Cascade_AT mode (master-side) 2-20, 3-41, 8-94

Cascade_AT mode (slave-side) 2-20, 3-41, 8-94

Cascade_Derivative time (master-side)
2-14, 3-21, 8-92

Cascade_Derivative time (slave-side) ... 2-14, 3-21, 8-93

Cascade_Digital filter 2-14, 3-21, 8-93

Cascade_Integral time (master-side) ... 2-14, 3-21, 8-92

Cascade_Integral time (slave-side) ... 2-14, 3-21, 8-93

Cascade_Proportional band (master-side)
2-14, 3-21, 8-92

Cascade_Proportional band (slave-side)
2-14, 3-21, 8-92

Cascade_Scale high 2-14, 3-21, 8-93

Cascade_Scale low 2-14, 3-21, 8-94

Communication protocol 2-20, 3-42, 4-2, 4-19

Communication response monitor 2-20, 3-42

Communication speed 2-20, 3-42

Comprehensive event state
2-2, 2-3, 2-4, 2-5, 3-4, 7-41

Control action

Input 1_Control action
2-18, 3-38, 4-2, 4-13, 8-8, 8-41, 8-51

Input 2_Control action 2-19, 3-39, 4-2, 4-14, 8-8

Control area Local/External transfer 2-7, 3-6, 5-26

Control loop break alarm (LBA) time

Input 1_Control loop break alarm (LBA) time
2-10, 3-11, 7-38

Input 2_Control loop break alarm (LBA) time
2-10, 3-12, 7-38

Control motor time 2-19, 3-40, 8-53

Control response parameter

Input 1_Control response parameter
2-10, 3-11, 8-8, 8-119

Input 2_Control response parameter
2-10, 3-12, 8-8, 8-119

CT1 assignment 2-18, 3-36, 7-31

CT1 low input cut-off 2-18, 3-36, 7-35

CT1 ratio 2-18, 3-36, 7-33

CT1 type 2-18, 3-36, 4-2, 4-18, 7-33

CT2 assignment 2-18, 3-36, 7-31

CT2 low input cut-off 2-18, 3-36, 7-35

CT2 ratio 2-18, 3-36, 7-34

CT2 type 2-18, 3-36, 4-2, 4-19, 7-33

Current transformer 1 (CT1) input value monitor
2-2, 2-3, 2-4, 2-5, 3-4

Current transformer 2 (CT2) input value monitor
2-2, 2-3, 2-4, 2-5, 3-4

D

Data bit configuration 2-20, 3-42

Data registration 2-15, 3-24, 10-34

Decimal point position

Input 1_Decimal point position
2-15, 3-25, 4-2, 4-4, 4-9, 4-21, 4-25, 5-7

Input 2_Decimal point position
2-15, 3-27, 4-21, 4-28, 5-7

Derivative time

Input 1_Derivative time [cool-side]
2-11, 3-13, 8-29, 8-40



Input 1_Derivative time [heat-side]	2-10, 3-10, 8-28, 8-40, 8-90
Input 2_Derivative time	2-10, 3-12, 8-29, 8-91
Determination point of external disturbance	
Input 1_Determination point of external disturbance ..	2-14, 3-20, 8-120
Input 2_Determination point of external disturbance ..	2-14, 3-20, 8-121
Device address	2-20, 3-42
DI logic invert	2-16, 3-29, 5-25
DI1 function selection	2-16, 3-29, 5-23
DI2 function selection	2-16, 3-29, 5-24
DI3 function selection	2-16, 3-29, 5-24
DI4 function selection	2-16, 3-29, 5-24
DI5 function selection	2-16, 3-29, 5-25
DI6 function selection	2-16, 3-29, 5-25
Differential temperature input	
Measured value (PV) of differential temperature input/ Set value (SV) of differential temperature input	2-5, 3-4
Set value (SV) of differential temperature input	2-5, 2-10, 3-4, 3-9, 8-72
Display unit	
Input 1_Display unit	2-15, 3-25, 4-2, 4-6, 5-6
Input 2_Display unit	2-15, 3-27, 4-2, 4-10, 5-6
Display update cycle	2-12, 3-16, 9-31
DO1 function selection	2-17, 3-33, 6-8
DO1 logic calculation selection	2-17, 3-33, 6-10
DO2 function selection	2-17, 3-33, 6-8
DO2 logic calculation selection	2-17, 3-33, 6-10
DO3 function selection	2-17, 3-33, 6-8
DO4 function selection	2-17, 3-33, 6-9
DO4 logic calculation selection	2-17, 3-33, 6-10

E

Energized/De-energized selection	2-16, 3-30, 6-25
Engineering Mode [H]	1-2, 2-15, 3-23
Event 1 assignment	2-17, 3-34, 4-2, 4-17, 7-3
Event 1 differential gap	2-17, 3-34, 7-19
Event 1 hold action	2-17, 3-34, 7-17
Event 1 set value (EV1)	2-10, 3-9
Event 1 set value (EV1) [high]	2-10, 3-9
Event 1 set value (EV1') [low]	2-10, 3-9
Event 1 timer	2-17, 3-34, 7-22
Event 1 type	2-17, 3-34, 4-2, 4-17, 7-14
Event 2 assignment	2-17, 3-35, 4-2, 4-17, 7-4
Event 2 differential gap	2-17, 3-35, 7-19
Event 2 hold action	2-17, 3-35, 7-18
Event 2 set value (EV2)	2-10, 3-10

Event 2 set value (EV2) [high]	2-10, 3-10
Event 2 set value (EV2') [low]	2-10, 3-10
Event 2 timer	2-17, 3-35, 7-22
Event 2 type	2-17, 3-35, 4-2, 4-17, 7-15
Event 3 assignment	2-17, 3-35, 4-2, 4-18, 7-4
Event 3 differential gap	2-17, 3-35, 7-19
Event 3 hold action	2-17, 3-35, 7-18
Event 3 set value (EV3)	2-10, 3-10
Event 3 set value (EV3) [high]	2-10, 3-10
Event 3 set value (EV3') [low]	2-10, 3-10
Event 3 timer	2-17, 3-35, 7-22
Event 3 type	2-17, 3-35, 4-2, 4-18, 7-15
Event 4 assignment	2-18, 3-35, 4-2, 4-18, 7-4
Event 4 differential gap	2-18, 3-35, 7-19
Event 4 hold action	2-18, 3-35, 7-18
Event 4 set value (EV4)	2-10, 3-10
Event 4 set value (EV4) [high]	2-10, 3-10
Event 4 set value (EV4') [low]	2-10, 3-10
Event 4 timer	2-18, 3-35, 7-22
Event 4 type	2-18, 3-35, 4-2, 4-18, 7-15

F

Feedback adjustment	2-19, 3-40, 8-52
FF amount	
FF amount learning	2-14, 3-20, 8-120
Input 1_FF amount	2-10, 3-11, 8-120
Input 2_FF amount	2-10, 3-12, 8-12
FUNC key assignment	2-15, 3-24, 10-36
FUNC key operation selection	2-15, 3-24, 10-36
Function block No. 10: Display (dSP)	2-15, 3-23
Function block No. 11: Key operation (KEY) ...	2-15, 3-24
Function block No. 21: Input 1 (1. InP)	2-15, 3-25
Function block No. 22: Input 2 (2. InP)	2-15, 3-27
Function block No. 23: Digital input (dI)	2-16, 3-29
Function block No. 30: Output (oUT)	2-16, 3-30
Function block No. 31: Retransmission output 1 (Ao1)	2-16, 3-31
Function block No. 32: Retransmission output 2 (Ao2)	2-16, 3-32
Function block No. 33: Retransmission output 3 (Ao3)	2-17, 3-32
Function block No. 34: Digital output (do)	2-17, 3-33
Function block No. 41: Event 1 (EV1)	2-17, 3-34
Function block No. 42: Event 2 (EV2)	2-17, 3-35
Function block No. 43: Event 3 (EV3)	2-17, 3-35
Function block No. 44: Event 4 (EV4)	2-18, 3-35
Function block No. 45: CT1 (CT1)	2-18, 3-36
Function block No. 46: CT2 (CT2)	2-18, 3-36
Function block No. 50: Control (ConT)	2-18, 3-37



Function block No. 51: Input 1_Control (1.ConT)	2-18, 3-38
Function block No. 52: Input 2_Control (2.ConT)	2-19, 3-39
Function block No. 55: Position proportioning control (PoSIT)	2-19, 3-40
Function block No. 56: Input 1_Cooling control (1.Cool)	2-19, 3-40
Function block No. 57: Proactive (PACT)	2-19, 3-40
Function block No. 58: 2-input function (2PV) ..	2-20, 3-41
Function block No. 60: Communication (SCI) ..	2-20, 3-42
Function block No. 62: PLC communication (MAP)	2-20, 3-43
Function block No. 70: Memory area (ArEA) ..	2-20, 3-43
Function block No. 71: Input 1_Setting limiter (1. SVL) ..	2-21, 3-43
Function block No. 72: Input 2_Setting limiter (2. SVL) ..	2-21, 3-44
Function block No. 91: System (SYS)	2-21, 3-44

H

HBA

Heater break alarm 1 (HBA1) set value	2-12, 3-17, 7-26
Heater break alarm 2 (HBA2) set value	2-13, 3-18, 7-26
Number of heater break alarm 1 (HBA1) delay times ..	2-12, 3-17, 7-28
Number of heater break alarm 2 (HBA2) delay times ..	2-13, 3-18, 7-29
Heater break alarm 1 (HBA1) set value	2-12, 3-17, 7-26
Heater break alarm 2 (HBA2) set value	2-13, 3-18, 7-26
Hold reset	
Input 1_Hold reset	2-14, 3-22, 9-27
Input 2_Hold reset	2-14, 3-22, 9-28
Hot/Cold start	2-18, 3-37, 8-126

I

Initialization	2-21, 3-44, 4-2, 4-20, 10-41
Input 1_Action (high) input error	2-18, 3-38, 5-43
Input 1_Action (low) input error	2-18, 3-38, 5-44
Input 1_AT bias	2-13, 3-19, 8-14
Input 1_AT remaining time monitor	2-13, 3-19, 8-14
Input 1_AT/ST status monitor	2-13, 3-19, 8-15, 8-21
Input 1_Auto/Manual transfer	2-7, 3-6, 8-60, 8-113
Input 1_Auto/Manual transfer selection (Area)	2-11, 3-14, 6-35, 10-28
Input 1_Autotuning (AT)	2-7, 3-6, 8-14

Input 1_Bottom hold monitor	2-14, 3-22, 9-27
Input 1_Burnout direction	2-15, 3-25, 5-43
Input 1_Control action	2-18, 3-38, 4-2, 4-13, 8-8, 8-41, 8-51
Input 1_Control loop break alarm (LBA) time	2-10, 3-11, 7-38
Input 1_Control response parameter	2-10, 3-11, 8-8, 8-119
Input 1_Decimal point position	2-15, 3-25, 4-2, 4-4, 4-9, 4-21, 4-25, 5-7
Input 1_Derivative time [cool-side]	2-11, 3-13, 8-29, 8-40
Input 1_Derivative time [heat-side]	2-10, 3-10, 8-28, 8-40, 8-90
Input 1_Determination point of external disturbance	2-14, 3-20, 8-120
Input 1_Display unit	2-15, 3-25, 4-2, 4-6, 5-6
Input 1_FF amount	2-10, 3-11, 8-120
Input 1_Hold reset	2-14, 3-22, 9-27
Input 1_Input error determination point (high)	2-15, 3-25, 5-42
Input 1_Input error determination point (low)	2-15, 3-25, 5-42
Input 1_Input range high	2-15, 3-25, 4-21, 4-25, 5-9
Input 1_Input range low	2-15, 3-25, 4-21, 4-25, 5-9
Input 1_Input type	2-15, 3-25, 4-2, 4-6, 5-4
Input 1_Integral time [cool-side]	2-11, 3-13, 8-28, 8-39
Input 1_Integral time [heat-side]	2-10, 3-10, 8-28, 8-39, 8-90
Input 1_Inverting input	2-15, 3-26, 5-33
Input 1_LBA deadband (LBD)	2-10, 3-11, 7-39
Input 1_Level PID action selection	2-18, 3-38, 8-105
Input 1_Level PID differential gap	2-18, 3-38, 8-105
Input 1_Level PID setting 1	2-13, 3-18, 4-21, 4-32, 8-104
Input 1_Level PID setting 2	2-13, 3-18, 4-21, 4-33, 8-104
Input 1_Level PID setting 3	2-13, 3-18, 4-21, 4-33, 8-104
Input 1_Level PID setting 4	2-13, 3-18, 4-21, 4-33, 8-104
Input 1_Level PID setting 5	2-13, 3-18, 4-21, 4-34, 8-104
Input 1_Level PID setting 6	2-13, 3-18, 4-21, 4-34, 8-104
Input 1_Level PID setting 7	2-13, 3-18, 4-21, 4-34, 8-104
Input 1_Manipulated output value (Area)	2-11, 3-14, 6-36, 10-29



Input 1_Manipulated output value at input error	2-18, 3-38, 5-44
Input 1_Manipulated output value at STOP [cool-side] ...	2-19, 3-40, 6-40
Input 1_Manipulated output value at STOP [heat-side] ...	2-18, 3-38, 6-39, 8-51
Input 1_Manipulated output value monitor [cool-side]	2-2, 2-3, 2-4, 2-5, 3-4, 6-42
Input 1_Manipulated output value monitor [heat-side]	2-2, 2-3, 2-4, 2-5, 3-4, 6-42
Input 1_Manual manipulated output value	2-13, 3-18, 6-35
Input 1_Manual reset	2-10, 3-11, 8-108
Input 1_Measured value (PV)/Input 1_Set value (SV)	2-2, 2-3, 2-5, 3-3
Input 1_Measured value (PV)/Input 2_Measured value (PV)	2-2, 2-3, 2-4, 2-5, 3-4
Input 1_ON/OFF action differential gap (lower)	2-10, 3-11, 8-34
Input 1_ON/OFF action differential gap (upper)	2-10, 3-11, 8-33
Input 1_Output change rate limiter (down) [cool-side]	2-19, 3-40, 6-31
Input 1_Output change rate limiter (down) [heat-side] ...	2-18, 3-38, 6-30
Input 1_Output change rate limiter (up) [cool-side]	2-19, 3-40, 6-31
Input 1_Output change rate limiter (up) [heat-side]	2-18, 3-38, 6-30
Input 1_Output limiter high [cool-side]	2-11, 3-13, 4-21, 4-27, 6-27
Input 1_Output limiter high [heat-side]	2-10, 3-11, 4-21, 4-27, 6-26, 8-51
Input 1_Output limiter low [cool-side]	2-11, 3-13, 4-21, 4-27, 6-27
Input 1_Output limiter low [heat-side]	2-10, 3-11, 4-21, 4-27, 6-26, 8-51
Input 1_Overlap/Deadband	2-11, 3-13, 8-40
Input 1_Peak hold monitor	2-14, 3-22, 9-26
Input 1_Proactive intensity	2-10, 3-11, 8-119
Input 1_Proportional band [cool-side]	2-11, 3-13, 8-27, 8-39
Input 1_Proportional band [heat-side]	2-10, 3-10, 8-27, 8-33, 8-38, 8-90
Input 1_PV bias	2-12, 3-16, 5-29
Input 1_PV digital filter	2-12, 3-16, 5-31
Input 1_PV low input cut-off	2-12, 3-16, 5-36
Input 1_PV ratio	2-12, 3-16, 5-29
Input 1_Set value (SV) ...	2-2, 2-3, 2-4, 2-5, 2-10, 3-4, 3-9
Input 1_Setting change rate limiter (down)	2-11, 3-14, 10-7
Input 1_Setting change rate limiter (up)	2-11, 3-14, 10-7
Input 1_Setting limiter high	2-20, 3-43, 4-21, 4-27, 10-3
Input 1_Setting limiter low	2-20, 3-43, 4-21, 4-27, 10-4
Input 1_Square root extraction	2-15, 3-26, 5-35
Input 1_Start determination point	2-18, 3-38, 8-126
Input 1_Startup tuning (ST)	2-7, 3-6, 8-20
Input 1_Temperature compensation calculation	2-15, 3-25
Input 2_Action (high) input error	2-19, 3-39, 5-44
Input 2_Action (low) input error	2-19, 3-39, 5-44
Input 2_AT bias	2-13, 3-20, 8-14
Input 2_AT remaining time monitor	2-13, 3-20, 8-15
Input 2_AT/ST status monitor	2-13, 3-20, 8-15, 8-21
Input 2_Auto/Manual transfer	2-7, 3-6, 8-60, 8-113
Input 2_Auto/Manual transfer selection (Area)	2-11, 3-14, 6-36, 10-29
Input 2_Autotuning (AT)	2-7, 3-6, 8-14
Input 2_Bottom hold monitor	2-14, 3-22, 9-27
Input 2_Burnout direction	2-15, 3-28, 5-43
Input 2_Control action	2-19, 3-39, 4-2, 4-14, 8-8
Input 2_Control loop break alarm (LBA) time	2-10, 3-12, 7-38
Input 2_Control response parameter	2-10, 3-12, 8-8, 8-119
Input 2_Decimal point position	2-15, 3-27, 4-21, 4-28, 5-7
Input 2_Derivative time	2-10, 3-12, 8-29, 8-91
Input 2_Determination point of external disturbance	2-14, 3-20, 8-121
Input 2_Display unit	2-15, 3-27, 4-2, 4-10, 5-6
Input 2_FF amount	2-10, 3-12, 8-120
Input 2_Hold reset	2-14, 3-22, 9-28
Input 2_Input error determination point (high)	2-15, 3-28, 5-42
Input 2_Input error determination point (low)	2-15, 3-28, 5-43
Input 2_Input range high	2-15, 3-27, 4-21, 4-30, 5-8
Input 2_Input range low	2-15, 3-27, 4-21, 4-30, 5-9
Input 2_Input type	2-15, 3-27, 4-2, 4-4, 4-10, 5-5, 8-64
Input 2_Integral time	2-10, 3-12, 8-28, 8-91
Input 2_Inverting input	2-15, 3-28, 5-33
Input 2_LBA deadband (LBD)	2-10, 3-12, 7-39
Input 2_Level PID action selection	2-19, 3-39, 8-105
Input 2_Level PID differential gap	2-19, 3-39, 8-105
Input 2_Level PID setting 1	2-13, 3-19, 4-21, 4-35, 8-104



Input 2_Level PID setting 2.....	2-13, 3-19, 4-21, 4-35, 8-104
Input 2_Level PID setting 3.....	2-13, 3-19, 4-21, 4-35, 8-104
Input 2_Level PID setting 4.....	2-13, 3-19, 4-21, 4-36, 8-104
Input 2_Level PID setting 5.....	2-13, 3-19, 4-21, 4-36, 8-104
Input 2_Level PID setting 6.....	2-13, 3-19, 4-21, 4-36, 8-104
Input 2_Level PID setting 7.....	2-13, 3-19, 4-21, 4-37, 8-104
Input 2_Manipulated output value (Area)	2-11, 3-14, 6-36, 10-29
Input 2_Manipulated output value at input error	2-19, 3-39, 5-45
Input 2_Manipulated output value at STOP mode.....	2-19, 3-39, 6-40
Input 2_Manipulated output value monitor	2-2, 2-3, 2-4, 2-5, 3-4, 6-42
Input 2_Manual manipulated output value.....	2-13, 3-19, 6-35
Input 2_Manual reset	2-10, 3-12, 8-109
Input 2_Measured value (PV)/Input 2_Set value (SV).....	2-3, 2-5, 3-3
Input 2_ON/OFF action differential gap (lower)	2-10, 3-12, 8-34
Input 2_ON/OFF action differential gap (upper).....	2-10, 3-12, 8-34
Input 2_Output change rate limiter (down)	2-19, 3-39, 6-30
Input 2_Output change rate limiter (up)	2-19, 3-39, 6-30
Input 2_Output limiter high ..	2-10, 3-12, 4-21, 4-32, 6-27
Input 2_Output limiter low.....	2-10, 3-12, 4-21, 4-32, 6-27
Input 2_Peak hold monitor.....	2-14, 3-22, 9-27
Input 2_Proactive intensity	2-10, 3-12, 8-119
Input 2_Proportional band ..	2-10, 3-12, 8-27, 8-33, 8-91
Input 2_PV bias (RS bias)	2-12, 3-16, 5-29
Input 2_PV digital filter (RS digital filter)	2-12, 3-16, 5-31
Input 2_PV low input cut-off	2-12, 3-16, 5-36
Input 2_PV ratio (RS ratio)	2-12, 3-16, 5-29
Input 2_Set value (SV)	2-3, 2-5, 2-10, 3-4, 3-9, 8-72
Input 2_Setting change rate limiter (down)	2-11, 3-14, 10-7
Input 2_Setting change rate limiter (up).....	2-11, 3-14, 10-7
Input 2_Setting limiter high ..	2-21, 3-44, 4-21, 4-32, 10-4
Input 2_Setting limiter low ..	2-21, 3-44, 4-21, 4-32, 10-4
Input 2_Square root extraction	2-15, 3-28, 5-36
Input 2_Start determination point	2-19, 3-39, 8-126
Input 2_Startup tuning (ST).....	2-7, 3-6, 8-21
Input 2_Temperature compensation calculation	2-15, 3-28
Input circuit error alarm set value	2-20, 3-41, 7-41
Input data type	2-15, 3-26, 4-21, 4-23, 5-10
Input type symbol	1-3
Instrument link recognition time	2-20, 3-43
Instrument number monitor	2-21, 3-44, 9-92
Integral/Derivative time decimal point position.....	2-18, 3-3, 4-2, 4-19
Integral time	
Input 1_Integral time [cool-side]	2-11, 3-13, 8-28, 8-39
Input 1_Integral time [heat-side]	2-10, 3-10, 8-28, 8-39, 8-90
Input 2_Integral time.....	2-10, 3-12, 8-28, 8-91
Integrated operating time.....	2-21, 3-44, 9-32
Integrated output limiter	2-19, 3-40, 8-53
Interlock release	2-2, 2-3, 2-4, 2-5, 3-5, 7-45
Interlock selection	2-16, 3-30, 7-42
Interval time.....	2-20, 3-42
Inverting input	
Input 1_Inverting input	2-15, 3-26, 5-33
Input 2_Inverting input	2-15, 3-28, 5-33
L	
LBA	
Input 1_Control loop break alarm (LBA) time.....	2-10, 3-11, 7-38
Input 2_Control loop break alarm (LBA) time.....	2-10, 3-12, 7-38
Input 1_LBA deadband (LBD).....	2-10, 3-11, 7-39
Input 2_LBA deadband (LBD).....	2-10, 3-12, 7-39
Link area number.....	2-11, 3-14, 10-25, 10-28
Level PID action selection	
Input 1_Level PID action selection	2-18, 3-38, 8-105
Input 2_Level PID action selection	2-19, 3-39, 8-105
Level PID differential gap	
Input 1_Level PID differential gap.....	2-18, 3-38, 8-105
Input 2_Level PID differential gap.....	2-19, 3-39, 8-105
Level PID setting	
Input 1_Level PID setting 1	2-13, 3-18, 4-21, 4-32, 8-104
Input 2_Level PID setting 1	2-13, 3-19, 4-21, 4-35, 8-104
Input 1_Level PID setting 2	2-13, 3-18, 4-21, 4-33, 8-104



Input 2_Level PID setting 2	2-13, 3-19, 4-21, 4-35, 8-104
Input 1_Level PID setting 3	2-13, 3-18, 4-21, 4-33, 8-104
Input 2_Level PID setting 3	2-13, 3-19, 4-21, 4-35, 8-104
Input 1_Level PID setting 4	2-13, 3-18, 4-21, 4-33, 8-104
Input 2_Level PID setting 4	2-13, 3-19, 4-21, 4-36, 8-104
Input 1_Level PID setting 5	2-13, 3-18, 4-21, 4-34, 8-104
Input 2_Level PID setting 5	2-13, 3-19, 4-21, 4-36, 8-104
Input 1_Level PID setting 6	2-13, 3-18, 4-21, 4-34, 8-104
Input 2_Level PID setting 6	2-13, 3-19, 4-21, 4-36, 8-104
Input 1_Level PID setting 7	2-13, 3-18, 4-21, 4-34, 8-104
Input 2_Level PID setting 7	2-13, 3-19, 4-21, 4-37, 8-104

M

Manipulated output value

Input 1_Manipulated output value (Area)	2-11, 3-14, 6-36, 10-29
Input 2_Manipulated output value (Area)	2-11, 3-14, 6-36, 10-29
Input 1_Manipulated output value at input error	2-18, 3-38, 5-44
Input 2_Manipulated output value at input error	2-19, 3-39, 5-45
Input 1_Manipulated output value at STOP [cool-side]	2-19, 3-40, 6-40
Input 1_Manipulated output value at STOP [heat-side]	2-18, 3-38, 6-39, 8-51
Input 2_Manipulated output value at STOP mode	2-19, 3-39, 6-40
Input 1_Manipulated output value monitor [cool-side]	2-2, 2-3, 2-4, 2-5, 3-4, 6-42
Input 1_Manipulated output value monitor [heat-side]	2-2, 2-3, 2-4, 2-5, 3-4, 6-42
Input 2_Manipulated output value monitor	2-2, 2-3, 2-4, 2-5, 3-4, 6-42

Manual manipulated output value

Input 1_Manual manipulated output value	2-13, 3-18, 6-35
Input 2_Manual manipulated output value	2-13, 3-19, 6-35

Manual manipulated output value selection	2-18, 3-37, 6-35

Manual reset

Input 1_Manual reset	2-10, 3-11, 8-108
Input 2_Manual reset	2-10, 3-12, 8-109

Measured value (PV)

Input 1_Measured value (PV)/Input 1_Set value (SV)	2-2, 2-3, 2-5, 3-3

Input 2_Measured value (PV)/Input 2_Set value (SV)	2-3, 2-5, 3-3

Input 1_Measured value (PV)/Input 2_Measured value (PV)	2-2, 2-3, 2-4, 2-5, 3-4

Measured value (PV) of differential temperature input/ Set value (SV) of differential temperature input ..

2-5, 3-4

Memory area soak time monitor

2-2, 2-3, 2-4, 2-5, 3-5

Memory area transfer

2-2, 2-9, 3-5, 3-8, 4-21, 4-32, 10-15

Memory Area Transfer Mode [E]

1-2, 2-9, 3-8

Model code monitor

2-21, 3-44, 9-92

Monitor & SV Setting Mode [A]

1-2, 1-3, 2-2, 3-3

Monitor item register bias

2-20, 3-43

MV

Show/Hide Input 1_MV	2-15, 3-23, 9-24

Show/Hide Input 2_MV	2-15, 3-23, 9-25

N

Number of heater break alarm 1 (HBA1) delay times

2-12, 3-17, 7-28

Number of heater break alarm 2 (HBA2) delay times

2-13, 3-18, 7-29

Number of recognizable devices

2-20, 3-43

O

Open/Close output differential gap

2-14, 3-20, 8-52

Open/Close output neutral zone

2-14, 3-20, 4-2, 4-14, 8-52

Operation Transfer Mode [C]

1-2, 2-7, 3-6

OUT1 function selection

2-16, 3-30, 4-2, 4-14, 6-7

OUT1 logic calculation selection

2-16, 3-30, 6-9

OUT1 minimum ON/OFF time of proportioning cycle

2-12, 3-17, 6-21

OUT1 proportional cycle time

2-12, 3-17, 6-21

OUT2 function selection

2-16, 3-30, 4-2, 4-15, 6-7

OUT2 logic calculation selection

2-16, 3-30, 6-9

OUT2 minimum ON/OFF time of proportioning cycle

2-12, 3-17, 6-22

OUT2 proportional cycle time

2-12, 3-17, 6-21

OUT3 function selection

2-16, 3-30, 4-2, 4-14, 6-8

OUT3 logic calculation selection

2-16, 3-30, 6-9



OUT3 minimum ON/OFF time of proportioning cycle.....	2-12, 3-17, 6-22
OUT3 proportional cycle time.....	2-12, 3-17, 6-21
Output action at control stop	2-16, 3-31, 6-39
Output change rate limiter	
Input 1_Output change rate limiter (down)	
[cool-side]	2-19, 3-40, 6-31
Input 1_Output change rate limiter (down)	
[heat-side]	2-18, 3-38, 6-30
Input 2_Output change rate limiter (down).....	2-19, 3-39, 6-30
Input 1_Output change rate limiter (up) [cool-side]	2-19, 3-40, 6-31
Input 1_Output change rate limiter (up) [heat-side]....	2-18, 3-38, 6-30
Input 2_Output change rate limiter (up)	2-19, 3-39, 6-30
Output limiter	
Input 1_Output limiter high [cool-side]	2-11, 3-13, 4-21, 4-27, 6-27
Input 1_Output limiter high [heat-side]	2-10, 3-11, 4-21, 4-27, 6-26, 8-51
Input 2_Output limiter high	2-10, 3-12, 4-21, 4-32, 6-27
Input 1_Output limiter low [cool-side]	2-11, 3-13, 4-21, 4-27, 6-27
Input 1_Output limiter low [heat-side]	2-10, 3-11, 4-21, 4-27, 6-26, 8-51
Input 2_Output limiter low	2-10, 3-12, 4-21, 4-32, 6-27
Overlap/Deadband	
Input 1_Overlap/Deadband	2-11, 3-13, 8-40
Overlap/Deadband reference point...2-19, 3-40, 8-41	
P	
Parameter group No. 00: Setting (SV).....	2-10, 3-9
Parameter group No. 40: Event (EV)	2-10, 3-9
Parameter group No. 51: Input 1_Control (1.ConT).....	2-10, 3-10
Parameter group No. 52: Input 2_Control (2.ConT).....	2-10, 3-12
Parameter group No. 56: Input 1_Cooling control	
(1.Cool)	2-11, 3-13
Parameter group No. 70: Memory area (ArEA)	2-11, 3-14
Parameter select direct registration	2-8, 3-7, 9-8
Parameter Select Mode [B].....	1-2, 2-6, 3-5
Parameter select setting 1.....	2-8, 3-7, 9-8
Parameter select setting 2.....	2-8, 3-7, 9-8
Parameter select setting 3.....	2-8, 3-7, 9-8
Parameter select setting 4	2-8, 3-7, 9-8
Parameter select setting 5	2-8, 3-7, 9-8
Parameter select setting 6	2-8, 3-7, 9-8
Parameter select setting 7	2-8, 3-7, 9-8
Parameter select setting 8	2-8, 3-7, 9-8
Parameter select setting 9	2-8, 3-7, 9-8
Parameter select setting 10	2-8, 3-7, 9-8
Parameter select setting 11	2-8, 3-7, 9-8
Parameter select setting 12	2-8, 3-7, 9-8
Parameter select setting 13	2-8, 3-7, 9-8
Parameter select setting 14	2-8, 3-7, 9-8
Parameter select setting 15	2-8, 3-7, 9-8
Parameter select setting 16	2-8, 3-7, 9-8
Peak hold monitor	
Input 1_Peak hold monitor	2-14, 3-22, 9-26
Input 2_Peak hold monitor	2-14, 3-22, 9-27
Peak hold monitor of ambient temperature	2-21, 3-44, 9-32
PLC communication start time	2-20, 3-43
PLC response waiting time	2-20, 3-43
Peak hold monitor	
Input 1_Peak hold monitor	2-14, 3-22, 9-26
Input 2_Peak hold monitor	2-14, 3-22, 9-27
Proactive intensity	
Input 1_Proactive intensity	2-10, 3-11, 8-119
Input 2_Proactive intensity	2-10, 3-12, 8-119
Proportional band	
Input 1_Proportional band [cool-side]	2-11, 3-13, 8-27, 8-39
Input 1_Proportional band [heat-side].....	2-10, 3-10, 8-27, 8-33, 8-38, 8-90
Input 2_Proportional band.....	2-10, 3-12, 8-27, 8-33, 8-91
Proportional cycle time	
OUT1 minimum ON/OFF time of proportioning cycle ·	2-12, 3-17, 6-21
OUT1 proportional cycle time	2-12, 3-17, 6-21
OUT2 minimum ON/OFF time of proportioning cycle ·	2-12, 3-17, 6-22
OUT2 proportional cycle time	2-12, 3-17, 6-21
OUT3 minimum ON/OFF time of proportioning cycle ·	2-12, 3-17, 6-22
OUT3 proportional cycle time	2-12, 3-17, 6-21
PV flashing display at input error	2-15, 3-23, 5-42
PV bias	
Input 1_PV bias	2-12, 3-16, 5-29
Input 2_PV bias (RS bias).....	2-12, 3-16, 5-29
PV digital filter	
Input 1_PV digital filter	2-12, 3-16, 5-31



Input 2_PV digital filter (RS digital filter)	2-12, 3-16, 5-31
PV low level cut-off	
Input 1_PV low input cut-off	2-12, 3-16, 5-36
Input 2_PV low input cut-off	2-12, 3-16, 5-36
PV ratio	
Input 1_PV ratio	2-12, 3-16, 5-29
Input 2_PV ratio (RS ratio)	2-12, 3-16, 5-29
PV select input range high	3-2
PV select input range low	3-2
PV select input span	3-2
PV select Measured value (PV)/Input 1_Set value (SV) ..	2-4, 3-3
PV select transfer level	2-14, 3-21, 8-81
PV select transfer time	2-14, 3-21, 8-81

R

Register start number (High-order 4-bit)	2-20, 3-43
Register start number (Low-order 16-bit)	2-20, 3-43
Register type	2-20, 3-43, 4-2, 4-20
Remote setting input value monitor	2-2, 3-4
Remote/Local transfer	2-7, 3-6, 8-64, 8-69, 8-72, 8-81, 8-90, 8-114
Remote/Local transfer selection (Area)	2-11, 3-15, 10-30
Retransmission output 1 scale high	2-16, 3-31, 6-16
Retransmission output 1 scale low	2-16, 3-32, 6-17
Retransmission output 1 type	2-16, 3-31, 4-2, 4-16, 6-16
Retransmission output 2 scale high	2-16, 3-32, 6-17
Retransmission output 2 scale low	2-16, 3-32, 6-17
Retransmission output 2 type	2-16, 3-32, 4-2, 4-16, 6-17
Retransmission output 3 scale high	2-17, 3-32, 6-18
Retransmission output 3 scale low	2-17, 3-32, 6-18
Retransmission output 3 type	2-17, 3-32, 4-2, 4-17, 6-18
RS bias	
Input 2_PV bias (RS bias)	2-12, 3-16, 5-29
RS digital filter	
Input 2_PV digital filter (RS digital filter)	2-12, 3-16, 5-31
RS ratio	
Input 2_PV ratio (RS ratio)	2-12, 3-16, 5-29
ROM version	2-21, 3-44, 9-32
RUN/STOP transfer	2-7, 3-6, 8-3

S

Select Blind function	2-8, 3-7, 9-17

Select function for input 2	2-20, 3-41, 4-2, 4-3, 5-49, 7-47, 8-65, 8-69, 8-82, 8-94
Select hide items in Monitor mode	2-15, 3-23, 9-13
Select hide items in Operation transfer mode	2-15, 3-24, 9-14
Select Trigger type for Memory area transfer	2-11, 3-14, 10-28
Selection of PV select trigger	2-20, 3-41, 8-82
Set data unlock/lock transfer	2-8, 3-7, 10-39
Set lock level	2-8, 3-7, 10-40
Setting change rate limiter	
Input 1_Setting change rate limiter (down)	2-11, 3-14, 10-7
Input 2_Setting change rate limiter (down)	2-11, 3-14, 10-7
Input 1_Setting change rate limiter (up)	2-11, 3-14, 10-7
Input 2_Setting change rate limiter (up)	2-11, 3-14, 10-7
Setting limiter	
Input 1_Setting limiter high	2-20, 3-43, 4-21, 4-27, 10-3
Input 2_Setting limiter high	2-21, 3-44, 4-21, 4-32, 10-4
Input 1_Setting limiter low	2-20, 3-43, 4-21, 4-27, 10-4
Input 2_Setting limiter low	2-21, 3-44, 4-21, 4-32, 10-4
Set value (SV)	
Input 1_Set value (SV)	2-2, 2-3, 2-4, 2-5, 2-10, 3-4, 3-9
Input 2_Set value (SV)	2-3, 2-5, 2-10, 3-4, 3-9, 8-72
Set value (SV) of differential temperature input	2-5, 2-10, 3-4, 3-9, 8-72
Setting change rate limiter unit time	2-20, 3-43, 10-8
Setting group No. 10: Display (dSP)	2-12, 3-16
Setting group No. 21: Input 1 (1. InP)	2-12, 3-16
Setting group No. 22: Input 2 (2. InP)	2-12, 3-16
Setting group No. 30: Output (oUT)	2-12, 3-17
Setting group No. 45: Heater break alarm 1 (HBA1)	2-12, 3-17
Setting group No. 46: Heater break alarm 2 (HBA2)	2-13, 3-18
Setting group No. 51: Input 1_Control (1.ConT)	2-13, 3-18
Setting group No. 52: Input 2_Control (2.ConT)	2-13, 3-19
Setting group No. 53: Input 1_Tuning (1.TUNE)	2-13, 3-19



Setting group No. 54: Input 2_Tuning (2.TUNE)	2-13, 3-20	Input 2_Temperature compensation calculation	2-15, 3-28
Setting group No. 55: Position proportioning control (POSIT)	2-14, 3-20	U	
Setting group No. 57: Proactive (PACT)	2-14, 3-20	Undershoot suppression factor	2-19, 3-40, 8-41
Setting group No. 58: 2-input function (2PV) ..	2-14, 3-21	Universal output type selection (OUT3)	2-16, 3-31, 4-2, 4-15, 6-12
Setting group No. 91: System (SYS)	2-14, 3-22	V	
Setting item register bias	2-20, 3-43	Valve action at STOP	2-19, 3-40, 8-53
Setting Lock Mode [D]	1-2, 2-8, 3-7		
Setup Setting Mode [G]	1-2, 2-12, 3-16		
Show/Hide Input 1_MV	2-15, 3-23, 9-24		
Show/Hide Input 1_SV	2-15, 3-23, 9-18		
Show/Hide Input 2_MV	2-15, 3-23, 9-25		
Show/Hide Input 2_SV	2-15, 3-23, 9-18		
Slave register bias	2-20, 3-43		
Soak time unit	2-20, 3-43, 4-2, 4-20, 10-25, 10-30		
Square root extraction			
Input 1_Square root extraction	2-15, 3-26, 5-35		
Input 2_Square root extraction	2-15, 3-28, 5-36		
Start determination point			
Input 1_Start determination point ...	2-18, 3-38, 8-126		
Input 2_Start determination point ...	2-19, 3-39, 8-126		
Startup tuning (ST)			
Input 1_Startup tuning (ST)	2-7, 3-6, 8-20		
Input 2_Startup tuning (ST)	2-7, 3-6, 8-21		
ST start condition	2-18, 3-37, 8-21		
STOP			
Input 1_Manipulated output value at STOP [cool-side]	2-19, 3-40, 6-40		
Input 1_Manipulated output value at STOP [heat-side]	2-18, 3-38, 6-39, 8-51		
Input 2_Manipulated output value at STOP mode	2-19, 3-39, 6-40		
Output action at control stop	2-16, 3-31, 6-39		
STOP display selection	2-15, 3-23, 9-20		
Valve action at STOP	2-19, 3-40, 8-53		
SV			
Input 1_Set value (SV)	2-2, 2-3, 2-4, 2-5, 2-10, 3-4, 3-9		
Input 2_Set value (SV)	2-3, 2-5, 2-10, 3-4, 3-9, 8-72		
Show/Hide Input 1_SV	2-15, 3-23, 9-18		
Show/Hide Input 2_SV	2-15, 3-23, 9-18		
SV tracking	2-18, 3-37, 8-114		
T			
Temperature compensation calculation			
Input 1_Temperature compensation calculation	2-15, 3-25		



INDEX [Character Order]

* Mode

A: Monitor & SV setting Mode

B: Parameter select mode

C: Operation transfer mode

D: Setting lock mode

E: Memory area transfer mode

F: Parameter setting mode

G: Setup setting mode

H: Engineering mode

 Displayed in case of FZ400/900.

Symbol	Name	Mode*	Page
1 (I)			
I. R/M	1. A/M Input 1_Auto/Manual transfer	C —	2-7, 3-6
I.R/M.A	1.A/M.A Input 1_Auto/Manual transfer selection (Area)	F Pn70	2-11, 3-14
I.AoVE	1.AoVE Input 1_Action (high) input error	H Fn51	2-18, 3-38
I. ATb	1. ATb Input 1_AT bias	G Sn53	2-13, 3-19
I.ATTM	1.ATTM Input 1_AT remaining time monitor	G Sn53	2-13, 3-19
I. ATU	1. ATU Input 1_Autotuning (AT)	C —	2-7, 3-6
I.AUNE	1.AUNE Input 1_Action (low) input error	H Fn51	2-18, 3-38
I.bHLd	1.bHLd Input 1_Bottom hold monitor	G Sn91	2-14, 3-22
I. boS	1. boS Input 1_Burnout direction	H Fn21	2-15, 3-25
I. d	1. d Input 1_Derivative time [heat-side]	F Pn51	2-10, 3-11
I. db	1. db Input 1_Overlap/Deadband 1	F Pn56	2-11, 3-13
I. dc	1. dc Input 1_Derivative time [cool-side]	F Pn56	2-11, 3-13
I. dF	1. dF Input 1_PV digital filter	G Sn21	2-12, 3-16
I.dS.MV	1.dS.MV Show/Hide Input 1_MV	H Fn10	2-15, 3-23
I.dS.SV	1.dS.SV Show/Hide Input 1_SV	H Fn10	2-15, 3-23
I.EXdJ	1.EXdJ Input 1_Determination point of external disturbance	G Sn57	2-14, 3-20
I. FF	1. FF Input 1_FF amount	F Pn51	2-10, 3-11
I.HLdR	1.HLdR Input 1_Hold reset	G Sn91	2-14, 3-22
I. I	1. I Input 1_Integral time [heat-side]	F Pn51	2-10, 3-11
I. Ic	1. Ic Input 1_Integral time [cool-side]	F Pn56	2-11, 3-13
I. INP	1. INP Input 1_Input type	H Fn21	2-15, 3-25
I. INV	1. INV Input 1_Inverting input	H Fn21	2-15, 3-26
I. LbA	1. LbA Input 1_Control loop break alarm (LBA) time	F Pn51	2-10, 3-11
I. Lbd	1. Lbd Input 1_LBA deadband (LBD)	F Pn51	2-10, 3-11
I.LEV1	1.LEV1 Input 1_Level PID setting1	G Sn51	2-13, 3-18
I.LEV2	1.LEV2 Input 1_Level PID setting 2	G Sn51	2-13, 3-18
I.LEV3	1.LEV3 Input 1_Level PID setting 3	G Sn51	2-13, 3-18
I.LEV4	1.LEV4 Input 1_Level PID setting 4	G Sn51	2-13, 3-18
I.LEV5	1.LEV5 Input 1_Level PID setting 5	G Sn51	2-13, 3-18
I.LEV6	1.LEV6 Input 1_Level PID setting 6	G Sn51	2-13, 3-18
I.LEV7	1.LEV7 Input 1_Level PID setting 7	G Sn51	2-13, 3-18
I. LHS	1. LHS Input 1_Level PID differential gap 2	H Fn51	2-18, 3-38
I.LPI d	1.LPId Input 1_Level PID action selection	H Fn51	2-18, 3-38
I. M.MV	1. M.MV Input 1_Manual manipulated output value	G Sn51	2-13, 3-18
I. MR	1. MR Input 1_Manual reset	F Pn51	2-10, 3-11
I. MV	1. MV Input 1_Manipulated output value monitor [heat-side]	A —	2-2, 2-3, 2-4, 2-5, 3-4
I. MV.A	1.MV.A Input 1_Manipulated output value (Area)	F Pn70	2-11, 3-14
I. MVc	1. MVc Input 1_Manipulated output value monitor [cool-side]	A —	2-2, 2-3, 2-4, 2-5, 3-4

Symbol	Name	Mode*	Page
I. oHH	1. oHH Input 1_ON/OFF action differential gap (upper)	F Pn51	2-10, 3-11
I. oHL	1. oHL Input 1_ON/OFF action differential gap (lower)	F Pn51	2-10, 3-11
I. oLH	1. oLH Input 1_Output limiter high [heat-side]	F Pn51	2-10, 3-11
I.oLHc	1.oLHc Input 1_Output limiter high [cool-side]	F Pn56	2-11, 3-13
I. oLL	1. oLL Input 1_Output limiter low [heat-side]	F Pn51	2-10, 3-11
I.oLLc	1.oLLc Input 1_Output limiter low [cool-side]	F Pn56	2-11, 3-13
I. oRd	1. oRd Input 1_Output change rate limiter (down) [heat-side]	H Fn51	2-18, 3-38
I.oRdc	1.oRdc Input 1_Output change rate limiter (down) [cool-side]	H Fn56	2-19, 3-40
I. oRU	1. oRU Input 1_Output change rate limiter (up) [heat-side]	H Fn51	2-18, 3-38
I.oRUc	1.oRUc Input 1_Output change rate limiter (up) [cool-side]	H Fn56	2-19, 3-40
I. oS	1. oS Input 1_Control action	H Fn51	2-18, 3-38
I. P	1. P Input 1_Proportional band [heat-side]	F Pn51	2-10, 3-11
I.PACT	1.PACT Input 1_Proactive intensity	F Pn51	2-10, 3-11
I. Pb	1. Pb Input 1_PV bias	G Sn21	2-12, 3-16
I. Pc	1. Pc Input 1_Proportional band [cool-side]	F Pn56	2-11, 3-13
I. PdA	1. PdA Input 1_Start determination point	H Fn51	2-18, 3-38
I.PGdP	1.PGdP Input 1_Decimal point position	H Fn21	2-15, 3-25
I.PGSH	1.PGSH Input 1_Input range high	H Fn21	2-15, 3-25
I.PGSL	1.PGSL Input 1_Input range low	H Fn21	2-15, 3-25
I.PHLd	1.PHLd Input 1_Peak hold monitor	G Sn91	2-14, 3-22
I. PLC	1. PLC Input 1_PV low input cut-off	G Sn21	2-12, 3-16
I. PoV	1. PoV Input 1_Input error determination point (high)	H Fn21	2-15, 3-25
I. PSM	1. PSM Input 1_Manipulated output value at input error	H Fn51	2-18, 3-38
I. PR	1. PR Input 1_PV ratio	G Sn21	2-12, 3-16
I. PUN	1. PUN Input 1_Input error determination point (low)	H Fn21	2-15, 3-25
I. RMV	1. RMV Input 1_Manipulated output value at STOP [heat-side]	H Fn51	2-18, 3-38
I.RMVc	1.RMVc Input 1_Manipulated output value at STOP [cool-side]	H Fn56	2-19, 3-40
I. RPT	1. RPT Input 1_Control response parameter	F Pn51	2-10, 3-11
I. SLH	1. SLH Input 1_Setting limiter high	H Fn71	2-21, 3-43
I. SLL	1. SLL Input 1_Setting limiter low	H Fn71	2-21, 3-43
I. SQR	1. SQR Input 1_Square root extraction	H Fn21	2-15, 3-26
I. STU	1. STU Input 1_Startup tuning (ST)	C —	2-7, 3-6
I. SV	1. SV Input 1_Set value (SV)	A —	2-2, 2-3, 2-4, 2-5, 3-4
I. SV	1. SV Input 1_Set value (SV)	F Pn00	2-10, 3-9
I.SVRd	1.SVRd Input 1_Setting change rate limiter (down)	F Pn70	2-11, 3-14
I.SVRU	1.SVRU Input 1_Setting change rate limiter (up)	F Pn70	2-11, 3-14
I.TCJC	1.TCJC Input 1_Temperature compensation calculation	H Fn21	2-15, 3-25
I.TUNE	1.TUNE Input 1_AT/ST status monitor	G Sn53	2-13, 3-19
I.UNI Γ	1.UNIT Input 1_Display unit	H Fn21	2-15, 3-25



Symbol	Name	Mode*	Page
2 (2)			
2. A/M	2. A/M Input 2_Auto/Manual transfer	C —	2-7, 3-6
2.A/M.A	Input 2_Auto/Manual transfer selection (Area)	F Pn70	2-11, 3-14
2.AoVE	2.AoVE Input 2_Action (high) input error	H Fn52	2-19, 3-39
2. ATb	2. ATb Input 2_AT bias	G Sn54	2-13, 3-20
2.ATTM	Input 2_AT remaining time monitor	G Sn54	2-13, 3-20
2. ATU	2. ATU Input 2_Autotuning (AT)	C —	2-7, 3-6
2.AUNE	2.AUNE Input 2_Action (low) input error	H Fn52	2-19, 3-39
2.bHLd	2.bHLd Input 2_Bottom hold monitor	G Sn91	2-14, 3-22
2. boS	2. boS Input 2_Burnout direction	H Fn22	2-15, 3-28
2. d	2. d Input 2_Derivative time	F Pn52	2-10, 3-12
2. dF	Input 2_PV digital filter (RS digital filter)	G Sn22	2-12, 3-16
2.dS.MV	2.dS.MV Show/Hide Input 2_MV	H Fn10	2-15, 3-23
2.dS.SV	2.dS.SV Show/Hide Input 2_SV	H Fn10	2-15, 3-23
2.ExdJ	Input 2_Determination point of external disturbance	G Sn57	2-14, 3-20
2. FF	2. FF Input 2_FF amount	F Pn52	2-10, 3-12
2.HLdR	Input 2_Hold reset	G Sn91	2-14, 3-22
2. I	2. I Input 2_Integral time	F Pn52	2-10, 3-12
2. I NP	2. INP Input 2_Input type	H Fn22	2-15, 3-27
2. I NV	2. INV Input 2_Inverting input	H Fn22	2-15, 3-28
2. LbA	Input 2_Control loop break alarm (LBA) time	F Pn52	2-10, 3-12
2. Lbd	Input 2_LBA deadband (LBD)	F Pn52	2-10, 3-12
2.LEV1	Input 2_Level PID setting 1	G Sn52	2-13, 3-19
2.LEV2	Input 2_Level PID setting 2	G Sn52	2-13, 3-19
2.LEV3	Input 2_Level PID setting 3	G Sn52	2-13, 3-19
2.LEV4	Input 2_Level PID setting 4	G Sn52	2-13, 3-19
2.LEV5	Input 2_Level PID setting 5	G Sn52	2-13, 3-19
2.LEV6	Input 2_Level PID setting 6	G Sn52	2-13, 3-19
2.LEV7	Input 2_Level PID setting 7	G Sn52	2-13, 3-19
2. LHS	2. LHS Input 2_Level PID differential gap	H Fn52	2-19, 3-39
2.LPI d	Input 2_Level PID action selection	H Fn52	2-19, 3-39
2. M.MV	Input 2_Manual manipulated output value	G Sn52	2-13, 3-19
2. MR	Input 2_Manual reset	F Pn52	2-10, 3-12
2. MV	Input 2_Manipulated output value monitor	A —	2-2, 2-3, 2-4, 2-5, 3-4
2. MV.A	Input 2_Manipulated output value (Area)	F Pn70	2-11, 3-14
2. oHH	Input 2_ON/OFF action differential gap (upper)	F Pn52	2-10, 3-12
2. oHL	Input 2_ON/OFF action differential gap (lower)	F Pn52	2-10, 3-12
2. oLH	Input 2_Output limiter high	F Pn52	2-10, 3-12
2. oLL	Input 2_Output limiter low	F Pn52	2-10, 3-12
2. oRd	Input 2_Output change rate limiter (down)	H Fn52	2-19, 3-39
2. oRU	Input 2_Output change rate limiter (up)	H Fn52	2-19, 3-39
2. oS	Input 2_Control action	H Fn52	2-19, 3-39
2. P	Input 2_Proportional band	F Pn52	2-10, 3-12

Symbol	Name	Mode*	Page
2.PACT	2.PACT Input 2_Proactive intensity	F Pn52	2-10, 3-12
2. Pb	2. Pb Input 2_PV bias (RS bias)	G Sn22	2-12, 3-16
2. PdA	2. PdA Input 2_Start determination point	H Fn52	2-19, 3-39
2.PGdP	2.PGdP Input 2_Decimal point position	H Fn22	2-15, 3-27
2.PGSH	2.PGSH Input 2_Input range high	H Fn22	2-15, 3-27
2.PGSL	2.PGSL Input 2_Input range low	H Fn22	2-15, 3-27
2.PHLd	2.PHLd Input 2_Peak hold monitor	G Sn91	2-14, 3-22
2. PLC	2. PLC Input 2_PV low input cut-off	G Sn22	2-12, 3-16
2. PoV	Input 2_Input error determination point (high)	H Fn22	2-15, 3-28
2. PR	2. PR Input 2_PV ratio (RS ratio)	G Sn22	2-12, 3-16
2. PSM	Input 2_Manipulated output value at input error	H Fn52	2-19, 3-39
2. PUN	Input 2_Input error determination point (low)	H Fn22	2-15, 3-28
2PV	2PV Select function for input 2	H Fn58	2-20, 3-41
2PV.LV	2PV.LV PV select transfer level	G Sn58	2-14, 3-21
2PV.TG	2PV.TG Selection of PV select trigger	H Fn58	2-20, 3-41
2PV.TM	2PV.TM PV select transfer time	G Sn58	2-14, 3-21
2. SV	2. SV Input 2_Set value (SV)	A —	2-3, 2-5, 3-4
2. SV	Input 2_Set value (SV)	F Pn00	2-10, 3-9
2. RMV	Input 2_Manipulated output value at STOP	H Fn52	2-19, 3-39
2. RPT	Input 2_Control response parameter	F Pn52	2-10, 3-12
2. SLH	Input 2_Setting limiter high	H Fn72	2-21, 3-44
2. SLL	Input 2_Setting limiter low	H Fn72	2-21, 3-44
2. SQR	Input 2_Square root extraction	H Fn22	2-15, 3-28
2. STU	Input 2_Startup tuning (ST)	C —	2-7, 3-6
2.SVRd	Input 2_Setting change rate limiter (down)	F Pn70	2-11, 3-14
2.SVRU	Input 2_Setting change rate limiter (up)	F Pn70	2-11, 3-14
2.TCJC	Input 2_Temperature compensation calculation	H Fn22	2-15, 3-28
2.TUNE	Input 2_AT/ST status monitor	G Sn54	2-13, 3-20
2.UNI r	Input 2_Display unit	H Fn22	2-15, 3-27
A (A)			
Add	Add Device address	H Fn60	2-20, 3-42
AHS1	Retransmission output 1 scale high	H Fn31	2-16, 3-31
AHS2	Retransmission output 2 scale high	H Fn32	2-16, 3-32
AHS3	Retransmission output 3 scale high	H Fn33	2-17, 3-32
ALC	ALM lamp lighting condition	H Fn10	2-15, 3-23
ALS1	Retransmission output 1 scale low	H Fn31	2-16, 3-32
ALS2	Retransmission output 2 scale low	H Fn32	2-16, 3-32
ALS3	Retransmission output 3 scale low	H Fn33	2-17, 3-32
Ao1	Retransmission output 1 type	H Fn31	2-16, 3-31
Ao2	Retransmission output 2 type	H Fn32	2-16, 3-32
Ao3	Retransmission output 3 type	H Fn33	2-17, 3-32
APT	Memory area soak time monitor	A —	2-2, 2-3, 2-4, 2-5, 3-5
ARE.LK	Area lock	D —	2-8, 3-7



INDEX

Symbol	Name	Mode*	Page
<i>AREA</i>	AREA	Memory area transfer	A — 2-2, 3-5
<i>AREA</i>	AREA	Memory area transfer	E — 2-9, 3-8
<i>AST</i>	AST	Area soak time	F Pn70 2-11, 3-14
B (b) (b)			
<i>bIT</i>	bIT	Data bit configuration	H Fn60 2-20, 3-42
<i>bLINd</i>	bLINd	Select Blind function	D — 2-8, 3-7
<i>bPS</i>	bPS	Communication speed	H Fn60 2-20, 3-42
<i>bTMSp</i>	bTMSp	Bottom suppression function	H Fn57 2-19, 3-40
C (C)			
<i>C.dF</i>	C.dF	Cascade_Digital filter	G Sn58 2-14, 3-21
<i>CMPS</i>	CMPS	Communication protocol	H Fn60 2-20, 3-42
<i>CMRM</i>	CMRM	Communication response monitor	H Fn60 2-20, 3-42
<i>C.SCH</i>	C.SCH	Cascade_Digital filter	G Sn58 2-14, 3-21
<i>C.SCL</i>	C.SCL	Cascade_Scale low	G Sn58 2-14, 3-21
<i>CT1</i>	CT1	Current transformer 1 (CT1) input value monitor	A — 2-2, 2-3, 2-4, 2-5, 3-4
<i>CT2</i>	CT2	Current transformer 2 (CT2) input value monitor	A — 2-2, 2-3, 2-4, 2-5, 3-4
<i>CTA1</i>	CTA1	CT1 assignment	H Fn45 2-18, 3-36
<i>CTA2</i>	CTA2	CT2 assignment	H Fn46 2-18, 3-36
<i>CLC1</i>	CLC1	CT1 low input cut-off	H Fn45 2-18, 3-36
<i>CLC2</i>	CLC2	CT2 low input cut-off	H Fn46 2-18, 3-36
<i>CTR1</i>	CTR1	CT1 ratio	H Fn45 2-18, 3-36
<i>CTR2</i>	CTR2	CT2 ratio	H Fn46 2-18, 3-36
<i>CT1</i>	CT1	CT1 type	H Fn45 2-18, 3-36
<i>CT2</i>	CT2	CT2 type	H Fn46 2-18, 3-36
D (d) (d)			
<i>dbPA</i>	dbPA	Overlap/Deadband reference point	H Fn56 2-19, 3-40
<i>dEF</i>	dEF	Initialization	H Fn91 2-21, 3-44
<i>dIINV</i>	dIINV	DI logic invert	H Fn23 2-16, 3-29
<i>dISL1</i>	dISL1	DI1 function selection	H Fn23 2-16, 3-29
<i>dISL2</i>	dISL2	DI2 function selection	H Fn23 2-16, 3-29
<i>dISL3</i>	dISL3	DI3 function selection	H Fn23 2-16, 3-29
<i>dISL4</i>	dISL4	DI4 function selection	H Fn23 2-16, 3-29
<i>dISL5</i>	dISL5	DI5 function selection	H Fn23 2-16, 3-29
<i>dISL6</i>	dISL6	DI6 function selection	H Fn23 2-16, 3-29
<i>dITIM</i>	dITIM	Area switching time (without area set signal)	H Fn23 2-16, 3-29
<i>doLG1</i>	doLG1	DO1 logic calculation selection	H Fn34 2-17, 3-33
<i>doLG2</i>	doLG2	DO2 logic calculation selection	H Fn34 2-17, 3-33
<i>doLG3</i>	doLG3	DO3 logic calculation selection	H Fn34 2-17, 3-33
<i>doLG4</i>	doLG4	DO4 logic calculation selection	H Fn34 2-17, 3-33
<i>doSL1</i>	doSL1	DO1 function selection	H Fn34 2-17, 3-33
<i>doSL2</i>	doSL2	DO2 function selection	H Fn34 2-17, 3-33
<i>doSL3</i>	doSL3	DO3 function selection	H Fn34 2-17, 3-33
<i>doSL4</i>	doSL4	DO4 function selection	H Fn34 2-17, 3-33

Symbol	Name	Mode*	Page
<i>dS.Mod</i>	dS.Mod	Select hide items in Operation transfer mode	H Fn10 2-15, 3-24
<i>dS.MoN</i>	dS.MoN	Select hide items in Monitor mode	H Fn10 2-15, 3-24
<i>dSoP</i>	dSoP	PV flashing display at input error	H Fn10 2-15, 3-23
<i>dSV</i>	dSV	Set value (SV) of differential temperature input	A — 2-5, 3-4
<i>dSV</i>	dSV	Set value (SV) of differential temperature input	F Pn00 2-10, 3-9
E (E)			
<i>EH1</i>	EH1	Event 1 differential gap	H Fn41 2-17, 3-34
<i>EH2</i>	EH2	Event 2 differential gap	H Fn42 2-17, 3-35
<i>EH3</i>	EH3	Event 3 differential gap	H Fn43 2-17, 3-35
<i>EH4</i>	EH4	Event 4 differential gap	H Fn44 2-18, 3-35
<i>EHo1</i>	EHo1	Event 1 hold action	H Fn41 2-17, 3-34
<i>EHo2</i>	EHo2	Event 2 hold action	H Fn42 2-17, 3-35
<i>EHo3</i>	EHo3	Event 3 hold action	H Fn43 2-17, 3-35
<i>EHo4</i>	EHo4	Event 4 hold action	H Fn44 2-18, 3-35
<i>ES1</i>	ES1	Event 1 type	H Fn41 2-17, 3-34
<i>ES2</i>	ES2	Event 2 type	H Fn42 2-17, 3-35
<i>ES3</i>	ES3	Event 3 type	H Fn43 2-17, 3-35
<i>ES4</i>	ES4	Event 4 type	H Fn44 2-18, 3-35
<i>EV1</i>	EV1	Event 1 set value (EV1)	F Pn40 2-10, 3-9
<i>EV1</i>	EV1	Event 1 set value (EV1) [high]	F Pn40 2-10, 3-9
<i>EV1'</i>	EV1'	Event 1 set value (EV1') [low]	F Pn40 2-10, 3-9
<i>EV2</i>	EV2	Event 2 set value (EV2)	F Pn40 2-10, 3-10
<i>EV2</i>	EV2	Event 2 set value (EV2) [high]	F Pn40 2-10, 3-10
<i>EV2'</i>	EV2'	Event 2 set value (EV2') [low]	F Pn40 2-10, 3-10
<i>EV3</i>	EV3	Event 3 set value (EV3)	F Pn40 2-10, 3-10
<i>EV3</i>	EV3	Event 3 set value (EV3) [high]	F Pn40 2-10, 3-10
<i>EV3'</i>	EV3'	Event 3 set value (EV3') [low]	F Pn40 2-10, 3-10
<i>EV4</i>	EV4	Event 4 set value (EV4)	F Pn40 2-10, 3-10
<i>EV4</i>	EV4	Event 4 set value (EV4) [high]	F Pn40 2-10, 3-10
<i>EV4'</i>	EV4'	Event 4 set value (EV4') [low]	F Pn40 2-10, 3-10
<i>EVA1</i>	EVA1	Event 1 assignment	H Fn41 2-17, 3-34
<i>EVA2</i>	EVA2	Event 2 assignment	H Fn42 2-17, 3-35
<i>EVA3</i>	EVA3	Event 3 assignment	H Fn43 2-17, 3-35
<i>EVA4</i>	EVA4	Event 4 assignment	H Fn44 2-18, 3-35
<i>EVENT</i>	EVENT	Comprehensive event state	A — 2-2, 2-3, 2-4, 2-5, 3-4
<i>EVT1</i>	EVT1	Event 1 timer	H Fn41 2-17, 3-34
<i>EVT2</i>	EVT2	Event 2 timer	H Fn42 2-17, 3-35
<i>EVT3</i>	EVT3	Event 3 timer	H Fn43 2-17, 3-35
<i>EVT4</i>	EVT4	Event 4 timer	H Fn44 2-18, 3-35
<i>EXC</i>	EXC	Energized/De-energized selection	H Fn30 2-16, 3-30
F (F)			
<i>FFST</i>	FFST	FF amount learning	G Sn57 2-14, 3-20
<i>Fn10</i>	Fn10	Function block No. 10: Display	H Fn10 2-15, 3-23



Symbol	Name	Mode*	Page
<i>F_{n11}</i>	F _{n11} Function block No. 11: Key operation	H F _{n11}	2-15, 3-24
<i>F_{n21}</i>	F _{n21} Function block No. 21: Input 1	H F _{n21}	2-15, 3-25
<i>F_{n22}</i>	F _{n22} Function block No. 22: Input 2	H F _{n22}	2-15, 3-27
<i>F_{n23}</i>	F _{n23} Function block No. 23: Digital input	H F _{n23}	2-16, 3-29
<i>F_{n30}</i>	F _{n30} Function block No. 30: Output	H F _{n30}	2-16, 3-30
<i>F_{n31}</i>	F _{n31} Function block No. 31: Retransmission output 1	H F _{n31}	2-16, 3-31
<i>F_{n32}</i>	F _{n32} Function block No. 32: Retransmission output 2	H F _{n32}	2-16, 3-32
<i>F_{n33}</i>	F _{n33} Function block No. 33: Retransmission output 3	H F _{n33}	2-17, 3-32
<i>F_{n34}</i>	F _{n34} Function block No. 34: Digital output	H F _{n34}	2-17, 3-33
<i>F_{n41}</i>	F _{n41} Function block No. 41: Event 1	H F _{n41}	2-17, 3-34
<i>F_{n42}</i>	F _{n42} Function block No. 42: Event 2	H F _{n42}	2-17, 3-35
<i>F_{n43}</i>	F _{n43} Function block No. 43: Event 3	H F _{n43}	2-17, 3-35
<i>F_{n44}</i>	F _{n44} Function block No. 44: Event 4	H F _{n44}	2-18, 3-35
<i>F_{n45}</i>	F _{n45} Function block No. 45: CT1	H F _{n45}	2-18, 3-36
<i>F_{n46}</i>	F _{n46} Function block No. 46: CT2	H F _{n46}	2-18, 3-36
<i>F_{n50}</i>	F _{n50} Function block No. 50: Control	H F _{n50}	2-18, 3-37
<i>F_{n51}</i>	F _{n51} Function block No. 51: Input 1 Control	H F _{n51}	2-18, 3-38
<i>F_{n52}</i>	F _{n52} Function block No. 52: Input 2 Control	H F _{n52}	2-19, 3-39
<i>F_{n55}</i>	F _{n55} Function block No. 55: Position proportioning control	H F _{n55}	2-19, 3-40
<i>F_{n56}</i>	F _{n56} Function block No. 56: Input 1 Cooling control	H F _{n56}	2-19, 3-40
<i>F_{n57}</i>	F _{n57} Function block No. 57: Proactive	H F _{n57}	2-19, 3-40
<i>F_{n58}</i>	F _{n58} Function block No. 58: 2-input function	H F _{n58}	2-20, 3-41
<i>F_{n60}</i>	F _{n60} Function block No. 60: Communication	H F _{n60}	2-20, 3-42
<i>F_{n62}</i>	F _{n62} Function block No. 62: PLC communication	H F _{n62}	2-20, 3-43
<i>F_{n70}</i>	F _{n70} Function block No. 70: Memory area	H F _{n70}	2-20, 3-43
<i>F_{n71}</i>	F _{n71} Function block No. 71: Input 1 Setting limiter	H F _{n71}	2-21, 3-43
<i>F_{n72}</i>	F _{n72} Function block No. 72: Input 2 Setting limiter	H F _{n72}	2-21, 3-44
<i>F_{n91}</i>	F _{n91} Function block No. 91: Sysyem	H F _{n91}	2-21, 3-44
<i>FN.KY</i>	FN.KY FUNC key assignment	H F _{n11}	2-15, 3-24
<i>FN.TYP</i>	FN.TYP FUNC key operation selection	H F _{n11}	2-15, 3-24
H (H)			
<i>HbA1</i>	HbA1 Heater break alarm 1 (HBA1) set value	G Sn45	2-12, 3-17
<i>HbA2</i>	HbA2 Heater break alarm 2 (HBA2) set value	G Sn46	2-13, 3-18
<i>HbC1</i>	HbC1 Number of heater break alarm 1 (HBA1) delay times	G Sn45	2-12, 3-17
<i>HbC2</i>	HbC2 Number of heater break alarm 2 (HBA2) delay times	G Sn46	2-13, 3-18
I (I)			
<i>I CA</i>	ICA Input circuit error alarm set value	H F _{n58}	2-20, 3-41
<i>I ddp</i>	Iddp Integral/Derivative time decimal point position	H F _{n50}	2-18, 3-37
<i>I LR</i>	ILR Interlock release	A —	2-2, 2-3, 2-4, 2-5, 3-5
<i>I LS</i>	ILS Interlock selection	H F _{n30}	2-16, 3-30
<i>I NdT</i>	INDT Input data type	H F _{n21}	2-15, 3-26
<i>I NT</i>	INT Interval time	H F _{n60}	2-20, 3-42

Symbol	Name	Mode*	Page
L (L)			
<i>L/E</i>	L/E Control area Local/External transfer	C —	2-7, 3-6
<i>LCK.LV</i>	LCK.LV Set lock level	D —	2-8, 3-7
<i>LNKA</i>	LNKA Link area number	F Pn70	2-11, 3-14
<i>LoCK</i>	LoCK Set data unlock/lock transfer	D —	2-8, 3-7
M (M)			
<i>MAS.AT</i>	MAS.AT Cascade_AT mode (master-side)	H F _{n58}	2-20, 3-41
<i>MAS.d</i>	MAS.d Cascade_Derivative time (master-side)	G Sn58	2-14, 3-21
<i>MAS.I</i>	MAS.I Cascade_Integral time (master-side)	G Sn58	2-14, 3-21
<i>MAS.P</i>	MAS.P Cascade_Proportional band (master-side)	G Sn58	2-14, 3-21
<i>MoT</i>	MoT Control motor time	H F _{n55}	2-19, 3-40
<i>MP.LTM</i>	MP.LTM Instrument link recognition time	H F _{n62}	2-20, 3-43
<i>MP.MAd</i>	MP.MAd Number of recognizable devices	H F _{n62}	2-20, 3-43
<i>MP.Mod</i>	MP.Mod Monitor item register bias	H F _{n62}	2-20, 3-43
<i>MP.REG</i>	MP.REG Register type	H F _{n62}	2-20, 3-43
<i>MP.SLb</i>	MP.SLb Slave register bias	H F _{n62}	2-20, 3-43
<i>MP.SRH</i>	MP.SRH Register start number (High-order 4-bit)	H F _{n62}	2-20, 3-43
<i>MP.SRL</i>	MP.SRL Register start number (Low-order 16-bit)	H F _{n62}	2-20, 3-43
<i>MP.STb</i>	MP.STb Setting item register bias	H F _{n62}	2-20, 3-43
<i>MP.STM</i>	MP.STM PLC communication start time	H F _{n62}	2-20, 3-43
<i>MP.TMo</i>	MP.TMo PLC response waiting time	H F _{n62}	2-20, 3-43
<i>MT1</i>	MT1 OUT1 minimum ON/OFF time of proportional cycle	G Sn30	2-12, 3-17
<i>MT2</i>	MT2 OUT2 minimum ON/OFF time of proportional cycle	G Sn30	2-12, 3-17
<i>MT3</i>	MT3 OUT3 minimum ON/OFF time of proportional cycle	G Sn30	2-12, 3-17
<i>MVTS</i>	MVTS Manual manipulated output value selection	H F _{n50}	2-18, 3-37
O (O)			
<i>oLA</i>	oLA Integrated output limiter	H F _{n55}	2-19, 3-40
<i>oLG1</i>	oLG1 OUT1 logic calculation selection	H F _{n30}	2-16, 3-30
<i>oLG2</i>	oLG2 OUT2 logic calculation selection	H F _{n30}	2-16, 3-30
<i>oLG3</i>	oLG3 OUT3 logic calculation selection	H F _{n30}	2-16, 3-30
<i>oSL1</i>	oSL1 OUT1 function selection	H F _{n30}	2-16, 3-30
<i>oSL2</i>	oSL2 OUT2 function selection	H F _{n30}	2-16, 3-30
<i>oSL3</i>	oSL3 OUT3 function selection	H F _{n30}	2-16, 3-30
P (P)			
<i>Pd</i>	Pd Hot/Cold start	H F _{n50}	2-18, 3-37
<i>Pn00</i>	Pn00 Parameter group No. 00: Setting	F Pn00	2-10, 3-9
<i>Pn40</i>	Pn40 Parameter group No. 40: Event	F Pn40	2-10, 3-9
<i>Pn51</i>	Pn51 Parameter group No. 51: Input 1 Control	F Pn51	2-10, 3-11
<i>Pn52</i>	Pn52 Parameter group No. 52: Input 2 Control	F Pn52	2-10, 3-12
<i>Pn56</i>	Pn56 Parameter group No. 56: Input 1 Cooling control	F Pn56	2-11, 3-13
<i>Pn70</i>	Pn70 Parameter group No. 70: Memory area	F Pn70	2-11, 3-14
<i>Pos</i>	Pos Feedback adjustment	H F _{n55}	2-19, 3-40
<i>PSL.d</i>	PSL.d Parameter select direct registration	D —	2-8, 3-7



INDEX

Symbol	Name	Mode*	Page
<i>PSL01</i>	PSL01 Parameter select setting 1	D —	2-8, 3-7
<i>PSL02</i>	PSL02 Parameter select setting 2	D —	2-8, 3-7
<i>PSL03</i>	PSL03 Parameter select setting 3	D —	2-8, 3-7
<i>PSL04</i>	PSL04 Parameter select setting 4	D —	2-8, 3-7
<i>PSL05</i>	PSL05 Parameter select setting 5	D —	2-8, 3-7
<i>PSL06</i>	PSL06 Parameter select setting 6	D —	2-8, 3-7
<i>PSL07</i>	PSL07 Parameter select setting 7	D —	2-8, 3-7
<i>PSL08</i>	PSL08 Parameter select setting 8	D —	2-8, 3-7
<i>PSL09</i>	PSL09 Parameter select setting 9	D —	2-8, 3-7
<i>PSL10</i>	PSL10 Parameter select setting 10	D —	2-8, 3-7
<i>PSL11</i>	PSL11 Parameter select setting 11	D —	2-8, 3-7
<i>PSL12</i>	PSL12 Parameter select setting 12	D —	2-8, 3-7
<i>PSL13</i>	PSL13 Parameter select setting 13	D —	2-8, 3-7
<i>PSL14</i>	PSL14 Parameter select setting 14	D —	2-8, 3-7
<i>PSL15</i>	PSL15 Parameter select setting 15	D —	2-8, 3-7
<i>PSL16</i>	PSL16 Parameter select setting 16	D —	2-8, 3-7
<i>PVCY</i>	PVCY Display update cycle	G Sn10	2-12, 3-16
R (R)			
<i>R/L</i>	R/L Remote/Local transfer	C —	2-7, 3-6
<i>R/L.R</i>	R/L.A Remote/Local transfer selection (Area)	F Pn70	2-11, 3-15
<i>R/S</i>	R/S RUN/STOP transfer	C —	2-7, 3-6
<i>RoM</i>	RoM ROM version	H Fn91	2-21, 3-44
S (S)			
<i>SET.KY</i>	SET.KY Data registration	H Fn11	2-15, 3-24
<i>SLV.AR</i>	SLV.AT Cascade_AT mode (slave-side)	H Fn58	2-20, 3-41
<i>SLV.d</i>	SLV.d Cascade_Derivative time (slave-side)	G Sn58	2-14, 3-21
<i>SLV.I</i>	SLV.I Cascade_Integral time (slave-side)	G Sn58	2-14, 3-21
<i>SLV.P</i>	SLV.P Cascade_Proportional band (slave-side)	G Sn58	2-14, 3-21
<i>Sn10</i>	Sn10 Setting group No. 10: Display	G Sn10	2-12, 3-16
<i>Sn21</i>	Sn21 Setting group No. 21: Input 1	G Sn21	2-12, 3-16
<i>Sn22</i>	Sn22 Setting group No. 22: Input 2	G Sn22	2-12, 3-16
<i>Sn30</i>	Sn30 Setting group No. 30: Output	G Sn30	2-12, 3-17
<i>Sn45</i>	Sn45 Setting group No. 45: Heater break alarm 1	G Sn45	2-12, 3-17
<i>Sn46</i>	Sn46 Setting group No. 46: Heater break alarm 2	G Sn46	2-13, 3-18
<i>Sn51</i>	Sn51 Setting group No. 51: Input 1_Control	G Sn51	2-13, 3-18
<i>Sn52</i>	Sn52 Setting group No. 52: Input 2_Control	G Sn52	2-13, 3-19
<i>Sn53</i>	Sn53 Setting group No. 53: Input 1_Tuning	G Sn53	2-13, 3-19
<i>Sn54</i>	Sn54 Setting group No. 54: Input 2_Tuning	G Sn54	2-13, 3-20
<i>Sn55</i>	Sn55 Setting group No. 55: Position proportioning control	G Sn55	2-14, 3-20
<i>Sn57</i>	Sn57 Setting group No. 57: Proactive	G Sn57	2-14, 3-20
<i>Sn58</i>	Sn58 Setting group No. 58: 2-input function	G Sn58	2-14, 3-21
<i>Sn91</i>	Sn91 Setting group No. 91: System	G Sn91	2-14, 3-22
<i>SPCH</i>	SPCH STOP display selection	H Fn10	2-15, 3-23

Symbol	Name	Mode*	Page
<i>SS</i>	SS Output action at control stop	H Fn30	2-16, 3-31
<i>STdP</i>	STdP Soak time unit	H Fn70	2-20, 3-43
<i>STS</i>	STS ST start condition	H Fn50	2-18, 3-37
<i>SVR</i>	SVR Remote setting input value monitor	A —	2-2, 3-4
<i>SVRT</i>	SVRT Setting change rate limiter unit time	H Fn70	2-20, 3-43
T (T)			
<i>T1</i>	T1 OUT1 proportional cycle time	G Sn30	2-12, 3-17
<i>T2</i>	T2 OUT2 proportional cycle time	G Sn30	2-12, 3-17
<i>T3</i>	T3 OUT3 proportional cycle time	G Sn30	2-12, 3-17
<i>TCJ</i>	TCJ Peak hold monitor of ambient temperature	H Fn91	2-21, 3-44
<i>TRGA</i>	TRGA Select Trigger type for Memory area transfer	F Pn70	2-11, 3-14
<i>TRK</i>	TRK SV tracking	H Fn50	2-18, 3-37
U (U)			
<i>UNIo</i>	UNIo Universal output type selection (OUT3)	H Fn30	2-16, 3-31
<i>US</i>	US Undershoot suppression factor	H Fn56	2-19, 3-40
V (V)			
<i>VAL</i>	VAL Valve action at STOP	H Fn55	2-19, 3-40
W (W)			
<i>WT</i>	WT Integrated operating time	H Fn91	2-21, 3-44
Y (Y)			
<i>YASo</i>	YASo Action at saturated output	H Fn55	2-19, 3-40
<i>YbR</i>	YbR Action at feedback resistance (FBR) input error	H Fn55	2-19, 3-40
<i>Ydb</i>	Ydb Open/Close output neutral zone	G Sn55	2-14, 3-20
<i>YHS</i>	YHS Open/Close output differential gap	G Sn55	2-14, 3-20





RKC INSTRUMENT INC.

HEADQUARTERS: 16-6, KUGAHARA 5-CHOME, OHTA-KU TOKYO 146-8515 JAPAN

PHONE: 03-3751-9799 (+81 3 3751 9799)

FAX: 03-3751-8585 (+81 3 3751 8585)

E-mail: info@rkcinst.co.jp

Website: <http://www.rkcinst.com/>





Temperature Controller

FZ110/FZ400/FZ900

Instruction Manual
[Host Communication]



NOTICE

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

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

- Windows is a trademark of Microsoft Corporation.
- Modbus is a registered trademark of Schneider Electric.
- Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.

Safety Precautions

■ Pictorial Symbols (safety symbols)

Various pictorial symbols are used in this manual to ensure safe use of the product, to protect you and other people from harm, and to prevent damage to property. The symbols are described below.

Be sure you thoroughly understand the meaning of the symbols before reading this manual.



WARNING

: This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.



CAUTION

: This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.



: This mark indicates that all precautions should be taken for safe usage.



WARNING

- To prevent injury to persons, damage to the instrument and equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to the instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to the 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 may occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy plant.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
 - If input/output or signal lines within the building are longer than 30 meters.
 - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock to operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- All wiring must be in accordance with local codes and regulations.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as a fuse, circuit breaker, etc.
- A malfunction in this product may occasionally make control operations impossible or prevent alarm outputs, resulting in a possible hazard. Take appropriate measures in the end use to prevent hazards in the event of malfunction.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dissipation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to the instrument display, do not rub with an abrasive material or push the front panel with a hard object.

For Proper Disposal

When disposing of each part used for this instrument, always follows the procedure for disposing of industrial wastes stipulated by the respective local community.



Symbols

■ Pictorial Symbols (safety symbols)



NOTE : This mark indicates important information on installation, handling and operating procedures.



: This mark indicates supplemental information on installation, handling and operating procedures.



: This mark indicates where additional information may be located.

■ Character Symbols

11-segment character

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

7-segment character

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

■ Abbreviation symbols

These abbreviations are used in this manual:

Abbreviation symbols	Name	Abbreviation symbols	Name
PV	Measured value	TC (input)	Thermocouple (input)
SV	Set value	RTD (input)	Resistance temperature detector (input)
MV	Manipulated output value	V (input)	Voltage (input)
AT	Autotuning	I (input)	Current (input)
ST	Startup tuning	HBA (1, 2)	Heater break alarm (1, 2)
OUT (1 to 3)	Output (1 to 3)	CT (1, 2)	Current transformer (1, 2)
DI (1 to 6)	Digital input (1 to 6)	LBA	Control loop break alarm
DO (1 to 4)	Digital output (1 to 4)	LBD	LBA deadband
FBR	Feedback resistance		



Document Configuration

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

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

http://www.rkcinst.com/english/manual_load.htm.

Manual	Manual Number	Remarks
FZ110/FZ400/FZ900 Installation Manual	IMR03A01-E□	This manual is enclosed with instrument. This manual explains the mounting and wiring.
FZ110/FZ400/FZ900 Quick Operation Manual	IMR03A02-E□	This manual is enclosed with instrument. This manual explains the basic key operation, mode menu, and data setting.
FZ110/FZ400/FZ900 Parameter List	IMR03A03-E□	This manual is enclosed with instrument. This list is a compilation of the parameter data of each mode.
FZ110/FZ400/FZ900 Instruction Manual [Part 1: Hardware]	IMR03A04-E□	This manual describes installation, wiring, troubleshooting and product specification.
FZ110/FZ400/FZ900 Instruction Manual [Part 2: Parameters/Functions]	IMR03A05-E□	Parameters: This manual describes how to switch the operation modes and parameters, the range of parameters, and initialization/automatic conversion associated with the change of settings. Functions: This manual describes how to set up and each function.
FZ110/FZ400/FZ900 Instruction Manual [Host Communication]	IMR03A07-E3	This manual you are reading now. This manual explains RKC communication protocol (ANSI X3.28-1976) and Modbus relating to communication parameters setting.
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]	IMR03A08-E□	This manual describes how to set up the instrument for communication with a programmable controller (PLC).



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



About This Manual

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

	What do you want to do?	See the following section for more details
☐	I want to know the features of the host communication	1. OUTLINE
☐	I want to know how to connect to the host computer	2. WIRING
☐	I want to know how to connect to the loader communication device	2. WIRING
☐	I want to know how to set up the communication parameters	3. PARAMETER SETTING
☐	I want to know the content of RKC communication protocol	4. RKC COMMUNICATION PROTOCOL
☐	I want to know the content of Modbus protocol	5. MODBUS PROTOCOL
☐	I want to know how to use Modbus data mapping	5. MODBUS PROTOCOL
☐	I want to know how to use Memory area data	5. MODBUS PROTOCOL
☐	I want to check the data map structure	6. COMMUNICATION DATA LIST
☐	I want to know how to read the table	6. COMMUNICATION DATA LIST
☐	I want to check RKC communication/Modbus (double word) [data register address, data attribute, data range and factory set values]	6. COMMUNICATION DATA LIST
☐	I want to check Modbus data register address (single word)	6. COMMUNICATION DATA LIST
☐	I want to check the communication data register address equivalent to the FB series	6. COMMUNICATION DATA LIST
☐	I want to know how to cope with errors	7. TROUBLESHOOTING
☐	I want to know the specification of the host communication	8. SPECIFICATIONS
☐	I want to see the table of ASCII/JIS 7-bit code	A. APPENDIX

Contents

	Page
NOTICE	
Safety Precautions	i-1
■ Pictorial Symbols (safety symbols)	i-1
WARNING	i-1
CAUTION	i-2
For Proper Disposal	i-2
Symbols	i-3
■ Pictorial Symbols (safety symbols)	i-3
■ Character Symbols	i-3
■ Abbreviation symbols	i-4
Document Configuration	i-5
About This Manual	i-6

1. OUTLINE.....1-1

Chapter 1 describes the host communication of FZ110/400/900.

2. WIRING 2-1

Chapter 2 describes how to connect to the host computer.

2.1 Wiring Cautions	2-2
2.2 Wiring for Host Communication	2-3
2.2.1 Connection to the RS-485 port of FZ110/400/900	2-3
■ Communication terminal number and signal details	2-3
■ Connection to the RS-485 port of the host computer (master)	2-4
■ Connection to the RS-232C port of the host computer (master)	2-5
■ Connection to the USB of the host computer (master)	2-6
2.2.2 Connection to the RS-422A port of FZ400/900	2-7
■ Communication terminal number and signal details	2-7
■ Connection to the RS-422A port of the host computer (master)	2-8
■ Connection to the RS-232C port of the host computer (master)	2-9
■ Connection to the USB of the host computer (master)	2-10
2.3 Connections for Loader Communication	2-11
■ Position of loader communication connector	2-11
■ Wiring method	2-11



3. PARAMETER SETTING 3-1

Chapter 3 describes how to set up parameters necessary for the host communication.

3.1 Setting of Communication Parameter	3-2
3.1.1 Description of each parameter	3-2
3.1.2 Setting procedure	3-4
3.2 Selection of Communication Data Type	3-5
3.2.1 Communication data type	3-5
3.2.2 Description of each parameter	3-6
3.2.3 Setting procedure	3-7
3.3 Communication Requirements	3-8
■ Processing times during data send/receive	3-8
■ RS-485 (2-wire system) send/receive timing (RKC communication).....	3-9
■ Fail-safe	3-9

4. RKC COMMUNICATION PROTOCOL.....4-1

Chapter 4 describes the RKC communication protocol.

4.1 Polling.....	4-2
4.1.1 Polling procedures	4-3
4.1.2 Polling procedure example.....	4-7
4.2 Selecting.....	4-8
4.2.1 Selecting procedures	4-8
4.2.2 Selecting procedure example.....	4-12

5. MODBUS PROTOCOL 5-1

Chapter 5 describes the Modbus protocol.

5.1 Message Format.....	5-2
5.2 Function Code	5-3
5.3 Communication Mode.....	5-3
5.4 Slave Responses.....	5-4
5.5 Calculating CRC-16.....	5-5
5.6 Register Read and Write	5-8
■ Read holding registers [03H]	5-8
■ Preset single register [06H].....	5-10
■ Diagnostics (Loopback test) [08H]	5-11
■ Preset multiple registers (Write multiple registers) [10H].....	5-12
5.7 Caution for Handling Communication Data	5-13
5.8 How to Use Modbus Data Mapping	5-15
5.9 How to Use Memory Area Data	5-18
5.9.1 Read and write of memory area data.....	5-18
5.9.2 Control area transfer	5-21



6. COMMUNICATION DATA LIST 6-1

Chapter 6 describes the communication data.

6.1 Data Map Structure	6-2
6.1.1 Structure of RKC Communication/Modbus (Double Word) data map	6-2
6.1.2 Structure of Modbus (Single Word) data map	6-4
6.2 How to Read the Table	6-5
■ Data map of RKC communication identifiers/Modbus double word	6-5
■ Data map of Modbus single word	6-7
■ Data map of FB series equivalent communication	6-8
6.3 RKC Communication/Modbus (Double Word) Data.....	6-9
6.3.1 Communication data [RKC communication identifier/ Modbus double word]	6-9
6.3.2 Memory area data (Direct designation method) [Modbus double word]	6-76
6.3.3 Data mapping address [Modbus double word]	6-101
6.4 Modbus (Single Word) Data	6-106
6.4.1 FZ110/400/900 communication data [Modbus single word]	6-106
6.4.2 Memory area data (Direct designation method) [Modbus single word]	6-119
6.4.3 Data mapping address [Modbus single word].....	6-131
6.4.4 FB series equivalent communication data [Modbus single word].....	6-135
6.4.5 Memory area data equivalent to the FB series (Area designation method) [Modbus single word]	6-149

7. TROUBLESHOOTING 7-1

Chapter 7 describes how to cope with errors during the communication.

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

8. SPECIFICATIONS 8-1

Chapter 8 describes the specification of the host communication.

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

A. APPENDIX..... A-1

A.1 ASCII 7-Bit Code Table	A-2
A.2 Communication Data Equivalent to Our REX-D Series.....	A-3
A.3 Communication Data Equivalent to Our REX-F400/700/900.....	A-4

INDEX..... B-1



MEMO



OUTLINE

1

This chapter describes the host communication of FZ110/400/900.

The communication function makes it possible to monitor and set the data of the Temperature Controller FZ110/400/900 from a host computer. The FZ110/400/900 interfaces with the host computer via Modbus or RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4) protocols. Communication function is available only when optional communication function has been specified at the time of ordering.

In addition, the controller FZ110/400/900 is equipped standard with a loader communication connector. Therefore, loader communication is possible. For reference purposes, the Modbus protocol identifies the host computer as master, the controller as slave.

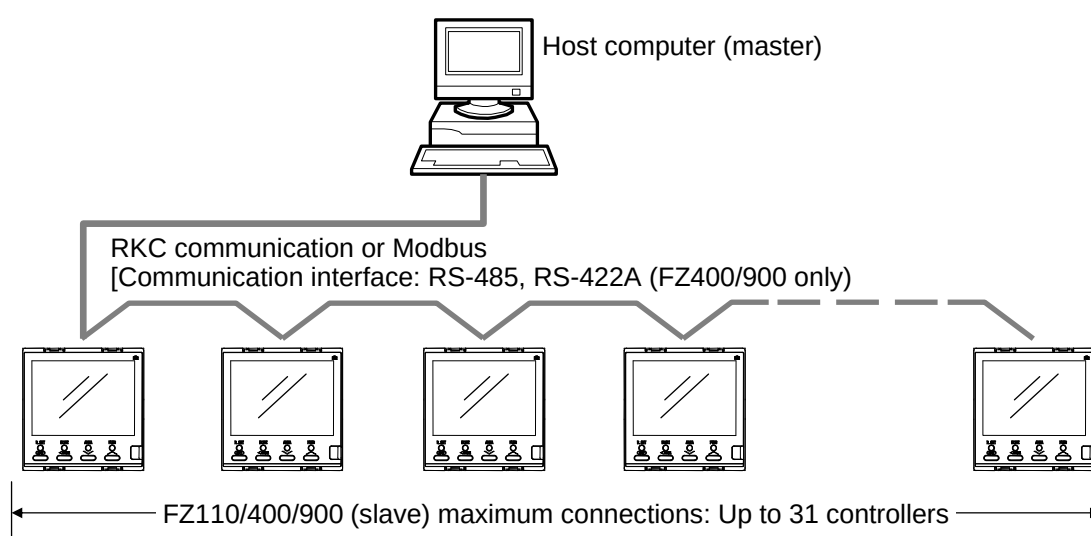
■ Host communication (RKC communication, Modbus) [Optional]

Communication interface: RS-485

RS-422A (FZ400/900 only)

● Multi-drop connection (Communication interface: RS-485)

One host computer (master) can communicate with up to 31 FZ110/400/900s.



● Communication data type

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

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

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

● RKC communication

- 7 digits data, Communication data of FZ110/400/900
- 6 digits data, Communication data of FZ110/400/900
- 6 digits data, Communication data equivalent to our REX-D series (RKC communication identifiers are compatible)

The RKC communication identifiers for the REX-D series can be used to handle the communication data of the FZ110/400/900 corresponding to the REX-D series.

If there is no relevant communication data on the FZ110/400/900, dummy data is used.

● Modbus

- Double word, Communication data of FZ110/400/900
- Single word, Communication data of FZ110/400/900
- Single word, Communication data equivalent to our FB series (Modbus register addresses are compatible)

The Modbus register addresses for the FB series can be used to handle the communication data of the FZ110/400/900 corresponding to the FB series.

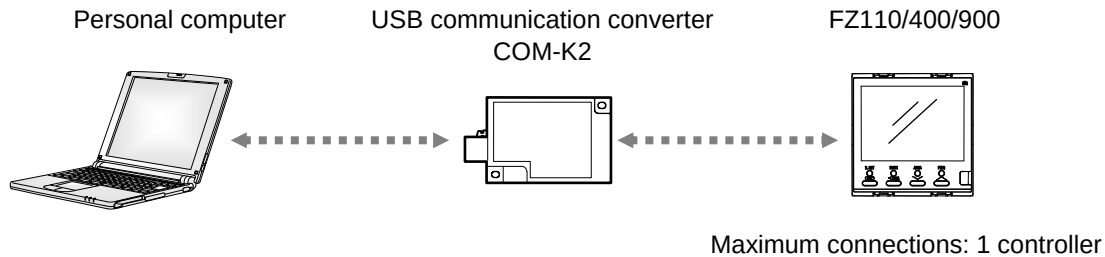
If there is no relevant communication data on the FZ110/400/900, the data is handled as unused data.

■ Loader communication

Loader communication allows FZ110/400/900 data to be set from a personal computer.

By saving the data that was set using our Communication Tool PROTEM2 to a computer, the data can be transferred to other FZ110/400/900s, allowing setup to be accomplished much more quickly than when the data is set in each FZ110/400/900 using the front panel keys.

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



NOTE

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



Loader communication can be used on a FZ110/400/900 even when the Communication function (optional) is not installed.



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



A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM 2 is used using a COM-K, the PROTEM2 will not be supported by Windows 8 or later.

■ PLC communication

The PLC communication function makes it possible to monitor and set the data of the Temperature Controller FZ110/400/900 from a programmable controller (PLC).

The FZ110/400/900 can be connected to the programmable controller (PLC) without using any program.



This manual describes the host communication (RKC communication and Modbus).
For the PLC communication, refer to **FZ110/FZ400/FZ900 Instruction Manual [PLC Communication] (IMR03A08-E□)**.



■ Communication Tool PROTEM2

PROTEM2 is an integrated configuration support software to manage parameter setting and measured values of our controllers and consists of the following tools:

- Base Tool:
Used to set/verify controller parameters.
- Recipe Tool:
Used to conduct overall management of parameter set values of our controllers (storing to a computer and transfer to other controllers.)
- Logger Tool:
Used to visualize various data with graphs and perform data logging in CSV format.
- Configuration Tool:
Used to configure virtual controllers for the Base Tool. *
* PROTEM2 handles controllers as the unit of a project.
Controllers connected to the project are called “Virtual controllers.”



PROTEM2 requires Microsoft.NET Framework 4 to be installed on the computer.



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



The PROTEM2 can be downloaded from the official RKC website:
<http://www.rkcinst.com>



WIRING

2

This chapter describes how to connect to the host computer.

2.1 Wiring Cautions.....	2-2
2.2 Wiring for Host Communication	2-3
2.2.1 Connection to the RS-485 port of FZ110/400/900	2-3
■ Communication terminal number and signal details	2-3
■ Connection to the RS-485 port of the host computer (master)	2-4
■ Connection to the RS-232C port of the host computer (master).....	2-5
■ Connection to the USB of the host computer (master)	2-6
2.2.2 Connection to the RS-422A port of FZ400/900	2-7
■ Communication terminal number and signal details	2-7
■ Connection to the RS-422A port of the host computer (master).....	2-8
■ Connection to the RS-232C port of the host computer (master).....	2-9
■ Connection to the USB of the host computer (master)	2-10
2.3 Connections for Loader Communication	2-11
■ Position of loader communication connector	2-11
■ Wiring method.....	2-11

⚠ WARNING

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

2.1 Wiring Cautions

- To avoid noise induction, keep communication wire away from instrument power line, load lines and power lines of other electric equipment.
- Use the solderless terminal appropriate to the screw size.
Screw size: M3×7 (with 5.8×5.8 square washer)
Recommended tightening torque:

0.4 N·m [4 kgf·cm]

Applicable wire: Solid/twisted wire of 0.25 to 1.65 mm²

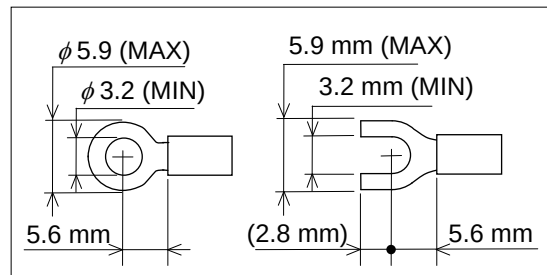
Specified dimension:

Refer to Fig. at the right

Specified solderless terminal:

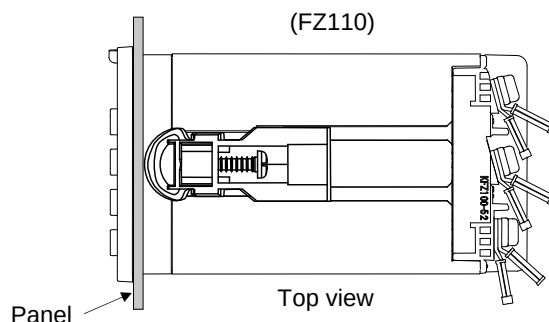
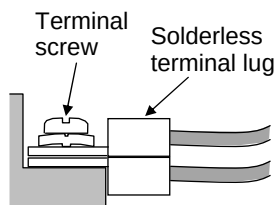
Manufactured by J.S.T MFG CO., LTD.

Circular terminal with isolation V1.25 MS3



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

Two solderless terminals are used overlapped.



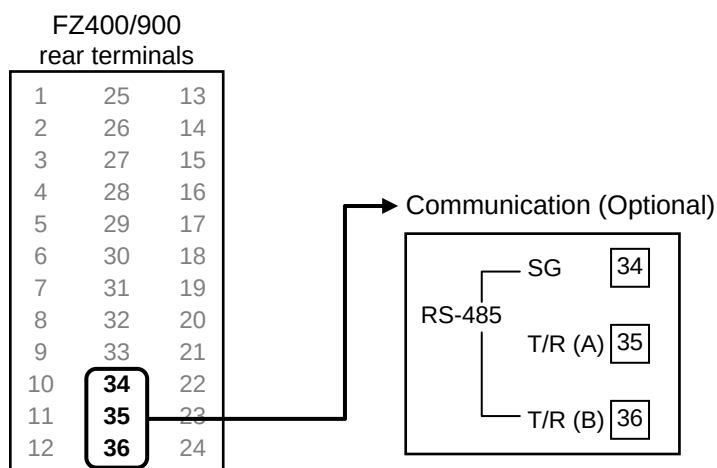
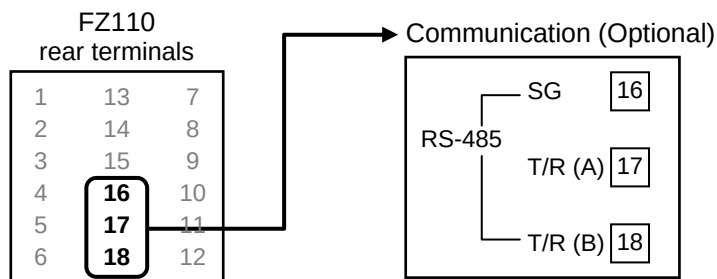
(FZ110 is used in the example shown, but restrictions for crossover wiring are the same for FZ400/900.)

2.2 Wiring for Host Communication

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

2.2.1 Connection to the RS-485 port of FZ110/400/900

■ Communication terminal number and signal details

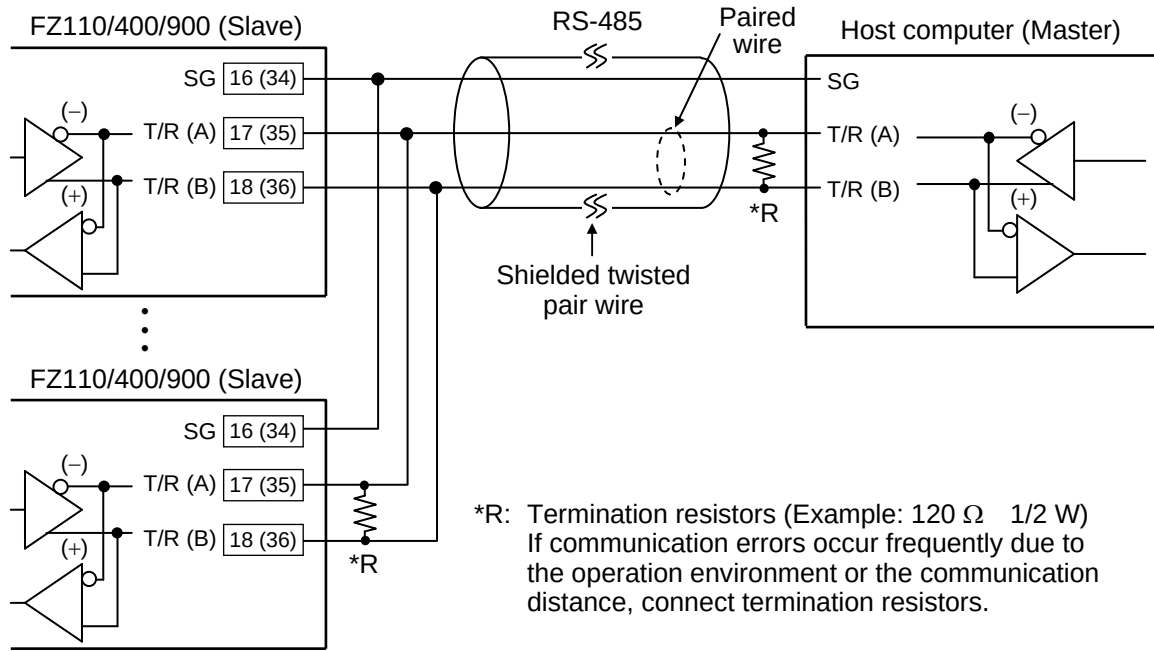


RS-485

FZ110 terminal No.	FZ400/900 terminal No.	Symbol	Signal name
16	34	SG	Signal ground
17	35	T/R (A)	Send data/Receive data
18	36	T/R (B)	Send data/Receive data

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

● Wiring example



Maximum connections: Up to 31 FZ110/400/900s

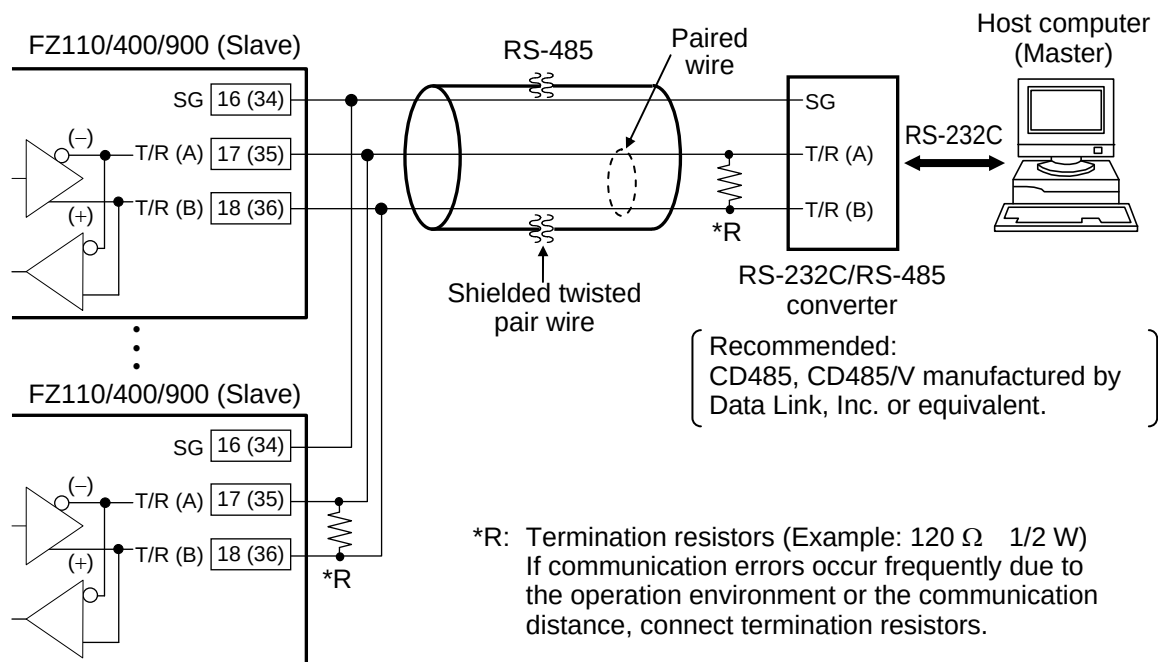


The communication cable and termination resistor(s) must be provided by the customer.

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

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

● Wiring example

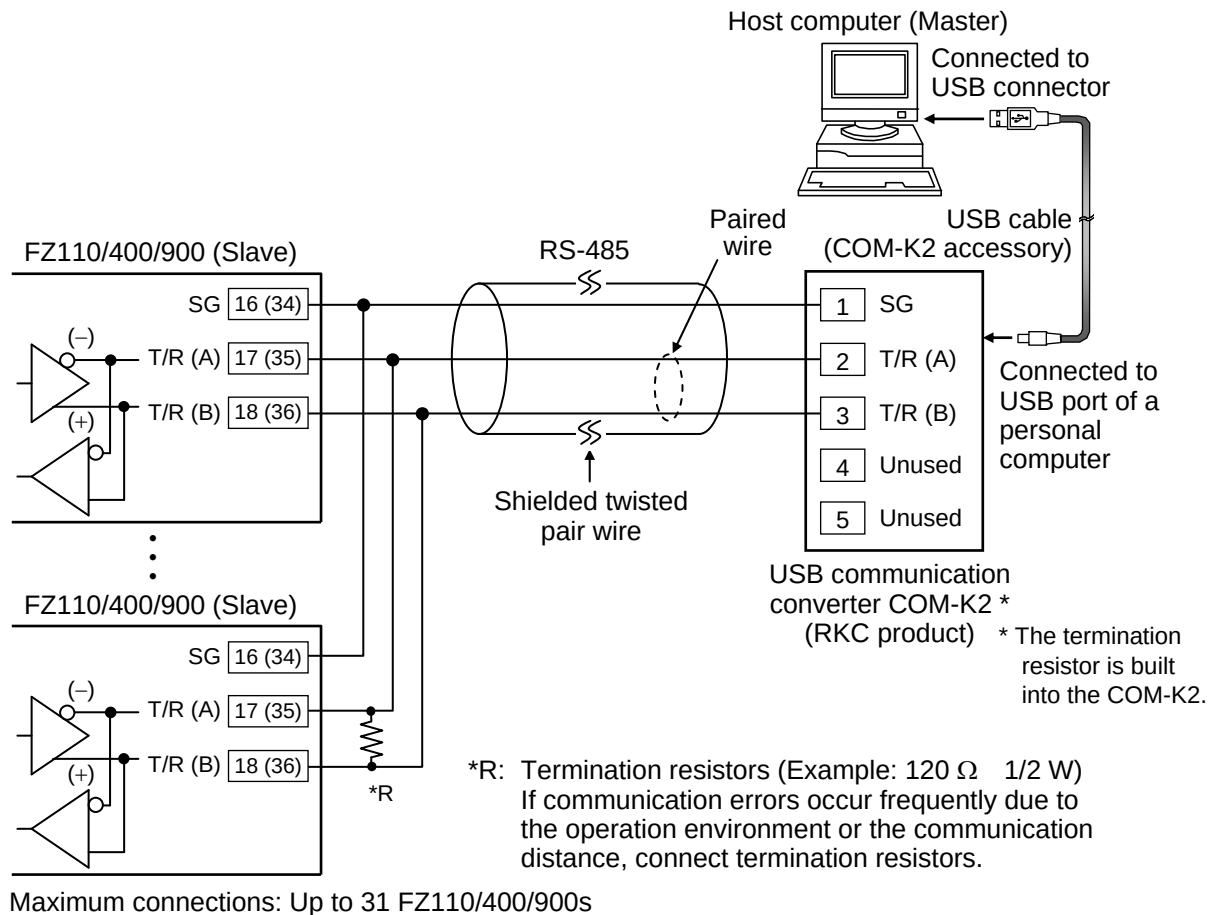


The communication cable and termination resistor(s) must be provided by the customer.

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

Connect the USB communication converter between the host computer and the FZ110/400/900.

● Wiring example



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



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

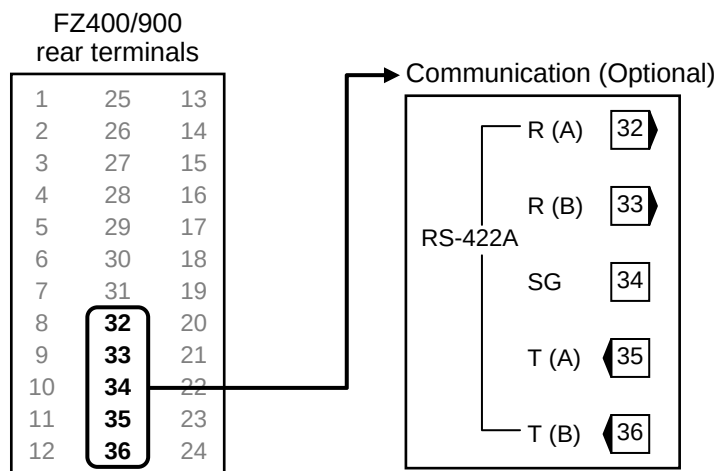
For the COM-K2, refer to the **COM-K2 Instruction Manual**.



A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM 2 is used using a COM-K, the PROTEM2 will not be supported by Windows 8 or later.

2.2.2 Connection to the RS-422A port of FZ400/900

■ Communication terminal number and signal details

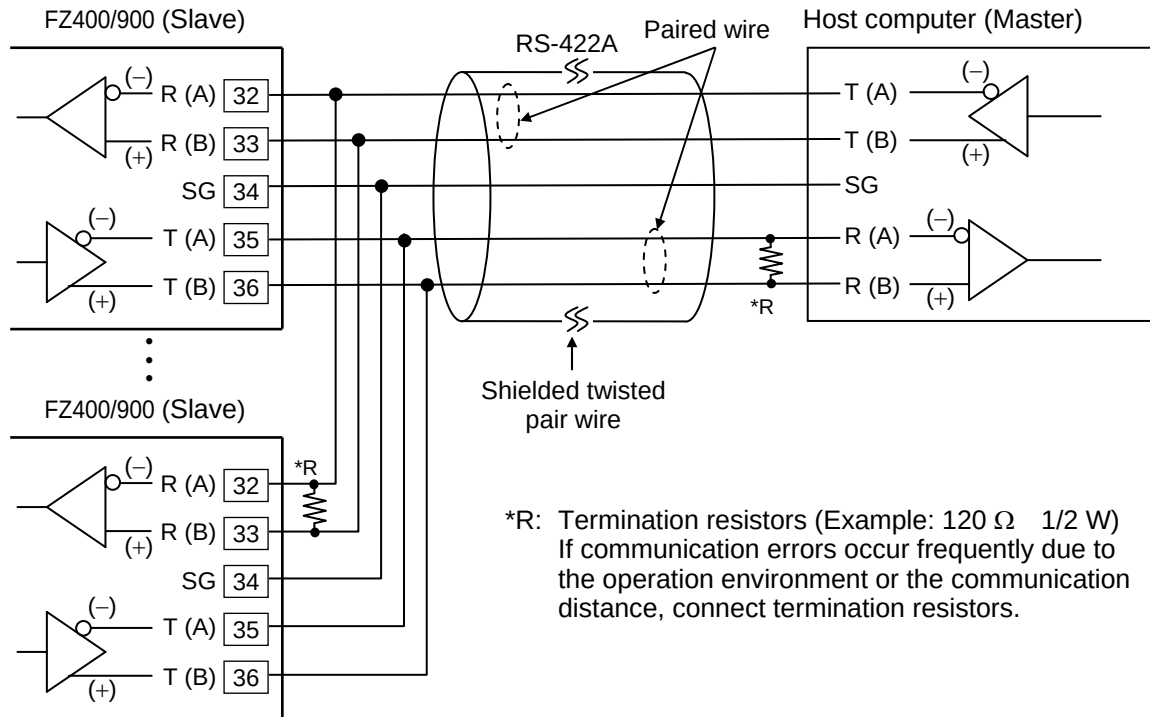


RS-422A

FZ400/900 terminal No.	Symbol	Signal name
32	R (A)	Receive data
33	R (B)	Receive data
34	SG	Signal ground
35	T (A)	Send data
36	T (B)	Send data

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

● Wiring example



Maximum connections: Up to 31 FZ400/900s

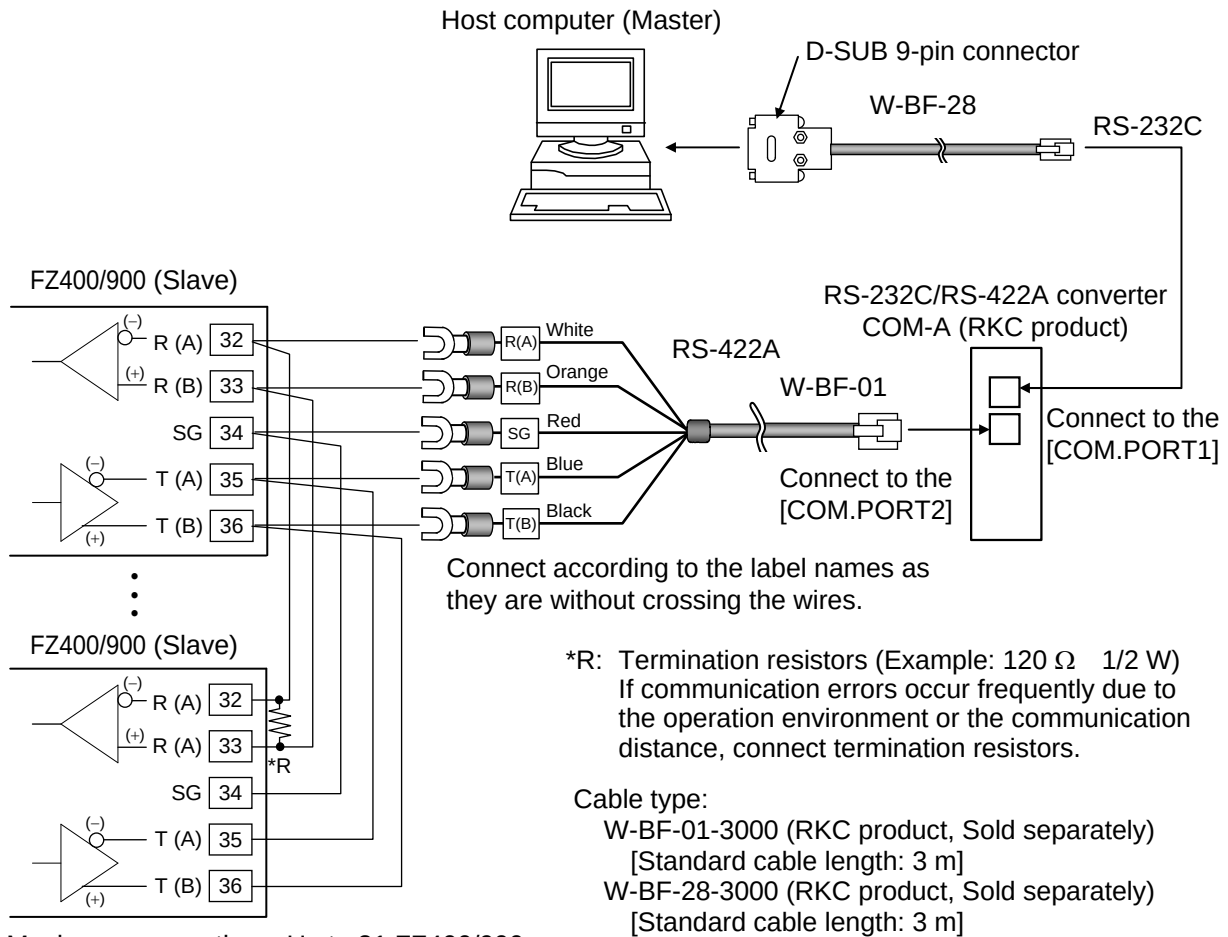


The cable and termination resistor(s) must be provided by the customer.

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

A RS-232C/RS-422A converter is required.

● Wiring example



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



W-BF-01 or W-BF-28 communication cable (RKC product) can be used as communication cable (sold separately). If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.

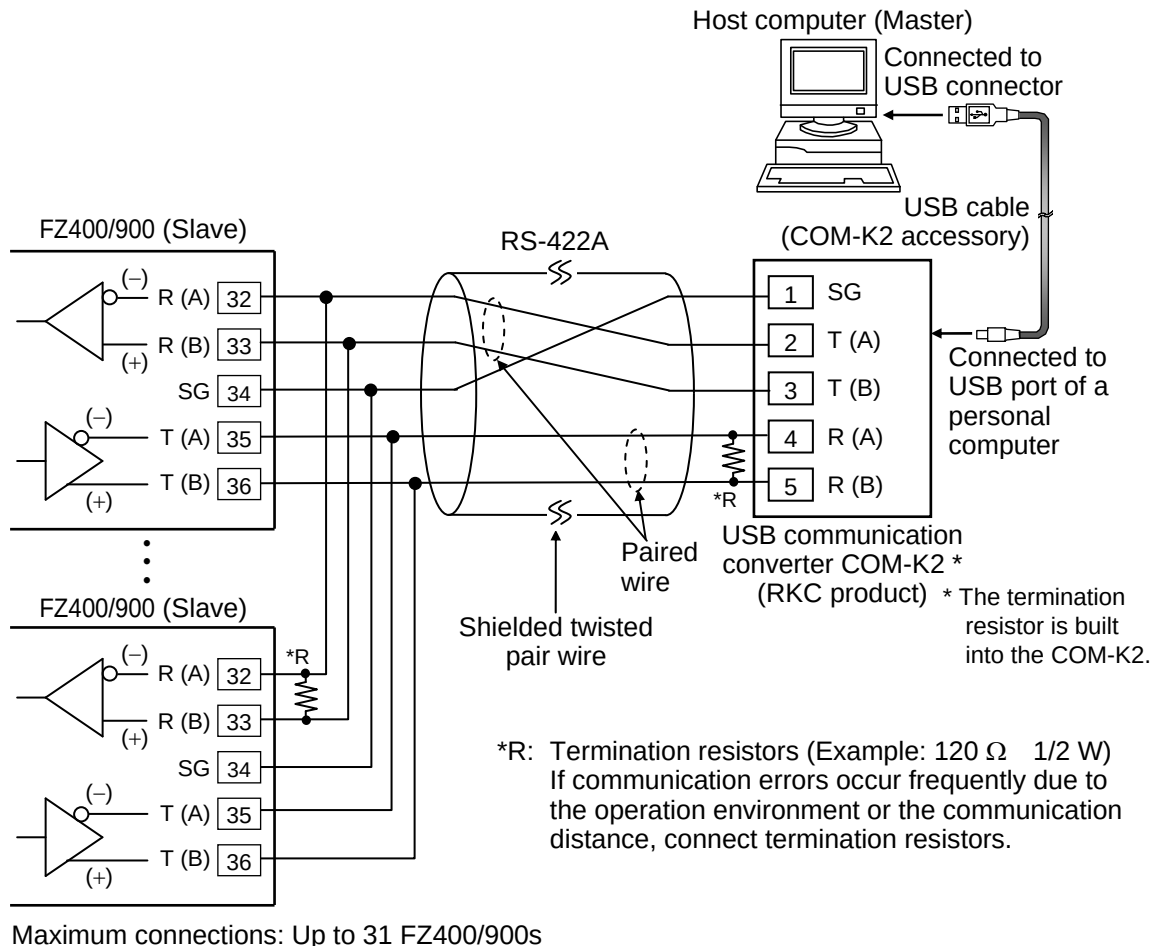


Recommended RS-232C/RS-422A converter: **COM-A** (RKC product)
For the COM-A, refer to the **COM-A/COM-B Instruction Manual**.

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

Connect the USB communication converter between the host computer and the FZ400/900.

● Wiring example



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



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

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

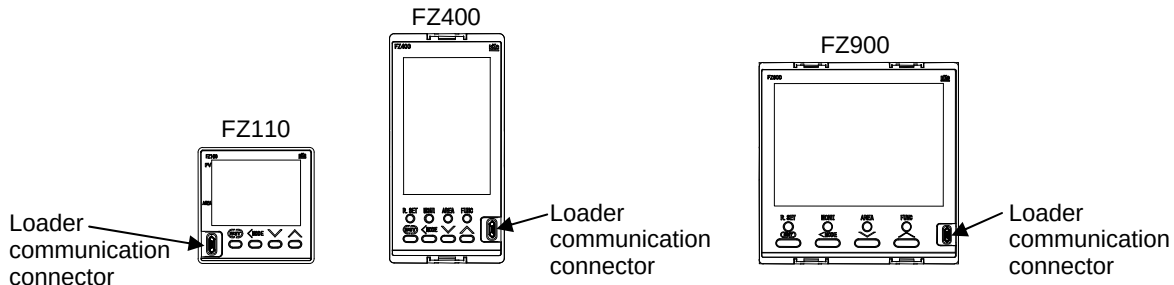


A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM 2 is used using a COM-K, the PROTEM2 will not be supported by Windows 8 or later.

2.3 Connections for Loader Communication

■ Position of loader communication connector

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



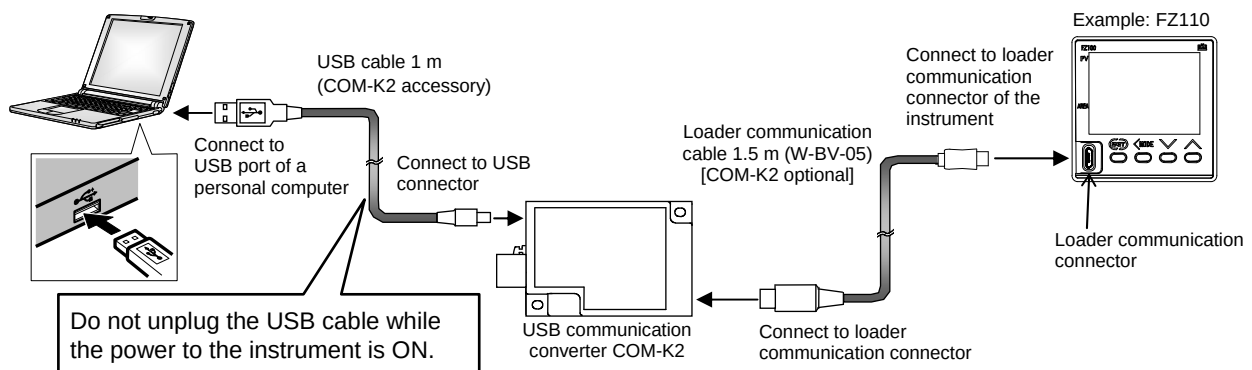
■ Wiring method

Connect the FZ110/400/900, COM-K2, and personal computer using a USB cable and a loader communication cable. Make sure the connectors are oriented correctly when connecting.



NOTE

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



- Communication Tool
PROTEM2
Software operation environment:
Consult the manual that you downloaded
- Communication settings on the computer
(The following values are all fixed)
Communication speed: 38400 bps
Start bit: 1
Data bit: 8
Parity bit: Without
Stop bit: 1
- Communication port of host computer
USB port: Based on USB Ver. 2.0



- The device address of the loader communication is fixed at "0." The setting of the device address is disregarded.
- The loader communication corresponds to the RKC communication protocol "Based on ANSI X3.28-1976 subcategories 2.5 and A4."
- Loader communication can be used on a FZ110/400/900 even when the Communication function (optional) is not installed.



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



When using the loader communication, USB driver for COM-K2 must be installed on the personal computer.

The USB driver for COM-K2 can be downloaded the official RKC website:
<http://www.rkcinst.com>



A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM 2 is used using a COM-K, the PROTEM2 will not be supported by Windows 8 or later.



When the instrument is powered off, power can be supplied to the instrument from COM-K2 (or COM-K version 1). This function is exclusive for parameter setting, and the instrument functions as follows.

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



While the instrument is powered by COM-K2 (or COM-K version 1), if power is applied to the instrument, the instrument will be reset and starts for normal operation.



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



PARAMETER SETTING

3

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

3.1 Setting of Communication Parameter	3-2
3.1.1 Description of each parameter	3-2
3.1.2 Setting procedure	3-4
3.2 Selection of Communication Data Type	3-5
3.2.1 Communication data type	3-5
3.2.2 Description of each parameter	3-6
3.2.3 Setting procedure	3-7
3.3 Communication Requirements	3-8
■ Processing times during data send/receive	3-8
■ RS-485 (2-wire system) send/receive timing (RKC communication)	3-9
■ Fail-safe	3-9



3.1 Setting of Communication Parameter

3.1.1 Description of each parameter

To establish communication between host computer (master) and FZ110/400/900 (slave), it is necessary to set the following parameters. The communication related parameters can be found in the Function block No. 60: communication (5C1) of Engineering mode.

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

■ Function block No. 60: Communication (5C1)

No.	Symbol	Name	Data range	Description	Factory set value
—	<i>F_n60</i>	Function block No. 60	This is the first parameter symbol of Function block No. 60.		—
282	<i>CMPS</i>	Communication protocol	0: RKC communication 1: Modbus (Order of data transfer: high-order word to low-order word) 2: Modbus (Order of data a transfer: low-order word to high-order word) 3: PLC communication (MITSUBISHI MELSEC series special protocol QnA-compatible 3C frame [format 4]) Do not set for the host communication.	Select the communication protocol type.	When the communication protocol is specified at the time of order, the specified communication protocol will be the factory set value. With communication, communication protocol not specified: 0
283	<i>Add</i>	Device address	RKC communication: 0 to 99 Modbus: 1 to 99	Do not use the same device address for more than one FZ110/400/900 in multi-drop connection. Each FZ110/400/900 must have a unique address in multi-drop connection.	RKC communication: 0 Modbus: 1
284	<i>bPS</i>	Communication speed	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps	Set the same communication speed for both the FZ110/400/900 (slave) and the host computer (master).	3
285	<i>bit</i>	Data bit configuration	0 to 11 Refer to Data bit configuration table (P. 3-3)	Set the same data bit configuration for both the FZ110/400/900 (slave) and the host computer (master).	0
286	<i>INT</i>	Interval time	0 to 250 ms	The Interval time is the waiting time between the receipt of the message from the host computer and the transmission of the reply message from FZ110/400/900. Adjust the interval time when the switchover between send and receive is not appropriate.	10
287	<i>CMRM</i>	Communication response monitor	Refer to ● Communication response monitor (P. 3-3)	Displays the communication state.	—

Data bit configuration table

Set value	Data bit	Parity bit	Stop bit
0	8	Without	1
1	8	Without	2
2	8	Even	1
3	8	Even	2
4	8	Odd	1
5	8	Odd	2

Set value	Data bit	Parity bit	Stop bit
6	7	Without	1
7	7	Without	2
8	7	Even	1
9	7	Even	2
10	7	Odd	1
11	7	Odd	2

■ : Not settable for Modbus


Interval time:

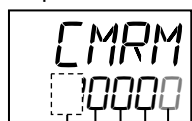
The interval time for the FZ110/400/900 should be set to provide a time for host computer to finish sending all data including stop bit and to switch the line to receive status for the host. If the interval time between the two is too short, the FZ110/400/900 may send data before the host computer is ready to receive it. In this case, communication transmission cannot be conducted correctly.



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

● Communication response monitor

Communication response monitor



SV display unit

Communication response monitor

0: Normal response

1: Overrun error

2: Parity error

4: Framing error

8: Receive buffer overflow

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

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

0 (fixed)

Reception status monitor

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

Transmission status monitor

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

Lights off

3.1.2 Setting procedure

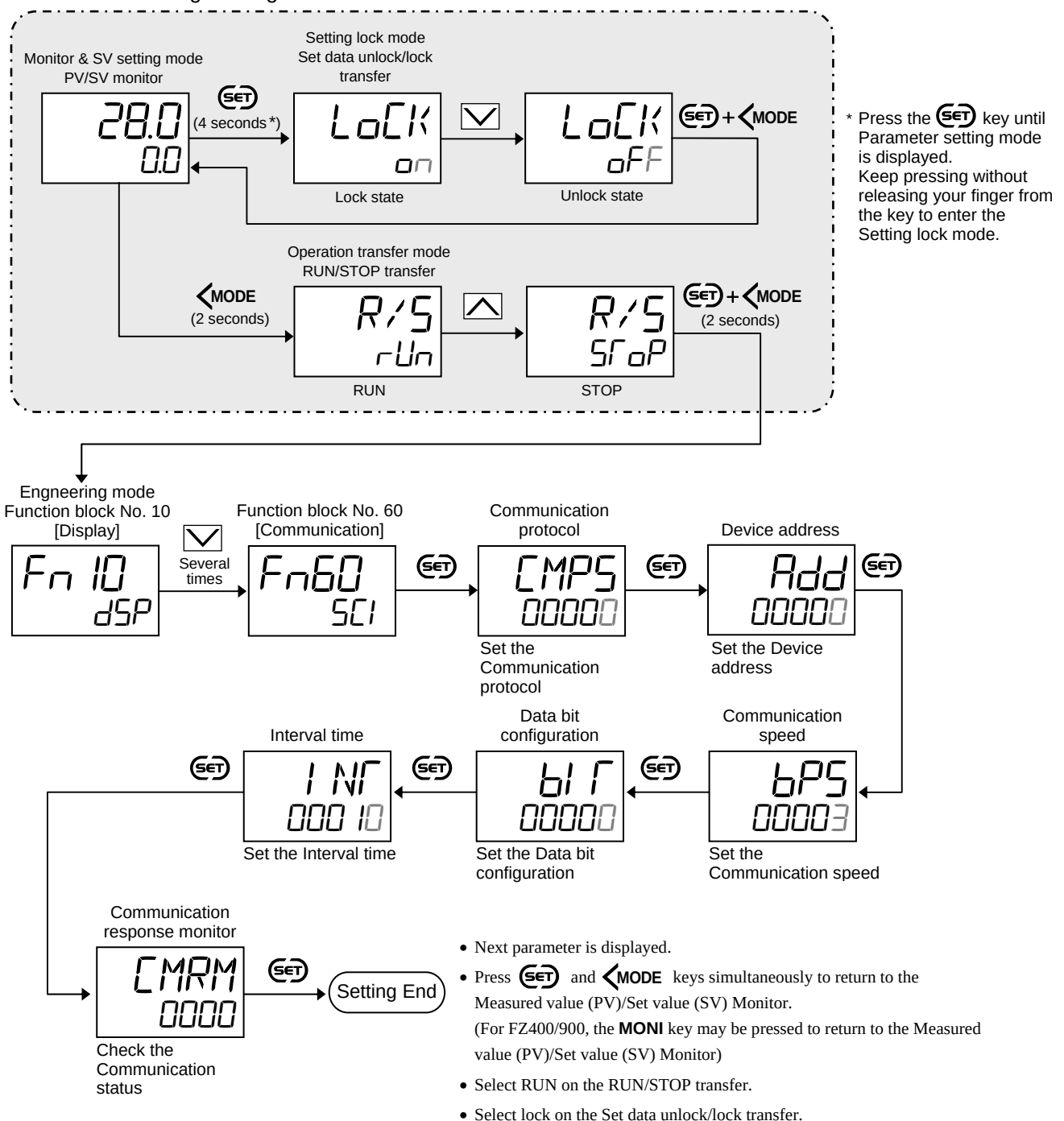
The communication related parameters can be found in the Function block No. 60: Communication (SCI) of Engineering mode.

Set value change and registration

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

■ Setting procedure

To enter the Engineering mode



3.2 Selection of Communication Data Type

3.2.1 Communication data type

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

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

■ RKC communication

Communication data type	Set value of Input data type
• 7 digits data, Communication data of FZ110/400/900	0
• 6 digits data, Communication data of FZ110/400/900	1
• 6 digits data, Communication data equivalent to our REX-D series (RKC communication identifiers are compatible) The RKC communication identifiers for the REX-D series can be used to handle the communication data of the FZ110/400/900 corresponding to the REX-D series. If there is no relevant communication data on the FZ110/400/900, dummy data is used.	2

For the data map of RKC communication, **6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-9)**.

■ Modbus

Communication data type	Set value of Input data type
• Double word, Communication data of FZ110/400/900 For details, refer to the 6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-9) .	0
• Single word, Communication data of FZ110/400/900 For details, refer to the 6.4.1 FZ110/400/900 communication data [Modbus single word] (P. 6-106) .	1
• Single word, Communication data equivalent to our FB series (Modbus register addresses are compatible) The Modbus register addresses for the FB series can be used to handle the communication data of the FZ110/400/900 corresponding to the FB series. If there is no relevant communication data on the FZ110/400/900, the data is handled as unused data. For details, refer to the 6.4.4 FB series equivalent communication data [Modbus single word] (P. 6-135) .	1 (or 2*)

* Select "2" only when you need to handle the REX-D equivalent data in RKC communication.



3.2.2 Description of each parameter

Communication data type can be selected at Input data type (*I Ndf*). The Input data type can be found in the Function block No. 21: Input 1 (*I I nP*) of Engineering mode.

■ Function block No. 21: Input 1 (*I I nP*)

No.	Symbol	Name	Data range	Description	Factory set value
—	<i>F n2 I</i>	Function block No. 21	This is the first parameter symbol of Function block No. 21		—
⋮	⋮	⋮	⋮	⋮	⋮
282	<i>I Ndf</i>	Input data type	0: Number of measured value digits: 5 Number of RKC communication data digits: 7 Modbus data: Double word 1: Number of measured value digits: 4 Number of RKC communication data digits: 6 Modbus data: Single word * 2: Number of measured value digits: 4 Number of RKC communication data digits: 6 Our REX-D series equivalent (Some identifiers are replaced with the REX-D series equivalent identifiers) Modbus data: Single word * * Including our FB series equivalent data Select “2” only when you need to handle REX-D series equivalent data in RKC communication. When changing the Input data type from 0 to 1 (or 2) and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand. The display of the time unit depends on the Input data type. In case of Input data type 0 FZ400/900: hour/minute/second, hour/minute, minute/second FZ110: hour/minute, minute/second In case of Input data type 1 hour/minute, minute/second	Select the input data type.	Depends on the input range code specified at the time of order.



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

Input data type

RKC communication identifier: SE (Refer to P. 6-45)

Modbus Double word: 018CH, 018DH (Refer to P. 6-45)

Modbus Single word: 20C6H (Refer to P. 6-113)

3.2.3 Setting procedure

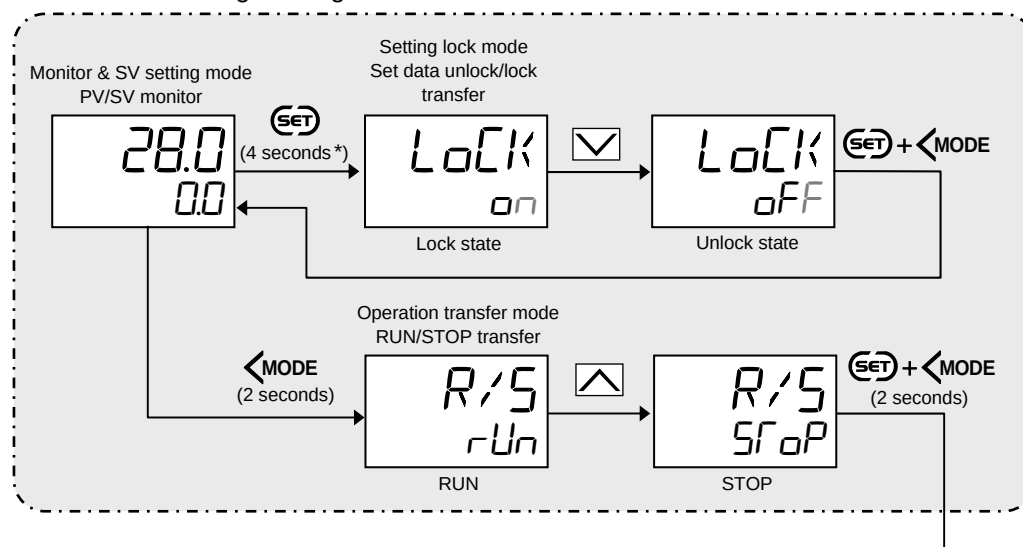
The Input data type can be found in the Function block No. 21 (1.1 nP) of Engineering mode.

Set value change and registration

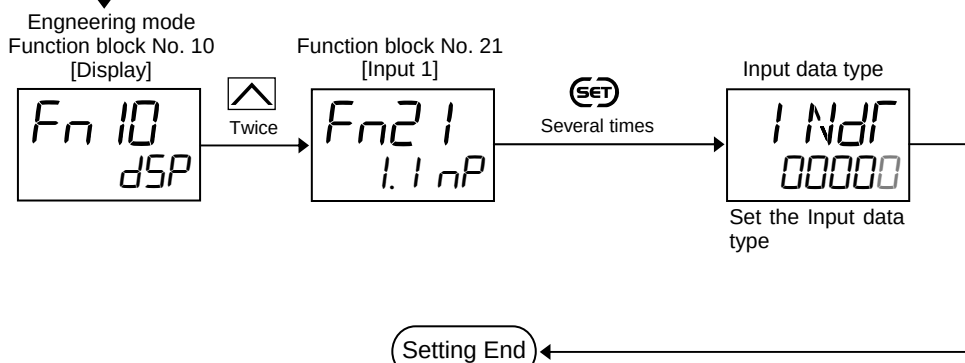
- The flashing digit indicates which digit can be set. Press **MODE** key to go to a different digit.
- To store a new value for the parameter, always press the **SET** key. The display changes to the next parameter and the new value will be stored. The modified data will not be stored only by operating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

Setting procedure

To enter the Engineering mode



* Press the **SET** key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor.
(For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

3.3 Communication Requirements

■ Processing times during data send/receive

When the host computer is using either the polling or selecting procedure for communication, the following processing times are required for FZ110/400/900 to send data:

- Response wait time after FZ110/400/900 sends BCC in polling procedure
- Response wait time after FZ110/400/900 sends ACK or NAK in selecting procedure



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

RKC communication (Polling procedure) processing times

Procedure details	Time
Response send time after FZ110/400/900 receives ENQ	4.48 ms max.
Response send time after FZ110/400/900 receives ACK	4.64 ms max.
Response send time after FZ110/400/900 receives NAK	4.64 ms max.
Response send time after FZ110/400/900 sends BCC	304 μs max.

RKC communication (Selecting procedure) processing times

Procedure details	Time
Response send time after FZ110/400/900 receives BCC	150.4 ms max.
Response wait time after FZ110/400/900 sends ACK	276 μs max.
Response wait time after FZ110/400/900 sends NAK	276 μs max.

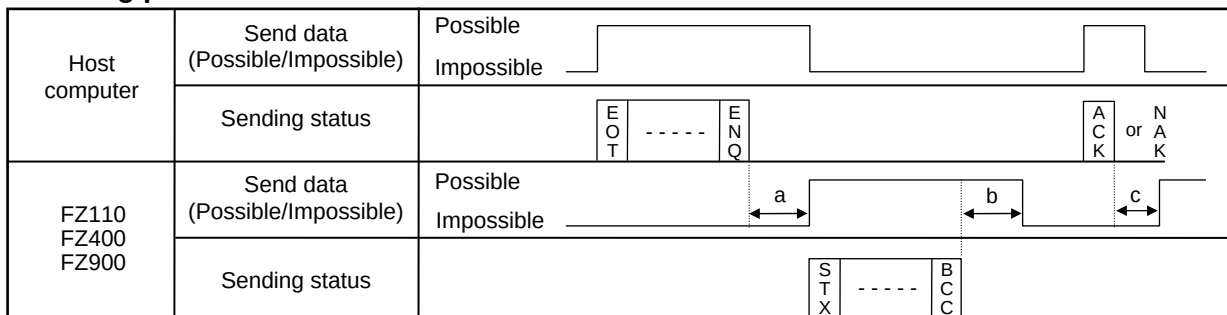
Modbus processing times

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

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

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

● Polling procedure

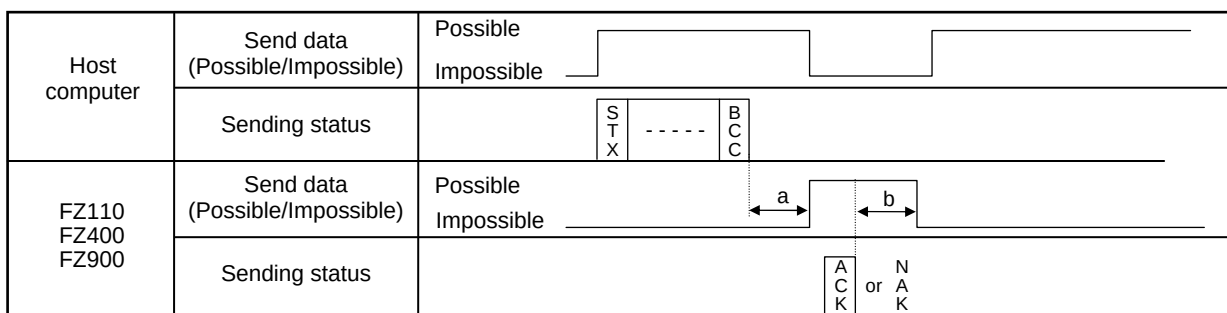


a: Response send time after the FZ110/400/900 receives [ENQ] + Interval time

b: Response send time after the FZ110/400/900 sends BCC

c: Response send time after the FZ110/400/900 receives [ACK] + Interval time or
Response send time after the FZ110/400/900 receives [NAK] + Interval time

● Selecting procedure



a: Response send time after the FZ110/400/900 receives BCC + Interval time

b: Response wait time after the FZ110/400/900 sends ACK or Response wait time after the
FZ110/400/900 sends NAK



To switch the host computer from transmission to reception, send data must be on line.



The following processing times are required for the FZ110/400/900 to process data:

- In polling procedure, Response wait time after the FZ110/400/900 sends BCC
- In selecting procedure, Response wait time after the FZ110/400/900 sends ACK or NAK

■ Fail-safe

A transmission error may occur if the transmission line is disconnected, shorted or set to the high-impedance state. In order to prevent the above error, it is recommended that the fail-safe function be provided on the receiver side of the host computer. The fail-safe function can prevent a framing error from its occurrence by making the receiver output stable to the MARK (1) when the transmission line is in the high-impedance state.



MEMO



RKC COMMUNICATION PROTOCOL

4

This chapter describes the RKC communication protocol.

4.1 Polling	4-2
4.1.1 Polling procedures	4-3
4.1.2 Polling procedure example	4-7
4.2 Selecting	4-8
4.2.1 Selecting procedures	4-8
4.2.2 Selecting procedure example	4-12

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

In this chapter FZ110/400/900 are called controllers.

- The Polling/Selecting procedures are a centralized control method where the host computer controls the entire process. The host computer initiates all communication so the controller responds according to queries and commands from the host.
- The code used in communication is 7-bit ASCII code including transmission control characters. The transmission control characters are EOT (04H), ENQ (05H), ACK (06H), NAK (15H), STX (02H) and ETX (03H). The figures in the parentheses indicate the corresponding hexadecimal number.



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

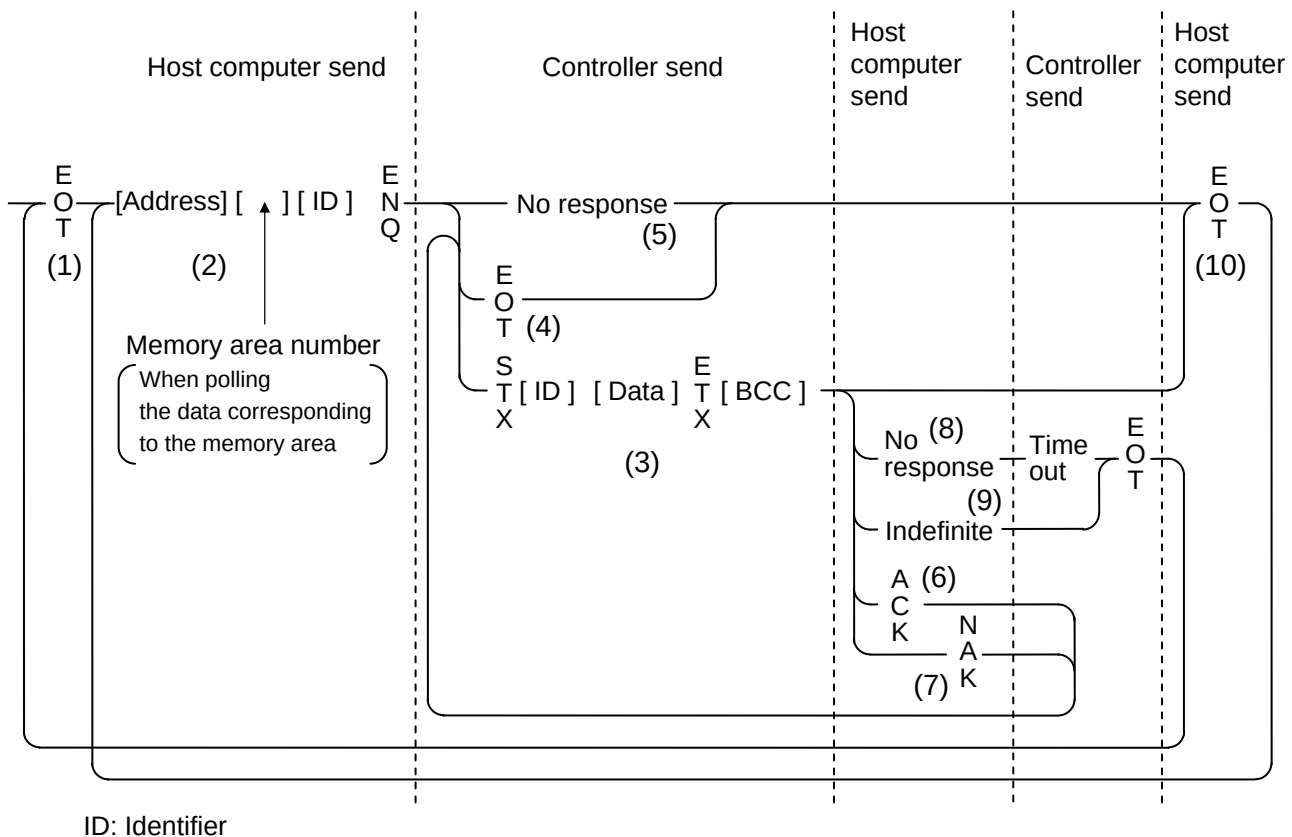
Communication Tool “PROTEM2”

The software can be downloaded from the official RKC website:

<http://www.rkcinst.com>

4.1 Polling

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



4.1.1 Polling procedures

(1) Data link initialization

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

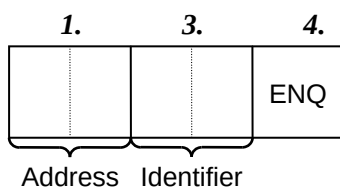
(2) Data sent from host computer - Polling sequence

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

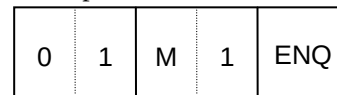
- Format in which no Memory area number is specified, and
- Format in which the Memory area number is specified.

■ When no Memory area number is specified

To be sent in this format for any identifier not corresponding to the memory area.

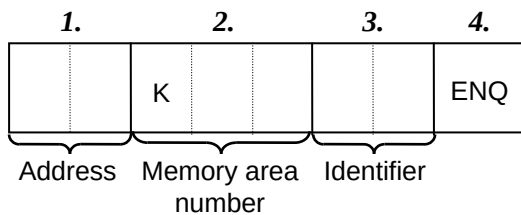


Example:

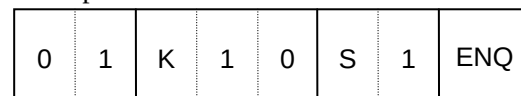


■ When the Memory area number is specified

To be sent in this format for any identifier corresponding to the memory area.



Example:



1. Address (2 digits)

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

This data is a device address of the controller to be selected and must be the same as the device address set value in item 3. **PARAMETER SETTING (P. 3-1)**.



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

2. Memory area number (3 digits)

This is the identifier to specify the Memory area number. It is expressed by K1 to K16 to each Memory area number (from 1 to 16). If the Memory area number is assigned with K0, this represents that Control area is specified.



The memory area now used for control is called Control area.



If the Memory area number is not specified when polling the identifier corresponding to the memory area, this represents that the Control area is specified.



If any identifier not corresponding to the memory area is assigned with a Memory area number, this Memory area number is ignored.

3. Identifier (2 digits)

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

For details, refer to **6.3 RKC Communication/Modbus (Double Word) Data (P. 6-9)**.

4. ENQ

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

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

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

(3) Data sent from the controller

If the polling sequence is received correctly, the controller sends data in the following format:

1.	2.	3.	4.	5.
STX	Identifier	Data	ETX	BCC

1. STX

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

2. Identifier (2 digits)

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

For details, refer to **6.3 RKC Communication/Modbus (Double Word) Data (P. 6-9)**.

3. Data (7 or 6 digits)

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



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

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



Memory area soak time monitor and Area soak time become the following data:

- When data range is 0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds:
Data range is 0:00:00 to 9:59:59, punctuation of time unit is expressed in colon “: (3AH).”
- When data range is 0 hour 00 minute to 99 hours 59 minutes:
Data range is 0:00 to 99:59, punctuation of time unit is expressed in colon “: (3AH).”
- When data range is 0 minute 00 second to 199 minutes 59 seconds:
Data range is 0:00 to 199:59, punctuation of time unit is expressed in colon “: (3AH).”



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

4. ETX

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

5. BCC

BCC (Block Check Character) detects error by using horizontal parity (even number).

Calculation method of BCC: *Exclusive OR* all data and characters from STX through ETX, not including STX.

Example:

STX	M	1	0	0	1	0	0	.	0	ETX	BCC
4DH	31H	30H	30H	31H	30H	30H	2EH	30H	03H	← Hexadecimal numbers	

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

($\oplus$: *Exclusive OR*)

Value of BCC becomes 50H.

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

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

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

(5) No response from the controller

The controller will not respond if the polling address is not received correctly. It may be necessary for the host computer to take corrective action such as a time-out.

(6) ACK (Acknowledgment)

An acknowledgment ACK is sent by the host computer when data received is correct. When the controller receives ACK from the host computer, the controller will send any remaining data of the next identifier without additional action from the host computer.

For the identifier, refer to **6.3 RKC Communication/Modbus (Double Word) Data (P. 6-9)**.

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

(7) NAK (Negative acknowledgment)

If the host computer does not receive correct data from the controller, it sends a negative acknowledgment NAK to the controller. The controller will re-send the same data when NAK is received. This cycle will go on continuously until either recovery is achieved or the data link is corrected at the host computer.



(8) No response from host computer

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

(9) Indefinite response from host computer

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

(10) EOT (Data link termination)

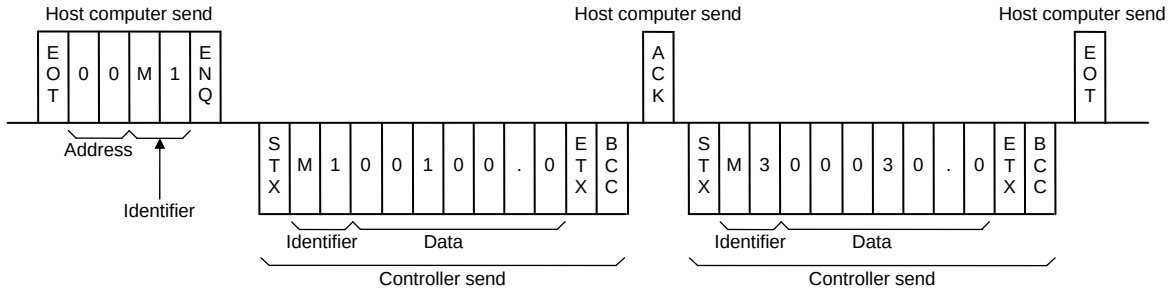
The host computer sends EOT message when it is necessary to suspend communication with the controller or to terminate the data link due to lack of response from the controller.

4.1.2 Polling procedure example

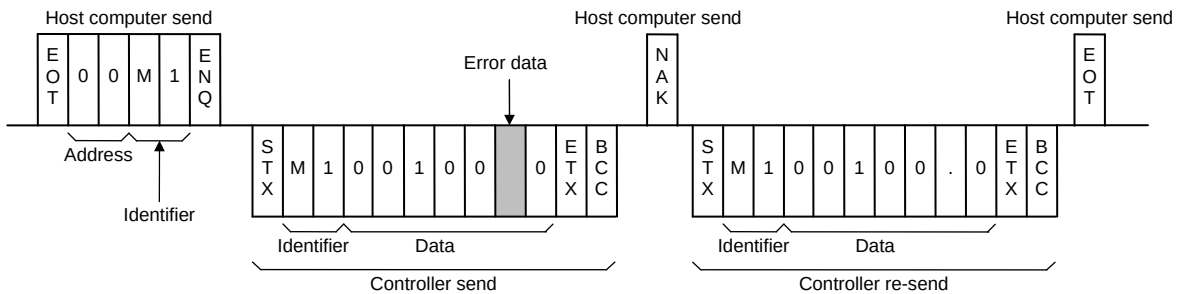
(1) When the monitored items are polled

[Example: Input 1_Measured value (PV) M1]

■ Normal transmission



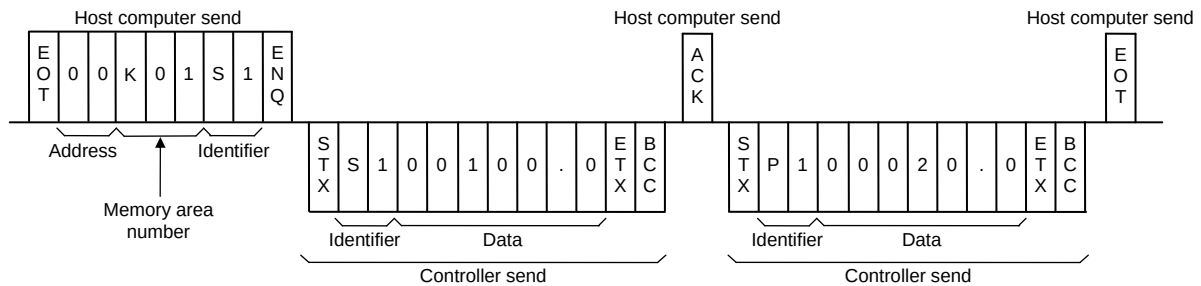
■ Error transmission



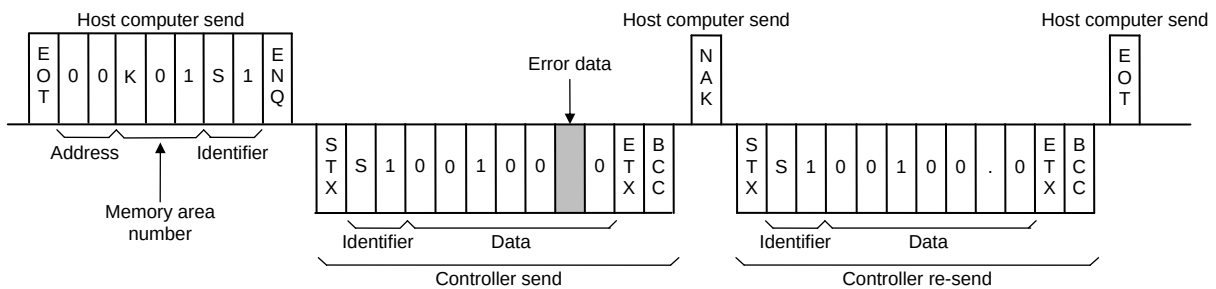
(2) When the items corresponding to the memory area are polled

[Example: Input 1_Set value (SV) S1]

■ Normal transmission

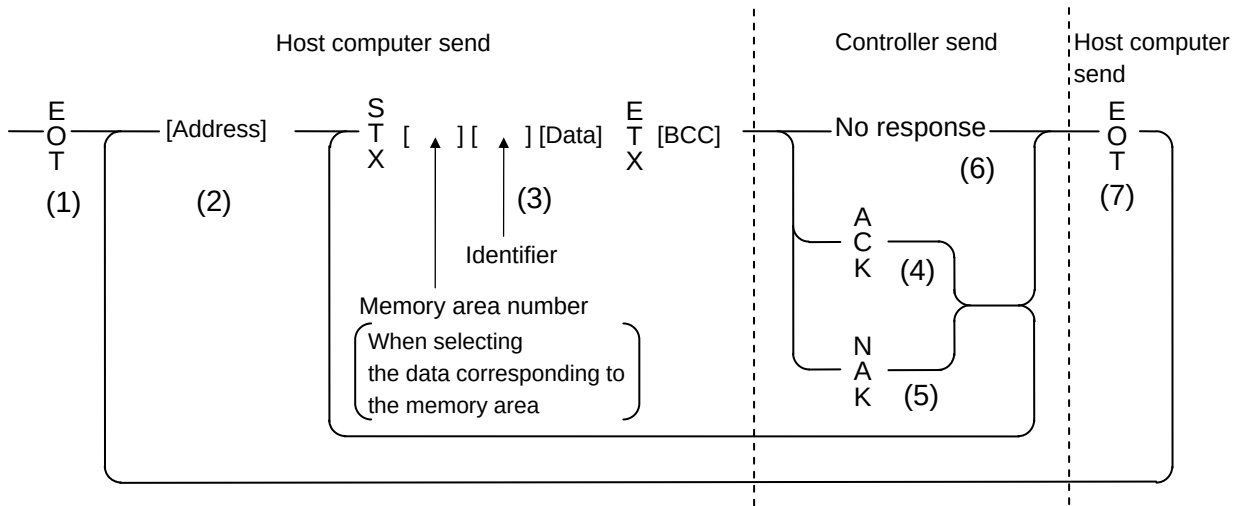


■ Error transmission



4.2 Selecting

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



4.2.1 Selecting procedures

(1) Data link initialization

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

(2) Sending selecting address from the host computer

Host computer sends selecting address for the selecting sequence.

■ Address (2 digits)

This data is a device address of the controller to be selected and must be the same as the device address set value in item 3. **PARAMETER SETTING (P. 3-1)**.



As long as the data link is not initialized by sending or receiving EOT, the selecting address once sent becomes valid.

(3) Data sent from the host computer

The host computer sends data for the selecting sequence with the following format:

■ When no memory area number is specified

2.		3.		
STX	Identifier	Data	ETX	BCC

■ When the memory area number is specified

1.	2.	3.		
STX	Memory area number	Identifier	Data	ETX BCC

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

1. Memory area number (3 digits)

This is the identifier to specify the Memory area number. It is expressed by K1 to K16 to each Memory area number (from 1 to 16). If the Memory area number is assigned with K0 this represents that Control area is specified.



The memory area now used for control is called Control area.



If the Memory area number is not specified when selecting the identifier corresponding to the memory area, selecting is made to the memory area.



If any identifier not corresponding to the memory area is assigned with a Memory area number, this Memory area number is ignored.

2. Identifier (2 digits)

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



For details, refer to **6.3 RKC Communication/Modbus (Double Word) Data (P. 6-9)**.

3. Data

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

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



Memory area soak time monitor and Area soak time become the following data:

- When data range is 0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds:
Data range is 0:00:00 to 9:59:59, punctuation of time unit is expressed in colon “:” (3AH).”
- When data range is 0 hour 00 minute to 99 hours 59 minutes:
Data range is 0:00 to 99:59, punctuation of time unit is expressed in colon “:” (3AH).”
- When data range is 0 minute 00 second to 199 minutes 59 seconds:
Data range is 0:00 to 199:59, punctuation of time unit is expressed in colon “:” (3AH).”

In addition to above, when minute and second data are set in more than 60, become as the following:

Example: 1:65 (1 hour 65 minutes) → 2:05 (2 hours 05 minutes)
0:65 (0 minute 65 seconds) → 1:05 (1 minute 05 seconds)



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



● About numerical data

Numerical data which the controller can receive

- Data with numbers below the decimal point omitted or zero-suppressed data can be received.

(Number of digits: Within 7 digits)

<Example> When data send with -001.5, -01.5, -1.5, -1.50, -1.500 at the time of -1.5, controller can receive data.

- When the host computer sends data containing a decimal point to an item without a decimal point, the controller receives a message rounded down to the nearest whole number.

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

Send data	0.5	100.5
Receive data	0	100

- The controller receives the value based on the decided number of places after decimal point. Any number beyond the established number of decimal points will be cut off.

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

Send data	-1.5	-1.058	1.05	-0
Receive data	-0.50	-1.05	1.05	0.00

Numerical data which the controller can not receive

The controller sends NAK when received a following data.

+	Plus sign and the data that gained plus sing
-	Only minus sign (there is no figure)
.	Only decimal point (period)
-.	Only minus sign and decimal point (period)

(4) ACK (Acknowledgment)

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

(5) NAK (Negative acknowledge)

If the controller does not receive correct data from the host computer, it sends a negative acknowledgment NAK to the host computer. Corrections, such as re-send, must be made at the host computer. The controller will send NAK in the following cases:

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

**(6) No response from controller**

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

(7) EOT (Data link termination)

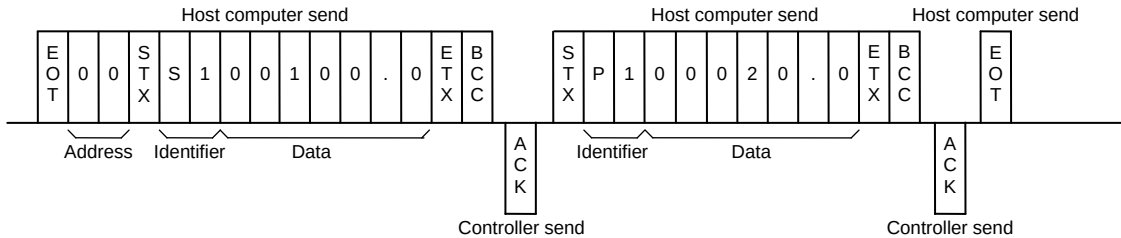
The host computer sends EOT when there is no more data to be sent from the host computer or there is no response from the controller.

4.2.2 Selecting procedure example

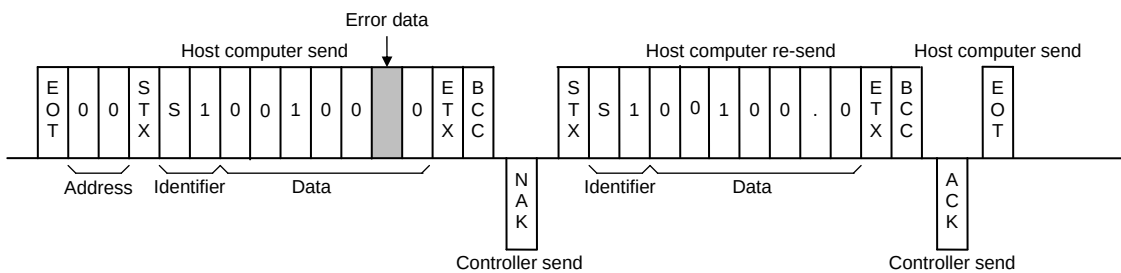
(1) When the items corresponding to the Control area are selected

[Example: Input 1_Set value (SV) S1]

■ Normal transmission



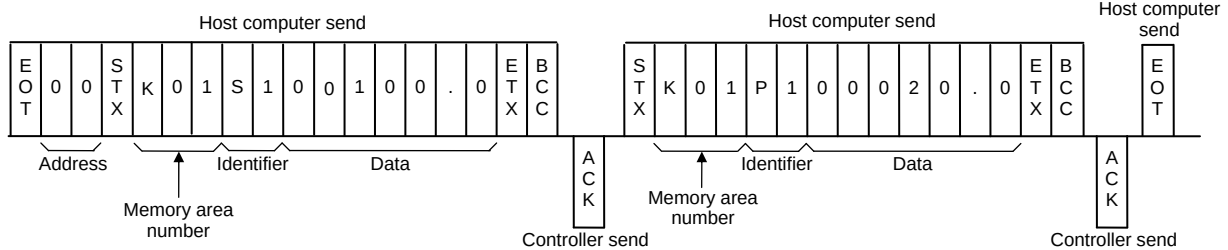
■ Error transmission



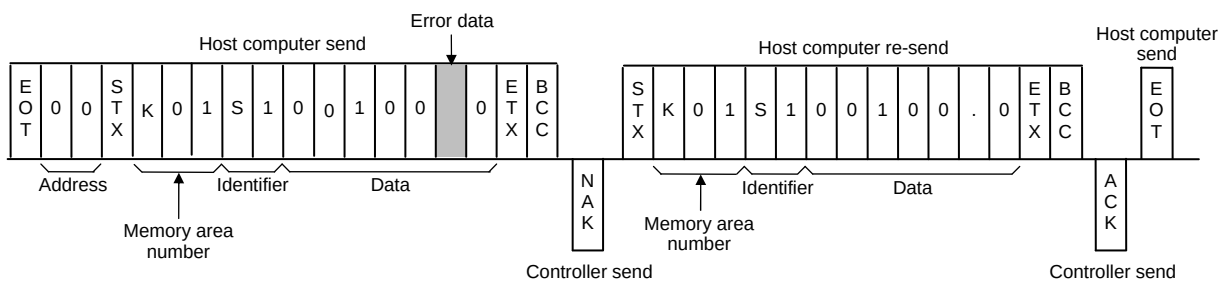
(2) When the items corresponding to the memory area are selected

[Example: Input 1_Set value (SV) S1]

■ Normal transmission



■ Error transmission





MODBUS PROTOCOL

5

This chapter describes the Modbus protocol.

5.1 Message Format	5-2
5.2 Function Code.....	5-3
5.3 Communication Mode	5-3
5.4 Slave Responses	5-4
5.5 Calculating CRC-16	5-5
5.6 Register Read and Write.....	5-8
■ Read holding registers [03H]	5-8
■ Preset single register [06H]	5-10
■ Diagnostics (Loopback test) [08H].....	5-11
■ Preset multiple registers (Write multiple registers) [10H].....	5-12
5.7 Caution for Handling Communication Data.....	5-13
5.8 How to Use Modbus Data Mapping	5-15
5.9 How to Use Memory Area Data	5-18
5.9.1 Read and write of memory area data	5-18
5.9.2 Control area transfer	5-21

In this chapter a host computer is called Master and FZ110/400/900 is called Slave.

The master controls communication between master and slave. A typical message consists of a request (query message) sent from the master followed by an answer (response message) from the slave. When master begins data transmission, a set of data is sent to the slave in a fixed sequence. When it is received, the slave decodes it, takes the necessary action, and returns data to the master.



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

Communication Tool “PROTEM2”

The software can be downloaded from the official RKC website:

<http://www.rkcinst.com>

5.1 Message Format

The message consists of four parts: slave address, function code, data, and error check code which are always transmitted in the same sequence.

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

Message format

■ Slave address

The slave address is a number from 1 to 99 manually set at the front key panel of the F110/400/900.



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



For details, refer to **3. PARAMETER SETTING (P. 3-1)**.

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

■ Function code

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



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

■ Data

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



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

■ Error check

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



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

5.2 Function Code

Function code contents

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

Message length of each function (Unit: byte)

Function code (Hexadecimal)	Function	Query message		Response message	
		Min	Max	Min	Max
03H	Read holding registers	8	8	5	255
06H	Preset single register	8	8	5	8
08H	Diagnostics (loopback test)	8	8	5	8
10H	Preset multiple registers (Write multiple registers)	11	255	5	8

5.3 Communication Mode

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

Items	Contents
Data bit length	8-bit (Binary)
Start mark of message	Unused
End mark of message	Unused
Message length	Refer to 5.2 Function Code
Data time interval	Less than 24-bit time *
Error check	CRC-16 (Cyclic Redundancy Check)

* When sending a command message from the master, set intervals of data configuring one message to time shorter than the 24-bit time. If time intervals become time longer than the 24-bit time the relevant slave assumes that message sending from the master is terminated and there is no response.

5.4 Slave Responses

(1) Normal response

- In the response message of the Read Holding Registers, the slave returns the read out data and the number of data items with the same slave address and function code as the query message.
- In the response message of the Preset Single Register, the slave returns the same message as the query message.
- In the response message of the Diagnostics (Loopback test), the slave returns the same message as the query message.
- In the response message of the Preset Multiple Registers (Write Multiple Registers), the slave returns the slave address, the function code, starting number, and number of holding registers in the multi-query message.

(2) Defective message response

- If the query message from the master is defective, except for transmission error, the slave returns the error response message without any action.

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

Error response message

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

Error code	Contents
1	Function code error (An unsupported function code was specified)
2	• When the mismatched address is specified. • Address other than 0000H to 00AFH is specified as the starting number.
3	• The maximum number (Read from a read holding register or write to Preset multiple registers [Write multiple registers]) has been exceeded. • The setting of the number of data (the number of requested byte) is not set to a double of the requested number of data at the time of "Preset multiple registers (Write multiple registers)"
4	Self-diagnostic error response

(3) No response

The slave ignores the query message and does not respond when:

- The slave address in the query message does not coincide with any slave address settings.
- The CRC code of the master does not coincide with that of the slave.
- Transmission error such as overrun, framing, parity etc., is found in the query message.
- Data time interval in the query message from the master exceeds 24-bit time.

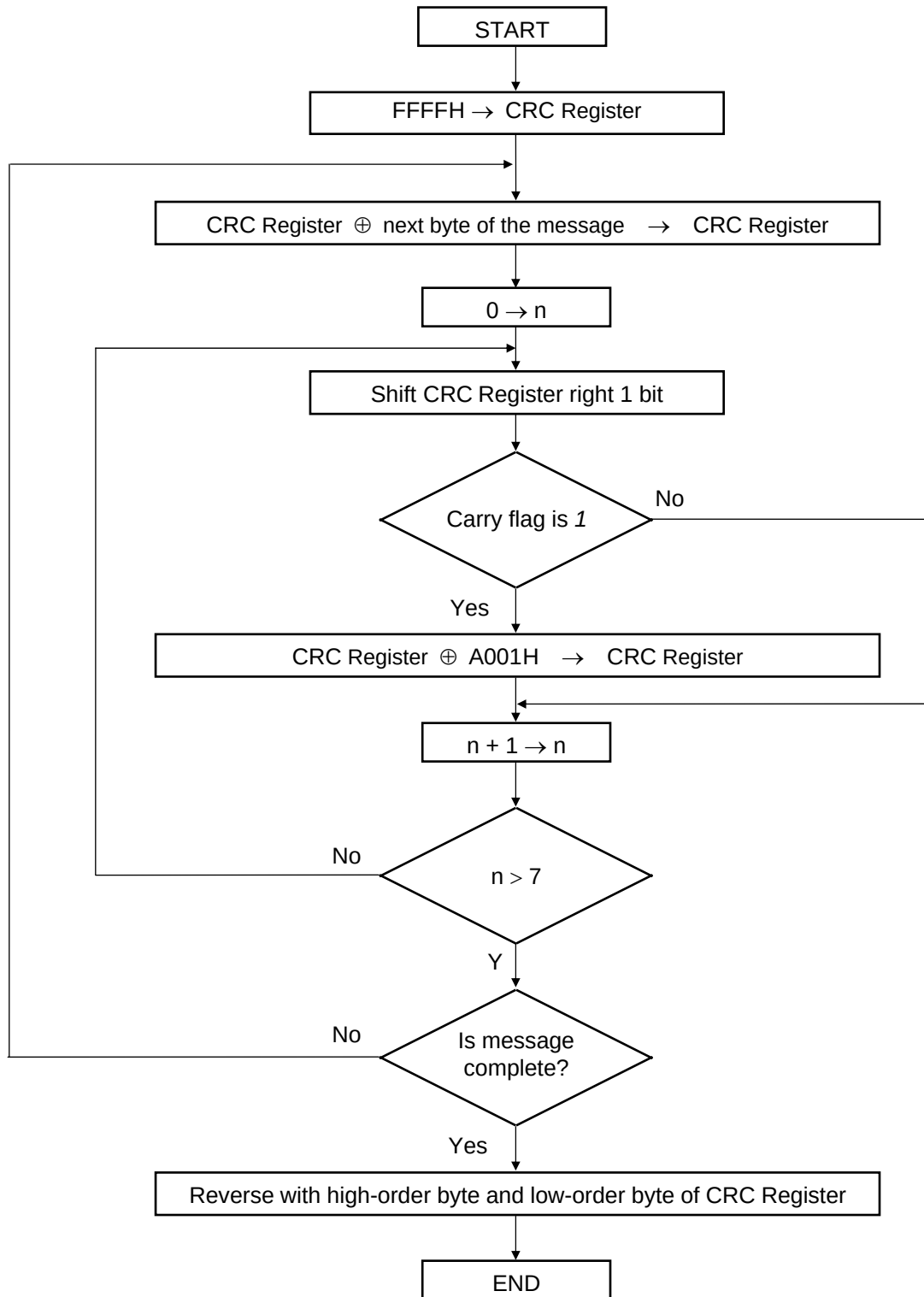
5.5 Calculating CRC-16

The Cyclic Redundancy Check (CRC) is a 2 byte (16-bit) error check code. After constructing the data message, not including start, stop, or parity bit, the master calculates a CRC code and appends this to the end of the message. The slave will calculate a CRC code from the received message, and compare it with the CRC code from the master. If they do not coincide, a communication error has occurred and the slave does not respond.

The CRC code is formed in the following sequence:

1. Load FFFFH to a 16-bit CRC register.
2. *Exclusive OR* ($\oplus$) the first byte (8 bits) of the message with the CRC register. Return the result to the CRC register.
3. Shift the CRC register 1 bit to the right.
4. If the carry flag is 1, *exclusive OR* the CRC register with A001 hexadecimal and return the result to the CRC register. If the carry flag is 0, repeat step 3.
5. Repeat step 3 and 4 until there have been 8 shifts.
6. *Exclusive OR* the next byte (8 bits) of the message with the CRC register.
7. Repeat step 3 through 6 for all bytes of the message (except the CRC).
8. The CRC register contains the 2 byte CRC error code. When they are appended to the message, the low-order byte is appended first, followed by the high-order byte.

■ The flow chart of CRC-16



The $\oplus$ symbol indicates an *exclusive OR* operation. The symbol for the number of data bits is *n*.

■ Example of a CRC calculation in the 'C' language

This routine assumes that the data types 'uint16' and 'uint8' exist. These are unsigned 16-bit integer (usually an 'unsigned short int' for most compiler types) and unsigned 8-bit integer (unsigned char). 'z_p' is a pointer to a Modbus message, and 'z_messaage_length' is its length, excluding the CRC. Note that the Modbus message will probably contain NULL characters and so normal C string handling techniques will not work.

```
uint16 calculate_crc (byte *z_p, uint16 z_message_length)

/* CRC runs cyclic Redundancy Check Algorithm on input z_p */
/* Returns value of 16 bit CRC after completion and          */
/* always adds 2 crc bytes to message                        */
/* returns 0 if incoming message has correct CRC            */

{
    uint16 CRC= 0xffff;
    uint16 next;
    uint16 carry;
    uint16 n;
    uint8 crch, crcl;

    while (z_message_length--) {
        next = (uint16) *z_p;
        CRC ^= next;
        for (n = 0; n < 8; n++) {
            carry = CRC & 1;
            CRC >>= 1;
            if (carry) {
                CRC ^= 0xA001;
            }
        }
        z_p++;
    }
    crch = CRC / 256;
    crcl = CRC % 256
    z_p [z_messaage_length++] = crcl;
    z_p [z_messaage_length] = crch;
    return CRC;
}
```

5.6 Register Read and Write

■ Read holding registers [03H]

The query message specifies the starting register address and quantity of registers to be read.

The contents of the holding registers are entered in the response message as data, divided into two parts: the high-order 8-bit and the low-order 8-bit, arranged in the order of the register numbers.

Example: The contents of the four holding registers from 0000H to 0003H are the read out from slave address 2.

● Double word

Query message

Slave address		02H
Function code		03H
Starting number	High	00H
	Low	00H
Quantity	High	00H
	Low	04H
CRC-16	High	44H
	Low	3AH

} First holding register address

} The setting must be between 1 (0001H) and 62 (003EH).

Normal response message

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

→ Number of holding registers × 2

Error response message

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

● Single word

Query message

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

Normal response message

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

Error response message

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



■ Preset single register [06H]

The query message specifies data to be written into the designated holding register. The write data is arranged in the query message with high-order 8-bit first and low-order 8-bit next.

Only R/W holding registers can be specified.

Example: Data is written into the holding register 0072H of slave address 1.

Query message

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

} Any data within the range

Normal response message

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

} Contents will be the same as query message data.

Error response message

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



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

■ Diagnostics (Loopback test) [08H]

The master's query message will be returned as the response message from the slave.

This function checks the communication system between the master and slave (the F110/400/900).

Example: Loopback test for slave address 1

Query message

Slave address		01H	
Function code		08H	
Test code	High	00H	} Test code must be set to "00."
	Low	00H	
Data	High	1FH	} Any pertinent data
	Low	34H	
CRC-16	High	E9H	
	Low	ECH	

Normal response message

Slave address		01H	
Function code		08H	
Test code	High	00H	} Contents will be the same as query message data.
	Low	00H	
Data	High	1FH	
	Low	34H	
CRC-16	High	E9H	
	Low	ECH	

Error response message

Slave address		01H
80H + Function code (+ denotes a logical add)		88H
Error code		03H
CRC-16	High	06H
	Low	01H



■ Preset multiple registers (Write multiple registers) [10H]

The query message specifies the starting register address and quantity of registers to be written. The write data is arranged in the query message with high-order 8-bit first and low-order 8-bit next. Only R/W holding registers can be specified.

Example: Data is written into the two holding registers from 0070H to 0071H of slave address 1.

Query message

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

Normal response message

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

Error response message

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

5.7 Caution for Handling Communication Data

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



FFFFH represents –1.

- The Modbus protocol does not recognize data with decimal points during communication.

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

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

Example 2: When Input 1_Set value (SV) is –20.0 °C, –20.0 is processed as –200,
–200 = 0000H – 00C8H = FF38H.

Set value (SV)	High	FFH
	Low	38H

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



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

[Double word]

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



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

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

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

The controller interprets high-order word as “0000H.”

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

The controller interprets high-order word as “FFFFH.”

[Single word]

- A variable is handled as a two-byte data.
 - Each variable occupies one register address.
- In this communication, the variables that memory area includes handle different address with for control area and for setting area.



- If data (holding register) exceeding the accessible address range is accessed, an error response message is returned.
- Read data of unused item is “0.”
- Any attempt to write to an unused item is not processed as an error. Data cannot be written into an unused item.
- If data range error occurs during data writing (Write Action), it is not processed as an error. Normal data is written in data register but data with error is not written; therefore, it is recommended to confirm data of changed items after the data setting.
- Communication items not existing in the product because of the specifications are handled as “0” when the data is read in. If write action to this item is performed, no error message is indicated and no data is written.
- Commands should be sent at time intervals of 24 bits after the master receives the response message.

5.8 How to Use Modbus Data Mapping

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

Up to 32 communication data can be assigned to the register address in the following table used to actually read the data from/write the data to. (HEX: Hexadecimal number DEC: Decimal number)

	Double word	Single word
Register address specifying the mapping data	HEX: 1000H to 103FH DEC: 4096 to 4159	HEX: 1000H to 101FH DEC: 4096 to 4127
Register address actually read from/write to	HEX: 1500H to 153FH DEC: 5376 to 5439	HEX: 1500H to 151FH DEC: 5376 to 5407
Register address of the mappable data	Refer to 6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-9).	Refer to 6.4.1 FZ110/400/900 communication data [Modbus single word] (P. 6-106), 6.4.4 FB series equivalent communication data [Modbus single word] (P. 6-135).



For the data mapping address list, refer to the **6.3.3 Data mapping address [Modbus double word] (P. 6-101), 6.4.3 Data mapping address [Modbus single word] (P. 6-131).**

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

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

1. Write register addresses of mapping data to register address setting from 1 (1000H, 1001H) to 4 (1006H, 1007H).

Data to be mapped

Name	Register address			
	HEX		DEC	
	Low-order	High-order	Low-order	High-order
Input 1_Measured value (PV)	0000	0001	0	1
Input 1_Manipulated output value monitor [heat-side]	000E	000F	14	15
Event 1 state monitor	001E	001F	30	31
Event 2 state monitor	0020	0021	32	33

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

Register address for data designation

Name	Register address				Setting data
	HEX		DEC		
	Low-order	High-order	Low-order	High-order	
Register address setting 1 [Read/write address: Low-order word 1500H, high-order word 1501H]	1000	1001	4096	4097	Low-order word: 0000H High-order word: 0001H
Register address setting 2 [Read/write address: Low-order word 1502H, high-order word 1503H]	1002	1003	4098	4099	Low-order word: 000EH High-order word: 000FH
Register address setting 3 [Read/write address: Low-order word 1504H, high-order word 1505H]	1004	1005	4100	4101	Low-order word: 001EH High-order word: 001FH
Register address setting 4 [Read/write address: Low-order word 1506H, high-order word 1507H]	1006	1007	4102	4103	Low-order word: 0020H High-order word: 0021H



5. MODBUS PROTOCOL

The table below shows the assignment of read/write register addresses 1500H to 1507H by the above mapping.

Register address				Name
HEX		DEC		
Low-order	High-order	Low-order	High-order	
1500	1501	5376	5377	Input 1_Measured value (PV)
1502	1503	5378	5379	Input 1_Manipulated output value monitor [heat-side]
1504	1505	5380	5381	Event 1 state monitor
1506	1507	5382	5383	Event 2 state monitor

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

Slave address		02H	} First holding register address (1500H)
Function code		03H	
Starting number	High	15H	
	Low	00H	
Quantity	High	00H	} Number of data (4)
	Low	04H	
CRC-16	High	40H	
	Low	36H	

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

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

1. Write register addresses of mapping data to register address setting from 1 (1000H) to 4 (1003H).

Data to be mapped

Name	Register address		Write register address to be mapped to the register address for the designation of data
	HEX	DEC	
Input 1_Measured value (PV)	2000	8192	
Input 1_Manipulated output value monitor [heat-side]	2007	8199	
Event 1 state monitor	200F	8207	
Event 2 state monitor	2010	8208	

Register address for data designation

Name	Register address		Setting data
	HEX	DEC	
Register address setting 1 [Read/write address: 1500H]	1000	4096	2000
Register address setting 2 [Read/write address: 1501H]	1001	4097	2007
Register address setting 3 [Read/write address: 1502H]	1002	4098	200F
Register address setting 4 [Read/write address: 1503H]	1003	4099	2010



The table below shows the assignment of read/write register addresses 1500H to 1503H by the above mapping.

Register address		Name
HEX	DEC	
1500	5376	Input 1_Measured value (PV)
1501	5377	Input 1_Manipulated output value monitor [heat-side]
1502	5378	Event 1 state monitor
1503	5379	Event 2 state monitor

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

Slave address		02H	
Function code		03H	
Starting number	High	15H	} First holding register address (1500H)
	Low	00H	
Quantity	High	00H	} Number of data (4)
	Low	04H	
CRC-16	High	40H	
	Low	36H	

5.9 How to Use Memory Area Data

Memory area function can store up to 16 individual sets of SVs and parameters. One of the areas is used for control, and the currently selected area is Control area.

Memory area data can be used to check and change settings that belong to memory areas other than the Control area.

5.9.1 Read and write of memory area data

There are two types of methods for reading from and writing to the Memory area.

- **Direct designation method (Single word, Double word)**

The direct designation method uses register address (0500H to 0B5FH for double word or 2500H to 282FH for single word) to read data from or write data to the Memory area.

- **Area designation method (Single word)**

If any Memory area number to perform data read and write is specified by the Setting memory area number (0500H), data corresponding to the specified Memory area number is called up to the register addresses from 0501H to 0548H. This register address is used to read data from and write data to the Memory area.

The area designation method is mainly designed for the use of the data equivalent to our FB series *.

* The data equivalent to our FB series refers to the communication data of our FB series compatible with the FZ110/400/900.

- **Direct designation method (Single word, Double word)**

The direct designation method uses register address (0500H to 0B5FH for double word or 2500H to 282FH for single word) to read data from or write data to the Memory area.

(HEX: Hexadecimal number DEC: Decimal number)

Memory area number	Register address of Memory area					
	Double word				Single word	
	HEX		DEC		HEX	DEC
	Low-order	High-order	Low-order	High-order		
Memory area 1	0500	0501	1280	1281	2500	9472
	⋮	⋮	⋮	⋮	⋮	⋮
	0564	0565	1380	1381	2532	9522
Memory area 2	0566	0567	1382	1383	2533	9523
	⋮	⋮	⋮	⋮	⋮	⋮
	05CA	05CB	1482	1483	2565	9573
Memory area 3	05CC	05CD	1484	1485	2566	9574
	⋮	⋮	⋮	⋮	⋮	⋮
	0630	0631	1584	1585	2598	9624
Memory area 4	0632	0633	1586	1587	2599	9625
	⋮	⋮	⋮	⋮	⋮	⋮
	0696	0697	1686	1687	25CB	9675
Memory area 5	0698	0699	1688	1689	25CC	9676
	⋮	⋮	⋮	⋮	⋮	⋮
	06FC	06FD	1788	1789	25FE	9726
Memory area 6	06FE	06FF	1790	1791	25FF	9727
	⋮	⋮	⋮	⋮	⋮	⋮
	0762	0763	1890	1891	2631	9777

Memory area number	Register address of Memory area					
	Double word				Single word	
	HEX		DEC		HEX	DEC
	Low-order	High-order	Low-order	High-order		
Memory area 7	0764	0765	1892	1893	2632	9778
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 8	07C8	07C9	1992	1993	2664	9828
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 9	07CA	07CB	1994	1995	2665	9829
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 10	082E	082F	2094	2095	2697	9879
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 11	0830	0831	2096	2097	2698	9880
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 12	0894	0895	2196	2197	26CA	9930
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 13	0896	0897	2198	2199	26CB	9931
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 14	08FA	08FB	2298	2299	26FD	9981
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 15	08FC	08FD	2300	2301	26FE	9982
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 16	0960	0961	2400	2401	2730	10032
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 17	0962	0963	2402	2403	2731	10033
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 18	09C6	09C7	2502	2503	2763	10083
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 19	09C8	09C9	2504	2505	2764	10084
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 20	0A2C	0A2D	2604	2605	2796	10134
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 21	0A2E	0A2F	2606	2607	2797	10135
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 22	0A92	0A93	2706	2707	27C9	10185
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 23	0A94	0A95	2708	2709	27CA	10186
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 24	0AF8	0AF9	2808	2809	27FC	10236
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 25	0AFA	0AFB	2810	2811	27FD	10237
	⋮	⋮	⋮	⋮	⋮	⋮
Memory area 26	0B5E	0B5F	2910	2911	282F	10287
	⋮	⋮	⋮	⋮	⋮	⋮

☞ For the memory area data list, refer to the **6.3.2 Memory area data (Direct designation method) [Modbus double word] (P. 6-76)**, **6.4.2 Memory area data (Direct designation method) [Modbus single word] (P. 6-119)**.

☞ The memory area data is used in three groups for the Level PID. For details of Level PID, refer to the **FZ110/FZ400/FZ900 Instruction Manual [Part 2: Parameters/Functions] (IMR03A05-E□)**.

■ Area designation method (Single word)

If any Memory area number to perform data read and write is specified by the Setting memory area number (0500H), data corresponding to the specified Memory area number is called up to the register addresses from 0501H to 0548H. This register address is used to read data from and write data to the Memory area.

The area designation method is mainly designed for the use of the data equivalent to our FB series *.

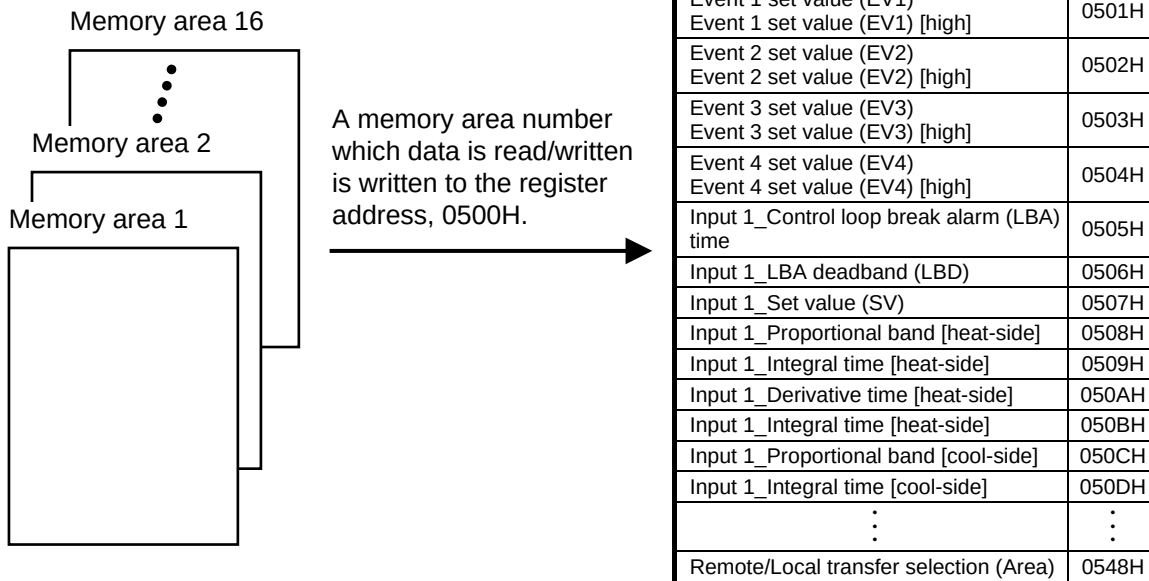
* The data equivalent to our FB series refers to the communication data of our FB series compatible with the FZ110/400/900.

(HEX: Hexadecimal number DEC: Decimal number)

Setting memory area number (Register address designating the memory area.)	HEX: 0500H DEC: 1280
Register address of memory area data (Register address for data read and data write.)	HEX: 0501H to 0548H DEC: 1281 to 1352

☞ For the memory area data list, refer to the **6.4.5 Memory area data equivalent to the FB series (Area designation method) [Modbus single word] (P. 6-149)**.

Data corresponding to a specified Memory area number is called up to the register addresses from 0501H to 0548H.



Example 1: When data on the Event 1 set value (EV1) in Memory area 2 is read

1. The Memory area number, “2” is written to the Setting memory area number (0500H).
Data in Memory area 2 is called up to the register addresses from 0501H to 0548H.
2. Data on Event 1 set values (EV1) (0501H) is read.

Example 2: When the Input 1_Set value (SV) in Memory area 3 is changed to 200

1. The Memory area number, “3” is written to the Setting memory area number (0500H).
Data in Memory area 3 is called up to the register addresses from 0501H to 0548H.
2. “200” is written to the Set value (SV) (0507H).

5.9.2 Control area transfer

Any memory area used for control is specified by the Memory area transfer. The area now used for control is called Control area.

(HEX: Hexadecimal number DEC: Decimal number)

	Double word	Single word
Memory area transfer	HEX: Low-order word: 0068H High-order word: 0069H DEC: Low-order word: 104 High-order word: 105	HEX: 0024H DEC: 0036
Control area (Area now used for control)	HEX: 0082H to 00E7H DEC: 130 to 231	- FZ110/400/900 communication data HEX: 2041H to 2073H DEC: 8257 to 8307 - FB series equivalent communication data * HEX: 0026H to 0039H, 00A5H, 00A6H, 00A9H, 00AAH DEC: 0038 to 0057, 0165, 0166, 0169, 0170

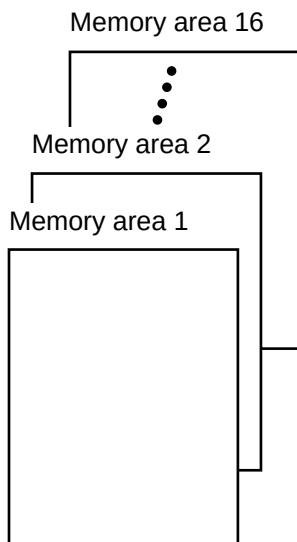
* The data equivalent to our FB series refers to the communication data of our FB series compatible with the FZ110/400/900.

For the control area data list, refer to the **6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-9)**, **6.4.1 FZ110/400/900 communication data [Modbus single word] (P. 6-106)** and **6.4.4 FB series equivalent communication data [Modbus single word] (P. 6-135)**.

The Memory area number (Control area) can be changed at either RUN or STOP.

● Double word

Data corresponding to a specified Memory area number is called up to the register addresses from 0082H to 00E7H



Write the Memory area No. used for the control to register address.
 Write into
 Low-order word: 0068H
 High-order word: 0069H

Name	HEX	
	Low-order	High-order
Input 1_Set value (SV)	0082	0083
Input 2_Set value (SV)	0084	0085
Set value (SV) of differential temperature input	0086	0087
Event 1 set value (EV1)	0088	0089
Event 1 set value (EV1') [low]	008A	008B
Event 2 set value (EV2)	008C	008D
Event 2 set value (EV2') [low]	008E	008F
Event 3 set value (EV3)	0090	0091
Event 3 set value (EV3') [low]	0092	0093
Event 4 set value (EV4)	0094	0095
Event 4 set value (EV4') [low]	0096	0097
Input 1_Proportional band [heat-side]	0098	0099
Input 1_Integral time [heat-side]	009A	009B
Input 1_Derivative time [heat-side]	009C	009D
Input 1_Control response parameter	009E	009F
Input 1_Proactive intensity	00A0	00A1
Input 1_Manual reset	00A2	00A3
Input 1_FF amount	00A4	00A5
⋮	⋮	⋮
Remote/Local transfer selection (Area)	00E6	00E7

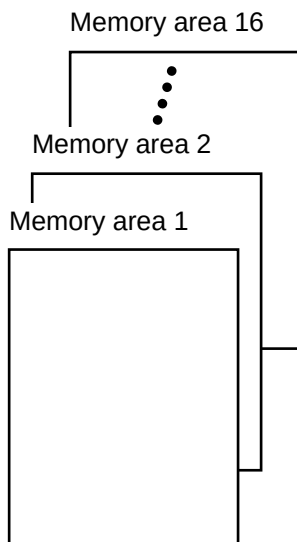


Example: When performing control by calling up data in Memory area 3 (Double word)

1. The Memory area number, “3” is written to the Memory area transfer (Low-order word: 0068H
High-order word: 0069H).
Data in Memory area 3 is called up to the register addresses from 0082H to 00E7H.
2. Control is performed by using data in the register addresses from 0082H to 00E7H.

● Single word

The data in Memory area 3 will be retrieved into register addresses 2041H to 2073H, 0026H to 0039H, 00A5H, 00A6H, 00A9H and 00AAH.



Write the Memory area No.
used for the control to
register address.
Write into 0024H.

FZ110/400/900 communication data

Name	HEX
Input 1_Set value (SV)	2041H
Input 2_Set value (SV)	2042H
Set value (SV) of differential temperature input	2043H
Event 1 set value (EV1)	2044H
Event 1 set value (EV1') [low]	2045H
Event 2 set value (EV2)	2046H
Event 2 set value (EV2') [low]	2047H
⋮	⋮
Remote/Local transfer selection (Area)	2073H

FB series equivalent communication data

Name	HEX
Event 1 set value (EV1)	0026H
Event 1 set value (EV1) [high]	
Event 2 set value (EV2)	0027H
Event 2 set value (EV2) [high]	
Event 3 set value (EV3)	0028H
Event 3 set value (EV3) [high]	
Event 4 set value (EV4)	0029H
Event 4 set value (EV4) [high]	
Input 1_Control loop break alarm (LBA) time	002AH
Input 1_LBA deadband (LBD)	002BH
Input 1_Set value (SV)	002CH
Input 1_Proportional band [heat-side]	002DH
Input 1_Integral time [heat-side]	002EH
Input 1_Derivative time [heat-side]	002FH
Input 1_Integral time [heat-side]	0030H
Input 1_Proportional band [cool-side]	0031H
Input 1_Integral time [cool-side]	0032H
Input 1_Derivative time [cool-side]	0033H
Input 1_Overlap/Deadband	0034H
Input 1_Manual reset	0035H
Input 1_Setting change rate limiter (up)	0036H
Input 1_Setting change rate limiter (down)	0037H
Area soak time	0038H
Link area number	0039H
Input 1_Output limiter high [heat-side]	00A5H
Input 1_Output limiter low [heat-side]	00A6H
Input 1_Output limiter high [cool-side]	00A9H
Input 1_Output limiter low [cool-side]	00AAH



The FB series equivalent communication data [retrieved to the control area of Modbus single word] may be overlapped with the communication data of the FZ110/400/900 retrieved to the control area of [Modbus single word], but not all of the data in the Memory area will be retrieved into the Control area of FB series equivalent communication data [Modbus single word]. To use all o the data in the Memory area for control, use the control area (2041H to 2073H) of FZ110/400/900 communication data [Modbus single word].



Example: When performing control by calling up data in Memory area 3 (Single word)

1. The Memory area number, “3” is written to the Memory area transfer (0024H).
The data in Memory area 3 will be retrieved into register addresses 0026H to 0039H, 00A5H, 00A6H, 00A9H, 00AAH, and 0041H to 0073H.
2. Control will be conducted using the data in register addresses 0026H to 0039H, 00A5H, 00A6H, 00A9H, 00AAH and 0041H to 0073H.



If the Memory area transfer (0024H) and the Setting memory area number (0500H) are set to the same Memory area number, the respective data can be synchronized.

- Values in the Control areas (0026H to 0039H, 00A5H, 00A6H, 00A9H, 00AAH and 0041H to 0073H) become the same as those in the memory areas (0501H to 0548H).
- If data in the control area is changed, data in the memory area is also changed.
- If data in the memory area is changed, data in the control area is also changed.



COMMUNICATION DATA LIST

6

This chapter describes communication data.

6.1 Data Map Structure	6-2
6.1.1 Structure of RKC Communication/Modbus (Double Word) data map	6-2
6.1.2 Structure of Modbus (Single Word) data map	6-4
6.2 How to Read the Table	6-5
■ Data map of RKC communication identifiers/Modbus double word	6-5
■ Data map of Modbus single word	6-7
■ Data map of FB series equivalent communication	6-8
6.3 RKC Communication/Modbus (Double Word) Data	6-9
6.3.1 Communication data [RKC communication identifier/Modbus double word]	6-9
6.3.2 Memory area data (Direct designation method) [Modbus double word]	6-76
6.3.3 Data mapping address [Modbus double word]	6-101
6.4 Modbus (Single Word) Data	6-106
6.4.1 FZ110/400/900 communication data [Modbus single word]	6-106
6.4.2 Memory area data (Direct designation method) [Modbus single word]	6-119
6.4.3 Data mapping address [Modbus single word]	6-131
6.4.4 FB series equivalent communication data [Modbus single word]	6-135
6.4.5 Memory area data equivalent to the FB series (Area designation method) [Modbus single word]	6-149



6.1 Data Map Structure

This chapter contains two types of data maps.

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

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



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

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

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

■ RKC communication

Monitor items	
Setting items	← The separator position of the continuous [ACK] polling.
For compatibility of identifiers with other models (dummy data)	← The separator position of the continuous [ACK] polling.

■ Modbus (Double word)

HEX: Hexadecimal number DEC: Decimal number

Register address				Contents
HEX		DEC		
Low-order	High-order	Low-order	High-order	
0000 ⋮ 015C	0001 ⋮ 015D	0 ⋮ 348	1 ⋮ 349	Data of FZ110/400/900 (Normal setting data) Refer to 6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-9).
015E ⋮ 02E4	015F ⋮ 02E5	350 ⋮ 740	351 ⋮ 741	Data of FZ110/400/900 (Data in the Engineering mode) Refer to 6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-9).
02E6 ⋮ 04FE	02E7 ⋮ 04FF	742 ⋮ 1278	743 ⋮ 1279	Unused
0500 ⋮ 0B5E	0501 ⋮ 0B5F	1280 ⋮ 2910	1281 ⋮ 2911	Memory area data of FZ110/400/900 Refer to 6.3.2 Memory area data (Direct designation method) [Modbus double word] (P. 6-76).
0B60 ⋮ 0FFE	0B61 ⋮ 0FFF	2912 ⋮ 4094	2913 ⋮ 4095	Unused
1000 ⋮ 103E	1001 ⋮ 103F	4096 ⋮ 4158	4097 ⋮ 4159	Mapping setting of FZ110/400/900 (32) Refer to ■ Register address for data designation of 6.3.3 Data mapping address [Modbus double word] (P. 6-101).
1040 ⋮ 14FE	1041 ⋮ 14FF	4160 ⋮ 5374	4161 ⋮ 5375	Unused
1500 ⋮ 153E	1501 ⋮ 153F	5376 ⋮ 5438	5377 ⋮ 5439	Mapping data of FZ110/400/900 (32) Refer to ■ Register address for data read/write of 6.3.3 Data mapping address [Modbus double word] (P. 6-104).

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

For the Memory area, refer to the **5.9 How to Use Memory Area Data (P. 5-18)**.

6.1.2 Structure of Modbus (Single Word) data map

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

HEX: Hexadecimal number DEC: Decimal number

Register address		Contents
HEX	DEC	
0000 ⋮ 00E0	0 ⋮ 224	Communication data equivalent to our FB series* (address compatible) Refer to 6.4.4 FB series equivalent communication data [Modbus single word] (P. 6-135).
00E1 ⋮ 04FF	225 ⋮ 1279	Unused
0500 ⋮ 0548	1280 ⋮ 1352	Memory area data equivalent to our FB series* (address compatible) Refer to 6.4.5 Memory area data equivalent to the FB series (Area designation method) [Modbus single word] (P. 6-149).
0549 ⋮ 0FFF	1353 ⋮ 4095	Unused
1000 ⋮ 101F	4096 ⋮ 4127	Mapping setting of FZ110/400/900 (32) Up to 16 for FB series equivalent Refer to ■ Register address for data designation of 6.4.3 Data mapping address [Modbus single word] (P. 6-131).
1020 ⋮ 14FF	4128 ⋮ 5375	Unused
1500 ⋮ 151F	5376 ⋮ 5407	Mapping data of FZ110/400/900 (32) Up to 16 for FB series equivalent Refer to ■ Register address for data read/write of 6.4.3 Data mapping address [Modbus single word] (P. 6-133).
1520 ⋮ 1FFF	5408 ⋮ 8191	Unused
2000 ⋮ 20AE	8192 ⋮ 8366	Data of FZ110/400/900 (Normal setting data items) Refer to 6.4.1 FZ110/400/900 communication data [Modbus single word] (P. 6-106).
20AF ⋮ 2172	8367 ⋮ 8562	Data of FZ110/400/900 (Data in the Engineering mode) Refer to 6.4.1 FZ110/400/900 communication data [Modbus single word] (P. 6-106).
2173 ⋮ 24FF	8563 ⋮ 9471	Unused
2500 ⋮ 282F	9472 ⋮ 10287	Memory area data of FZ110/400/900 Refer to 6.4.2 Memory area data (Direct designation method) [Modbus single word] (P. 6-119).

* The communication identifiers of FZ110/400/900 equivalent to our FB series can be used.

If there is no relevant communication data on the FZ110/400/900, the data is handled as unused data.



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



For the Memory area, refer to the **5.9 How to Use Memory Area Data (P. 5-18).**

6.2 How to Read the Table

■ Data map of RKC communication identifiers/Modbus double word

This part describes how to read the data map of **6.3.1 Communication data [RKC communication identifier/Modbus double word]** (P. 6-9).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)			
No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
1	Input 1_Measured value (PV) [FZ110/400/900]	M1	7 or 6	0000	0001	0	1	RO	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—
2	Input 1_Set value (SV) monitor [FZ110/400/900]	MS	7 or 6	0002	0003	2	3	RO	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	—

(1) No.: Communication data number

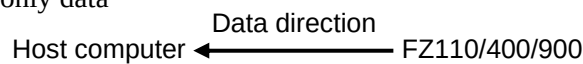
(2) Name: Communication data name
 [FZ400/900]: FZ400/900 data compatible
 (This function is disabled on the FZ110)
 [FZ110/400/900]: FZ110/400/900 data compatible

(3) Identifier: Identifier for RKC communication

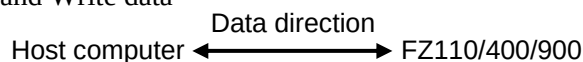
(4) Digits: Number of digits for RKC communication

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

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

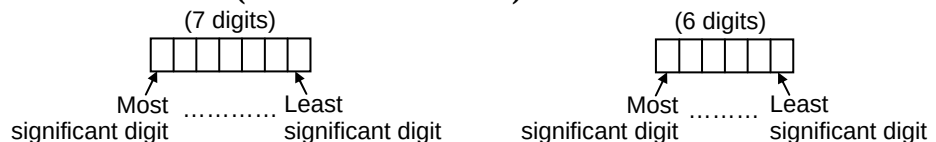


R/W: Read and Write data



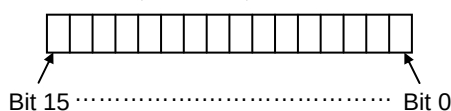
(7) Data range: Read or write range of communication data

• ASCII code data (RKC communication)



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

• 16-bit data (Modbus)



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



In the data range and the factory set value some unfamiliar expressions are used. These are used for Control with PV select and can be rephrased as follows:

PV select input span as Input span

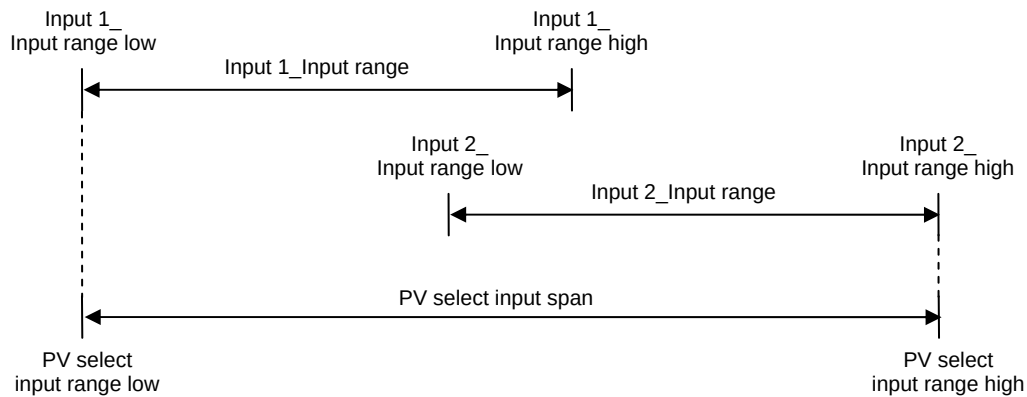
PV select input range high as Input range high

PV select input range low as Input range low

The setting range is as follows.

- PV select input range high: Input range high of Input 1 and Input 2, whichever is larger
- PV select input range low: Input range low of Input 1 and Input 2, whichever is smaller
- PV select input span: PV select input range low up to PV select input range high

[Example] When there is a relation as follows between the Input range of Input 1 and Input 2.



The communication data include “Normal setting data,” “Data in the Engineering mode,” “Data of identifiers compatible with other models (dummy data).”

Normal setting data:

No. 1 to 179

Data in the Engineering mode:

No. 180 to 375

Data of identifiers compatible with other models (dummy data): No. 376 to 387



The attribute of the data in the Engineering mode is RO (read only) during RUN (control).

WARNING

Communication data in the Engineering mode should be set according to the application before setting any parameter related to operation. Once the communication data in the Engineering mode are set correctly, no further changes need to be made to parameters for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Engineering mode.



NOTE

Communication data in Engineering mode are settable only when the controller is in STOP mode. However, only checking can be made even in the RUN state.

Data map of Modbus single word

This part describes how to read the data map of **6.4.1 FZ110/400/900 communication data [Modbus single word] (P. 6-106)**.

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
1	Input 1_Measured value (PV) [FZ110/400/900]	2000	8192	1
2	Input 1_Set value (SV) monitor [FZ110/400/900]	2001	8193	2

- (1) **No.:** Communication data number
- (2) **Name:** Communication data name
[FZ400/900]: FZ400/900 data compatible
(This function is disabled on the FZ110)
[FZ110/400/900]: FZ110/400/900 data compatible
- (3) **Register address:** Register address for Modbus communication
(HEX: Hexadecimal number DEC: Decimal number)
- (4) **6.3.1 Reference No.:** Refer to **6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-9)** for communication data numbers.

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

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
1	Input 1_Measured value (PV) [FZ110/400/900]	M1	7 or 6	0000	0001	0	1	RO	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—
2	Input 1_Set value (SV) monitor [FZ110/400/900]	MS	7 or 6	0002	0003	2	3	RO	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	—



The communication data include “Normal setting data,” “Data in the Engineering mode,” “Data of identifiers compatible with other models (dummy data).”

Normal setting data: No. 1 to 175

Data in the Engineering mode: No. 176 to 371



The attribute of the data in the Engineering mode is RO (read only) during RUN (control).

WARNING

Communication data in the Engineering mode should be set according to the application before setting any parameter related to operation. Once the communication data in the Engineering mode are set correctly, no further changes need to be made to parameters for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Engineering mode.



NOTE

Communication data in Engineering mode are settable only when the controller is in STOP mode. However, only checking can be made even in the RUN state.



■ Data map of FB series equivalent communication

This part describes how to read the data map of **6.4.4 FB series equivalent communication data [Modbus single word] (P. 6-135)**.

(1) No.	(2) Name		(3) Register address		(4) 6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
1	Measured value (PV)	Input 1_Measured value (PV) [FZ110/400/900]	0000	0	1
2	Current transformer 1 (CT1) input value monitor	Current transformer 1 (CT1) input value monitor [FZ110/400/900]	0001	1	11

(1) No.: Communication data number

(2) Name: Communication data name

Data equivalent to our FB series:

The communication data of our FB series compatible with the data of FZ110/400/900.

Relevant data of FZ110/400/900:

The data of FZ110/400/900 equivalent to the communication data of our FB series.

[FZ400/900]: FZ400/900 data compatible
(This function is disabled on the FZ110)

[FZ110/400/900]: FZ110/400/900 data compatible

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

(4) 6.3.1 Reference No.: Refer to **6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-9)** for communication data numbers.

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

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
1	Input 1_Measured value (PV) [FZ110/400/900]	M1	7 or 6	0000	0001	0	1	RO	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—
2	Input 1_Set value (SV) monitor [FZ110/400/900]	MS	7 or 6	0002	0003	2	3	RO	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	—



6.3 RKC Communication/Modbus (Double Word) Data

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



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



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

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

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

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
1	Input 1_Measured value (PV) [FZ110/400/900]	M1	7 or 6	0000	0001	0	1	RO	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—
2	Input 1_Set value (SV) monitor [FZ110/400/900]	MS	7 or 6	0002	0003	2	3	RO	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	—
3	Input 2_Measured value (PV) [FZ400/900]	M0	7 or 6	0004	0005	4	5	RO	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—
4	Input 2_Set value (SV) monitor [FZ400/900]	MT	7 or 6	0006	0007	6	7	RO	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	—
5	PV select Measured value (PV) [FZ400/900]	L3	7 or 6	0008	0009	8	9	RO	When controlling with Input 1: Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) When controlling with Input 2: Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
6	Measured value (PV) of differential temperature input [FZ400/900]	L2	7	000A	000B	10	11	RO	In case of Input data type 0 –19999 to +99999 [Varies with the setting of the Decimal point position.]	—
			6	—	—	—	—	RO	In case of Input data type 1 –1999 to +9999 [Varies with the setting of the Decimal point position.]	—
7	Set value (SV) monitor of differential temperature input [FZ400/900]	LE	7 or 6	000C	000D	12	13	RO	– (Input 1_Input span) to + (Input 1_Input span) [Varies with the setting of the Decimal point position.]	—
8	Input 1_Manipulated output value monitor [heat-side] [FZ110/400/900]	O1	7 or 6	000E	000F	14	15	RO	–5.0 to +105.0 %	—
9	Input 1_Manipulated output value monitor [cool-side] [FZ110/400/900]	O2	7 or 6	0010	0011	16	17	RO	–5.0 to +105.0 %	—
10	Input 2_Manipulated output value monitor [FZ400/900]	O0	7 or 6	0012	0013	18	19	RO	–5.0 to +105.0 %	—
11	Current transformer 1 (CT1) input value monitor [FZ110/400/900]	M3	7 or 6	0014	0015	20	21	RO	0.0 to 100.0 A	—
	—			—	—	—	—	In case of Input data type “2,” it is “Second current transformer input value (CT2)” of our REX-D equivalent parameter.	—	
	Second current transformer input value (CT2) (REX-D series equivalent) [FZ110/400/900] In case of Input data type 2									
12	Current transformer 2 (CT2) input value monitor [FZ400/900]	M4	7 or 6	0016	0017	22	23	RO	0.0 to 100.0 A	—



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
13	Memory area soak time monitor [FZ110/400/900]	TR	7	0018	0019	24	25	RO	In case of Input data type 0 • RKC communication 0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds • Modbus 0 to 35999 seconds * 0 to 11999 seconds 0 to 5999 minutes * Monitoring is available only on FZ400/900. [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	—
			6	—	—	—	—	RO	In case of Input data type 1 • RKC communication 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds • Modbus (Single word only) 0 to 5999 minutes 0 to 11999 seconds [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	—
14	Remote setting input value monitor [FZ110/400/900]	S2	7 or 6	001A	001B	26	27	RO	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	—
	Dummy data （REX-D series: For the Step set-value (SV2)） [FZ110/400/900] In case of Input data type 2			—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
15	Feedback resistance (FBR) input value [FZ110/400/900]	M2	7 or 6	001C	001D	28	29	RO	0.0 to 100.0 % In case of Input data type “2,” it is “First current transformer input value (CT1)” of our REX-D equivalent parameter.	—
	First current transformer input value (CT1) (REX-D series equivalent) [FZ110/400/900] In case of Input data type 2			—	—	—	—	RO		—



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
16	Event 1 state monitor [FZ110/400/900]	AA	7 or 6	001E	001F	30	31	RO	0: OFF 1: ON	—
17	Event 2 state monitor [FZ110/400/900]	AB	7 or 6	0020	0021	32	33	RO	0: OFF 1: ON	—
18	Event 3 state monitor [FZ110/400/900]	AG	7 or 6	0022	0023	34	35	RO	0: OFF 1: ON	—
19	Event 4 state monitor [FZ110/400/900]	AH	7 or 6	0024	0025	36	37	RO	0: OFF 1: ON	—
20	Heater break alarm 1 (HBA1) state monitor [FZ110/400/900]	AC	7 or 6	0026	0027	38	39	RO	0: OFF 1: ON	—
21	Heater break alarm 2 (HBA2) state monitor [FZ400/900]	AD	7 or 6	0028	0029	40	41	RO	0: OFF 1: ON	—
22	Control loop break alarm 1 (LBA1) state monitor [FZ110/400/900]	AE	7 or 6	002A	002B	42	43	RO	0: OFF 1: ON	—
23	Control loop break alarm 2 (LBA2) state monitor [FZ400/900]	AF	7 or 6	002C	002D	44	45	RO	0: OFF 1: ON	—

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
24	Comprehensive event state [FZ110/400/900]	AJ	7 or 6	002E	002F	46	47	RO	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low When multiple items are applicable, they are summed up.	—
25	Input 1_Burnout state monitor [FZ110/400/900]	B1	7 or 6	0030	0031	48	49	RO	0: OFF 1: ON	—
26	Input 2_Burnout state monitor [FZ400/900]	B0	7 or 6	0032	0033	50	51	RO	0: OFF 1: ON	—
27	Feedback resistance (FBR) break monitor [FZ110/400/900]	B2	7 or 6	0034	0035	52	53	RO	0: OFF 1: ON	—



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
28	DI state monitor [FZ110/400/900]	L1	7 or 6	0036	0037	54	55	RO	RKC communication 0 to 63 The contact input state is assigned as a bit image in binary numbers. Transmission data from the FZ series is replaced with ASCII code in decimal number. Bit 0: DI1 Bit 1: DI2 Bit 2: DI3 Bit 3: DI4 Bit 4: DI5 Bit 5: DI6 Bit 6 to Bit 7: Unused Data 0: Open 1: Closed	—
									Modbus 0 to 63 0: Open +1: DI1 Closed +2: DI2 Closed +4: DI3 Closed +8: DI4 Closed +16: DI5 Closed +32: DI6 Closed When multiple items are applicable, they are summed up.	—



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
29	OUT state monitor [FZ110/400/900]	Q1	7 or 6	0038	0039	56	57	RO	RKC communication 0 to 7 The contact input state is assigned as a bit image in binary numbers. Transmission data from the FZ series is replaced with ASCII code in decimal number. Bit 0:OUT1 Bit 1:OUT2 Bit 2:OUT3 Bit 3 to Bit 7: Unused Data 0: OFF 1: ON	—
									Modbus 0 to 7 0: OFF +1: OUT1 ON +2: OUT2 ON +4: OUT3 ON When multiple items are applicable, they are summed up.	—
30	DO state monitor [FZ110/400/900]	Q2	7 or 6	003A	003B	58	59	RO	RKC communication 0 to 15 The contact input state is assigned as a bit image in binary numbers. Transmission data from the FZ series is replaced with ASCII code in decimal number. Bit 0:DO1 Bit 1:DO2 Bit 2:DO3 Bit 3 DO4 Bit 4 to Bit 7: Unused Data 0: OFF 1: ON	—
									Modbus 0 to 15 0: OFF +1: DO1 ON +2: DO2 ON +4: DO3 ON +8: DO4 ON When multiple items are applicable, they are summed up.	—



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
31	Overall operation status [FZ110/400/900]	L0	7 or 6	003C	003D	60	61	RO	0 to 511 0: OFF +1: STOP state +2: Input 1_Manual mode state +4: Input 2_Manual mode state +8: Remote mode state (Cascade control state, Differential temperature control state, Input 2 state of Control with PV select) +16: Input 1_Autotuning (AT) state +32: Input 2_Autotuning (AT) state +64: Set value of Input 1 is now changing +128: Set value of Input 2 is now changing +256: Communication monitoring result When multiple items are applicable, they are summed up.	—
32	Input 1_PID memory [FZ110/400/900]	PC	7 or 6	003E	003F	62	63	RO	Switching by Memory area number: 1 to 16 Switching by Set value (SV): 1 to 8 Switching by Measured value (PV): 1 to 8 [Which PID memory can be used depends on the setting of the Input 1_Level PID action selection.]	—
33	Input 2_PID memory [FZ400/900]	PD	7 or 6	0040	0041	64	65	RO	Switching by Memory area number: 1 to 16 Switching by Set value (SV): 1 to 8 Switching by Measured value (PV): 1 to 8 [Which PID memory can be used depends on the setting of the Input 2_Level PID action selection.]	—
34	Input 1_Peak hold monitor [FZ110/400/900]	HQ	7 or 6	0042	0043	66	67	RO	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—
35	Input 1_Bottom hold monitor [FZ110/400/900]	FQ	7 or 6	0044	0045	68	69	RO	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	—
36	Input 2_Peak hold monitor [FZ400/900]	HR	7 or 6	0046	0047	70	71	RO	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
37	Input 2_Bottom hold monitor [FZ400/900]	FR	7 or 6	0048	0049	72	73	RO	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—
38	Input 1_AT remaining time monitor [FZ110/400/900]	AN	7 or 6	004A	004B	74	75	RO	RKC communication 0 hours 00 minutes to 48 hours 00 minutes	—
									Modbus 0 to 2880 minutes	—
39	Input 2_AT remaining time monitor [FZ400/900]	AO	7 or 6	004C	004D	76	77	RO	RKC communication 0 hours 00 minutes to 48 hours 00 minutes	—
									Modbus 0 to 2880 minutes	—
40	Input 1_AT/ST status monitor [FZ110/400/900]	AP	7 or 6	004E	004F	78	79	RO	–4 to +2 0: AT/ST complete +1: AT running now +2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—
41	Input 2_AT/ST status monitor [FZ400/900]	AQ	7 or 6	0050	0051	80	81	RO	–4 to +2 0: AT/ST complete +1: AT running now +2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—
42	Error code [FZ110/400/900]	ER	7 or 6	0052	0053	82	83	RO	0 to 71 0: Normal +1: Adjustment data error +2: Data back-up error +4: A/D conversion error (Temperature compensation error included) +64: Display units error When multiple items are applicable, they are summed up.	—



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
43	Integrated operating time [FZ110/400/900]	UT	7 or 6	0054	0055	84	85	RO	0 to 65535 hours	—
44	Peak hold monitor of ambient temperature [FZ110/400/900]	HP	7 or 6	0056	0057	86	87	RO	−120 to +120 °C	—
45	ROM version [FZ110/400/900]	VR	7 or 6	—	—	—	—	RO	Version of ROM built in the instrument	—
46	Model code monitor [FZ110/400/900]	ID	32	—	—	—	—	RO	Model code	—
47	Instrument serial number monitor [FZ110/400/900]	RX	10	—	—	—	—	RO	Instrument serial number	—
48	Retransmission output 1 decimal point position [FZ110/400/900]	—	—	0058	0059	88	89	RO	0: No decimal place 3: Three decimal place 1: One decimal place 4: Four decimal place 2: Two decimal place When the type of retransmission output is as follows: Varies with the setting of the Input 1_Decimal point position. No retransmission output Remote setting input value Input 1_Measured value (PV) Input 1_SV monitor value Input 1_Local SV Input 1_Deviation Measured value (PV) of differential temperature input	—
49	Retransmission output 2 decimal point position [FZ110/400/900]	—	—	005A	005B	90	91	RO	When the type of retransmission output is as follows: Varies with the setting of the Input 2_Decimal point position. Input 2_Measured value (PV) Input 2_SV monitor value Input 2_Local SV Input 2_Deviation	—
50	Retransmission output 3 decimal point position [FZ110/400/900]	—	—	005C	005D	92	93	RO	When the type of retransmission output is as follows: 1 (One decimal place) Input 1_Manipulated output value [heat-side] Input 1_Manipulated output value [cool-side] Input 2_Manipulated output value Current transformer 1 (CT1) input value Current transformer 2 (CT2) input value	—



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
51	Event 1 decimal point position [FZ110/400/900]	—	—	005E	005F	94	95	RO	0: No decimal place 1: One decimal place 2: Two decimal place 3: Three decimal place 4: Four decimal place	—
52	Event 2 decimal point position [FZ110/400/900]	—	—	0060	0061	96	97	RO	When the event type is No event, Deviation, Process, or SV: For Input 1, differential temperature input: Varies with the setting of the Input 1_Decimal point position. For Input 2: Varies with the setting of the Input 2_Decimal point position.	—
53	Event 3 decimal point position [FZ110/400/900]	—	—	0062	0063	98	99	RO		—
54	Event 4 decimal point position [FZ110/400/900]	—	—	0064	0065	100	101	RO		When the Event type is Manipulated output value: 1 (One decimal place)
55	Interlock release [FZ110/400/900]	IL	7 or 6	0066	0067	102	103	R/W	0: Interlock release 1: Interlock state “1: Interlock state” is for monitoring the interlocked state. Do not write “1.”	0
56	Memory area transfer [FZ110/400/900]	ZA	7 or 6	0068	0069	104	105	R/W	1 to 16 When the DI1 function selection is set to “Memory area transfer (Without area set signal)” and when “External mode” is selected with the Control area Local/External transfer, the data is RO (Read only).	1
57	Input 1_Hold reset [FZ110/400/900]	CQ	7 or 6	006A	006B	106	107	R/W	0: Hold 1: Reset Returns to Hold state automatically after reset.	0
58	Input 2_Hold reset [FZ400/900]	CR	7 or 6	006C	006D	108	109	R/W	0: Hold 1: Reset Returns to Hold state automatically after reset.	0
59	Bottom suppression start signal [FZ110/400/900]	S8	7 or 6	006E	006F	110	111	R/W	0 to 3 0: No forced ON +1: Input 1_Bottom suppression action Forced ON +2: Input 2_Bottom suppression action_Forced ON	0
60	RUN/STOP transfer [FZ110/400/900]	SR	7 or 6	0070	0071	112	113	R/W	0: RUN (Control start) 1: STOP (Control stop)	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
61	Input 1_Autotuning (AT) [FZ110/400/900]	G1	7 or 6	0072	0073	114	115	R/W	0: PID control 1: Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to “0.”	0
62	Input 2_Autotuning (AT) [FZ400/900]	G0	7 or 6	0074	0075	116	117	R/W	0: PID control 1: Start Autotuning When the Autotuning (AT) is finished, the control will automatically return to “0.”	0
63	Input 1_Startup tuning (ST) [FZ110/400/900]	ST	7 or 6	0076	0077	118	119	R/W	0: ST unused 1: Execute once * 2: Execute always * When the ST is finished, the control will automatically return to “0.”	0
64	Input 2_Startup tuning (ST) [FZ400/900]	SZ	7 or 6	0078	0079	120	121	R/W	0: ST unused 1: Execute once * 2: Execute always * When the ST is finished, the control will automatically return to “0.”	0
65	Input 1_Auto/Manual transfer [FZ110/400/900]	J1	7 or 6	007A	007B	122	123	R/W	0: Auto mode 1: Manual mode	0
66	Input 2_Auto/Manual transfer [FZ400/900]	J0	7 or 6	007C	007D	124	125	R/W	0: Auto mode 1: Manual mode	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
67	Remote/Local transfer [FZ110/400/900]	C1	7 or 6	007E	007F	126	127	R/W	When Select function for input 2 is: “Remote setting input” [FZ400/900] 0: Local mode 1: Remote mode	0
									When Remote setting input is specified: [FZ110] 0: Local mode 1: Remote mode	
									When Select function for input 2 is: “Cascade control” [FZ400/900] 0: Single control 1: Cascade control	0
									When Select function for input 2 is: “Control with PV select” [FZ400/900] 0: Input 1 1: Input 2 When “Switching by level” is selected at “Selection of PV select trigger,” the parameter becomes RO (Read only).	0
									When Select function for input 2 is: “2-loop control/Differential temperature control” [FZ400/900] 0: 2-loop control 1: Differential temperature control	0
68	Control area Local/External transfer [FZ110/400/900]	E1	7 or 6	0080	0081	128	129	R/W	0: Local mode 1: External mode	0
69	Input 1_Set value (SV) [FZ110/400/900]★	S1	7 or 6	0082	0083	130	131	R/W	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	0
70	Input 2_Set value (SV) [FZ400/900]★	S0	7 or 6	0084	0085	132	133	R/W	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	0
71	Set value (SV) of differential temperature input [FZ400/900]★	S3	7 or 6	0086	0087	134	135	R/W	– (Input 1_Input span) to + (Input 1_Input span) [Varies with the setting of the Decimal point position.]	0

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



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
72	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high] [FZ110/400/900] ★	A1	7 or 6	0088	0089	136	137	R/W	● Deviation When assigned to Input 1 or Differential temperature input – (Input 1_Input span) to + (Input 1_Input span) When assigned to Input 2 – (Input 2_Input span) to + (Input 2_Input span) When Control with PV select is selected at Select function for input 2 – (PV select input span) to + (PV select input span) [Varies with the setting of the Decimal point position.] ● Input value or Set value When assigned to Input 1 Input 1_Input range low to Input 1_Input range high When assigned to Input 2 Input 2_Input range low to Input 2_Input range high When assigned to Differential temperature input – (Input 1_Input span) to + (Input 1_Input span) When Control with PV select is selected at Select function for input 2 PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.] ● Manipulated output value –5.0 to +105.0 %	TC/RTD inputs: 10 V/I inputs: 5 % of input span
										50.0

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



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
73	Event 1 set value (EV1') [low] [FZ110/400/900] ★	BT	7 or 6	008A	008B	138	139	R/W	● Deviation When assigned to Input_1 or Differential temperature input – (Input 1_Input span) to + (Input 1_Input span) When assigned to Input 2 – (Input 2_Input span) to + (Input 2_Input span) When Control with PV select is selected at Select function for Input 2 – (PV select input span) to + (PV select input span) [Varies with the setting of the Decimal point position.] ● Input value or Set value When assigned to Input 1 Input 1_Input range low to Input 1_Input range high When assigned to Input 2 Input 2_Input range low to Input 2_Input range high When assigned to Differential temperature input – (Input 1_Input span) to + (Input 1_Input span) When Control with PV select is selected at Select function for Input 2 PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.]	TC/RTD inputs: –10 V/I inputs: –5 % of input span
74	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high] [FZ110/400/900] ★	A2	7 or 6	008C	008D	140	141	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
75	Event 2 set value (EV2') [low] [FZ110/400/900] ★	BU	7 or 6	008E	008F	142	143	R/W	Same as Event 1 set value (EV1') [low]	
76	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high] [FZ110/400/900] ★	A7	7 or 6	0090	0091	144	145	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	

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



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
77	Event 3 set value (EV3') [low] [FZ110/400/900] ★	BV	7 or 6	0092	0093	146	147	R/W	Same as Event 1 set value (EV1') [low]	
78	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high] [FZ110/400/900] ★	A8	7 or 6	0094	0095	148	149	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
79	Event 4 set value (EV4') [low] [FZ110/400/900] ★	BW	7 or 6	0096	0097	150	151	R/W	Same as Event 1 set value (EV1') [low]	
80	Input 1_Proportional band [heat-side] [FZ110/400/900] ★	P1	7 or 6	0098	0099	152	153	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0
81	Input 1_Integral time [heat-side] [FZ110/400/900] ★	I1	7 or 6	009A	009B	154	155	R/W	PID control or Heat/Cool PID control 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240
82	Input 1_Derivative time [heat-side] [FZ110/400/900] ★	D1	7 or 6	009C	009D	156	157	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

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



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
83	Input 1_Control response parameter [FZ110/400/900] ★	CA	7 or 6	009E	009F	158	159	R/W	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2
84	Input 1_Proactive intensity [FZ110/400/900] ★	ZP	7 or 6	00A0	00A1	160	161	R/W	0 to 4 0: No function	2
85	Input 1_Manual reset [FZ110/400/900] ★	MR	7 or 6	00A2	00A3	162	163	R/W	−100.0 to +100.0 %	0.0
86	Input 1_FF amount [FZ110/400/900] ★	F3	7 or 6	00A4	00A5	164	165	R/W	−100.0 to +100.0 %	0.0
87	Input 1_Output limiter high [heat-side] [FZ110/400/900] ★	OH	7 or 6	00A6	00A7	166	167	R/W	Input 1_Output limiter low [heat-side] to 105.0 %	105.0
88	Input 1_Output limiter low [heat-side] [FZ110/400/900] ★	OX	7 or 6	00A8	00A9	168	169	R/W	−5.0 % to Input 1_Output limiter high [heat-side]	−5.0
89	Input 1_Control loop break alarm (LBA) time [FZ110/400/900] ★	A5	7 or 6	00AA	00AB	170	171	R/W	0 to 7200 seconds 0: No function	LBA function is specified: 480 LBA function is not specified: 0
90	Input 1_LBA deadband (LBD) [FZ110/400/900] ★	V3 A6	7 or 6	00AC	00AD	172	173	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	0
91	Input 2_Proportional band [FZ400/900] ★	P0	7 or 6	00AE	00AF	174	175	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

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



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
92	Input 2_Integral time [FZ400/900] ★	I0	7 or 6	00B0	00B1	176	177	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
93	Input 2_Derivative time [FZ400/900] ★	D3	7 or 6	00B2	00B3	178	179	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
94	Input 2_Control response parameter [FZ400/900] ★	C8	7 or 6	00B4	00B5	180	181	R/W	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	0
95	Input 2_Proactive intensity [FZ400/900] ★	ZQ	7 or 6	00B6	00B7	182	183	R/W	0 to 4 0: No function	2
96	Input 2_Manual reset [FZ400/900] ★	MQ	7 or 6	00B8	00B9	184	185	R/W	−100.0 to +100.0 %	0.0
97	Input 2_FF amount [FZ400/900] ★	F4	7 or 6	00BA	00BB	186	187	R/W	−100.0 to +100.0 %	0.0
98	Input 2_Output limiter high [FZ400/900] ★	OO	7 or 6	00BC	00BD	188	189	R/W	Input 2_Output limiter low to 105.0 %	105.0
99	Input 2_Output limiter low [FZ400/900] ★	OS	7 or 6	00BE	00BF	190	191	R/W	−5.0 % to Input 2_Output limiter high	−5.0
100	Input 2_Control loop break alarm (LBA) time [FZ400/900] ★	A9	7 or 6	00C0	00C1	192	193	R/W	0 to 7200 seconds 0: No function	LBA function is specified: 480 LBA function is not specified: 0
101	Input 2_LBA deadband (LBD) [FZ400/900] ★	V4	7 or 6	00C2	00C3	194	195	R/W	0 to Input 2_Input span [Varies with the setting of the Decimal point position.]	0

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



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
102	Input 1_Proportional band [cool-side] [FZ110/400/900] ★	P2	7 or 6	00C4	00C5	196	197	R/W	TC/RTD inputs 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.1 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.1 to 1000.0 % of PV select input span)	TC/RTD inputs: 30 V/I inputs: 3.0
103	Input 1_Integral time [cool-side] [FZ110/400/900] ★	I2	7 or 6	00C6	00C7	198	199	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
104	Input 1_Derivative time [cool-side] [FZ110/400/900] ★	D2	7 or 6	00C8	00C9	200	201	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
105	Input 1_Overlap/Deadband [FZ110/400/900] ★	V1	7 or 6	00CA	00CB	202	203	R/W	TC/RTD inputs – (Input 1_Input span) to + (Input 1_Input span) 〔 When Control with PV select: – (PV select input span) to + (PV select input span) 〕 (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs –100.0 to +100.0 % of Input 1_Input span 〔 When Control with PV select: –100.0 to +100.0 % of PV select input span 〕 Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0
106	Input 1_Output limiter high [cool-side] [FZ110/400/900] ★	OL	7 or 6	00CC	00CD	204	205	R/W	Heat/Cool PID control Input 1_Output limiter low [cool-side] to 105.0 %	105.0
	Input 1_Output limiter low [heat-side] [FZ110/400/900] ★								PID control or Position proportioning PID control –5.0 % to Input 1_Output limiter high [heat-side] Same data as RKC communication identifier OX	–5.0

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



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
107	Input 1_Output limiter low [cool-side] [FZ110/400/900] ★	OY	7 or 6	00CE	00CF	206	207	R/W	−5.0 % to Input 1_Output limiter high [cool-side]	−5.0
108	Select Trigger type for Memory area transfer [FZ110/400/900] ★	EY	7 or 6	00D0	00D1	208	209	R/W	0 to 63 0: No assignment +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Digital input 1 (DI1) Close edge +32: Digital input 1 (DI1) Open edge To select two or more functions, sum each value.	0
109	Area soak time [FZ110/400/900] ★	TM	7	00D2	00D3	210	211	R/W	In case of Input data type 0 • RKC communication 0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds • Modbus 0 to 35999 seconds * 0 to 11999 seconds 0 to 5999 minutes * Settable only for FZ400/900 [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	RKC communication: 0:00 (0 minutes 00 seconds) Modbus: 0 (0 minutes)
			6	—	—	—	—	R/W	In case of Input data type 1 • RKC communication 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds • Modbus (Single word only) 0 to 5999 minutes 0 to 11999 seconds [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	RKC communication: 0:00 (0 minutes 00 seconds) Modbus: 0 (0 minutes)
110	Link area number [FZ110/400/900] ★	LP	7 or 6	00D4	00D5	212	213	R/W	0 to 16 0: No function	0

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



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
111	Input 1_Setting change rate limiter (up) [FZ110/400/900] ★	HH	7 or 6	00D6	00D7	214	215	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function [Varies with the setting of the Decimal point position.]	0
112	Input 1_Setting change rate limiter (down) [FZ110/400/900] ★	HL	7 or 6	00D8	00D9	216	217	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function [Varies with the setting of the Decimal point position.]	0
113	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900] ★	J2	7 or 6	00DA	00DB	218	219	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
114	Input 1_Manipulated output value (Area) [FZ110/400/900] ★	O8	7 or 6	00DC	00DD	220	221	R/W	PID control, Position proportioning PID control –5.0 to +105.0 % Heat/Cool PID control –105.0 to +105.0 %	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0
115	Input 2_Setting change rate limiter (up) [FZ400/900] ★	HX	7 or 6	00DE	00DF	222	223	R/W	0 to Input 2_Input span 0: No function [Varies with the setting of the Decimal point position.]	0
116	Input 2_Setting change rate limiter (down) [FZ400/900] ★	HY	7 or 6	00E0	00E1	224	225	R/W	0 to Input 2_Input span 0: No function [Varies with the setting of the Decimal point position.]	0
117	Input 2_Auto/Manual transfer selection (Area) [FZ400/900] ★	J3	7 or 6	00E2	00E3	226	227	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
118	Input 2_Manipulated output value (Area) [FZ400/900] ★	O9	7 or 6	00E4	00E5	228	229	R/W	–5.0 to +105.0 %	–5.0

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



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
119	Remote/Local transfer selection (Area) [FZ110/400/900] 									

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

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
121	Input 1_PV bias [FZ110/400/900]	PB	7 or 6	00EA	00EB	234	235	R/W	– (Input 1_Input span) to + (Input 1_Input span) ⎧ When Control with PV select: – (PV select input span) to + (PV select input span) ⎫ [Varies with the setting of the Decimal point position.]	0
122	Input 1_PV digital filter [FZ110/400/900]	F1	7 or 6	00EC	00ED	236	237	R/W	0.0 to 100.0 seconds 0.0: Filter OFF	0.0
123	Input 1_PV ratio [FZ110/400/900]	PR	7 or 6	00EE	00EF	238	239	R/W	0.500 to 1.500	1.000
124	Input 1_PV low input cut-off [FZ110/400/900]	DP	7 or 6	00F0	00F1	240	241	R/W	0.00 to 25.00 % of Input 1_Input span (When Control with PV select: 0.00 to 25.00 % of PV select input span)	0.00
125	Input 2_PV bias (RS bias) [FZ110/400/900]	RB	7 or 6	00F2	00F3	242	243	R/W	Input 2_PV bias – (Input 2_Input span) to + (Input 2_Input span) RS bias – (Input 1_Input span) to + (Input 1_Input span) [Varies with the setting of the Decimal point position.] In the case of FZ400/900, RS bias is selected by selecting “Remote setting input” at Select function for input 2. In the case of FZ110, RS bias is selected by selecting “Remote setting input.”	0
126	Input 2_PV digital filter (RS digital filter) [FZ110/400/900]	F2	7 or 6	00F4	00F5	244	245	R/W	0.0 to 100.0 seconds 0.0: Filter OFF In the case of FZ400/900, RS digital filter is selected by selecting “Remote setting input” at Select function for input 2. In the case of FZ110, RS digital filter is selected by selecting “Remote setting input.”	0.0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
127	Input 2_PV ratio (RS ratio) [FZ110/400/900]	RR	7 or 6	00F6	00F7	246	247	R/W	Input 2_PV ratio 0.500 to 1.500 RS ratio 0.001 to 9.999 In the case of FZ400/900, RS ratio is selected by selecting “Remote setting input” at Select function for input 2. In the case of FZ110, RS ratio is selected by selecting “Remote setting input.”	1.000
128	Input 2_PV low input cut-off [FZ400/900]	DS	7 or 6	00F8	00F9	248	249	R/W	0.00 to 25.00 % of Input 2_Input span	0.00
129	OUT1 proportional cycle time [FZ110/400/900]	T0	7 or 6	00FA	00FB	250	251	R/W	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note1
130	OUT2 proportional cycle time [FZ110/400/900]	T1	7 or 6	00FC	00FD	252	253	R/W	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note2
131	OUT3 proportional cycle time [FZ110/400/900]	T2	7 or 6	00FE	00FF	254	255	R/W	0.1 to 100.0 seconds	Voltage pulse output: Note3

Note1: In case OUT1 function selection is “Input 1_Control output [cool-side]” and Input 1_Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

Note2: In case OUT2 function selection is “Input 1_Control output [cool-side]” and Input 1_Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

Note3: In case OUT3 function selection is “Input 1_Control output [cool-side]” and Input 1_Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
132	OUT1 minimum ON/OFF time of proportional cycle [FZ110/400/900]	OP	7 or 6	0100	0101	256	257	R/W	0 to 1000 ms	0
133	OUT2 minimum ON/OFF time of proportional cycle [FZ110/400/900]	OQ	7 or 6	0102	0103	258	259	R/W	0 to 1000 ms	0
134	OUT3 minimum ON/OFF time of proportional cycle [FZ110/400/900]	OR	7 or 6	0104	0105	260	261	R/W	0 to 1000 ms	0
135	Heater break alarm 1 (HBA1) set value [FZ110/400/900]	A3	7 or 6	0106	0107	262	263	R/W	0.0 to 100.0 A 0.0: HBA function OFF	0.0
136	Number of heater break alarm 1 (HBA1) delay times [FZ110/400/900]	TH	7 or 6	0108	0109	264	265	R/W	0 to 255 times	5
137	Heater break alarm 2 (HBA2) set value [FZ400/900]	A4	7 or 6	010A	010B	266	267	R/W	0.0 to 100.0 A 0.0: HBA function OFF	0.0
138	Number of heater break alarm 2 (HBA2) delay times [FZ400/900]	TI	7 or 6	010C	010D	268	269	R/W	0 to 255 times	5
139	Input 1_Manual manipulated output value [FZ110/400/900]	ON	7 or 6	010E	010F	270	271	R/W	PID control, Position proportioning PID control Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side] Heat/Cool PID control * –(Input 1_Output limiter high [cool-side]) to +(Input 1_Output limiter high [heat-side])	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0

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

- (1) Input 1_Output limiter high [cool-side] is $\leq 0.0\%$
 - Input 1_Output limiter low [heat-side] is $\leq 0.0\%$: 0.0% to +(Input 1_Output limiter high [heat-side])
 - Input 1_Output limiter low [heat-side] is $> 0.0\%$: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side]
- (2) Input 1_Output limiter high [heat-side] is $\leq 0.0\%$
 - Input 1_Output limiter low [cool-side] is $\leq 0.0\%$: –(Input 1_Output limiter high [cool-side]) to 0.0%
 - Input 1_Output limiter low [cool-side] is $> 0.0\%$: –(Input 1_Output limiter high [cool-side]) to –(Input 1_Output limiter low [cool-side])
- (3) Fixed at 0.0% in the following cases: Input 1_Output limiter high [cool-side] $\leq 0.0\%$, and Input 1_Output limiter high [heat-side] $\leq 0.0\%$



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
140	Input 1_Level PID setting 1 * [FZ110/400/900]	Q4	7 or 6	0110	0111	272	273	R/W	Input 1_Input range low to Input 1_Input range high 〔 When Control with PV select: PV select input range low to PV select input range high 〕 [Varies with the setting of the Decimal point position.]	Input 1_ Input range high 〔 When Control with PV select: PV select input range high 〕
141	Input 1_Level PID setting 2 * [FZ110/400/900]	Q5	7 or 6	0112	0113	274	275	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
142	Input 1_Level PID setting 3 * [FZ110/400/900]	Q6	7 or 6	0114	0115	276	277	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_Level PID setting 1
143	Input 1_Level PID setting 4 * [FZ110/400/900]	Q7	7 or 6	0116	0117	278	279	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_Level PID setting 1
144	Input 1_Level PID setting 5 * [FZ110/400/900]	Q8	7 or 6	0118	0119	280	281	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_Level PID setting 1
145	Input 1_Level PID setting 6 * [FZ110/400/900]	Q9	7 or 6	011A	011B	282	283	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_Level PID setting 1
146	Input 1_Level PID setting 7 * [FZ110/400/900]	QA	7 or 6	011C	011D	284	285	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_Level PID setting 1

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

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

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
147	Input 1_ON/OFF action differential gap [FZ110/400/900]	MH	7 or 6	011E	011F	286	287	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 2 V/I inputs: 0.2
148	Input 1_ON/OFF action differential gap (upper) [FZ110/400/900]	IV	7 or 6	0120	0121	288	289	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1
149	Input 1_ON/OFF action differential gap (lower) [FZ110/400/900]	IW	7 or 6	0122	0123	290	291	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1
150	Input 2_Manual manipulated output value [FZ400/900]	OM	7 or 6	0124	0125	292	293	R/W	Input 2_ Output limiter low to Input 2_Output limiter high	−5.0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
151	Input 2_Level PID setting 1 * [FZ400/900]	QB	7 or 6	0126	0127	294	295	R/W	Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.]	Input 2_Input range high
152	Input 2_Level PID setting 2 * [FZ400/900]	QC	7 or 6	0128	0129	296	297	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_Level PID setting 1
153	Input 2_Level PID setting 3 * [FZ400/900]	QD	7 or 6	012A	012B	298	299	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_Level PID setting 1
154	Input 2_Level PID setting 4 * [FZ400/900]	QE	7 or 6	012C	012D	300	301	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_Level PID setting 1
155	Input 2_Level PID setting 5 * [FZ400/900]	QF	7 or 6	012E	012F	302	303	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_Level PID setting 1
156	Input 2_Level PID setting 6 * [FZ400/900]	QG	7 or 6	0130	0131	304	305	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_Level PID setting 1
157	Input 2_Level PID setting 7 * [FZ400/900]	QH	7 or 6	0132	0133	306	307	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_Level PID setting 1

*Level PID settings 1 to 7 of Input 2 always maintain the following relation.

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



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
158	Input 2_ON/OFF action differential gap [FZ400/900]	MG	7 or 6	0134	0135	308	309	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 2 V/I inputs: 0.2
159	Input 2_ON/OFF action differential gap (upper) [FZ400/900]	IX	7 or 6	0136	0137	310	311	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1
160	Input 2_ON/OFF action differential gap (lower) [FZ400/900]	IY	7 or 6	0138	0139	312	313	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1
161	Input 1_AT bias [FZ110/400/900]	GB	7 or 6	013A	013B	314	315	R/W	– (Input 1_Input span) to + (Input 1_Input span) 〔 When Control with PV select: – (PV select input span) to + (PV select input span) 〕 [Varies with the setting of the Decimal point position.]	0
162	Input 2_AT bias [FZ400/900]	GA	7 or 6	013C	013D	316	317	R/W	– (Input 2_Input span) to + (Input 2_Input span) [Varies with the setting of the Decimal point position.]	0
163	Open/Close output neutral zone [FZ110/400/900]	V2	7 or 6	013E	013F	318	319	R/W	0.1 to 10.0 % of output	2.0
164	Open/Close output differential gap [FZ110/400/900]	VH	7 or 6	0140	0141	320	321	R/W	0.1 to 5.0 % of output	1.0
165	FF amount learning [FZ110/400/900]	G7	7 or 6	0142	0143	322	323	R/W	0 to 3 0: No learning +1: Learn Input 1 +2: Learn Input 2 To select two or more functions, sum each value.	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
166	Input 1_Determination point of external disturbance [FZ110/400/900]	G8	7 or 6	0144	0145	324	325	R/W	– (Input 1_Input span) to + (Input 1_Input span) 〔 When Control with PV select: – (PV select input span) to + (PV select input span) 〕 [Varies with the setting of the Decimal point position.]	–1
167	Input 2_Determination point of external disturbance [FZ400/900]	G9	7 or 6	0146	0147	326	327	R/W	– (Input 2_Input span) to + (Input 2_Input span) [Varies with the setting of the Decimal point position.]	–1
168	Cascade_Proportional band (master-side) [FZ400/900]	MP	7 or 6	0148	0149	328	329	R/W	TC/RTD inputs 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.1 to 1000.0 % of Input 1_Input span	TC/RTD inputs: 30 V/I inputs: 3.0
169	Cascade_Integral time (master-side) [FZ400/900]	MI	7 or 6	014A	014B	330	331	R/W	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240
170	Cascade_Derivative time (master-side) [FZ400/900]	MD	7 or 6	014C	014D	332	333	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
171	Cascade_Proportional band (slave-side) [FZ400/900]	SP	7 or 6	014E	014F	334	335	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 2_Input span	TC/RTD inputs: 30 V/I inputs: 3.0
172	Cascade_Integral time (slave-side) [FZ400/900]	SI	7 or 6	0150	0151	336	337	R/W	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240
173	Cascade_Derivative time (slave-side) [FZ400/900]	SD	7 or 6	0152	0153	338	339	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
174	Cascade_Digital filter [FZ400/900]	RD	7 or 6	0154	0155	340	341	R/W	0.0 to 100.0 seconds 0.0: Filter OFF	10.0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
175	Cascade_Scale high [FZ400/900]	RN	7 or 6	0156	0157	342	343	R/W	Cascade_Scale low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	Input 2_ Setting limiter high
176	Cascade_Scale low [FZ400/900]	RO	7 or 6	0158	0159	344	345	R/W	Input 2_Setting limiter low to Cascade_Scale high [Varies with the setting of the Decimal point position.]	Input 2_ Setting limiter low
177	PV select transfer level [FZ400/900]	L8	7 or 6	015A	015B	346	347	R/W	Input 1_Input range low to Input 1_Input range high [Varies with the setting of the Decimal point position.]	Input 1_ Input range high
178	PV select transfer time [FZ400/900]	L9	7 or 6	015C	015D	348	349	R/W	0.0 to 100.0 seconds	0.0



Items 180 to 375 are data in the Engineering mode.

WARNING

Communication data the Engineering mode should be set according to the application before setting any parameter related to operation. Once the communication data in the Engineering mode are set correctly, no further changes need to be made to parameters for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Engineering mode.



NOTE

Parameters in Engineering mode are settable only when the controller is in STOP mode. However, only checking can be made even in the RUN state.

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
180	STOP display selection [FZ110/400/900]	DX	7 or 6	015E	015F	350	351	R/W	0: Stop on PV display 1: Stop on SV display 2: Stop on MV display FZ400/900: 0 to 2 FZ110: 0 to 1	1
181	ALM lamp lighting condition [FZ110/400/900]	LY	7 or 6	0160	0161	352	353	R/W	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	255

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
182	PV flashing display at input error [FZ110/400/900]	DU	7 or 6	0162	0163	354	355	R/W	0: Flashing display 1: Non-flashing display	0
183	Show/Hide Input 1_SV [FZ110/400/900]	H8	7 or 6	0164	0165	356	357	R/W	0: Hide Input 1_SV 1: Show Input 1_SV	1
184	Show/Hide Input 2_SV [FZ400/900]	HN	7 or 6	0166	0167	358	359	R/W	0: Hide Input 2_SV 1: Show Input 2_SV	1
185	Show/Hide Input 1_MV [FZ400/900]	H9	7 or 6	0168	0169	360	361	R/W	0: Hide 1: Show Input 1_Manipulated output value (MV) 2: Show Memory area soak time 3: Show Current transformer 1 (CT1) input value 4: Show Current transformer 2 (CT2) input value	1
186	Show/Hide Input 2_MV [FZ400/900]	HO	7 or 6	016A	016B	362	363	R/W	0: Hide 1: Show Input 2_Manipulated output value (MV) 2: Show Memory area soak time 3: Show Current transformer 1 (CT1) input value 4: Show Current transformer 2 (CT2) input value	1
187	Select hide items in Monitor mode [FZ110/400/900]	LN	7 or 6	016C	016D	364	365	R/W	0 to 31 0: Show all +1: Remote setting input value monitor +2: Manipulated output value (MV) monitor +4: Current transformer (CT) monitor +8: Comprehensive event state +16: Memory area soak time To select two or more functions, sum each value.	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
188	Select hide items in Operation transfer mode [FZ110/400/900]	LM	7 or 6	016E	016F	366	367	R/W	0 to 63 0: Show all +1: RUN/STOP transfer +2: Autotuning (AT) +4: Startup tuning (ST) +8: Auto/Manual transfer +16: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +32: Control area Local/External transfer To select two or more functions, sum each value.	0
189	Data registration [FZ110/400/900]	KN	7 or 6	0170	0171	368	369	R/W	0: SET key method Used to register the Set value (SV) using the SET key. 1: Direct registration Used to register the Set value (SV) without pressing the SET key.	0
190	FUNC key assignment [FZ400/900]	FK	7 or 6	0172	0173	370	371	R/W	0: Unused 1: RUN/STOP transfer 2: Autotuning (AT) (Common to Input 1 and 2) 3: Input 1_Autotuning (AT) 4: Input 2_Autotuning (AT) 5: Auto/Manual transfer (Common to Input 1 and 2) 6: Input 1_Auto/Manual transfer 7: Input 2_Auto/Manual transfer 8: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 9: Control area Local/External transfer 10: Interlock release 11: Hold reset (Common to Input 1 and 2) 12: Input 1_Hold reset 13: Input 2_Hold reset 14: Set data Unlock/Lock transfer 15: Area jump	1



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
191	FUNC key operation selection [FZ400/900]	FL	7 or 6	0174	0175	372	373	R/W	0: Press once The function set at “FUNC key assignment” is activated upon a press of the FUNC key. 1: Press and hold The function set at “FUNC key assignment” is activated by holding the FUNC key pressed.	0
192	Input 1_Input type [FZ110/400/900]	XI	7 or 6	0176	0177	374	375	R/W	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PLII 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input –10 to +10 V DC 22: Voltage input –5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC	Same as the input type of the input range code specified at the time of order.
193	Input 1_Display unit [FZ110/400/900]	PU	7 or 6	0178	0179	376	377	R/W	0: °C 1: °F	Same as the display unit of the input range code specified at the time of order.
194	Input 1_Decimal point position [FZ110/400/900]	XU	7 or 6	017A	017B	378	379	R/W	0: No decimal place 1: One decimal place 2: Two decimal place 3: Three decimal place 4: Four decimal place TC input: K, J, T, U, L: 0 or 1 Thermocouples other than those shown above: 0 (fixed) RTD input: 0 to 2 Voltage (V)/Current (I) inputs: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3 〔 When Control with PV select: Decimal point position setting of Input 1 and Input 2 is compared and the smaller will be used. 〕	Same as the decimal point position of the input range code specified at the time of order. For V/I inputs: 1



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
195	Input 1_Input range high [FZ110/400/900]	XV	7 or 6	017C	017D	380	381	R/W	(Input 1_Input range low + 1digit) to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.]	High limit value of the input range code specified at the time of order. For V/I inputs: 100.0
196	Input 1_Input range low [FZ110/400/900]	XW	7 or 6	017E	017F	382	383	R/W	Input 1_Minimum value of input range to (Input 1_Input range high – 1digit) [Varies with the setting of the Decimal point position.]	Low limit value of the input range code specified at the time of order. For V/I inputs: 0.0
197	Input 1_Input error determination point (high) [FZ110/400/900]	AV	7 or 6	0180	0181	384	385	R/W	Input 1_Input error determination point (low) to Input 1_Input range high + (Input 1_5 % of input span) [Varies with the setting of the Decimal point position.]	Input 1_ Input range high + (Input 1_5 % of input span)
198	Input 1_Input error determination point (low) [FZ110/400/900]	AW	7 or 6	0182	0183	386	387	R/W	Input 1_Input range low – (Input 1_5 % of input span) * to Input 1_Input error determination point (high) [Varies with the setting of the Decimal point position.] *When Input type of Input 1 is RTD, low limit value is about 2 Ohms. (Pt100: –245.5 °C [–409.8 °F], JPt100: –237.6 °C [–395.7 °F])	Input 1_ Input range low – (Input 1_5 % of input span)
199	Input 1_Temperature compensation calculation [FZ110/400/900]	R0	7 or 6	0184	0185	388	389	R/W	0: No temperature compensation calculation 1: With temperature compensation calculation	1
200	Input 1_Burnout direction [FZ110/400/900]	BS	7 or 6	0186	0187	390	391	R/W	0: Upscale 1: Downscale	0
201	Input 1_Square root extraction [FZ110/400/900]	XH	7 or 6	0188	0189	392	393	R/W	0: Unused 1: Used	0
202	Input 1_Inverting input [FZ110/400/900]	IB	7 or 6	018A	018B	394	395	R/W	0: Unused 1: Used	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
203	Input data type [FZ110/400/900]	SE	7 or 6	018C	018D	396	397	R/W	0: Number of measured value digits: 5 Number of RKC communication data digits: 7 Modbus data: Double word 1: Number of measured value digits: 4 Number of RKC communication data digits: 6 Modbus data: Single word * 2: Number of measured value digits: 4 Number of RKC communication data digits: 6 Our REX-D equivalent (Some identifiers are replaced with the REX-D equivalent identifiers) Modbus data: Single word * * Including our FB series equivalent data Select “2” only when you need to handle REX-D equivalent data in RKC communication. When changing the Input data type from 0 to 1 (or 2) and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand. The display of the time unit depends on the Input data type. In case of Input data type 0 FZ400/900: hour/minute/second, hour/minute, minute/second FZ110: hour/minute, minute/second In case of Input data type 1 hour/minute, minute/second The time unit is selectable at Soak time unit (RKC communication: RU, Modbus: 02B0H to 02B1H)	Depends on the input range code specified at the time of order.



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value	
				HEX		DEC					
				Low-order	High-order	Low-order	High-order				
204	Input 2_Input type [FZ110/400/900]	XR	7 or 6	018E	018F	398	399	R/W	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PLII 10: TC input U 11: TC input L 12: TC input PR40-20 • When Measured Input 2 is selected for FZ400/900: 0 to 24 • When Remote setting input is selected for FZ400/900: 15 to 24 • When Remote setting input is selected for FZ110: 15 to 22	13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input −10 to +10 V DC 22: Voltage input −5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC	Same as Input 1_Input type When Remote setting input is specified at the time of order, but the input type is not specified: 17
	Dummy data (REX-D series: Current transformer type selection) [FZ110/400/900] In case of Input data type 2			—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0	



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
205	Input 2_Display unit [FZ400/900]	PT	7 or 6	0190	0191	400	401	R/W	0: °C 1: °F	Same as Input 1_Display unit
206	Input 2_Decimal point position [FZ400/900]	XZ	7 or 6	0192	0193	402	403	R/W	0: No decimal place 1: One decimal place 2: Two decimal place TC input: K, J, T, U, L: 0 or 1 Thermocouples other than those shown above: 0 (fixed) RTD input: 0 to 2 Voltage (V)/Current (I) inputs: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3	Same as Input 1_Decimal point position
207	Input 2_Input range high [FZ110/400/900]	XX	7 or 6	0194	0195	404	405	R/W	TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): (Input 2_Input range low + 1digit) to Input 2_Maximum value of input range Voltage (V)/Current (I) Inputs (For Remote setting input): Input 2_Input range low to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.]	Same as Input 1_Input range high
208	Input 2_Input range low [FZ110/400/900]	XY	7 or 6	0196	0197	406	407	R/W	TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): Input 2_Minimum value of input range to (Input 2_Input range high – 1digit) Voltage (V)/Current (I) Inputs (For Remote setting input): Input 1_Minimum value of input range to Input 2_Input range high [Varies with the setting of the Decimal point position.]	Same as Input 1_Input range low
209	Input 2_Input error determination point (high) [FZ400/900]	AX	7 or 6	0198	0199	408	409	R/W	Input 2_Input error determination point (low) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	Input 2_Input range high + (Input 2_5 % of input span)
210	Input 2_Input error determination point (low) [FZ400/900]	AY	7 or 6	019A	019B	410	411	R/W	Input 2_Input range low – (Input 2_5 % of input span) * to Input 2_Input error determination point (high) [Varies with the setting of the Decimal point position.] * When Input type of Input 2 is RTD, low limit value is about 2 Ohms. (Pt100: –245.5 °C [–409.8 °F] , JPt100: –237.6 °C [–395.7 °F])	Input 2_ Input range low – (Input 2_5 % of input span)



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
211	Input 2_Temperature compensation calculation [FZ400/900]	R1	7 or 6	019C	019D	412	413	R/W	0: No temperature compensation calculation 1: With temperature compensation calculation	1
212	Input 2_Burnout direction [FZ400/900]	BR	7 or 6	019E	019F	414	415	R/W	0: Upscale 1: Downscale	0
213	Input 2_Square root extraction [FZ400/900]	XG	7 or 6	01A0	01A1	416	417	R/W	0: Unused 1: Used	0
214	Input 2_Inverting input [FZ400/900]	IC	7 or 6	01A2	01A3	418	419	R/W	0: Unused 1: Used	0
215	DI1 function selection [FZ110/400/900]	H2	7 or 6	01A4	01A5	420	421	R/W	0: No function 1: RUN/STOP transfer 2: Auto/Manual transfer (Common to Input 1 and 2) 3: Input 1_Auto/Manual transfer 4: Input 2_Auto/Manual transfer 5: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 6: Interlock release 7: Hold reset (Common to Input 1 and 2) 8: Input 1_Hold reset 9: Input 2_Hold reset 10: Autotuning (AT) (Common to Input 1 and 2) 11: Input 1_Autotuning (AT) 12: Input 2_Autotuning (AT) 13: Set data unlock/lock transfer 14: Direct/Reverse action transfer 15: Memory area transfer (2 points, Without area set signal) 16: Memory area transfer (8 points, Without area set signal) 17: Memory area transfer (8 points, With area set signal) 18: Memory area transfer (16 points, Without area set signal) 19: Memory area transfer (16 points, With area set signal) 20: Area jump	Based on Model code



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
216	DI2 function selection [FZ110/400/900]	H3	7 or 6	01A6	01A7	422	423	R/W	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code
217	DI3 function selection [FZ110/400/900]	H4	7 or 6	01A8	01A9	424	425	R/W	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code
218	DI4 function selection [FZ400/900]	H5	7 or 6	01AA	01AB	426	427	R/W	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code
219	DI5 function selection [FZ400/900]	H6	7 or 6	01AC	01AD	428	429	R/W	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code
220	DI6 function selection [FZ400/900]	H7	7 or 6	01AE	01AF	430	431	R/W	0 to 14 Same as DI1 function selection (0 to 14)	Based on Model code
221	DI logic invert [FZ110/400/900]	D0	7 or 6	01B0	01B1	432	433	R/W	0 to 31 0: No logic invert +1: RUN/STOP transfer +2: Auto/Manual transfer +4: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +8: Set data unlock/lock transfer +16: Direct/Reverse action transfer To select two or more functions, sum each value.	0
222	Area switching time (Without area set signal) [FZ110/400/900]	LJ	7 or 6	01B2	01B3	434	435	R/W	1 to 5 seconds	2



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
223	OUT1 function selection [FZ110/400/900]	E0	7 or 6	01B4	01B5	436	437	R/W	0: No assignment 1: Input 1_Control output [heat-side] or [open-side] 2: Input 1_Control output [cool-side] or [close-side] 3: Input 2_Control output 4: Retransmission output 5: Logic calculation output (Event, HBA, LBA, Input error) 6: RUN state output 7: Input 1_Manual mode state output 8: Input 2_Manual mode state output 9: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 10: Input 1_Autotuning (AT) state output 11: Input 2_Autotuning (AT) state output 12: Output while Set value of Input 1 is changing 13: Output while Set value of Input 2 is changing 14: Output of the communication monitoring result 15: FAIL output	Based on Model code
224	OUT2 function selection [FZ110/400/900]	E2	7 or 6	01B6	01B7	438	439	R/W	Same as OUT1 function selection	Based on Model code
225	OUT3 function selection [FZ110/400/900]	E3	7 or 6	01B8	01B9	440	441	R/W	Same as OUT1 function selection	4



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
226	OUT1 logic calculation selection [FZ110/400/900]	W0	7 or 6	01BA	01BB	442	443	R/W	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0
227	OUT2 logic calculation selection [FZ110/400/900]	W2	7 or 6	01BC	01BD	444	445	R/W	Same as OUT1 logic calculation selection	Based on Model code
228	OUT3 logic calculation selection [FZ110/400/900]	W3	7 or 6	01BE	01BF	446	447	R/W	Same as OUT1 logic calculation selection	4
229	Energized/De-energized selection [FZ110/400/900]	NA	7 or 6	01C0	01C1	448	449	R/W	0 to 127 0: All outputs are energized +1: OUT1 de-energized +2: OUT2 de-energized +4: OUT3 de-energized +8: DO1 de-energized +16: DO2 de-energized +32: DO3 de-energized +64: DO4 de-energized To select two or more functions, sum each value.	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
230	Interlock selection [FZ110/400/900]	LF	7 or 6	01C2	01C3	450	451	R/W	0 to 4095 0: Unused +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0
231	Output action at control stop [FZ110/400/900]	SS	7 or 6	01C4	01C5	452	453	R/W	0 to 7 0: OFF +1: Logic calculation output: Action continues +2: Retransmission output: Action continues +4: Instrument status output: Action continues To select two or more functions, sum each value.	0
232	Universal output type selection (OUT3) [FZ110/400/900]	XO	7 or 6	01C6	01C7	454	455	R/W	0: Voltage pulse output 1: Current output (4 to 20 mA) 2: Current output (0 to 20 mA)	1



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
233	Retransmission output 1 type [FZ110/400/900]	LA	7 or 6	01C8	01C9	456	457	R/W	0: No retransmission output 1: Input 1_Measured value (PV) 2: Input 1_Local SV 3: Input 1_SV monitor value 4: Input 1_Deviation 5: Input 1_Manipulated output value [heat-side] 6: Input 1_Manipulated output value [cool-side] 7: Input 2_Measured value (PV) 8: Input 2_Local SV 9: Input 2_SV monitor value 10: Input 2_Deviation 11: Input 2_Manipulated output value 12: Remote setting input value 13: Current transformer 1 (CT1) input value 14: Current transformer 2 (CT2) input value 15: Measured value (PV) of differential temperature input	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
234	Retransmission output 1 scale high [FZ110/400/900]	HV	7 or 6	01CA	01CB	458	459	R/W	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) [Varies with the setting of the Decimal point position.] Input 1_Deviation – (Input 1_Input span) to + (Input 1_Input span) [Varies with the setting of the Decimal point position.] Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Deviation – (Input 2_Input span) to + (Input 2_Input span) [Varies with the setting of the Decimal point position.] Manipulated output value –5.0 to +105.0 % Current transformer (CT) input value 0.0 to 100.0 % Measured value (PV) of differential temperature input – (Input 1_Input span) to + (Input 1_Input span) [Varies with the setting of the Decimal point position.]	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range high (Control with PV select: PV select input range high) Input 1_Deviation: +(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range high Input 2_Deviation: +(Input 2_Input span) Manipulated output value, and Current transformer (CT) input value: 100.0 Measured value (PV) of differential temperature input: 100



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
235	Retransmission output 1 scale low [FZ110/400/900]	HW	7 or 6	01CC	01CD	460	461	R/W	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value Input 1_Input range low to Input 1_Input range high 〔When Control with PV select: PV select input range low to PV select input range high〕 [Varies with the setting of the Decimal point position.] Input 1_Deviation – (Input 1_Input span) to + (Input 1_Input span) [Varies with the setting of the Decimal point position.] Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Deviation – (Input 2_Input span) to + (Input 2_Input span) [Varies with the setting of the Decimal point position.] Manipulated output value –5.0 to +105.0 % Current transformer (CT) input value 0.0 to 100.0 % Measured value (PV) of differential temperature input – (Input 1_Input span) to + (Input 1_Input span) [Varies with the setting of the Decimal point position.]	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value: Input 1_Input range low 〔Control with PV select: PV select input range low〕 Input 1_Deviation: – (Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low Input 2_Deviation: – (Input 2_Input span) Manipulated output value, and Current transformer (CT) input value: 0.0 Measured value (PV) of differential temperature input: –100
236	Retransmission output 2 type [FZ110/400/900]	LB	7 or 6	01CE	01CF	462	463	R/W	Same as Retransmission output 1 type	0
237	Retransmission output 2 scale high [FZ110/400/900]	CV	7 or 6	01D0	01D1	464	465	R/W	Same as Retransmission output 1 scale high	
238	Retransmission output 2 scale low [FZ110/400/900]	CW	7 or 6	01D2	01D3	466	467	R/W	Same as Retransmission output 1 scale low	
239	Retransmission output 3 type [FZ110/400/900]	LC	7 or 6	01D4	01D5	468	469	R/W	Same as Retransmission output 1 type	1



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
240	Retransmission output 3 scale high [FZ110/400/900]	EV	7 or 6	01D6	01D7	470	471	R/W	Same as Retransmission output 1 scale high	
241	Retransmission output 3 scale low [FZ110/400/900]	EW	7 or 6	01D8	01D9	472	473	R/W	Same as Retransmission output 1 scale low	
242	DO1 function selection [FZ110/400/900]	E4	7 or 6	01DA	01DB	474	475	R/W	0: No assignment 1: Logic calculation output (Event, HBA, LBA, Input error) 2: RUN state output 3: Input 1_Manual mode state output 4: Input 2_Manual mode state output 5: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 6: Input 1_Autotuning (AT) state output 7: Input 2_Autotuning (AT) state output 8: Output while Set value of Input 1 is changing 9: Output while Set value of Input 2 is changing 10: Output of the communication monitoring result 11: FAIL output	Based on Model code
243	DO2 function selection [FZ110/400/900]	E5	7 or 6	01DC	01DD	476	477	R/W	Same as DO1 function selection	Based on Model code
244	DO3 function selection [FZ400/900]	E6	7 or 6	01DE	01DF	478	479	R/W	Same as DO1 function selection	Based on Model code
245	DO4 function selection [FZ400/900]	E7	7 or 6	01E0	01E1	480	481	R/W	Same as DO1 function selection	Based on Model code



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
246	DO1 logic calculation selection [FZ110/400/900]	W4	7 or 6	01E2	01E3	482	483	R/W	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	Based on Model code
247	DO2 logic calculation selection [FZ110/400/900]	W5	7 or 6	01E4	01E5	484	485	R/W	Same as DO1 logic calculation selection	Based on Model code
248	DO3 logic calculation selection [FZ400/900]	W6	7 or 6	01E6	01E7	486	487	R/W	Same as DO1 logic calculation selection	Based on Model code
249	DO4 logic calculation selection [FZ400/900]	W7	7 or 6	01E8	01E9	488	489	R/W	Same as DO1 logic calculation selection	Based on Model code
250	Event 1 assignment [FZ400/900]	FA	7 or 6	01EA	01EB	490	491	R/W	1: Input 1 2: Input 2 3: Differential temperature input	1



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
251	Event 1 type [FZ110/400/900]	XA	7 or 6	01EC	01ED	492	493	R/W	0: None 1: Deviation high (Using SV monitor value) ^a 2: Deviation low (Using SV monitor value) ^a 3: Deviation high/low (Using SV monitor value) ^a 4: Band (Using SV monitor value) ^a 5: Deviation high/low (Using SV monitor value) [High/Low individual setting] ^a 6: Band (Using SV monitor value) [High/Low individual setting] ^a 7: SV high (Using SV monitor value) 8: SV low (Using SV monitor value) 9: Process high ^b 10: Process low ^b 11: Deviation high (Using local SV) ^a 12: Deviation low (Using local SV) ^a 13: Deviation high/low (Using local SV) ^a 14: Band (Using local SV) ^a 15: Deviation high/low (Using local SV) [High/Low individual setting] ^a 16: Band (Using local SV) [High/Low individual setting] ^a 17: SV high (Using local SV) 18: SV low (Using local SV) 19: MV high [heat-side] ^{b, c} 20: MV low [heat-side] ^{b, c} 21: MV high [cool-side] ^b 22: MV low [cool-side] ^b 23: Process high/low [High/Low individual setting] ^b 24: Process band [High/Low individual setting] ^b ^a Event hold and re-hold action is available. ^b Event hold action is available. ^c When the instrument is specified as position proportioning PID control with feedback resistance, this item becomes Feedback resistance (FBR) input.	If the Event type is specified by the initial setting code when ordering, that Event type will be the factory set value. If the Event type is not specified: 1
252	Event 1 hold action [FZ110/400/900]	WA	7 or 6	01EE	01EF	494	495	R/W	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	If the Event type is specified by the initial setting code when ordering, the factory set value of Event hold action differs depending on the Event type. If the Event type is not specified: 0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
253	Event 1 differential gap [FZ110/400/900]	HA	7 or 6	01F0	01F1	496	497	R/W	Deviation, Process and SV: • If event assignment is either Input 1 or Differential temperature. 0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) • If event assignment is Input 2 0 to Input 2_Input span [Varies with the setting of the Decimal point position.] MV: 0.0 to 110.0 %	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2
254	Event 1 timer [FZ110/400/900]	TD	7 or 6	01F2	01F3	498	499	R/W	0.0 to 600.0 seconds	0.0
255	Event 2 assignment [FZ400/900]	FB	7 or 6	01F4	01F5	500	501	R/W	Same as Event 1 assignment	
256	Event 2 type [FZ110/400/900]	XB	7 or 6	01F6	01F7	502	503	R/W	Same as Event 1 type	
257	Event 2 hold action [FZ110/400/900]	WB	7 or 6	01F8	01F9	504	505	R/W	Same as Event 1 hold action	
258	Event 2 differential gap [FZ110/400/900]	HB	7 or 6	01FA	01FB	506	507	R/W	Same as Event 1 differential gap	
259	Event 2 timer [FZ110/400/900]	TG	7 or 6	01FC	01FD	508	509	R/W	Same as Event 1 timer	
260	Event 3 assignment [FZ400/900]	FC	7 or 6	01FE	01FF	510	511	R/W	Same as Event 1 assignment	
261	Event 3 type [FZ110/400/900]	XC	7 or 6	0200	0201	512	513	R/W	Same as Event 1 type	



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
262	Event 3 hold action [FZ110/400/900]	WC	7 or 6	0202	0203	514	515	R/W	Same as Event 1 hold action	
263	Event 3 differential gap [FZ110/400/900]	HC	7 or 6	0204	0205	516	517	R/W	Same as Event 1 differential gap	
264	Event 3 timer [FZ110/400/900]	TE	7 or 6	0206	0207	518	519	R/W	Same as Event 1 timer	
265	Event 4 assignment [FZ400/900]	FD	7 or 6	0208	0209	520	521	R/W	Same as Event 1 assignment	
266	Event 4 type [FZ110/400/900]	XD	7 or 6	020A	020B	522	523	R/W	Same as Event 1 type	
267	Event 4 hold action [FZ110/400/900]	WD	7 or 6	020C	020D	524	525	R/W	Same as Event 1 hold action	
268	Event 4 differential gap [FZ110/400/900]	HD	7 or 6	020E	020F	526	527	R/W	Same as Event 1 differential gap	
269	Event 4 timer [FZ110/400/900]	TF	7 or 6	0210	0211	528	529	R/W	Same as Event 1 timer	
270	CT1 assignment [FZ110/400/900]	ZF	7 or 6	0212	0213	530	531	R/W	0: None 1: OUT1 2: OUT2 3: OUT3	1
271	CT1 type [FZ110/400/900]	YE	7 or 6	0214	0215	532	533	R/W	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
272	CT1 ratio [FZ110/400/900]	XS	7 or 6	0216	0217	534	535	R/W	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000
273	CT1 low input cut-off [FZ110/400/900]	M5	7 or 6	0218	0219	536	537	R/W	0.0 to 1.0 A	0.0
274	CT2 assignment [FZ400/900]	ZG	7 or 6	021A	021B	538	539	R/W	0: None 1: OUT1 2: OUT2 3: OUT3	Based on Model code
275	CT2 type [FZ400/900]	YF	7 or 6	021C	021D	540	541	R/W	0: CTL-6-P-N 1: CTL-12-S56-10L-N 2: CTL-6-P-Z	Based on Model code
276	CT2 ratio [FZ400/900]	XT	7 or 6	021E	021F	542	543	R/W	0 to 9999 When the CT type is changed, the following value will be automatically set. CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000 CTL-6-P-Z: 800	If CTL-6-P-N or CTL-6-P-Z is specified for the Current transformer (CT) type: 800 If CTL-12-S56-10L-N is specified for the Current transformer (CT) type: 1000
277	CT2 low input cut-off [FZ400/900]	M7	7 or 6	0220	0221	544	545	R/W	0.0 to 1.0 A	0.0
278	Hot/Cold start [FZ110/400/900]	XN	7 or 6	0222	0223	546	547	R/W	0: Hot/Cold start 1 1: Hot/Cold start 2 2: Cold start 3: STOP start	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
279	Manual manipulated output value selection [FZ110/400/900]	OT	7 or 6	0224	0225	548	549	R/W	0: The last manipulated output value (Balanceless-bumpless function) 1: Manual manipulated output value	0
280	SV tracking [FZ110/400/900]	XL	7 or 6	0226	0227	550	551	R/W	0 to 3 0: No SV tracking function +1: SV tracking at transferring Remote/Local * * Including Cascade mode transfer, 2-loop control/Differential temperature control transfer +2: SV tracking at transferring Auto/Manual To select two or more functions, sum each value.	1
281	Integral/Derivative time decimal point position [FZ110/400/900]	PK	7 or 6	0228	0229	552	553	R/W	0: No decimal place 1: One decimal place 2: Two decimal place	0
282	ST start condition [FZ110/400/900]	SU	7 or 6	022A	022B	554	555	R/W	0: Activate the Startup tuning (ST) function when the power is turned on; when transferred from STOP to RUN; or when the Set value (SV) is changed. 1: Activate the Startup tuning (ST) function when the power is turned on; or when transferred from STOP to RUN. 2: Activate the Startup tuning (ST) function when the Set value (SV) is changed.	0
283	Input 1_Control action [FZ110/400/900]	XE	7 or 6	022C	022D	556	557	R/W	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling linear type] 5: Brilliant II Position proportioning PID control (reverse action) 6: Brilliant II Position proportioning PID control (direct action) For cascade control, only 0 or 1 is selectable.	Control action specified at the time of order.
284	Input 1_Output change rate limiter (up) [heat-side] [FZ110/400/900]	PH	7 or 6	022E	022F	558	559	R/W	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0
285	Input 1_Output change rate limiter (down) [heat-side] [FZ110/400/900]	PL	7 or 6	0230	0231	560	561	R/W	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
286	Input 1_Action (high) input error [FZ110/400/900]	WH	7 or 6	0232	0233	562	563	R/W	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Manipulated output at Input error of Input 1 is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Manipulated output at Input error of Input 1 is output. When the error is recovered, the operation mode is switched to the PID control.	2
287	Input 1_Action (low) input error [FZ110/400/900]	WL	7 or 6	0234	0235	564	565	R/W	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Manipulated output at Input error of Input 1 is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Manipulated output at Input error of Input 1 is output. When the error is recovered, the operation mode is switched to the PID control.	2
288	Input 1_Manipulated output value at input error [FZ110/400/900]	OE	7 or 6	0236	0237	566	567	R/W	PID control, Position proportioning PID control –5.0 to +105.0 % Heat/Cool PID control –105.0 to +105.0 %	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0
289	Input 1_Manipulated output value at STOP [heat-side] [FZ110/400/900]	OF	7 or 6	0238	0239	568	569	R/W	–5.0 to +105.0 %	–5.0
290	Input 1_Start determination point [FZ110/400/900]	SX	7 or 6	023A	023B	570	571	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of Input 1_input span When Control with PV select: 3 % of PV select input span
291	Input 1_Level PID action selection [FZ110/400/900]	PP	7 or 6	023C	023D	572	573	R/W	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0
292	Input 1_Level PID differential gap [FZ110/400/900]	L5	7 or 6	023E	023F	574	575	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
293	Input 2_Control action [FZ400/900]	XF	7 or 6	0240	0241	576	577	R/W	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action)	Same as Input 1_ Control action
294	Input 2_Output change rate limiter (up) [FZ400/900]	PX	7 or 6	0242	0243	578	579	R/W	0.0 to 1000.0 %/seconds of manipulated output 0.0: No function	0.0
295	Input 2_Output change rate limiter (down) [FZ400/900]	PY	7 or 6	0244	0245	580	581	R/W	0.0 to 1000.0 %/seconds of manipulated output 0.0: No function	0.0
296	Input 2_Action (high) input error [FZ400/900]	WX	7 or 6	0246	0247	582	583	R/W	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Manipulated output at Input error of Input 2 is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Manipulated output at Input error of Input 2 is output. When the error is recovered, the operation mode is switched to the PID control.	2
297	Input 2_Action (low) input error [FZ400/900]	WY	7 or 6	0248	0249	584	585	R/W	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Manipulated output at Input error of Input 2 is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Manipulated output at Input error of Input 2 is output. When the error is recovered, the operation mode is switched to the PID control.	2
298	Input 2_Manipulated output value at input error [FZ400/900]	PE	7 or 6	024A	024B	586	587	R/W	−5.0 to +105.0 %	−5.0
299	Input 2_ Manipulated output value at STOP [FZ400/900]	OJ	7 or 6	024C	024D	588	589	R/W	−5.0 to +105.0 %	−5.0
300	Input 2_Start determination point [FZ400/900]	SW	7 or 6	024E	024F	590	591	R/W	0 to Input 2_Input span 0: Operation starts from any start state selected by Hot/Cold start [Varies with the setting of the Decimal point position.]	3 % of Input 2_input span



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
301	Input 2_Level PID action selection [FZ400/900]	PO	7 or 6	0250	0251	592	593	R/W	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0
302	Input 2_Level PID differential gap [FZ400/900]	L6	7 or 6	0252	0253	594	595	R/W	0 to Input 2_Input span [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2
303	Action at feedback resistance (FBR) input error [FZ110/400/900]	SY	7 or 6	0254	0255	596	597	R/W	0: Action depending on the value action at STOP 1: Control action continued	0
304	Feedback adjustment [FZ400/900]	FV	7 or 6	0256	0257	598	599	R/W	0: Adjustment end 1: During adjustment on the open-side 2: During adjustment on the close-side 3: Adjustment error	0
305	Control motor time [FZ110/400/900]	TN	7 or 6	0258	0259	600	601	R/W	5 to 1000 seconds	10
306	Integrated output limiter [FZ110/400/900]	OK	7 or 6	025A	025B	602	603	R/W	0.0 to 200.0 % of control motor time 0.0: No function	150.0
307	Valve action at STOP [FZ110/400/900]	VS	7 or 6	025C	025D	604	605	R/W	0: Close-side output OFF, Open-side output OFF 1: Close-side output ON, Open-side output OFF 2: Close-side output OFF, Open-side output ON	0
308	Action at saturated output [FZ400/900]	UZ	7 or 6	025E	025F	606	607	R/W	0: Invalid (The close-side [or open-side] output turns to OFF when the valve position is fully closed [or opened]). 1: Valid (The close-side [or open-side] output remains ON state when the valve position is fully closed [or opened]).	0
309	Input 1_Output change rate limiter (up) [cool-side] [FZ110/400/900]	PM	7 or 6	0260	0261	608	609	R/W	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0
310	Input 1_Output change rate limiter (down) [cool-side] [FZ110/400/900]	PN	7 or 6	0262	0263	610	611	R/W	0.0 to 1000.0 %/seconds of manipulated output 0.0: OFF	0.0
311	Input 1_Manipulated output value at STOP [cool-side] [FZ110/400/900]	OG	7 or 6	0264	0265	612	613	R/W	−5.0 to +105.0 %	−5.0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
312	Undershoot suppression factor [FZ110/400/900]	KB	7 or 6	0266	0267	614	615	R/W	0.000 to 1.000	Water cooling: 0.100 Air cooling: 0.250 Cooling linear: 1.000
313	Overlap/Deadband reference point [FZ110/400/900]	UY	7 or 6	0268	0269	616	617	R/W	0.0 to 1.0	0.0
314	Bottom suppression function [FZ110/400/900]	G6	7 or 6	026A	026B	618	619	R/W	0: No function 1: FF amount is added by level 2: FF amount is forcibly added	0
315	Select function for input 2 [FZ110/400/900]	KL	7 or 6	026C	026D	620	621	R/W	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) * 5: Cascade control (Master single ↔ Cascade) * 6: Input circuit error alarm *This parameter cannot be specified if the instrument is a Heat/Cool PID or a Position proportioning PID type. • When Measured input 2 is selected for FZ400/900 at the time of order: 0 to 6 • When the Remote setting input is selected for FZ400/900 or when the Remote setting input is selected for FZ110: 0 to 1	• FZ400/900: When the Remote setting input is specified: 1 When the Measured input 2 is specified: 2 • FZ110: 1
316	Cascade_AT mode (master-side) [FZ400/900]	GK	7 or 6	026E	026F	622	623	R/W	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1
317	Cascade_AT mode (slave-side) [FZ400/900]	GL	7 or 6	0270	0271	624	625	R/W	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1
318	Selection of PV select trigger [FZ400/900]	L7	7 or 6	0272	0273	626	627	R/W	0: Switching by level 1: Switching by signal (Key, DI and Communication)	0
319	Input circuit error alarm set value [FZ400/900]	L4	7 or 6	0274	0275	628	629	R/W	0 to Input 1_Input span 0: No function [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 10 V/I inputs: 5 % of Input 1_Input span



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value																																																				
				HEX		DEC																																																								
				Low-order	High-order	Low-order	High-order																																																							
320	Communication protocol [FZ110/400/900]	IS	7 or 6	0276	0277	630	631	R/W	0: RKC communication 1: Modbus (Order of data transfer: high-order word to low-order word) 2: Modbus (Order of data transfer: low-order word to high-order word) 3: PLC communication (MITSUBISHI MELSEC series special protocol QnA compatible 3C frame [Format 4])	When the communication protocol is specified at the time of order, the specified communication protocol will be the factory set value. With communication, communication protocol not specified: 0																																																				
321	Device address [FZ110/400/900]	IP	7 or 6	0278	0279	632	633	R/W	RKC communication: 0 to 99 Modbus: 1 to 99 PLC communication: 0 to 30	RKC communication: 0 Modbus: 1 PLC communication: 0																																																				
322	Communication speed [FZ110/400/900]	IR	7 or 6	027A	027B	634	635	R/W	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps	3																																																				
323	Data bit configuration [FZ110/400/900]	IQ	7 or 6	027C	027D	636	637	R/W	Data bit configuration table<table><tr><th>Set value</th><th>Data bit</th><th>Parity bit</th><th>Stop bit</th></tr><tr><td>0</td><td>8</td><td>Without</td><td>1</td></tr><tr><td>1</td><td>8</td><td>Without</td><td>2</td></tr><tr><td>2</td><td>8</td><td>Even</td><td>1</td></tr><tr><td>3</td><td>8</td><td>Even</td><td>2</td></tr><tr><td>4</td><td>8</td><td>Odd</td><td>1</td></tr><tr><td>5</td><td>8</td><td>Odd</td><td>2</td></tr><tr><td>6</td><td>7</td><td>Without</td><td>1</td></tr><tr><td>7</td><td>7</td><td>Without</td><td>2</td></tr><tr><td>8</td><td>7</td><td>Even</td><td>1</td></tr><tr><td>9</td><td>7</td><td>Even</td><td>2</td></tr><tr><td>10</td><td>7</td><td>Odd</td><td>1</td></tr><tr><td>11</td><td>7</td><td>Odd</td><td>2</td></tr></table> RKC communication: 0 to 11 Modbus: 0 to 5	Set value	Data bit	Parity bit	Stop bit	0	8	Without	1	1	8	Without	2	2	8	Even	1	3	8	Even	2	4	8	Odd	1	5	8	Odd	2	6	7	Without	1	7	7	Without	2	8	7	Even	1	9	7	Even	2	10	7	Odd	1	11	7	Odd	2	0
Set value	Data bit	Parity bit	Stop bit																																																											
0	8	Without	1																																																											
1	8	Without	2																																																											
2	8	Even	1																																																											
3	8	Even	2																																																											
4	8	Odd	1																																																											
5	8	Odd	2																																																											
6	7	Without	1																																																											
7	7	Without	2																																																											
8	7	Even	1																																																											
9	7	Even	2																																																											
10	7	Odd	1																																																											
11	7	Odd	2																																																											



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
324	Interval time [FZ110/400/900]	IT	7 or 6	027E	027F	638	639	R/W	0 to 250 ms	10
325	Register type [FZ110/400/900]	QZ	7 or 6	0280	0281	640	641	R/W	MITSUBISHI PLC 0: D register (data register) 1: R register (file register) 2: W register (link register) 3: ZR register (Method of specifying consecutive numbers when 32767 of R register is exceeded.)	0
326	Register start number (High-order 4-bit) [FZ110/400/900]	QS	7 or 6	0282	0283	642	643	R/W	0 to 15	0
327	Register start number (Low-order 16-bit) [FZ110/400/900]	QX	7 or 6	0284	0285	644	645	R/W	0 to 65535	1000
328	Monitor item register bias [FZ110/400/900]	R3	7 or 6	0286	0287	646	647	R/W	12 to 65535	12
329	Setting item register bias [FZ110/400/900]	R4	7 or 6	0288	0289	648	649	R/W	0 to 65535	0
330	Instrument link recognition time [FZ110/400/900]	QT	7 or 6	028A	028B	650	651	R/W	0 to 255 seconds	5
331	PLC response waiting time [FZ110/400/900]	VT	7 or 6	028C	028D	652	653	R/W	0 to 3000 ms	255
332	PLC communication start time [FZ110/400/900]	R5	7 or 6	028E	028F	654	655	R/W	1 to 255 seconds	5
333	Slave register bias [FZ110/400/900]	R8	7 or 6	0290	0291	656	657	R/W	0 to 65535	80



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
334	Number of recognizable devices [FZ110/400/900]	QU	7 or 6	0292	0293	658	659	R/W	0 to 30	8
335	Station number [FZ110/400/900]	QV	7 or 6	0294	0295	660	661	R/W	0 to 31	0
336	PC number [FZ110/400/900]	QW	7 or 6	0296	0297	662	663	R/W	0 to 255	255
337	Monitor item selection 1 [FZ110/400/900]	R6	7 or 6	0298	0299	664	665	R/W	0 to 65535	3459
338	Monitor item selection 2 [FZ110/400/900]	R7	7 or 6	029A	029B	666	667	R/W	0 to 65535	16512
339	Monitor item selection 3 [FZ110/400/900]	R9	7 or 6	029C	029D	668	669	R/W	0 to 65535	1024
340	Setting item selection 1 [FZ110/400/900]	RE	7 or 6	029E	029F	670	671	R/W	0 to 65535	16480
341	Setting item selection 2 [FZ110/400/900]	RF	7 or 6	02A0	02A1	672	673	R/W	0 to 65535	7850
342	Setting item selection 3 [FZ110/400/900]	RG	7 or 6	02A2	02A3	674	675	R/W	0 to 65535	32768
343	Setting item selection 4 [FZ110/400/900]	RH	7 or 6	02A4	02A5	676	677	R/W	0 to 65535	771
344	Setting item selection 5 [FZ110/400/900]	RI	7 or 6	02A6	02A7	678	679	R/W	0 to 65535	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
345	Setting item selection 6 [FZ110/400/900]	RJ	7 or 6	02A8	02A9	680	681	R/W	0 to 65535	5
346	Setting item selection 7 [FZ110/400/900]	RK	7 or 6	02AA	02AB	682	683	R/W	0 to 65535	0
347	Setting item selection 8 [FZ110/400/900]	RL	7 or 6	02AC	02AD	684	685	R/W	0 to 65535	0
348	Setting change rate limiter unit time [FZ110/400/900]	HU	7 or 6	02AE	02AF	686	687	R/W	1 to 3600 seconds	60
349	Soak time unit [FZ110/400/900]	RU	7	02B0	02B1	688	689	R/W	In case of Input data type 0 0: 0 hours 00 minutes to 99 hours 59 minutes 1: 0 minutes 00 seconds to 199 minutes 59 seconds 2: 0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds	1
			6	—	—	—	—	R/W	In case of Input data type 1 0: 0 hours 00 minutes to 99 hours 59 minutes 1: 0 minutes 00 seconds to 199 minutes 59 seconds	1
350	Input 1_Setting limiter high [FZ110/400/900]	SH	7 or 6	02B2	02B3	690	691	R/W	Input 1_Setting limiter low to Input 1_Input range high ⎧ When Control with PV select Input 1_Setting limiter low to PV select input range high ⎫ [Varies with the setting of the Decimal point position.]	Input 1_ Input range high ⎧ When Control with PV select: PV select input range high ⎫
351	Input 1_Setting limiter low [FZ110/400/900]	SL	7 or 6	02B4	02B5	692	693	R/W	Input 1_Setting limiter low to Input 1_Input range high ⎧ When Control with PV select PV select input range low to Input 1_Setting limiter high ⎫ [Varies with the setting of the Decimal point position.]	Input 1_ Input range low ⎧ When Control with PV select: PV select input range low ⎫

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
352	Input 2_Setting limiter high [FZ400/900]	U0	7 or 6	02B6	02B7	694	695	R/W	Input 2_Setting limiter low to Input 2_Input range high [Varies with the setting of the Decimal point position.]	Input 2_ Input range high
353	Input 2_Setting limiter low [FZ400/900]	U1	7 or 6	02B8	02B9	696	697	R/W	Input 2_Input range low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	Input 2_ Input range low
354	Initialization [FZ110/400/900]	DC	7 or 6	02BA	02BB	698	699	R/W	1225: Start initialization Other values: Set values are maintained After the initialization, this instrument is restarted. This setting will automatically go back to zero.	0
355	Set data unlock/lock transfer [FZ110/400/900]	LU	7 or 6	02BC	02BD	700	701	RO	0: Unlock state 1: Lock state	0
356	Set lock level [FZ110/400/900]	LK	7 or 6	02BE	02BF	702	703	R/W	RKC communication 0 to 31 The contact input state is assigned as a bit image in binary numbers. Transmission data from the FZ series is replaced with ASCII code in decimal number. Bit 0:SV setting mode * + Parameter select mode Bit 1:Operation transfer mode Bit 2:Parameter setting mode Bit 3 Setup setting mode Bit 4 Engineering mode Bit 5 to Bit 7: Unused Data 0: Unlock 1: Lock * FZ400/900: The data of Set value (SV) and Interlock release can be locked. FZ110: The data of Set value (SV), Interlock release and Memory area transfer can be locked.	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
356	Set lock level [FZ110/400/900] (Continued from the previous page)	LK	7 or 6	02BE	02BF	702	703	R/W	Modbus 0 to 31 0: Unlock + 1: SV setting mode * + Parameter select mode + 2: Operation transfer mode + 4: Parameter setting mode + 8: Setup setting mode +16: Engineering mode * FZ400/900: The data of Set value (SV) and Interlock release can be locked. FZ110: The data of Set value (SV), Interlock release and Memory area transfer can be locked.	0
357	Area lock [FZ400/900]	LL	7 or 6	02C0	02C1	704	705	R/W	0: Memory area is adjustable when the setting data is locked. 1: Memory area is not adjustable when the setting data is locked. (Memory area transfer mode is not displayed)	0
358	Select Blind function [FZ110/400/900]	BQ	7 or 6	02C2	02C3	706	707	R/W	0: Blind function: OFF 1: Blind function: ON	0
359	Parameter select direct registration [FZ110/400/900]	LD	7 or 6	02C4	02C5	708	709	R/W	0: Direct registration: OFF 1: Direct registration: ON	0
360	Parameter select setting 1 [FZ110/400/900]	BA	7 or 6	02C6	02C7	710	711	R/W	0 to 303 (Screen No.) 0: No registration	0
361	Parameter select setting 2 [FZ110/400/900]	BB	7 or 6	02C8	02C9	712	713	R/W	0 to 303 (Screen No.) 0: No registration	0
362	Parameter select setting 3 [FZ110/400/900]	BC	7 or 6	02CA	02CB	714	715	R/W	0 to 303 (Screen No.) 0: No registration	0
363	Parameter select setting 4 [FZ110/400/900]	BD	7 or 6	02CC	02CD	716	717	R/W	0 to 303 (Screen No.) 0: No registration	0
364	Parameter select setting 5 [FZ110/400/900]	BE	7 or 6	02CE	02CF	718	719	R/W	0 to 303 (Screen No.) 0: No registration	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
365	Parameter select setting 6 [FZ110/400/900]	BF	7 or 6	02D0	02D1	720	721	R/W	0 to 303 (Screen No.) 0: No registration	0
366	Parameter select setting 7 [FZ110/400/900]	BG	7 or 6	02D2	02D3	722	723	R/W	0 to 303 (Screen No.) 0: No registration	0
367	Parameter select setting 8 [FZ110/400/900]	BH	7 or 6	02D4	02D5	724	725	R/W	0 to 303 (Screen No.) 0: No registration	0
368	Parameter select setting 9 [FZ110/400/900]	BI	7 or 6	02D6	02D7	726	727	R/W	0 to 303 (Screen No.) 0: No registration	0
369	Parameter select setting 10 [FZ110/400/900]	BJ	7 or 6	02D8	02D9	728	729	R/W	0 to 303 (Screen No.) 0: No registration	0
370	Parameter select setting 11 [FZ110/400/900]	BK	7 or 6	02DA	02DB	730	731	R/W	0 to 303 (Screen No.) 0: No registration	0
371	Parameter select setting 12 [FZ110/400/900]	BL	7 or 6	02DC	02DD	732	733	R/W	0 to 303 (Screen No.) 0: No registration	0
372	Parameter select setting 13 [FZ110/400/900]	BM	7 or 6	02DE	02DF	734	735	R/W	0 to 303 (Screen No.) 0: No registration	0
373	Parameter select setting 14 [FZ110/400/900]	BN	7 or 6	02E0	02E1	736	737	R/W	0 to 303 (Screen No.) 0: No registration	0
374	Parameter select setting 15 [FZ110/400/900]	BO	7 or 6	02E2	02E3	738	739	R/W	0 to 303 (Screen No.) 0: No registration	0
375	Parameter select setting 16 [FZ110/400/900]	BP	7 or 6	02E4	02E5	740	741	R/W	0 to 303 (Screen No.) 0: No registration	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
376	Dummy data (REX-F400/700/900: For Bar-graph display selection) [FZ110/400/900]	DA	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
377	Dummy data (REX-F400/700/900: For Second alarm energized/de-energized selection) [FZ110/400/900]	NB	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
378	Dummy data (REX-F400/700/900: For Local mode/computer mode identification) [FZ110/400/900]	RA	7 or 6	—	—	—	—	RO	The read data is “0.”	0
379	Dummy data (REX-F400/700/900: For Operation execution (RUN)/STOP transfer) [FZ110/400/900]	DH	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
380	Dummy data (REX-F400/700/900: For First alarm action selection at input abnormality) [FZ110/400/900]	OA	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
381	Dummy data (REX-F400/700/900: For Second alarm action selection at input abnormality) [FZ110/400/900]	OB	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
382	Dummy data (REX-D series: For Output limit [high-limit] (OUT2)) [FZ110/400/900]	OI	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
383	Dummy data (REX-D series: For Auto-tuning (AT) differential gap) [FZ110/400/900]	GH	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
384	Dummy data (REX-D series: For AUTO/MAN function selection) [FZ110/400/900]	PQ	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0



No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
385	Dummy data (REX-D series: For Fazzy) [FZ110/400/900]	XP	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
386	Dummy data (REX-D series: For Air cooling/ water cooling selection) [FZ110/400/900]	XQ	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
387	Dummy data (REX-D series: For Anti-reset windup (ARW)) [FZ110/400/900]	W1	7 or 6	—	—	—	—	R/W	The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0



6.3.2 Memory area data (Direct designation method) [Modbus double word]

Register addresses 0500H to 0B5FH are used to check and change set values belonging to the Memory area.

 For Memory area, refer to the **5.9 How to Use Memory Area Data (P. 5-18)**.

■ Memory area 1 data

No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
1	Input 1_Set value (SV) [FZ110/400/900]	0500	0501	1280	1281	R/W	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	0
2	Input 2_Set value (SV) [FZ400/900]	0502	0503	1282	1283	R/W	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	0
3	Set value (SV) of differential temperature input [FZ400/900]	0504	0505	1284	1285	R/W	– (Input 1_Input span) to + (Input 1_Input span) [Varies with the setting of the Decimal point position.]	0
4	Event 1 set value (EV1) Event 1 set value (EV1) [high] [FZ110/400/900]	0506	0507	1286	1287	R/W	• Deviation When assigned to Input 1 or Differential temperature input – (Input 1_Input span) to + (Input 1_Input span) When assigned to Input 2 – (Input 2_Input span) to + (Input 2_Input span) When Control with PV select is selected at Select function for input 2 – (PV select input span) to + (PV select input span) [Varies with the setting of the Decimal point position.] • Input value or Set value When assigned to Input 1 Input 1_Input range low to Input 1_Input range high When assigned to Input 2 Input 2_Input range low to Input 2_Input range high When assigned to Differential temperature input – (Input 1_Input span) to + (Input 1_Input span) When Control with PV select is selected at Select function for input 2 PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 10 V/I inputs: 5 % of input span



No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
4	Event 1 set value (EV1) Event 1 set value (EV1) [high] [FZ110/400/900] (Continued from the previous page)	0506	0507	1286	1287	R/W	• Manipulated output value –5.0 to +105.0 %	50.0
5	Event 1 set value (EV1') [low] [FZ110/400/900]	0508	0509	1288	1289	R/W	• Deviation When assigned to Input_1 or Differential temperature input – (Input 1_Input span) to + (Input 1_Input span) When assigned to Input 2 – (Input 2_Input span) to + (Input 2_Input span) When Control with PV select is selected at Select function for Input 2 – (PV select input span) to + (PV select input span) [Varies with the setting of the Decimal point position.] • Input value or Set value When assigned to Input 1 Input 1_Input range low to Input 1_Input range high When assigned to Input 2 Input 2_Input range low to Input 2_Input range high When assigned to Differential temperature input – (Input 1_Input span) to + (Input 1_Input span) When Control with PV select is selected at Select function for Input 2 PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.]	TC/RTD inputs: –10 V/I inputs: –5 % of input span
6	Event 2 set value (EV2) Event 2 set value (EV2) [high] [FZ110/400/900]	050A	050B	1290	1291	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
7	Event 2 set value (EV2') [low] [FZ110/400/900]	050C	050D	1292	1293	R/W	Same as Event 1 set value (EV1') [low]	
8	Event 3 set value (EV3) Event 3 set value (EV3) [high] [FZ110/400/900]	050E	050F	1294	1295	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
9	Event 3 set value (EV3') [low] [FZ110/400/900]	0510	0511	1296	1297	R/W	Same as Event 1 set value (EV1') [low]	



No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
10	Event 4 set value (EV4) Event 4 set value (EV4) [high] [FZ110/400/900]	0512	0513	1298	1299	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
11	Event 4 set value (EV4') [low] [FZ110/400/900]	0514	0515	1300	1301	R/W	Same as Event 1 set value (EV1') [low]	
12	Input 1_Proportional band [heat-side] [FZ110/400/900]	0516	0517	1302	1303	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0
13	Input 1_Integral time [heat-side] [FZ110/400/900]	0518	0519	1304	1305	R/W	PID control or Heat/Cool PID control 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240
14	Input 1_Derivative time [heat-side] [FZ110/400/900]	051A	051B	1306	1307	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
15	Input 1_Control response parameter [FZ110/400/900]	051C	051D	1308	1309	R/W	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2
16	Input 1_Proactive intensity [FZ110/400/900]	051E	051F	1310	1311	R/W	0 to 4 0: No function	2
17	Input 1_Manual reset [FZ110/400/900]	0520	0521	1312	1313	R/W	−100.0 to +100.0 %	0.0



No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
18	Input 1_FF amount [FZ110/400/900]	0522	0523	1314	1315	R/W	−100.0 to +100.0 %	0.0
19	Input 1_Output limiter high [heat-side] [FZ110/400/900]	0524	0525	1316	1317	R/W	Input 1_Output limiter low [heat-side] to 105.0 %	105.0
20	Input 1_Output limiter low [heat-side] [FZ110/400/900]	0526	0527	1318	1319	R/W	−5.0 % to Input 1_Output limiter high [heat-side]	−5.0
21	Input 1_Control loop break alarm (LBA) time [FZ110/400/900]	0528	0529	1320	1321	R/W	0 to 7200 seconds 0: No function	LBA function is specified: 480 LBA function is not specified: 0
22	Input 1_LBA deadband (LBD) [FZ110/400/900]	052A	052B	1322	1323	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	0
23	Input 2_Proportional band [FZ400/900]	052C	052D	1324	1325	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0
24	Input 2_Integral time [FZ400/900]	052E	052F	1326	1327	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
25	Input 2_Derivative time [FZ400/900]	0530	0531	1328	1329	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
26	Input 2_Control response parameter [FZ400/900]	0532	0533	1330	1331	R/W	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	0
27	Input 2_Proactive intensity [FZ400/900]	0534	0535	1332	1333	R/W	0 to 4 0: No function	2
28	Input 2_Manual reset [FZ400/900]	0536	0537	1334	1335	R/W	−100.0 to +100.0 %	0.0
29	Input 2_FF amount [FZ400/900]	0538	0539	1336	1337	R/W	−100.0 to +100.0 %	0.0



No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
30	Input 2_Output limiter high [FZ400/900]	053A	053B	1338	1339	R/W	Input 2_Output limiter low to 105.0 %	105.0
31	Input 2_Output limiter low [FZ400/900]	053C	053D	1340	1341	R/W	−5.0 % to Input 2_Output limiter high	−5.0
32	Input 2_Control loop break alarm (LBA) time [FZ400/900]	053E	053F	1342	1343	R/W	0 to 7200 seconds 0: No function	LBA function is specified: 480 LBA function is not specified: 0
33	Input 2_LBA deadband (LBD) [FZ400/900]	0540	0541	1344	1345	R/W	0 to Input 2_Input span [Varies with the setting of the Decimal point position.]	0
34	Input 1_Proportional band [cool-side] [FZ110/400/900]	0542	0543	1346	1347	R/W	TC/RTD inputs 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.1 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.1 to 1000.0 % of PV select input span)	TC/RTD inputs: 30 V/I inputs: 3.0
35	Input 1_Integral time [cool-side] [FZ110/400/900]	0544	0545	1348	1349	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
36	Input 1_Derivative time [cool-side] [FZ110/400/900]	0546	0547	1350	1351	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60



No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
37	Input 1_Overlap/Deadband [FZ110/400/900]	0548	0549	1352	1353	R/W	TC/RTD inputs – (Input 1_Input span) to + (Input 1_Input span) 〔 When Control with PV select: – (PV select input span) to + (PV select input span) 〕 (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs –100.0 to +100.0 % of Input 1_Input span 〔 When Control with PV select: –100.0 to +100.0 % of PV select input span 〕 Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0
38	Input 1_Output limiter high [cool-side] [FZ110/400/900]	054A	054B	1354	1355	R/W	Heat/Cool PID control Input 1_Output limiter low [cool-side] to 105.0 %	105.0
	Input 1_Output limiter low [heat-side] [FZ110/400/900]						PID control or Position proportioning PID control –5.0 % to Input 1_Output limiter high [heat-side] Same data as RKC communication identifier OX	–5.0
39	Input 1_Output limiter low [cool-side] [FZ110/400/900]	054C	054D	1356	1357	R/W	–5.0 % to Input 1_Output limiter high [cool-side]	–5.0
40	Select Trigger type for Memory area transfer [FZ110/400/900]	054E	054F	1358	1359	R/W	0 to 63 0: No assignment +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Digital input 1 (DI1) Close edge +32: Digital input 1 (DI1) Open edge To select two or more functions, sum each value.	0



No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
41	Area soak time [FZ110/400/900]	0550	0051	1360	1361	R/W	In case of Input data type 0 • RKC communication 0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds * 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds • Modbus 0 to 35999 seconds * 0 to 11999 seconds 0 to 5999 minutes * Settable only for FZ400/900 [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	RKC communication: 0:00 (0 minutes 00 seconds) Modbus: 0 (0 minutes)
		0550	0051	1360	1361	R/W	In case of Input data type 1 • RKC communication 0 hours 00 minutes to 99 hours 59 minutes 0 minutes 00 seconds to 199 minutes 59 seconds • Modbus (Single word only) 0 to 5999 minutes 0 to 11999 seconds [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	RKC communication: 0:00 (0 minutes 00 seconds) Modbus: 0 (0 minutes)
42	Link area number [FZ110/400/900]	0552	0553	1362	1363	R/W	0 to 16 0: No function	0
43	Input 1_Setting change rate limiter (up) [FZ110/400/900]	0554	0555	1364	1365	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function [Varies with the setting of the Decimal point position.]	0
44	Input 1_Setting change rate limiter (down) [FZ110/400/900]	0556	0557	1366	1367	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function [Varies with the setting of the Decimal point position.]	0



No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
45	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900]	0558	0559	1368	1369	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
46	Input 1_Manipulated output value (Area) [FZ110/400/900]	055A	055B	1370	1371	R/W	PID control, Position proportioning PID control –5.0 to +105.0 % Heat/Cool PID control –105.0 to +105.0 %	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0
47	Input 2_Setting change rate limiter (up) [FZ400/900]	055C	055D	1372	1373	R/W	0 to Input 2_Input span 0: No function [Varies with the setting of the Decimal point position.]	0
48	Input 2_Setting change rate limiter (down) [FZ400/900]	055E	055F	1374	1375	R/W	0 to Input 2_Input span 0: No function [Varies with the setting of the Decimal point position.]	0
49	Input 2_Auto/Manual transfer selection (Area) [FZ400/900]	0560	0561	1376	1377	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
50	Input 2_Manipulated output value (Area) [FZ400/900]	0562	0563	1378	1379	R/W	–5.0 to +105.0 %	–5.0



No.	Name	Register address				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
51	Remote/Local transfer selection (Area) [FZ110/400/900]	0564	0565	1380	1381	R/W	When Select function for input 2 is: “Remote setting input” [FZ400/900] 0: No transfer 1: Local mode 2: Remote mode When Remote setting input is specified: [FZ110] 0: No transfer 1: Local mode 2: Remote mode When Select function for input 2 is: “Cascade control” [FZ400/900] 0: No transfer 1: Single control 2: Cascade control When Select function for input 2 is: “Control with PV select” [FZ400/900] 0: No transfer 1: Input 1 2: Input 2 When Select function for input 2 is: “2-loop control/Differential temperature control” [FZ400/900] 0: No transfer 1: 2-loop control 2: Differential temperature control	0



■ Memory area 2 to 5 data

Register address for Memory area 2 to 5.

For details of attribute, data range and factory set values, refer to the same line No. in ■ Memory area 1 data (P.6-76).

Low: Low-order High: High-order

No.	Name	Memory area2				Memory area3				Memory area 4				Memory area 5			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Input 1_Set value (SV) [FZ110/400/900]	0566	0567	1382	1383	05CC	05CD	1484	1485	0632	0633	1586	1587	0698	0699	1688	1689
2	Input 2_Set value (SV) [FZ400/900]	0568	0569	1384	1385	05CE	05CF	1486	1487	0634	0635	1588	1589	069A	069B	1690	1691
3	Set value (SV) of differential temperature input [FZ400/900]	056A	056B	1386	1387	05D0	05D1	1488	1489	0636	0637	1590	1591	069C	069D	1692	1693
4	Event 1 set value (EV1) Event 1 set value (EV1) [high] [FZ110/400/900]	056C	056D	1388	1389	05D2	05D3	1490	1491	0638	0639	1592	1593	069E	069F	1694	1695
5	Event 1 set value (EV1') [low] [FZ110/400/900]	056E	056F	1390	1391	05D4	05D5	1492	1493	063A	063B	1594	1595	06A0	06A1	1696	1697
6	Event 2 set value (EV2) Event 2 set value (EV2) [high] [FZ110/400/900]	0570	0571	1392	1393	05D6	05D7	1494	1495	063C	063D	1596	1597	06A2	06A3	1698	1699
7	Event 2 set value (EV2') [low] [FZ110/400/900]	0572	0573	1394	1395	05D8	05D9	1496	1497	063E	063F	1598	1599	06A4	06A5	1700	1701
8	Event 3 set value (EV3) Event 3 set value (EV3) [high] [FZ110/400/900]	0574	0575	1396	1397	05DA	05DB	1498	1499	0640	0641	1600	1601	06A6	06A7	1702	1703
9	Event 3 set value (EV3') [low] [FZ110/400/900]	0576	0577	1398	1399	05DC	05DD	1500	1501	0642	0643	1602	1603	06A8	06A9	1704	1705
10	Event 4 set value (EV4) Event 4 set value (EV4) [high] [FZ110/400/900]	0578	0579	1400	1401	05DE	05DF	1502	1503	0644	0645	1604	1605	06AA	06AB	1706	1707
11	Event 4 set value (EV4') [low] [FZ110/400/900]	057A	057B	1402	1403	05E0	05E1	1504	1505	0646	0647	1606	1607	06AC	06AD	1708	1709



No.	Name	Memory area 2				Memory area 3				Memory area 4				Memory area 5			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
12	Input 1_Proportional band [heat-side] [FZ110/400/900]	057C	057D	1404	1405	05E2	05E3	1506	1507	0648	0649	1608	1609	06AE	06AF	1710	1711
13	Input 1_Integral time [heat-side] [FZ110/400/900]	057E	057F	1406	1407	05E4	05E5	1508	1509	064A	064B	1610	1611	06B0	06B1	1712	1713
14	Input 1_Derivative time [heat-side] [FZ110/400/900]	0580	0581	1408	1409	05E6	05E7	1510	1511	064C	064D	1612	1613	06B2	06B3	1714	1715
15	Input 1_Control response parameter [FZ110/400/900]	0582	0583	1410	1411	05E8	05E9	1512	1513	064E	064F	1614	1615	06B4	06B5	1716	1717
16	Input 1_Proactive intensity [FZ110/400/900]	0584	0585	1412	1413	05EA	05EB	1514	1515	0650	0651	1616	1617	06B6	06B7	1718	1719
17	Input 1_Manual reset [FZ110/400/900]	0586	0587	1414	1415	05EC	05ED	1516	1517	0652	0653	1618	1619	06B8	06B9	1720	1721
18	Input 1_FF amount [FZ110/400/900]	0588	0589	1416	1417	05EE	05EF	1518	1519	0654	0655	1620	1621	06BA	06BB	1722	1723
19	Input 1_Output limiter high [heat-side] [FZ110/400/900]	058A	058B	1418	1419	05F0	05F1	1520	1521	0656	0657	1622	1623	06BC	06BD	1724	1725
20	Input 1_Output limiter low [heat-side] [FZ110/400/900]	058C	058D	1420	1421	05F2	05F3	1522	1523	0658	0659	1624	1625	06BE	06BF	1726	1727
21	Input 1_Control loop break alarm (LBA) time [FZ110/400/900]	058E	058F	1422	1423	05F4	05F5	1524	1525	065A	065B	1626	1627	06C0	06C1	1728	1729
22	Input 1_LBA deadband (LBD) [FZ110/400/900]	0590	0591	1424	1425	05F6	05F7	1526	1527	065C	065D	1628	1629	06C2	06C3	1730	1731
23	Input 2_Proportional band [FZ400/900]	0592	0593	1426	1427	05F8	05F9	1528	1529	065E	065F	1630	1631	06C4	06C5	1732	1733
24	Input 2_Integral time [FZ400/900]	0594	0595	1428	1429	05FA	05FB	1530	1531	0660	0661	1632	1633	06C6	06C7	1734	1735
25	Input 2_Derivative time [FZ400/900]	0596	0597	1430	1431	05FC	05FD	1532	1533	0662	0663	1634	1635	06C8	06C9	1736	1737
26	Input 2_Control response parameter [FZ400/900]	0598	0599	1432	1433	05FE	05FF	1534	1535	0664	0665	1636	1637	06CA	06CB	1738	1739



No.	Name	Memory area 2				Memory area 3				Memory area 4				Memory area 5			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
27	Input 2_Proactive intensity [FZ400/900]	059A	059B	1434	1435	0600	0601	1536	1537	0666	0667	1638	1639	06CC	06CD	1740	1741
28	Input 2_Manual reset [FZ400/900]	059C	059D	1436	1437	0602	0603	1538	1539	0668	0669	1640	1641	06CE	06CF	1742	1743
29	Input 2_FF amount [FZ400/900]	059E	059F	1438	1439	0604	0605	1540	1541	066A	066B	1642	1643	06D0	06D1	1744	1745
30	Input 2_Output limiter high [FZ400/900]	05A0	05A1	1440	1441	0606	0607	1542	1543	066C	066D	1644	1645	06D2	06D3	1746	1747
31	Input 2_Output limiter low [FZ400/900]	05A2	05A3	1442	1443	0608	0609	1544	1545	066E	066F	1646	1647	06D4	06D5	1748	1749
32	Input 2_Control loop break alarm (LBA) time [FZ400/900]	05A4	05A5	1444	1445	060A	060B	1546	1547	0670	0671	1648	1649	06D6	06D7	1750	1751
33	Input 2_LBA deadband (LBD) [FZ400/900]	05A6	05A7	1446	1447	060C	060D	1548	1549	0672	0673	1650	1651	06D8	06D9	1752	1753
34	Input 1_Proportional band [cool-side] [FZ110/400/900]	05A8	05A9	1448	1449	060E	060F	1550	1551	0674	0675	1652	1653	06DA	06DB	1754	1755
35	Input 1_Integral time [cool-side] [FZ110/400/900]	05AA	05AB	1450	1451	0610	0611	1552	1553	0676	0677	1654	1655	06DC	06DD	1756	1757
36	Input 1_Derivative time [cool-side] [FZ110/400/900]	05AC	05AD	1452	1453	0612	0613	1554	1555	0678	0679	1656	1657	06DE	06DF	1758	1759
37	Input 1_Overlap/Deadband [FZ110/400/900]	05AE	05AF	1454	1455	0614	0615	1556	1557	067A	067B	1658	1659	06E0	06E1	1760	1761
38	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side] [FZ110/400/900]	05B0	05B1	1456	1457	0616	0617	1558	1559	067C	067D	1660	1661	06E2	06E3	1762	1763
39	Input 1_Output limiter low [cool-side] [FZ110/400/900]	05B2	05B3	1458	1459	0618	0619	1560	1561	067E	067F	1662	1663	06E4	06E5	1764	1765
40	Select Trigger type for Memory area transfer [FZ110/400/900]	05B4	05B5	1460	1461	061A	061B	1562	1563	0680	0681	1664	1665	06E6	06E7	1766	1767



No.	Name	Memory area 2				Memory area 3				Memory area 4				Memory area 5			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
41	Area soak time [FZ110/400/900]	05B6	05B7	1462	1463	061C	061D	1564	1565	0682	0683	1666	1667	06E8	06E9	1768	1769
42	Link area number [FZ110/400/900]	05B8	05B9	1464	1465	061E	061F	1566	1567	0684	0685	1668	1669	06EA	06EB	1770	1771
43	Input 1_Setting change rate limiter (up) [FZ110/400/900]	05BA	05BB	1466	1467	0620	0621	1568	1569	0686	0687	1670	1671	06EC	06ED	1772	1773
44	Input 1_Setting change rate limiter (down) [FZ110/400/900]	05BC	05BD	1468	1469	0622	0623	1570	1571	0688	0689	1672	1673	06EE	06EF	1774	1775
45	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900]	05BE	05BF	1470	1471	0624	0625	1572	1573	068A	068B	1674	1675	06F0	06F1	1776	1777
46	Input 1_Manipulated output value (Area) [FZ110/400/900]	05C0	05C1	1472	1473	0626	0627	1574	1575	068C	068D	1676	1677	06F2	06F3	1778	1779
47	Input 2_Setting change rate limiter (up) [FZ400/900]	05C2	05C3	1474	1475	0628	0629	1576	1577	068E	068F	1678	1679	06F4	06F5	1780	1781
48	Input 2_Setting change rate limiter (down) [FZ400/900]	05C4	05C5	1476	1477	062A	062B	1578	1579	0690	0691	1680	1681	06F6	06F7	1782	1783
49	Input 2_Auto/Manual transfer selection (Area) [FZ400/900]	05C6	05C7	1478	1479	062C	062D	1580	1581	0692	0693	1682	1683	06F8	06F9	1784	1785
50	Input 2_Manipulated output value (Area) [FZ400/900]	05C8	05C9	1480	1481	062E	062F	1582	1583	0694	0695	1684	1685	06FA	06FB	1786	1787
51	Remote/Local transfer selection (Area) [FZ110/400/900]	05CA	05CB	1482	1483	0630	0631	1584	1585	0696	0697	1686	1687	06FC	06FD	1788	1789



■ Memory area 6 to 9 data

Register address for Memory area 6 to 9.

For details of attribute, data range and factory set values, refer to the same line No. in ■ Memory area 1 data (P.6-76).

Low: Low-order High: High-order

No.	Name	Memory area 6				Memory area 7				Memory area 8				Memory area 9			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Input 1_Set value (SV) [FZ110/400/900]	06FE	06FF	1790	1791	0764	0765	1892	1893	07CA	07CB	1994	1995	0830	0831	2096	2097
2	Input 2_Set value (SV) [FZ400/900]	0700	0701	1792	1793	0766	0767	1894	1895	07CC	07CD	1996	1997	0832	0833	2098	2099
3	Set value (SV) of differential temperature input [FZ400/900]	0702	0703	1794	1795	0768	0769	1896	1897	07CE	07CF	1998	1999	0834	0835	2100	2101
4	Event 1 set value (EV1) Event 1 set value (EV1) [high] [FZ110/400/900]	0704	0705	1796	1797	076A	076B	1898	1899	07D0	07D1	2000	2001	0836	0837	2102	2103
5	Event 1 set value (EV1') [low] [FZ110/400/900]	0706	0707	1798	1799	076C	076D	1900	1901	07D2	07D3	2002	2003	0838	0839	2104	2105
6	Event 2 set value (EV2) Event 2 set value (EV2) [high] [FZ110/400/900]	0708	0709	1800	1801	076E	076F	1902	1903	07D4	07D5	2004	2005	083A	083B	2106	2107
7	Event 2 set value (EV2') [low] [FZ110/400/900]	070A	070B	1802	1803	0770	0771	1904	1905	07D6	07D7	2006	2007	083C	083D	2108	2109
8	Event 3 set value (EV3) Event 3 set value (EV3) [high] [FZ110/400/900]	070C	070D	1804	1805	0772	0773	1906	1907	07D8	07D9	2008	2009	083E	083F	2110	2111
9	Event 3 set value (EV3') [low] [FZ110/400/900]	070E	070F	1806	1807	0774	0775	1908	1909	07DA	07DB	2010	2011	0840	0841	2112	2113
10	Event 4 set value (EV4) Event 4 set value (EV4) [high] [FZ110/400/900]	0710	0711	1808	1809	0776	0777	1910	1911	07DC	07DD	2012	2013	0842	0843	2114	2115
11	Event 4 set value (EV4') [low] [FZ110/400/900]	0712	0713	1810	1811	0778	0779	1912	1913	07DE	07DF	2014	2015	0844	0845	2116	2117



No.	Name	Memory area 6				Memory area 7				Memory area 8				Memory area 9			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
12	Input 1_Proportional band [heat-side] [FZ110/400/900]	0714	0715	1812	1813	077A	077B	1914	1915	07E0	07E1	2016	2017	0846	0847	2118	2119
13	Input 1_Integral time [heat-side] [FZ110/400/900]	0716	0717	1814	1815	077C	077D	1916	1917	07E2	07E3	2018	2019	0848	0849	2120	2121
14	Input 1_Derivative time [heat-side] [FZ110/400/900]	0718	0719	1816	1817	077E	077F	1918	1919	07E4	07E5	2020	2021	084A	084B	2122	2123
15	Input 1_Control response parameter [FZ110/400/900]	071A	071B	1818	1819	0780	0781	1920	1921	07E6	07E7	2022	2023	084C	084D	2124	2125
16	Input 1_Proactive intensity [FZ110/400/900]	071C	071D	1820	1821	0782	0783	1922	1923	07E8	07E9	2024	2025	084E	084F	2126	2127
17	Input 1_Manual reset [FZ110/400/900]	071E	071F	1822	1823	0784	0785	1924	1925	07EA	07EB	2026	2027	0850	0851	2128	2129
18	Input 1_FF amount [FZ110/400/900]	0720	0721	1824	1825	0786	0787	1926	1927	07EC	07ED	2028	2029	0852	0853	2130	2131
19	Input 1_Output limiter high [heat-side] [FZ110/400/900]	0722	0723	1826	1827	0788	0789	1928	1929	07EE	07EF	2030	2031	0854	0855	2132	2133
20	Input 1_Output limiter low [heat-side] [FZ110/400/900]	0724	0725	1828	1829	078A	078B	1930	1931	07F0	07F1	2032	2033	0856	0857	2134	2135
21	Input 1_Control loop break alarm (LBA) time [FZ110/400/900]	0726	0727	1830	1831	078C	078D	1932	1933	07F2	07F3	2034	2035	0858	0859	2136	2137
22	Input 1_LBA deadband (LBD) [FZ110/400/900]	0728	0729	1832	1833	078E	078F	1934	1935	07F4	07F5	2036	2037	085A	085B	2138	2139
23	Input 2_Proportional band [FZ400/900]	072A	072B	1834	1835	0790	0791	1936	1937	07F6	07F7	2038	2039	085C	085D	2140	2141
24	Input 2_Integral time [FZ400/900]	072C	072D	1836	1837	0792	0793	1938	1939	07F8	07F9	2040	2041	085E	085F	2142	2143
25	Input 2_Derivative time [FZ400/900]	072E	072F	1838	1839	0794	0795	1940	1941	07FA	07FB	2042	2043	0860	0861	2144	2145
26	Input 2_Control response parameter [FZ400/900]	0730	0731	1840	1841	0796	0797	1942	1943	07FC	07FD	2044	2045	0862	0863	2146	2147



No.	Name	Memory area 6				Memory area 7				Memory area 8				Memory area 9			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
27	Input 2_Proactive intensity [FZ400/900]	0732	0733	1842	1843	0798	0799	1944	1945	07FE	07FF	2046	2047	0864	0865	2148	2149
28	Input 2_Manual reset [FZ400/900]	0734	0735	1844	1845	079A	079B	1946	1947	0800	0801	2048	2049	0866	0867	2150	2151
29	Input 2_FF amount [FZ400/900]	0736	0737	1846	1847	079C	079D	1948	1949	0802	0803	2050	2051	0868	0869	2152	2153
30	Input 2_Output limiter high [FZ400/900]	0738	0739	1848	1849	079E	079F	1950	1951	0804	0805	2052	2053	086A	086B	2154	2155
31	Input 2_Output limiter low [FZ400/900]	073A	073B	1850	1851	07A0	07A1	1952	1953	0806	0807	2054	2055	086C	086D	2156	2157
32	Input 2_Control loop break alarm (LBA) time [FZ400/900]	073C	073D	1852	1853	07A2	07A3	1954	1955	0808	0809	2056	2057	086E	086F	2158	2159
33	Input 2_LBA deadband (LBD) [FZ400/900]	073E	073F	1854	1855	07A4	07A5	1956	1957	080A	080B	2058	2059	0870	0871	2160	2161
34	Input 1_Proportional band [cool-side] [FZ110/400/900]	0740	0741	1856	1857	07A6	07A7	1958	1959	080C	080D	2060	2061	0872	0873	2162	2163
35	Input 1_Integral time [cool-side] [FZ110/400/900]	0742	0743	1858	1859	07A8	07A9	1960	1961	080E	080F	2062	2063	0874	0875	2164	2165
36	Input 1_Derivative time [cool-side] [FZ110/400/900]	0744	0745	1860	1861	07AA	07AB	1962	1963	0810	0811	2064	2065	0876	0877	2166	2167
37	Input 1_Overlap/Deadband [FZ110/400/900]	0746	0747	1862	1863	07AC	07AD	1964	1965	0812	0813	2066	2067	0878	0879	2168	2169
38	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side] [FZ110/400/900]	0748	0749	1864	1865	07AE	07AF	1966	1967	0814	0815	2068	2069	087A	087B	2170	2171
39	Input 1_Output limiter low [cool-side] [FZ110/400/900]	074A	074B	1866	1867	07B0	07B1	1968	1969	0816	0817	2070	2071	087C	087D	2172	2173
40	Select Trigger type for Memory area transfer [FZ110/400/900]	074C	074D	1868	1869	07B2	07B3	1970	1971	0818	0819	2072	2073	087E	087F	2174	2175



No.	Name	Memory area 6				Memory area 7				Memory area 8				Memory area 9			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
41	Area soak time [FZ110/400/900]	074E	074F	1870	1871	07B4	07B5	1972	1973	081A	081B	2074	2075	0880	0881	2176	2177
42	Link area number [FZ110/400/900]	0750	0751	1872	1873	07B6	07B7	1974	1975	081C	081D	2076	2077	0882	0883	2178	2179
43	Input 1_Setting change rate limiter (up) [FZ110/400/900]	0752	0753	1874	1875	07B8	07B9	1976	1977	081E	081F	2078	2079	0884	0885	2180	2181
44	Input 1_Setting change rate limiter (down) [FZ110/400/900]	0754	0755	1876	1877	07BA	07BB	1978	1979	0820	0821	2080	2081	0886	0887	2182	2183
45	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900]	0756	0757	1878	1879	07BC	07BD	1980	1981	0822	0823	2082	2083	0888	0889	2184	2185
46	Input 1_Manipulated output value (Area) [FZ110/400/900]	0758	0759	1880	1881	07BE	07BF	1982	1983	0824	0825	2084	2085	088A	088B	2186	2187
47	Input 2_Setting change rate limiter (up) [FZ400/900]	075A	075B	1882	1883	07C0	07C1	1984	1985	0826	0827	2086	2087	088C	088D	2188	2189
48	Input 2_Setting change rate limiter (down) [FZ400/900]	075C	075D	1884	1885	07C2	07C3	1986	1987	0828	0829	2088	2089	088E	088F	2190	2191
49	Input 2_Auto/Manual transfer selection (Area) [FZ400/900]	075E	075F	1886	1887	07C4	07C5	1988	1989	082A	082B	2090	2091	0890	0891	2192	2193
50	Input 2_Manipulated output value (Area) [FZ400/900]	0760	0761	1888	1889	07C6	07C7	1990	1991	082C	082D	2092	2093	0892	0893	2194	2195
51	Remote/Local transfer selection (Area) [FZ110/400/900]	0762	0763	1890	1891	07C8	07C9	1992	1993	082E	082F	2094	2095	0894	0895	2196	2197



■ Memory area 10 to 13 data

Register address for Memory area 10 to 13.

For details of attribute, data range and factory set values, refer to the same line No. in ■ Memory area 1 data (P.6-76).

Low: Low-order High: High-order

No.	Name	Memory area 10				Memory area 11				Memory area 12				Memory area 13			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Input 1_Set value (SV) [FZ110/400/900]	0896	0897	2198	2199	08FC	08FD	2300	2301	0962	0963	2402	2403	09C8	09C9	2504	2505
2	Input 2_Set value (SV) [FZ400/900]	0898	0899	2200	2201	08FE	08FF	2302	2303	0964	0965	2404	2405	09CA	09CB	2506	2507
3	Set value (SV) of differential temperature input [FZ400/900]	089A	089B	2202	2203	0900	0901	2304	2305	0966	0967	2406	2407	09CC	09CD	2508	2509
4	Event 1 set value (EV1) Event 1 set value (EV1) [high] [FZ110/400/900]	089C	089D	2204	2205	0902	0903	2306	2307	0968	0969	2408	2409	09CE	09CF	2510	2511
5	Event 1 set value (EV1') [low] [FZ110/400/900]	089E	089F	2206	2207	0904	0905	2308	2309	096A	096B	2410	2411	09D0	09D1	2512	2513
6	Event 2 set value (EV2) Event 2 set value (EV2) [high] [FZ110/400/900]	08A0	08A1	2208	2209	0906	0907	2310	2311	096C	096D	2412	2413	09D2	09D3	2514	2515
7	Event 2 set value (EV2') [low] [FZ110/400/900]	08A2	08A3	2210	2211	0908	0909	2312	2313	096E	096F	2414	2415	09D4	09D5	2516	2517
8	Event 3 set value (EV3) Event 3 set value (EV3) [high] [FZ110/400/900]	08A4	08A5	2212	2213	090A	090B	2314	2315	0970	0971	2416	2417	09D6	09D7	2518	2519
9	Event 3 set value (EV3') [low] [FZ110/400/900]	08A6	08A7	2214	2215	090C	090D	2316	2317	0972	0973	2418	2419	09D8	09D9	2520	2521
10	Event 4 set value (EV4) Event 4 set value (EV4) [high] [FZ110/400/900]	08A8	08A9	2216	2217	090E	090F	2318	2319	0974	0975	2420	2421	09DA	09DB	2522	2523
11	Event 4 set value (EV4') [low] [FZ110/400/900]	08AA	08AB	2218	2219	0910	0911	2320	2321	0976	0977	2422	2423	09DC	09DD	2524	2525

No.	Name	Memory area 10				Memory area 11				Memory area 12				Memory area 13			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
12	Input 1_Proportional band [heat-side] [FZ110/400/900]	08AC	08AD	2220	2221	0912	0913	2322	2323	0978	0979	2424	2425	09DE	09DF	2526	2527
13	Input 1_Integral time [heat-side] [FZ110/400/900]	08AE	08AF	2222	2223	0914	0915	2324	2325	097A	097B	2426	2427	09E0	09E1	2528	2529
14	Input 1_Derivative time [heat-side] [FZ110/400/900]	08B0	08B1	2224	2225	0916	0917	2326	2327	097C	097D	2428	2429	09E2	09E3	2530	2531
15	Input 1_Control response parameter [FZ110/400/900]	08B2	08B3	2226	2227	0918	0919	2328	2329	097E	097F	2430	2431	09E4	09E5	2532	2533
16	Input 1_Proactive intensity [FZ110/400/900]	08B4	08B5	2228	2229	091A	091B	2330	2331	0980	0981	2432	2433	09E6	09E7	2534	2535
17	Input 1_Manual reset [FZ110/400/900]	08B6	08B7	2230	2231	091C	091D	2332	2333	0982	0983	2434	2435	09E8	09E9	2536	2537
18	Input 1_FF amount [FZ110/400/900]	08B8	08B9	2232	2233	091E	091F	2334	2335	0984	0985	2436	2437	09EA	09EB	2538	2539
19	Input 1_Output limiter high [heat-side] [FZ110/400/900]	08BA	08BB	2234	2235	0920	0921	2336	2337	0986	0987	2438	2439	09EC	09ED	2540	2541
20	Input 1_Output limiter low [heat-side] [FZ110/400/900]	08BC	08BD	2236	2237	0922	0923	2338	2339	0988	0989	2440	2441	09EE	09EF	2542	2543
21	Input 1_Control loop break alarm (LBA) time [FZ110/400/900]	08BE	08BF	2238	2239	0924	0925	2340	2341	098A	098B	2442	2443	09F0	09F1	2544	2545
22	Input 1_LBA deadband (LBD) [FZ110/400/900]	08C0	08C1	2240	2241	0926	0927	2342	2343	098C	098D	2444	2445	09F2	09F3	2546	2547
23	Input 2_Proportional band [FZ400/900]	08C2	08C3	2242	2243	0928	0929	2344	2345	098E	098F	2446	2447	09F4	09F5	2548	2549
24	Input 2_Integral time [FZ400/900]	08C4	08C5	2244	2245	092A	092B	2346	2347	0990	0991	2448	2449	09F6	09F7	2550	2551
25	Input 2_Derivative time [FZ400/900]	08C6	08C7	2246	2247	092C	092D	2348	2349	0992	0993	2450	2451	09F8	09F9	2552	2553
26	Input 2_Control response parameter [FZ400/900]	08C8	08C9	2248	2249	092E	092F	2350	2351	0994	0995	2452	2453	09FA	09FB	2554	2555



No.	Name	Memory area 10				Memory area 11				Memory area 12				Memory area 13			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
27	Input 2_Proactive intensity [FZ400/900]	08CA	08CB	2250	2251	0930	0931	2352	2353	0996	0997	2454	2455	09FC	09FD	2556	2557
28	Input 2_Manual reset [FZ400/900]	08CC	08CD	2252	2253	0932	0933	2354	2355	0998	0999	2456	2457	09FE	09FF	2558	2559
29	Input 2_FF amount [FZ400/900]	08CE	08CF	2254	2255	0934	0935	2356	2357	099A	099B	2458	2459	0A00	0A01	2560	2561
30	Input 2_Output limiter high [FZ400/900]	08D0	08D1	2256	2257	0936	0937	2358	2359	099C	099D	2460	2461	0A02	0A03	2562	2563
31	Input 2_Output limiter low [FZ400/900]	08D2	08D3	2258	2259	0938	0939	2360	2361	099E	099F	2462	2463	0A04	0A05	2564	2565
32	Input 2_Control loop break alarm (LBA) time [FZ400/900]	08D4	08D5	2260	2261	093A	093B	2362	2363	09A0	09A1	2464	2465	0A06	0A07	2566	2567
33	Input 2_LBA deadband (LBD) [FZ400/900]	08D6	08D7	2262	2263	093C	093D	2364	2365	09A2	09A3	2466	2467	0A08	0A09	2568	2569
34	Input 1_Proportional band [cool-side] [FZ110/400/900]	08D8	08D9	2264	2265	093E	093F	2366	2367	09A4	09A5	2468	2469	0A0A	0A0B	2570	2571
35	Input 1_Integral time [cool-side] [FZ110/400/900]	08DA	08DB	2266	2267	0940	0941	2368	2369	09A6	09A7	2470	2471	0A0C	0A0D	2572	2573
36	Input 1_Derivative time [cool-side] [FZ110/400/900]	08DC	08DD	2268	2269	0942	0943	2370	2371	09A8	09A9	2472	2473	0A0E	0A0F	2574	2575
37	Input 1_Overlap/Deadband [FZ110/400/900]	08DE	08DF	2270	2271	0944	0945	2372	2373	09AA	09AB	2474	2475	0A10	0A11	2576	2577
38	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side] [FZ110/400/900]	08E0	08E1	2272	2273	0946	0947	2374	2375	09AC	09AD	2476	2477	0A12	0A13	2578	2579
39	Input 1_Output limiter low [cool-side] [FZ110/400/900]	08E2	08E3	2274	2275	0948	0949	2376	2377	09AE	09AF	2478	2479	0A14	0A15	2580	2581
40	Select Trigger type for Memory area transfer [FZ110/400/900]	08E4	08E5	2276	2277	094A	094B	2378	2379	09B0	09B1	2480	2481	0A16	0A17	2582	2583



No.	Name	Memory area 10				Memory area 11				Memory area 12				Memory area 13			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
41	Area soak time [FZ110/400/900]	08E6	08E7	2278	2279	094C	094D	2380	2381	09B2	09B3	2482	2483	0A18	0A19	2584	2585
42	Link area number [FZ110/400/900]	08E8	08E9	2280	2281	094E	094F	2382	2383	09B4	09B5	2484	2485	0A1A	0A1B	2586	2587
43	Input 1_Setting change rate limiter (up) [FZ110/400/900]	08EA	08EB	2282	2283	0950	0951	2384	2385	09B6	09B7	2486	2487	0A1C	0A1D	2588	2589
44	Input 1_Setting change rate limiter (down) [FZ110/400/900]	08EC	08ED	2284	2285	0952	0953	2386	2387	09B8	09B9	2488	2489	0A1E	0A1F	2590	2591
45	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900]	08EE	08EF	2286	2287	0954	0955	2388	2389	09BA	09BB	2490	2491	0A20	0A21	2592	2593
46	Input 1_Manipulated output value (Area) [FZ110/400/900]	08F0	08F1	2288	2289	0956	0957	2390	2391	09BC	09BD	2492	2493	0A22	0A23	2594	2595
47	Input 2_Setting change rate limiter (up) [FZ400/900]	08F2	08F3	2290	2291	0958	0959	2392	2393	09BE	09BF	2494	2495	0A24	0A25	2596	2597
48	Input 2_Setting change rate limiter (down) [FZ400/900]	08F4	08F5	2292	2293	095A	095B	2394	2395	09C0	09C1	2496	2497	0A26	0A27	2598	2599
49	Input 2_Auto/Manual transfer selection (Area) [FZ400/900]	08F6	08F7	2294	2295	095C	095D	2396	2397	09C2	09C3	2498	2499	0A28	0A29	2600	2601
50	Input 2_Manipulated output value (Area) [FZ400/900]	08F8	08F9	2296	2297	095E	095F	2398	2399	09C4	09C5	2500	2501	0A2A	0A2B	2602	2603
51	Remote/Local transfer selection (Area) [FZ110/400/900]	08FA	08FB	2298	2299	0960	0961	2400	2401	09C6	09C7	2502	2503	0A2C	0A2D	2604	2605



■ Memory area 14 to 16 data

Register address for Memory area 14 to 16.

For details of attribute, data range and factory set values, refer to the same line No. in ■ **Memory area 1 data (P.6-76)**.

Low: Low-order High: High-order

No.	Name	Memory area 14				Memory area 15				Memory area 16			
		Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Input 1_Set value (SV) [FZ110/400/900]	0A2E	0A2F	2606	2607	0A94	0A95	2708	2709	0AFA	0AFB	2810	2811
2	Input 2_Set value (SV) [FZ400/900]	0A30	0A31	2608	2609	0A96	0A97	2710	2711	0AFC	0AFD	2812	2813
3	Set value (SV) of differential temperature input [FZ400/900]	0A32	0A33	2610	2611	0A98	0A99	2712	2713	0AFE	0AFF	2814	2815
4	Event 1 set value (EV1) Event 1 set value (EV1) [high] [FZ110/400/900]	0A34	0A35	2612	2613	0A9A	0A9B	2714	2715	0B00	0B01	2816	2817
5	Event 1 set value (EV1') [low] [FZ110/400/900]	0A36	0A37	2614	2615	0A9C	0A9D	2716	2717	0B02	0B03	2818	2819
6	Event 2 set value (EV2) Event 2 set value (EV2) [high] [FZ110/400/900]	0A38	0A39	2616	2617	0A9E	0A9F	2718	2719	0B04	0B05	2820	2821
7	Event 2 set value (EV2') [low] [FZ110/400/900]	0A3A	0A3B	2618	2619	0AA0	0AA1	2720	2721	0B06	0B07	2822	2823
8	Event 3 set value (EV3) Event 3 set value (EV3) [high] [FZ110/400/900]	0A3C	0A3D	2620	2621	0AA2	0AA3	2722	2723	0B08	0B09	2824	2825
9	Event 3 set value (EV3') [low] [FZ110/400/900]	0A3E	0A3F	2622	2623	0AA4	0AA5	2724	2725	0B0A	0B0B	2826	2827
10	Event 4 set value (EV4) Event 4 set value (EV4) [high] [FZ110/400/900]	0A40	0A41	2624	2625	0AA6	0AA7	2726	2727	0B0C	0B0D	2828	2829
11	Event 4 set value (EV4') [low] [FZ110/400/900]	0A42	0A43	2626	2627	0AA8	0AA9	2728	2729	0B0E	0B0F	2830	2831



No.	Name	Memory area 14				Memory area 15				Memory area 16			
		Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
12	Input 1_Proportional band [heat-side] [FZ110/400/900]	0A44	0A45	2628	2629	0AAA	0AAB	2730	2731	0B10	0B11	2832	2833
13	Input 1_Integral time [heat-side] [FZ110/400/900]	0A46	0A47	2630	2631	0AAC	0AAD	2732	2733	0B12	0B13	2834	2835
14	Input 1_Derivative time [heat-side] [FZ110/400/900]	0A48	0A49	2632	2633	0AAE	0AAF	2734	2735	0B14	0B15	2836	2837
15	Input 1_Control response parameter [FZ110/400/900]	0A4A	0A4B	2634	2635	0AB0	0AB1	2736	2737	0B16	0B17	2838	2839
16	Input 1_Proactive intensity [FZ110/400/900]	0A4C	0A4D	2636	2637	0AB2	0AB3	2738	2739	0B18	0B19	2840	2841
17	Input 1_Manual reset [FZ110/400/900]	0A4E	0A4F	2638	2639	0AB4	0AB5	2740	2741	0B1A	0B1B	2842	2843
18	Input 1_FF amount [FZ110/400/900]	0A50	0A51	2640	2641	0AB6	0AB7	2742	2743	0B1C	0B1D	2844	2845
19	Input 1_Output limiter high [heat-side] [FZ110/400/900]	0A52	0A53	2642	2643	0AB8	0AB9	2744	2745	0B1E	0B1F	2846	2847
20	Input 1_Output limiter low [heat-side] [FZ110/400/900]	0A54	0A55	2644	2645	0ABA	0ABB	2746	2747	0B20	0B21	2848	2849
21	Input 1_Control loop break alarm (LBA) time [FZ110/400/900]	0A56	0A57	2646	2647	0ABC	0ABD	2748	2749	0B22	0B23	2850	2851
22	Input 1_LBA deadband (LBD) [FZ110/400/900]	0A58	0A59	2648	2649	0ABE	0ABF	2750	2751	0B24	0B25	2852	2853
23	Input 2_Proportional band [FZ400/900]	0A5A	0A5B	2650	2651	0AC0	0AC1	2752	2753	0B26	0B27	2854	2855
24	Input 2_Integral time [FZ400/900]	0A5C	0A5D	2652	2653	0AC2	0AC3	2754	2755	0B28	0B29	2856	2857
25	Input 2_Derivative time [FZ400/900]	0A5E	0A5F	2654	2655	0AC4	0AC5	2756	2757	0B2A	0B2B	2858	2859
26	Input 2_Control response parameter [FZ400/900]	0A60	0A61	2656	2657	0AC6	0AC7	2758	2759	0B2C	0B2D	2860	2861



No.	Name	Memory area 14				Memory area 15				Memory area 16			
		Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
27	Input 2_Proactive intensity [FZ400/900]	0A62	0A63	2658	2659	0AC8	0AC9	2760	2761	0B2E	0B2F	2862	2863
28	Input 2_Manual reset [FZ400/900]	0A64	0A65	2660	2661	0ACA	0ACB	2762	2763	0B30	0B31	2864	2865
29	Input 2_FF amount [FZ400/900]	0A66	0A67	2662	2663	0ACC	0ACD	2764	2765	0B32	0B33	2866	2867
30	Input 2_Output limiter high [FZ400/900]	0A68	0A69	2664	2665	0ACE	0ACF	2766	2767	0B34	0B35	2868	2869
31	Input 2_Output limiter low [FZ400/900]	0A6A	0A6B	2666	2667	0AD0	0AD1	2768	2769	0B36	0B37	2870	2871
32	Input 2_Control loop break alarm (LBA) time [FZ400/900]	0A6C	0A6D	2668	2669	0AD2	0AD3	2770	2771	0B38	0B39	2872	2873
33	Input 2_LBA deadband (LBD) [FZ400/900]	0A6E	0A6F	2670	2671	0AD4	0AD5	2772	2773	0B3A	0B3B	2874	2875
34	Input 1_Proportional band [cool-side] [FZ110/400/900]	0A70	0A71	2672	2673	0AD6	0AD7	2774	2775	0B3C	0B3D	2876	2877
35	Input 1_Integral time [cool-side] [FZ110/400/900]	0A72	0A73	2674	2675	0AD8	0AD9	2776	2777	0B3E	0B3F	2878	2879
36	Input 1_Derivative time [cool-side] [FZ110/400/900]	0A74	0A75	2676	2677	0ADA	0ADB	2778	2779	0B40	0B41	2880	2881
37	Input 1_Overlap/Deadband [FZ110/400/900]	0A76	0A77	2678	2679	0ADC	0ADD	2780	2781	0B42	0B43	2882	2883
38	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side] [FZ110/400/900]	0A78	0A79	2680	2681	0ADE	0ADF	2782	2783	0B44	0B45	2884	2885
39	Input 1_Output limiter low [cool-side] [FZ110/400/900]	0A7A	0A7B	2682	2683	0AE0	0AE1	2784	2785	0B46	0B47	2886	2887
40	Select Trigger type for Memory area transfer [FZ110/400/900]	0A7C	0A7D	2684	2685	0AE2	0AE3	2786	2787	0B48	0B49	2888	2889



No.	Name	Memory area 14				Memory area 15				Memory area 16			
		Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
41	Area soak time [FZ110/400/900]	0A7E	0A7F	2686	2687	0AE4	0AE5	2788	2789	0B4A	0B4B	2890	2891
42	Link area number [FZ110/400/900]	0A80	0A81	2688	2689	0AE6	0AE7	2790	2791	0B4C	0B4D	2892	2893
43	Input 1_Setting change rate limiter (up) [FZ110/400/900]	0A82	0A83	2690	2691	0AE8	0AE9	2792	2793	0B4E	0B4F	2894	2895
44	Input 1_Setting change rate limiter (down) [FZ110/400/900]	0A84	0A85	2692	2693	0AEA	0AEB	2794	2795	0B50	0B51	2896	2897
45	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900]	0A86	0A87	2694	2695	0AEC	0AED	2796	2797	0B52	0B53	2898	2899
46	Input 1_Manipulated output value (Area) [FZ110/400/900]	0A88	0A89	2696	2697	0AEE	0AEF	2798	2799	0B54	0B55	2900	2901
47	Input 2_Setting change rate limiter (up) [FZ400/900]	0A8A	0A8B	2698	2699	0AF0	0AF1	2800	2801	0B56	0B57	2902	2903
48	Input 2_Setting change rate limiter (down) [FZ400/900]	0A8C	0A8D	2700	2701	0AF2	0AF3	2802	2803	0B58	0B59	2904	2905
49	Input 2_Auto/Manual transfer selection (Area) [FZ400/900]	0A8E	0A8F	2702	2703	0AF4	0AF5	2804	2805	0B5A	0B5B	2906	2907
50	Input 2_Manipulated output value (Area) [FZ400/900]	0A90	0A91	2704	2705	0AF6	0AF7	2806	2807	0B5C	0B5D	2908	2909
51	Remote/Local transfer selection (Area) [FZ110/400/900]	0A92	0A93	2706	2707	0AF8	0AF9	2808	2809	0B5E	0B5F	2910	2911

6.3.3 Data mapping address [Modbus double word]

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

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

■ Register address for data designation

No.	Name	Registeraddress				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
1	Register address setting 1 [Read/write address: Low-order word 1500H, high-order word 1501H]	1000	1001	4096	4097	R/W	Set the register address of data to be assigned to 1500H to 153FH Decimal number: –1 to 20479 (–1: Without mapping) Hexadecimal numeral: FFFFH to 4FFFH (FFFFH: Without mapping) The register addresses for data designation (1000H to 103FH) and read/write (1500H to 153FH) will be invalid (without mapping), even if set.	–1
2	Register address setting 2 [Read/write address: Low-order word 1502H, high-order word 1503H]	1002	1003	4098	4099	R/W		–1
3	Register address setting 3 [Read/write address: Low-order word 1504H, high-order word 1505H]	1004	1005	4100	4101	R/W		–1
4	Register address setting 4 [Read/write address: Low-order word 1506H, high-order word 1507H]	1006	1007	4102	4103	R/W		–1
5	Register address setting 5 [Read/write address: Low-order word 1508H, high-order word 1509H]	1008	1009	4104	4105	R/W		–1
6	Register address setting 6 [Read/write address: Low-order word 150AH, high-order word 150BH]	100A	100B	4106	4107	R/W		–1
7	Register address setting 7 [Read/write address: Low-order word 150CH, high-order word 150DH]	100C	100D	4108	4109	R/W		–1
8	Register address setting 8 [Read/write address: Low-order word 150EH, high-order word 150FH]	100E	100F	4110	4111	R/W		–1
9	Register address setting 9 [Read/write address: Low-order word 1510H, high-order word 1511H]	1010	1011	4112	4113	R/W		–1
10	Register address setting 10 [Read/write address: Low-order word 1512H, high-order word 1513H]	1012	1013	4114	4115	R/W		–1
11	Register address setting 11 [Read/write address: Low-order word 1514H, high-order word 1515H]	1014	1015	4116	4117	R/W		–1
12	Register address setting 12 [Read/write address: Low-order word 1516H, high-order word 1517H]	1016	1017	4118	4119	R/W		–1



No.	Name	Registeraddress				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
13	Register address setting 13 [Read/write address: Low-order word 1518H, high-order word 1519H]	1018	1019	4120	4121	R/W	Set the register address of data to be assigned to 1500H to 153FH Decimal number: –1 to 20479 (–1: Without mapping) Hexadecimal numeral: FFFFH to 4FFFH (FFFFH: Without mapping) The register addresses for data designation (1000H to 103FH) and read/write (1500H to 153FH) will be invalid (without mapping), even if set.	–1
14	Register address setting 14 [Read/write address: Low-order word 151AH, high-order word 151BH]	101A	101B	4122	4123	R/W		–1
15	Register address setting 15 [Read/write address: Low-order word 151CH, high-order word 151DH]	101C	101D	4124	4125	R/W		–1
16	Register address setting 16 [Read/write address: Low-order word 151EH, high-order word 151FH]	101E	101F	4126	4127	R/W		–1
17	Register address setting 17 [Read/write address: Low-order word 1520H, high-order word 1521H]	1020	1021	4128	4129	R/W		–1
18	Register address setting 18 [Read/write address: Low-order word 1522H, high-order word 1523H]	1022	1023	4130	4131	R/W		–1
19	Register address setting 19 [Read/write address: Low-order word 1524H, high-order word 1525H]	1024	1025	4132	4133	R/W		–1
20	Register address setting 20 [Read/write address: Low-order word 1526H, high-order word 1527H]	1026	1027	4134	4135	R/W		–1
21	Register address setting 21 [Read/write address: Low-order word 1528H, high-order word 1529H]	1028	1029	4136	4137	R/W		–1
22	Register address setting 22 [Read/write address: Low-order word 152AH, high-order word 152BH]	102A	102B	4138	4139	R/W		–1
23	Register address setting 23 [Read/write address: Low-order word 152CH, high-order word 152DH]	102C	102D	4140	4141	R/W		–1
24	Register address setting 24 [Read/write address: Low-order word 152EH, high-order word 152FH]	102E	102F	4142	4143	R/W		–1
25	Register address setting 25 [Read/write address: Low-order word 1530H, high-order word 1531H]	1030	1031	4144	4145	R/W		–1
26	Register address setting 26 [Read/write address: Low-order word 1532H, high-order word 1533H]	1032	1033	4146	4147	R/W		–1
27	Register address setting 27 [Read/write address: Low-order word 1534H, high-order word 1535H]	1034	1035	4148	4149	R/W		–1



No.	Name	Registeraddress				Attribute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
28	Register address setting 28 [Read/write address: Low-order word 1536H, high-order word 1537H]	1036	1037	4150	4151	R/W	Set the register address of data to be assigned to 1500H to 153FH Decimal number: -1 to 20479 (-1: Without mapping) Hexadecimal numeral: FFFFH to 4FFFH (FFFFH: Without mapping) The register addresses for data designation (1000H to 103FH) and read/write (1500H to 153FH) will be invalid (without mapping), even if set.	-1
29	Register address setting 29 [Read/write address: Low-order word 1538H, high-order word 1539H]	1038	1039	4152	4153	R/W		-1
30	Register address setting 30 [Read/write address: Low-order word 153AH, high-order word 153BH]	103A	103B	4154	4155	R/W		-1
31	Register address setting 31 [Read/write address: Low-order word 153CH, high-order word 153DH]	103C	103D	4156	4157	R/W		-1
32	Register address setting 32 [Read/write address: Low-order word 153EH, high-order word 153FH]	103E	103F	4158	4159	R/W		-1



■ Register address for data read/write

No.	Name	Registeraddress				Attri- bute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
1	Data specified Register address setting 1 (Low-order word 1000H, high-order word 1001H)	1500	1501	5376	5377	Based on the data specified at 1000H to 103FH.		
2	Data specified Register address setting 2 (Low-order word 1002H, high-order word 1003H)	1502	1503	5378	5379			
3	Data specified Register address setting 3 (Low-order word 1004H, high-order word 1005H)	1504	1505	5380	5381			
4	Data specified Register address setting 4 (Low-order word 1006H, high-order word 1007H)	1506	1507	5382	5383			
5	Data specified Register address setting 5 (Low-order word 1008H, high-order word 1009H)	1508	1509	5384	5385			
6	Data specified Register address setting 6 (Low-order word 100AH, high-order word 100BH)	150A	150B	5386	5387			
7	Data specified Register address setting 7 (Low-order word 100CH, high-order word 100DH)	150C	150D	5388	5389			
8	Data specified Register address setting 8 (Low-order word 100EH, high-order word 100FH)	150E	150F	5390	5391			
9	Data specified Register address setting 9 (Low-order word 1010H, high-order word 1011H)	1510	1511	5392	5393			
10	Data specified Register address setting 10 (Low-order word 1012H, high-order word 1013H)	1512	1513	5394	5395			
11	Data specified Register address setting 11 (Low-order word 1014H, high-order word 1015H)	1514	1515	5396	5397			
12	Data specified Register address setting 12 (Low-order word 1016H, high-order word 1017H)	1516	1517	5398	5399			
13	Data specified Register address setting 13 (Low-order word 1018H, high-order word 1019H)	1518	1519	5400	5401			
14	Data specified Register address setting 14 (Low-order word 101AH, high-order word 101BH)	151A	151B	5402	5403			
15	Data specified Register address setting 15 (Low-order word 101CH, high-order word 101DH)	151C	151D	5404	5405			
16	Data specified Register address setting 16 (Low-order word 101EH, high-order word 101FH)	151E	151F	5406	5407			



No.	Name	Registeraddress				Attri- bute	Data range	Factory set value
		HEX		DEC				
		Low-order	High-order	Low-order	High-order			
17	Data specified Register address setting 17 (Low-order word 1020H, high-order word 1021H)	1520	1521	5408	5409	Based on the data specified at 1000H to 103FH.		
18	Data specified Register address setting 18 (Low-order word 1022H, high-order word 1023H)	1522	1523	5410	5411			
19	Data specified Register address setting 19 (Low-order word 1024H, high-order word 1025H)	1524	1525	5412	5413			
20	Data specified Register address setting 20 (Low-order word 1026H, high-order word 1027H)	1526	1527	5414	5415			
21	Data specified Register address setting 21 (Low-order word 1028H, high-order word 1029H)	1528	1529	5416	5417			
22	Data specified Register address setting 22 (Low-order word 102AH, high-order word 102BH)	152A	152B	5418	5419			
23	Data specified Register address setting 23 (Low-order word 102CH, high-order word 102DH)	152C	152D	5420	5421			
24	Data specified Register address setting 24 (Low-order word 102EH, high-order word 102FH)	152E	152F	5422	5423			
25	Data specified Register address setting 25 (Low-order word 1030H, high-order word 1031H)	1530	1531	5424	5425			
26	Data specified Register address setting 26 (Low-order word 1032H, high-order word 1033H)	1532	1533	5426	5427			
27	Data specified Register address setting 27 (Low-order word 1034H, high-order word 1035H)	1534	1535	5428	5429			
28	Data specified Register address setting 28 (Low-order word 1036H, high-order word 1037H)	1536	1537	5430	5431			
29	Data specified Register address setting 29 (Low-order word 1038H, high-order word 1039H)	1538	1539	5432	5433			
30	Data specified Register address setting 30 (Low-order word 103AH, high-order word 103BH)	153A	153B	5434	5435			
31	Data specified Register address setting 31 (Low-order word 103CH, high-order word 103DH)	153C	153D	5436	5437			
32	Data specified Register address setting 32 (Low-order word 103EH, high-order word 103FH)	153E	153F	5438	5439			



6.4 Modbus (Single Word) Data

6.4.1 FZ110/400/900 communication data [Modbus single word]

The following table shows single word register address of Modbus.

For attribute, data range, and factory set values, refer to **6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-9)**.



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



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

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

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
1	Input 1_Measured value (PV) [FZ110/400/900]	2000	8192	1
2	Input 1_Set value (SV) monitor [FZ110/400/900]	2001	8193	2
3	Input 2_Measured value (PV) [FZ400/900]	2002	8194	3
4	Input 2_Set value (SV) monitor [FZ400/900]	2003	8195	4
5	PV select Measured value (PV) [FZ400/900]	2004	8196	5
6	Measured value (PV) of differential temperature input [FZ400/900]	2005	8197	6
7	Set value (SV) monitor of differential temperature input [FZ400/900]	2006	8198	7
8	Input 1_Manipulated output value monitor [heat-side] [FZ110/400/900]	2007	8199	8
9	Input 1_Manipulated output value monitor [cool-side] [FZ110/400/900]	2008	8200	9
10	Input 2_Manipulated output value monitor [FZ400/900]	2009	8201	10
11	Current transformer 1 (CT1) input value monitor [FZ110/400/900]	200A	8202	11
12	Current transformer 2 (CT2) input value monitor [FZ400/900]	200B	8203	12

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
13	Memory area soak time monitor [FZ110/400/900]	200C	8204	13
14	Remote setting input value monitor [FZ110/400/900]	200D	8205	14
15	Feedback resistance (FBR) input value [FZ110/400/900]	200E	8206	15
16	Event 1 state monitor [FZ110/400/900]	200F	8207	16
17	Event 2 state monitor [FZ110/400/900]	2010	8208	17
18	Event 3 state monitor [FZ110/400/900]	2011	8209	18
19	Event 4 state monitor [FZ110/400/900]	2012	8210	19
20	Heater break alarm 1 (HBA1) state monitor [FZ110/400/900]	2013	8211	20
21	Heater break alarm 2 (HBA2) state monitor [FZ400/900]	2014	8212	21
22	Control loop break alarm 1 (LBA1) state monitor [FZ110/400/900]	2015	8213	22
23	Control loop break alarm 2 (LBA2) state monitor [FZ400/900]	2016	8214	23
24	Comprehensive event state [FZ110/400/900]	2017	8215	24



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
25	Input 1_Burnout state monitor [FZ110/400/900]	2018	8216	25
26	Input 2_Burnout state monitor [FZ400/900]	2019	8217	26
27	Feedback resistance (FBR) break monitor [FZ110/400/900]	201A	8218	27
28	DI state monitor [FZ110/400/900]	201B	8219	28
29	OUT state monitor [FZ110/400/900]	201C	8220	29
30	DO state monitor [FZ110/400/900]	201D	8221	30
31	Overall operation status [FZ110/400/900]	201E	8222	31
32	Input 1_PID memory [FZ110/400/900]	201F	8223	32
33	Input 2_PID memory [FZ400/900]	2020	8224	33
34	Input 1_Peak hold monitor [FZ110/400/900]	2021	8225	34
35	Input 1_Bottom hold monitor [FZ110/400/900]	2022	8226	35
36	Input 2_Peak hold monitor [FZ400/900]	2023	8227	36
37	Input 2_Bottom hold monitor [FZ400/900]	2024	8228	37
38	Input 1_AT remaining time monitor [FZ110/400/900]	2025	8229	38
39	Input 2_AT remaining time monitor [FZ400/900]	2026	8230	39
40	Input 1_AT/ST status monitor [FZ110/400/900]	2027	8231	40

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
41	Input 2_AT/ST status monitor [FZ400/900] [FZ400/900]	2028	8232	41
42	Error code [FZ110/400/900]	2029	8233	42
43	Integrated operating time [FZ110/400/900]	202A	8234	43
44	Peak hold monitor of ambient temperature [FZ110/400/900]	202B	8235	44
45	Retransmission output 1 decimal point position [FZ110/400/900]	202C	8236	48
46	Retransmission output 2 decimal point position [FZ110/400/900]	202D	8237	49
47	Retransmission output 3 decimal point position [FZ110/400/900]	202E	8238	50
48	Event 1 decimal point position [FZ110/400/900]	202F	8239	51
49	Event 2 decimal point position [FZ110/400/900]	2030	8240	52
50	Event 3 decimal point position [FZ110/400/900]	2031	8241	53
51	Event 4 decimal point position [FZ110/400/900]	2032	8242	54
52	Interlock release [FZ110/400/900]	2033	8243	55
53	Memory area transfer [FZ110/400/900]	2034	8244	56
54	Input 1_Hold reset [FZ110/400/900]	2035	8245	57
55	Input 2_Hold reset [FZ400/900]	2036	8246	58
56	Bottom suppression start signal [FZ110/400/900]	2037	8247	59



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
57	RUN/STOP transfer [FZ110/400/900]	2038	8248	60
58	Input 1_Autotuning (AT) [FZ110/400/900]	2039	8249	61
59	Input 2_Autotuning (AT) [FZ400/900]	203A	8250	62
60	Input 1_Startup tuning (ST) [FZ110/400/900]	203B	8251	63
61	Input 2_Startup tuning (ST) [FZ400/900]	203C	8252	64
62	Input 1_Auto/Manual transfer [FZ110/400/900]	203D	8253	65
63	Input 2_Auto/Manual transfer [FZ400/900]	203E	8254	66
64	Remote/Local transfer [FZ110/400/900]	203F	8255	67
65	Control area Local/External transfer [FZ110/400/900]	2040	8256	68
66	Input 1_Set value (SV) ★ [FZ110/400/900]	2041	8257	69
67	Input 2_Set value (SV) ★ [FZ400/900]	2042	8258	70
68	Set value (SV) of differential temperature input ★ [FZ400/900]	2043	8259	71
69	Event 1 set value (EV1) Event 1 set value (EV1) [high] ★ [FZ110/400/900]	2044	8260	72
70	Event 1 set value (EV1') [low] ★ [FZ110/400/900]	2045	8261	73
71	Event 2 set value (EV2) Event 2 set value (EV2) [high] ★ [FZ110/400/900]	2046	8262	74

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

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
72	Event 2 set value (EV2') [low] ★ [FZ110/400/900]	2047	8263	75
73	Event 3 set value (EV3) Event 3 set value (EV3) [high] ★ [FZ110/400/900]	2048	8264	76
74	Event 3 set value (EV3') [low] ★ [FZ110/400/900]	2049	8265	77
75	Event 4 set value (EV4) Event 4 set value (EV4) [high] ★ [FZ110/400/900]	204A	8266	78
76	Event 4 set value (EV4') [low] ★ [FZ110/400/900]	204B	8267	79
77	Input 1_Proportional band [heat-side] ★ [FZ110/400/900]	204C	8268	80
78	Input 1_Integral time [heat-side] ★ [FZ110/400/900]	204D	8269	81
79	Input 1_Derivative time [heat-side] ★ [FZ110/400/900]	204E	8270	82
80	Input 1_Control response parameter ★ [FZ110/400/900]	204F	8271	83
81	Input 1_Proactive intensity ★ [FZ110/400/900]	2050	8272	84
82	Input 1_Manual reset ★ [FZ110/400/900]	2051	8273	85
83	Input 1_FF amount ★ [FZ110/400/900]	2052	8274	86
84	Input 1_Output limiter high [heat-side] ★ [FZ110/400/900]	2053	8275	87
85	Input 1_Output limiter low [heat-side] ★ [FZ110/400/900]	2054	8276	88
86	Input 1_Control loop break alarm (LBA) time ★ [FZ110/400/900]	2055	8277	89

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



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
87	Input 1_LBA deadband (LBD) [FZ110/400/900] ★	2056	8278	90
88	Input 2_Proportional band [FZ400/900] ★	2057	8279	91
89	Input 2_Integral time [FZ400/900] ★	2058	8280	92
90	Input 2_Derivative time [FZ400/900] ★	2059	8281	93
91	Input 2_Control response parameter [FZ400/900] ★	205A	8282	84
92	Input 2_Proactive intensity [FZ400/900] ★	205B	8283	95
93	Input 2_Manual reset [FZ400/900] ★	205C	8284	96
94	Input 2_FF amount [FZ400/900] ★	205D	8285	97
95	Input 2_Output limiter high [FZ400/900] ★	205E	8286	98
96	Input 2_Output limiter low [FZ400/900] ★	205F	8287	99
97	Input 2_Control loop break alarm (LBA) time [FZ400/900] ★	2060	8288	100
98	Input 2_LBA deadband (LBD) [FZ400/900] ★	2061	8289	101
99	Input 1_Proportional band [cool-side] [FZ110/400/900] ★	2062	8290	102
100	Input 1_Integral time [cool-side] [FZ110/400/900] ★	2063	8291	103
101	Input 1_Derivative time [cool-side] [FZ110/400/900] ★	2064	8292	104
102	Input 1_Overlap/Deadband [FZ110/400/900] ★	2065	8293	105

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

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
103	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side] [FZ110/400/900] ★	2066	8294	106
104	Input 1_Output limiter low [cool-side] [FZ110/400/900] ★	2067	8295	107
105	Select Trigger type for Memory area transfer [FZ110/400/900] ★	2068	8296	108
106	Area soak time [FZ110/400/900] ★	2069	8297	109
107	Link area number [FZ110/400/900] ★	206A	8298	110
108	Input 1_Setting change rate limiter (up) [FZ110/400/900] ★	206B	8299	111
109	Input 1_Setting change rate limiter (down) [FZ110/400/900] ★	206C	8300	112
110	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900] ★	206D	8301	113
111	Input 1_Manipulated output value (Area) [FZ110/400/900] ★	206E	8302	114
112	Input 2_Setting change rate limiter (up) [FZ400/900] ★	206F	8303	115
113	Input 2_Setting change rate limiter (down) [FZ400/900] ★	2070	8304	116
114	Input 2_Auto/Manual transfer selection (Area) [FZ400/900] ★	2071	8305	117
115	Input 2_Manipulated output value (Area) [FZ400/900] ★	2072	8306	118
116	Remote/Local transfer selection (Area) [FZ110/400/900] ★	2073	8307	119

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



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
117	Display update cycle [FZ110/400/900]	2074	8308	120
118	Input 1_PV bias [FZ110/400/900]	2075	8309	121
119	Input 1_PV digital filter [FZ110/400/900]	2076	8310	122
120	Input 1_PV ratio [FZ110/400/900]	2077	8311	123
121	Input 1_PV low input cut-off [FZ110/400/900]	2078	8312	124
122	Input 2_PV bias (RS bias) [FZ110/400/900]	2079	8313	125
123	Input 2_PV digital filter (RS digital filter) [FZ110/400/900]	207A	8314	126
124	Input 2_PV ratio (RS ratio) [FZ110/400/900]	207B	8315	127
125	Input 2_PV low input cut-off [FZ400/900]	207C	8316	128
126	OUT1 proportional cycle time [FZ110/400/900]	207D	8317	129
127	OUT2 proportional cycle time [FZ110/400/900]	207E	8318	130
128	OUT3 proportional cycle time [FZ110/400/900]	207F	8319	131
129	OUT1 minimum ON/OFF time of proportional cycle [FZ110/400/900]	2080	8320	132
130	OUT2 minimum ON/OFF time of proportional cycle [FZ110/400/900]	2081	8321	133
131	OUT3 minimum ON/OFF time of proportional cycle [FZ110/400/900]	2082	8322	134
132	Heater break alarm 1 (HBA1) set value [FZ110/400/900]	2083	8323	135

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
133	Number of heater break alarm 1 (HBA1) delay times [FZ110/400/900]	2084	8324	136
134	Heater break alarm 2 (HBA2) set value [FZ400/900]	2085	8325	137
135	Number of heater break alarm 2 (HBA2) delay times [FZ400/900]	2086	8326	138
136	Input 1_Manual manipulated output value [FZ110/400/900]	2087	8327	139
137	Input 1_Level PID setting 1 [FZ110/400/900]	2088	8328	140
138	Input 1_Level PID setting 2 [FZ110/400/900]	2089	8329	141
139	Input 1_Level PID setting 3 [FZ110/400/900]	208A	8330	142
140	Input 1_Level PID setting 4 [FZ110/400/900]	208B	8331	143
141	Input 1_Level PID setting 5 [FZ110/400/900]	208C	8332	144
142	Input 1_Level PID setting 6 [FZ110/400/900]	208D	8333	145
143	Input 1_Level PID setting 7 [FZ110/400/900]	208E	8334	146
144	Input 1_ON/OFF action differential gap [FZ110/400/900]	208F	8335	147
145	Input 1_ON/OFF action differential gap (upper) [FZ110/400/900]	2090	8336	148
146	Input 1_ON/OFF action differential gap (lower) [FZ110/400/900]	2091	8337	149
147	Input 2_ Manual manipulated output value [FZ400/900]	2092	8338	150
148	Input 2_Level PID setting 1 [FZ400/900]	2093	8339	151



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
149	Input 2_Level PID setting 2 [FZ400/900]	2094	8340	152
150	Input 2_Level PID setting 3 [FZ400/900]	2095	8341	153
151	Input 2_Level PID setting 4 [FZ400/900]	2096	8342	154
152	Input 2_Level PID setting 5 [FZ400/900]	2097	8343	155
153	Input 2_Level PID setting 6 [FZ400/900]	2098	8344	156
154	Input 2_Level PID setting 7 [FZ400/900]	2099	8345	157
155	Input 2_ON/OFF action differential gap [FZ400/900]	209A	8346	158
156	Input 2_ON/OFF action differential gap (upper) [FZ400/900]	209B	8347	159
157	Input 2_ON/OFF action differential gap (lower) [FZ400/900]	209C	8348	160
158	Input 1_AT bias [FZ110/400/900]	209D	8349	161
159	Input 2_AT bias [FZ400/900]	209E	8350	162
160	Open/Close output neutral zone [FZ110/400/900]	209F	8351	163
161	Open/Close output differential gap [FZ110/400/900]	20A0	8352	164
162	FF amount learning [FZ110/400/900]	20A1	8353	165
163	Input 1_Determination point of external disturbance [FZ110/400/900]	20A2	8354	166
164	Input 2_Determination point of external disturbance [FZ400/900]	20A3	8355	167

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
165	Cascade_Proportional band (master-side) [FZ400/900]	20A4	8356	168
166	Cascade_Integral time (master-side) [FZ400/900]	20A5	8357	169
167	Cascade_Derivative time (master-side) [FZ400/900]	20A6	8358	170
168	Cascade_Proportional band (slave-side) [FZ400/900]	20A7	8359	171
169	Cascade_Integral time (slave-side) [FZ400/900]	20A8	8360	172
170	Cascade_Derivative time (slave-side) [FZ400/900]	20A9	8361	173
171	Cascade_Digital filter [FZ400/900]	20AA	8362	174
172	Cascade_Scale high [FZ400/900]	20AB	8363	175
173	Cascade_Scale low [FZ400/900]	20AC	8364	176
174	PV select transfer level [FZ400/900]	20AD	8365	177
175	PV select transfer time [FZ400/900]	20AE	8366	178

Items 176 to 371 are data in the Engineering mode.

WARNING

Communication data the Engineering mode should be set according to the application before setting any parameter related to operation. Once the communication data in the Engineering mode are set correctly, no further changes need to be made to parameters for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Engineering mode.



NOTE

Parameters in Engineering mode are settable only when the controller is in STOP mode. However, only checking can be made even in the RUN state.

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
176	STOP display selection [FZ110/400/900]	20AF	8367	180
177	ALM lamp lighting condition [FZ110/400/900]	20B0	8368	181
178	PV flashing display at input error [FZ110/400/900]	20B1	8369	182
179	Show/Hide Input 1_SV [FZ110/400/900]	20B2	8370	183
180	Show/Hide Input 2_SV [FZ400/900]	20B3	8371	184
181	Show/Hide Input 1_MV [FZ400/900]	20B4	8372	185
182	Show/Hide Input 2_MV [FZ400/900]	20B5	8373	186
183	Select hide items in Monitor mode [FZ110/400/900]	20B6	8374	187
184	Select hide items in Operation transfer mode [FZ110/400/900]	20B7	8375	188

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
185	Data registration [FZ110/400/900]	20B8	8376	189
186	FUNC key assignment [FZ400/900]	20B9	8377	190
187	FUNC key operation selection [FZ400/900]	20BA	8378	191
188	Input 1_Input type [FZ110/400/900]	20BB	8379	192
189	Input 1_Display unit [FZ110/400/900]	20BC	8380	193
190	Input 1_Decimal point position [FZ110/400/900]	20BD	8381	194
191	Input 1_Input range high [FZ110/400/900]	20BE	8382	195
192	Input 1_Input range low [FZ110/400/900]	20BF	8383	196
193	Input 1_Input error determination point (high) [FZ110/400/900]	20C0	8384	197



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
194	Input 1_Input error determination point (low) [FZ110/400/900]	20C1	8385	198
195	Input 1_Temperature compensation calculation [FZ110/400/900]	20C2	8386	199
196	Input 1_Burnout direction [FZ110/400/900]	20C3	8387	200
197	Input 1_Square root extraction [FZ110/400/900]	20C4	8388	201
198	Input 1_Inverting input [FZ110/400/900]	20C5	8389	202
199	Input data type [FZ110/400/900]	20C6	8390	203
200	Input 2_Input type [FZ110/400/900]	20C7	8391	204
201	Input 2_Display unit [FZ400/900]	20C8	8392	205
202	Input 2_Decimal point position [FZ400/900]	20C9	8393	206
203	Input 2_Input range high [FZ110/400/900]	20CA	8394	207
204	Input 2_Input range low [FZ110/400/900]	20CB	8395	208
205	Input 2_Input error determination point (high) [FZ400/900]	20CC	8396	209
206	Input 2_Input error determination point (low) [FZ400/900]	20CD	8397	210
207	Input 2_Temperature compensation calculation [FZ400/900]	20CE	8398	211
208	Input 2_Burnout direction [FZ400/900]	20CF	8399	212
209	Input 2_Square root extraction [FZ400/900]	20D0	8400	213

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
210	Input 2_Inverting input [FZ400/900]	20D1	8401	214
211	DI1 function selection [FZ110/400/900]	20D2	8402	215
212	DI2 function selection [FZ110/400/900]	20D3	8403	216
213	DI3 function selection [FZ110/400/900]	20D4	8404	217
214	DI4 function selection [FZ400/900]	20D5	8405	218
215	DI5 function selection [FZ400/900]	20D6	8406	219
216	DI6 function selection [FZ400/900]	20D7	8407	220
217	DI logic invert [FZ110/400/900]	20D8	8408	221
218	Area switching time (Without area set signal) [FZ110/400/900]	20D9	8409	222
219	OUT1 function selection [FZ110/400/900]	20DA	8410	223
220	OUT2 function selection [FZ110/400/900]	20DB	8411	224
221	OUT3 function selection [FZ110/400/900]	20DC	8412	225
222	OUT1 logic calculation selection [FZ110/400/900]	20DD	8413	226
223	OUT2 logic calculation selection [FZ110/400/900]	20DE	8414	227
224	OUT3 logic calculation selection [FZ110/400/900]	20DF	8415	228
225	Energized/De-energized selection [FZ110/400/900]	20E0	8416	229



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
226	Interlock selection [FZ110/400/900]	20E1	8417	230
227	Output action at control stop [FZ110/400/900]	20E2	8418	231
228	Universal output type selection (OUT3) [FZ110/400/900]	20E3	8419	232
229	Retransmission output 1 type [FZ110/400/900]	20E4	8420	233
230	Retransmission output 1 scale high [FZ110/400/900]	20E5	8421	234
231	Retransmission output 1 scale low [FZ110/400/900]	20E6	8422	235
232	Retransmission output 2 type [FZ110/400/900]	20E7	8423	236
233	Retransmission output 2 scale high [FZ110/400/900]	20E8	8424	237
234	Retransmission output 2 scale low [FZ110/400/900]	20E9	8425	238
235	Retransmission output 3 type [FZ110/400/900]	20EA	8426	239
236	Retransmission output 3 scale high [FZ110/400/900]	20EB	8427	240
237	Retransmission output 3 scale low [FZ110/400/900]	20EC	8428	241
238	DO1 function selection [FZ110/400/900]	20ED	8429	242
239	DO2 function selection [FZ110/400/900]	20EE	8430	243
240	DO3 function selection [FZ400/900]	20EF	8431	244
241	DO4 function selection [FZ400/900]	20F0	8432	245

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
242	DO1 logic calculation selection [FZ110/400/900]	20F1	8433	246
243	DO2 logic calculation selection [FZ110/400/900]	20F2	8434	247
244	DO3 logic calculation selection [FZ400/900]	20F3	8435	248
245	DO4 logic calculation selection [FZ400/900]	20F4	8436	249
246	Event 1 assignment [FZ400/900]	20F5	8437	250
247	Event 1 type [FZ110/400/900]	20F6	8438	251
248	Event 1 hold action [FZ110/400/900]	20F7	8439	252
249	Event 1 differential gap [FZ110/400/900]	20F8	8440	253
250	Event 1 timer [FZ110/400/900]	20F9	8441	254
251	Event 2 assignment [FZ400/900]	20FA	8442	255
252	Event 2 type [FZ110/400/900]	20FB	8443	256
253	Event 2 hold action [FZ110/400/900]	20FC	8444	257
254	Event 2 differential gap [FZ110/400/900]	20FD	8445	258
255	Event 2 timer [FZ110/400/900]	20FE	8446	259
256	Event 3 assignment [FZ400/900]	20FF	8447	260
257	Event 3 type [FZ110/400/900]	2100	8448	261



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
258	Event 3 hold action [FZ110/400/900]	2101	8449	262
259	Event 3 differential gap [FZ110/400/900]	2102	8450	263
260	Event 3 timer [FZ110/400/900]	2103	8451	264
261	Event 4 assignment [FZ400/900]	2104	8452	265
262	Event 4 type [FZ110/400/900]	2105	8453	266
263	Event 4 hold action [FZ110/400/900]	2106	8454	267
264	Event 4 differential gap [FZ110/400/900]	2107	8455	268
265	Event 4 timer [FZ110/400/900]	2108	8456	269
266	CT1 assignment [FZ110/400/900]	2109	8457	270
267	CT1 assignment [FZ110/400/900]	210A	8458	271
268	CT1 ratio [FZ110/400/900]	210B	8459	272
269	CT1 low input cut-off [FZ110/400/900]	210C	8460	273
270	CT2 assignment [FZ400/900]	210D	8461	274
271	CT2 type [FZ400/900]	210E	8462	275
272	CT2 ratio [FZ400/900]	210F	8463	276
273	CT2 low input cut-off [FZ400/900]	2110	8464	277

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
274	Hot/Cold start [FZ110/400/900]	2111	8465	278
275	Manual manipulated output value selection [FZ110/400/900]	2112	8466	279
276	SV tracking [FZ110/400/900]	2113	8467	280
277	Integral/Derivative time decimal point position [FZ110/400/900]	2114	8468	281
278	ST start condition [FZ110/400/900]	2115	8469	282
279	Input 1_Control action [FZ110/400/900]	2116	8470	283
280	Input 1_Output change rate limiter (up) [heat-side] [FZ110/400/900]	2117	8471	284
281	Input 1_Output change rate limiter (down) [heat-side] [FZ110/400/900]	2118	8472	285
282	Input 1_Action (high) input error [FZ110/400/900]	2119	8473	286
283	Input 1_Action (low) input error [FZ110/400/900]	211A	8474	287
284	Input 1_Manipulated output value at input error [FZ110/400/900]	211B	8475	288
285	Input 1_Manipulated output value at STOP [heat-side] [FZ110/400/900]	211C	8476	289
286	Input 1_Start determination point [FZ110/400/900]	211D	8477	290
287	Input 1_Level PID action selection [FZ110/400/900]	211E	8478	291
288	Input 1_Level PID differential gap [FZ110/400/900]	211F	8479	292
289	Input 2_Control action [FZ400/900]	2120	8480	293



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
290	Input 2_Output change rate limiter (up) [FZ400/900]	2121	8481	294
291	Input 2_Output change rate limiter (down) [FZ400/900]	2122	8482	295
292	Input 2_Action (high) input error [FZ400/900]	2123	8483	296
293	Input 2_Action (low) input error [FZ400/900]	2124	8484	297
294	Input 2_Manipulated output value at input error [FZ400/900]	2125	8485	298
295	Input 2_Manipulated output value at STOP [FZ400/900]	2126	8486	299
296	Input 2_Start determination point [FZ400/900]	2127	8487	300
297	Input 2_Level PID action selection [FZ400/900]	2128	8488	301
298	Input 2_Level PID differential gap [FZ400/900]	2129	8489	302
299	Action at feedback resistance (FBR) input error [FZ110/400/900]	212A	8490	303
300	Feedback adjustment [FZ400/900]	212B	8491	304
301	Control motor time [FZ110/400/900]	212C	8492	305
302	Integrated output limiter [FZ110/400/900]	212D	8493	306
303	Valve action at STOP [FZ110/400/900]	212E	8494	307
304	Action at saturated output [FZ400/900]	212F	8495	308
305	Input 1_Output change rate limiter (up) [cool-side] [FZ110/400/900]	2130	8496	309

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
306	Input 1_Output change rate limiter (down) [cool-side] [FZ110/400/900]	2131	8497	310
307	Input 1_Manipulated output value at STOP [cool-side] [FZ110/400/900]	2132	8498	311
308	Undershoot suppression factor [FZ110/400/900]	2133	8499	312
309	Overlap/Deadband reference point [FZ110/400/900]	2134	8500	313
310	Bottom suppression function [FZ110/400/900]	2135	8501	314
311	Select function for input 2 [FZ110/400/900]	2136	8502	315
312	Cascade_AT mode (master-side) [FZ400/900]	2137	8503	316
313	Cascade_AT mode (slave-side) [FZ400/900]	2138	8504	317
314	Selection of PV select trigger [FZ400/900]	2139	8505	318
315	Input circuit error alarm set value [FZ400/900]	213A	8506	319
316	Communication protocol [FZ110/400/900]	213B	8507	320
317	Device address [FZ110/400/900]	213C	8508	321
318	Communication speed [FZ110/400/900]	213D	8509	322
319	Data bit configuration [FZ110/400/900]	213E	8510	323
320	Interval time [FZ110/400/900]	213F	8511	324
321	Register type [FZ110/400/900]	2140	8512	325



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
322	Register start number (High-order 4-bit) [FZ110/400/900]	2141	8513	326
323	Register start number (Low-order 16-bit) [FZ110/400/900]	2142	8514	327
324	Monitor item register bias [FZ110/400/900]	2143	8515	328
325	Setting item register bias [FZ110/400/900]	2144	8516	329
326	Instrument link recognition time [FZ110/400/900]	2145	8517	330
327	PLC response waiting time [FZ110/400/900]	2146	8518	331
328	PLC communication start time [FZ110/400/900]	2147	8519	332
329	Slave register bias [FZ110/400/900]	2148	8520	333
330	Number of recognizable devices [FZ110/400/900]	2149	8521	334
331	Station number [FZ110/400/900]	214A	8522	335
332	PC number [FZ110/400/900]	214B	8523	336
333	Monitor item selection 1 [FZ110/400/900]	214C	8524	337
334	Monitor item selection 2 [FZ110/400/900]	214D	8525	338
335	Monitor item selection 3 [FZ110/400/900]	214E	8526	339
336	Setting item selection 1 [FZ110/400/900]	214F	8527	340
337	Setting item selection 2 [FZ110/400/900]	2150	8528	341

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
338	Setting item selection 3 [FZ110/400/900]	2151	8529	342
339	Setting item selection 4 [FZ110/400/900]	2152	8530	343
340	Setting item selection 5 [FZ110/400/900]	2153	8531	344
341	Setting item selection 6 [FZ110/400/900]	2154	8532	345
342	Setting item selection 7 [FZ110/400/900]	2155	8533	346
343	Setting item selection 8 [FZ110/400/900]	2156	8534	347
344	Setting change rate limiter unit time [FZ110/400/900]	2157	8535	348
345	Soak time unit [FZ110/400/900]	2158	8536	349
346	Input 1_Setting limiter high [FZ110/400/900]	2159	8537	350
347	Input 1_Setting limiter low [FZ110/400/900]	215A	8538	351
348	Input 2_Setting limiter high [FZ400/900]	215B	8539	352
349	Input 2_Setting limiter low [FZ400/900]	215C	8540	353
350	Initialization [FZ110/400/900]	215D	8541	354
351	Set data unlock/lock transfer [FZ110/400/900]	215E	8542	355
352	Set lock level [FZ110/400/900]	215F	8543	356
353	Area lock [FZ400/900]	2160	8544	357



No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
354	Select Blind function [FZ110/400/900]	2161	8545	358
355	Parameter select direct registration [FZ110/400/900]	2162	8546	359
356	Parameter select setting 1 [FZ110/400/900]	2163	8547	360
357	Parameter select setting 2 [FZ110/400/900]	2164	8548	361
358	Parameter select setting 3 [FZ110/400/900]	2165	8549	362
359	Parameter select setting 4 [FZ110/400/900]	2166	8550	363
360	Parameter select setting 5 [FZ110/400/900]	2167	8551	364
361	Parameter select setting 6 [FZ110/400/900]	2168	8552	365
362	Parameter select setting 7 [FZ110/400/900]	2169	8553	366
363	Parameter select setting 8 [FZ110/400/900]	216A	8554	367
364	Parameter select setting 9 [FZ110/400/900]	216B	8555	368
365	Parameter select setting 10 [FZ110/400/900]	216C	8556	369
366	Parameter select setting 11 [FZ110/400/900]	216D	8557	370
367	Parameter select setting 12 [FZ110/400/900]	216E	8558	371
368	Parameter select setting 13 [FZ110/400/900]	216F	8559	372
369	Parameter select setting 14 [FZ110/400/900]	2170	8560	373

No.	Name	Register address		6.3.1 Reference No.
		HEX	DEC	
370	Parameter select setting 15 [FZ110/400/900]	2171	8561	374
371	Parameter select setting 16 [FZ110/400/900]	2172	8562	375



6.4.2 Memory area data (Direct designation method) [Modbus single word]

Register addresses 2500H to 282FH are used to check and change set values belonging to the Memory area.

For the details of attribute, data range and factory set values, refer to ■ **Memory area 1 data (P.6-76)**, **6.3.2 Memory area data (Direct designation method) [Modbus double word]**.

☞ For the Memory area, refer to the **5.9 How to Use Memory Area Data (P. 5-18)**.

■ Memory area 1 to 6 data

No.	Name	Memory area 1		Memory area 2		Memory area 3		Memory area 4		Memory area 5		Memory area 6		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
1	Input 1_Set value (SV) [FZ110/400/900]	2500	9472	2533	9523	2566	9574	2599	9625	25CC	9676	25FF	9727	1
2	Input 2_Set value (SV) [FZ400/900]	2501	9473	2534	9524	2567	9575	259A	9626	25CD	9677	2600	9728	2
3	Set value (SV) of differential temperature input [FZ400/900]	2502	9474	2535	9525	2568	9576	259B	9627	25CE	9678	2601	9729	3
4	Event 1 set value (EV1) Event 1 set value (EV1) [high] [FZ110/400/900]	2503	9475	2536	9526	2569	9577	259C	9628	25CF	9679	2602	9730	4
5	Event 1 set value (EV1') [low] [FZ110/400/900]	2504	9476	2537	9527	256A	9578	259D	9629	25D0	9680	2603	9731	5
6	Event 2 set value (EV2) Event 2 set value (EV2) [high] [FZ110/400/900]	2505	9477	2538	9528	256B	9579	259E	9630	25D1	9681	2604	9732	6
7	Event 2 set value (EV2') [low] [FZ110/400/900]	2506	9478	2539	9529	256C	9580	259F	9631	25D2	9682	2605	9733	7
8	Event 3 set value (EV3) Event 3 set value (EV3) [high] [FZ110/400/900]	2507	9479	253A	9530	256D	9581	25A0	9632	25D3	9683	2606	9734	8
9	Event 3 set value (EV3') [low] [FZ110/400/900]	2508	9480	253B	9531	256E	9582	25A1	9633	25D4	9684	2607	9735	9
10	Event 4 set value (EV4) Event 4 set value (EV4) [high] [FZ110/400/900]	2509	9481	253C	9532	256F	9583	25A2	9634	25D5	9685	2608	9736	10



No.	Name	Memory area 1		Memory area 2		Memory area 3		Memory area 4		Memory area 5		Memory area 6		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
11	Event 4 set value (EV4') [low] [FZ110/400/900]	250A	9482	253D	9533	2570	9584	25A3	9635	25D6	9686	2609	9737	11
12	Input 1_Proportional band [heat-side] [FZ110/400/900]	250B	9483	253E	9534	2571	9585	25A4	9636	25D7	9687	260A	9738	12
13	Input 1_Integral time [heat-side] [FZ110/400/900]	250C	9484	253F	9535	2572	9586	25A5	9637	25D8	9688	260B	9739	13
14	Input 1_Derivative time [heat-side] [FZ110/400/900]	250D	9485	2540	9536	2573	9587	25A6	9638	25D9	9689	260C	9740	14
15	Input 1_Control response parameter [FZ110/400/900]	250E	9486	2541	9537	2574	9588	25A7	9639	25DA	9690	260D	9741	15
16	Input 1_Proactive intensity [FZ110/400/900]	250F	9487	2542	9538	2575	9589	25A8	9640	25DB	9691	260E	9742	16
17	Input 1_Manual reset [FZ110/400/900]	2510	9488	2543	9539	2576	9590	25A9	9641	25DC	9692	260F	9743	17
18	Input 1_FF amount [FZ110/400/900]	2511	9489	2544	9540	2577	9591	25AA	9642	25DD	9693	2610	9744	18
19	Input 1_Output limiter high [heat-side] [FZ110/400/900]	2512	9490	2545	9541	2578	9592	25AB	9643	25DE	9694	2611	9745	19
20	Input 1_Output limiter low [heat-side] [FZ110/400/900]	2513	9491	2546	9542	2579	9593	25AC	9644	25DF	9695	2612	9746	20
21	Input 1_Control loop break alarm (LBA) time [FZ110/400/900]	2514	9492	2547	9543	257A	9594	25AD	9645	25E0	9696	2613	9747	21
22	Input 1_LBA deadband (LBD) [FZ110/400/900]	2515	9493	2548	9544	257B	9595	25AE	9646	25E1	9697	2614	9748	22
23	Input 2_Proportional band [FZ400/900]	2516	9494	2549	9545	257C	9596	25AF	9647	25E2	9698	2615	9749	23
24	Input 2_Integral time [FZ400/900]	2517	9495	254A	9546	257D	9597	25B0	9648	25E3	9699	2616	9750	24
25	Input 2_Derivative time [FZ400/900]	2518	9496	254B	9547	257E	9598	25B1	9649	25E4	9700	2617	9751	25



No.	Name	Memory area 1		Memory area 2		Memory area 3		Memory area 4		Memory area 5		Memory area 6		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
26	Input 2_Control response parameter [FZ400/900]	2519	9497	254C	9548	257F	9599	25B2	9650	25E5	9701	2618	9752	26
27	Input 2_Proactive intensity [FZ400/900]	251A	9498	254D	9549	2580	9600	25B3	9651	25E6	9702	2619	9753	27
28	Input 2_Manual reset [FZ400/900]	251B	9499	254E	9550	2581	9601	25B4	9652	25E7	9703	261A	9754	28
29	Input 2_FF amount [FZ400/900]	251C	9500	254F	9551	2582	9602	25B5	9653	25E8	9704	261B	9755	29
30	Input 2_Output limiter high [FZ400/900]	251D	9501	2550	9552	2583	9603	25B6	9654	25E9	9705	261C	9756	30
31	Input 2_Output limiter low [FZ400/900]	251E	9502	2551	9553	2584	9604	25B7	9655	25EA	9706	261D	9757	31
32	Input 2_Control loop break alarm (LBA) time [FZ400/900]	251F	9503	2552	9554	2585	9605	25B8	9656	25EB	9707	261E	9758	32
33	Input 2_LBA deadband (LBD) [FZ400/900]	2520	9504	2553	9555	2586	9606	25B9	9657	25EC	9708	261F	9759	33
34	Input 1_Proportional band [cool-side] [FZ110/400/900]	2521	9505	2554	9556	2587	9607	25BA	9658	25ED	9709	2620	9760	34
35	Input 1_Integral time [cool-side] [FZ110/400/900]	2522	9506	2555	9557	2588	9608	25BB	9659	25EE	9710	2621	9761	35
36	Input 1_Derivative time [cool-side] [FZ110/400/900]	2523	9507	2556	9558	2589	9609	25BC	9660	25EF	9711	2622	9762	36
37	Input 1_Overlap/Deadband [FZ110/400/900]	2524	9508	2557	9559	258A	9610	25BD	9661	25F0	9712	2623	9763	37
38	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side] [FZ110/400/900]	2525	9509	2558	9560	258B	9611	25BE	9662	25F1	9713	2624	9764	38
39	Input 1_Output limiter low [cool-side] [FZ110/400/900]	2526	9510	2559	9561	258C	9612	25BF	9663	25F2	9714	2625	9765	39
40	Select Trigger type for Memory area transfer [FZ110/400/900]	2527	9511	255A	9562	258D	9613	25C0	9664	25F3	9715	2626	9766	40



No.	Name	Memory area 1		Memory area 2		Memory area 3		Memory area 4		Memory area 5		Memory area 6		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
41	Area soak time [FZ110/400/900]	2528	9512	255B	9563	258E	9614	25C1	9665	25F4	9716	2627	9767	41
42	Link area number [FZ110/400/900]	2529	9513	255C	9564	258F	9615	25C2	9666	25F5	9717	2628	9768	42
43	Input 1_Setting change rate limiter (up) [FZ110/400/900]	252A	9514	255D	9565	2590	9616	25C3	9667	25F6	9718	2629	9769	43
44	Input 1_Setting change rate limiter (down) [FZ110/400/900]	252B	9515	255E	9566	2591	9617	25C4	9668	25F7	9719	262A	9770	44
45	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900]	252C	9516	255F	9567	2592	9618	25C5	9669	25F8	9720	262B	9771	45
46	Input 1_Manipulated output value (Area) [FZ110/400/900]	252D	9517	2560	9568	2593	9619	25C6	9670	25F9	9721	262C	9772	46
47	Input 2_Setting change rate limiter (up) [FZ400/900]	252E	9518	2561	9569	2594	9620	25C7	9671	25FA	9722	262D	9773	47
48	Input 2_Setting change rate limiter (down) [FZ400/900]	252F	9519	2562	9570	2595	9621	25C8	9672	25FB	9723	262E	9774	48
49	Input 2_Auto/Manual transfer selection (Area) [FZ400/900]	2530	9520	2563	9571	2596	9622	25C9	9673	25FC	9724	262F	9775	49
50	Input 2_Manipulated output value (Area) [FZ400/900]	2531	9521	2564	9572	2597	9623	25CA	9674	25FD	9725	2630	9776	50
51	Remote/Local transfer selection (Area) [FZ110/400/900]	2532	9522	2565	9573	2598	9624	25CB	9675	25FE	9726	2631	9777	51



■ Memory area 7 to 12 data

No.	Name	Memory area 7		Memory area 8		Memory area 9		Memory area 10		Memory area 11		Memory area 12		6.3.2 Reference No.
		Register address		Register address		Registeraddress		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
1	Input 1_Set value (SV) [FZ110/400/900]	2632	9778	2665	9829	2698	9880	26CB	9931	26FE	9982	2731	10033	1
2	Input 2_Set value (SV) [FZ400/900]	2633	9779	2666	9830	2699	9881	26CC	9932	26FF	9983	2732	10034	2
3	Set value (SV) of differential temperature input [FZ400/900]	2634	9780	2667	9831	269A	9882	26CD	9933	2700	9984	2733	10035	3
4	Event 1 set value (EV1) Event 1 set value (EV1) [high] [FZ110/400/900]	2635	9781	2668	9832	269B	9883	26CE	9934	2701	9985	2734	10036	4
5	Event 1 set value (EV1') [low] [FZ110/400/900]	2636	9782	2669	9833	269C	9884	26CF	9935	2702	9986	2735	10037	5
6	Event 2 set value (EV2) Event 2 set value (EV2) [high] [FZ110/400/900]	2637	9783	266A	9834	269D	9885	26D0	9936	2703	9987	2736	10038	6
7	Event 2 set value (EV2') [low] [FZ110/400/900]	2638	9784	266B	9835	269E	9886	26D1	9937	2704	9988	2737	10039	7
8	Event 3 set value (EV3) Event 3 set value (EV3) [high] [FZ110/400/900]	2639	9785	266C	9836	269F	9887	26D2	9938	2705	9989	2738	10040	8
9	Event 3 set value (EV3') [low] [FZ110/400/900]	263A	9786	266D	9837	26A0	9888	26D3	9939	2706	9990	2739	10041	9
10	Event 4 set value (EV4) Event 4 set value (EV4) [high] [FZ110/400/900]	263B	9787	266E	9838	26A1	9889	26D4	9940	2707	9991	273A	10042	10
11	Event 4 set value (EV4') [low] [FZ110/400/900]	263C	9788	266F	9839	26A2	9890	26D5	9941	2708	9992	273B	10043	11
12	Input 1_Proportional band [heat-side] [FZ110/400/900]	263D	9789	2670	9840	26A3	9891	26D6	9942	2709	9993	273C	10044	12
13	Input 1_Integral time [heat-side] [FZ110/400/900]	263E	9790	2671	9841	26A4	9892	26D7	9943	270A	9994	273D	10045	13



No.	Name	Memory area 7		Memory area 8		Memory area 9		Memory area 10		Memory area 11		Memory area 12		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
14	Input 1_Derivative time [heat-side] [FZ110/400/900]	263F	9791	2672	9842	26A5	9893	26D8	9944	270B	9995	273E	10046	14
15	Input 1_Control response parameter [FZ110/400/900]	2640	9792	2673	9843	26A6	9894	26D9	9945	270C	9996	273F	10047	15
16	Input 1_Proactive intensity [FZ110/400/900]	2641	9793	2674	9844	26A7	9895	26DA	9946	270D	9997	2740	10048	16
17	Input 1_Manual reset [FZ110/400/900]	2642	9794	2675	9845	26A8	9896	26DB	9947	270E	9998	2741	10049	17
18	Input 1_FF amount [FZ110/400/900]	2643	9795	2676	9846	26A9	9897	26DC	9948	270F	9999	2742	10050	18
19	Input 1_Output limiter high [heat-side] [FZ110/400/900]	2644	9796	2677	9847	26AA	9898	26DD	9949	2710	10000	2743	10051	19
20	Input 1_Output limiter low [heat-side] [FZ110/400/900]	2645	9797	2678	9848	26AB	9899	26DE	9950	2711	10001	2744	10052	20
21	Input 1_Control loop break alarm (LBA) time [FZ110/400/900]	2646	9798	2679	9849	26AC	9900	26DF	9951	2712	10002	2745	10053	21
22	Input 1_LBA deadband (LBD) [FZ110/400/900]	2647	9799	267A	9850	26AD	9901	26E0	9952	2713	10003	2746	10054	22
23	Input 2_Proportional band [FZ400/900]	2648	9800	267B	9851	26AE	9902	26E1	9953	2714	10004	2747	10055	23
24	Input 2_Integral time [FZ400/900]	2649	9801	267C	9852	26AF	9903	26E2	9954	2715	10005	2748	10056	24
25	Input 2_Derivative time [FZ400/900]	264A	9802	267D	9853	26B0	9904	26E3	9955	2716	10006	2749	10057	25
26	Input 2_Control response parameter [FZ400/900]	264B	9803	267E	9854	26B1	9905	26E4	9956	2717	10007	274A	10058	26
27	Input 2_Proactive intensity [FZ400/900]	264C	9804	267F	9855	26B2	9906	26E5	9957	2718	10008	274B	10059	27
28	Input 2_Manual reset [FZ400/900]	264D	9805	2680	9856	26B3	9907	26E6	9958	2719	10009	274C	10060	28



No.	Name	Memory area 7		Memory area 8		Memory area 9		Memory area 10		Memory area 11		Memory area 12		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
29	Input 2_FF amount [FZ400/900]	264E	9806	2681	9857	26B4	9908	26E7	9959	271A	10010	274D	10061	29
30	Input 2_Output limiter high [FZ400/900]	264F	9807	2682	9858	26B5	9909	26E8	9960	271B	10011	274E	10062	30
31	Input 2_Output limiter low [FZ400/900]	2650	9808	2683	9859	26B6	9910	26E9	9961	271C	10012	274F	10063	31
32	Input 2_Control loop break alarm (LBA) time [FZ400/900]	2651	9809	2684	9860	26B7	9911	26EA	9962	271D	10013	2750	10064	32
33	Input 2_LBA deadband (LBD) [FZ400/900]	2652	9810	2685	9861	26B8	9912	26EB	9963	271E	10014	2751	10065	33
34	Input 1_Proportional band [cool-side] [FZ110/400/900]	2653	9811	2686	9862	26B9	9913	26EC	9964	271F	10015	2752	10066	34
35	Input 1_Integral time [cool-side] [FZ110/400/900]	2654	9812	2687	9863	26BA	9914	26ED	9965	2720	10016	2753	10067	35
36	Input 1_Derivative time [cool-side] [FZ110/400/900]	2655	9813	2688	9864	26BB	9915	26EE	9966	2721	10017	2754	10068	36
37	Input 1_Overlap/Deadband [FZ110/400/900]	2656	9814	2689	9865	26BC	9916	26EF	9967	2722	10018	2755	10069	37
38	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side] [FZ110/400/900]	2657	9815	268A	9866	26BD	9917	26F0	9968	2723	10019	2756	10070	38
39	Input 1_Output limiter low [cool-side] [FZ110/400/900]	2658	9816	268B	9867	26BE	9918	26F1	9969	2724	10020	2757	10071	39
40	Select Trigger type for Memory area transfer [FZ110/400/900]	2659	9817	268C	9868	26BF	9919	26F2	9970	2725	10021	2758	10072	40
41	Area soak time [FZ110/400/900]	265A	9818	268D	9869	26C0	9920	26F3	9971	2726	10022	2759	10073	41
42	Link area number [FZ110/400/900]	265B	9819	268E	9870	26C1	9921	26F4	9972	2727	10023	275A	10074	42
43	Input 1_Setting change rate limiter (up) [FZ110/400/900]	265C	9820	268F	9871	26C2	9922	26F5	9973	2728	10024	275B	10075	43



No.	Name	Memory area 7		Memory area 8		Memory area 9		Memory area 10		Memory area 11		Memory area 12		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
44	Input 1_Setting change rate limiter (down) [FZ110/400/900]	265D	9821	2690	9872	26C3	9923	26F6	9974	2729	10025	275C	10076	44
45	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900]	265E	9822	2691	9873	26C4	9924	26F7	9975	272A	10026	275D	10077	45
46	Input 1_Manipulated output value (Area) [FZ110/400/900]	265F	9823	2692	9874	26C5	9925	26F8	9976	272B	10027	275E	10078	46
47	Input 2_Setting change rate limiter (up) [FZ400/900]	2660	9824	2693	9875	26C6	9926	26F9	9977	272C	10028	275F	10079	47
48	Input 2_Setting change rate limiter (down) [FZ400/900]	2661	9825	2694	9876	26C7	9927	26FA	9978	272D	10029	2760	10080	48
49	Input 2_Auto/Manual transfer selection (Area) [FZ400/900]	2662	9826	2695	9877	26C8	9928	26FB	9979	272E	10030	2761	10081	49
50	Input 2_Manipulated output value (Area) [FZ400/900]	2663	9827	2696	9878	26C9	9929	26FC	9980	272F	10031	2762	10082	50
51	Remote/Local transfer selection (Area) [FZ110/400/900]	2664	9828	2697	9879	26CA	9930	26FD	9981	2730	10032	2763	10083	51

**■ Memory area 13 to 16 data**

No.	Name	Memory area 13		Memory area 14		Memory area 15		Memory area 16		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
1	Input 1_Set value (SV) [FZ110/400/900]	2764	10084	2797	10135	27CA	10186	27FD	10237	1
2	Input 2_Set value (SV) [FZ400/900]	2765	10085	2798	10136	27CB	10187	27FE	10238	2
3	Set value (SV) of differential temperature input [FZ400/900]	2766	10086	2799	10137	27CC	10188	27FF	10239	3
4	Event 1 set value (EV1) Event 1 set value (EV1) [high] [FZ110/400/900]	2767	10087	279A	10138	27CD	10189	2800	10240	4
5	Event 1 set value (EV1') [low] [FZ110/400/900]	2768	10088	279B	10139	27CE	10190	2801	10241	5
6	Event 2 set value (EV2) Event 2 set value (EV2) [high] [FZ110/400/900]	2769	10089	279C	10140	27CF	10191	2802	10242	6
7	Event 2 set value (EV2') [low] [FZ110/400/900]	276A	10090	279D	10141	27D0	10192	2803	10243	7
8	Event 3 set value (EV3) Event 3 set value (EV3) [high] [FZ110/400/900]	276B	10091	279E	10142	27D1	10193	2804	10244	8
9	Event 3 set value (EV3') [low] [FZ110/400/900]	276C	10092	279F	10143	27D2	10194	2805	10245	9
10	Event 4 set value (EV4) Event 4 set value (EV4) [high] [FZ110/400/900]	276D	10093	27A0	10144	27D3	10195	2806	10246	10
11	Event 4 set value (EV4') [low] [FZ110/400/900]	276E	10094	27A1	10145	27D4	10196	2807	10247	11
12	Input 1_Proportional band [heat-side] [FZ110/400/900]	276F	10095	27A2	10146	27D5	10197	2808	10248	12
13	Input 1_Integral time [heat-side] [FZ110/400/900]	2770	10096	27A3	10147	27D6	10198	2809	10249	13

No.	Name	Memory area 13		Memory area 14		Memory area 15		Memory area 16		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
14	Input 1_Derivative time [heat-side] [FZ110/400/900]	2771	10097	27A4	10148	27D7	10199	280A	10250	14
15	Input 1_Control response parameter [FZ110/400/900]	2772	10098	27A5	10149	27D8	10200	280B	10251	15
16	Input 1_Proactive intensity [FZ110/400/900]	2773	10099	27A6	10150	27D9	10201	280C	10252	16
17	Input 1_Manual reset [FZ110/400/900]	2774	10100	27A7	10151	27DA	10202	280D	10253	17
18	Input 1_FF amount [FZ110/400/900]	2775	10101	27A8	10152	27DB	10203	280E	10254	18
19	Input 1_Output limiter high [heat-side] [FZ110/400/900]	2776	10102	27A9	10153	27DC	10204	280F	10255	19
20	Input 1_Output limiter low [heat-side] [FZ110/400/900]	2777	10103	27AA	10154	27DD	10205	2810	10256	20
21	Input 1_Control loop break alarm (LBA) time [FZ110/400/900]	2778	10104	27AB	10155	27DE	10206	2811	10257	21
22	Input 1_LBA deadband (LBD) [FZ110/400/900]	2779	10105	27AC	10156	27DF	10207	2812	10258	22
23	Input 2_Proportional band [FZ400/900]	277A	10106	27AD	10157	27E0	10208	2813	10259	23
24	Input 2_Integral time [FZ400/900]	277B	10107	27AE	10158	27E1	10209	2814	10260	24
25	Input 2_Derivative time [FZ400/900]	277C	10108	27AF	10159	27E2	10210	2815	10261	25
26	Input 2_Control response parameter [FZ400/900]	277D	10109	27B0	10160	27E3	10211	2816	10262	26
27	Input 2_Proactive intensity [FZ400/900]	277E	10110	27B1	10161	27E4	10212	2817	10263	27
28	Input 2_Manual reset [FZ400/900]	277F	10111	27B2	10162	27E5	10213	2818	10264	28

No.	Name	Memory area 13		Memory area 14		Memory area 15		Memory area 16		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
29	Input 2_FF amount [FZ400/900]	2780	10112	27B3	10163	27E6	10214	2819	10265	29
30	Input 2_Output limiter high [FZ400/900]	2781	10113	27B4	10164	27E7	10215	281A	10266	30
31	Input 2_Output limiter low [FZ400/900]	2782	10114	27B5	10165	27E8	10216	281B	10267	31
32	Input 2_Control loop break alarm (LBA) time [FZ400/900]	2783	10115	27B6	10166	27E9	10217	281C	10268	32
33	Input 2_LBA deadband (LBD) [FZ400/900]	2784	10116	27B7	10167	27EA	10218	281D	10269	33
34	Input 1_Proportional band [cool-side] [FZ110/400/900]	2785	10117	27B8	10168	27EB	10219	281E	10270	34
35	Input 1_Integral time [cool-side] [FZ110/400/900]	2786	10118	27B9	10169	27EC	10220	281F	10271	35
36	Input 1_Derivative time [cool-side] [FZ110/400/900]	2787	10119	27BA	10170	27ED	10221	2820	10272	36
37	Input 1_Overlap/Deadband [FZ110/400/900]	2788	10120	27BB	10171	27EE	10222	2821	10273	37
38	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side] [FZ110/400/900]	2789	10121	27BC	10172	27EF	10223	2822	10274	38
39	Input 1_Output limiter low [cool-side] [FZ110/400/900]	278A	10122	27BD	10173	27F0	10224	2823	10275	39
40	Select Trigger type for Memory area transfer [FZ110/400/900]	278B	10123	27BE	10174	27F1	10225	2824	10276	40
41	Area soak time [FZ110/400/900]	278C	10124	27BF	10175	27F2	10226	2825	10277	41
42	Link area number [FZ110/400/900]	278D	10125	27C0	10176	27F3	10227	2826	10278	42
43	Input 1_Setting change rate limiter (up) [FZ110/400/900]	278E	10126	27C1	10177	27F4	10228	2827	10279	43



No.	Name	Memory area 13		Memory area 14		Memory area 15		Memory area 16		6.3.2 Reference No.
		Register address		Register address		Register address		Register address		
		HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	
44	Input 1_Setting change rate limiter (down) [FZ110/400/900]	278F	10127	27C2	10178	27F5	10229	2828	10280	44
45	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900]	2790	10128	27C3	10179	27F6	10230	2829	10281	45
46	Input 1_Manipulated output value (Area) [FZ110/400/900]	2791	10129	27C4	10180	27F7	10231	282A	10282	46
47	Input 2_Setting change rate limiter (up) [FZ400/900]	2792	10130	27C5	10181	27F8	10232	282B	10283	47
48	Input 2_Setting change rate limiter (down) [FZ400/900]	2793	10131	27C6	10182	27F9	10233	282C	10284	48
49	Input 2_Auto/Manual transfer selection (Area) [FZ400/900]	2794	10132	27C7	10183	27FA	10234	282D	10285	49
50	Input 2_Manipulated output value (Area) [FZ400/900]	2795	10133	27C8	10184	27FB	10235	282E	10286	50
51	Remote/Local transfer selection (Area) [FZ110/400/900]	2796	10134	27C9	10185	27FC	10236	282F	10287	51



6.4.3 Data mapping address [Modbus single word]

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

For FZ110/400/900 data: max. 32 (Register address setting 1 to 32)

For our FB series equivalent data: max. 16 (Register address setting 1 to 16)



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

■ Register address for data designation

No.	Name	Register address		Attribute	Data range	Factory set value
		HEX	DEC			
1	Register address setting 1 [Read/write address: 1500H]	1000	4096	R/W	Set the register address of data to be assigned to 1500H to 151FH Decimal number: -1 to 20479 (-1: Without mapping) Hexadecimal numeral: FFFFH to 4FFFH (FFFFH: Without mapping) The register addresses for data designation (1000H to 101FH) and read/write (1500H to 151FH) will be invalid (without mapping), even if set.	-1
2	Register address setting 2 [Read/write address: 1501H]	1001	4097	R/W		-1
3	Register address setting 3 [Read/write address: 1502H]	1002	4098	R/W		-1
4	Register address setting 4 [Read/write address: 1503H]	1003	4099	R/W		-1
5	Register address setting 5 [Read/write address: 1504H]	1004	4100	R/W		-1
6	Register address setting 6 [Read/write address: 1505H]	1005	4101	R/W		-1
7	Register address setting 7 [Read/write address: 1506H]	1006	4102	R/W		-1
8	Register address setting 8 [Read/write address: 1507H]	1007	4103	R/W		-1
9	Register address setting 9 [Read/write address: 1508H]	1008	4104	R/W		-1
10	Register address setting 10 [Read/write address: 1509H]	1009	4105	R/W		-1
11	Register address setting 11 [Read/write address: 150AH]	100A	4106	R/W		-1
12	Register address setting 12 [Read/write address: 150BH]	100B	4107	R/W		-1
13	Register address setting 13 [Read/write address: 150CH]	100C	4108	R/W		-1
14	Register address setting 14 [Read/write address: 150DH]	100D	4109	R/W		-1
15	Register address setting 15 [Read/write address: 150EH]	100E	4110	R/W		-1
16	Register address setting 16 [Read/write address: 150FH]	100F	4111	R/W		-1

No.	Name	Register address		Attribute	Data range	Factory set value
		HEX	DEC			
17	Register address setting 17 [Read/write address: 1510H]	1010	4112	R/W	Set the register address of data to be assigned to 1500H to 151FH Decimal number: -1 to 20479 (-1: Without mapping) Hexadecimal numeral: FFFFH to 4FFFFH (FFFFH: Without mapping) The register addresses for data designation (1000H to 101FH) and read/write (1500H to 151FH) will be invalid (without mapping), even if set.	-1
18	Register address setting 18 [Read/write address: 1511H]	1011	4113	R/W		-1
19	Register address setting 19 [Read/write address: 1512H]	1012	4114	R/W		-1
20	Register address setting 20 [Read/write address: 1513H]	1013	4115	R/W		-1
21	Register address setting 21 [Read/write address: 1514H]	1014	4116	R/W		-1
22	Register address setting 22 [Read/write address: 1515H]	1015	4117	R/W		-1
23	Register address setting 23 [Read/write address: 1516H]	1016	4118	R/W		-1
24	Register address setting 24 [Read/write address: 1517H]	1017	4119	R/W		-1
25	Register address setting 25 [Read/write address: 1518H]	1018	4120	R/W		-1
26	Register address setting 26 [Read/write address: 1519H]	1019	4121	R/W		-1
27	Register address setting 27 [Read/write address: 151AH]	101A	4122	R/W		-1
28	Register address setting 28 [Read/write address: 151BH]	101B	4123	R/W		-1
29	Register address setting 29 [Read/write address: 151CH]	101C	4124	R/W		-1
30	Register address setting 30 [Read/write address: 151DH]	101D	4125	R/W		-1
31	Register address setting 31 [Read/write address: 151EH]	101E	4126	R/W		-1
32	Register address setting 32 [Read/write address: 151FH]	101F	4127	R/W		-1



■ Register address for data read/write

No.	Name	Register address		Attribute	Data range	Factory set value
		HEX	DEC			
1	Data specified Register address setting 1 (1000H)	1500	5376	Based on the data specified at 1000H to 101FH.		
2	Data specified Register address setting 2 (1001H)	1501	5377			
3	Data specified Register address setting 3 (1002H)	1502	5378			
4	Data specified Register address setting 4 (1003H)	1503	5379			
5	Data specified Register address setting 5 (1004H)	1504	5380			
6	Data specified Register address setting 6 (1005H)	1505	5381			
7	Data specified Register address setting 7 (1006H)	1506	5382			
8	Data specified Register address setting 8 (1007H)	1507	5383			
9	Data specified Register address setting 9 (1008H)	1508	5384			
10	Data specified Register address setting 10 (1009H)	1509	5385			
11	Data specified Register address setting 11 (100AH)	150A	5386			
12	Data specified Register address setting 12 (100BH)	150B	5387			
13	Data specified Register address setting 13 (100CH)	150C	5388			
14	Data specified Register address setting 14 (100DH)	150D	5389			
15	Data specified Register address setting 15 (100EH)	150E	5390			
16	Data specified Register address setting 16 (100FH)	150F	5391			
17	Data specified Register address setting 17 (1010H)	1510	5392			
18	Data specified Register address setting 18 (1011H)	1511	5393			
19	Data specified Register address setting 19 (1012H)	1512	5394			
20	Data specified Register address setting 20 (1013H)	1513	5395			
21	Data specified Register address setting 21 (1014H)	1514	5396			
22	Data specified Register address setting 22 (1015H)	1515	5397			



No.	Name	Register address		Attribute	Data range	Factory set value
		HEX	DEC			
23	Data specified Register address setting 23 (1016H)	1516	5398	Based on the data specified at 1000H to 101FH.		
24	Data specified Register address setting 24 (1017H)	1517	5399			
25	Data specified Register address setting 25 (1018H)	1518	5400			
26	Data specified Register address setting 26 (1019H)	1519	5401			
27	Data specified Register address setting 27 (101AH)	151A	5402			
28	Data specified Register address setting 28 (101BH)	151B	5403			
29	Data specified Register address setting 29 (101CH)	151C	5404			
30	Data specified Register address setting 30 (101DH)	151D	5405			
31	Data specified Register address setting 31 (101EH)	151E	5406			
32	Data specified Register address setting 32 (101FH)	151F	5407			



6.4.4 FB series equivalent communication data [Modbus single word]

These are register addresses for our FB series equivalent data.

For attribute, data range, and factory set values, refer to **6.3.1 Communication data [RKC communication identifier/Modbus double word] (P. 6-9)**.

The “FB series equivalent communication data” means the data of our FB series controllers compatible with the data of FZ110/400/900.



When Input data type is set to “1,” the communication data will be Modbus single word (including data equivalent to our FB series).



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

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

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
1	Measured value (PV)	Input 1_Measured value (PV) [FZ110/400/900]	0000	0	1
2	Current transformer 1 (CT1) input value monitor	Current transformer 1 (CT1) input value monitor [FZ110/400/900]	0001	1	11
3	Current transformer 2 (CT2) input value monitor	Current transformer 2 (CT2) input value monitor [FZ400/900]	0002	2	12
4	Set value (SV) monitor	Input 1_Set value (SV) monitor [FZ110/400/900]	0003	3	2
5	Remote setting (RS) input value monitor	Remote setting input value monitor [FZ110/400/900]	0004	4	14
6	Burnout state monitor	Input 1_Burnout state monitor [FZ110/400/900]	0005	5	25
7	Burnout state monitor of feedback resistance input	Feedback resistance (FBR) break monitor [FZ110/400/900]	0006	6	27
8	Event 1 state monitor	Event 1 state monitor [FZ110/400/900]	0007	7	16
9	Event 2 state monitor	Event 2 state monitor [FZ110/400/900]	0008	8	17
10	Event 3 state monitor	Event 3 state monitor [FZ110/400/900]	0009	9	18



No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
11	Event 4 state monitor	Event 4 state monitor [FZ110/400/900]	000A	10	19
12	Heater break alarm 1 (HBA1) state monitor	Heater break alarm 1 (HBA1) state monitor [FZ110/400/900]	000B	11	20
13	Heater break alarm 2 (HBA2) state monitor	Heater break alarm 2 (HBA2) state monitor [FZ400/900]	000C	12	21
14	Manipulated output value (MV1) monitor [heat-side]	Input 1_Manipulated output value monitor [heat-side] [FZ110/400/900]	000D	13	8
15	Manipulated output value (MV2) monitor [cool-side]	Input 1_Manipulated output value monitor [cool-side] [FZ110/400/900]	000E	14	9
16	Error code	Error code [FZ110/400/900]	000F	15	42
17	Unused (Digital input (DI) state monitor)	Unused (No applicable models)	0010	16	—
18	Unused (Output state monitor)	Unused (No applicable models)	0011	17	—
19	Unused (Operation mode state monitor)	Unused (No applicable models)	0012	18	—
20	Memory area soak time monitor	Memory area soak time monitor [FZ110/400/900]	0013	19	13
21	Integrated operating time monitor	Integrated operating time [FZ110/400/900]	0014	20	43
22	Holding peak value ambient temperature monitor	Peak hold monitor of ambient temperature [FZ110/400/900]	0015	21	44
23	Unused (Power feed forward input value monitor)	Unused (No applicable models)	0016	22	—
24	Unused (Backup memory state monitor)	Unused (No applicable models)	0017	23	—
25	Unused	Unused	0018	24	—
26	Unused	Unused	0019	25	—
27	Unused	Unused	001A	26	—
28	Unused	Unused	001B	27	—
29	Unused	Unused	001C	28	—



No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
30	Unused	Unused	001D	29	—
31	Unused	Unused	001E	30	—
32	Unused	Unused	001F	31	—
33	PID/AT transfer	Input 1_Autotuning (AT) [FZ110/400/900]	0020	32	61
34	Auto/Manual transfer	Input 1_Auto/Manual transfer [FZ110/400/900]	0021	33	65
35	Remote/Local transfer	When Select function for input 2 is: “Remote setting input” [FZ400/900] Remote/Local transfer When Remote setting input is specified [FZ110] Remote/Local transfer When Select function for input 2 is: “Control with PV select” [FZ400/900] Input transfer of Control with PV select When Select function for input 2 is: “2-loop control/Differential temperature control” [FZ400/900] 2-loop control/Differential temperature control When Select function for input 2 is: “Cascade control” [FZ400/900] Cascade mode transfer	0022	34	67
36	RUN/STOP transfer	RUN/STOP transfer [FZ110/400/900]	0023	35	60
37	Memory area transfer	Memory area transfer [FZ110/400/900]	0024	36	56
38	Interlock release	Interlock release [FZ110/400/900]	0025	37	55
39	Event 1 set value (EV1) ★	Event 1 set value (EV1) [FZ110/400/900] ★ When Event 1 type is either high or low limit with individual setting [FZ110/400/900] Event 1 set value (EV1) [high] ★	0026	38	72

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



No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
40	Event 2 set value (EV2) ★	Event 2 set value (EV2) [FZ110/400/900] ★	0027	39	74
		When Event 2 type is either high or low limit with individual setting [FZ110/400/900]			
		Event 2 set value (EV2) [high] ★			
41	Event 3 set value (EV3) ★	Event 3 set value (EV3) [FZ110/400/900] ★	0028	40	76
		When Event 3 type is either high or low limit with individual setting [FZ110/400/900]			
		Event 3 set value (EV3) [high] ★			
42	Event 4 set value (EV4) ★	Event 4 set value (EV4) [FZ110/400/900] ★	0029	41	78
		When Event 4 type is either high or low limit with individual setting [FZ110/400/900]			
		Event 4 set value (EV4) [high] ★			
43	Control loop break alarm (LBA) time ★	Input 1_Control loop break alarm (LBA) time [FZ110/400/900] ★	002A	42	89
44	LBA deadband ★	Input 1_LBA deadband (LBD) [FZ110/400/900] ★	002B	43	90
45	Set value (SV) ★	Input 1_Set value (SV) [FZ110/400/900] ★	002C	44	69
46	Proportional band [heat-side] ★	Input 1_Proportional band [heat-side] [FZ110/400/900] ★	002D	45	80
47	Integral time [heat-side] ★	Input 1_Integral time [heat-side] [FZ110/400/900] ★	002E	46	81
48	Derivative time [heat-side] ★	Input 1_Derivative time [heat-side] [FZ110/400/900] ★	002F	47	82
49	Control response parameter ★	Input 1_Control response parameter [FZ110/400/900] ★	0030	48	83
50	Proportional band [cool-side] ★	Input 1_Proportional band [cool-side] [FZ110/400/900] ★	0031	49	102
51	Integral time [cool-side] ★	Input 1_Integral time [cool-side] [FZ110/400/900] ★	0032	50	103

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



No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
52	Derivative time [cool-side] ★	Input 1_Derivative time [cool-side] [FZ110/400/900] ★	0033	51	104
53	Overlap/Deadband ★	Input 1_Overlap/Deadband [FZ110/400/900] ★	0034	52	105
54	Manual reset ★	Input 1_Manual reset [FZ110/400/900] ★	0035	53	85
55	Setting change rate limiter (up) ★	Input 1_Setting change rate limiter (up) [FZ110/400/900] ★	0036	54	111
56	Setting change rate limiter (down) ★	Input 1_Setting change rate limiter (down) [FZ110/400/900] ★	0037	55	112
57	Area soak time ★	Area soak time [FZ110/400/900] ★	0038	56	109
58	Link area number ★	Link area number [FZ110/400/900] ★	0039	57	110
59	Heater break alarm 1 (HBA1) set value	Heater break alarm 1 (HBA1) set value [FZ110/400/900]	003A	58	135
60	Unused (Heater break determination point 1)	Unused (No applicable models)	003B	59	—
61	Unused (Heater melting determination point 1)	Unused (No applicable models)	003C	60	—
62	Heater break alarm 2 (HBA2) set value	Number of heater break alarm 2 (HBA2) delay times [FZ400/900]	003D	61	137
63	Unused (Heater break determination point 2)	Unused (No applicable models)	003E	62	—
64	Unused (Heater melting determination point 2)	Unused (No applicable models)	003F	63	—
65	PV bias	Input 1_PV bias [FZ110/400/900]	0040	64	121
66	PV digital filter	Input 1_PV digital filter [FZ110/400/900]	0041	65	122
67	PV ratio	Input 1_PV ratio [FZ110/400/900]	0042	66	120
68	PV low input cut-off	Input 1_PV low input cut-off [FZ110/400/900]	0043	67	124

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



No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
69	RS bias Cascade control: Cascade bias Ratio setting: Ratio setting bias	When Select function for input 2 is: “Remote setting input” [FZ400/900] RS bias When Remote setting input is specified [FZ110] RS bias Input 2_PV bias [FZ110/400/900] No applicable models Cascade bias Ratio setting bias	0044	68	125
70	RS digital filter Cascade control: Cascade digital filter Ratio setting: Ratio setting digital filter	When Select function for input 2 is: “Remote setting input” [FZ400/900] RS digital filter When Remote setting input is specified [FZ110] RS digital filter When Select function for input 2 is: “Cascade control” [FZ400/900] Cascade_Digital filter Input 2_PV digital filter is invalid Input 2_PV digital filter [FZ110/400/900] No applicable models Ratio setting digital filter	0045	69	126 (Cascade digital filter is 174)
71	RS ratio Cascade control: Cascade ratio Ratio setting: Ratio setting ratio	When Select function for input 2 is: “Remote setting input” [FZ400/900] RS ratio When Remote setting input is specified [FZ110] RS ratio Input 2_PV ratio [FZ110/400/900] No applicable models Cascade ratio Ratio setting ratio	0046	70	127
72	Proportional cycle time [heat-side]	OUT1 proportional cycle time [FZ110/400/900]	0047	71	129
73	Proportional cycle time [cool-side]	OUT2 proportional cycle time [FZ110/400/900]	0048	72	130
74	Manual manipulated output value	Input 1_Manual manipulated output value [FZ110/400/900]	0049	73	139

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
75	Set lock level	Set lock level [FZ110/400/900]	004A	74	356
76	STOP display	STOP display selection [FZ110/400/900]	004B	75	180
77	Unused (Bar graph display)	Unused (No applicable models)	004C	76	—
78	Unused (Bar graph display resolution)	Unused (No applicable models)	004D	77	—
79	Unused (Direct key 1)	Unused (No applicable models)	004E	78	—
80	Unused (Direct key 2)	Unused (No applicable models)	004F	79	—
81	Unused (Direct key 3)	Unused (No applicable models)	0050	80	—
82	Unused (Direct key type)	Unused (No applicable models)	0051	81	—
83	Input type	Input 1_Input type [FZ110/400/900]	0052	82	192
84	Display unit	Input 1_Display unit [FZ110/400/900]	0053	83	193
85	Decimal point position	Input 1_Decimal point position [FZ110/400/900]	0054	84	194
86	Input scale high	Input 1_Input range high [FZ110/400/900]	0055	85	195
87	Input scale low	Input 1_Input range low [FZ110/400/900]	0056	86	196
88	Input error determination point (high)	Input 1_Input error determination point (high) [FZ110/400/900]	0057	87	197
89	Input error determination point (low)	Input 1_Input error determination point (low) [FZ110/400/900]	0058	88	198
90	Burnout direction	Input 1_Burnout direction [FZ110/400/900]	0059	89	200
91	Square root extraction	Input 1_Square root extraction [FZ110/400/900]	005A	90	201
92	Unused (Power supply frequency)	Unused (No applicable models)	005B	91	—
93	Unused (Sampling cycle)	Unused (No applicable models)	005C	92	—

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
94	Unused (Remote setting input type)	Unused (No applicable models)	005D	93	—
95	Unused (Digital input (DI) assignment)	Unused (No applicable models)	005E	94	—
96	Unused (Output assignment)	Unused (No applicable models)	005F	95	—
97	Unused (Timer 1)	Unused (No applicable models)	0060	96	—
98	Unused (Timer 2)	Unused (No applicable models)	0061	97	—
99	Unused (Timer 3)	Unused (No applicable models)	0062	98	—
100	Unused (Timer 4)	Unused (No applicable models)	0063	99	—
101	Energized/De-energized	Energized/De-energized selection [FZ110/400/900]	0064	100	229
102	Alarm (ALM) lamp lighting condition 1	ALM lamp lighting condition [FZ110/400/900]	0065	101	181
103	Unused (Alarm (ALM) lamp lighting condition 2)	Unused (No applicable models)	0066	102	—
104	Output status at STOP mode	Output action at control stop [FZ110/400/900]	0067	103	231
105	Unused	Unused	0068	104	—
106	Unused	Unused	0069	105	—
107	Unused	Unused	006A	106	—
108	Unused	Unused	006B	107	—
109	Unused	Unused	006C	108	—
110	Unused	Unused	006D	109	—
111	Transmission output type	Retransmission output 1 type [FZ110/400/900]	006E	110	233
112	Transmission output scale high	Retransmission output 1 scale high [FZ110/400/900]	006F	111	234
113	Transmission output scale low	Retransmission output 1 scale low [FZ110/400/900]	0070	112	235



No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
114	Event 1 type	Event 1 type [FZ110/400/900]	0071	113	251
115	Event 1 hold action	Event 1 hold action [FZ110/400/900]	0072	114	252
116	Unused (Event 1 interlock)	Unused (No applicable models)	0073	115	—
117	Event 1 differential gap	Event 1 differential gap [FZ110/400/900]	0074	116	253
118	Event 1 differential gap	Event 1 timer [FZ110/400/900]	0075	117	254
119	Unused (Force ON of Event 1 action)	Unused (No applicable models)	0076	118	—
120	Event 2 type	Event 2 type [FZ110/400/900]	0077	119	256
121	Event 2 hold action	Event 2 hold action [FZ110/400/900]	0078	120	257
122	Unused (Event 2 interlock)	Unused (No applicable models)	0079	121	—
123	Event 2 differential gap	Event 2 differential gap [FZ110/400/900]	007A	122	258
124	Event 2 delay timer	Event 2 timer [FZ110/400/900]	007B	123	259
125	Unused (Force ON of Event 2 action)	Unused (No applicable models)	007C	124	—
126	Event 3 type	Event 3 type [FZ110/400/900]	007D	125	261
127	Event 3 hold action	Event 3 hold action [FZ110/400/900]	007E	126	262
128	Unused (Event 3 interlock)	Unused (No applicable models)	007F	127	—
129	Event 3 differential gap	Event 3 differential gap [FZ110/400/900]	0080	128	263
130	Event 3 delay timer	Event 3 timer [FZ110/400/900]	0081	129	264
131	Unused (Force ON of Event 3 action)	Unused (No applicable models)	0082	130	—



No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
132	Event 4 type	Event 4 type [FZ110/400/900]	0083	131	266
133	Event 4 hold action	Event 4 hold action [FZ110/400/900]	0084	132	267
134	Unused (Event 4 interlock)	Unused (No applicable models)	0085	133	—
135	Event 4 differential gap	Event 4 differential gap [FZ110/400/900]	0086	134	268
136	Event 4 delay timer	Event 4 timer [FZ110/400/900]	0087	135	269
137	Unused (Force ON of Event 4 action)	Unused (No applicable models)	0088	136	—
138	CT1 ratio	CT1 ratio [FZ110/400/900]	0089	137	272
139	CT1 assignment	CT1 assignment [FZ110/400/900]	008A	138	270
140	Unused (Heater break alarm 1 (HBA1) type)	Unused (No applicable models)	008B	139	—
141	Number of heater break alarm 1 (HBA1) delay times	Number of heater break alarm 1 (HBA1) delay times [FZ110/400/900]	008C	140	136
142	CT2 ratio	CT2 ratio [FZ400/900]	008D	141	276
143	CT2 assignment	CT2 assignment [FZ400/900]	008E	142	274
144	Unused (Heater break alarm 2 (HBA2) type)	Unused (No applicable models)	008F	143	—
145	Number of heater break alarm 2 (HBA2) delay times	Number of heater break alarm 2 (HBA2) delay times [FZ400/900]	0090	144	138
146	Hot/Cold start	Hot/Cold start [FZ110/400/900]	0091	145	278
147	Start determination point	Input 1_Start determination point [FZ110/400/900]	0092	146	290
148	External input type	Select function for input 2 [FZ110/400/900]	0093	147	315
149	Unused (Master channel selection)	Unused (No applicable models)	0094	148	—

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
150	SV tracking	SV tracking [FZ110/400/900]	0095	149	280
151	MV transfer function [Action taken when changed to Manual mode from Auto mode]	Manual manipulated output value selection [FZ110/400/900]	0096	150	279
152	Control action	Input 1_Control action [FZ110/400/900]	0097	151	283
153	Integral/derivative time decimal point position	Integral/Derivative time decimal point position [FZ110/400/900]	0098	152	281
154	Unused (Derivative action)	Unused (No applicable models)	0099	153	—
155	Undershoot suppression factor	Undershoot suppression factor [FZ110/400/900]	009A	154	312
156	Unused (Derivative gain)	Unused (No applicable models)	009B	155	—
157	ON/OFF action differential gap (upper)	Input 1_ON/OFF action differential gap (upper) [FZ110/400/900]	009C	156	148
158	ON/OFF action differential gap (lower)	Input 1_ON/OFF action differential gap (lower) [FZ110/400/900]	009D	157	149
159	Action (high) at input error	Input 1_Action (high) input error [FZ110/400/900]	009E	158	286
160	Action (low) at input error	Input 1_Action (low) input error [FZ110/400/900]	009F	159	287
161	Manipulated output value at input error	Input 1_Manipulated output value at input error [FZ110/400/900]	00A0	160	288
162	Manipulated output value (MV1) at STOP mode	Input 1_Manipulated output value at STOP [heat-side] [FZ110/400/900]	00A1	161	289
163	Manipulated output value (MV2) at STOP mode	Input 1_Manipulated output value at STOP [cool-side] [FZ110/400/900]	00A2	162	311
164	Output change rate limiter (up) [MV1]	Input 1_Output change rate limiter (up) [heat-side] [FZ110/400/900]	00A3	163	284
165	Output change rate limiter (down) [MV1]	Input 1_Output change rate limiter (up) [heat-side] [FZ110/400/900]	00A4	164	285

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
166	Output limiter high (MV1)	Input 1_Output limiter high [heat-side] [FZ110/400/900] ★	00A5	165	87
167	Output limiter low (MV1)	Input 1_Output limiter low [heat-side] [FZ110/400/900] ★	00A6	166	88
168	Output change rate limiter (up) [MV2]	Input 1_Output change rate limiter (up) [cool-side] [FZ110/400/900]	00A7	167	309
169	Output change rate limiter (down) [MV2]	Input 1_Output change rate limiter (down) [cool-side] [FZ110/400/900]	00A8	168	310
170	Output limiter high (MV2)	Input 1_Output limiter high [cool-side] [FZ110/400/900] ★	00A9	169	106
171	Output limiter low (MV2)	Input 1_Output limiter low [cool-side] [FZ110/400/900] ★	00AA	170	107
172	Unused (Power feed forward selection)	Unused (No applicable models)	00AB	171	—
173	Unused (Power feed forward gain)	Unused (No applicable models)	00AC	172	—
174	AT bias	Input 1_AT bias [FZ110/400/900]	00AD	173	161
175	Unused (AT cycles)	Unused (No applicable models)	00AE	174	—
176	Unused (Output value with AT turned on)	Unused (No applicable models)	00AF	175	—
177	Unused (Output value with AT turned off)	Unused (No applicable models)	00B0	176	—
178	Unused (AT differential gap time)	Unused (No applicable models)	00B1	177	—
179	Unused (Proportional band adjusting factor [heat-side])	Unused (No applicable models)	00B2	178	—
180	Unused (Integral time adjusting factor [heat-side])	Unused (No applicable models)	00B3	179	—
181	Unused (Derivative time adjusting factor [heat-side])	Unused (No applicable models)	00B4	180	—
182	Unused (Proportional band adjusting factor [cool-side])	Unused (No applicable models)	00B5	181	—
183	Unused (Integral time adjusting factor [cool-side])	Unused (No applicable models)	00B6	182	—
184	Unused (Derivative time adjusting factor [cool-side])	Unused (No applicable models)	00B7	183	—
185	Unused (Proportional band limiter (high) [heat-side])	Unused (No applicable models)	00B8	184	—

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

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
186	Unused (Proportional band limiter (low) [heat-side])	Unused (No applicable models)	00B9	185	—
187	Unused (Integral time limiter (high) [heat-side])	Unused (No applicable models)	00BA	186	—
188	Unused (Integral time limiter (low) [heat-side])	Unused (No applicable models)	00BB	187	—
189	Unused (Derivative time limiter (high) [heat-side])	Unused (No applicable models)	00BC	188	—
190	Unused (Derivative time limiter (low) [heat-side])	Unused (No applicable models)	00BD	189	—
191	Unused (Proportional band limiter (high) [cool-side])	Unused (No applicable models)	00BE	190	—
192	Unused (Proportional band limiter (low) [cool-side])	Unused (No applicable models)	00BF	191	—
193	Unused (Integral time limiter (high) [cool-side])	Unused (No applicable models)	00C0	192	—
194	Unused (Integral time limiter (low) [cool-side])	Unused (No applicable models)	00C1	193	—
195	Unused (Derivative time limiter (high) [cool-side])	Unused (No applicable models)	00C2	194	—
196	Unused (Derivative time limiter (low) [cool-side])	Unused (No applicable models)	00C3	195	—
197	Open/Close output neutral zone	Open/Close output neutral zone [FZ110/400/900]	00C4	196	163
198	Open/Close output differential gap	Open/Close output differential gap [FZ110/400/900]	00C5	197	164
199	Action at feedback resistance (FBR) input error	Action at feedback resistance (FBR) input error [FZ110/400/900]	00C6	198	303
200	Feedback adjustment	Feedback adjustment [FZ400/900]	00C7	199	304
201	Control motor time	Control motor time [FZ110/400/900]	00C8	200	305
202	Integrated output limiter	Integrated output limiter [FZ110/400/900]	00C9	201	306
203	Valve action at STOP	Valve action at STOP [FZ110/400/900]	00CA	202	307
204	Startup tuning (ST)	Input 1_Startup tuning (ST) [FZ110/400/900]	00CB	203	63
205	Unused (ST proportional band adjusting factor)	Unused (No applicable models)	00CC	204	—



No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
206	Unused (ST integral time adjusting factor)	Unused (No applicable models)	00CD	205	—
207	Unused (ST derivative time adjusting factor)	Unused (No applicable models)	00CE	206	—
208	ST start condition	ST start condition [FZ110/400/900]	00CF	207	282
209	Unused (Automatic temperature rise group)	Unused (No applicable models)	00D0	208	—
210	Unused (Automatic temperature rise learning)	Unused (No applicable models)	00D1	209	—
211	Unused (Automatic temperature rise dead time)	Unused (No applicable models)	00D2	210	—
212	Unused (Automatic temperature rise gradient data)	Unused (No applicable models)	00D3	211	—
213	Unused (RUN/STOP group)	Unused (No applicable models)	00D4	212	—
214	Setting change rate limiter unit time	Setting change rate limiter unit time [FZ110/400/900]	00D5	213	348
215	Soak time unit	Soak time unit [FZ110/400/900]	00D6	214	349
216	Setting limiter high	Input 1_Setting limiter high [FZ110/400/900]	00D7	215	350
217	Setting limiter low	Input 1_Setting limiter low [FZ110/400/900]	00D8	216	351
218	Unused (PV transfer function)	Unused (No applicable models)	00D9	217	—
219	PV flashing display at input error	PV flashing display at input error [FZ110/400/900]	00DA	218	182
220	Overlap/Deadband reference point	Overlap/Deadband reference point [FZ110/400/900]	00DB	219	313
221	Action at saturated output	Action at saturated output [FZ400/900]	00DC	220	308
222	Unused	Unused	00DD	221	—
223	Unused	Unused	00DE	222	—
224	Unused	Unused	00DF	223	—
225	Control area Local/External transfer	Control area Local/External transfer [FZ110/400/900]	00E0	224	68



6.4.5 Memory area data equivalent to the FB series (Area designation method) [Modbus single word]

Register addresses 0500H to 0548H are used to check and change set values belonging to the Memory area.
For the details of attribute, data range and factory set values, refer to ■ **Memory area 1 data (P.6-76)**, **6.3.2 Memory area data (Direct designation method) [Modbus double word]**.

 For Memory area, refer to the **5.9 How to Use Memory Area Data (P. 5-18)**.

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
1	Setting memory area number Specify the Memory area No. Data range: 1 to 16 (Factory set value: 1)		0500	1280	—
2	Event 1 set value (EV1)	Event 1 set value (EV1) [FZ110/400/900]	0501	1281	4
		When Event 1 type is either high or low limit with individual setting [FZ110/400/900] Event 1 set value (EV1) [high]			
3	Event 2 set value (EV2)	Event 2 set value (EV2) [FZ110/400/900]	0502	1282	6
		When Event 2 type is either high or low limit with individual setting [FZ110/400/900] Event 2 set value (EV2) [high]			
4	Event 3 set value (EV3)	Event 3 set value (EV3) [FZ110/400/900]	0503	1283	8
		When Event 3 type is either high or low limit with individual setting [FZ110/400/900] Event 3 set value (EV3) [high]			
5	Event 4 set value (EV4)	Event 4 set value (EV4) [FZ110/400/900]	0504	1284	10
		When Event 4 type is either high or low limit with individual setting [FZ110/400/900] Event 4 set value (EV4) [high]			
6	Control loop break alarm (LBA) time	Input 1_Control loop break alarm (LBA) time [FZ110/400/900]	0505	1285	21

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
7	LBA deadband	Input 1_LBA deadband (LBD) [FZ110/400/900]	0506	1286	22
8	Set value (SV)	Input 1_Set value (SV) [FZ110/400/900]	0507	1287	1
9	Proportional band [heat-side]	Input 1_Proportional band [heat-side] [FZ110/400/900]	0508	1288	12
10	Integral time [heat-side]	Input 1_Integral time [heat-side] [FZ110/400/900]	0509	1289	13
11	Derivative time [heat-side]	Input 1_Derivative time [heat-side] [FZ110/400/900]	050A	1290	14
12	Control response parameter	Input 1_Integral time [heat-side] [FZ110/400/900]	050B	1291	15
13	Proportional band [cool-side]	Input 1_Proportional band [cool-side] [FZ110/400/900]	050C	1292	34
14	Integral time [cool-side]	Input 1_Integral time [cool-side] [FZ110/400/900]	050D	1293	35
15	Derivative time [cool-side]	Input 1_Derivative time [cool-side] [FZ110/400/900]	050E	1294	36
16	Overlap/Deadband	Input 1_Overlap/Deadband [FZ110/400/900]	050F	1295	37
17	Manual reset	Input 1_Manual reset [FZ110/400/900]	0510	1296	17
18	Setting change rate limiter (up)	Input 1_Setting change rate limiter (up) [FZ110/400/900]	0511	1297	43
19	Setting change rate limiter (down)	Input 1_Setting change rate limiter (down) [FZ110/400/900]	0512	1298	44
20	Area soak time	Area soak time [FZ110/400/900]	0513	1299	41
21	Link area number	Link area number [FZ110/400/900]	0514	1300	42
22	Unused	Unused	0515	1301	—

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
23	_____	Input 1_Set value (SV) [FZ110/400/900]	0516	1302	1
24	_____	Input 2_Set value (SV) [FZ400/900]	0517	1303	2
25	_____	Set value (SV) of differential temperature input [FZ400/900]	0518	1304	3
26	_____	Event 1 set value (EV1) Event 1 set value (EV1) [high] [FZ110/400/900]	0519	1305	4
27	_____	Event 1 set value (EV1') [low] [FZ110/400/900]	051A	1306	5
28	_____	Event 2 set value (EV2) Event 2 set value (EV2) [high] [FZ110/400/900]	051B	1307	6
29	_____	Event 2 set value (EV2') [low] [FZ110/400/900]	051C	1308	7
30	_____	Event 3 set value (EV3) Event 3 set value (EV3) [high] [FZ110/400/900]	051D	1309	8
31	_____	Event 3 set value (EV3') [low] [FZ110/400/900]	051E	1310	9
32	_____	Event 4 set value (EV4) Event 4 set value (EV4) [high] [FZ110/400/900]	051F	1311	10
33	_____	Event 4 set value (EV4') [low] [FZ110/400/900]	0520	1312	11
34	_____	Input 1_Proportional band [heat-side] [FZ110/400/900]	0521	1313	12
35	_____	Input 1_Integral time [heat-side] [FZ110/400/900]	0522	1314	13
36	_____	Input 1_Derivative time [heat-side] [FZ110/400/900]	0523	1315	14

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
37	_____	Input 1_Control response parameter [FZ110/400/900]	0524	1316	15
38	_____	Input 1_Proactive intensity [FZ110/400/900]	0525	1317	16
39	_____	Input 1_Manual reset [FZ110/400/900]	0526	1318	17
40	_____	Input 1_FF amount [FZ110/400/900]	0527	1319	18
41	_____	Input 1_Output limiter high [heat-side] [FZ110/400/900]	0528	1320	19
42	_____	Input 1_Output limiter low [heat-side] [FZ110/400/900]	0529	1321	20
43	_____	Input 1_Control loop break alarm (LBA) time [FZ110/400/900]	052A	1322	21
44	_____	Input 1_LBA deadband (LBD) [FZ110/400/900]	052B	1323	22
45	_____	Input 2_Proportional band [FZ400/900]	052C	1324	23
46	_____	Input 2_Integral time [FZ400/900]	052D	1325	24
47	_____	Input 2_Derivative time [FZ400/900]	052E	1326	25
48	_____	Input 2_Control response parameter [FZ400/900]	052F	1327	26
49	_____	Input 2_Proactive intensity [FZ400/900]	0530	1328	27
50	_____	Input 2_Manual reset [FZ400/900]	0531	1329	28
51	_____	Input 2_FF amount [FZ400/900]	0532	1330	29
52	_____	Input 2_Output limiter high [FZ400/900]	0533	1331	30



No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
53	_____	Input 2_Output limiter low [FZ400/900]	0534	1332	31
54	_____	Input 2_Control loop break alarm (LBA) time [FZ400/900]	0535	1333	32
55	_____	Input 2_LBA deadband (LBD) [FZ400/900]	0536	1334	33
56	_____	Input 1_Proportional band [cool-side] [FZ110/400/900]	0537	1335	34
57	_____	Input 1_Integral time [cool-side] [FZ110/400/900]	0538	1336	35
58	_____	Input 1_Derivative time [cool-side] [FZ110/400/900]	0539	1337	36
59	_____	Input 1_Overlap/Deadband [FZ110/400/900]	053A	1338	37
60	_____	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side] [FZ110/400/900]	053B	1339	38
61	_____	Input 1_Output limiter low [cool-side] [FZ110/400/900]	053C	1340	39
62	_____	Select Trigger type for Memory area transfer [FZ110/400/900]	053D	1341	40
63	_____	Area soak time [FZ110/400/900]	053E	1342	41
64	_____	Link area number [FZ110/400/900]	053F	1343	42
65	_____	Input 1_Setting change rate limiter (up) [FZ110/400/900]	0540	1344	43
66	_____	Input 1_Setting change rate limiter (down) [FZ110/400/900]	0541	1345	44
67	_____	Input 1_Auto/Manual transfer selection (Area) [FZ110/400/900]	0542	1346	45
68	_____	Input 1_Manipulated output value (Area) [FZ110/400/900]	0543	1347	46

No.	Name		Register address		6.3.1 Reference No.
	Data equivalent to our FB series:	Relevant data of FZ110/400/900:	HEX	DEC	
69	_____	Input 2_Setting change rate limiter (up) [FZ400/900]	0544	1348	47
70	_____	Input 2_Setting change rate limiter (down) [FZ400/900]	0545	1349	48
71	_____	Input 2_Auto/Manual transfer selection (Area) [FZ400/900]	0546	1350	49
72	_____	Input 2_Manipulated output value (Area) [FZ400/900]	0547	1351	50
73	_____	Remote/Local transfer selection (Area) [FZ110/400/900]	0548	1352	51





TROUBLE SHOOTING

7

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

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

 WARNING

- To prevent electric shock or instrument failure, always turn off the system power before replacing the instrument.
- To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.
- To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.
- To prevent electric shock or instrument failure, do not touch the inside of the instrument.
- All wiring must be performed by authorized personnel with electrical experience in this type of work.

CAUTION

All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action. The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.

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

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

7.1 RKC Communication

Problem	Possible cause	Solution
No response	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Mismatch of the setting data of communication speed and data bit configuration with those of the host computer	Confirm the settings and set them correctly
	Wrong address setting	
	Error in the data format	Re-examine the communication program
	Transmission line is not set to the receive state after data send (for RS-485)	
	Communication protocol setting is wrong	Set "0: RKC communication" at Communication protocol referring to 3.1 Setting of Communication Parameter (P. 3-2) .
EOT return	The specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it
	Error in the data format	Reexamine the communication program
NAK return	Error occurs on the line (parity bit error, framing error, etc.)	Confirm the cause of error, and solve the problem appropriately. (Confirm the transmitting data, and resend data)
	BCC error	
	The data exceeds the setting range	Confirm the setting range and transmit correct data
	The specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it

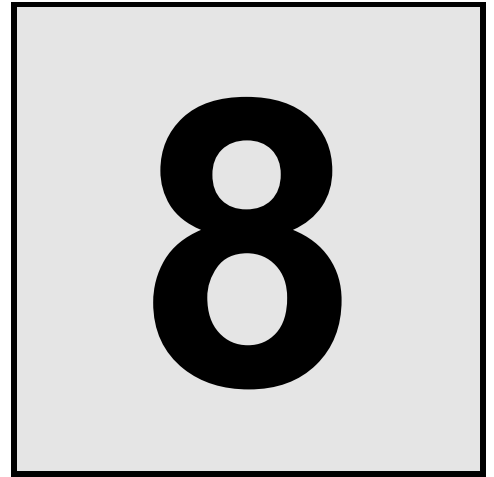


7.2 Modbus

Problem	Possible cause	Solution
No response	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Mismatch of the setting data of communication speed and data bit configuration with those of the host computer	Confirm the settings and set them correctly
	Wrong address setting	
	A transmission error (overrun error, framing error, parity error or CRC-16 error) is found in the query message	Re-transmit after time-out occurs or verify communication program
	The time interval between adjacent data in the query message is too long, exceeding 24-bit time	
	Communication protocol setting is wrong	Set “1” or “2” at Communication protocol referring to 3.1 Setting of Communication Parameter (P. 3-2) . 1: Modbus (Order of data transfer: high-order word to low-order word) 2: Modbus (Order of data a transfer: low-order word to high-order word)
Error code 1	Function code error (Specifying nonexistent function code)	Confirm the function code
Error code 2	When the mismatched address is specified.	Confirm the address of holding register
Error code 3	When the specified number of data items in the query message exceeds the maximum number of data items available	Confirm the setting data
Error code 4	Self-diagnostic error	Turn off the power to the instrument. If the same error occurs when the power is turned back on, please contact RKC sales office or the agent.



SPECIFICATIONS



This chapter describes the specification of the host communication.

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



8.1 RKC Communication

Interface:	Based on RS-485, EIA standard Based on RS-422A, EIA standard (FZ400/900 only)
Connection method:	2-wire system, half-duplex multi-drop connection
Synchronous method:	Start/Stop synchronous type
Communication speed:	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps
Protocol:	ANSI X3.28-1976 subcategories 2.5 and A4 Polling/Selecting type
Data bit configuration:	Start bit: 1 Data bit: 7 or 8 Parity bit: Without, Odd or Even Stop bit: 1 or 2
Error control:	Vertical parity (With parity bit selected) Horizontal parity (BCC check)
Communication code:	ASCII 7-bit code
Termination resistor:	Externally terminal connected ($120\ \Omega$ 1/2 W)
Xon/Xoff control:	None
Maximum connections:	Up to 31 controllers
Signal logic:	RS-485/RS-422A

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

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

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

8.2 Modbus

Interface:	Based on RS-485, EIA standard Based on RS-422A, EIA standard (FZ400/900 only)						
Connection method:	2-wire system, half-duplex multi-drop connection						
Synchronous method:	Start/Stop synchronous type						
Communication speed:	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps						
Data bit configuration:	Start bit: 1 Data bit: 8 Parity bit: Without, Odd or Even Stop bit: 1 or 2						
Protocol:	Modbus						
Signal transmission mode:	Remote Terminal Unit (RTU) mode						
Function code:	03H (Read holding registers) 06H (Preset single register) 08H (Diagnostics: loopback test) 10H (Preset multiple registers [Write multiple registers])						
Error check method:	CRC-16						
Error code:	1: Function code error 2: When the mismatched address is specified. 3: • The maximum number (Read from a read holding resistor or write to Preset multiple resistors [Write multiple registers]) has been exceeded. • The setting of the number of data (the number of requested byte) is not set to a double of the requested number of data at the time of “Preset multiple registers (Write multiple registers)” 4: Self-diagnostic error response						
Termination resistor:	Externally terminal connected (Example: 120 Ω 1/2 W)						
Maximum connections:	Up to 31 controllers						
Signal logic:	RS-485/RS-422A <table border="1"> <thead> <tr> <th>Signal logic</th><th>Logic</th></tr> </thead> <tbody> <tr> <td>$V(A) - V(B) \geq 1.5 \text{ V}$</td><td>0 (SPACE)</td></tr> <tr> <td>$V(A) - V(B) \leq -1.5 \text{ V}$</td><td>1 (MARK)</td></tr> </tbody> </table> Voltage between V (A) and V (B) is the voltage of (A) terminal for the (B) terminal.	Signal logic	Logic	$V(A) - V(B) \geq 1.5 \text{ V}$	0 (SPACE)	$V(A) - V(B) \leq -1.5 \text{ V}$	1 (MARK)
Signal logic	Logic						
$V(A) - V(B) \geq 1.5 \text{ V}$	0 (SPACE)						
$V(A) - V(B) \leq -1.5 \text{ V}$	1 (MARK)						
Maximum transmission distance:	1.2 km (This is the maximum value specified in the standard and actual value depends on the product specification.)						



8.3 Loader Communication

Protocol:	For RKC communication protocol only (ANSI X3.28-1976 subcategories 2.5 and A4)
Synchronous method:	Start/Stop synchronous type
Communication speed:	38400 bps
Data bit configuration:	Start bit: 1 Data bit: 8 Parity bit: Without Stop bit: 1 Number of communication data digits: 7(fixed)
Maximum connections:	1 point (COM-K2 only)
Connection method:	COM-K2 loader cable (W-BV-05)
Interval time:	10 ms



When the instrument is powered off, power can be supplied to the instrument from COM-K2 (or COM-K version 1). This function is exclusive for parameter setting, and the instrument functions as follows.

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



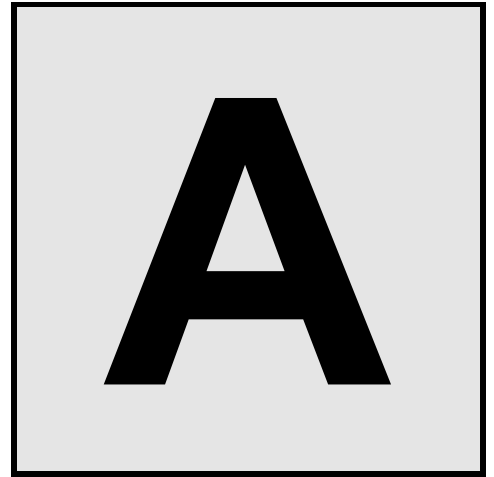
While the instrument is powered by COM-K2 (or COM-K version 1), if power is applied to the instrument, the instrument will be reset and starts for normal operation.



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



APPENDIX



A.1 ASCII 7-Bit Code Table	A-2
A.2 Communication Data Equivalent to Our REX-D Series	A-3
A.3 Communication Data Equivalent to Our REX-F400/700/900	A-4

A.1 ASCII 7-Bit Code Table

This table is only for use with RKC communication.

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

A.2 Communication Data Equivalent to Our REX-D Series

The RKC communication identifiers for the REX-D series can be used to handle the communication data of the FZ110/400/900 corresponding to the REX-D series. If there is no relevant communication data on the FZ110/400/900, dummy data is used.

To use the data equivalent to our REX-D series, you have to set “2” at Input data type (*Input*). This means RKC communication data (6 digits) equivalent to REX-D series.

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

● REX-D series equivalent communication data items not available on FZ110/400/900

REX-D series communication data name	Identifier	Digits	Attribute	Data range	Factory set value
Step set-value (SV2)	S2	6	R/W	Dummy data The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
Current transformer type selection	XR	6	R/W		0
Output limit [high-limit] (OUT2)	OI	6	R/W		0
Auto-tuning (AT) differential gap	GH	6	R/W		0
AUTO/MAN function selection	PQ	6	R/W		0
Fazzy	XP	6	R/W		0
Air cooling/ water cooling selection	XQ	6	R/W		0
Anti-reset windup (ARW)	W1	6	R/W		0



When Input data type is set to “2,” the following communication items of FZ110/400/900 will be switched to the data equivalent to the REX-D series (attribute, data range, factory set value).

Identifier	In case of Input data type 0 or 1	In case of Input data type 2
	FZ110/400/900 communication data	REX-D series communication data
M3	Current transformer 1 (CT1) input value monitor	Second current transformer input value (CT2)
M2	Feedback resistance (FBR) input value	First current transformer input value (CT1)

A.3 Communication Data Equivalent to Our REX-F400/700/900

The RKC communication identifiers for the REX-F400/700/900 can be used to handle the communication data of the FZ110/400/900 corresponding to the REX-F400/700/900. If there is no relevant communication data on the FZ110/400/900, dummy data is used.

To use the data equivalent to our REX-F400/700/900, you have to set “1” at Input data type (*Idf*). This means RKC communication data (6 digits).



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

● REX-F400/700/900 equivalent communication data items not available on FZ110/400/900

REX-F400/700/900 communication data name	Identifier	Digits	Attribute	Data range	Factory set value
Bar-graph display selection	DA	6	R/W	Dummy data The read data is “0.” When data is written, a normal response message will be returned to the all of the values, but “0” will be written.	0
Second alarm energized/ de-energized selection	NB	6	R/W		0
Local mode/computer mode identification	RA	6	RO		0
Operation execution (RUN)/STOP transfer	DH	6	R/W		0
First alarm action selection at input abnormality	OA	6	R/W		0
Second alarm action selection at input abnormality	OB	6	R/W		0



INDEX

Numbers

03H	5-8
06H	5-10
08H	5-11
10H	5-12

A

Action at feedback resistance (FBR) input error	6-65, 6-116
Action at saturated output	6-65, 6-116
Air cooling/water cooling selection	6-75
ALM lamp lighting condition	6-40, 6-112
Area lock	6-72, 6-117
Area soak time	6-28, 6-109
Area switching time (Without area set signal)	6-49, 6-113
ASCII 7-Bit Code Table	A-2
AT (Autotuning)	
Auto-tuning (AT) differential gap	6-74
Input 1_AT bias	6-37, 6-111
Input 2_AT bias	6-37, 6-111
Input 1_AT remaining time monitor	6-17, 6-107
Input 2_AT remaining time monitor	6-17, 6-107
Input 1_AT/ST status monitor	6-17, 6-107
Input 2_AT/ST status monitor	6-17, 6-107
Input 1_Autotuning (AT)	6-20, 6-108
Input 2_Autotuning (AT)	6-20, 6-108
AUTO/MAN function selection	6-74
Autotuning (AT)	
Auto-tuning (AT) differential gap	6-74
Input 1_Autotuning (AT)	6-20, 6-108
Input 2_Autotuning (AT)	6-20, 6-108
Auto/Manual transfer	
Input 1_Auto/Manual transfer	6-20, 6-108
Input 2_Auto/Manual transfer	6-20, 6-108
Input 1_Auto/Manual transfer selection (Area)	6-29, 6-109
Input 2_Auto/Manual transfer selection (Area)	6-29, 6-109
Auto-tuning (AT) differential gap	6-74

B

Bar-graph display selection	6-74
Bottom hold monitor	
Input 1_Bottom hold monitor	6-16, 6-107
Input 2_Bottom hold monitor	6-17, 6-107
Bottom suppression function	6-66, 6-116
Bottom suppression start signal	6-19, 6-107
Burnout	
Input 1_Burnout direction	6-44, 6-113
Input 1_Burnout state monitor	6-13, 6-107
Input 2_Burnout direction	6-48, 6-113
Input 2_Burnout state monitor	6-13, 6-107

C

Cascade_AT mode (master-side)	6-66, 6-116
Cascade_AT mode (slave-side)	6-66, 6-116
Cascade_Derivative time (master-side)	6-38, 6-111
Cascade_Derivative time (slave-side)	6-38, 6-111
Cascade_Digital filter	6-38, 6-111
Cascade_Integral time (master-side)	6-38, 6-111
Cascade_Integral time (slave-side)	6-38, 6-111
Cascade_Proportional band (master-side)	6-38, 6-111
Cascade_Proportional band (slave-side)	6-38, 6-111
Cascade_Scale high	6-39, 6-111
Cascade_Scale low	6-39, 6-111
Communication protocol	6-67, 6-116
Communication response monitor	3-3
Communication speed	6-67, 6-116
Communication terminal number	2-3, 2-7
Comprehensive event state	6-13, 6-106
Control action	
Input 1_Control action	6-62, 6-115
Input 2_Control action	6-64, 6-115
Control area	5-21
Control area Local/External transfer	6-21, 6-108
Control loop break alarm (LBA) time	
Input 1_Control loop break alarm (LBA) time	6-25, 6-108
Input 2_Control loop break alarm (LBA) time	6-26, 6-109
Control loop break alarm 1 (LBA1) state monitor	6-12, 6-106
Control loop break alarm 2 (LBA2) state monitor	6-12, 6-106
Control motor time	6-65, 6-116
Control response parameter	
Input 1_Control response parameter	6-25, 6-108
Input 2_Control response parameter	6-26, 6-109
CRC-16	5-5
CT (Current transformer)	
CT1 assignment	6-60, 6-115
CT1 low input cut-off	6-61, 6-115
CT1 ratio	6-61, 6-115
CT1 type	6-60, 6-115
CT2 assignment	6-61, 6-115
CT2 low input cut-off	6-61, 6-115
CT2 ratio	6-61, 6-115
CT2 type	6-61, 6-115
Current transformer 1 (CT1) input value monitor	6-10, 6-106
Current transformer 2 (CT2) input value monitor	6-10, 6-106
Current transformer type selection	6-46, 6-113

**D**

Data bit configuration	6-67, 6-116
Data mapping	5-15
Data registration	6-42, 6-112
Decimal point position	
Input 1_Decimal point position	6-43, 6-112
Input 2_Decimal point position	6-47, 6-113
Derivative time	
Input 1_Derivative time [cool-side]	6-27, 6-109
Input 1_Derivative time [heat-side]	6-24, 6-108
Input 2_Derivative time	6-26, 6-109
Determination point of external disturbance	
Input 1_Determination point of external disturbance	6-38, 6-111
Input 2_Determination point of external disturbance	6-38, 6-111
Device address	6-67, 6-116
DI logic invert	6-49, 6-113
DI state monitor	6-14, 6-107
DI1 function selection	6-48, 6-113
DI2 function selection	6-49, 6-113
DI3 function selection	6-49, 6-113
DI4 function selection	6-49, 6-113
DI5 function selection	6-49, 6-113
DI6 function selection	6-49, 6-113
Diagnostics (Loopback test) [08H]	5-11
Display unit	
Input 1_Display unit	6-43, 6-112
Input 2_Display unit	6-47, 6-113
Display update cycle	6-30, 6-110
DO state monitor	6-15, 6-107
DO1 function selection	6-56, 6-114
DO1 logic calculation selection	6-57, 6-114
DO2 function selection	6-56, 6-114
DO2 logic calculation selection	6-57, 6-114
DO3 function selection	6-56, 6-114
DO3 logic calculation selection	6-57, 6-114
DO4 function selection	6-56, 6-114
DO4 logic calculation selection	6-57, 6-114
Double word	6-3, 6-5, 6-9

E

Energized/De-energized selection	6-51, 6-113
Error code	6-17, 6-107
Event 1 assignment	6-57, 6-114
Event 1 differential gap	6-59, 6-114
Event 1 hold action	6-58, 6-114
Event 1 set value (EV1)	6-22, 6-108
Event 1 set value (EV1') [low]	6-23, 6-108
Event 1 state monitor	6-12, 6-106
Event 1 timer	6-59, 6-114
Event 1 type	6-58, 6-114
Event 1 decimal point position	6-19, 6-107
Event 2 assignment	6-59, 6-114
Event 2 differential gap	6-59, 6-114
Event 2 hold action	6-59, 6-114

Event 2 set value (EV2)	6-23, 6-108
Event 2 set value (EV2') [low]	6-23, 6-108
Event 2 state monitor	6-12, 6-106
Event 2 timer	6-59, 6-114
Event 2 type	6-59, 6-114
Event 2 decimal point position	6-19, 6-107
Event 3 assignment	6-59, 6-114
Event 3 differential gap	6-60, 6-115
Event 3 hold action	6-60, 6-115
Event 3 set value (EV3)	6-23, 6-108
Event 3 set value (EV3') [low]	6-24, 6-108
Event 3 state monitor	6-12, 6-106
Event 3 timer	6-60, 6-115
Event 3 type	6-59, 6-114
Event 3 decimal point position	6-19, 6-107
Event 4 assignment	6-60, 6-115
Event 4 differential gap	6-60, 6-115
Event 4 hold action	6-60, 6-115
Event 4 set value (EV4)	6-24, 6-108
Event 4 set value (EV4') [low]	6-24, 6-108
Event 4 state monitor	6-12, 6-106
Event 4 timer	6-60, 6-115
Event 4 type	6-60, 6-115
Event 4 decimal point position	6-19, 6-107

F

Fail-safe	3-9
Fuzzy	6-75
FB series equivalent communication	6-135
Feedback adjustment	6-65, 6-116
Feedback resistance (FBR) break monitor	6-13, 6-107
Feedback resistance (FBR) input value	6-11, 6-106
FF amount	
Input 1_FF amount	6-25, 6-108
Input 2_FF amount	6-26, 6-109
FF amount learning	6-37, 6-111
First alarm action selection at input abnormality	6-74
First current transformer input value (CT1)	6-11
For Anti-reset windup (ARW)	6-75
FUNC key assignment	6-42, 6-112
FUNC key operation selection	6-43, 6-112
Function code	5-3

H**HBA**

Heater break alarm 1 (HBA1) set value	6-33, 6-110
Heater break alarm 1 (HBA1) state monitor	6-12, 6-106
Heater break alarm 2 (HBA2) set value	6-33, 6-110
Heater break alarm 2 (HBA2) state monitor	6-12, 6-106
Number of heater break alarm 1 (HBA1) delay times	6-33, 6-110
Number of heater break alarm 2 (HBA2) delay times	6-33, 6-110

Hold reset

Input 1_Hold reset	6-19, 6-107
Input 2_Hold reset	6-19, 6-107
Hot/Cold start	6-61, 6-115

**I**

Initialization	6-71, 6-117
Input 1_Manipulated output value at STOP [cool-side]	6-65, 6-116
Input 1_Manipulated output value at STOP [heat-side]	6-63, 6-115
Input 1_Action (high) input error	6-63, 6-115
Input 1_Action (low) input error	6-63, 6-115
Input 1_AT bias	6-37, 6-111
Input 1_AT remaining time monitor	6-17, 6-107
Input 1_AT/ST status monitor	6-17, 6-107
Input 1_Auto/Manual transfer	6-20, 6-108
Input 1_Auto/Manual transfer selection (Area)	6-29, 6-109
Input 1_Autotuning (AT)	6-20, 6-108
Input 1_Bottom hold monitor	6-16, 6-107
Input 1_Burnout direction	6-44, 6-113
Input 1_Burnout state monitor	6-13, 6-107
Input 1_Control action	6-62, 6-115
Input 1_Control loop break alarm (LBA) time	6-25, 6-108
Input 1_Control response parameter	6-25, 6-108
Input 1_Decimal point position	6-43, 6-112
Input 1_Derivative time [cool-side]	6-27, 6-109
Input 1_Derivative time [heat-side]	6-24, 6-108
Input 1_Determination point of external disturbance	6-38, 6-111
Input 1_Display unit	6-43, 6-112
Input 1_FF amount	6-25, 6-108
Input 1_Hold reset	6-19, 6-107
Input 1_Input error determination point (high)	6-44, 6-112
Input 1_Input error determination point (low)	6-44, 6-113
Input 1_Input range high	6-44, 6-112
Input 1_Input range low	6-44, 6-112
Input 1_Input type	6-43, 6-112
Input 1_Integral time [cool-side]	6-27, 6-109
Input 1_Integral time [heat-side]	6-24, 6-108
Input 1_Inverting input	6-44, 6-113
Input 1_LBA deadband (LBD)	6-25, 6-109
Input 1_Level PID action selection	6-63, 6-115
Input 1_Level PID differential gap	6-63, 6-115
Input 1_Level PID setting 1	6-34, 6-110
Input 1_Level PID setting 2	6-34, 6-110
Input 1_Level PID setting 3	6-34, 6-110
Input 1_Level PID setting 4	6-34, 6-110
Input 1_Level PID setting 5	6-34, 6-110
Input 1_Level PID setting 6	6-34, 6-110
Input 1_Level PID setting 7	6-34, 6-110
Input 1_Manipulated output value (Area)	6-29, 6-109
Input 1_Manipulated output value at input error	6-63, 6-115
Input 1_Manipulated output value monitor [cool-side]	6-10, 6-106
Input 1_Manipulated output value monitor [heat-side]	6-10, 6-106
Input 1_Manual manipulated output value	6-33, 6-110
Input 1_Manual reset	6-25, 6-108
Input 1_Measured value (PV)	6-9, 6-106
Input 1_ON/OFF action differential gap	6-35, 6-110
Input 1_ON/OFF action differential gap (lower)	6-35, 6-110
Input 1_ON/OFF action differential gap (upper)	6-35, 6-110
Input 1_Output change rate limiter (down) [cool-side]	6-65, 6-116
Input 1_Output change rate limiter (down) [heat-side]	6-62, 6-115
Input 1_Output change rate limiter (up) [cool-side]	6-65, 6-116
Input 1_Output change rate limiter (up) [heat-side]	6-62, 6-115
Input 1_Output limiter high [cool-side]	6-27, 6-109
Input 1_Output limiter high [heat-side]	6-25, 6-108
Input 1_Output limiter low [cool-side]	6-28, 6-109
Input 1_Output limiter low [heat-side]	6-25, 6-27, 6-108
Input 1_Overlap/Deadband	6-27, 6-109
Input 1_Peak hold monitor	6-16, 6-107
Input 1_PID memory	6-16, 6-107
Input 1_Proactive intensity	6-25, 6-108
Input 1_Proportional band [cool-side]	6-27, 6-109
Input 1_Proportional band [heat-side]	6-24, 6-108
Input 1_PV bias	6-31, 6-110
Input 1_PV digital filter	6-31, 6-110
Input 1_PV low input cut-off	6-31, 6-110
Input 1_PV ratio	6-31, 6-110
Input 1_Set value (SV)	6-21, 6-108
Input 1_Set value (SV) monitor	6-9, 6-106
Input 1_Setting change rate limiter (down)	6-29, 6-109
Input 1_Setting change rate limiter (up)	6-29, 6-109
Input 1_Setting limiter high	6-70, 6-117
Input 1_Setting limiter low	6-70, 6-117
Input 1_Square root extraction	6-44, 6-113
Input 1_Start determination point	6-63, 6-115
Input 1_Startup tuning (ST)	6-20, 6-108
Input 1_Temperature compensation calculation	6-44, 6-113
Input 2_Manipulated output value at STOP	6-64, 6-116
Input 2_Action (high) input error	6-64, 6-116
Input 2_Action (low) input error	6-64, 6-116
Input 2_AT bias	6-37, 6-111
Input 2_AT remaining time monitor	6-17, 6-107
Input 2_AT/ST status monitor	6-17, 6-107
Input 2_Auto/Manual transfer	6-20, 6-108
Input 2_Auto/Manual transfer selection (Area)	6-29, 6-109
Input 2_Autotuning (AT)	6-20, 6-108
Input 2_Bottom hold monitor	6-17, 6-107
Input 2_Burnout direction	6-48, 6-113
Input 2_Burnout state monitor	6-13, 6-107
Input 2_Control action	6-64, 6-115
Input 2_Control loop break alarm (LBA) time	6-26, 6-109
Input 2_Control response parameter	6-26, 6-109
Input 2_Decimal point position	6-47, 6-113
Input 2_Derivative time	6-26, 6-109
Input 2_Determination point of external disturbance	6-38, 6-111
Input 2_Display unit	6-47, 6-113
Input 2_FF amount	6-26, 6-109



INDEX

Input 2_Hold reset 6-19, 6-107
 Input 2_Input error determination point (high).....6-47, 6-113
 Input 2_Input error determination point (low).....6-47, 6-113
 Input 2_Input range high.....6-47, 6-113
 Input 2_Input range low 6-47, 6-113
 Input 2_Input type 6-46, 6-113
 Input 2_Integral time 6-26, 6-109
 Input 2_Inverting input.....6-48, 6-113
 Input 2_LBA deadband (LBD).....6-26, 6-109
 Input 2_Level PID action selection.....6-65, 6-116
 Input 2_Level PID differential gap 6-65, 6-116
 Input 2_Level PID setting 1 6-36, 6-110
 Input 2_Level PID setting 2 6-36, 6-111
 Input 2_Level PID setting 3 6-36, 6-111
 Input 2_Level PID setting 4 6-36, 6-111
 Input 2_Level PID setting 5 6-36, 6-111
 Input 2_Level PID setting 6 6-36, 6-111
 Input 2_Level PID setting 7 6-36, 6-111
 Input 2_Manipulated output value.....6-35, 6-110
 Input 2_Manipulated output value (Area).....6-29, 6-109
 Input 2_Manipulated output value at input error ..6-64, 6-116
 Input 2_Manipulated output value monitor 6-10, 6-106
 Input 2_Manual reset 6-26, 6-109
 Input 2_Measured value (PV) 6-9, 6-106
 Input 2_ON/OFF action differential gap.....6-37, 6-111
 Input 2_ON/OFF action differential gap (lower).....6-37, 6-111
 Input 2_ON/OFF action differential gap (upper) ..6-37, 6-111
 Input 2_Output change rate limiter (down).....6-64, 6-116
 Input 2_Output change rate limiter (up).....6-64, 6-116
 Input 2_Output limiter high 6-26, 6-109
 Input 2_Output limiter low 6-26, 6-109
 Input 2_Peak hold monitor 6-16, 6-107
 Input 2_PID memory.....6-16, 6-107
 Input 2_Proactive intensity 6-26, 6-109
 Input 2_Proportional band.....6-25, 6-109
 Input 2_PV bias 6-31, 6-110
 Input 2_PV digital filter 6-31, 6-110
 Input 2_PV low input cut-off.....6-32, 6-110
 Input 2_PV ratio.....6-32, 6-110
 Input 2_Set value (SV) 6-21, 6-108
 Input 2_Set value (SV) monitor 6-9, 6-106
 Input 2_Setting change rate limiter (down) 6-29, 6-109
 Input 2_Setting change rate limiter (up) 6-29, 6-109
 Input 2_Setting limiter high.....6-71, 6-117
 Input 2_Setting limiter low.....6-71, 6-117
 Input 2_Square root extraction.....6-48, 6-113
 Input 2_Start determination point.....6-64, 6-116
 Input 2_Startup tuning (ST) 6-20, 6-108
 Input 2_Temperature compensation calculation..6-48, 6-113
 Input circuit error alarm set value.....6-66, 6-116
 Input data type 6-45, 6-113
 Instrument link recognition time.....6-68, 6-117
 Instrument serial number monitor 6-18, 6-107
 Integral time
 Input 1_Integral time [cool-side] 6-27, 6-109
 Input 1_Integral time [heat-side].....6-24, 6-108

Input 2_Integral time 6-26, 6-109
 Integral/Derivative time decimal point position 6-62, 6-115
 Integrated operating time 6-18, 6-107
 Integrated output limiter 6-65, 6-116
 Interlock release 6-19, 6-107
 Interlock selection 6-52, 6-114
 Interval time 6-68, 6-116
 Inverting input
 Input 1_Inverting input.....6-44, 6-113
 Input 2_Inverting input.....6-48, 6-113

L

LBA

Control loop break alarm 1 (LBA1) state monitor
 6-12, 6-106
 Control loop break alarm 2 (LBA2) state monitor
 6-12, 6-106
 Input 1_Control loop break alarm (LBA) time ...6-25, 6-108
 Input 2_Control loop break alarm (LBA) time ...6-26, 6-109
 Input 1_LBA deadband (LBD) 6-25, 6-109
 Input 2_LBA deadband (LBD) 6-26, 6-109

Level PID action selection

Input 1_Level PID action selection.....6-63, 6-115
 Input 2_Level PID action selection.....6-65, 6-116

Level PID differential gap

Input 1_Level PID differential gap.....6-63, 6-115
 Input 2_Level PID differential gap.....6-65, 6-116

Level PID setting

Input 1_Level PID setting 1 6-34, 6-110
 Input 2_Level PID setting 1 6-36, 6-110
 Input 1_Level PID setting 2 6-34, 6-110
 Input 2_Level PID setting 2 6-36, 6-111
 Input 1_Level PID setting 3 6-34, 6-110
 Input 2_Level PID setting 3 6-36, 6-111
 Input 1_Level PID setting 4 6-34, 6-110
 Input 2_Level PID setting 4 6-36, 6-111
 Input 1_Level PID setting 5 6-34, 6-110
 Input 2_Level PID setting 5 6-36, 6-111
 Input 1_Level PID setting 6 6-34, 6-110
 Input 2_Level PID setting 6 6-36, 6-111
 Input 1_Level PID setting 7 6-34, 6-110
 Input 2_Level PID setting 7 6-36, 6-111

Link area number 6-28, 6-109

Loader communication 1-3, 8-4

Local mode/computer mode identification.....6-74

M

Manipulated output value (MV)

Input 1_Manipulated output value (Area).....6-29, 6-109
 Input 2_Manipulated output value (Area).....6-29, 6-109
 Input 1_Manipulated output value monitor [cool-side]
 6-10, 6-106
 Input 1_Manipulated output value monitor [heat-side]
 6-10, 6-106
 Input 2_Manipulated output value monitor 6-10, 6-106



Manual manipulated output value
 Input 1_Manual manipulated output value 6-33, 6-110
 Input 2_Manual manipulated output value 6-35, 6-110
Manual manipulated output value selection 6-62, 6-115
Manual reset
 Input 1_Manual reset 6-25, 6-108
 Input 2_Manual reset 6-26, 6-109
Measured value (PV) of differential temperature input (PV)..
 6-10, 6-106
Measured value (PV1)
 Input 1_Measured value (PV) 6-9, 6-106
 Input 2_Measured value (PV) 6-9, 6-106
Memory area 5-18
Memory area soak time monitor 6-11, 6-106
Memory area transfer.....6-19, 6-107
Modbus.....8-3
Modbus protocol 5-1
Model code monitor 6-18, 6-107
Monitor item register bias.....6-68, 6-117
Monitor item selection 1.....6-69, 6-117
Monitor item selection 2.....6-69, 6-117
Monitor item selection 3.....6-69, 6-117
Multi-drop connection.....1-2
MV (Manipulated output value)
 Show/Hide Input 1_MV.....6-41, 6-112
 Show/Hide Input 2_MV.....6-41, 6-112

N

Number of heater break alarm 1 (HBA1) delay times
 6-33, 6-110
Number of heater break alarm 2 (HBA2) delay times
 6-33, 6-110
Number of recognizable devices 6-69, 6-117

O

Open/Close output differential gap.....6-37, 6-111
Open/Close output neutral zone 6-37, 6-111
Operation execution (RUN)/STOP transfer 6-74
OUT state monitor 6-15, 6-107
OUT1 function selection 6-50, 6-113
OUT1 logic calculation selection.....6-51, 6-113
OUT1 minimum ON/OFF time of proportional cycle.....
 6-33, 6-110
OUT1 proportional cycle time 6-32, 6-110
OUT2 function selection 6-50, 6-113
OUT2 logic calculation selection.....6-51, 6-113
OUT2 minimum ON/OFF time of proportional cycle.....
 6-33, 6-110
OUT2 proportional cycle time 6-32, 6-110
OUT3 function selection 6-50, 6-113
OUT3 logic calculation selection.....6-51, 6-113
OUT3 minimum ON/OFF time of proportional cycle.....
 6-33, 6-110
OUT3 proportional cycle time 6-32, 6-110
Output action at control stop.....6-52, 6-114
Output change rate limiter
 Input 1_Output change rate limiter (down) [cool-side]
 6-65, 6-116

 Input 1_Output change rate limiter (down) [heat-side]
 6-62, 6-115
 Input 2_Output change rate limiter (down) 6-64, 6-116
 Input 1_Output change rate limiter (up) [cool-side]
 6-65, 6-116
 Input 1_Output change rate limiter (up) [heat-side]
 Input 2_Output change rate limiter (up).....6-64, 6-116
Output limit [high-limit] (OUT2).....6-74
Output limiter
 Input 1_Output limiter high [cool-side].....6-27, 6-109
 Input 1_Output limiter high [heat-side] 6-25, 6-108
 Input 2_Output limiter high 6-26, 6-109
 Input 1_Output limiter low [cool-side] 6-28, 6-109
 Input 1_Output limiter low [heat-side] 6-25, 6-27, 6-108
 Input 2_Output limiter low 6-26, 6-109
Overall operation status.....6-16, 6-107
Overlap/Deadband
 Overlap/Deadband reference point 6-66, 6-116
 Input 1_Overlap/Deadband 6-27, 6-109

P

Parameter select direct registration.....6-72, 6-118
Parameter select setting 1 6-72, 6-118
Parameter select setting 10.....6-73, 6-118
Parameter select setting 11.....6-73, 6-118
Parameter select setting 12.....6-73, 6-118
Parameter select setting 13.....6-73, 6-118
Parameter select setting 14.....6-73, 6-118
Parameter select setting 15.....6-73, 6-118
Parameter select setting 16.....6-73, 6-118
Parameter select setting 2 6-72, 6-118
Parameter select setting 3 6-72, 6-118
Parameter select setting 4 6-72, 6-118
Parameter select setting 5 6-72, 6-118
Parameter select setting 6 6-73, 6-118
Parameter select setting 7 6-73, 6-118
Parameter select setting 8 6-73, 6-118
Parameter select setting 9 6-73, 6-118
PC number 6-69, 6-117
Peak hold monitor
 Input 1_Peak hold monitor 6-16, 6-107
 Input 2_Peak hold monitor 6-16, 6-107
 Peak hold monitor of ambient temperature 6-18, 6-107
PLC communication start time 6-68, 6-117
PLC response waiting time.....6-68, 6-117
Polling 4-2
Preset multiple registers (Write multiple registers) [10H].....
 5-12
Preset single register [06H] 5-10
Proactive intensity
 Input 1_Proactive intensity 6-25, 6-108
 Input 2_Proactive intensity 6-26, 6-109
Processing times during data send/receive.....3-8
Proportional band
 Input 1_Proportional band [cool-side] 6-27, 6-109
 Input 1_Proportional band [heat-side] 6-24, 6-108
 Input 2_Proportional band 6-25, 6-109



INDEX

Proportional cycle time	
OUT1 minimum ON/OFF time of proportional cycle	6-33, 6-110
OUT1 proportional cycle time	6-32, 6-110
OUT2 minimum ON/OFF time of proportional cycle	6-33, 6-110
OUT2 proportional cycle time	6-32, 6-110
OUT3 minimum ON/OFF time of proportional cycle	6-33, 6-110
OUT3 proportional cycle time	6-32, 6-110
PROTEM2	1-4, 2-11
PV bias	
Input 1_PV bias	6-31, 6-110
Input 2_PV bias	6-31, 6-110
PV digital filter	
Input 1_PV digital filter	6-31, 6-110
Input 2_PV digital filter	6-31, 6-110
PV flashing display at input error	6-41, 6-112
PV low input cut-off	
Input 1_PV low input cut-off	6-31, 6-110
Input 2_PV low input cut-off	6-32, 6-110
PV ratio	
Input 1_PV ratio	6-31, 6-110
Input 2_PV ratio	6-32, 6-110
PV select Measured value (PV)	6-9, 6-106
PV select transfer level	6-39, 6-111
PV select transfer time	6-39, 6-111
R	
Read holding registers [03H]	5-8
Register start number (High-order 4-bit)	6-68, 6-117
Register start number (Low-order 16-bit)	6-68, 6-117
Register type	6-68, 6-116
Remote setting input value monitor	6-11, 6-106
Remote/Local transfer	6-21, 6-108
Remote/Local transfer selection (Area)	6-30, 6-109
Retransmission output 1 scale high	6-54, 6-114
Retransmission output 1 scale low	6-55, 6-114
Retransmission output 1 type	6-53, 6-114
Retransmission output 1 decimal point position	6-18, 6-107
Retransmission output 2 scale high	6-55, 6-114
Retransmission output 2 scale low	6-55, 6-114
Retransmission output 2 type	6-55, 6-114
Retransmission output 2 decimal point position	6-18, 6-107
Retransmission output 3 scale high	6-56, 6-114
Retransmission output 3 scale low	6-56, 6-114
Retransmission output 3 type	6-55, 6-114
Retransmission output 3 decimal point position	6-18, 6-107
REX-D series	6-11, 6-46, 6-74, 6-75, 6-106, 6-113
REX-F400/700/900	6-74
RKC Communication	6-2, 6-5, 6-9, 8-2
RKC communication protocol	4-1
ROM version	6-18, 6-107
RS bias	6-31, 6-110
RS digital filter	6-31, 6-110
RS ratio	6-32, 6-110

RS-232C	2-5, 2-9
RS-422A	2-7, 2-8
RS-485	2-3, 2-4
RS-485 (2-wire system) send/receive timing	3-9
RUN/STOP transfer	6-19, 6-108

S

Second alarm action selection at input abnormality	6-74
Second alarm energized/de-energized selection	6-74
Second current transformer input value (CT2)	6-10
Select Blind function	6-72, 6-118
Select function for input 2	6-66, 6-116
Select hide items in Monitor mode	6-41, 6-112
Select hide items in Operation transfer mode	6-42, 6-112
Select Trigger type for Memory area transfer	6-28, 6-109
Selecting	4-8
Selection of PV select trigger	6-66, 6-116
Set data unlock/lock transfer	6-71, 6-117
Set lock level	6-71, 6-117
Set value (SV) monitor of differential temperature input	6-10, 6-106
Set value (SV) of differential temperature input	6-21, 6-108
Set value (SV)	
Input 1_Set value (SV)	6-21, 6-108
Input 2_Set value (SV)	6-21, 6-108
Input 1_Set value (SV) monitor	6-9, 6-106
Input 2_Set value (SV) monitor	6-9, 6-106
Setting change rate limiter	
Input 1_Setting change rate limiter (down)	6-29, 6-109
Input 1_Setting change rate limiter (up)	6-29, 6-109
Input 2_Setting change rate limiter (down)	6-29, 6-109
Input 2_Setting change rate limiter (up)	6-29, 6-109
Setting change rate limiter unit time	6-70, 6-117
Setting item register bias	6-68, 6-117
Setting item selection 1	6-69, 6-117
Setting item selection 2	6-69, 6-117
Setting item selection 3	6-69, 6-117
Setting item selection 4	6-69, 6-117
Setting item selection 5	6-69, 6-117
Setting item selection 6	6-70, 6-117
Setting item selection 7	6-70, 6-117
Setting item selection 8	6-70, 6-117
Setting limiter high	
Input 1_Setting limiter high	6-70, 6-117
Input 2_Setting limiter high	6-71, 6-117
Input 1_Setting limiter low	6-70, 6-117
Input 2_Setting limiter low	6-71, 6-117
Show/Hide Input 1_MV	6-41, 6-112
Show/Hide Input 1_SV	6-41, 6-112
Show/Hide Input 2_MV	6-41, 6-112
Show/Hide Input 2_SV	6-41, 6-112
Single word	6-4, 6-7, 6-106
Slave register bias	6-68, 6-117
Soak time unit	6-70, 6-117
Solderless terminal	2-2



Square root extraction	
Input 1_Square root extraction	6-44, 6-113
Input 2_Square root extraction	6-48, 6-113
ST start condition	6-62, 6-115
Start determination point	
Input 1_Start determination point	6-63, 6-115
Input 2_Start determination point	6-64, 6-116
Startup tuning (ST)	
Input 1_Startup tuning (ST)	6-20, 6-108
Input 2_Startup tuning (ST)	6-20, 6-108
Station number	6-69, 6-117
Step set-value (SV2)	6-11, 6-106
STOP	
Input 1_Manipulated output value at STOP [cool-side]	6-65, 6-116
Input 1_Manipulated output value at STOP [heat-side]	6-63, 6-115
Input 2_Manipulated output value at STOP	6-64, 6-116
Output action at control stop	6-52, 6-114
STOP display selection	6-40, 6-112
Valve action at STOP	6-65, 6-116
SV	
Show/Hide Input 1_SV	6-41, 6-112
Show/Hide Input 2_SV	6-41, 6-112
SV tracking	6-62, 6-115
T	
Temperature compensation calculation	
Input 1_Temperature compensation calculation	6-44, 6-113
Input 2_Temperature compensation calculation]	6-48, 6-113
U	
Undershoot suppression factor	6-66, 6-116
Universal output type selection (OUT3)	6-52, 6-114
USB	2-6, 2-10
V	
Valve action at STOP	6-65, 6-116



MEMO





RKC INSTRUMENT INC.

HEADQUARTERS: 16-6, KUGAHARA 5-CHOME, OHTA-KU TOKYO 146-8515 JAPAN

PHONE: 03-3751-9799 (+81 3 3751 9799)

FAX: 03-3751-8585 (+81 3 3751 8585)

E-mail: info@rkcinst.co.jp

Website: <http://www.rkcinst.com/>





Temperature Controller

FZ110/FZ400/FZ900

Instruction Manual
[PLC Communication]



NOTICE

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

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

- Windows is a trademark of Microsoft Corporation.
- Modbus is a registered trademark of Schneider Electric.
- The name of each programmable controller (PLC) means the products of each manufacturer.
- Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.



Safety Precautions

■ Pictorial Symbols (safety symbols)

Various pictorial symbols are used in this manual to ensure safe use of the product, to protect you and other people from harm, and to prevent damage to property. The symbols are described below.

Be sure you thoroughly understand the meaning of the symbols before reading this manual.

 **WARNING** : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

 **CAUTION** : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

 : This mark indicates that all precautions should be taken for safe usage.

WARNING

- To prevent injury to persons, damage to the instrument and equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to the instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to the 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 may occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy plant.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
 - If input/output or signal lines within the building are longer than 30 meters.
 - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock to operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- All wiring must be in accordance with local codes and regulations.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as a fuse, circuit breaker, etc.
- A malfunction in this product may occasionally make control operations impossible or prevent alarm outputs, resulting in a possible hazard. Take appropriate measures in the end use to prevent hazards in the event of malfunction.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dissipation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to the instrument display, do not rub with an abrasive material or push the front panel with a hard object.

For Proper Disposal

When disposing of each part used for this instrument, always follows the procedure for disposing of industrial wastes stipulated by the respective local community.



Symbols

■ Pictorial Symbols (safety symbols)



NOTE : This mark indicates important information on installation, handling and operating procedures.



: This mark indicates supplemental information on installation, handling and operating procedures.



: This mark indicates where additional information may be located.

■ Character Symbols

11-segment character

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

7-segment character

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



■ Abbreviation symbols

These abbreviations are used in this manual:

Abbreviation symbols	Name	Abbreviation symbols	Name
PV	Measured value	TC (input)	Thermocouple (input)
SV	Set value	RTD (input)	Resistance temperature detector (input)
MV	Manipulated output value	V (input)	Voltage (input)
AT	Autotuning	I (input)	Current (input)
ST	Startup tuning	HBA (1, 2)	Heater break alarm (1, 2)
OUT (1 to 3)	Output (1 to 3)	CT (1, 2)	Current transformer (1, 2)
DI (1 to 6)	Digital input (1 to 6)	LBA	Control loop break alarm
DO (1 to 4)	Digital output (1 to 4)	LBD	LBA deadband
FBR	Feedback resistance		



Document Configuration

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

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

http://www.rkcinst.com/english/manual_load.htm.

Manual	Manual Number	Remarks
FZ110/FZ400/FZ900 Installation Manual	IMR03A01-E□	This manual is enclosed with instrument. This manual explains the mounting and wiring.
FZ110/FZ400/FZ900 Quick Operation Manual	IMR03A02-E□	This manual is enclosed with instrument. This manual explains the basic key operation, mode menu, and data setting.
FZ110/FZ400/FZ900 Parameter List	IMR03A03-E□	This manual is enclosed with instrument. This list is a compilation of the parameter data of each mode.
FZ110/FZ400/FZ900 Instruction Manual [Part 1: Hardware]	IMR03A04-E□	This manual describes installation, wiring, troubleshooting and product specification.
FZ110/FZ400/FZ900 Instruction Manual [Part 2: Parameters/Functions]	IMR03A05-E□	Parameters: This manual describes how to switch the operation modes and parameters, the range of parameters, and initialization/automatic conversion associated with the change of settings. Functions: This manual describes how to set up and each function.
FZ110/FZ400/FZ900 Instruction Manual [Host Communication]	IMR03A07-E□	This manual explains RKC communication protocol (ANSI X3.28-1976) and Modbus relating to communication parameters setting.
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]	IMR03A08-E1	This manual you are reading now. This manual describes how to set up the instrument for communication with a programmable controller (PLC).



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



About This Manual

This manual describes how to connect the instrument to a programmable logic controller (PLC) after it has been installed and how to set up the instrument to transfer the data between the instrument and the PLC.

This manual consists of 8 chapters.

Chapter 7 describes how to make wiring between the instrument and the PLC and how to set up for the data transfer after the installation of the instrument giving an example.

In other chapters, detailed and supplementary explanations are provided.

	What do you want to do?	See the following section for more details
☐	I want to know the features of the PLC communication	1. OUTLINE
☐	I want to know the operation flow to establish PLC communication	1. OUTLINE 7. USAGE EXAMPLE
☐	I want to know the specification of the PLC communication	2. COMMUNICATION SPECIFICATIONS
☐	I want to setting the device address and the communication speed of the instrument	3. COMMUNICATION SETTING 7. USAGE EXAMPLE
☐	I want to check the communication speed and the data bit configuration of the PLC	3. COMMUNICATION SETTING
☐	I want to know how to wiring between the instrument and the PLC	4. CONNECTION TO THE PLC
☐	I want to check the PLC communication environment items	5. PLC COMMUNICATION ENVIRONMENT SETTING
☐	I want to know the communication data transfer method	6. COMMUNICATION DATA
☐	I want to know the communication data processing time	6. COMMUNICATION DATA
☐	I want to know the register address and the communication data range	6. COMMUNICATION DATA
☐	I want to reduce the amount of the communication data for the data transfer.	6. COMMUNICATION DATA
☐	I want to know what actions I should take in case of errors	8. TROUBLESHOOTING

Contents

	Page
NOTICE	
Safety Precautions	i-1
■ Pictorial Symbols (safety symbols).....	i-1
WARNING	i-1
CAUTION	i-2
For Proper Disposal.....	i-2
Symbols.....	i-3
■ Pictorial Symbols (safety symbols).....	i-3
■ Character Symbols	i-3
■ Abbreviation symbols.....	i-4
Document Configuration.....	i-5
About This Manual.....	i-6

1. OUTLINE.....1-1

Chapter 1 describes the outline of the PLC communication and the procedures for setup.

1.1 Features	1-2
1.2 Usable PLC Modules.....	1-4
1.3 Handling Procedure to Operation	1-5

2. COMMUNICATION SPECIFICATIONS.....2-1

Chapter 2 describes the specification of the PLC communication.

2.1 PLC Communication.....	2-2
2.2 Loader Communication	2-3

3. COMMUNICATION SETTING 3-1

Chapter 3 describes the communication setting of the instrument and the PLC (device address, communication speed, data bit configuration, etc).

3.1 Communication Setting of FZ	3-2
3.1.1 Contents of the communication data	3-2
■ Communication protocol selection [Engineering mode: Function block No. 60]	3-2
■ Device address [Engineering mode: Function block No. 60].....	3-3
■ Communication speed [Engineering mode: Function block No. 60].....	3-3
■ Data bit configuration [Engineering mode: Function block No. 60].....	3-4
■ Interval time [Engineering mode: Function block No. 60]	3-4
■ Decimal point position [Engineering mode: Function block No. 21, No. 22].....	3-5



	Page
■ Input range high/Input range low [Engineering mode: Function block No. 21, No. 22] ...	3-7
■ Input data type [Engineering mode: Function block No. 21]	3-9
■ Soak time unit [Engineering mode: Function block No. 70]	3-11
3.1.2 Setting via front keys	3-12
3.1.3 Setting by the loader communication	3-14
3.2 Communication Setting of PLC	3-14

4. CONNECTION TO THE PLC 4-1

Chapter 4 describes the wiring between the instrument and the PLC.

4.1 Wiring Cautions	4-2
4.2 Communication Terminal Number and Signal Details	4-4
■ Terminal configuration	4-4
■ Signal details	4-4
4.3 Wiring Method	4-5
4.3.1 Connecting through RS-485 (FZ110/400/900)	4-5
■ Connection example of FZ110 (RS-485)	4-5
■ Connection example of FZ400/900 (RS-485)	4-6
4.3.2 Connecting through RS-422A (FZ400/900)	4-8
■ Connection example of FZ400/FZ900 (RS-422A)	4-8

5. PLC COMMUNICATION ENVIRONMENT SETTING 5-1

Chapter 5 describes how to setup the PLC communication environment for data exchange between the instrument and the PLC.

5.1 Preparations of The Loader Communication	5-2
■ Communication converter	5-2
■ Communication program	5-2
■ Wiring method	5-2
5.2 PLC Communication Environment Items List	5-3
5.2.1 Setting items list	5-3
● Monitor item selection (Communication data of the monitor group)	5-8
● Setting item selection (Communication data of Setting group)	5-10
5.2.2 Explanation of PLC communication environment setting function	5-16
■ PC number	5-16
■ PLC response waiting time	5-17
■ Changing the register type	5-18
■ Register start number, Monitor item register bias, Setting item register bias	5-18
■ Monitor item selection and Setting item selection	5-19
■ Instrument link recognition time	5-20
■ Slave register bias	5-21



6. COMMUNICATION DATA 6-1

Page

Chapter 6 describes the PLC communication data.

6.1 Data Transfer.....	6-2
6.1.1 Data group.....	6-3
■ Monitor group (PLC ← FZ)	6-3
■ Request item number, and Request command (system data)	6-4
■ Instrument recognition request command (system data).....	6-11
■ Communication data that works with the Memory area.....	6-13
6.1.2 Data transfer procedures	6-16
6.1.3 Data processing precautions.....	6-20
6.1.4 Processing time of communication data	6-22
6.2 PLC Communication Data Map	6-23
6.2.1 Reference to data map.....	6-23
6.2.2 Data map list (Factory setting)	6-25
■ Common items (System data) to Double word and Single word	6-25
■ Double word items (Monitor group and Setting group).....	6-30
■ Single word items (Monitor group and Setting group)	6-37
6.2.3 Communication data set to “unused” at the factory	6-38
6.3 Example of PLC Communication Data Map Editing	6-61

7. USAGE EXAMPLE 7-1

Chapter 7 describes the operation flow from the connection to the PLC to the establishment of the communication.

7.1 Handling Procedures	7-2
7.2 System Configuration	7-3
7.3 Connection to The PLC	7-4
7.4 Setting of FZ900	7-5
7.5 Communication Setting of PLC.....	7-21
7.6 Initial Setting	7-22
7.7 Data Setting.....	7-24

8. TROUBLESHOOTING 8-1

Chapter 8 describes how to cope with errors during the communication.



MEMO



OUTLINE



1

1.1 Features.....	1-2
1.2 Usable PLC Modules	1-4
1.3 Handling Procedure to Operation.....	1-5

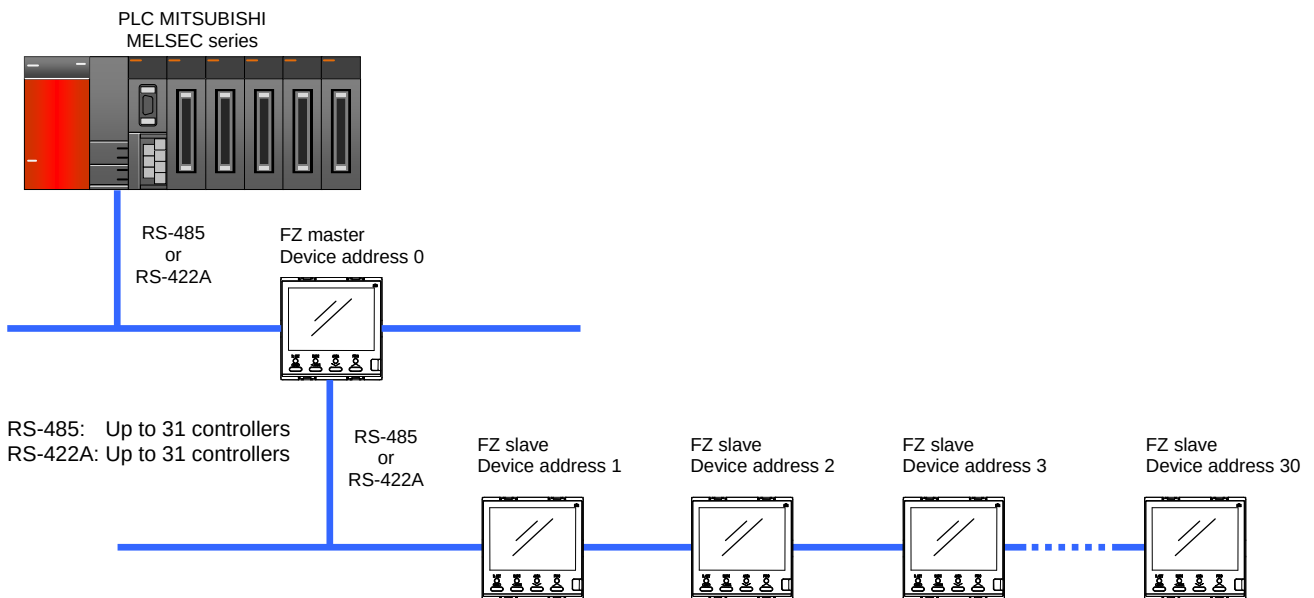
This manual describes the PLC communication.

- Refer to **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR03A07-E□)** for the Host communication (RKC communication and Modbus).
- Refer to **FZ110/FZ400/FZ900 Instruction Manual [Part1: Hardware] (IMR03A04-E□)** for wiring power supply and inputs/outputs.
- Refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)** for descriptions of communication data (parameter) and functions.

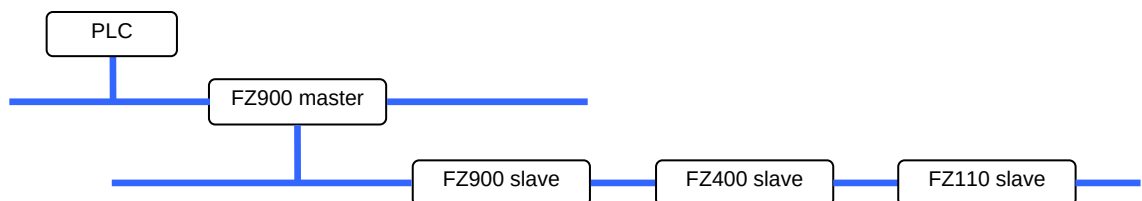
1.1 Features

The PLC communication function is used to exchange the data between a programmable logic controller (hereafter called “PLC”) and a FZ110/400/900 (hereafter called “FZ”) and to set the controller.

Up to 31 controllers can be connected to one PLC.



- The interface of FZ110 corresponds to the RS-485.
- Different types of the FZ can be used in the same network as shown below.



■ Program free connection to a PLC (MAPMAN function)

Users do not need to develop a program for communication between the PLC and the FZ controller. Users only have to set up the communication data that allows the communication with the PLC to be established.

Data required to establish the communication

Setting of FZ

- Communication protocol, Device address and Communication speed, etc.
→ Refer to “**3. COMMUNICATION SETTING**”
- PLC communication environment items
→ Refer to “**5. PLC COMMUNICATION ENVIRONMENT SETTING**”

Setting of PLC

- Protocol, Station number and Communication rate, etc.
→ Refer to “**3.2 Communication Setting of PLC**” or **PLC instruction manual**

■ PLC communication data map editing is possible

Communication data of a PLC communication data map can be edited by loader communication or host communication. For example, the amount of PLC register space that is used can be reduced by setting unnecessary communication data to “unused.”

Editing the PLC communication data map can be set in the PLC communication environment items.



To set the PLC communication environment items, it is recommended to use the loader communication.

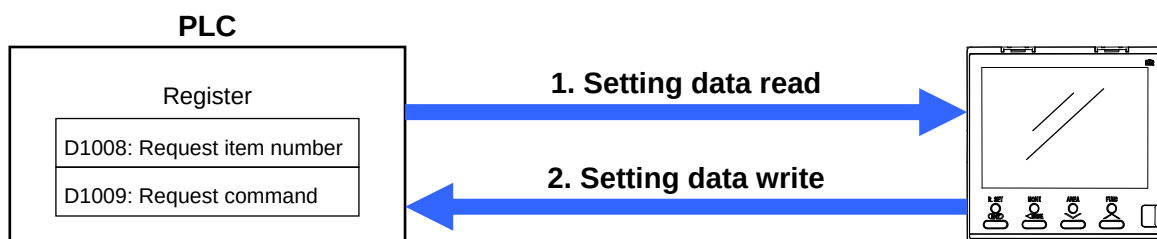
This is because the host and the PLC communication share the same communication terminals. When you edit the data map through the host communication, you have to make changes to the communication setup and the wiring to the PLC communication.



To use a loader communication, you will need a USB communication converter COM-K2 (or COM-K version 1) and loader communication cable (W-BV-05-1500) for the FZ.

■ Execute the data transfer using “Request item number” and “Request command”

The setting data can be transferred by setting values in “Request item number” and “Request command” available in the register of the PLC.



Refer to **6.1.1 Data group (P. 6-3)** for the “Request item number” and “Request command.”

■ Communication data type

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

- Double word
- Single word

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



For the Input data type, refer to **■ Input data type [Engineering mode: Function block No. 21] (P. 3-9)**.



1.2 Usable PLC Modules

The FZ can be connected to MITSUBISHI MELSEC series module.



Check the website of Mitsubishi Electric for discontinued PLC modules.

■ Usable PLC modules

MELSEC Q series

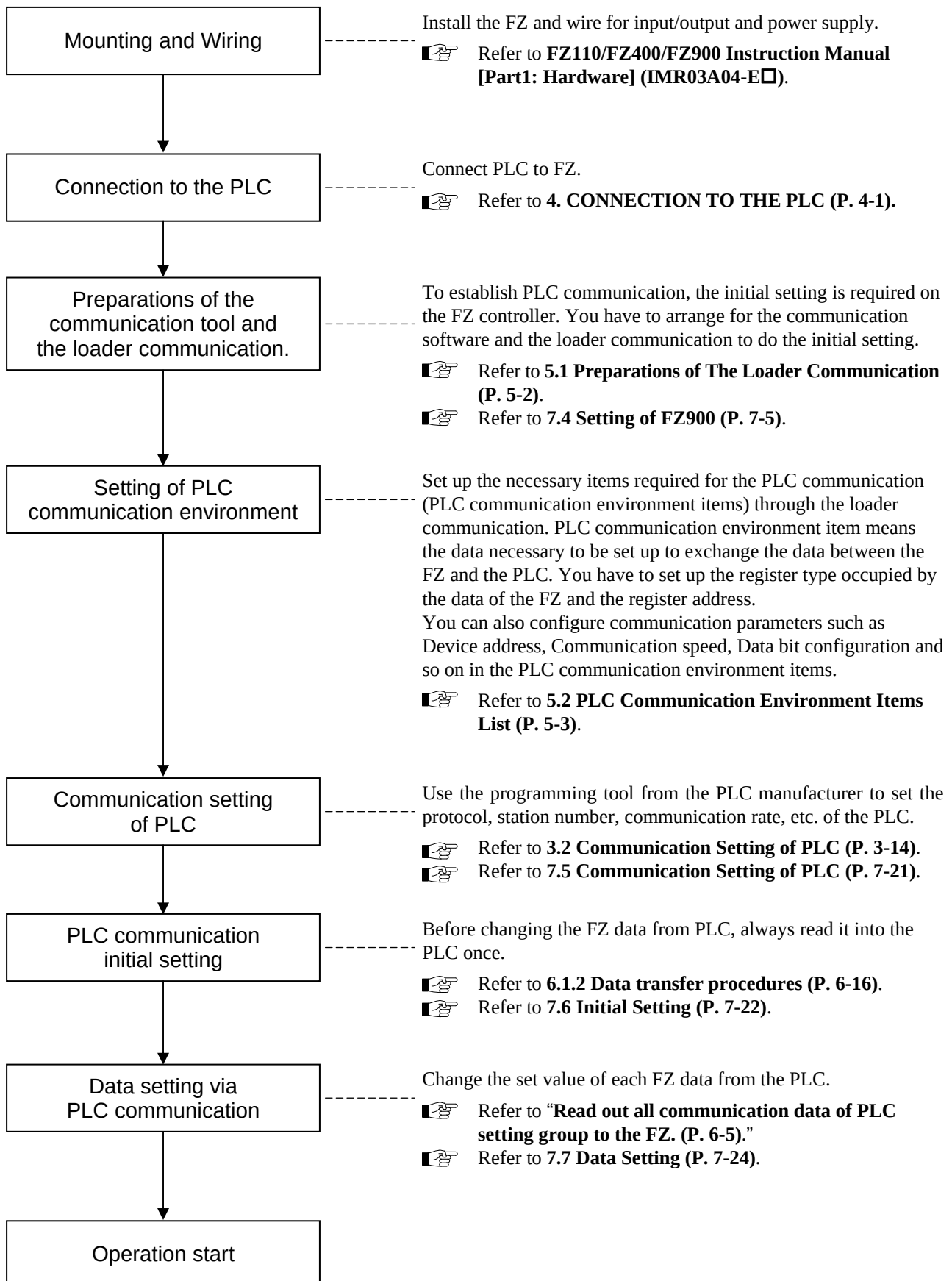
Name	Type
Serial communication modules	● QJ71C24 ● QJ71C24N ● QJ71C24N-R4, etc. The QnA compatible 3C frame (Format 4) can use.

MELSEC iQ-F series

Name	Type
FX5U CPU Module	● FX5U-32MR/ES ● FX5U-64MR/ES ● FX5U-80MR/ES The QnA compatible 3C frame (Format 4) can use.
FX5UC CPU Module	● FX5UC-32MT/D ● FX5UC-64MT/D ● FX5UC-96MT/D The QnA compatible 3C frame (Format 4) can use.
Expansion board for RS-485 communication	● FX5-485-BD
Expansion adapter for RS-485 communication	● FX5-485ADP

1.3 Handling Procedure to Operation

Proceed as follows to establish communication and operate the system.





MEMO



COMMUNICATION SPECIFICATIONS

2

2.1 PLC Communication	2-2
2.2 Loader Communication	2-3



2.1 PLC Communication

- Interface:** Based on RS-422A, EIA standard (FZ400/900)
Based on RS-485, EIA standard (FZ110/400/900)
- Connection method:** RS-422A: 4-wire system, half-duplex multi-drop connection
RS-485: 2-wire system, half-duplex multi-drop connection
- Synchronous method:** Start-stop synchronous type
- Communication speed:** 2400 bps
4800 bps
9600 bps
19200 bps
38400 bps
57600 bps
- Data bit configuration:** Start bit: 1
Data bit: 7 or 8
Parity bit: Without, Odd or Even
Stop bit: 1 or 2
- Protocol:** MELSEC Communication Protocol
QnA compatible 3C frame (Format 4)
[Manufactured by Mitsubishi Electric Corporation.]
Commands used
- 1401: Write to word device in word units
 - 0401: Read from word device in word units
- Termination resistor:** Externally terminal connected ($120\ \Omega$ 1/2 W)
- Xon/Xoff control:** None
- Maximum connections:** RS-422A: Up to 31 controllers
RS-485: Up to 31 controllers
Maximum connection quantity of the FZ to a single PLC

Signal logic: RS-422A, RS-485

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

Transmission distance: RS-422A: 1.2 km
RS-485: 1.2 km
The transmission distance is a theoretically maximum distance of the standard and may depend on the product specification.



Refer to **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR03A07-E□)** for the host communication and loader communication specifications.

2.2 Loader Communication

Protocol:	For RKC communication protocol only (ANSI X3.28-1976 subcategories 2.5 and A4)
Synchronous method:	Start/Stop synchronous type
Communication speed:	38400 bps
Data bit configuration:	Start bit: 1 Data bit: 8 Parity bit: Without Stop bit: 1 Number of communication data digits: 7 (fixed)
Maximum connections:	1 point (COM-K2 only)
Connection method:	COM-K2 loader cable (W-BV-05)
Interval time:	10 ms



When the instrument is powered off, power can be supplied to the instrument from COM-K2 (or COM-K version 1). This function is exclusive for parameter setting, and the instrument functions as follows.

- Control is stopped (Output is off, relay remains open).
- Host communication is stopped.
- The PV/SV monitor shows "LdPd" for the Measured value (PV) display and "----" for the Set value (SV) display. The LCD backlight is partially turned off.



While the instrument is powered by COM-K2 (or COM-K version 1), if power is applied to the instrument, the instrument will be reset and starts for normal operation.



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



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



MEMO



COMMUNICATION SETTING

3

3.1 Communication Setting of FZ.....	3-2
3.2 Communication Setting of PLC	3-14



3.1 Communication Setting of FZ

The following communication data of the FZ needs to be set to establish communication to the PLC. Use the front keypad or the loader communication to set.

- Communication protocol
- Device Address
- Communication speed
- Data bit configuration
- Interval time
- Decimal point position *
- Input range low/Input range high *
- Input data type *
- Soak time unit *

* These items are to be set when the communication data type (Double word [signed 32 bit integer]/Single word [signed 16 bit integer]) is changed. The exclusive register allocation of the PLC varies with communication data types. (Refer to **P. 6-28** and **P. 6-35**)

The communication data type can be selected at Input data type. The factory set value of the Input data type depends on the input range code specified at the time of ordering. (Refer to **P. 3-10**)

3.1.1 Contents of the communication data

■ Communication protocol selection [Engineering mode: Function block No. 60]

The table below shows a list of available communication protocols. Select the PLC communication. If two or more FZ are connected to the PLC, set “3: PLC communication” on all of the FZ connected to the PLC.



NOTE

To set up the parameters in the Engineering mode, the control must be stopped (STOP).



If you have ordered your controllers with the preset initial code specifying “(MITSUBISHI MELSEC series special protocol QnA compatible 3C frame [format 4]),” your controllers are delivered with this configuration.

Screen number	Symbol	Name	Data range	Factory set value
282	<i>CMPS</i>	Communication protocol	0: RKC communication 1: Modbus (Order of data transfer: upper word to lower word) 2: Modbus (Order of data transfer: lower word to upper word) 3: PLC communication (MITSUBISHI MELSEC series special protocol QnA compatible 3C frame [format 4])	When the communication protocol is specified at the time of order, the specified communication protocol will be the factory preset value. With communication, communication protocol not specified: 0

■ Device Address [Engineering mode: Function block No. 60]

This is a device address of the FZ. Select a device address between 0 and 30 for the PLC communication. It is recommended to assign continuous values to the device address. Setting noncontinuous device address may need longer time before the FZ master recognizes the total number of connected FZ slaves (device address 1 to 30).



NOTE

- To set up the parameters in the Engineering mode, the control must be stopped (STOP).
- A master FZ with a device address “0” (zero) must exist in the line.
- To avoid problems or malfunction, do not duplicate an address on the same communication line.

Screen number	Symbol	Name	Data range	Factory set value
283	<i>Add</i>	Device Address	PLC communication: 0 to 30 0: Master 1 to 30: Slave	0
			RKC communication: 0 to 99	0
			Modbus: 1 to 99	1



The device address of the FZ slave must be continuous starting from 1.

■ Communication speed [Engineering mode: Function block No. 60]

Select a communication speed for the data communication between the FZ and the PLC. The communication speed must be set to the same value for the FZ and the PLC. When two or more FZ are connected, set the same communication speed for all of them.



NOTE

To set up the parameters in the Engineering mode, the control must be stopped (STOP).

Screen number	Symbol	Name	Data range	Factory set value
284	<i>bPS</i>	Communication speed	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps	3



■ Data bit configuration [Engineering mode: Function block No. 60]

Set a bit configuration for the data communication with the PLC.

The data bit configuration must be set to the same value for the FZ and the PLC. When two or more FZ are connected, set the same data bit configuration for all of them.



NOTE

To set up the parameters in the Engineering mode, the control must be stopped (STOP).

Screen number	Symbol	Name	Data range	Factory set value
285	<i>bif</i>	Data bit configuration	0 to 11 Refer to Data bit configuration table	0

Data bit configuration table

Set value	Data bit	Parity bit	Stop bit
0	8	Without	1
1	8	Without	2
2	8	Even	1
3	8	Even	2
4	8	Odd	1
5	8	Odd	2

Set value	Data bit	Parity bit	Stop bit
6	7	Without	1
7	7	Without	2
8	7	Even	1
9	7	Even	2
10	7	Odd	1
11	7	Odd	2

: Not settable for Modbus

■ Interval time [Engineering mode: Function block No. 60]

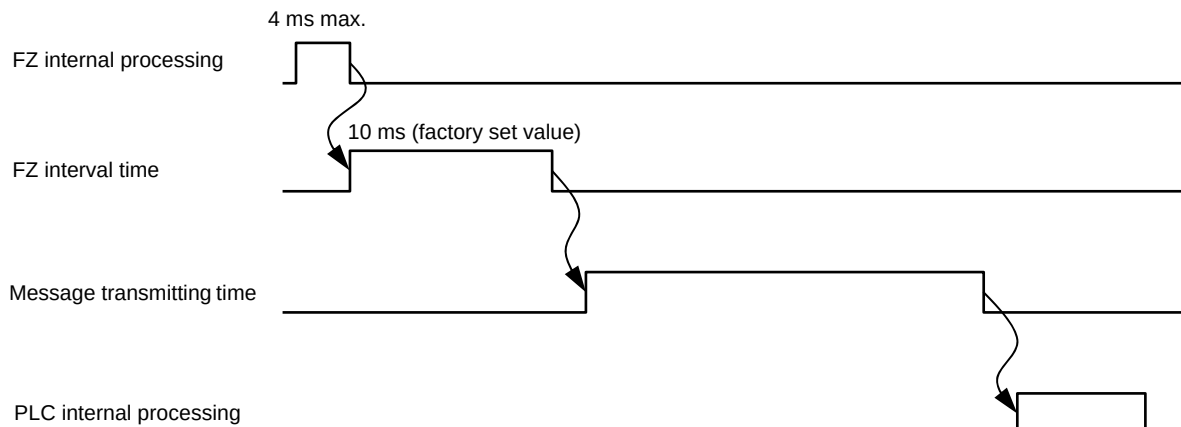
Set an interval time which is the latency between the data reception from the PLC and the data transmission from the FZ. The FZ sends the data to the PLC after the elapse of the time (FZ internal processing time + interval time).



NOTE

To set up the parameters in the Engineering mode, the control must be stopped (STOP).

Screen number	Symbol	Name	Data range	Factory set value
286	<i>INT</i>	Interval time	0 to 250 ms	10



■ Decimal point position [Engineering mode: Function block No. 21, No. 22]

When changing the input data type from double word to single word, the input range may need to be changed to cope with the 4-digit display of the measured value. Move the decimal point position to an appropriate position.

For the input range of 4-digit measured value, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.

Refer to “**■ Input range table**” of “**5.1 Changing Input**”

NOTE

- **To set up the parameters in the Engineering mode, the control must be stopped (STOP).**
- **Some communication data (parameters) may be initialized or automatically converted when a decimal point position is changed. It is recommended to record settings before changing the decimal point position.**

For the communication data (parameters) that are initialized or automatically converted, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.

Engineering mode: Function block No. 21

Screen number	Symbol	Name	Data range	Factory set value
156	<i>1.PCdP</i>	Input 1_Decimal point position	0: No decimal place 1: One decimal place 2: Two decimal place 3: Three decimal place 4: Four decimal place TC input: K, J, T, U, L: 0 to 1 Thermocouples other than those shown above: 0 (fixed) RTD input: 0 to 2 Voltage (V)/Current (I) input: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3 (When Control with PV select: Decimal point position setting of Input 1 and Input 2 is compared and the smaller will be used.)	Same as the decimal point position of the input range code specified at the time of order. For V/I inputs: 1

Continued on the next page.



Continued from the previous page.

Engineering mode: Function block No. 22

Screen number	Symbol	Name	Data range	Factory set value
168	<i>2.PCdP</i>	Input 2_Decimal point position	0: No decimal place 1: One decimal place 2: Two decimal place 3: Three decimal place 4: Four decimal place TC input: K, J, T, U, L: 0 to 1 Thermocouples other than those shown above: 0 (fixed) RTD input: 0 to 2 Voltage (V)/Current (I) input: For Input data type is 0: 0 to 4 For Input data type is 1: 0 to 3	Same as the decimal point position of the input range code specified at the time of order. For V/I inputs: 1

■ Input range high/Input range low

[Engineering mode: Function block No. 21, No. 22]

When changing the input data type from double word to single word, the input range may need to be changed to cope with the 4-digit display of the measured value. Adjust the input range narrower as required.

For the input range of 4-digit measured value, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.

Refer to “**■ Input range table**” of “**5.1 Changing Input**”

NOTE

- To set up the parameters in the Engineering mode, the control must be stopped (STOP).
- Some communication data (parameters) may be automatically converted when the input range high (or low) is changed. It is recommended to record settings before changing the input range high (or low).

For the communication data (parameters) that are automatically converted, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.

Engineering mode: Function block No. 21

Screen number	Symbol	Name	Data range	Factory set value
157	<i>I.PC5H</i>	Input 1_Input range high	(Input 1_Input range low + 1digit) to Input 1_Maximum value of input range Varies with the setting of the Decimal point position.	High limit value of the input range code specified at the time of order. For V/I inputs: 100.0
158	<i>I.PC5L</i>	Input 1_Input range low	Input 1_Minimum value of input range to (Input 1_Input range high – 1digit) Varies with the setting of the Decimal point position.	Low limit value of the input range code specified at the time of order. For V/I inputs: 0.0

Continued on the next page.



Continued from the previous page.

Engineering mode: Function block No. 22

Screen number	Symbol	Name	Data range	Factory set value
169	<i>2.PGSH</i>	Input 2_Input range high	• TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): (Input 2_Input range low + 1digit) to Input 2_Maximum value of input range Varies with the setting of the Decimal point position. • Voltage (V)/Current (I) Inputs (For Remote setting input): Input 2_Input range low to Input 1_Maximum value of input range Varies with the setting of the Decimal point position.	High limit value of the input range code specified at the time of order. For V/I inputs: 100.0
170	<i>2.PGSL</i>	Input 2_Input range low	• TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): Input 2_Minimum value of input range to (Input 2_Input range high – 1digit) Varies with the setting of the Decimal point position. • Voltage (V)/Current (I) Inputs (For Remote setting input): Input 1_Minimum value of input range to Input 2_Input range high Varies with the setting of the Decimal point position.	Low limit value of the input range code specified at the time of order. For V/I inputs: 0.0

Input data type [Engineering mode: Function block No. 21]

Select a single or a double word for the communication data. Changeable communication data can be found in Monitor group and Setting group.

When changing to a single word system from a double word system, the input range may need to be changed to cope with the 4-digit display of the measured value. If the input data type cannot be changed to “1” (single word) from “0” (double word), select the input range which supports 4-digit display of the measured value.

To set the instrument to a single word system, select “1” (single word). The instrument could be changed to a single word system by setting “2.” However, this set value is reserved for RKC communication to handle communication data of our REX-D series instruments. Do not select this set value.



For the input range of 4-digit measured value, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.

Refer to “**Input range table**” of “**5.1 Changing Input.**”



NOTE

- To set up the parameters in the Engineering mode, the control must be stopped (STOP).
- Some communication data (parameters) may be automatically converted when the input data type is changed. It is recommended to record settings before changing the input data type.



For the communication data (parameters) that are automatically converted, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.



In case of a dual input type, the input range of both Input 1 and Input 2 must be changed to a 4-digit display, otherwise changing to a single word system from a double word system is not possible.

Screen number	Symbol	Name	Data range	Factory set value
165	<i>I Ndr</i>	Input data type	0: Number of measured value digits: 5 Number of RKC communication data digits: 7 Modbus: Double word PLC communication data: Double word (System data: Single word) 1: Number of measured value digits: 4 Number of RKC communication data digits: 6 Modbus: Single word PLC communication data: Single word 2: Number of measured value digits: 4 Number of RKC communication data digits: 6 Our REX-D series equivalent (Some identifiers are replaced with the REX-D series equivalent identifiers) Modbus data: Single word PLC communication data: Single word When changing the Input data type from 0 to 1 (or 2) and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand. The unit of time depends on the Input data type. In case of Input data type 0 FZ400/900: hour/minute/second, hour/minute, minute/second FZ110: hour/minute, minute/second In case of Input data type 1 hour/minute, minute/second	Depends on the input range code specified at the time of order. (Refer to P. 3-10)



3. COMMUNICATION SETTING

• Input range code table

The factory set value of the communication data type depends on the input range code specified at the time of ordering. See the following table to check if the communication data type of your FZ is a double word or a single word.



- When the input range code for a double word has been specified, the factory set value of the Input data type is set to 0 (double word).
- When the input range code for a single word has been specified, the factory set value of the Input data type is set to 1 (single word).

●TC input

Type	Code	Range	Communication data type
K	K01	0 to 200 °C	Single word
	K02	0 to 400 °C	
	K03	0 to 600 °C	
	K04	0 to 800 °C	
	K06	0 to 1200 °C	
	K07	0 to 1372 °C	
	K08	−199.9 to +300.0 °C	
	K09	0.0 to 400.0 °C	
	K10	0.0 to 800.0 °C	
	K14	0 to 300 °C	
	K41	−200 to +1372 °C	
	K42	−200.0 to +1372.0 °C	Double word
J	KA1	0 to 800 °F	Single word
	KA2	0 to 1600 °F	
	KA3	0 to 2502 °F	
	J01	0 to 200 °C	Single word
	J02	0 to 400 °C	
	J03	0 to 600 °C	
	J04	0 to 800 °C	
	J08	0.0 to 400.0 °C	Single word
	J29	−200.0 to +1200.0 °C	
			Double word

Type	Code	Range	Communication data type
J	JA1	0 to 800 °F	Single word
	JA3	0 to 2192 °F	
	JA6	0 to 400 °F	
T	T01	−199.9 to +400.0 °C	
	T02	−199.9 to +100.0 °C	
	T03	−100.0 to +200.0 °C	
	T19	−200.0 to +400.0 °C	Double word
R	R01	0 to 1600 °C	Single word
	R07	−50 to +1768 °C	
S	S06	−50 to +1768 °C	
B	B03	0 to 1800 °C	
E	E01	0 to 800 °C	
N	N02	0 to 1300 °C	
W5Re/ W26Re	W03	0 to 2300 °C	
PL II	A01	0 to 1300 °C	
U	U01	−199.9 to +600.0 °C	
L	L04	0.0 to 900.0 °C	
			Double word
PR40-20	F02	0 to 1800 °C	
	FA2	0 to 3200 °F	

●RTD input

Type	Code	Range	Communication data type
Pt100	D01	−199.9 to +649.0 °C	Single word
	D04	−100.0 to +100.0 °C	
	D05	−100.0 to +200.0 °C	
	D06	0.0 to 50.0 °C	
	D07	0.0 to 100.0 °C	
	D08	0.0 to 200.0 °C	
	D09	0.0 to 300.0 °C	
	D10	0.0 to 500.0 °C	
	D12	−199.9 to +600.0 °C	

Type	Code	Range	Communication data type
Pt100	D21	−200.0 to +200.0 °C	Double word
	D27	0.00 to 50.00 °C	Single word
	D34	−100.00 to +100.00 °C	Double word
	D35	−200.0 to +850.0 °C	
	DA1	−199.9 to +999.9 °F	Single word
	DA9	0.0 to 500.0 °F	
JPt100	P08	0.0 to 200.0 °C	Double word
	P29	−100.00 to +100.00 °C	
	P30	−200.0 to +640.0 °C	

●Voltage/Current input

Type	Code	Range	Communication data type
DC 0 to 10 mV	101	Programmable range −19999 to +99999 (Factory set value 0.0 to 100.0)	Double word
DC 0 to 100 mV	201		
DC 0 to 1 V	301		
DC 0 to 5 V	401		
DC 0 to 10 V	501		

Type	Code	Range	Communication data type
DC 1 to 5 V	601	Programmable range −19999 to +99999 (Factory set value 0.0 to 100.0)	Double word
DC 0 to 20 mA	701		
DC 4 to 20 mA	801		
DC −10 to +10 V	904		
DC −5 to +5 V	905		

■ Soak time unit [Engineering mode: Function block No. 70]

The time unit of the Area soak time of the FZ is set here.

Available time unit may be restricted depending on the Input data type (Double word/Single word), whereas the Input data type may be restricted by the Soak time unit setting.

For example, when the Soak time unit is “2,” the Input data type cannot be changed from the double word to the single word. To change the type to the Single word, enter “0” or “1” in the Soak time unit.



NOTE

To set up the parameters in the Engineering mode, the control must be stopped (STOP).

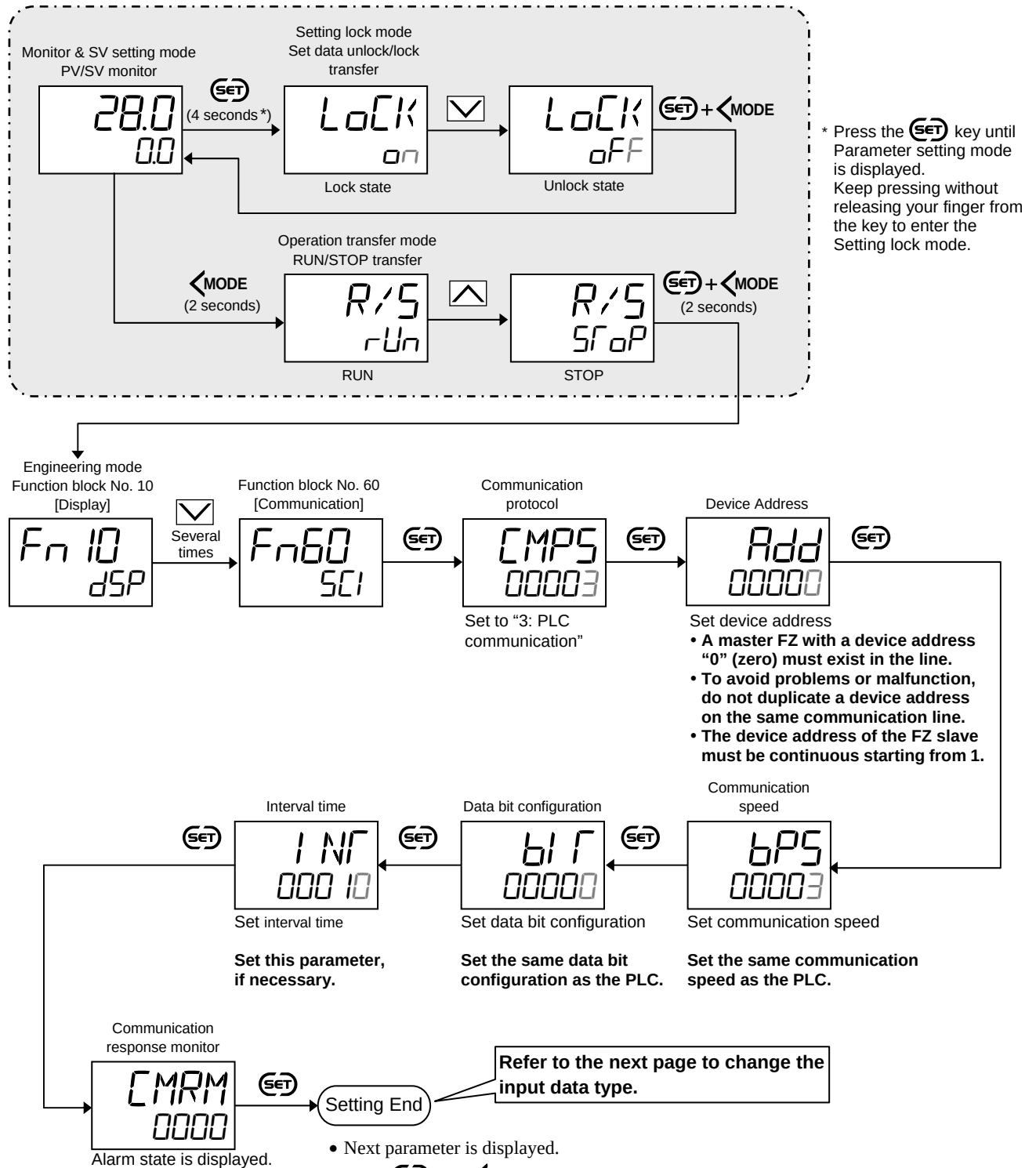
Screen number	Symbol	Name	Data range	Factory set value
299	<i>Sr dP</i>	Soak time unit	0: 0 hours 00 minutes to 99 hours 59 minutes 1: 0 minutes 00 seconds to 199 minutes 59 seconds 2: 0 hours 0 minutes 0 seconds to 9 hours 59 minutes 59 seconds In case of Input data type 0: 0 to 2 In case of Input data type 1: 0 or 1	1

3.1.2 Setting via front keys

The communication data on pages 3-2 to 3-4 can be set in Function block No.60 in the Engineering mode.

■ Setting procedure

To enter the Engineering mode



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

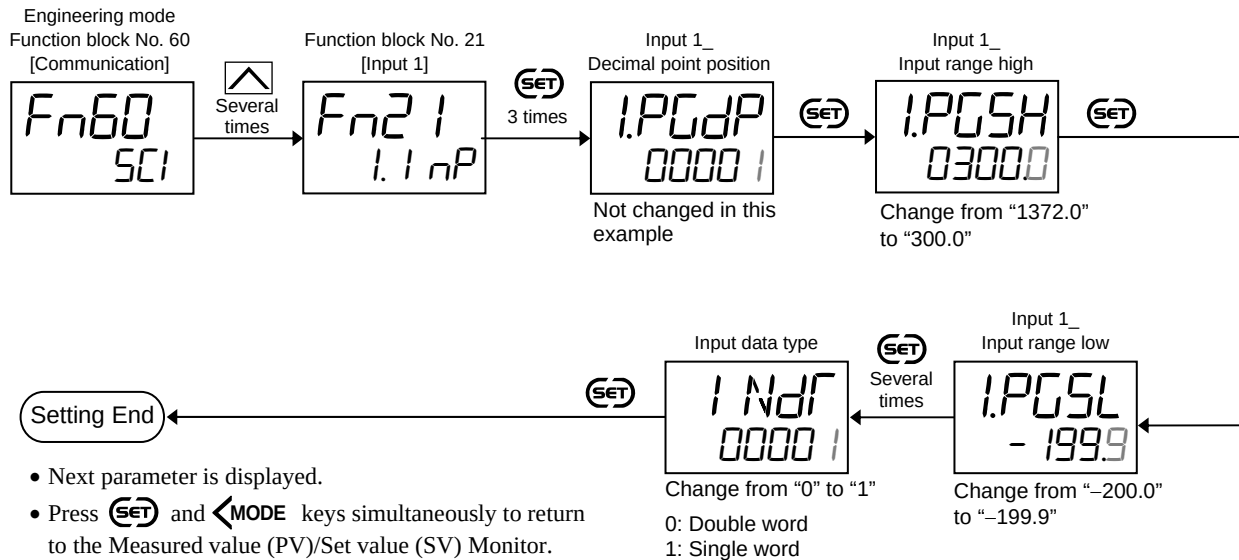
Changing example of Input data type

The Input data type can be set in Function block No.21 in the Engineering mode.

Refer to the previous page to switch the mode to Engineering mode.

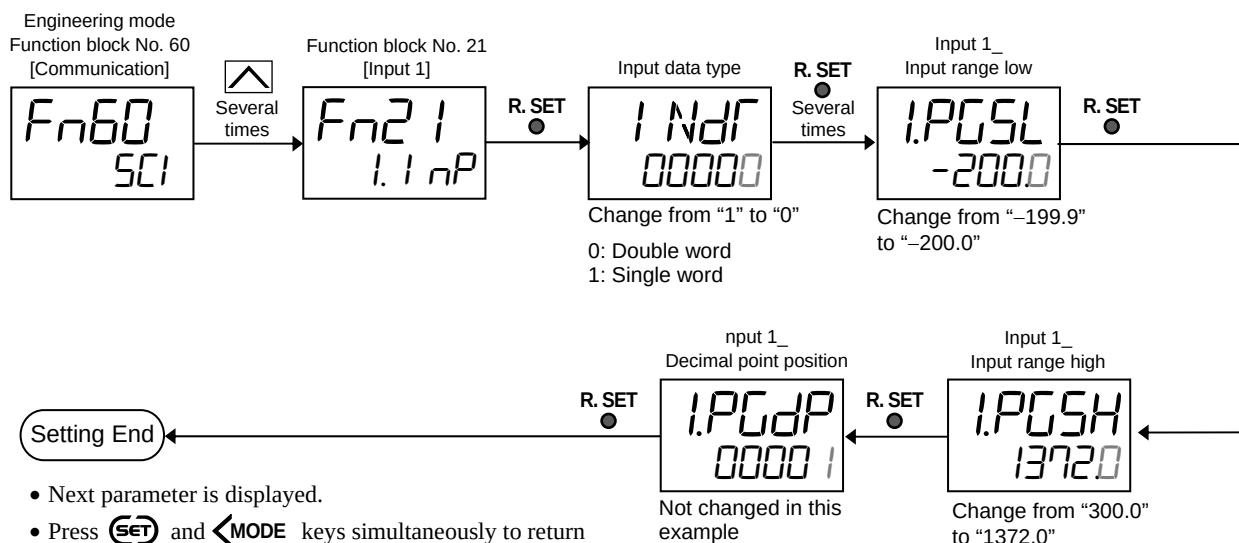
Conditions: Input type: Thermocouple K
Input range: –200.0 to +1372.0 °C (Double word) –199.9 to +300.0 °C (Single word)
Number of input: 1-input specification
Narrow the input range to change from a double word to a single word system.

• Changing from the Double word to the Single word



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

• Changing from the Single word to the Double word



- Next parameter is displayed.
- Press **SET** and **MODE** keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.



3.1.3 Setting by the loader communication

When you try to set the communication parameters (communication protocol, device address, data bit configuration, communication speed, and interval time) via the loader communication, refer to the following pages.

 **5. PLC PLC COMMUNICATION ENVIRONMENT SETTING (P. 5-1)**

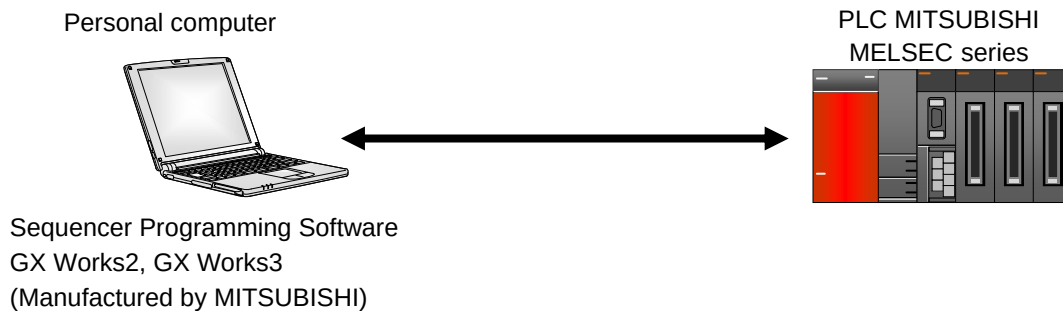
 **7.4 Setting of FZ900 (P. 7-5)**

3.2 Communication Setting of PLC

Sets the communication items of PLC side. Set the PLC as follows. (Recommend setting example)

 The setting item varies depending on the PLC. The details of the setting procedure for the PLC, see the instruction manual for the PLC being used.

Recommend setting example



Item	Details	
	MELSEC Q series	MELSEC iQ-F series
Protocol	MC protocol (Format 4)	MC protocol (Format 4)
Station number	0	0
Communication rate	Set the same as FZ (FZ factory set value: 19200 bps)	Set the same as FZ (FZ factory set value: 19200 bps)
Operation setting	Independent	—
Data bit	8 bit	8 bit
Parity bit	None	None
Stop bit	1 bit	1 bit
Sum check code	Exist	Added
Online Change	Enable	—
Setting modifications	Enable	—
Termination resistor	Connect the termination resistor attached to the PLC	Refer to PLC instruction Manual



CONNECTION TO THE PLC

4

4.1 Wiring Cautions.....	4-2
4.2 Communication Terminal Number and Signal Details.....	4-4
4.3 Wiring Method.....	4-5

⚠ WARNING

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

4.1 Wiring Cautions

- To avoid noise induction, keep communication wire away from instrument power line, load lines and power lines of other electric equipment.

- Use the solderless terminal appropriate to the screw size.

Screw size: M3×7 (with 5.8×5.8 square washer)

Recommended tightening torque:

0.4 N m [4 kgf cm]

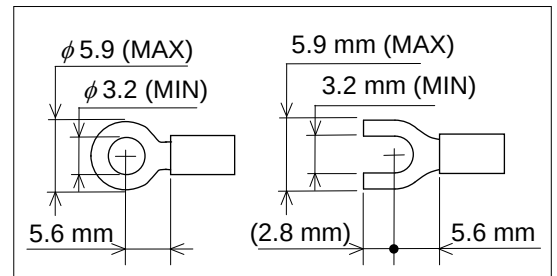
Applicable wire: Solid/twisted wire of 0.25 to 1.65 mm²

Specified dimension: Refer to Fig. at the right

Specified solderless terminal:

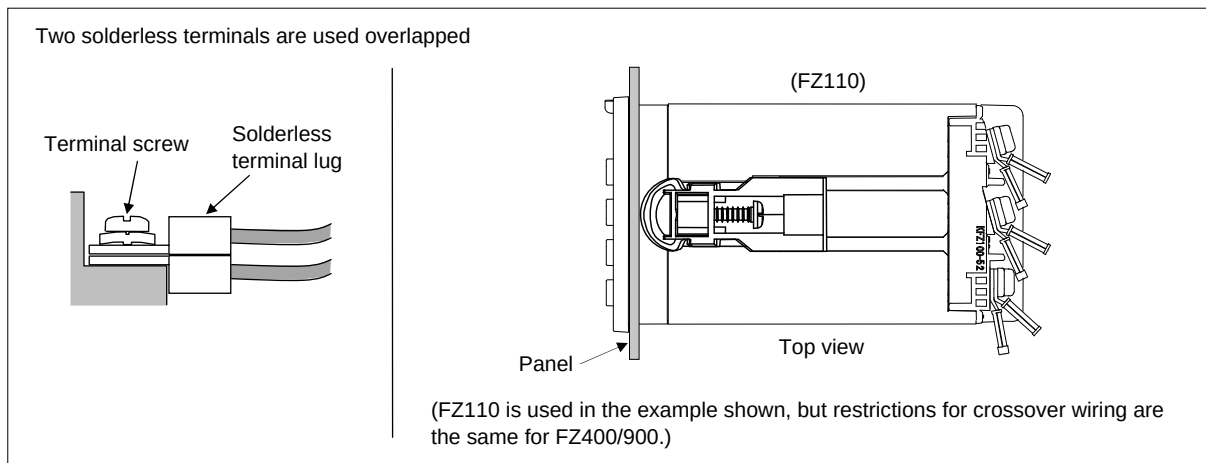
Manufactured by J.S.T MFG CO., LTD.

Circular terminal with isolation V1.25 MS3



For the solderless terminal of PLC, refer to instruction manual of PLC.

- Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.
- Up to two solderless terminal lugs can be connected to one terminal screw. **The requirements of reinforced insulation can be still complied with in this condition.** When actually doing this, place one solderless terminal lug over the other as illustrated below.



If solderless terminal lugs other than the recommended dimensions are used, terminal screws may not be tightened. In that case, bend each solderless terminal lug before wiring. If the terminal screw is forcibly tightened, it may be damaged.



In case of FZ110, if two solderless terminal lugs are connected to one terminal screw, a terminal cover cannot be used.

Continued on the next page.

Continued from the previous page.

- The symbol of signal polarity A and B may be reversed between the MITSUBISHI MELSEC series and the FZ. Normally signal A of a certain device is connected to signal A of the other device, and so for B to B. However, in this case, signal polarity A should be connected to B and the polarity B to A.
- If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors. Install a termination resistor on the FZ (between communication terminals) at the furthest ends from the PLC.



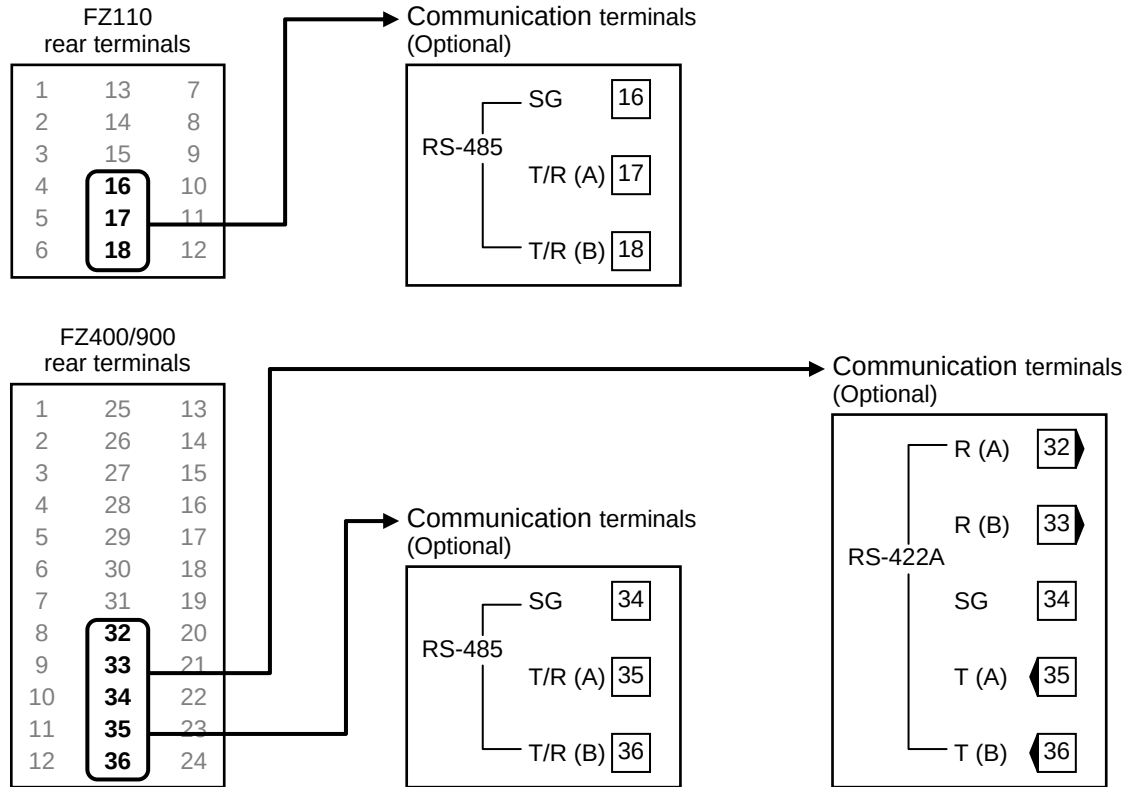
For the termination resistor of PLC, refer to instruction manual of PLC.



4.2 Communication Terminal Number and Signal Details

The FZ uses RS-485 or RS-422A as a communication interface for a connection to the PLC. Below is an explanation about the communication terminals and the signal function when the FZ is linked with a PLC.

■ Terminal configuration



■ Signal details

• RS-485

FZ110 terminal No.	FZ400/900 terminal No.	Symbol	Signal name
16	34	SG	Signal ground
17	35	T/R (A)	Send data/Receive data
18	36	T/R (B)	Send data/Receive data

• RS-422A

FZ400/900 terminal No.	Symbol	Signal name
32	R (A)	Receive data
33	R (B)	Receive data
34	SG	Signal ground
35	T (A)	Send data
36	T (B)	Send data

4.3 Wiring Method

Below is an explanation about how to connect the FZ to the PLC. The connection described in this manual is just an example. When connecting the FZ to an actual PLC, consult the instruction manual of the PLC carefully and make a proper wiring between them.



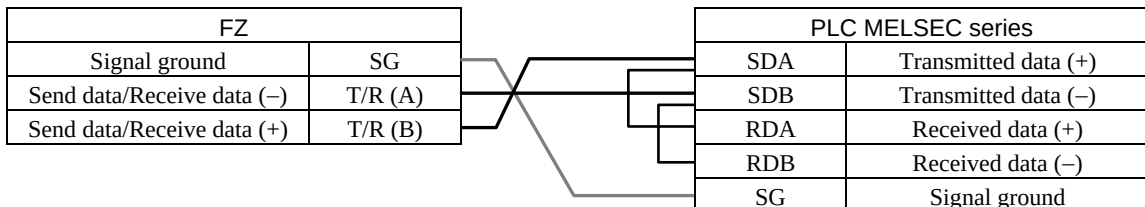
The communication cable must be provided by the customer.

4.3.1 Connecting through RS-485 (FZ110/400/900)

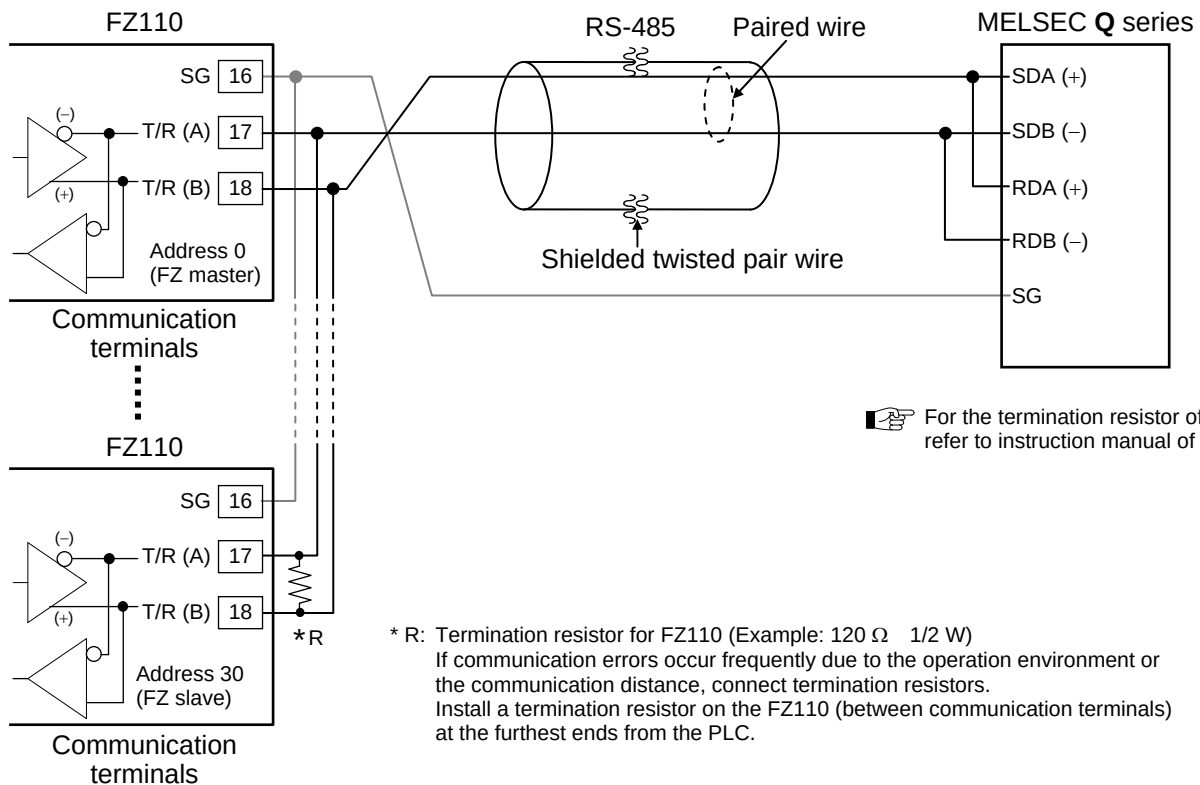


NOTE

The symbol of signal polarity A and B may be reversed between the MITSUBISHI MELSEC series and the FZ. Normally signal A of a certain device is connected to signal A of the other device, and so for B to B. However, in this case, signal polarity A should be connected to B and the polarity B to A.



■ Connection example of FZ110 (RS-485)

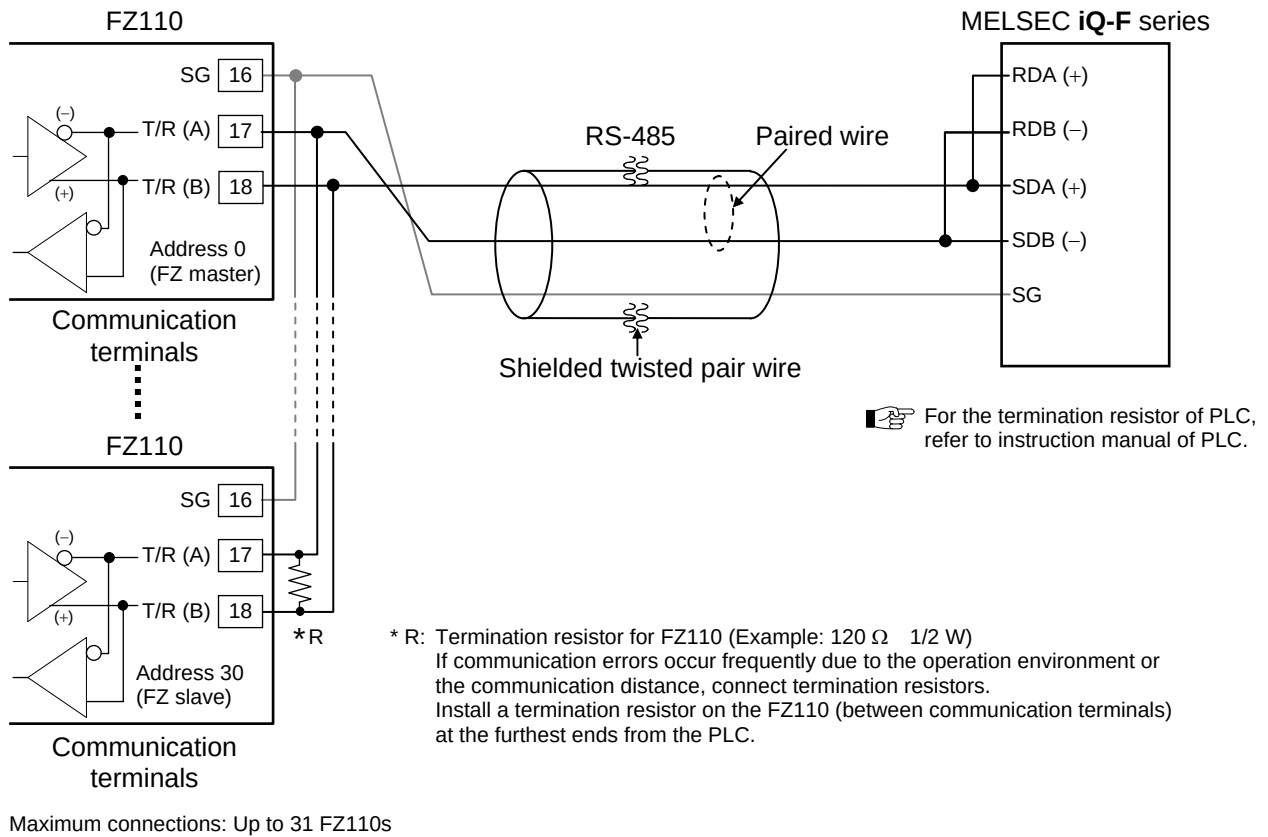


* R: Termination resistor for FZ110 (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors.
Install a termination resistor on the FZ110 (between communication terminals) at the furthest ends from the PLC.

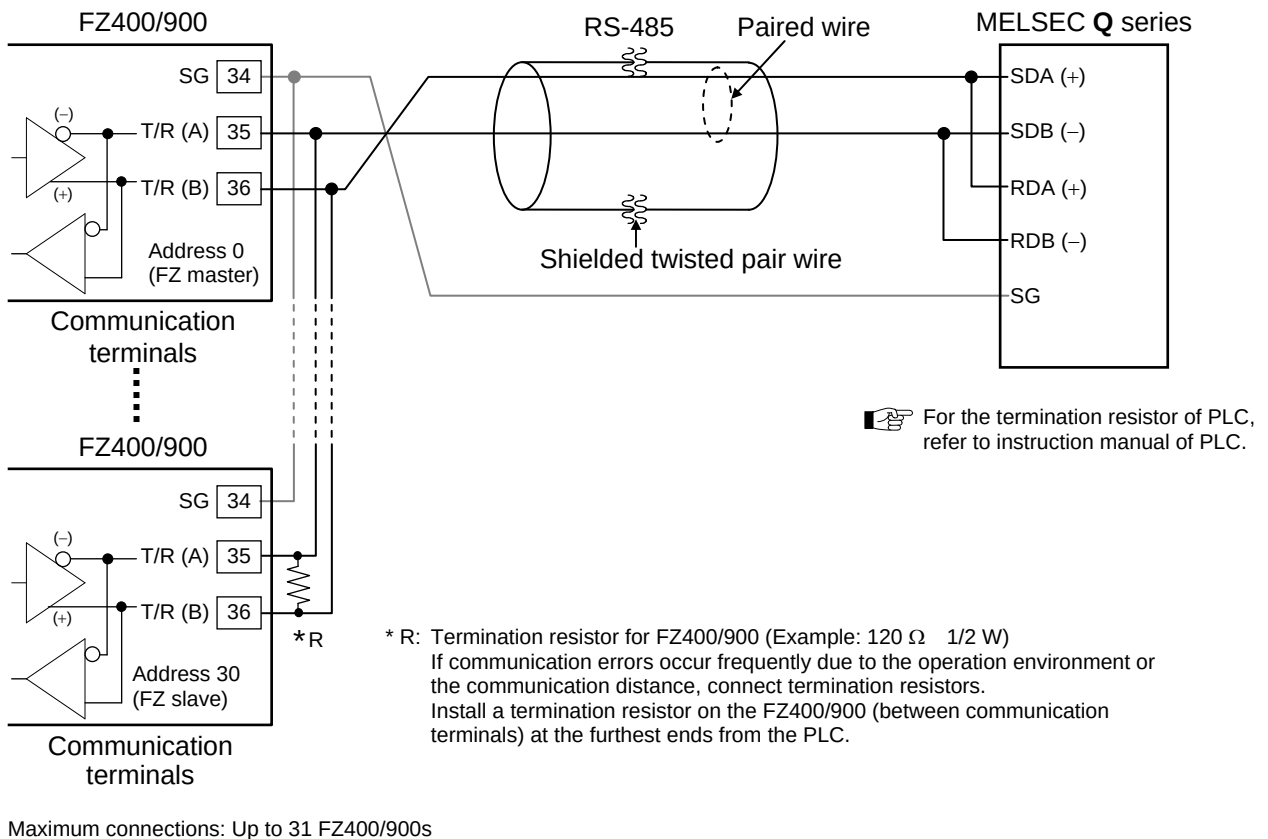
Maximum connections: Up to 31 FZ110s

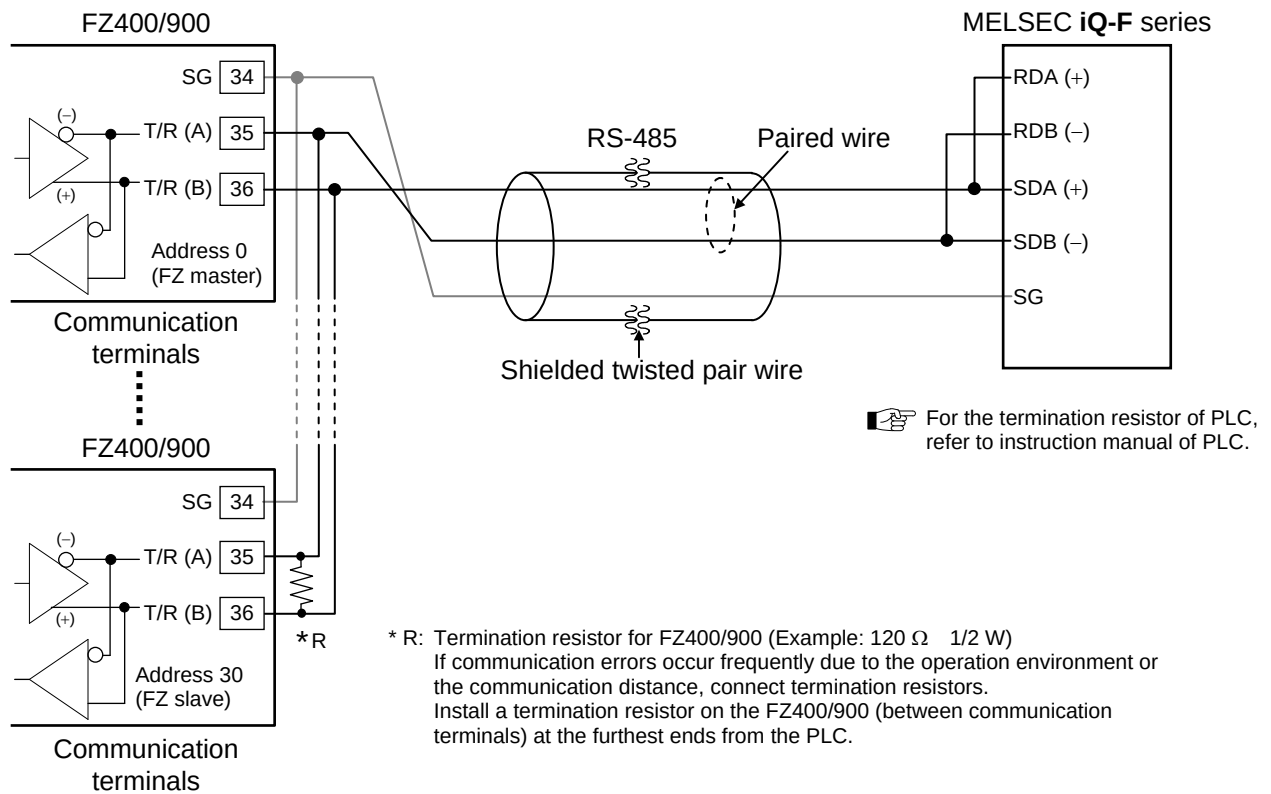


4. CONNECTION TO THE PLC



■ Connection example of FZ400/900 (RS-485)







4.3.2 Connecting through RS-422A (FZ400/900)

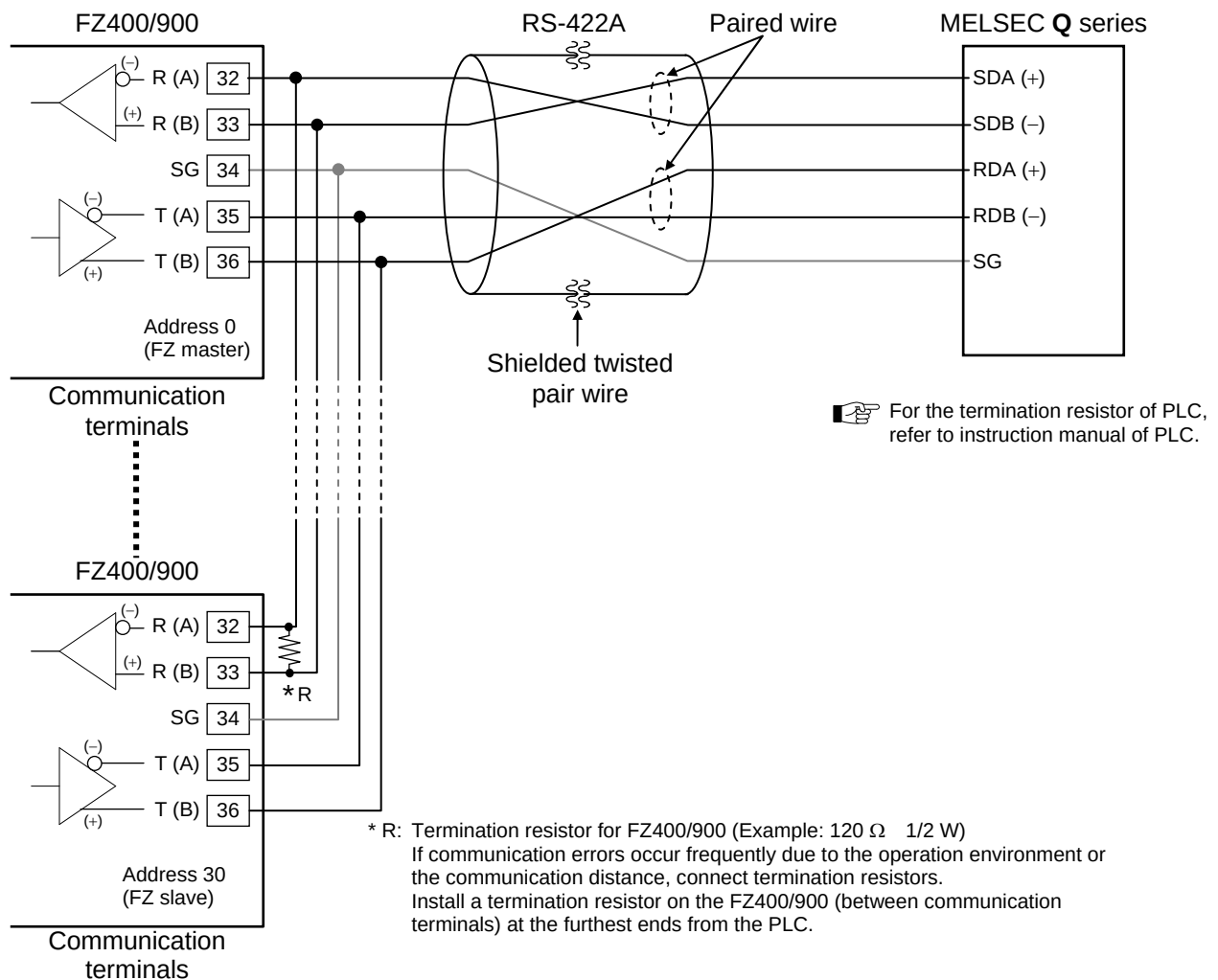


NOTE

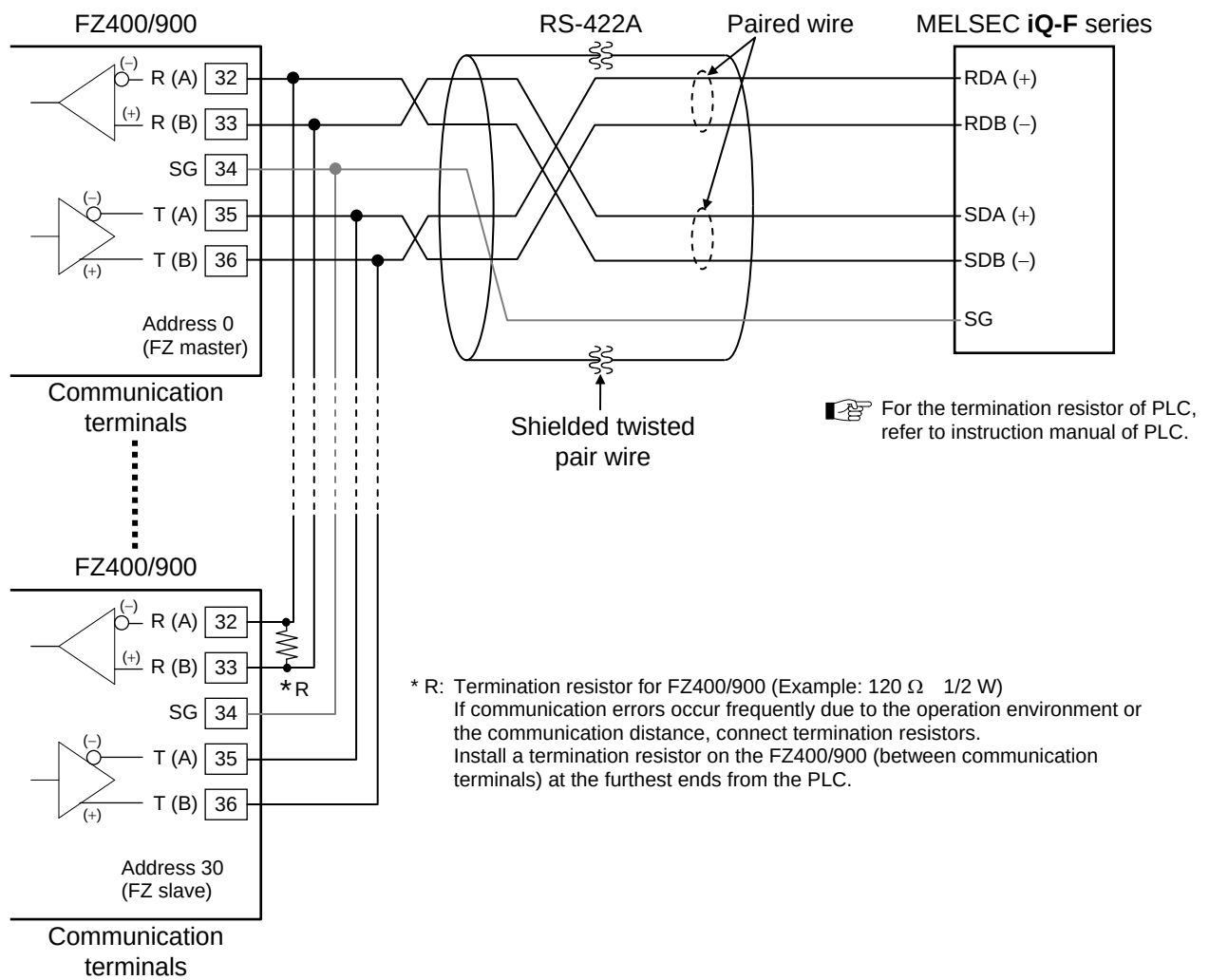
The symbol of signal polarity A and B may be reversed between the MITSUBISHI MELSEC series and the FZ. Normally signal A of a certain device is connected to signal A of the other device, and so for B to B. However, in this case, signal polarity A should be connected to B and the polarity B to A.

FZ		PLC MELSEC series	
Receive data (-)	R (A)	SDA	Transmitted data (+)
Receive data (+)	R (B)	SDB	Transmitted data (-)
Signal ground	SG	RDA	Received data (+)
Send data (-)	T (A)	RDB	Received data (-)
Send data (+)	T (B)	SG	Signal ground

■ Connection example of FZ400/900 (RS-422A)



Maximum connections: Up to 31 FZ400/900s



Maximum connections: Up to 31 FZ400/900s



MEMO



PLC COMMUNICATION ENVIRONMENT SETTING

5

5.1 Preparations of The Loader Communication	5-2
5.2 PLC Communication Environment Items List.....	5-3

To perform PLC communication, PLC communication environment settings must be configured in the FZ. The system data settings are made by the loader communication.
(Some communication data can be set via the front keypad of the FZ)

5.1 Preparations of The Loader Communication

■ Communication converter

To perform loader communication, our converter and a communication cable are required.

- USB communication converter COM-K2 (With USB cable) ¹

¹ A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM 2 is used using a COM-K, the PROTEM2 will not be supported by Windows 8 or later.

- Loader communication cable W-BV-05-1500 [COM-K2 optional] ²

² W-BV-05-1500 cable can be purchased as an individual part. It can be also used with a COM-K (version 1).

■ Communication program

Download our communication tool PROTEM2 from our web.

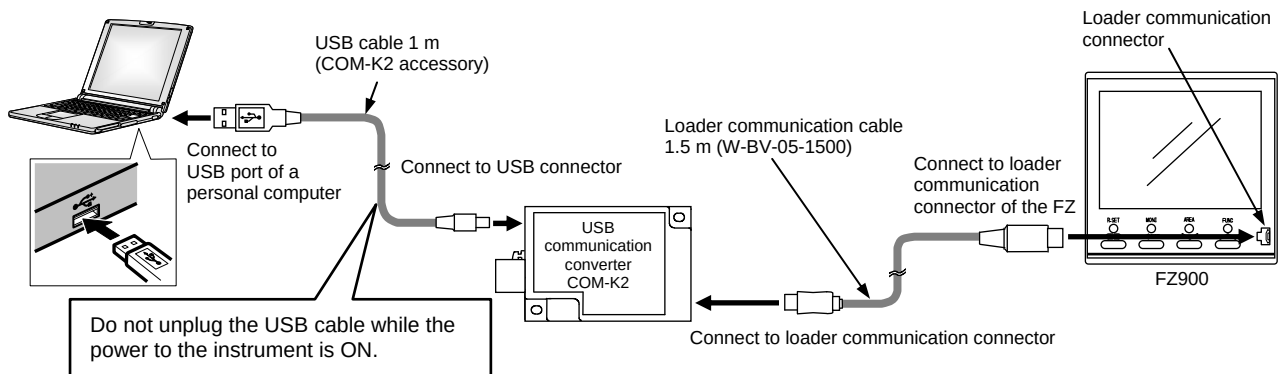
■ Wiring method

Connect the FZ110/400/900, COM-K2, and personal computer using a USB cable and a loader communication cable. Make sure the connectors are oriented correctly when connecting.



NOTE

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



Communication Tool
PROTEM2

Software operation environment: Consult the manual that you downloaded

Communication port of personal computer
USB port: Based on USB Ver. 2.0

Communication settings on the personal computer
(The following values are all fixed)
Communication speed: 38400 bps
Start bit: 1
Data bit: 8
Parity bit: Without
Stop bit: 1

- The device address of the loader communication is fixed at “0.”
- The setting of the device address is disregarded.
- The loader communication corresponds to the RKC communication protocol “Based on ANSI X3.28-1976 subcategories 2.5 and A4.”



When using the loader communication, USB driver for COM-K2 must be installed on the personal computer.

The USB driver for COM-K2 can be downloaded from the official RKC website:

<http://www.rkcinst.com>

5.2 PLC Communication Environment Items List

The following items are set to the FZ.

5.2.1 Setting items list



NOTE

The following items become valid by turning off the power of the FZ once, and then turning it on again after the settings are changed. These items also become valid* by switching the control to RUN from STOP. The PLC communication is restarted (excluding the PLC communication start time).

* The items can be made valid by performing an Instrument recognition request command.



All of the following PLC communication environment items can be read and written (R/W).



For the “Communication identifier” and “Modbus register address” of the PLC communication environment items, refer to **P. 5-14**.

Name	Data range	Factory set value
Station number	0 to 31 Set the PLC station number to the FZ. Set it to the same number as the PLC.	0
PC number	0 to 255 Set the PLC PC number to FZ. (Refer to P. 5-16) Set it to the same number as the PLC. When connecting multiple FZ controllers to a PLC, set the same PC number to all of the FZ. When connecting the FZ to the connected station (host station) of the Mitsubishi PLC, there is no need of changing the factory set values.	255
Register type (D, R, W, ZR) * 	0: D register (data register) 1: R register (file register) 2: W register (link register) 3: ZR register (Method of specifying consecutive numbers when 32767 of R register is exceeded.) Set the register types used in PLC communication.	0
Register start number (High-order 4-bit) * 	0 to 15 Set the start number of the register of system data used in PLC communication. Set this if the register address 65535 is exceeded. (For the setting procedure, refer to P. 5-19)	0
Register start number (Low-order 16-bit) * 	0 to 65535 Set the start number of the register of system data used in PLC communication. System data is required to perform PLC communication. The system data occupies twelve PLC registers. (For the setting procedure, refer to P. 5-19)	1000

: Communication data settable via the front keypad.

* Usable register ranges and types vary depending on used CPU types. For register ranges and types that can actually be used, refer to the PLC instruction manual.

If you set a register address larger than a million (1,000,000) to D and R registers, “PLC register Read/Write error” occurs.

Continued on the next page.



Continued from the previous page.

Name	Data range	Factory set value
Monitor item register bias * 	12 to 65535 Set the start number of the register of monitor group communication data. Bias is added to the Register start number in the system data. The factory set value for the register bias is twelve, and thus the register start number of the monitor group starts from D1012. (The Register start number in the system data is factory preset to 1000.) Equation for calculating: Register start number of monitor group = Register start number + Monitor item register bias (Refer to P. 5-18)	12
Setting item register bias * 	0 to 65535 Set the start number of the register of setting group communication data. When the Setting item register bias is set to 0 to 11: The set bias value becomes invalid. The Register start number of the Setting group is assigned next to the Monitor group. When the Setting item register bias is set to 12 or more (12 to 65535): Bias is added to the Register start number in the system data. The added value will be the Register start number of Setting group. Note: If set to 12 or greater (12 to 65535), take care that overlapping of the communication data of the monitor group and the register address does not occur. Equation for calculating: Register start number of setting group = Register start number + Setting item register bias (Refer to P. 5-18)	0
Monitor item selection 1 Monitor item selection 2 Monitor item selection 3	0 to 65535 Select a communication data of the monitor group for data communication between the FZ and the PLC. The selected communication data only performs PLC communication. Convert binary to decimal and configure the setting. (For communication data of the monitor group, refer to P. 5-8 and 5-9)	Monitor item selection 1: 3459 Monitor item selection 2: 16512 Monitor item selection 3: 1024

: Communication data settable via the front keypad.

* Usable register ranges and types vary depending on used CPU types. For register ranges and types that can actually be used, refer to the PLC instruction manual.

Continued on the next page.



Continued from the previous page.

Name	Data range	Factory set value
Setting item selection 1 Setting item selection 2 Setting item selection 3 Setting item selection 4 Setting item selection 5 Setting item selection 6 Setting item selection 7 Setting item selection 8	0 to 65535 Select a communication data of the setting group for data communication between the FZ and the PLC. The selected communication data only performs PLC communication. Convert binary to decimal and configure the setting. (For communication data of the setting group, refer to P. 5-10 to 5-13)	Setting item selection 1: 16480 Setting item selection 2: 7850 Setting item selection 3: 32768 Setting item selection 4: 771 Setting item selection 5: 0 Setting item selection 6: 5 Setting item selection 7: 0 Setting item selection 8: 0
Instrument link recognition time ☐	0 to 255 seconds When connecting two or more FZ controllers, set the time required to recognize the second FZ and thereafter. Set this item to the FZ master (device address 0). When many FZ slaves are connected, setting short for the Instrument link recognition time may cause some of the FZ slaves not to be recognized. Set the Instrument link recognition time longer for such a case.	5
PLC response waiting time ☐	0 to 3000 ms Set the time of waiting for a response from the PLC. (Refer to P. 5-17) If communication with a PLC is not properly established, adjust the time longer.	255
PLC communication start time ☐	1 to 255 seconds Time until communication with the PLC starts is set after the power is turned on. The PLC communication start time is the time that writing of the system data starts. Actual communication with the PLC by request command can only take place after the system communication state changes to "1."	5
Slave register bias ☐	0 to 65535 (0: Slave register bias is invalid) When connecting two or more FZ, a bias is set for the register addresses of each FZ so that no address duplication occurs. To activate the bias, set a value other than zero. Equation for calculating: Slave register start number = Register start number + (Device address × Slave register bias) (Refer to P. 5-21)	80

☐: Communication data settable via the front keypad.

Continued on the next page.



5. PLC COMMUNICATION ENVIRONMENT SETTING

Continued from the previous page.

Name	Data range	Factory set value
Number of recognizable devices ☒	0 to 30 Set the quantity of the FZ slaves to be recognized by the FZ master. The recognition processing starts from device address 1. Set the maximum value of the device address of the FZ slaves to be connected. Even if there is any device address that is not used, set the maximum number including such an address. This setting is effective only for the FZ master with a device address of 0.	8
Device address ☒	PLC communication: 0 to 30 0: Master 1 to 30: Slave This is a device address of the FZ. The FZ master with a device address of 0 must always exist. The device address of the FZ slave must be continuous starting from 1.	0
	RKC communication: 0 to 99	0
	Modbus: 1 to 99	1
Communication speed ☒	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps Under this parameter, communication speed for data communication with a PLC can be selected. Set the same communication speed for the FZ and the PLC.	3
Data bit configuration ☒	0 to 11 (Refer to Data bit configuration table) Under this parameter, data bit configuration for data communication with a PLC can be selected. Set the same data bit configuration for the FZ and the PLC.	0
Interval time ☒	0 to 250 ms Set the transmission waiting time until the data is returned after the receipt of the request from the PLC. The FZ sends the data to the PLC after the elapse of time (FZ internal processing time + interval time).	10

☒: Communication data settable via the front keypad.

Data bit configuration table

Set value	Data bit	Parity bit	Stop bit
0	8	Without	1
1	8	Without	2
2	8	Even	1
3	8	Even	2
4	8	Odd	1
5	8	Odd	2

Set value	Data bit	Parity bit	Stop bit
6	7	Without	1
7	7	Without	2
8	7	Even	1
9	7	Even	2
10	7	Odd	1
11	7	Odd	2

: Not settable for Modbus

Continued on the next page.

Continued from the previous page.

Name	Data range	Factory set value
Input data type 	0: Number of measured value digits: 5 Number of RKC communication data digits: 7 Modbus: Double word PLC communication data: Double word (System data: Single word) 1: Number of measured value digits: 4 Number of RKC communication data digits: 6 Modbus: Single word PLC communication data: Single word 2: Number of measured value digits: 4 Number of RKC communication data digits: 6 Our REX-D series equivalent (Some identifiers are replaced with the REX-D series equivalent identifiers) Modbus data: Single word PLC communication data: Single word Select a single or a double word for the communication data. When changing the Input data type from 0 to 1 (or 2) and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand. The unit of time depends on the Input data type. In case of Input data type 0 FZ400/900: hour/minute/second, hour/minute, minute/second FZ110: hour/minute, minute/second In case of Input data type 1 hour/minute, minute/second (Refer to P. 3-9)	Depends on the input range code specified at the time of order.

: Communication data settable via the front keypad.



When changing the input data type, the following communication data may also need to be changed. Make necessary changes to the set value.

Input 1_Decimal point position	■ Decimal point position (Refer to P. 3-5)
Input 2_Decimal point position	
Input 1_Input range high	■ Input range low/Input range high (Refer to P. 3-7)
Input 1_Input range low	
Input 2_Input range high	■ Input range low/Input range high (Refer to P. 3-8)
Input 2_Input range low	
Soak time unit	■ Soak time unit (Refer to P. 3-11)



● Monitor item selection (Communication data of the monitor group)

Communication data of monitor group is assigned as a bit image in binary numbers. Set decimal-converted values.

Bit image: 0000000000000000 0: Unused
 Bit 15 ----- Bit 0 1: Used



The selected communication data is justified upward in the PLC register.



When the input data type is a double word, each communication data occupies two PLC registers.

Table 1 Monitor item selection 1

Bit	Communication data (Monitor item)	Factory set value	
		Binary	Decimal
0	Input 1_Measured value (PV)	1	3459
1	Input 1_Set value (SV) monitor	1	
2	Input 2_Measured value (PV)	0	
3	Input 2_Set value (SV) monitor	0	
4	PV select Measured value (PV)	0	
5	Measured value (PV) of differential temperature input	0	
6	Set value (SV) monitor of differential temperature input	0	
7	Input 1_Manipulated output value monitor [heat-side]	1	
8	Input 1_Manipulated output value monitor [cool-side]	1	
9	Input 2_Manipulated output value monitor	0	
10	Current transformer 1 (CT1) input value monitor	1	
11	Current transformer 2 (CT2) input value monitor	1	
12	Memory area soak time monitor	0	
13	Remote setting input value monitor	0	
14	Feedback resistance (FBR) input value	0	
15	Event 1 state monitor	0	

Table 2 Monitor item selection 2

Bit	Communication data (Monitor item)	Factory set value	
		Binary	Decimal
0	Event 2 state monitor	0	16512
1	Event 3 state monitor	0	
2	Event 4 state monitor	0	
3	Heater break alarm 1 (HBA1) state monitor	0	
4	Heater break alarm 2 (HBA2) state monitor	0	
5	Control loop break alarm 1 (LBA1) state monitor	0	
6	Control loop break alarm 2 (LBA2) state monitor	0	
7	Comprehensive event state	1	
8	Input 1_Burnout state monitor	0	
9	Input 2_Burnout state monitor	0	
10	Feedback resistance (FBR) break monitor	0	
11	DI state monitor	0	
12	OUT state monitor	0	
13	DO state monitor	0	
14	Overall operation status	1	
15	Memory area number monitor	0	

Continued on the next page.

Continued from the previous page.



When the input data type is a double word, each communication data occupies two PLC registers.

Table 3 Monitor item selection 3

Bit	Communication data (Monitor item)	Factory set value	
		Binary	Decimal
0	Input 1_PID memory	0	1024
1	Input 2_PID memory	0	
2	Input 1_Peak hold monitor	0	
3	Input 1_Bottom hold monitor	0	
4	Input 2_Peak hold monitor	0	
5	Input 2_Bottom hold monitor	0	
6	Input 1_AT remaining time monitor	0	
7	Input 2_AT remaining time monitor	0	
8	Input 1_AT/ST status monitor	0	
9	Input 2_AT/ST status monitor	0	
10	Error code	1	
11	Integrated operating time	0	
12	Unused	0	
13	Unused	0	
14	Unused	0	
15	Unused	0	



● Setting item selection (Communication data of Setting group)

Communication data of Setting group is assigned as a bit image in binary numbers. Set decimal-converted values.

Bit image: 0000000000000000 0: Unused
 Bit 15 ----- Bit 0 1: Used



The selected communication data is justified upward in the PLC register.



When the input data type is a double word, each communication data occupies two PLC registers.

Table 1 Setting item selection 1

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	1	Interlock release	0	16480
1	2	Memory area transfer	0	
2	3	Input 1_Hold reset	0	
3	4	Input 2_Hold reset	0	
4	5	Bottom suppression start signal	0	
5	6	RUN/STOP transfer	1	
6	7	Input 1_Autotuning (AT)	1	
7	8	Input 2_Autotuning (AT)	0	
8	9	Input 1_Startup tuning (ST)	0	
9	10	Input 2_Startup tuning (ST)	0	
10	11	Input 1_Auto/Manual transfer	0	
11	12	Input 2_Auto/Manual transfer	0	
12	13	Remote/Local transfer	0	
13	14	Control area Local/External transfer	0	
14	15	Input 1_Set value (SV)	1	
15	16	Input 2_Set value (SV)	0	

Table 2 Setting item selection 2

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	17	Set value (SV) of differential temperature	0	7850
1	18	Event 1 set value (EV1) Event 1 set value (EV1) [high]	1	
2	19	Event 1 set value (EV1') [low]	0	
3	20	Event 2 set value (EV2) Event 2 set value (EV2) [high]	1	
4	21	Event 2 set value (EV2') [low]	0	
5	22	Event 3 set value (EV3) Event 3 set value (EV3) [high]	1	
6	23	Event 3 set value (EV3') [low]	0	
7	24	Event 4 set value (EV4) Event 4 set value (EV4) [high]	1	
8	25	Event 4 set value (EV4') [low]	0	
9	26	Input 1_Proportional band [heat-side]	1	
10	27	Input 1_Integral time [heat-side]	1	
11	28	Input 1_Derivative time [heat-side]	1	
12	29	Input 1_Control response parameter	1	
13	30	Input 1_Proactive intensity	0	
14	31	Input 1_Manual reset	0	
15	32	Input 1_FF amount	0	

Continued on the next page.

Continued from the previous page.



When the input data type is a double word, each communication data occupies two PLC registers.

Table 3 Setting item selection 3

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	33	Input 1_Output limiter high [heat-side]	0	32768
1	34	Input 1_Output limiter low [heat-side]	0	
2	35	Input 1_Control loop break alarm (LBA) time	0	
3	36	Input 1_LBA deadband (LBD)	0	
4	37	Input 2_Proportional band	0	
5	38	Input 2_Integral time	0	
6	39	Input 2_Derivative time	0	
7	40	Input 2_Control response parameter	0	
8	41	Input 2_Proactive intensity	0	
9	42	Input 2_Manual reset	0	
10	43	Input 2_FF amount	0	
11	44	Input 2_Output limiter high	0	
12	45	Input 2_Output limiter low	0	
13	46	Input 2_Control loop break alarm (LBA) time	0	
14	47	Input 2_LBA deadband (LBD)	0	
15	48	Input 1_Proportional band [cool-side]	1	

Table 4 Setting item selection 4

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	49	Input 1_Integral time [cool-side]	1	771
1	50	Input 1_Derivative time [cool-side]	1	
2	51	Input 1_Overlap/Deadband	0	
3	52	Input 1_Output limiter high [cool-side]	0	
4	53	Input 1_Output limiter low [cool-side]	0	
5	54	Select Trigger type for Memory area transfer	0	
6	55	Area soak time	0	
7	56	Link area number	0	
8	57	Input 1_Setting change rate limiter (up)	1	
9	58	Input 1_Setting change rate limiter (down)	1	
10	59	Input 1_Auto/Manual transfer selection (Area)	0	
11	60	Input 1_Manipulated output value (Area)	0	
12	61	Input 2_Setting change rate limiter (up)	0	
13	62	Input 2_Setting change rate limiter (down)	0	
14	63	Input 2_Auto/Manual transfer selection (Area)	0	
15	64	Input 2_Manipulated output value (Area)	0	

Continued on the next page.



Continued from the previous page.



When the input data type is a double word, each communication data occupies two PLC registers.

Table 5 Setting item selection 5

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	65	Remote/Local transfer selection (Area)	0	0
1	66	Display update cycle	0	
2	67	Input 1_PV bias	0	
3	68	Input 1_PV digital filter	0	
4	69	Input 1_PV ratio	0	
5	70	Input 1_PV low input cut-off	0	
6	71	Input 2_PV bias (RS bias)	0	
7	72	Input 2_PV digital filter (RS digital filter)	0	
8	73	Input 2_PV ratio (RS ratio)	0	
9	74	Input 2_PV low input cut-off	0	
10	75	OUT1 proportional cycle time	0	
11	76	OUT2 proportional cycle time	0	
12	77	OUT3 proportional cycle time	0	
13	78	OUT1 minimum ON/OFF time of proportional cycle	0	
14	79	OUT2 minimum ON/OFF time of proportional cycle	0	
15	80	OUT3 minimum ON/OFF time of proportional cycle	0	

Table 6 Setting item selection 6

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	81	Heater break alarm 1 (HBA1) set value	1	5
1	82	Number of heater break alarm 1 (HBA1) delay times	0	
2	83	Heater break alarm 2 (HBA2) set value	1	
3	84	Number of heater break alarm 2 (HBA2) delay times	0	
4	85	Input 1_Manual manipulated output value	0	
5	86	Input 1_Level PID setting 1	0	
6	87	Input 1_Level PID setting 2	0	
7	88	Input 1_Level PID setting 3	0	
8	89	Input 1_Level PID setting 4	0	
9	90	Input 1_Level PID setting 5	0	
10	91	Input 1_Level PID setting 6	0	
11	92	Input 1_Level PID setting 7	0	
12	93	For system use	0	
13	94	Input 1_ON/OFF action differential gap (upper)	0	
14	95	Input 1_ON/OFF action differential gap (lower)	0	
15	96	Input 2_Manual manipulated output value	0	

Continued on the next page.

Continued from the previous page.



When the input data type is a double word, each communication data occupies two PLC registers.

Table 7 Setting item selection 7

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	97	Input 2_Level PID setting 1	0	0
1	98	Input 2_Level PID setting 2	0	
2	99	Input 2_Level PID setting 3	0	
3	100	Input 2_Level PID setting 4	0	
4	101	Input 2_Level PID setting 5	0	
5	102	Input 2_Level PID setting 6	0	
6	103	Input 2_Level PID setting 7	0	
7	104	For system use	0	
8	105	Input 2_ON/OFF action differential gap (upper)	0	
9	106	Input 2_ON/OFF action differential gap (lower)	0	
10	107	Input 1_AT bias	0	
11	108	Input 2_AT bias	0	
12	109	Open/Close output neutral zone	0	
13	110	Open/Close output differential gap	0	
14	111	FF amount learning	0	
15	112	Input 1_Determination point of external disturbance	0	

Table 8 Setting item selection 8

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	113	Input 2_Determination point of external disturbance	0	0
1	114	Cascade_Proportional band (master-side)	0	
2	115	Cascade_Integral time (master-side)	0	
3	116	Cascade_Derivative time (master-side)	0	
4	117	Cascade_Proportional band (slave-side)	0	
5	118	Cascade_Integral time (slave-side)	0	
6	119	Cascade_Derivative time (slave-side)	0	
7	120	Cascade_Digital filter	0	
8	121	Cascade_Scale high	0	
9	122	Cascade_Scale low	0	
10	123	PV select transfer level	0	
11	124	PV select transfer time	0	
12	125	Unused	0	
13	126	Unused	0	
14	127	Unused	0	
15	128	Unused	0	



● "Communication identifier" and "Modbus register address" of PLC communication environment items

Communication identifier (RKC communication)

(R/W: Read and Write)

Name	Identifier	Digits	Attribute
Station number	QV	7 or 6	R/W
PC number	QW		
Register type (D, R, W, ZR)	QZ		
Register start number (High-order 4-bit)	QS		
Register start number (Low-order 16-bit)	QX		
Monitor item register bias	R3		
Setting item register bias	R4		
Monitor item selection 1	R6		
Monitor item selection 2	R7		
Monitor item selection 3	R9		
Setting item selection 1	RE		
Setting item selection 2	RF		
Setting item selection 3	RG		
Setting item selection 4	RH		
Setting item selection 5	RI		
Setting item selection 6	RJ		
Setting item selection 7	RK		
Setting item selection 8	RL		
Instrument link recognition time	QT		
PLC response waiting time	VT		
PLC communication start time	R5		
Slave register bias	R8		
Number of recognizable devices	QU		
Device address	IP		
Communication speed	IR		
Data bit configuration	IQ		
Interval time	IT		

Modbus register address (Double word)

(R/W: Read and Write)

Name	Register address				Attribute
	HEX (Hexadecimal)		DEC (Decimal)		
	Low-order	High-order	Low-order	High-order	
Device address	0278	0279	632	633	R/W
Communication speed	027A	027B	634	635	
Data bit configuration	027C	027D	636	637	
Interval time	027E	027F	638	639	
Register type (D, R, W, ZR)	0280	0281	640	641	
Register start number (High-order 4-bit)	0282	0283	642	643	
Register start number (Low-order 16-bit)	0284	0285	644	645	
Monitor item register bias	0286	0287	646	647	
Setting item register bias	0288	0289	648	649	
Instrument link recognition time	028A	028B	650	651	
PLC response waiting time	028C	028D	652	653	
PLC communication start time	028E	028F	654	655	
Slave register bias	0290	0291	656	657	
Number of recognizable devices	0292	0293	658	659	
Station number	0294	0295	660	661	
PC number	0296	0297	662	663	
Monitor item selection 1	0298	0299	664	665	
Monitor item selection 2	029A	029B	666	667	
Monitor item selection 3	029C	029D	668	669	
Setting item selection 1	029E	029F	670	671	
Setting item selection 2	02A0	02A1	672	673	
Setting item selection 3	02A2	02A3	674	675	
Setting item selection 4	02A4	02A5	676	677	
Setting item selection 5	02A6	02A7	678	679	
Setting item selection 6	02A8	02A9	680	681	
Setting item selection 7	02AA	02AB	682	683	
Setting item selection 8	02AC	02AD	684	685	



Modbus register address (Single word)

(R/W: Read and Write)

Name	Register address		Attribute
	HEX (Hexadecimal)	DEC (Decimal)	
Device address	213C	8508	R/W
Communication speed	213D	8509	
Data bit configuration	213E	8510	
Interval time	213F	8511	
Register type (D, R, W, ZR)	2140	8512	
Register start number (High-order 4-bit)	2141	8513	
Register start number (Low-order 16-bit)	2142	8514	
Monitor item register bias	2143	8515	
Setting item register bias	2144	8516	
Instrument link recognition time	2145	8517	
PLC response waiting time	2146	8518	
PLC communication start time	2147	8519	
Slave register bias	2148	8520	
Number of recognizable devices	2149	8521	
Station number	214A	8522	
PC number	214B	8523	
Monitor item selection 1	214C	8524	
Monitor item selection 2	214D	8525	
Monitor item selection 3	214E	8526	
Setting item selection 1	214F	8527	
Setting item selection 2	2150	8528	
Setting item selection 3	2151	8529	
Setting item selection 4	2152	8530	
Setting item selection 5	2153	8531	
Setting item selection 6	2154	8532	
Setting item selection 7	2155	8533	
Setting item selection 8	2156	8534	

● Monitor data related to PLC communication

Communication identifier (RKC communication)

(RO: Read only)

Name	Identifier	No. of digits	Attribute
PLC communication error code	ES	7 or 6	RO
PLC communication instrument recognition flag 1	QN		
PLC communication instrument recognition flag 2	QO		

For the data contents, refer to **P. 6-26** and **P. 6-27**.



5.2.2 Explanation of PLC communication environment setting function

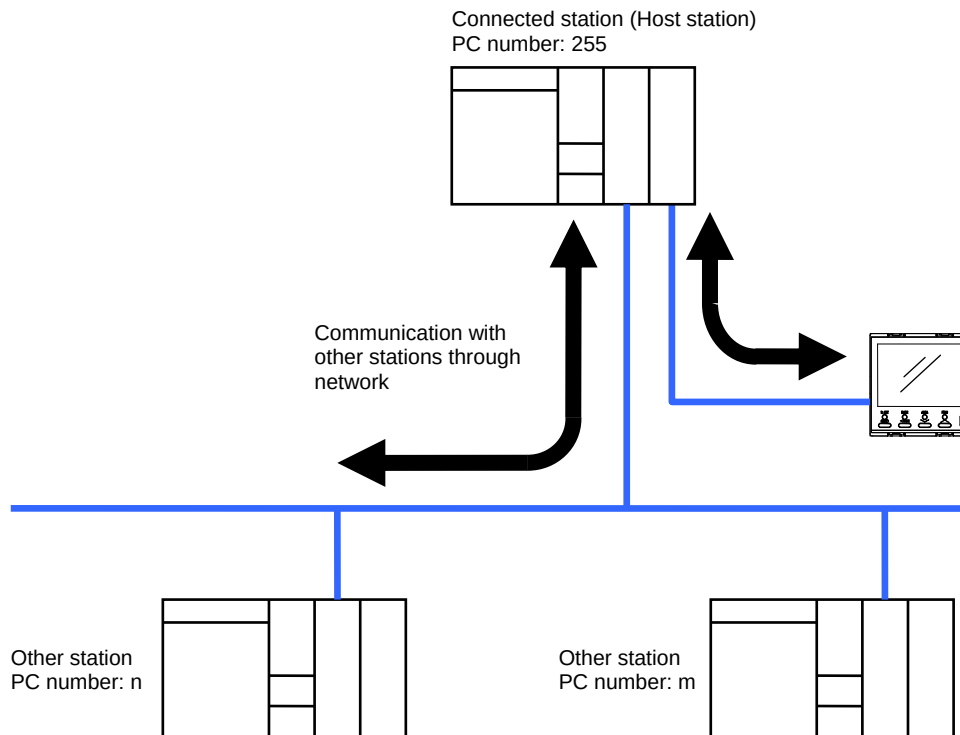
■ PC number

This is a communication data to set a station number of the PLC that communicates with the FZ.

Set the PC number of the connected station (host station) of the PLC, because the connected station (host station) is usually connected to the FZ. (Example: PC number of PLC by Mitsubishi PLC: 255)

In the network where multiple PLCs are connected, to communicate with the other PLC over the network, set the PC number of the target PLC to the FZ.

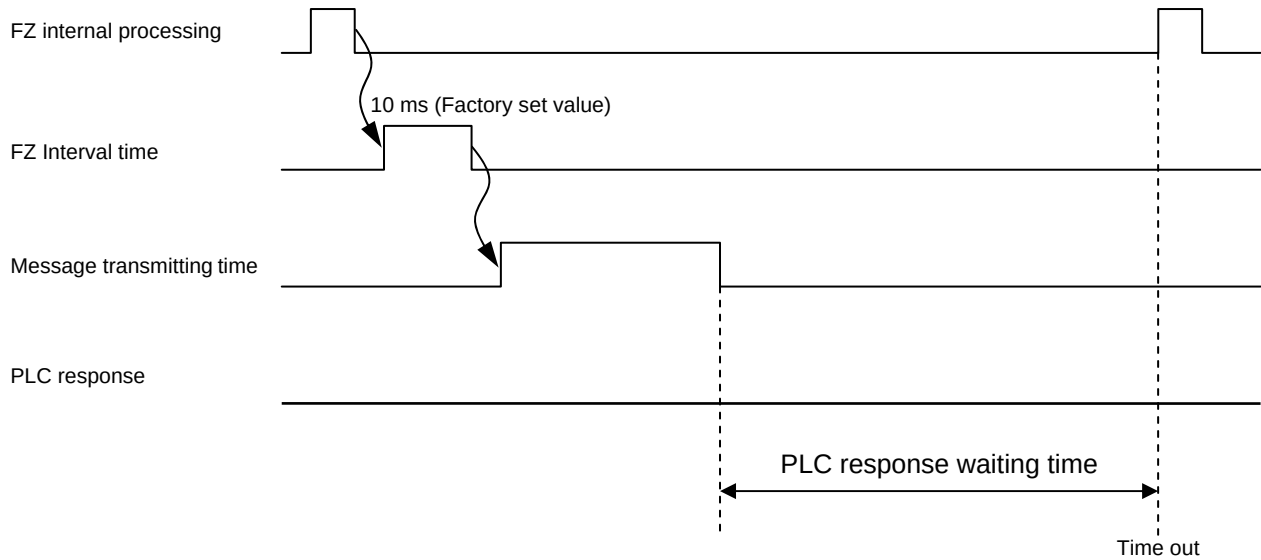
Example: PLC by Mitsubishi Electric



PC number, name, and data range of a PLC and PC number of a connected station (host station) may vary by the PLC. Consult the manual of the PLC for details.

■ PLC response waiting time

The FZ waits for a response for a certain period of time after the data has been sent to the PLC. If there is no response within the preset time, the FZ determines that there was a timeout and sends the next data. This preset time is defined as a PLC response waiting time.





■ Changing the register type

The register type used for PLC communication can be changed. The factory set value is set to D register (data register).

■ Register start number, Monitor item register bias, Setting item register bias

The area to be used in the PLC register address can be set. Data that can be communicated by PLC communication is arranged in the order “system data,” “monitor group” and “setting group.”

- In “Register start number (High-order 4-bit)” and “Register start number (Low-order 16-bit),” set the start number (start number of system data) of the register used for PLC communication. (factory set value: 1000)
- In “Monitor item register bias,” set the start number of the monitor group. The bias will be applied to the register start number (start number of system data). (factory set value: 12)

Equation for calculating:

Register start number of monitor group = Register start number + Monitor item register bias

- In “Setting item register bias,” set the start number of the setting group.

If the Setting item register bias set from 0 to 11, the set bias value becomes invalid.

The setting group register start number will be assigned following the register that has the last number in the monitor group. (factory set value: 0)

If set to 12 or more (12 to 65535), a bias is added to the start number of the register (start number of system data). If set to 12 or greater, take care that overlapping data of the monitor group and the register address does not occur.

Equation for calculating (When set to 12 or more):

Register start number of setting group = Register start number + Setting item register bias

Register address example of PLC communication data (factory set value)

Communication data type	Register address		Contents
	Double word	Single word	
System data	D1000	D1000	Start number [Register start number (Low-order 16-bit)]
	⋮	⋮	⋮
	D1011	D1011	Last number
Communication data of monitor group	D1012	D1012	Start number [Monitor item register bias factory set value: 12]
	⋮	⋮	⋮
	D1029	D1020	Last number
Communication data of setting group	D1030	D1021	Start number [Setting item register bias Factory set value: 0]
	⋮	⋮	⋮
	D1065	D1038	Last number



For register address of PLC communication data, refer to **6.2 PLC Communication Data Map (P. 6-23)**.

● Setting method of the register start number

When any numbers from 0 to 65535 are set to the register start number:

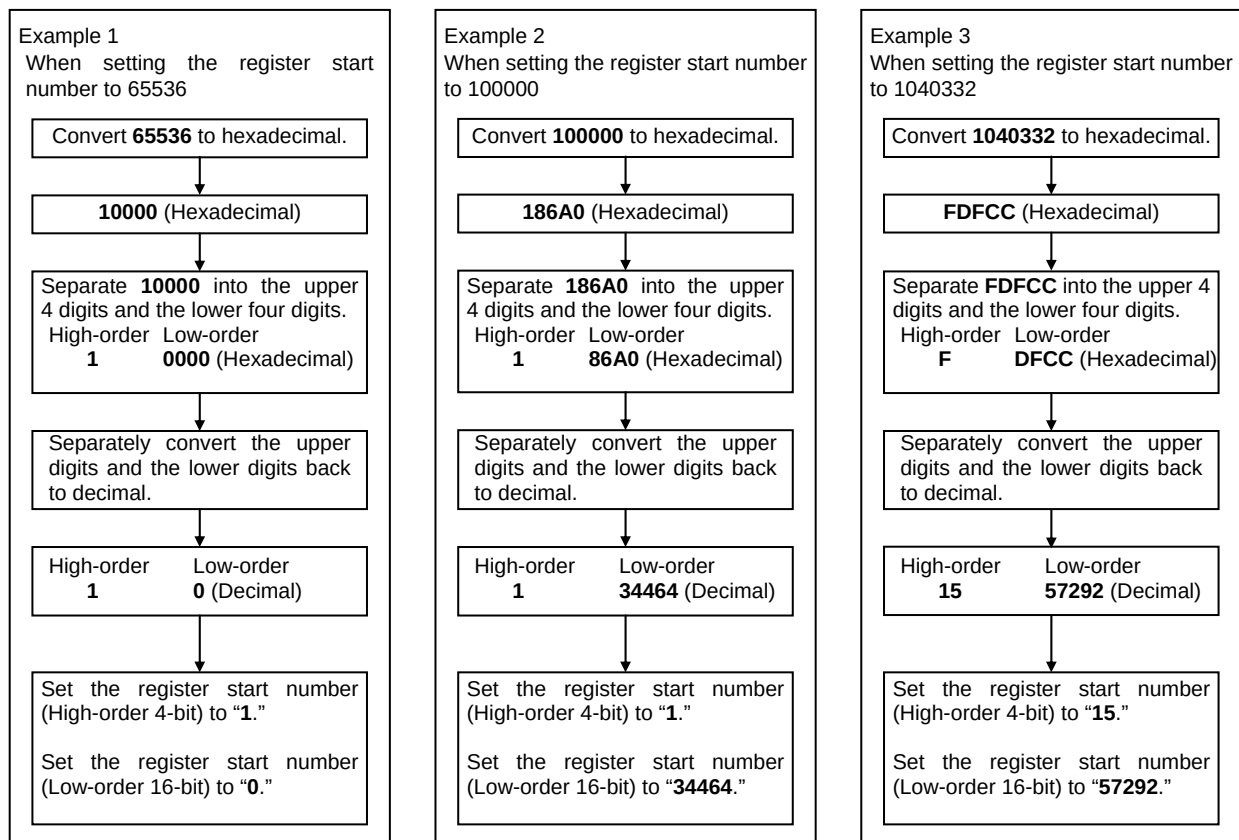
1. Set the register start number (High-order 4-bit) to 0.
2. In the register start number (low-order 16-bit), set the register address to a value from 0 to 65535.

Example: When setting the register start number to "10188"



When any numbers from 65536 to 1048575 are set to the register start number:

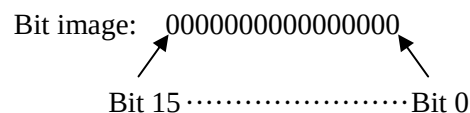
If set within the range from 65536 to 1048575, the register address must be converted. The converted register address is set in two parts in the register start number (high-order 4-bit) and the register start number (low-order 16-bit). Set the value as shown in the example below.



■ Monitor item selection and Setting item selection

This setting is used to shorten the data update period by eliminating unneeded items from the data communicated to the PLC. Only communication data selected using this setting is written to the PLC.
(The amount of the PLC register that is used can also be reduced.)

Monitor item selection or setting item selection state is assigned as a bit image in binary numbers.



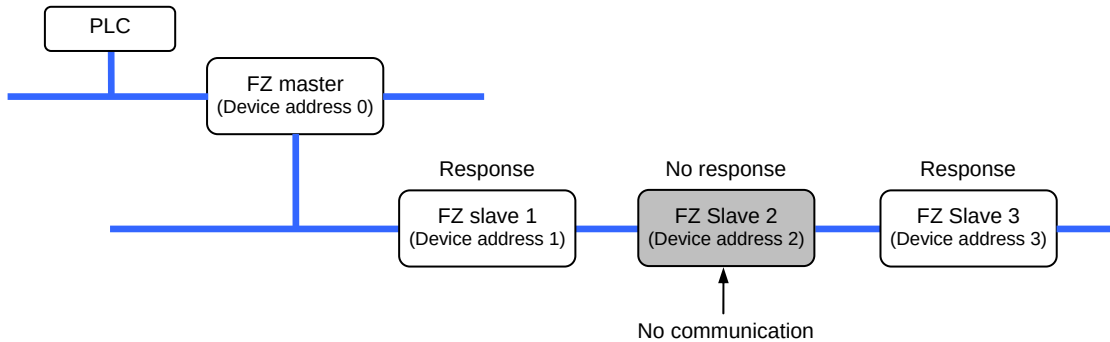


■ Instrument link recognition time

This is defined as the time until the FZ master (with a device address of 0) recognizes the connected FZ slaves (with a device address 1 to 30). Recognition processing is performed when power is supplied.

When the FZ master is powered on, after the elapse of PLC communication start time, the FZ master searches for any FZ slaves within the instrument link recognition time.

The FZ slaves which have not responded at all to the FZ master within the instrument link recognition time are determined to be nonexistent. After this recognition processing, the FZ master only communicates with the existing FZ slaves.



NOTE

This setting item must be used only on the FZ with a device address of 0.

● To calculate Instrument link recognition time (at power on)



The times shown are the processing times when the interval time is set to 10 milliseconds (factory set value).

Instrument link recognition time (seconds)

= FZ master processing time + (FZ slave processing time × Number of instrument recognition)

Communication speed	FZ processing time (Per one controller)
19200 bps	0.35 seconds
57600 bps	0.21 seconds

[Example]

The set value of the number of the instrument recognition = 10 and Communication speed = 19200 bps

FZ master processing time + (FZ slave processing time × Number of instrument recognition)
 = 0.35 seconds + (0.35 seconds × 10)
 = 3.85 seconds

Since the time unit of Instrument link recognition time is one second, the set value is 4 seconds.

Slave register bias

When two or more FZ are connected, a bias can be set to prevent duplication of register addresses.

Setting the slave register bias prevents duplication of register addresses of each FZ by the address setting switch.

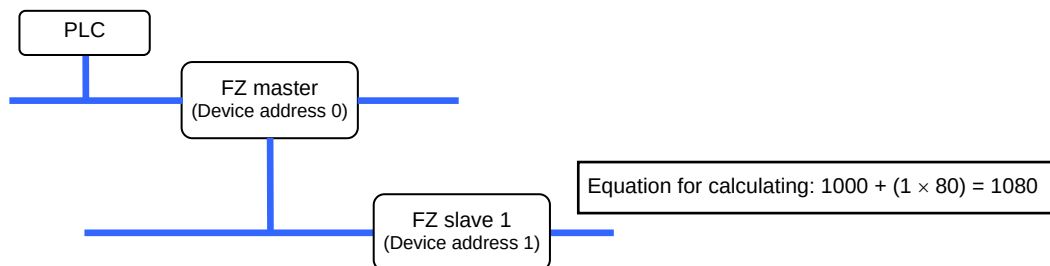
Equation for calculating:

Slave register start number = Register start number of master + (Device address × Slave register bias)

Register address example of PLC communication data (double word)

- Using two FZ
- Register start number of FZ master: 1000 (factory set value)
- Slave register bias value of FZ slave: 80 (factory set value)
- Monitor item register bias: 12 (factory set value)
- Setting item register bias: 0 (factory set value)

When the address of FZ slave is set to 1, the data is assigned to the register addresses indicated in the table below.



Communication data type	PLC register address	Contents
System data	D1000	Start number [Register start number (Low-order 16-bit)]
	⋮	
	D1011	Last number
Communication data of monitor group	D1012	Start number [Monitor item register bias]
	⋮	
	D1029	Last number
Communication data of setting group	D1030	Start number [Setting item register bias]
	⋮	
	D1079	Last number
System data	D1080	Start number [Register start number (Low-order 16-bit)]
	⋮	
	D1091	Last number
Communication data of monitor group	D1092	Start number [Monitor item register bias]
	⋮	
	D1109	Last number
Communication data of setting group	D1110	Start number [Setting item register bias]
	⋮	
	D1159	Last number

Register numbers in the PLC occupied with the communication data of the FZ master (with a device address of 0).

Register numbers in the PLC occupied with the communication data of the FZ slave (with a device address of 1).



MEMO



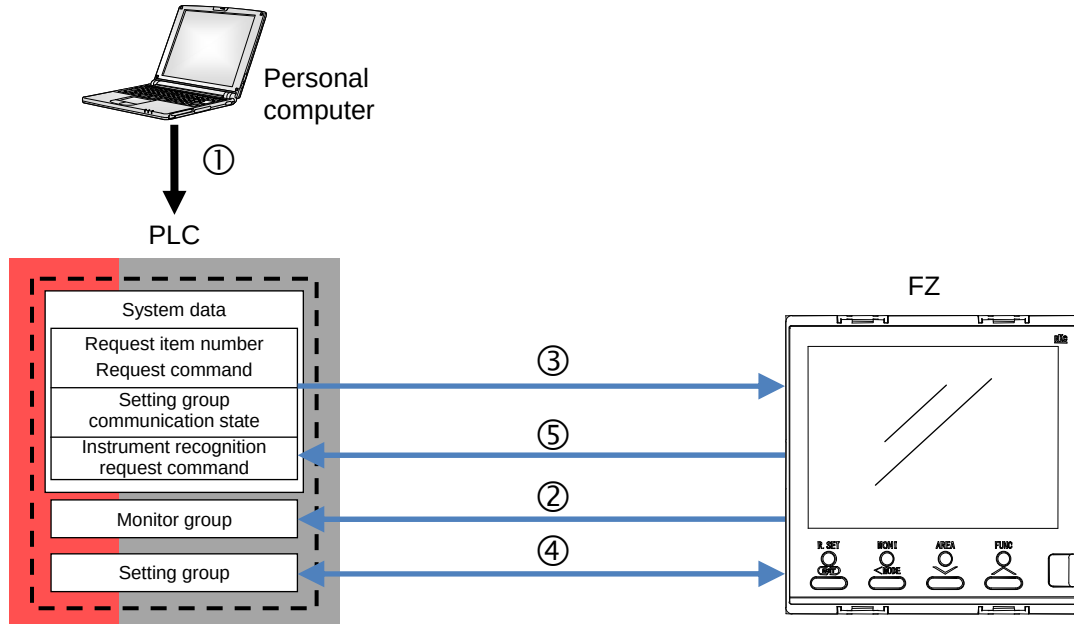
COMMUNICATION DATA

6

6.1 Data Transfer	6-2
6.2 PLC Communication Data Map	6-23
6.3 Example of PLC Communication Data Map Editing.....	6-61

6.1 Data Transfer

The communication data transmitted between the PLC and the FZ is compiled in the PLC communication data map (hereafter, called data map). In the PLC communication data map the communication data is classified into system data, monitor group, and setting group.

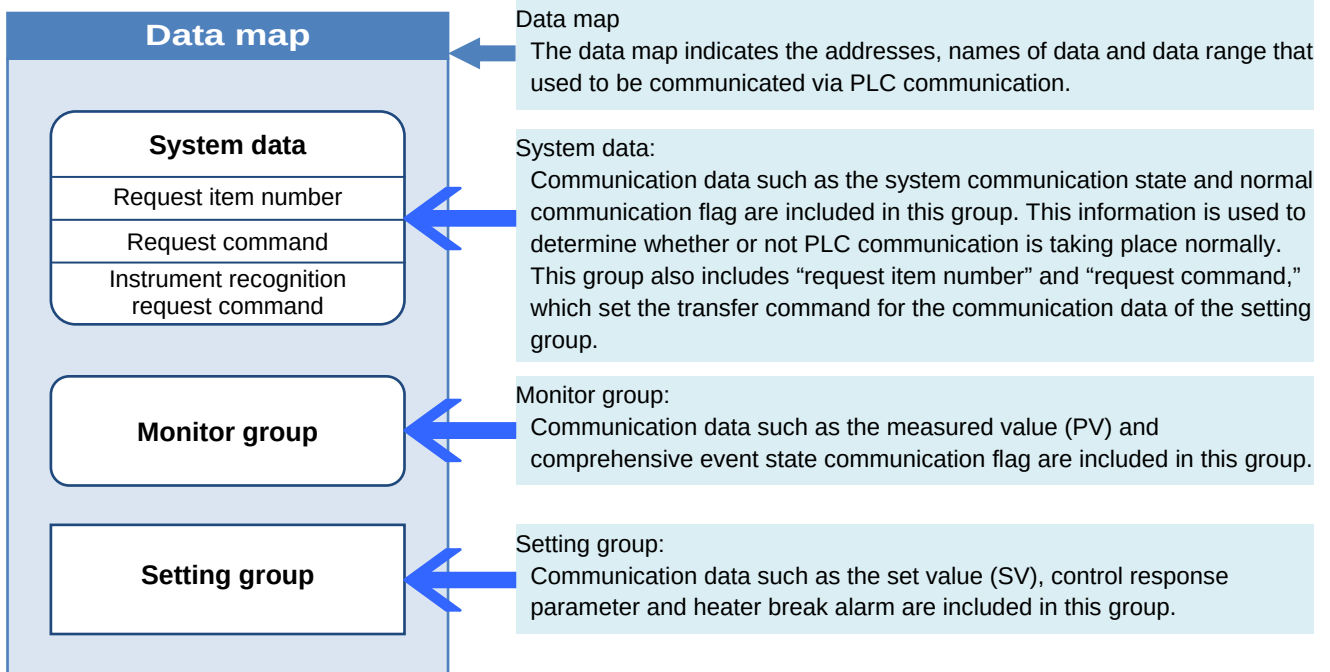


Communication procedures:

- ① Enter Request item number and Request command into the PLC register.
- ② Communication data in the Monitor group is constantly written into the PLC.
- ③ Request item number, Request command, and Instrument recognition request command are read out by the FZ.
- ④ The FZ implements read or write of the communication data in the Setting group in accordance with the Request item number, Request command, and Instrument recognition request command.
- ⑤ The FZ writes communication status (such as setting error and setting completed) into the PLC registers.

6.1.1 Data group

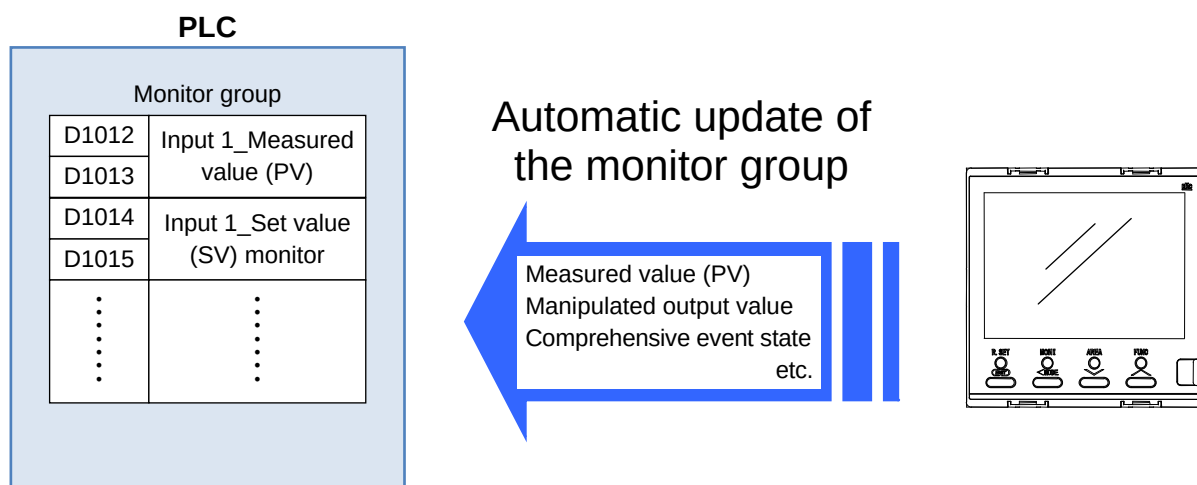
Communication data in the data map is categorized into groups: System data, Monitor group, and Setting group as shown below.



In the following explanation, an operation example is described showing factory preset register address (double word for Input data type).

■ Monitor group (PLC ← FZ)

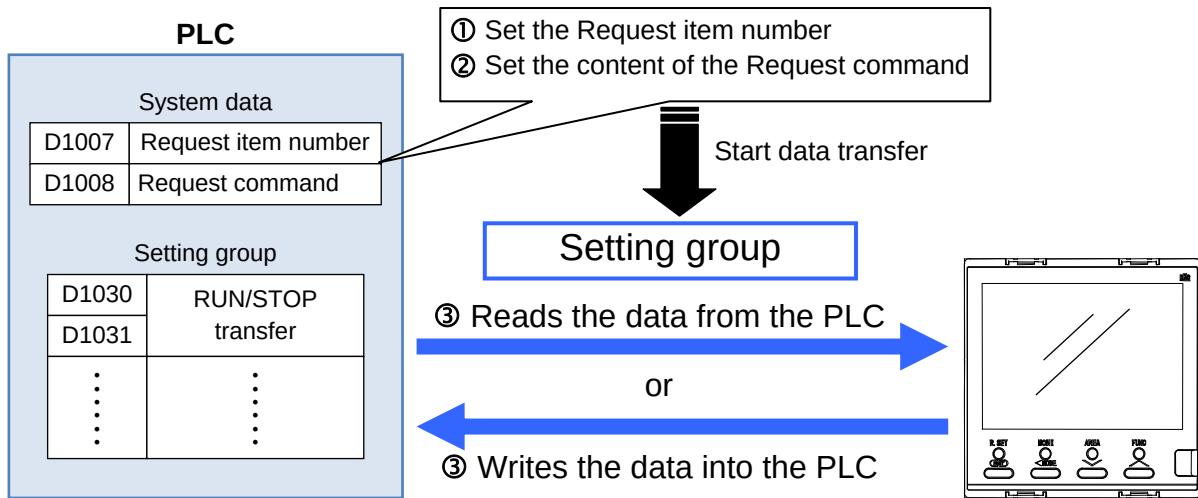
The communication data of the monitor group does not have a request command setting.



For the communication data of monitor group, refer to **6.2 PLC Communication Data Map (P. 6-23)**.

Request item number, and Request command (system data)

Request item number and Request command are commands for transferring the communication data of the setting group. When set values are set into the registers of Request item number register and Request command register in the PLC, communication data in the setting group will be transferred.

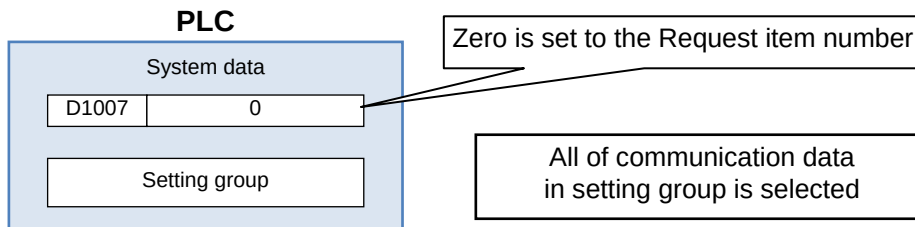


(1) Request item number

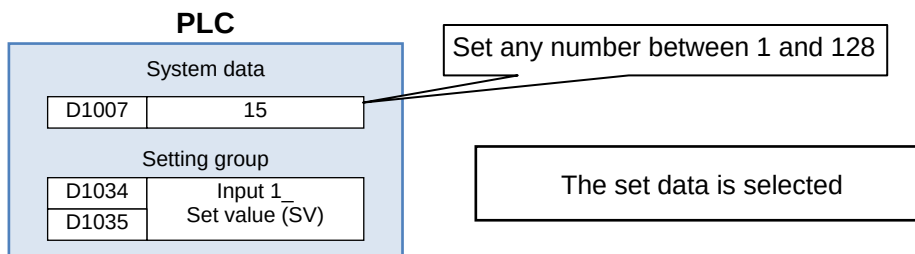
This command sets the communication data of the setting group that is transferred. Set transfer of all communication data of the setting group, or transfer by one data item. [Register address: D1007 (factory set value)]

Setting range: 0 or 1 to 128

- When set to 0, all communication data of the setting group is transferred.



- When set to a number from 1 to 128 (item number), only the set communication data item is transferred (transfer by one data item).



Communication data that has been set to “unused” (binary: 0) in the setting item selection of the PLC communication environment will not be transferred.



When set to a number from 1 to 128 (item number), the value of request item number will not return to 0 even after setting request or monitor request processing is completed.



For item numbers 1 to 128, refer to “● Setting item selection (Communication data of Setting group)” (P. 5-10).

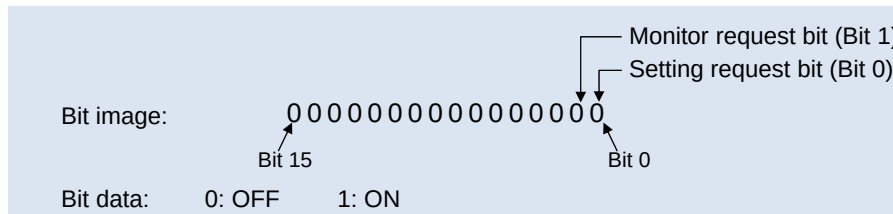
(2) Request command

Request command is a command to transfer the communication data of the setting group selected in the Request item number.

For the request command, both “Setting request bit” and “Monitor request bit” are available.

The Setting request bit and Monitor request bit of the request command are assigned to each bit datum as a binary number.

[Register address: D1008 (Factory set value)]

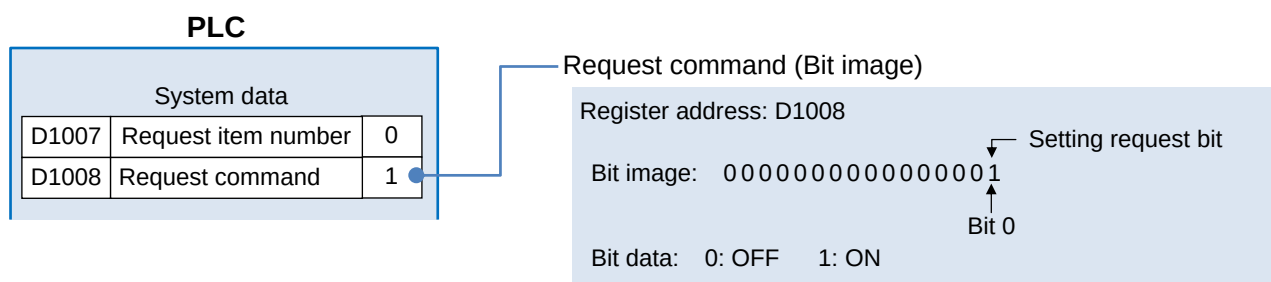


● Setting request bit (PLC → FZ).....Set the PLC communication data on to the FZ.

This command requests that the FZ read the communication data of the setting group on the PLC side.

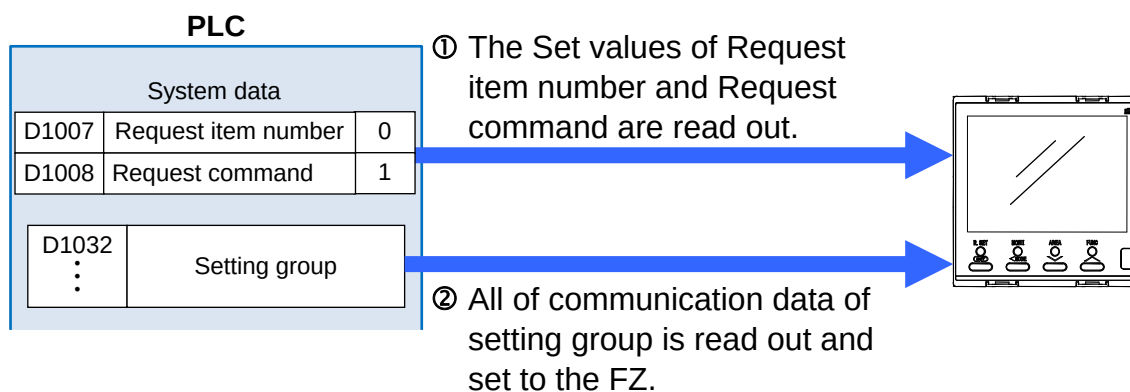
Processing example: Read out all communication data of PLC setting group to the FZ.

1. Set “0” to Request item number (D1007) and “1” to Request command (D1008).



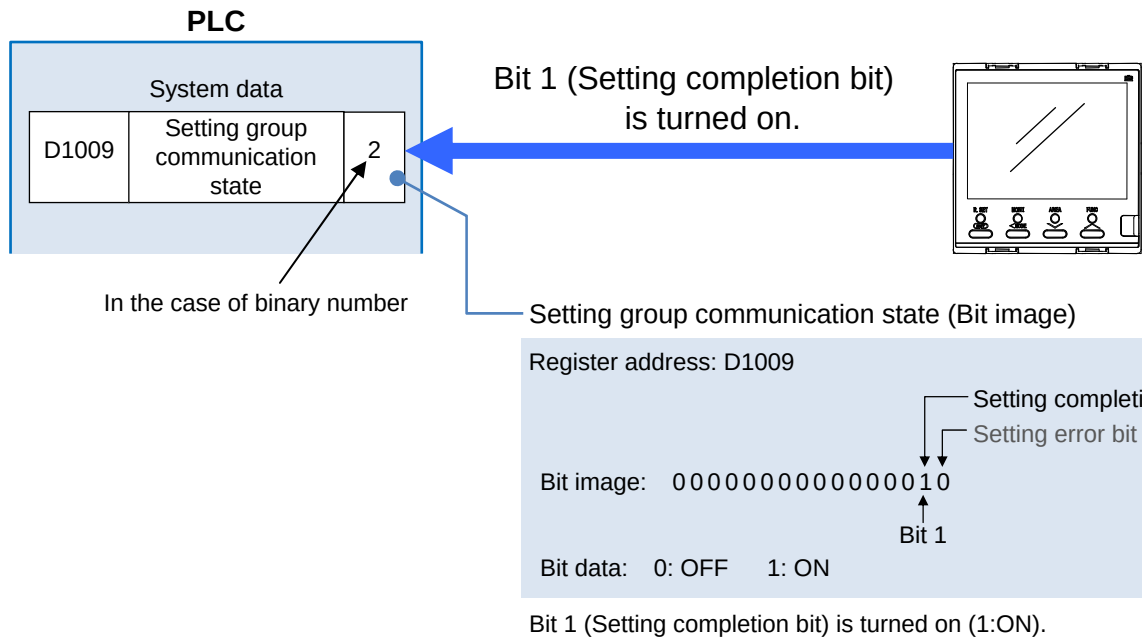
For a bit image, set “1” to the Bit 0 (Setting request bit).

2. The FZ checks the content set at Request item number and Request command, and reads out the communication data of the setting group from the PLC register.



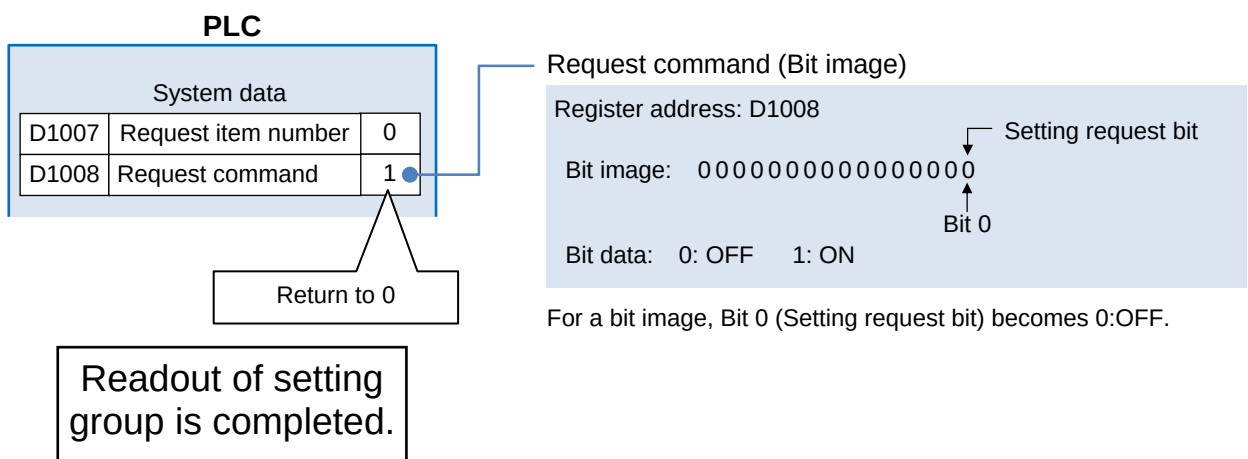


3. When the readout is completed, the FZ writes the communication state of setting group to the Setting completion bit (Bit 1) of the Setting group communication state (D1009).



If there is an error in the setting range of the data, the setting error bit (Bit 0) will change to “1.” Check and see if there is an error in the values set in the PLC register.

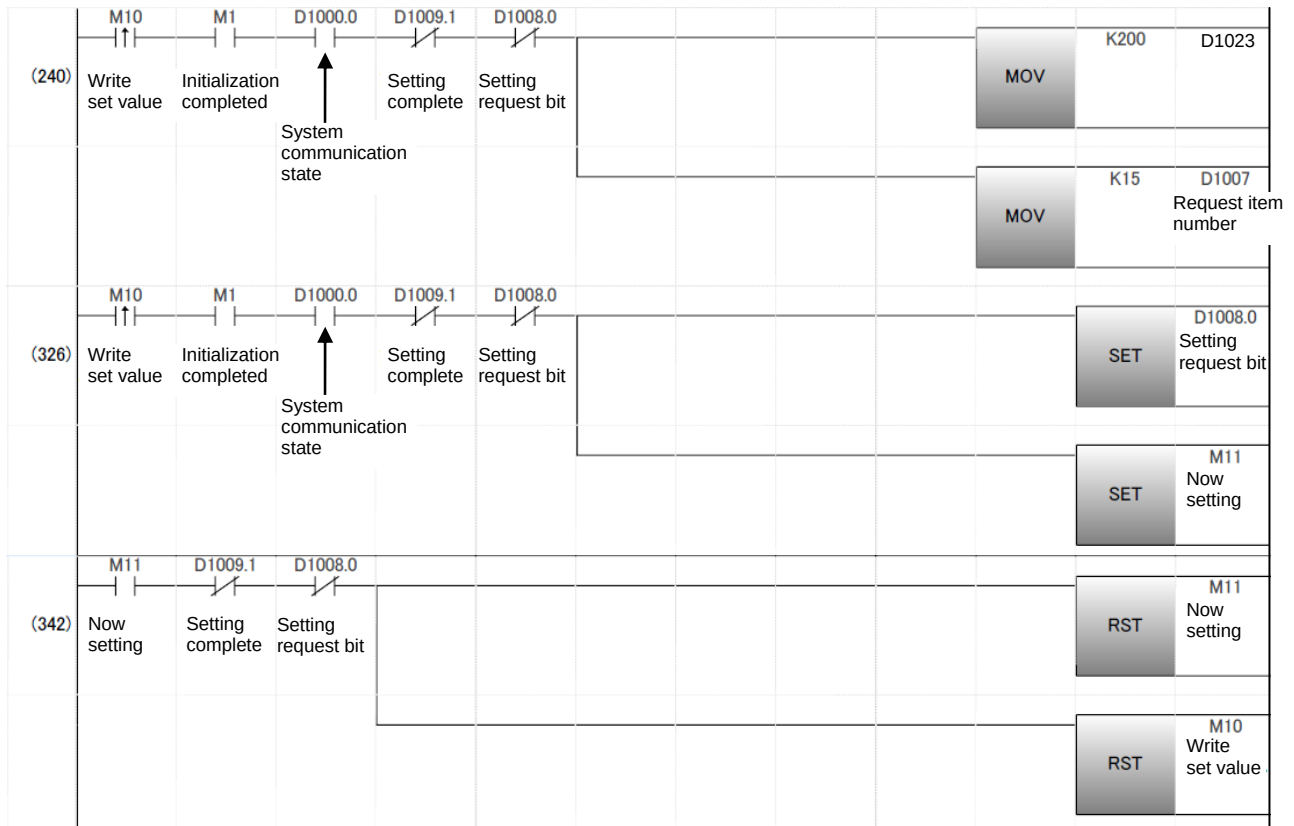
4. The Request command (D1008) will change to “0” to indicate that reading of data from the PLC is finished.



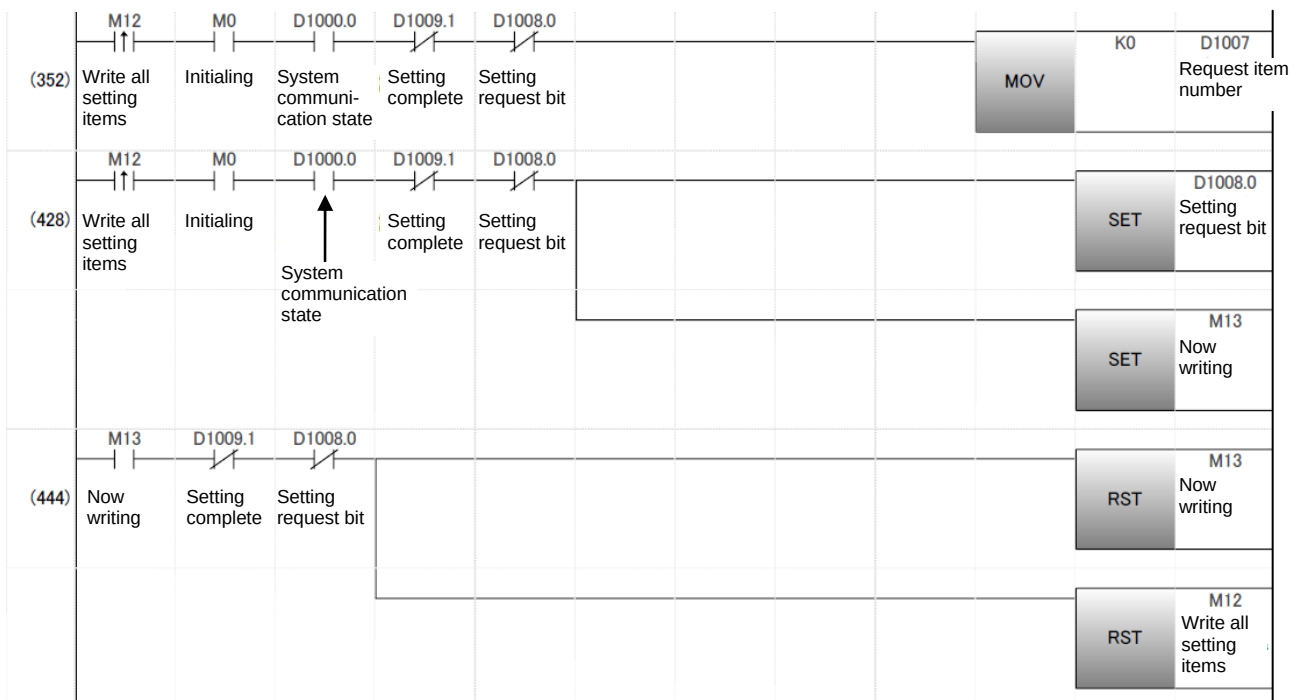
Refer to P. 6-7 for a programming example.

Program example:

Read out a Input 1_Set value (SV) of PLC to the FZ.



Read out all communication data of PLC setting group to the FZ.



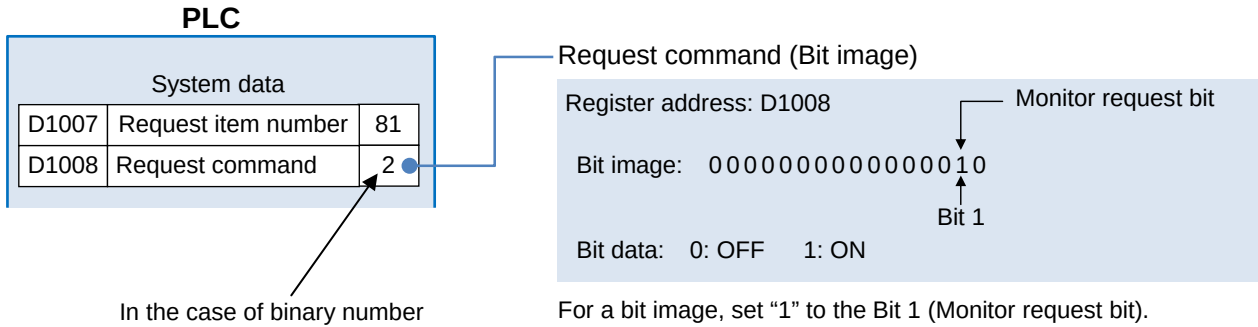
The sample program is intended solely for purposes of example and the operation is not guaranteed. When you create a program using the sample program, check the operation of the program and use it on your own responsibility.

- **Monitor request bit (PLC ← FZ).....**Set the communication data of the FZ to the PLC.

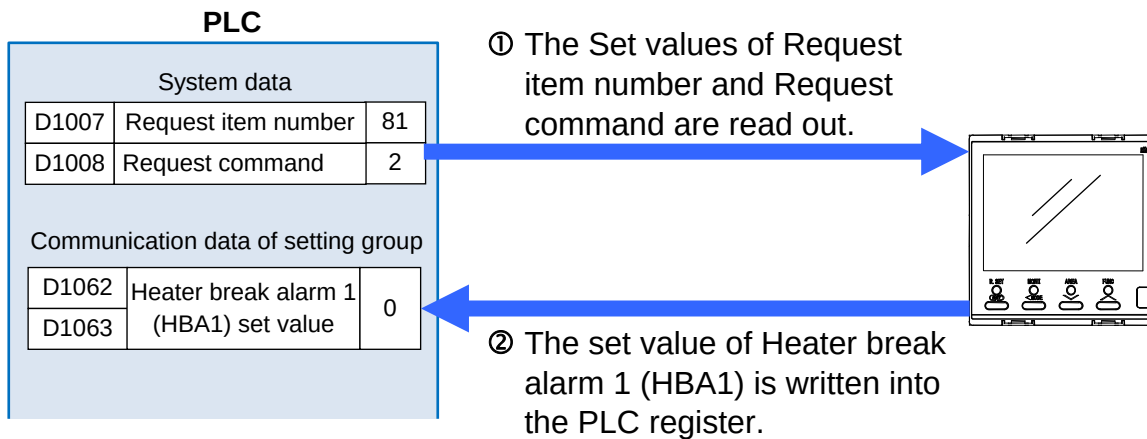
Monitor request bit is a command to request the communication data of the FZ setting group to be written into the PLC register.

Processing example: Writing a Set value of Heater break alarm 1 (HBA1) of the FZ into the PLC.

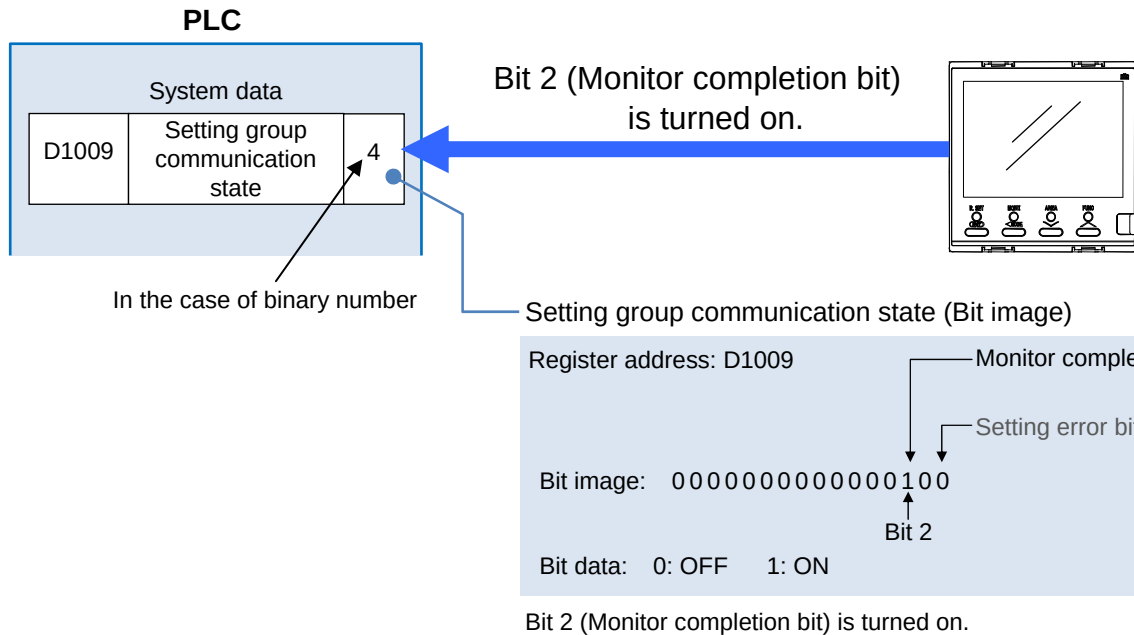
1. Set “81” to Request item number (D1007) and “2” to Request command (D1008).



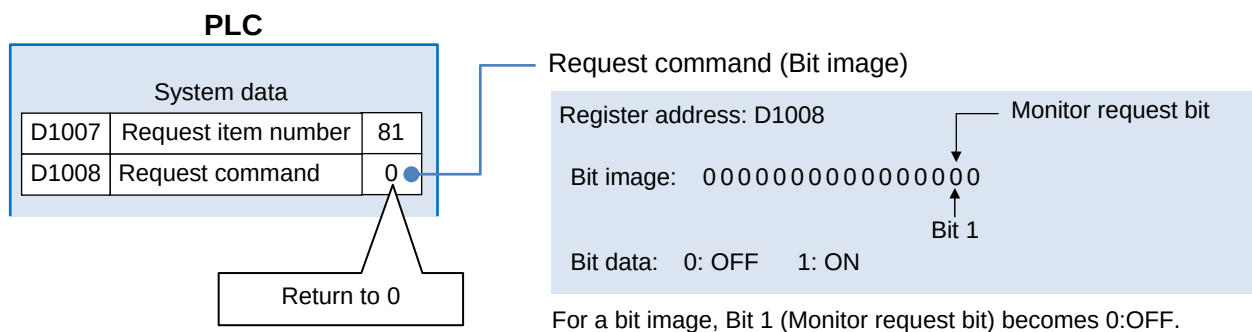
2. The FZ checks the content set at Request item number and Request command and writes the set value of Heater break alarm 1 (HBA1) into the PLC register.



3. When writing is finished, the FZ writes the communication state of the setting group to the Monitor completion bit (Bit 2) of setting group communication state (D1009).



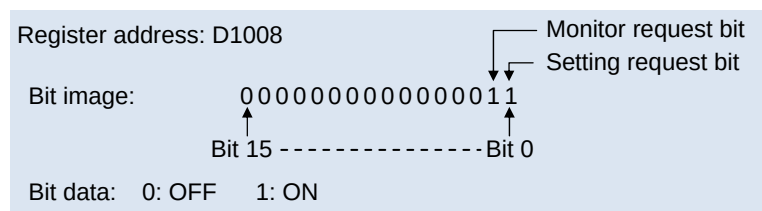
4. The request command (D1008) will change to “0” to indicate that reading of data from the PLC is finished.



Writing the set value of
Heater break alarm 1
(HBA1) is completed.

☞ Refer to **P. 6-10** for a programming example.

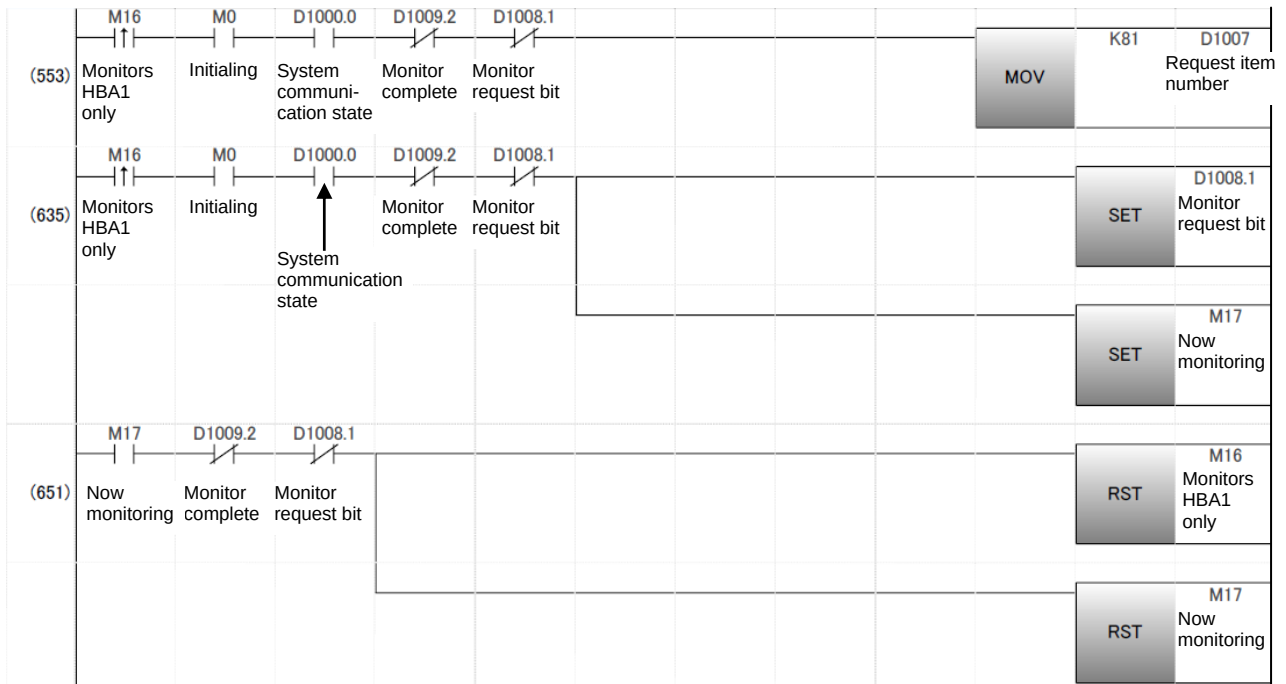
 When setting both the setting request bit (Bit 0) and the monitor request bit (Bit 1) to “1,” set the bits simultaneously. If set separately, the bit set later may be disregarded.



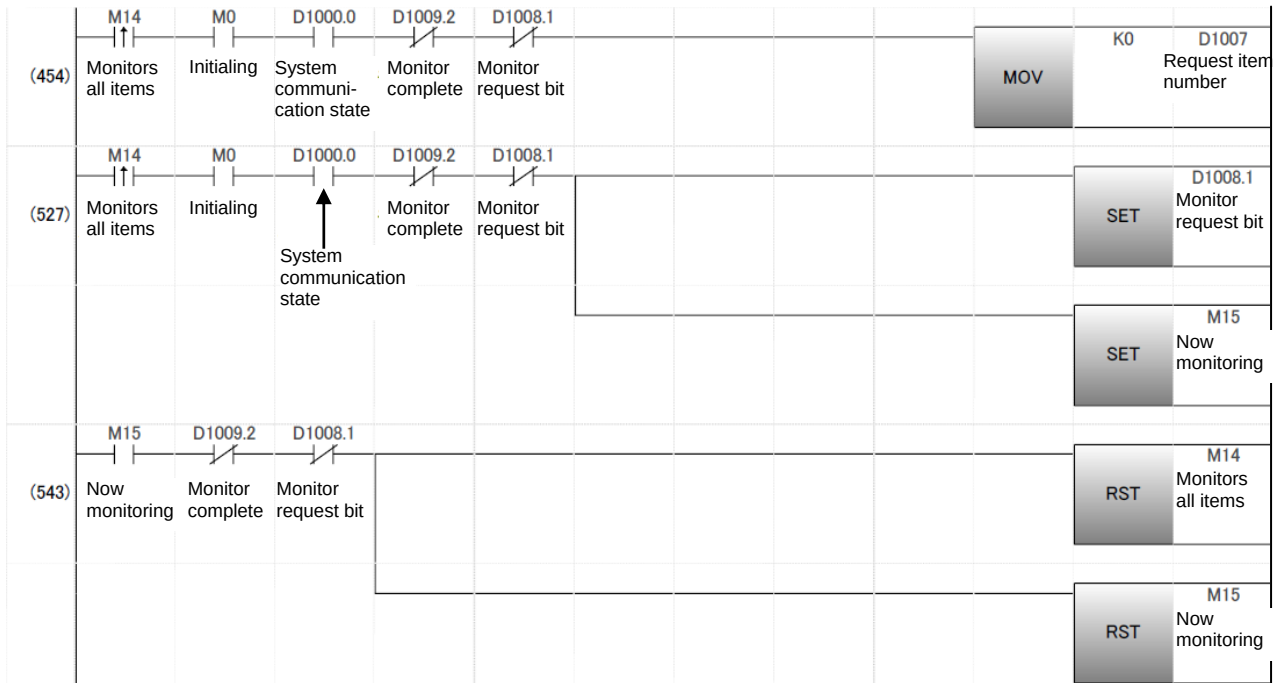


Program example:

Writing a Set value of Heater break alarm 1 (HBA1) of the FZ into the PLC.



Writing an all communication data of FZ setting group to the PLC.



The sample program is intended solely for purposes of example and the operation is not guaranteed. When you create a program using the sample program, check the operation of the program and use it on your own responsibility.

Instrument recognition request command (system data)

This is a request command to update the number of the FZ slaves (device address 1 to 30) recognized by the FZ master (device address 0). Recognition processing is conducted for the quantity of the instrument registered in the Number of recognizable devices (maximum value of device address) of the PLC communication environment items.

When some FZ slaves are not required and need to be turned off in a certain work process, perform the Instrument recognition request command to update the number of FZ slaves recognized by the FZ master. Then the FZ master will not perform the communication request and as a result the communication cycle will be made faster.

Setting range: 0: Waiting for a request

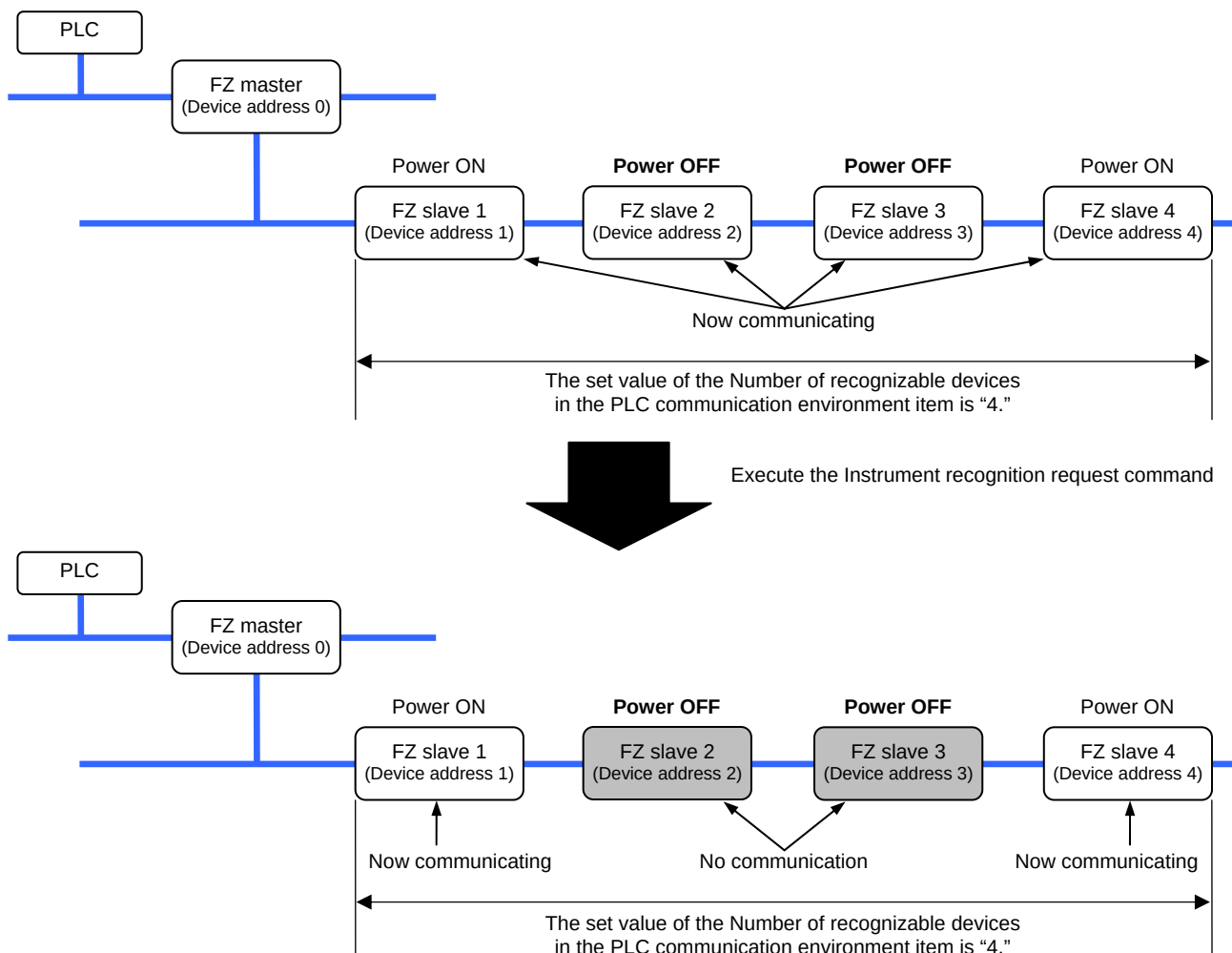
1: Execute instrument recognition processing

(After the recognition, the command state returns to "0")



NOTE

While Recognition processing is being implemented, do not operate the Request command.
The Instrument recognition request command must be used only on the FZ with a device address of 0.



Executing the Instrument recognition request command will not change the set value of Number of recognizable devices in the PLC communication environment items.



Execution example of the Instrument recognition request command:

- When some FZ slaves are turned off depending on the working process
If any of the FZ slaves recognized by the FZ master is turned off, the FZ master must wait for a reply from the FZ slave until timeout is reached. This may lead to a longer communication cycle.
In such a case, execute the Instrument recognition request command. The FZ master will not request communication with the FZ slaves which gave no response to the FZ master. This will quicken the communication cycle.
- When there are any FZ slaves which need to be turned on after the FZ master has been turned on
If the FZ slaves that were off when the FZ master made a recognition processing of the FZ slaves (power-on of the FZ master or execution of the Instrument recognition request command) have been turned on, perform the Instrument recognition request command.
Communication will be established with the FZ slave which was off in the last recognition process.



When the quantity of the FZ slave has been increased, some FZ slaves may not be recognized if the Instrument link recognition time is set short. Set the Instrument link recognition time longer for such a case. (Refer to **P. 5-5**)



When the quantity of the FZ slave is increased, make sure the Number of recognizable devices is properly set, otherwise, some FZ slaves may not be recognized.
In this case, change the set value of the Number of recognizable devices. (Refer to **P. 5-6**)

Program example:



The sample program is intended solely for purposes of example and the operation is not guaranteed. When you create a program using the sample program, check the operation of the program and use it on your own responsibility.

■ Communication data that works with the Memory area

The memory area data inside the setting group will not be automatically updated by switching the Memory area from the PLC side.

Use either (1) or (2) below to do the update processing.



For the communication data that works with the Memory area, refer to **6.2 PLC Communication Data Map (P. 6-23)**.

(1) Update the memory area data one after another using Request item number and Request command

After having switched the memory area, write Memory area data one after another into the PLC register using Request item number and Request command.

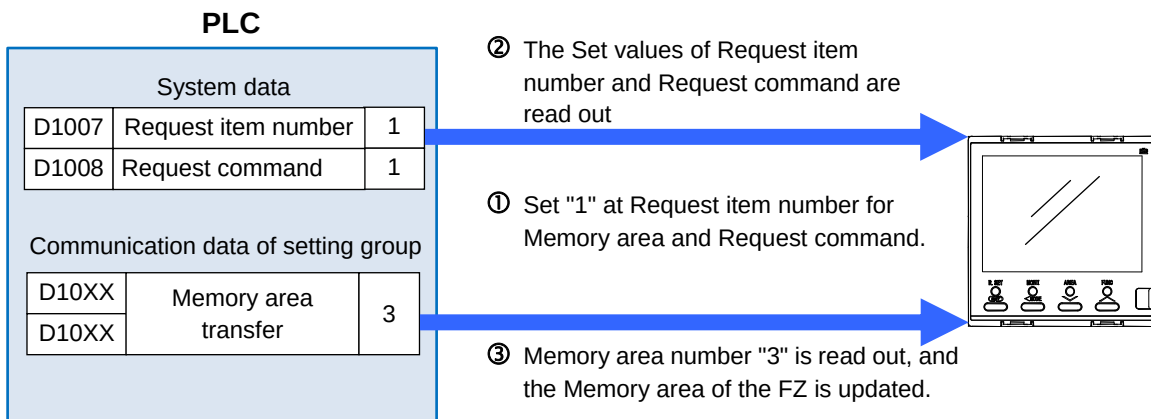
1. Set the Memory area number to change into the PLC register.

PLC		
Communication data of setting group		
D10XX	Memory area transfer	3
D10XX		

Example:

Change the Memory area number from 1 to 3.

2. Set commands of Request item number and Request command into the PLC register, then the Memory area of the FZ will be changed.



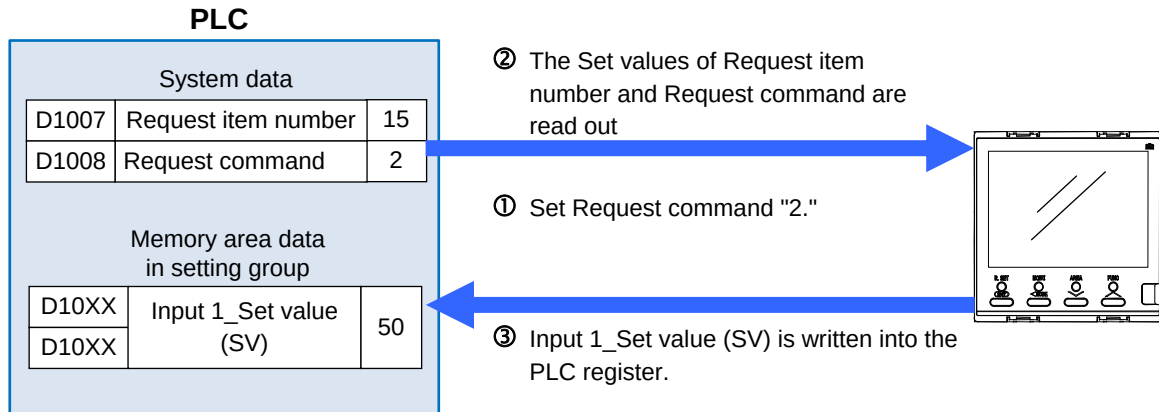
3. Set Request item number of the Memory area data to be updated into the PLC register.

PLC		
System data		
D1007	Request item number	15
D1008	Request command	0

Example: Update the memory area data "Input 1_Set value (SV)."

Set "15" as the Request item number of Input 1_Set value (SV).

4. Set Request command into the PLC register. The Input 1_Set value (SV) of is written into the PLC register.

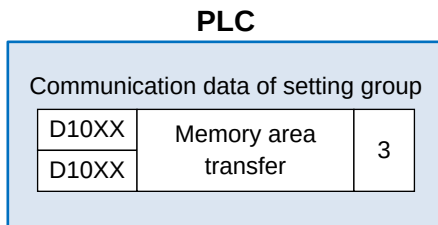


5. Repeat this procedure for all of the Memory area data that needs to be changed.

(2) Transfer all of communication data in setting group for update

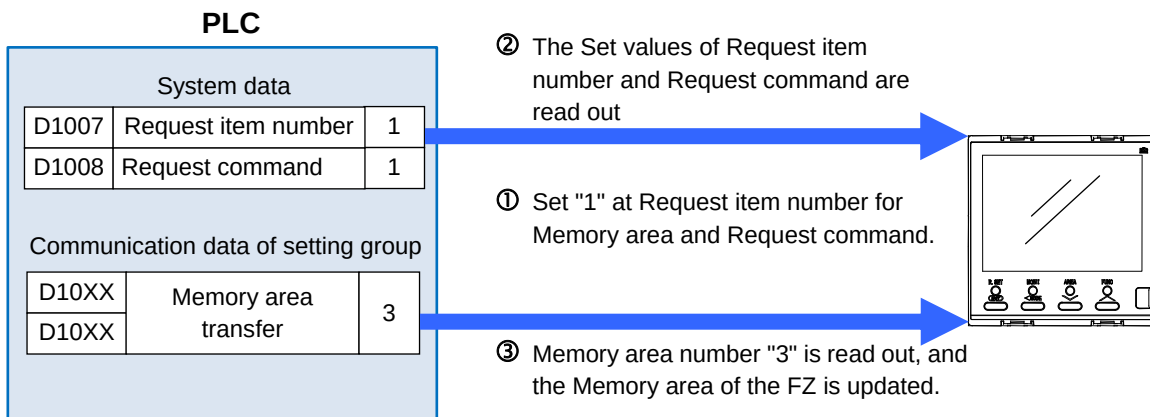
After having switched the Memory area, write all of the communication data into the PLC register using Request item number and Request command.

1. Set the Memory area number to change into the PLC register.



Example:
Change the Memory area number from 1 to 3.

2. Set commands of Request item number and Request command into the PLC register, then the Memory area of the FZ will be changed.



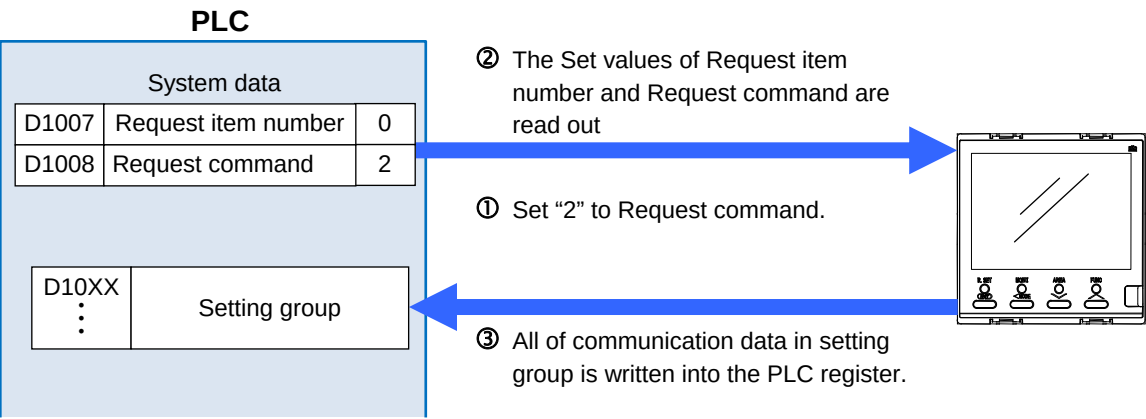
3. Set Request item number into the PLC register to write all of communication data in Setting group into the PLC register.

PLC

System data		
D1007	Request item number	0
D1008	Request command	0

Set "0" to Request item number.

4. Set Request command into the PLC register. Then, all of communication data in Setting group are written into the PLC register, and Memory area data is updated.



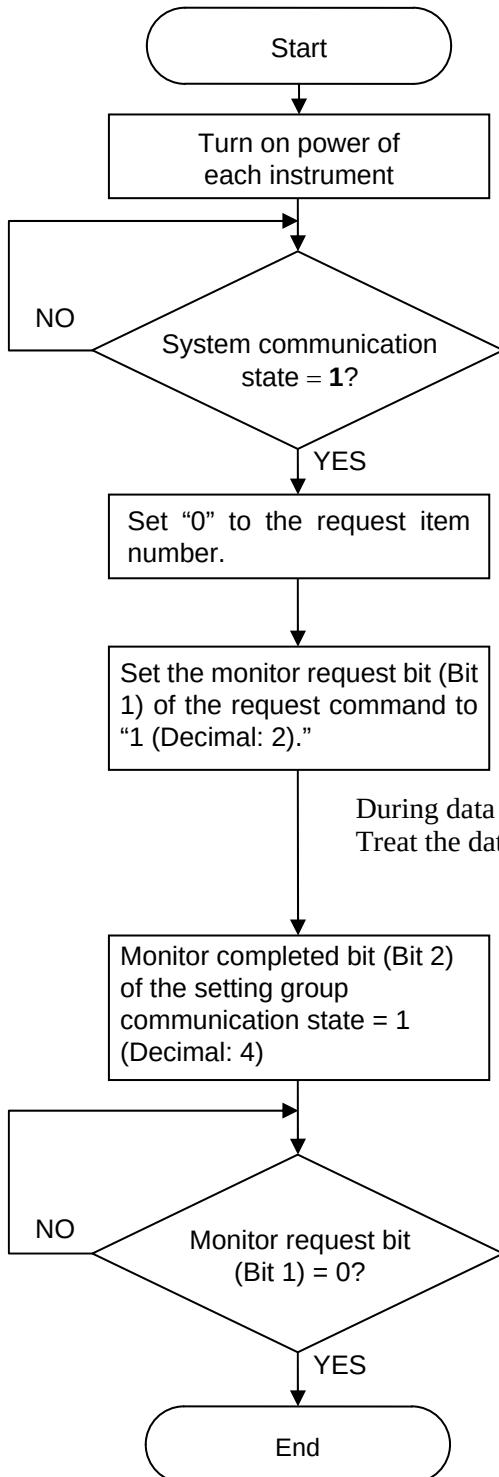
6.1.2 Data transfer procedures



NOTE

Change each set value of the FZ from the PLC after the initial settings are made. If each set value of the FZ is changed from the PLC without setting the initial values, it is re-written to “0” with each set value of the PLC at that time set to “0.”

■ Initial setting



Turn on the power of the FZ, and the PLC. When the PLC communication start time (factory setting: 5 seconds) elapses, writing of the system data begins.

After the system data is written, the FZ begins writing the communication data of the monitor group to the PLC. When monitor group writing starts, “system communication state” changes to “1.”

When the system communication condition becomes “1,” PLC communication can be performed.

Because all communication data of the setting group is written to the PLC, the request item number of the PLC register is set to “0.”

When the monitor request bit (Bit 1) of request command of the PLC register is set to “1 (Decimal: 2),” the FZ begins writing the setting group to the PLC.

During data write:
Treat the data of all items as inconsistent during the data write.

When writing is finished, the FZ writes the communication state of the setting group to the monitor completed bit (Bit 2) of the setting group communication state of the PLC.

If the monitor request bit (Bit 1) of the request command of the PLC register is “0,” this indicates that writing of data to the PLC is finished.



NOTE

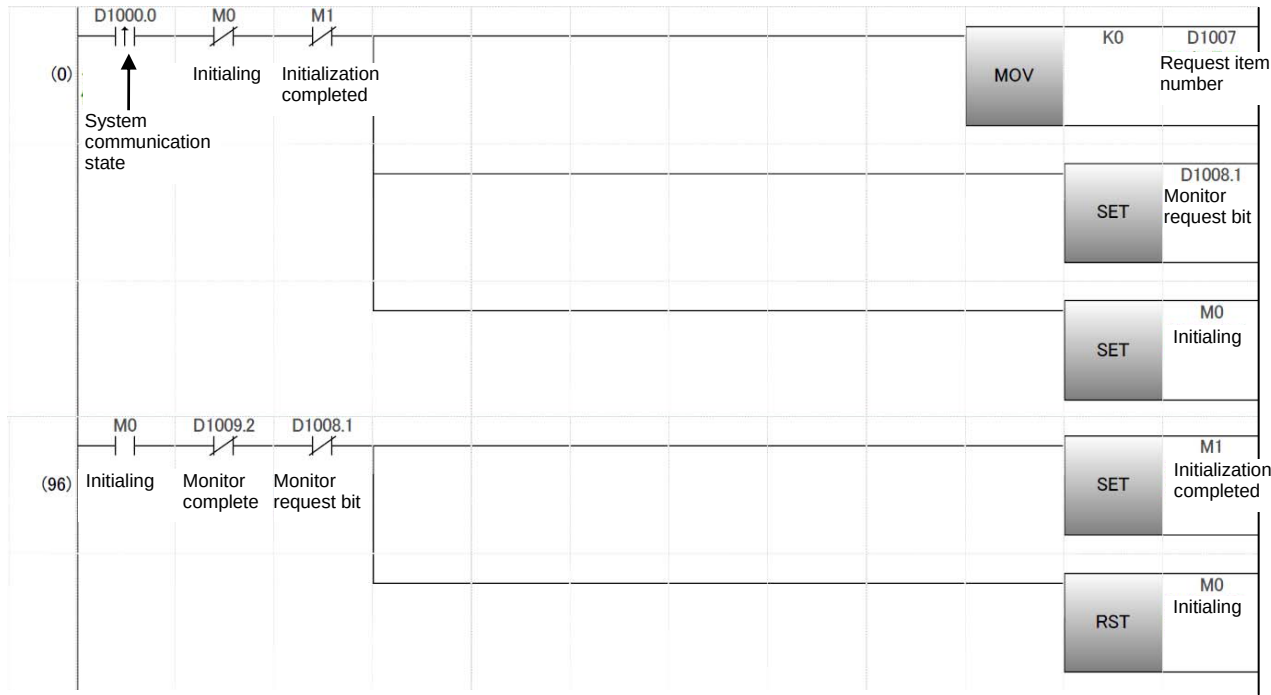
When multiple FZ are connected, write the communication data of all FZ to the PLC.



Refer to P. 6-17 for a programming example.

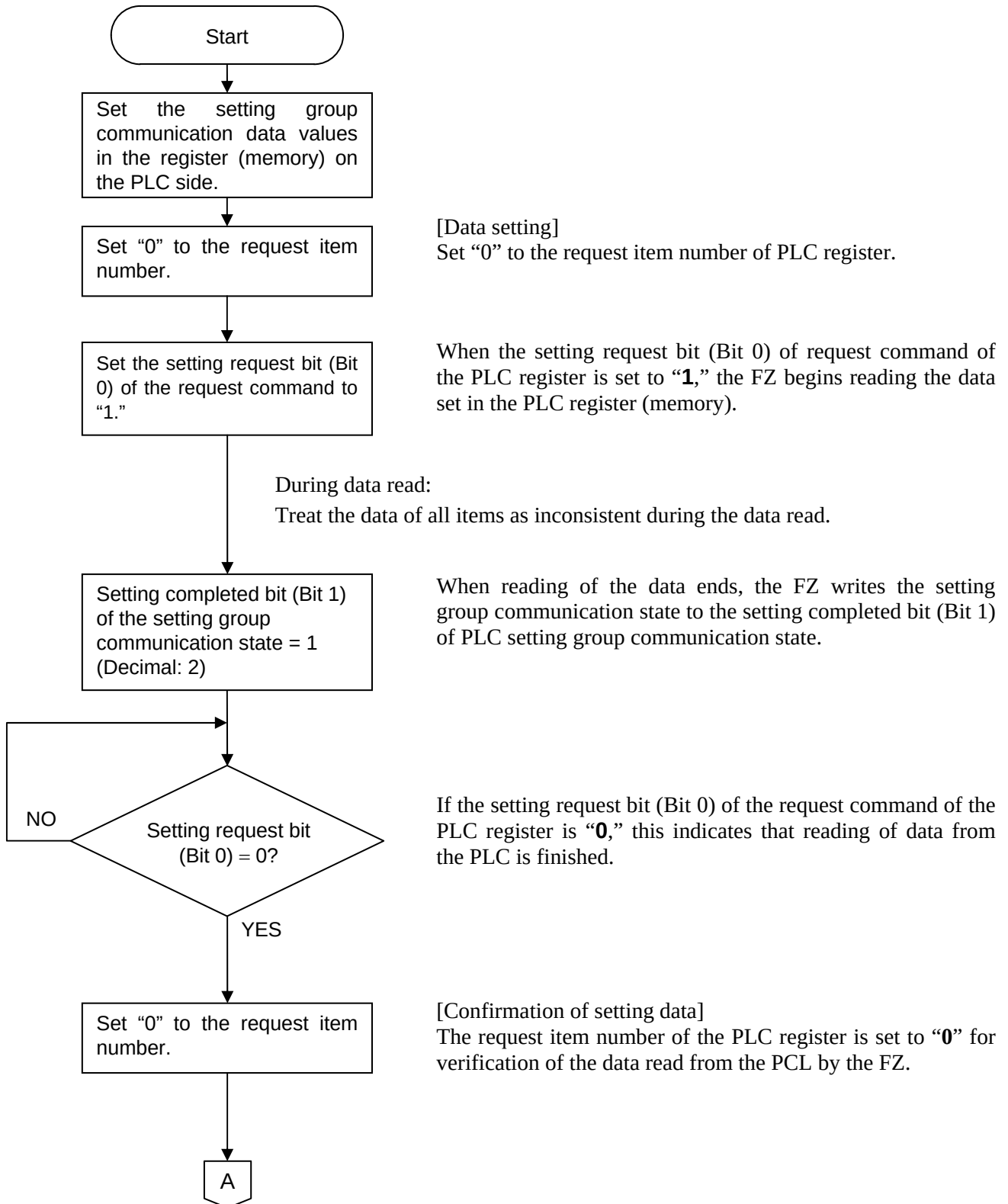
Program example:

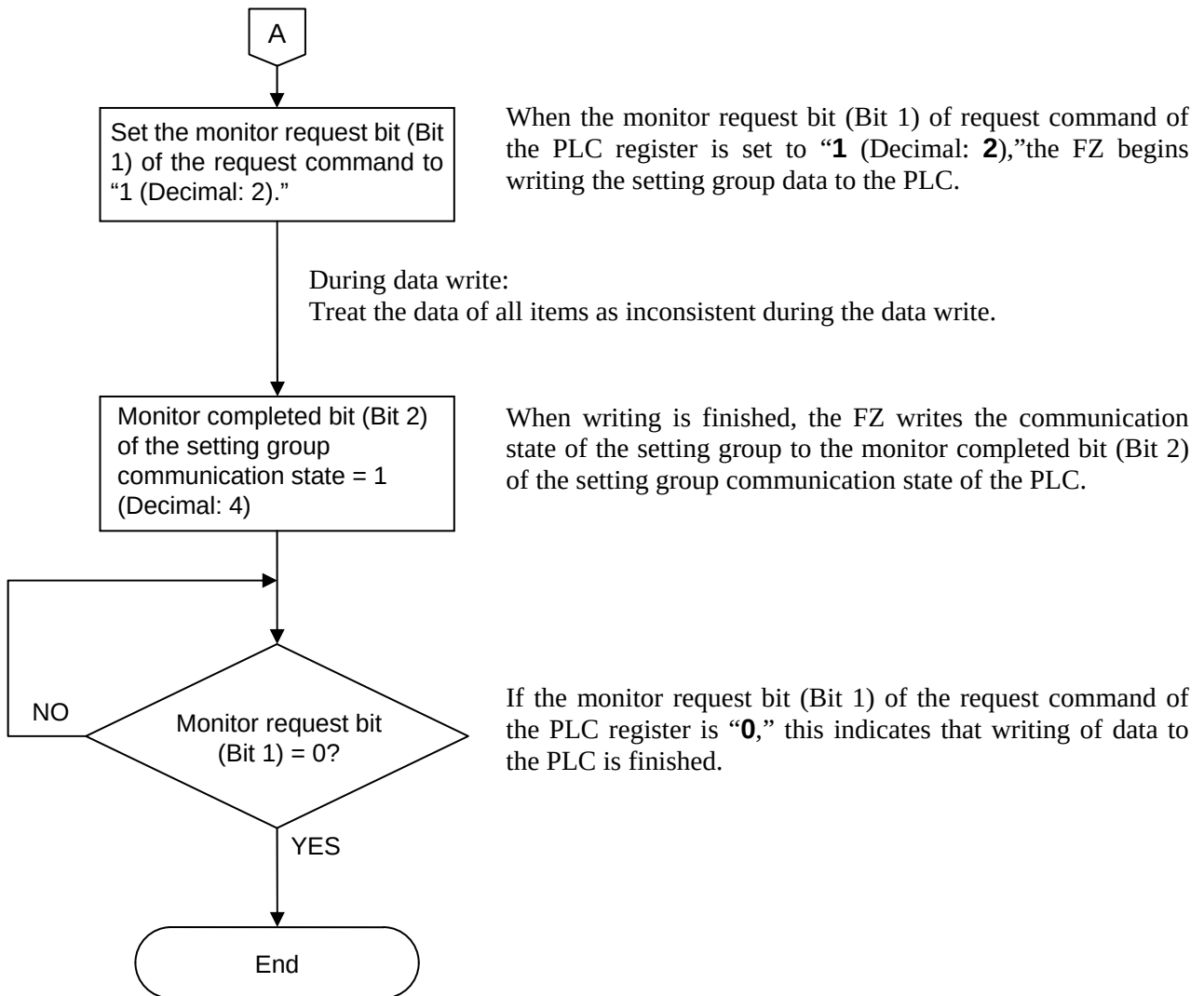
Initial setting



The sample program is intended solely for purposes of example and the operation is not guaranteed. When you create a program using the sample program, check the operation of the program and use it on your own responsibility.

■ When the setting group communication data is transferred from PLC to the FZ.





Refer to **P. 6-7** for a programming example.

6.1.3 Data processing precautions

(1) Automatic update of communication data

Some of the PLC data in the communication data of the setting group will be automatically updated.

To activate the automatic update, “Monitor request” must be performed at least once, after starting the PLC communication.

Communication data automatically updated

Group	Item number	Communication data (Setting items)
Setting item selection 1	1	Interlock release
	3	Input 1_Hold reset
	4	Input 2_Hold reset
	5	Bottom suppression start signal
	7	Input 1_Autotuning (AT)
	8	Input 2_Autotuning (AT)
	9	Input 1_Startup tuning (ST)
	10	Input 2_Startup tuning (ST)
	13	Remote/Local transfer
Setting item selection 2	26	Input 1_Proportional band [heat-side]
	27	Input 1_Integral time [heat-side]
	28	Input 1_Derivative time [heat-side]
	32	Input 1_FF amount
Setting item selection 3	35	Input 1_Control loop break alarm (LBA) time
	37	Input 2_Proportional band
	38	Input 2_Integral time
	39	Input 2_Derivative time
	43	Input 2_FF amount
	46	Input 2_Control loop break alarm (LBA) time
	48	Input 1_Proportional band [cool-side]
Setting item selection 4	49	Input 1_Integral time [cool-side]
	50	Input 1_Derivative time [cool-side]
Setting item selection 7	111	FF amount learning
Setting item selection 8	114	Cascade_Proportional band (master-side)
	115	Cascade_Integral time (master-side)
	116	Cascade_Derivative time (master-side)
	117	Cascade_Proportional band (slave-side)
	118	Cascade_Integral time (slave-side)
	119	Cascade_Derivative time (slave-side)

- (2) Communication data that works with Memory area will not be automatically updated even if the Memory area has been changed. Check the Memory area number after switching, and read out the communication data using the Request command.



For the communication data that works with the Memory area, refer to **6.2 PLC Communication Data Map (P. 6-23)**.

Continued on the next page.

Continued from the previous page.

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

[Example] Setting of Input 1_Proportional band

Initial value of internal data: 3.0

Communication data: 30

- (4) Invalid or disabled items

Concerning the items made invalid or disabled because of the following conditions, the actions in the case of Setting request or Monitor request are shown below.

Condition:

- Items made invalid on the FZ side
- Items disabled in Setting item selection 1 through 8

Actions taken by Setting request or Monitor request:

Request command	FZ operation
Setting request bit (FZ←PLC)	The data from the PLC is ignored and is not read into the FZ. The setting error bit is not turned on either.
Monitor request bit (FZ→PLC)	The FZ writes "0" into the PLC register.



6.1.4 Processing time of communication data

The processing times for communication data monitor and setting are shown below.



The times shown are the processing times when the interval time is set to 10 milliseconds (factory set value).

■ Communication data processing time of monitor group

Communication speed	Number of communication data items	Monitor processing time [Unit: seconds]					
		When there are 31 FZ		When there are 9 FZ		When there are one FZ	
		Double word	Single word	Double word	Single word	Double word	Single word
19200 bps	1	12.2	12.1	3.6	3.4	0.2	0.2
	9 *	13.5	12.6	3.8	3.7	0.3	0.2
	48	19.2	15.3	5.8	4.4	0.6	0.3
57600 bps	1	7.4	7.4	2.3	2.0	0.1	0.1
	9 *	7.7	7.5	2.3	2.0	0.2	0.1
	48	10.3	8.3	3.0	2.6	0.2	0.2

* Factory set value

■ Communication data processing time of setting group

Reading PLC communication data (setting request bit)

Communication speed	Number of communication data items	Setting processing time when there is one FZ [Unit: ms]	
		Double word	Single word
19200 bps	1	110	110
	18 *	170	140
	128	760	440
57600 bps	1	70	70
	18 *	90	80
	128	320	210

* Factory set value

Writing PLC communication data (monitor request bit)

Communication speed	Number of communication data items	Set value monitor processing time when there is one FZ [Unit: ms]	
		Double word	Single word
19200 bps	1	110	110
	18 *	170	140
	128	730	440
57600 bps	1	70	70
	18 *	80	80
	128	310	210

* Factory set value



When several FZ are connected, the processing time can be calculated from the equations below.

Reading PLC communication data (setting request bit)

(Setting processing time when there is one FZ + monitor processing time) × number of FZ

Writing PLC communication data (monitor request bit)

(Set value monitor processing time when there is one FZ + monitor processing time) × number of FZ

6.2 PLC Communication Data Map

The data map summarizes communication data name, register addresses, and data range which enable PLC communication.

6.2.1 Reference to data map

No.	Name	Register address	Attribute	Data range	Factory set value
System data					
1	System communication state ¹	D1000	RO	Bit data Bit 0: Data collection condition Bit 1 to Bit 15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0, 1]	—

(1) Name: Name of communication data
For setting group communication data, the item number is indicated.

(2) Register address: A register address of communication data in PLC communication
(A register address of MITSUBISHI MELSEC series)
Register addresses in this manual are those assigned when the PLC communication environment setting is set as follows. (factory set values)

- Register type: 0 (D register)
- Register start number (High-order 4-bit): 0
- Register start number (Low-order 16-bit): 1000
- Monitor item register bias: 12
- Setting item register bias: 0
- Monitor item selection 1: 3459
- Monitor item selection 2: 16512
- Monitor item selection 3: 1024
- Setting item selection 1: 16480
- Setting item selection 2: 7850
- Setting item selection 3: 32768
- Setting item selection 4: 771
- Setting item selection 5: 0
- Setting item selection 6: 5
- Setting item selection 7: 0
- Setting item selection 8: 0



Assignment of register addresses varies depending on the communication data of the PLC communication environment indicated below.

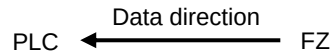
- Register type
- Register start number (High-order 4-bit)
- Register start number (Low-order 16-bit)
- Monitor item register bias
- Setting item register bias
- Monitor item selection 1 to 3
- Setting item selection 1 to 8
- Slave register bias
- Input data type



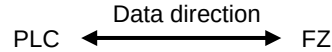
For PLC communication environment setting, refer to **5.2 PLC Communication Environment Items List (P. 5-3)**.



(3) Attribute: RO: Read only data



R/W: Read and Write data



(4) Data range: Read or write range of communication data

(5) Factory set value: Factory set value of communication data



When there is one FZ, the number of communication data is 39 (factory set value). When the maximum of 31 FZ are connected to the PLC communication port, the number of communication data is 1209.

When there is one FZ, the total number of communication data is 188. When the maximum of 31 FZ are connected to the PLC communication port, the total number of communication data is 5828.



The data map classifications of the communication data are shown below. (factory set value)

System data is a single word and occupies one register address of the PLC.

Monitor group and Setting group are either double word * or single word.

(It depends on the input range specified at the time of order.)

* Occupies two PLC register addresses.

In the data transfer of double word, data is sent from the lower word.

System data	D1000 [system communication state] to D1011 [Internal processing]
Monitor group	Double word: D1012 [Input 1_Measured value (PV)] to D1029 [Error code] Single word: D1012 [Input 1_Measured value (PV)] to D1020 [Error code]
Setting group	Double word: D1030 [RUN/STOP transfer] to D1065 [Heater break alarm 2 (HBA2) set value] Single word: D1021 [RUN/STOP transfer] to D1038 [Heater break alarm 2 (HBA2) set value]



The indicated communication data of the PLC communication data map are the communication data of factory set value. The number of communication data of factory set value is limited by monitor item selection and setting item selection.



Some communication data may be invalid or disabled depending on the type and the specification of the FZ. Check the following manual for detailed information of communication data that may be invalid or disabled.



FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)

6.2.2 Data map list (Factory setting)

■ Common items (System data) to Double word and Single word

No.	Name	Register address	Attribute	Data range	Factory set value
System data					
1	System communication state ¹	D1000	RO	Bit data Bit 0: Data collection condition Bit 1 to Bit 15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0, 1]	—
2	Communication flag ²	D1001	RO	0/1 transfer (For communication checking) “0” and “1” are repeated for each communication period.	—
3	—	D1002	RO	Internal processing Do not use the register address	—
4	—	D1003	RO	Internal processing Do not use the register address	—

¹ When system communication state becomes “1,” PLC communication can be performed.



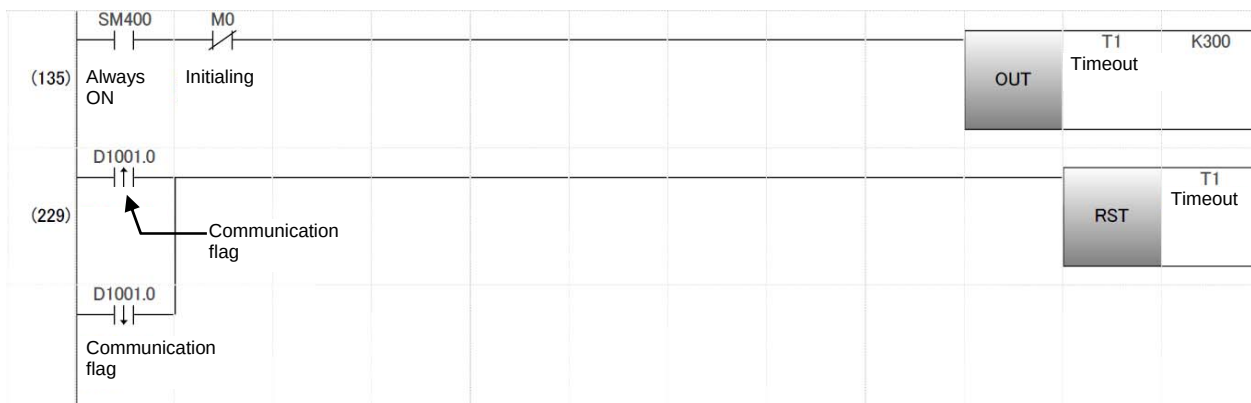
Data collection condition is assigned as a bit image in binary numbers.

Bit image: 0000000000000000
 Bit 15 ----- Bit 0

² The FZ writes alternating zeros and ones (0→1→0) to this area each communication period. By periodically monitoring this area in the PLC program, it can be determined whether or not the FZ has stopped communicating.

Programming example for determination of a communication error:

Determination of an error when the Communication flag has not been updated for 30 seconds.



The sample program is intended solely for purposes of example and the operation is not guaranteed. When you create a program using the sample program, check the operation of the program and use it on your own responsibility.

Continued on the next page.

No.	Name	Register address	Attribute	Data range	Factory set value
System data					
5	PLC communication error code *	D1004	RO	Bit data Bit 0: PLC register read/write error Bit 1: Slave communication timeout Bit 2: Unused Bit 3: Unused Bit 4: Master communication timeout Bit 5 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31]	—

		FZ master		FZ slave	
		PLC register	Loader communication	PLC register	Loader communication
Bit 0: PLC register read/write error	Error occurred on the FZ master	Bit 0: ON	Bit 0: ON	—	—
	Error occurred on the FZ slave	—	—	Bit 0: ON	Bit 0: ON
Bit 1: Slave communication timeout occurred		Bit 1: ON	Bit 1: ON	Value not updated ¹	Bit 1: ON
Bit 4: Master communication timeout occurred		Value not updated ¹	Bit 4: ON	—	—

Bit image: 0000000000000000

Bit 15 ----- Bit 0

IMR03A08-E1



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
System data					
6	PLC communication instrument recognition flag 1 *	D1005	RO	Bit data Bit 0: FZ 1 Bit 1: FZ 2 Bit 2: FZ 3 Bit 3: FZ 4 Bit 4: FZ 5 Bit 5: FZ 6 Bit 6: FZ 7 Bit 7: FZ 8 Bit 8: FZ 9 Bit 9: FZ 10 Bit 10: FZ 11 Bit 11: FZ 12 Bit 12: FZ 13 Bit 13: FZ 14 Bit 14: FZ 15 Bit 15: FZ 16 Data 0: No instrument exists 1: Instrument exists [Decimal number: 0 to 65535]	—
7	PLC communication instrument recognition flag 2 *	D1006	RO	Bit data Bit 0: FZ 17 Bit 1: FZ 18 Bit 2: FZ 19 Bit 3: FZ 20 Bit 4: FZ 21 Bit 5: FZ 22 Bit 6: FZ 23 Bit 7: FZ 24 Bit 8: FZ 25 Bit 9: FZ 26 Bit 10: FZ 27 Bit 11: FZ 28 Bit 12: FZ 29 Bit 13: FZ 30 Bit 14: FZ 31 Bit 15: Unused Data 0: No instrument exists 1: Instrument exists [Decimal number: 0 to 16383]	—

* The connection state of the FZ slaves is displayed. FZ slaves (device address 1 to 30) can only recognize itself. Only the FZ master (device address 0) can recognize the whole system.



The state of the PLC communication instrument recognition flag is assigned to each bit in the binary number.

Bit image: 0000000000000000
 Bit 15 ----- Bit 0

Continued on the next page.



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
System data					
8	Request item number ¹	D1007	R/W	0, 1 to 128 0: Transfer all communication data of the setting group. 1 to 128: Transfer only the communication data of the selected item number.	—
9	Request command ²	D1008	R/W	Bit data Bit 0: Setting request bit Bit 1: Monitor request bit Data 0: OFF 1: ON [Decimal number: 0 to 3]	0
10	Setting group communication state ³	D1009	R/W	Bit data Bit 0: Setting error bit Bit 1: Setting completed bit Bit 2: Monitor completed bit Data 0: OFF 1: ON [Decimal number: 0 to 7]	—

¹ Request item number

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

Communication data that has been set to “unused” (binary: 0) in the setting item selection of the PLC communication environment will not be transferred.

² Request command

Bit 0: Setting request bit

This command requests that the FZ read the communication data of the setting group on the PLC side.

Bit 1: Monitor request bit

This command requests that the FZ write the communication data of the setting group on the PLC side.



The setting request bit and monitor request bit is assigned as a bit image in binary numbers.

Bit image: 0000000000000000
 Bit 15 ----- Bit 0

³ This is the communication state of setting group.

Bit 0: Setting error bit

Turns ON when the PLC data and FZ data do not agree due to a setting range error or other error. Also turns ON when data cannot be set.

When setting error is “1” (ON), it will return to “0” (OFF) the next time data is set normally.

Bit 1: Setting completed bit

When there is a request by setting request bit for a PLC setting data read, this will turn ON when the PLC data read is finished.

At the next communication period with the setting request bit set to 0, the setting completed bit turns OFF.

Bit 2: Monitor completed bit

When there is a request by monitor request bit for a FZ setting data write, this will turn ON when the FZ setting data write is finished.

At the next communication period with the monitor request bit set to 0, the monitor completed bit turns OFF.



The setting error bit, setting completed bit, and monitor completed bit is assigned as a bit image in binary numbers.

Bit image: 0000000000000000
 Bit 15 ----- Bit 0

Continued on the next page.



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
System data					
11	Instrument recognition request command	D1010	R/W	Bit data Bit 0: Instrument recognition request Bit 1 to Bit 15: Unused Data 0: Wait for a request 1: Execute instrument recognition processing (After the recognition, the command state returns to "0") This setting is effective only for the FZ master with a device address of 0.	—
12	—	D1011	RO	Internal processing Do not use the register address	—



■ Double word items (Monitor group and Setting group)

No.	Name	Register address	Attribute	Data range	Factory set value
Monitor group (Monitor item selection 1)					
13	Input 1_Measured value (PV)	D1012 D1013	RO	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	—
14	Input 1_Set value (SV) monitor	D1014 D1015	RO	Input 1_Setting limiter low to Input 1_Setting limiter high Varies with the setting of the Decimal point position.	—
15	Input 1_Manipulated output value monitor [heat-side]	D1016 D1017	RO	–5.0 to +105.0 %	—
16	Input 1_Manipulated output value monitor [cool-side]	D1018 D1019	RO	–5.0 to +105.0 %	—
17	Current transformer 1 (CT1) input value monitor	D1020 D1021	RO	0.0 to 100.0 A	—
18	Current transformer 2 (CT2) input value monitor	D1022 D1023	RO	0.0 to 100.0 A	—
Monitor group (Monitor item selection 2)					
19	Comprehensive event state	D1024 D1025	RO	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low When multiple items are applicable, they are summed up.	—
20	Overall operation status	D1026 D1027	RO	0 to 511 0: OFF +1: STOP state +2: Input 1_Manual mode state +4: Input 2_Manual mode state +8: Remote mode state (Cascade control state, Differential temperature control state, Input 2 state of Control with PV select) +16: Input 1_Autotuning (AT) state +32: Input 2_Autotuning (AT) state +64: Set value of Input 1 is now changing +128: Set value of Input 2 is now changing +256: Communication monitoring result When multiple items are applicable, they are summed up.	—

 : Shows the communication data of FZ400/900.

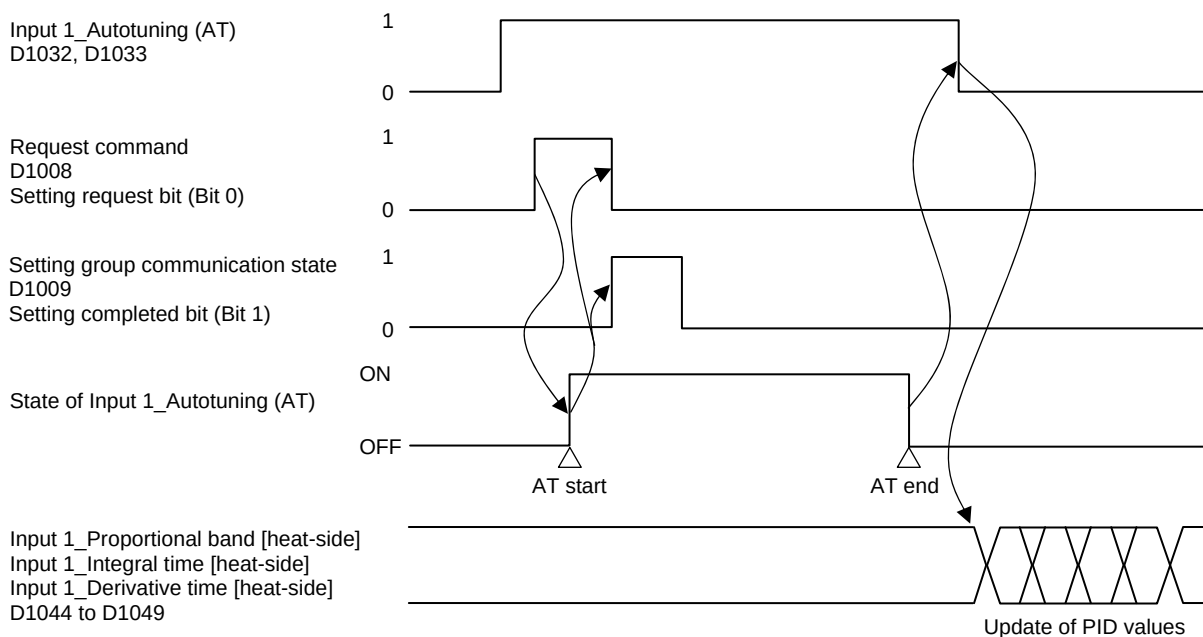
Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Monitor group (Monitor item selection 3)					
21	Error code	D1028 D1029	RO	0 to 71 0: Normal +1: Adjustment data error +2: Data back-up error +4: A/D conversion error (Temperature compensation error included) +64: Display units error When multiple items are applicable, they are summed up.	—
Setting group (Setting item selection 1)					
22	RUN/STOP transfer Item number: 6	D1030 D1031	R/W	0: RUN (Control start) 1: STOP (Control stop)	0
23	Input 1_Autotuning (AT) Item number: 7	D1032 D1033	R/W	0: PID control 1: Start Autotuning When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the corresponding data in the PLC will be also automatically updated. (Refer to a Time chart)	0
24	Input 1_Set value (SV) ★ Item number: 15	D1034 D1035	R/W	Input 1_Setting limiter low to Input 1_Setting limiter high Varies with the setting of the Decimal point position.	0

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Time chart



Continued on the next page.



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 2)					
25	Event 1 set value (EV1) Event 1 set value (EV1) [high] ★ Item number: 18	D1036 D1037	R/W	<u>Deviation</u> - When assigned to Input 1 or Differential temperature input –(Input 1_Input span) to +(Input 1_Input span) - When assigned to Input 2 –(Input 2_Input span) to +(Input 2_Input span) - When Control with PV select is selected –(PV select input span) to +(PV select input span) Varies with the setting of the Decimal point position. <u>Input value or Set value</u> - When assigned to Input 1 Input 1_Input range low to Input 1_Input range high - When assigned to Input 2 Input 2_Input range low to Input 2_Input range high - When assigned to Differential temperature input –(Input 1_Input span) to +(Input 1_Input span) - When Control with PV select is selected PV select input range low to PV select input range high Varies with the setting of the Decimal point position. <u>Manipulated output value</u> –5.0 to +105.0 %	For Deviation, Input value and Set value TC/RTD inputs: 10.0 V/I inputs: 5 % of input span For Manipulated output value 50.0
26	Event 2 set value (EV2) Event 2 set value (EV2) [high] ★ Item number: 20	D1038 D1039	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 2)					
27	Event 3 set value (EV3) Event 3 set value (EV3) [high] ★ Item number: 22	D1040 D1041	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
28	Event 4 set value (EV4) Event 4 set value (EV4) [high] ★ Item number: 24	D1042 D1043	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
29	Input 1_Proportional band [heat-side] ★ Item number: 26	D1044 D1045	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action In the following cases, Input 1_Proportional band [heat-side] of the PLC will be automatically updated. • The Input 1_Autotuning (AT) of the FZ has changed to zero from one. • When Input 1_Startup tuning (ST) of the FZ has been normally completed	TC/RTD inputs: 30.0 V/I inputs: 3.0

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 2)					
30	Input 1_Integral time [heat-side] ★ Item number: 27	D1046 D1047	R/W	PID control or Heat/Cool PID control: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control: 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds Varies with the setting of the Integral/ Derivative time decimal point position. In the following cases, Input 1_Integral time [heat-side] of the PLC will be automatically updated. • The Input 1_Autotuning (AT) of the FZ has changed to zero from one. • When Input 1_Startup tuning (ST) of the FZ has been normally completed	240
31	Input 1_Derivative time [heat-side] ★ Item number: 28	D1048 D1049	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action Varies with the setting of the Integral/ Derivative time decimal point position. In the following cases, Input 1_Derivative time [heat-side] of the PLC will be automatically updated. • The Input 1_Autotuning (AT) of the FZ has changed to zero from one. • When Input 1_Startup tuning (ST) of the FZ has been normally completed	60
32	Input 1_Control response parameter ★ Item number: 29	D1050 D1051	R/W	0: Slow 1: Medium 2: Fast When the P or PD action is selected, this setting becomes invalid	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 3)					
33	Input 1_Proportional band [cool-side] ★ Item number: 48	D1052 D1053	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.1 to 1000.0 % of PV select input span) When the Input 1_Autotuning (AT) in the FZ has been changed to "0" from "1," Input 1_Proportional band [cool-side] of the PLC will be automatically updated.	TC/RTD inputs: 30 V/I inputs: 3.0
Setting group (Setting item selection 4)					
34	Input 1_Integral time [cool-side] ★ Item number: 49	D1054 D1055	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Varies with the setting of the Integral/Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to "0" from "1," Input 1_Integral time [cool-side] of the PLC will be automatically updated.	240
35	Input 1_Derivative time [cool-side] ★ Item number: 50	D1056 D1057	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action Varies with the setting of the Integral/Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to "0" from "1," Input 1_Derivative time [cool-side] of the PLC will be automatically updated.	60

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.



6. COMMUNICATION DATA

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 4)					
36	Input 1_Setting change rate limiter (up) ★ Item number: 57	D1058 D1059	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function Varies with the setting of the Decimal point position.	0
37	Input 1_Setting change rate limiter (down) ★ Item number: 58	D1060 D1061	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function Varies with the setting of the Decimal point position.	0
Setting group (Setting item selection 6)					
38	Heater break alarm 1 (HBA1) set value Item number: 81	D1062 D1063	R/W	0.0 to 100.0 A 0.0: HBA function OFF	0.0
39	Heater break alarm 2 (HBA2) set value Item number: 83	D1064 D1065	R/W	0.0 to 100.0 A 0.0: HBA function OFF	0.0

 : Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Single word items (Monitor group and Setting group)



Refer to P. 6-30 to 6-36 for the data range and the factory set value.

No.	Name	Register address
Monitor group (Monitor item selection 1)		
13	Input 1_Measured value (PV)	D1012
14	Input 1_Set value (SV) monitor	D1013
15	Input 1_Manipulated output value monitor [heat-side]	D1014
16	Input 1_Manipulated output value monitor [cool-side]	D1015
17	Current transformer 1 (CT1) input value monitor	D1016
18	Current transformer 2 (CT2) input value monitor	D1017
Monitor group (Monitor item selection 2)		
19	Comprehensive event state	D1018
20	Overall operation status	D1019
Monitor group (Monitor item selection 3)		
21	Error code	D1020
Setting group (Setting item selection 1)		
22	RUN/STOP transfer Item number: 6	D1021
23	Input 1_Autotuning (AT) Item number: 7	D1022
24	Input 1_Set value (SV) ★ Item number: 15	D1023
Setting group (Setting item selection 2)		
25	Event 1 set value (EV1) Event 1 set value (EV1) [high] ★ Item number: 18	D1024
26	Event 2 set value (EV2) Event 2 set value (EV2) [high] ★ Item number: 20	D1025
27	Event 3 set value (EV3) Event 3 set value (EV3) [high] ★ Item number: 22	D1026
28	Event 4 set value (EV4) Event 4 set value (EV4) [high] ★ Item number: 24	D1027
29	Input 1_Proportional band [heat-side] ★ Item number: 26	D1028

No.	Name	Register address
30	Input 1_Integral time [heat-side] ★ Item number: 27	D1029
31	Input 1_Derivative time [heat-side] ★ Item number: 28	D1030
32	Input 1_Control response parameter ★ Item number: 29	D1031
Setting group (Setting item selection 3)		
33	Input 1_Proportional band [cool-side] ★ Item number: 48	D1032
Setting group (Setting item selection 4)		
34	Input 1_Integral time [cool-side] ★ Item number: 49	D1033
35	Input 1_Derivative time [cool-side] ★ Item number: 50	D1034
36	Input 1_Setting change rate limiter (up) ★ Item number: 57	D1035
37	Input 1_Setting change rate limiter (down) ★ Item number: 58	D1036
Setting group (Setting item selection 6)		
38	Heater break alarm 1 (HBA1) set value Item number: 81	D1037
39	Heater break alarm 2 (HBA2) set value Item number: 83	D1038

: Shows the communication data of FZ400/900.

★ Data for Memory area:

This is the data of the Control area selected by the Memory area transfer.

6.2.3 Communication data set to “unused” at the factory

These are communication data items that are set to “unused” when the product is shipped from the factory. The “use” or “unused” setting is configured in monitor item selection or setting item selection.

For the setting procedures, refer to **6.3 Example of PLC Communication Data Map Editing (P. 6-61)**. To configure the settings, reverse the procedure used to reduce communication data.

No.	Name	Register address	Attribute	Data range	Factory set value
Monitor group (Monitor item selection 1)					
1	Input 2_Measured value (PV)	—	RO	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	—
2	Input 2_Set value (SV) monitor	—	RO	Input 2_Setting limiter low to Input 2_Setting limiter high Varies with the setting of the Decimal point position.	—
3	PV select Measured value (PV)	—	RO	When controlling with Input 1: Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) When controlling with Input 2: Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	—
4	Measured value (PV) of differential temperature input	—	RO	In case of Input data type 0: 19999 to 99999 In case of Input data type 1: 1999 to 9999 Varies with the setting of the Decimal point position.	—
5	Set value (SV) monitor of differential temperature input	—	RO	–(Input 1_Input span) to +(Input 1_Input span) Varies with the setting of the Decimal point position.	—
6	Input 2_Manipulated output value monitor	—	RO	–5.0 to +105.0 %	—

: Shows the communication data of FZ400/900.

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Monitor group (Monitor item selection 1)					
7	Memory area soak time monitor	—	RO	0 to 35999 seconds * 0 to 11999 seconds 0 to 5999 minutes * Monitoring is available only on FZ400/900. Data range of Memory area soak time monitor can be selected on the Soak time unit.	—
8	Remote setting input value monitor	—	RO	Input 1_Setting limiter low to Input 1_Setting limiter high Varies with the setting of the Decimal point position.	—
9	Feedback resistance (FBR) input value	—	RO	0.0 to 100.0 %	—
10	Event 1 state monitor	—	RO	0: OFF 1: ON	—
Monitor group (Monitor item selection 2)					
11	Event 2 state monitor	—	RO	0: OFF 1: ON	—
12	Event 3 state monitor	—	RO	0: OFF 1: ON	—
13	Event 4 state monitor	—	RO	0: OFF 1: ON	—
14	Heater break alarm 1 (HBA1) state monitor	—	RO	0: OFF 1: ON	—
15	Heater break alarm 2 (HBA2) state monitor	—	RO	0: OFF 1: ON	—
16	Control loop break alarm 1 (LBA1) state monitor	—	RO	0: OFF 1: ON	—
17	Control loop break alarm 2 (LBA2) state monitor	—	RO	0: OFF 1: ON	—
18	Input 1_Burnout state monitor	—	RO	0: OFF 1: ON	—
19	Input 2_Burnout state monitor	—	RO	0: OFF 1: ON	—
20	Feedback resistance (FBR) break monitor	—	RO	0: OFF 1: ON	—

: Shows the communication data of FZ400/900.

Continued on the next page.



6. COMMUNICATION DATA

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Monitor group (Monitor item selection 2)					
21	DI state monitor	—	RO	0 to 63 0: Open +1: DI1 Closed +2: DI2 Closed +4: DI3 Closed +8: DI4 Closed +16: DI5 Closed +32: DI6 Closed When multiple items are applicable, they are summed up.	—
22	OUT state monitor	—	RO	0 to 7 0: OFF +1: OUT1 ON +2: OUT2 ON +4: OUT3 ON When multiple items are applicable, they are summed up.	—
23	DO state monitor	—	RO	0 to 15 0: OFF +1: DO1 ON +2: DO2 ON +4: DO3 ON +8: DO4 ON When multiple items are applicable, they are summed up.	—
24	Memory area number monitor	—	RO	1 to 16	—
Monitor group (Monitor item selection 3)					
25	Input 1_PID memory	—	RO	Switching by Memory area number: 1 to 16 Switching by Set value (SV): 1 to 8 Switching by Measured value (PV): 1 to 8	—
26	Input 2_PID memory	—	RO	Switching by Memory area number: 1 to 16 Switching by Set value (SV): 1 to 8 Switching by Measured value (PV): 1 to 8	—
27	Input 1_Peak hold monitor	—	RO	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	—

 : Shows the communication data of FZ400/900.

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Monitor group (Monitor item selection 3)					
28	Input 1_Bottom hold monitor	—	RO	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	—
29	Input 2_Peak hold monitor	—	RO	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	—
30	Input 2_Bottom hold monitor	—	RO	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	—
31	Input 1_AT remaining time monitor	—	RO	0 to 2880 minutes	—
32	Input 2_AT remaining time monitor	—	RO	0 to 2880 minutes	—
33	Input 1_AT/ST status monitor	—	RO	–4 to +2 0: AT/ST complete +1: AT running now +2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—
34	Input 2_AT/ST status monitor	—	RO	–4 to +2 0: AT/ST complete +1: AT running now +2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—
35	Integrated operating time	—	RO	0 to 65535 hours	—

 : Shows the communication data of FZ400/900.

Continued on the next page.



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 1)					
36	Interlock release Item number: 1	—	R/W	0: Interlock release 1: Interlock state “1: Interlock state” is for monitoring the interlocked state. Do not write “1.” When the Interlock release of the FZ has changed to “1” from “0,” the data in the PLC will be also automatically updated to “1.”	0
37	Memory area transfer Item number: 2	—	R/W	1 to 16 When the DI1 function selection is set to “Memory area transfer (Without area set signal)” and when “External mode” is selected with the Control area Local/External transfer, the data is RO (Read only).	1
38	Input 1_Hold reset Item number: 3	—	R/W	0: Hold 1: Reset When the Input 1_Hold reset of the FZ has changed to “0” from “1,” the data in the PLC will be also automatically updated to “0.”	0
39	Input 2_Hold reset Item number: 4	—	R/W	0: Hold 1: Reset When the Input 2_Hold reset of the FZ has changed to “0” from “1,” the data in the PLC will be also automatically updated to “0.”	0
40	Bottom suppression start signal Item number: 5	—	R/W	0 to 3 0: No forced ON +1: Input 1_Bottom suppression action_Fforced ON +2: Input 2_Bottom suppression action_Fforced ON When the Bottom suppression start signal has been switched, the data in the PLC will be also automatically updated.	0
41	Input 2_Autotuning (AT) Item number: 8	—	R/W	0: PID control 1: Start Autotuning When the Input 2_Autotuning (AT) in the FZ has been changed to “0” from “1,” the corresponding data in the PLC will be also automatically updated.	0
42	Input 1_Startup tuning (ST) Item number: 9	—	R/W	0: ST unused 1: Execute once * 2: Execute always * When the ST is finished, the control will automatically return to “0.” When the Input 1_Startup tuning (ST) signal has been changed to “0” from a value other than zero, the data in the PLC will be also automatically updated.	0

 : Shows the communication data of FZ400/900.

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 1)					
43	Input 2_Startup tuning (ST) Item number: 10	—	R/W	0: ST unused 1: Execute once * 2: Execute always * When the ST is finished, the control will automatically return to “0.” When the Input 2_Startup tuning (ST) signal has been changed to “0” from a value other than zero, the data in the PLC will be also automatically updated.	0
44	Input 1_Auto/Manual transfer Item number: 11	—	R/W	0: Auto mode 1: Manual mode	0
45	Input 2_Auto/Manual transfer Item number: 12	—	R/W	0: Auto mode 1: Manual mode	0
46	Remote/Local transfer Item number: 13	—	R/W	When Select function for input 2 is: “Remote setting input” 0: Local mode 1: Remote mode When Remote setting input is specified: [FZ110] 0: Local mode 1: Remote mode When Select function for input 2 is: “Cascade control” 0: Single control 1: Cascade control When Select function for input 2 is: “Control with PV select” 0: Input 1 1: Input 2 When “Switching by level” is selected at “Selection of PV select trigger,” the parameter becomes RO (Read only). When Select function for input 2 is: “2-loop control/Differential temperature control” 0: 2-loop control 1: Differential temperature control When the state of Remote/Local transfer of the FZ has been changed, the data in the PLC will be also automatically updated. The values are updated depending on the set values of “Remote/Local transfer selection (Area).”	0

 : Shows the communication data of FZ400/900.

Continued on the next page.



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 1)					
47	Control area Local/External transfer Item number: 14	—	R/W	0: Local mode 1: External mode	0
48	Input 2_Set value (SV) ★ Item number: 16	—	R/W	Input 2_Setting limiter low to Input 2_Setting limiter high Varies with the setting of the Decimal point position.	0
Setting group (Setting item selection 2)					
49	Set value (SV) of differential temperature input ★ Item number: 17	—	R/W	–(Input 1_Input span) to +(Input 1_Input span) Varies with the setting of the Decimal point position.	0
50	Event 1 set value (EV1') [low] ★ Item number: 19	—	R/W	<u>Deviation</u> - When assigned to Input 1 or Differential temperature input –(Input 1_Input span) to +(Input 1_Input span) - When assigned to Input 2 –(Input 2_Input span) to +(Input 2_Input span) - When Control with PV select is selected at Select function for input 2. –(PV select input span) to +(PV select input span) Varies with the setting of the Decimal point position. <u>Input value or Set value</u> - When assigned to Input 1 Input 1_Input range low to Input 1_Input range high - When assigned to Input 2 Input 2_Input range low to Input 2_Input range high - When assigned to Differential temperature input –(Input 1_Input span) to +(Input 1_Input span) - When Control with PV select is selected at Select function for input 2. PV select input range low to PV select input range high Varies with the setting of the Decimal point position.	TC/RTD inputs: –10 V/I inputs: –5 % of input span

 : Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 2)					
51	Event 2 set value (EV2') [low] ★ Item number: 21	—	R/W	Same as Event 1 set value (EV1') [low]	
52	Event 3 set value (EV3') [low] ★ Item number: 23	—	R/W	Same as Event 1 set value (EV1') [low]	
53	Event 4 set value (EV4') [low] ★ Item number: 25	—	R/W	Same as Event 1 set value (EV1') [low]	
54	Input 1_Proactive intensity ★ Item number: 30	—	R/W	0 to 4 0: No function	2
55	Input 1_Manual reset ★ Item number: 31	—	R/W	–100.0 to +100.0 %	0.0
56	Input 1_FF amount ★ Item number: 32	—	R/W	–100.0 to +100.0 % When the Input 1_FF amount of the FZ has changed, the data in the PLC will be also automatically updated.	0.0
Setting group (Setting item selection 3)					
57	Input 1_Output limiter high [heat-side] ★ Item number: 33	—	R/W	Input 1_Output limiter low [heat-side] to 105.0 %	105.0
58	Input 1_Output limiter low [heat-side] ★ Item number: 34	—	R/W	–5.0 % to Input 1_Output limiter high [heat-side]	–5.0 %

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.



6. COMMUNICATION DATA

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 3)					
59	Input 1_Control loop break alarm (LBA) time ★ Item number: 35	—	R/W	0 to 7200 seconds 0: No function When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Input 1_Control loop break alarm (LBA) time in the PLC will be also automatically updated. When Input 1_Startup tuning (ST) of the FZ has been normally completed, the Input 1_Control loop break alarm (LBA) time in the PLC will be also automatically updated.	LBA function is specified: 480 LBA function is not specified: 0
60	Input 1_LBA deadband (LBD) ★ Item number: 36	—	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) Varies with the setting of the Decimal point position.	0
61	Input 2_Proportional band ★ Item number: 37	—	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action In the following cases, Input 2_Proportional band of the PLC will be automatically updated. • The Input 2_Autotuning (AT) of the FZ has changed to zero from one. • When Input 2_Startup tuning (ST) of the FZ has been normally completed	TC/RTD inputs: 30.0 V/I inputs: 3.0

 : Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 3)					
62	Input 2_Integral time ★ Item number: 38	—	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Varies with the setting of the Integral/ Derivative time decimal point position. In the following cases, Input 2_Integral time of the PLC will be automatically updated. • The Input 2_Autotuning (AT) of the FZ has changed to zero from one. • When Input 2_Startup tuning (ST) of the FZ has been normally completed	240
63	Input 2_Derivative time ★ Item number: 39	—	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action Varies with the setting of the Integral/ Derivative time decimal point position. In the following cases, Input 2_Derivative time of the PLC will be automatically updated. • The Input 2_Autotuning (AT) of the FZ has changed to zero from one. • When Input 2_Startup tuning (ST) of the FZ has been normally completed	60
64	Input 2_Control response parameter ★ Item number: 40	—	R/W	0: Slow 1: Medium 2: Fast When the P or PD action is selected, this setting becomes invalid	0
65	Input 2_Proactive intensity ★ Item number: 41	—	R/W	0 to 4 0: No function	2
66	Input 2_Manual reset ★ Item number: 42	—	R/W	−100.0 to +100.0 %	0.0
67	Input 2_FF amount ★ Item number: 43	—	R/W	−100.0 to +100.0 % When the Input 2_FF amount of the FZ has changed, the data in the PLC will be also automatically updated.	0.0

: Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 3)					
68	Input 2_Output limiter high ★ Item number: 44	—	R/W	Input 2_Output limiter low to 105.0 %	105.0
69	Input 2_Output limiter low ★ Item number: 45	—	R/W	–5.0 % to Input 2_Output limiter high	–5.0
70	Input 2_Control loop break alarm (LBA) time ★ Item number: 46	—	R/W	0 to 7200 seconds 0: No function When the Input 2_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Input 2_Control loop break alarm (LBA) time in the PLC will be also automatically updated. When Input 2_Startup tuning (ST) of the FZ has been normally completed, the Input 2_Control loop break alarm (LBA) time in the PLC will be also automatically updated.	LBA function is specified: 480 LBA function is not specified: 0
71	Input 2_LBA deadband (LBD) ★ Item number: 47	—	R/W	0 to Input 2_Input span Varies with the setting of the Decimal point position.	0
Setting group (Setting item selection 4)					
72	Input 1_Overlap/Deadband ★ Item number: 51	—	R/W	TC/RTD inputs: –(Input 1_Input span) to +(Input 1_Input span) When Control with PV select: –(PV select input span) to +(PV select input span) (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: –100.0 to +100.0 % of Input 1_Input span When Control with PV select: –100.0 to +100.0 % of PV select input span Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0

 : Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 4)					
73	Input 1_Output limiter high [cool-side] ★ Item number: 52	—	R/W	Input 1_Output limiter low [cool-side] to 105.0 %	105.0
74	Input 1_Output limiter low [cool -side] ★ Item number: 53	—	R/W	–5.0 % to Input 1_Output limiter high [cool-side]	–5.0 %
75	Select Trigger type for Memory area transfer ★ Item number: 54	—	R/W	0 to 63 0: No assignment +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Digital input 1 (DI1) Close edge +32: Digital input 1 (DI1) Open edge To select two or more functions, sum each value.	0
76	Area soak time ★ Item number: 55	—	R/W	In case of Input data type 0: 0 to 35999 seconds * 0 to 11999 seconds 0 to 5999 minutes * Settable only for FZ400/900 In case of Input data type 1: 0 to 5999 minutes 0 to 11999 seconds Data range of Memory area soak time monitor can be selected on the Soak time unit.	0
77	Link area number ★ Item number: 56	—	R/W	0 to 16 0: No function	0
78	Input 1_Auto/Manual transfer selection (Area) ★ Item number: 59	—	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
79	Input 1_Manipulated output value (Area) ★ Item number: 60	—	R/W	PID control, Position proportioning PID control: –5.0 to +105.0 % Heat/Cool PID control: –105.0 to +105.0 %	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.



6. COMMUNICATION DATA

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 4)					
80	Input 2_Setting change rate limiter (up) ★ Item number: 61	—	R/W	0 to Input 2_Input span 0: No function Varies with the setting of the Decimal point position.	0
81	Input 2_Setting change rate limiter (down) ★ Item number: 62	—	R/W	0 to Input 2_Input span 0: No function Varies with the setting of the Decimal point position.	0
82	Input 2_Auto/Manual transfer selection (Area) ★ Item number: 63	—	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
83	Input 2_Manipulated output value (Area) ★ Item number: 64	—	R/W	–5.0 to +105.0 %	–5.0
Setting group (Setting item selection 5)					
84	Remote/Local transfer selection (Area) ★ Item number: 65	—	R/W	When Select function for input 2 is: “Remote setting input” 0: Local mode 1: Remote mode When Remote setting input is specified: [FZ110] 0: Local mode 1: Remote mode When Select function for input 2 is: “Cascade control” 0: Single control 1: Cascade control When Select function for input 2 is: “Control with PV select” 0: Input 1 1: Input 2 When Select function for input 2 is: “2-loop control/Differential temperature control” 0: 2-loop control 1: Differential temperature control	0

 : Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 5)					
85	Display update cycle Item number: 66	—	R/W	1: 50 ms 2: 100 ms 3: 150 ms 4: 200 ms 5: 250 ms 6: 300 ms 7: 350 ms 8: 400 ms 9: 450 ms 10: 500 ms Changing the Display update cycle will not affect the updating cycle of the communication.	1
86	Input 1_PV bias Item number: 67	—		–(Input 1_Input span) to +(Input 1_Input span) When Control with PV select: – PV select input span) to +(PV select input span) Varies with the setting of the Decimal point position.	0
87	Input 1_PV digital filter Item number: 68	—	R/W	0.0 to 100.0 seconds 0.0: Filter OFF	0.0
88	Input 1_PV ratio Item number: 69	—	R/W	0.500 to 1.500	1.000
89	Input 1_PV low input cut-off Item number: 70	—	R/W	0.00 to 25.00 % of Input 1_Input span (When Control with PV select: 0.00 to 25.00 % of PV select input span)	0.00
90	Input 2_PV bias (RS bias) Item number: 71	—	R/W	Input 2_PV bias –(Input 2_Input span) to +(Input 2_Input span) RS bias –(Input 1_Input span) to +(Input 1_Input span) Varies with the setting of the Decimal point position. In the case of FZ400/900, RS bias is selected by selecting “Remote setting input” at Select function for input 2. In the case of FZ110, RS bias is selected by selecting “Remote setting input.”	0

Continued on the next page.



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 5)					
91	Input 2_PV digital filter (RS digital filter) Item number: 72	—	R/W	0.0 to 100.0 seconds 0.0: Filter OFF In the case of FZ400/900, RS digital filter is selected by selecting “Remote setting input” at Select function for input 2. In the case of FZ110, RS digital filter is selected by selecting “Remote setting input.”	0.0
92	Input 2_PV ratio (RS ratio) Item number: 73	—	R/W	Input 2_PV ratio 0.500 to 1.500 RS ratio 0.001 to 9.999 In the case of FZ400/900, RS ratio is selected by selecting “Remote setting input” at Select function for input 2. In the case of FZ110, RS ratio is selected by selecting “Remote setting input.”	1.000
93	Input 2_PV low input cut-off Item number: 74	—	R/W	0.00 to 25.00 % of Input 2_Input span	0.00
94	OUT1 proportional cycle time Item number: 75	—	R/W	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note1
95	OUT2 proportional cycle time Item number: 76	—	R/W	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note2
96	OUT3 proportional cycle time Item number: 77	—	R/W	0.1 to 100.0 seconds	Voltage pulse output: Note 3

 : Shows the communication data of FZ400/900.

Note 1: In case OUT1 function selection is “Input 1_Control output [cool-side]” and Input 1_Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

Note2: In case OUT2 function selection is “Input 1_Control output [cool-side]” and Input 1_Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

Note3: In case OUT3 function selection is “Input 1_Control output [cool-side]” and Input 1_Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 5)					
97	OUT1 minimum ON/OFF time of proportional cycle Item number: 78	—	R/W	0 to 1000 ms	0
98	OUT2 minimum ON/OFF time of proportional cycle Item number: 79	—	R/W	0 to 1000 ms	0
99	OUT3 minimum ON/OFF time of proportional cycle Item number: 80	—	R/W	0 to 1000 ms	0
Setting group (Setting item selection 6)					
100	Number of heater break alarm 1 (HBA1) delay times Item number: 82	—	R/W	0 to 255 times	5
101	Number of heater break alarm 2 (HBA2) delay times Item number: 84	—	R/W	0 to 255 times	5
102	Input 1_Manual manipulated output value Item number: 85	—	R/W	PID control, Position proportioning PID control: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side] Heat/Cool PID control *: -(Input 1_Output limiter high [cool-side]) to +(Input 1_Output limiter high [heat-side])	PID control, Position proportioning PID control: -5.0 Heat/Cool PID control: 0.0

: Shows the communication data of FZ400/900.

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

(1) Input 1_Output limiter high [cool-side] is ≤ 0.0 %

- Input 1_Output limiter low [heat-side] is ≤ 0.0 %: 0.0 % to +(Input 1_Output limiter high [heat-side])
- Input 1_Output limiter low [heat-side] is > 0.0 %: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side]

(2) Input 1_Output limiter high [heat-side] is ≤ 0.0 %

- Input 1_Output limiter low [cool-side] is ≤ 0.0 %: -(Input 1_Output limiter high [cool-side]) to 0.0 %
- Input 1_Output limiter low [cool-side] is > 0.0 %: -(Input 1_Output limiter high [cool-side]) to -(Input 1_Output limiter low [cool-side])

(3) Fixed at 0.0 % in the following cases:

Input 1_Output limiter high [cool-side] ≤ 0.0 %, and Input 1_Output limiter high [heat-side] ≤ 0.0 %

Continued on the next page.



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 6)					
103	Input 1_ Level PID setting 1 * Item number: 86	—	R/W	Input 1_Input range low to Input 1_Input range high When Control with PV select: PV select input range low to PV select input range high Varies with the setting of the Decimal point position.	Input 1_ Input range high When Control with PV select: PV select input range high
104	Input 1_ Level PID setting 2 * Item number: 87	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
105	Input 1_ Level PID setting 3 * Item number: 88	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
106	Input 1_ Level PID setting 4 * Item number: 89	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
107	Input 1_ Level PID setting 5 * Item number: 90	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
108	Input 1_ Level PID setting 6 * Item number: 91	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
109	Input 1_ Level PID setting 7 * Item number: 92	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
110	For system use Item number: 93	—	—	Internal processing Do not use the register address	—

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

 $(\text{Input 1\_Level PID setting 1}) \leq (\text{Input 1\_Level PID setting 2}) \leq (\text{Input 1\_Level PID setting 3}) \leq$ $(\text{Input 1\_Level PID setting 4}) \leq (\text{Input 1\_Level PID setting 5}) \leq (\text{Input 1\_Level PID setting 6}) \leq$ $(\text{Input 1\_Level PID setting 7})$

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 6)					
111	Input 1_ON/OFF action differential gap (upper) Item number: 94	—	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1
112	Input 1_ON/OFF action differential gap (lower) Item number: 95	—	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1
113	Input 2_Manual manipulated output value Item number: 96	D1122 D1123	R/W	Input 2_Output limiter low to Input 2_Output limiter high	−5.0
Setting group (Setting item selection 7)					
114	Input 2_Level PID setting 1 * Item number: 97	—	R/W	Input 2_Input range low to Input 2_Input range high Varies with the setting of the Decimal point position.	Input 2_Input range high
115	Input 2_Level PID setting 2 * Item number: 98	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_Level PID setting 1
116	Input 2_Level PID setting 3 * Item number: 99	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_Level PID setting 1

: Shows the communication data of FZ400/900.

*Level PID settings 1 to 7 of Input 2 always maintain the following relation.

(Input 2_Level PID setting 1) ≤ (Input 2_Level PID setting 2) ≤ (Input 2_Level PID setting 3) ≤

(Input 2_Level PID setting 4) ≤ (Input 2_Level PID setting 5) ≤ (Input 2_Level PID setting 6) ≤

(Input 2_Level PID setting 7)

Continued on the next page.



Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 7)					
117	Input 2_ Level PID setting 4 *	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
	Item number: 100				
118	Input 2_ Level PID setting 5 *	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
	Item number: 101				
119	Input 2_ Level PID setting 6 *	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
	Item number: 102				
120	Input 2_ Level PID setting 7 *	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
	Item number: 103				
121	For system use	—	—	Internal processing Do not use the register address	—
	Item number: 104				
122	Input 2_ON/OFF action differential gap (upper)	—	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span	TC/RTD inputs: 1 V/I inputs: 0.1
	Item number: 105				
123	Input 2_ON/OFF action differential gap (lower)	—	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span	TC/RTD inputs: 1 V/I inputs: 0.1
	Item number: 106				

 : Shows the communication data of FZ400/900.

*Level PID settings 1 to 7 of Input 2 always maintain the following relation.

$(\text{Input 2\_Level PID setting 1}) \leq (\text{Input 2\_Level PID setting 2}) \leq (\text{Input 2\_Level PID setting 3}) \leq$
 $(\text{Input 2\_Level PID setting 4}) \leq (\text{Input 2\_Level PID setting 5}) \leq (\text{Input 2\_Level PID setting 6}) \leq$
 $(\text{Input 2\_Level PID setting 7})$

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 7)					
124	Input 1_AT bias Item number: 107	—	R/W	-(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: - (PV select input span) to + (PV select input span)) Varies with the setting of the Decimal point position.	0
125	Input 2_AT bias Item number: 108	—	R/W	-(Input 2_Input span) to +(Input 2_Input span) Varies with the setting of the Decimal point position.	0
126	Open/Close output neutral zone Item number: 109	—	R/W	0.1 to 10.0 % of output	2.0
127	Open/Close output differential gap Item number: 110	—	R/W	0.1 to 5.0 % of output	1.0
128	FF amount learning Item number: 111	—	R/W	0 to 3 0: No learning +1: Learn Input 1 +2: Learn Input 2 To select two or more functions, sum each value. When the status of the FF amount learning of the FZ has changed, the learning of the FF amount in the PLC will be also automatically updated.	0
129	Input 1_Determination point of external disturbance Item number: 112	—	R/W	-(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: - (PV select input span) to + (PV select input span)) Varies with the setting of the Decimal point position.	-1

 : Shows the communication data of FZ400/900.

Continued on the next page.



6. COMMUNICATION DATA

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 8)					
130	Input 2_Determination point of external disturbance Item number: 113	—	R/W	–(Input 2_Input span) to +(Input 2_Input span) Varies with the setting of the Decimal point position.	–1
131	Cascade_Proportional band (master-side) Item number: 114	—	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Proportional band (master-side) in the PLC will be also automatically updated.	TC/RTD inputs: 30 V/I inputs: 3.0
132	Cascade_Integral time (master-side) Item number: 115	—	R/W	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds Varies with the setting of the Integral/Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Integral time (master-side) in the PLC will be also automatically updated.	240
133	Cascade_Derivative time (master-side) Item number: 116	—	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action Varies with the setting of the Integral/Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Derivative time (master-side) in the PLC will be also automatically updated.	60

 : Shows the communication data of FZ400/900.

Continued on the next page.

Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 8)					
134	Cascade_Proportional band (slave-side) Item number: 117	—	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input 2_Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 2_Input span When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Proportional band (slave-side) in the PLC will be also automatically updated.	TC/RTD inputs: 30 V/I inputs: 3.0
135	Cascade_Integral time (slave-side) Item number: 118	—	R/W	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds Varies with the setting of the Integral/Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Integral time (slave-side) in the PLC will be also automatically updated.	240
136	Cascade_Derivative time (slave-side) Item number: 119	—	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action Varies with the setting of the Integral/Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Derivative time (slave-side) in the PLC will be also automatically updated.	60
137	Cascade_Digital filter Item number: 120	—	R/W	0.0 to 100.0 seconds 0.0: Filter OFF	10.0
138	Cascade_Scale high Item number: 121	—	R/W	Cascade_Scale low to Input 2_Setting limiter high Varies with the setting of the Decimal point position.	Input 2_Setting limiter high

 : Shows the communication data of FZ400/900.



6. COMMUNICATION DATA

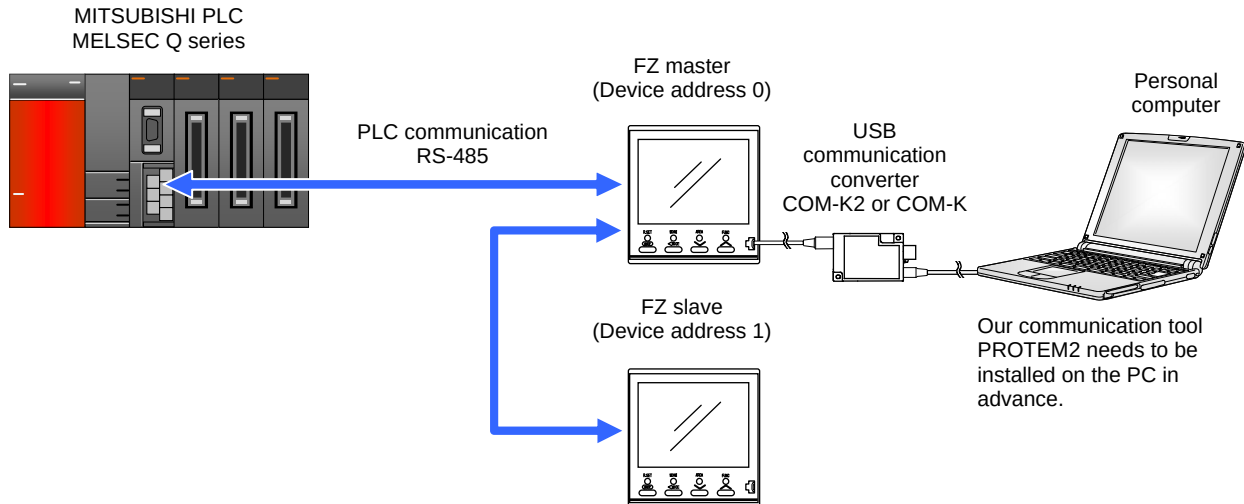
Continued from the previous page.

No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 8)					
139	Cascade_Scale low Item number: 122	—	R/W	Input 2_Setting limiter low to Cascade_Scale high Varies with the setting of the Decimal point position.	Input 2_Setting limiter low
140	PV select transfer level Item number: 123	—	R/W	Input 1_Input range low to Input 1_Input range high Varies with the setting of the Decimal point position.	Input 1_Input range high
141	PV select transfer time Item number: 124	—	R/W	0.0 to 100.0 seconds	0.0

 : Shows the communication data of FZ400/900.

6.3 Example of PLC Communication Data Map Editing

Example: Reducing the number of communication data of FZ master (Device address 0) and changing the register start number of FZ slave (Device address 1). (In case of a double word)



■ Communication data to be reduced

In this example, all of communication data in Setting item selections 3 and 4 of the FZ master (Device number 0) will be removed.

Group	Item	Name	Register address assigned as a factory set value	
Setting group	Setting item selection 3	Input 1_Proportional band [cool-side]	D1052	D1053
Setting group	Setting item selection 4	Input 1_Integral time [cool-side]	D1054	D1055
Setting group	Setting item selection 4	Input 1_Derivative time [cool-side]	D1056	D1057
Setting group	Setting item selection 4	Input 1_Setting change rate limiter (up)	D1058	D1059
Setting group	Setting item selection 4	Input 1_Setting change rate limiter (down)	D1060	D1061

Display example of GX Works2

Communication data to be reduced

Device	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
D1000	1	1	-28671	9001	16	3	0	0	0	0
D1010	0	0	334	0	50	0	-50	-1	1050	0
D1020	0	0	0	0	15	0	0	0	0	0
D1030	0	0	0	0	50	0	200	0	200	0
D1040	200	0	200	0	300	0	240	0	60	0
D1050	2	0	300	0	240	0	60	0	50	0
D1060	50	0	50	0	250	0	0	0	0	0
D1070	0	0	0	0	0	0	0	0	0	0
D1080	1	1	-28671	9001	0	2	0	0	0	0
D1090	0	0	302	0	0	0	-50	-1	1050	0
D1100	0	0	0	0	15	0	0	0	0	0
D1110	0	0	0	0	0	0	0	0	0	0
D1120	0	0	0	0	0	0	0	0	0	0
D1130	0	0	0	0	0	0	0	0	0	0
D1140	0	0	0	0	0	0	0	0	0	0
D1150	0	0	0	0	0	0	0	0	0	0
D1160	0	0	0	0	0	0	0	0	0	0
D1170	0	0	0	0	0	0	0	0	0	0

**(1) Reducing the communication data of FZ master**

Here in this example, the communication data of Setting item selections 3 and 4 of the FZ master will be removed using PROTEM2.

- How to set

1. First, calculate the set values of Setting item selections 3 and 4 in decimal format.

Set “0” (unused) to the communication data to be removed (of Setting item selections 3 and 4) and convert the values from binary to decimal. In this example, all items are set to “0: Unused” and therefore the set value is “0.”

Bit image (binary number): 0000000000000000
 Bit 15 ----- Bit 0

0: Unused
1: Used

Decimal number: 0

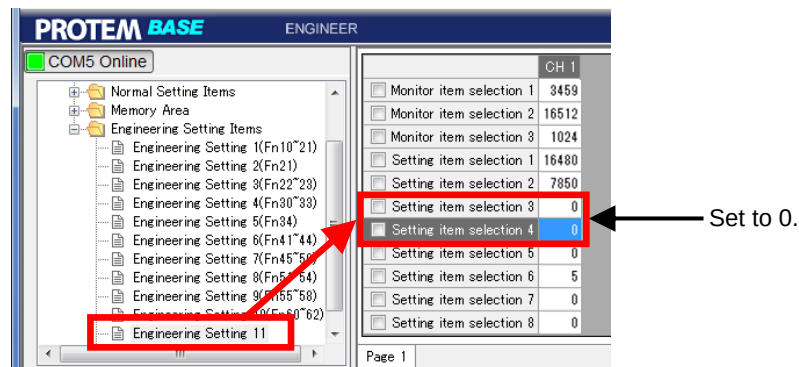
Setting item selection 3

Bit	Item number	Communication data (Setting items)	Factory set value	
			Binary number	Decimal number
0	33	Input 1_Output limiter high [heat-side]	0	0
1	34	Input 1_Output limiter low [heat-side]	0	
2	35	Input 1_Control loop break alarm (LBA) time	0	
3	36	Input 1_LBA deadband (LBD)	0	
4	37	Input 2_Proportional band	0	
5	38	Input 2_Integral time	0	
6	39	Input 2_Derivative time	0	
7	40	Input 2_Control response parameter	0	
8	41	Input 2_Proactive intensity	0	
9	42	Input 2_Manual reset	0	
10	43	Input 2_FF amount	0	
11	44	Input 2_Output limiter high	0	
12	45	Input 2_Output limiter low	0	
13	46	Input 2_Control loop break alarm (LBA) time	0	
14	47	Input 2_LBA deadband (LBD)	0	
15	48	Input 1_Proportional band [cool-side]	0	

Setting item selection 4

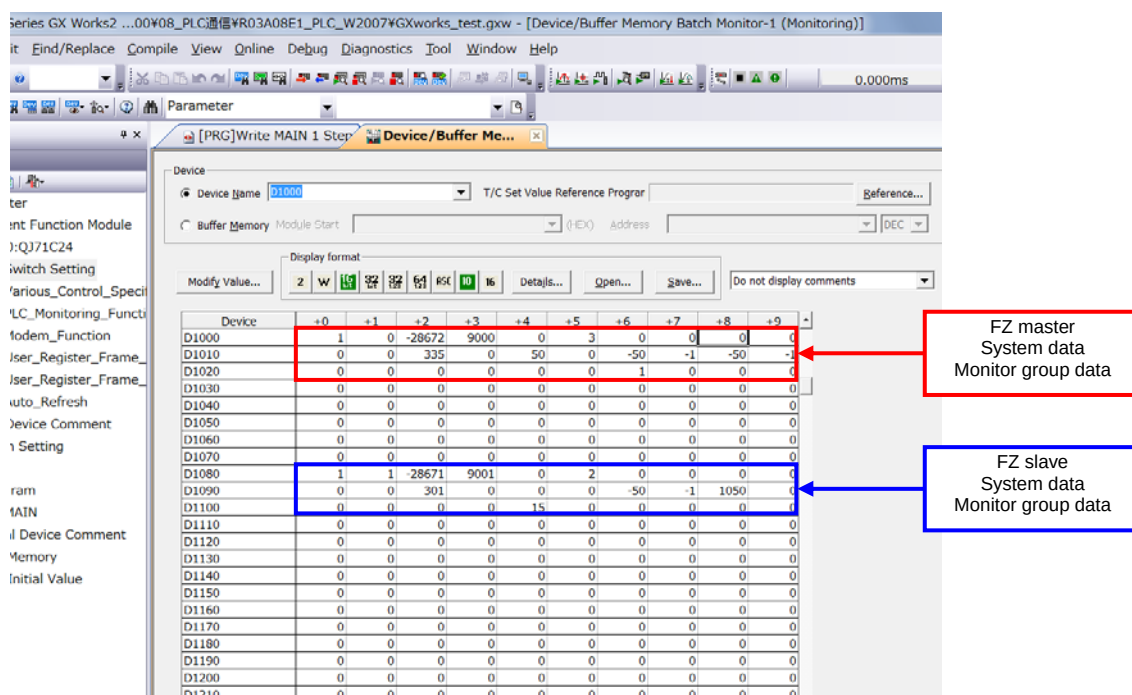
Bit	Item number	Communication data (Setting items)	Factory set value	
			Binary number	Decimal number
0	49	Input 1_Integral time [cool-side]	0	0
1	50	Input 1_Derivative time [cool-side]	0	
2	51	Input 1_Overlap/Deadband	0	
3	52	Input 1_Output limiter high [cool-side]	0	
4	53	Input 1_Output limiter low [cool -side]	0	
5	54	Select Trigger type for Memory area transfer	0	
6	55	Area soak time	0	
7	56	Link area number	0	
8	57	Input 1_Setting change rate limiter (up)	0	
9	58	Input 1_Setting change rate limiter (down)	0	
10	59	Input 1_Auto/Manual transfer selection (Area)	0	
11	60	Input 1_Manipulated output value (Area)	0	
12	61	Input 2_Setting change rate limiter (up)	0	
13	62	Input 2_Setting change rate limiter (down)	0	
14	63	Input 2_Auto/Manual transfer selection (Area)	0	
15	64	Input 2_Manipulated output value (Area)	0	

2. Use PROTEM2 to set “0” to Setting item selection 3 and 4 of the FZ master.



PLC communication environment setting screen of PROTEM2

3. Turn off the power of the FZ master and then turn it back on. When the power is turned on, the new values will take effect.
4. Check the edited PLC communication data map with “GX Works2.”
Clear PLC memory by the “GX Works2.”



- Configure the initial settings. With request item number (D1007) set to “0,” set the monitor request bit (Bit 1) of request command (D1008) to “1” (decimal number: 2), and write the setting group communication data of FZ master to the PLC.

0Y08_PLC通信R03A08E1_PLC_W2007*GXworks_test.gxw - [Device/Buffer Memory Batch Monitor-1 (Monitoring)]

mpile View Online Debug Diagnostics Tool Window Help

0.000ms Local Device not Execut

Parameter [PRG]Write MAIN 1 Step Device/Buffer Me...

Device: D1000 T/C Set Value Reference Program Reference...

Buffer Memory Module Start (HEX) Address DEC

Modify Value...

Display format: 2 W 16 32 64 128 256 512 1024 2048 4096 8192 16384 32768 65536 131072 262144 524288 1048576 2097152 4194304 8388608 16777216 33554432 67108864 134217728 268435456 536870912 1073741824 2147483648 4294967296 8589934592 17179869184 34359738368 68719476736 137438953472 274877906944 549755813888 1099511627776 2199023255552 4398046511104 8796093022208 17592186044416 35184372088832 70368744177664 140737488355328 281474976710656 562949953421312 1125899906842624 2251799813685248 4503599627370496 9007199254740992 18014398509481984 36028797018963968 72057594037927936 144115188075855872 288230376151711744 576460752303423488 1152921504606846976 2305843009213693952 4611686018427387904 9223372036854775808 18446744073709551616 36893488147419103232 73786976294838206464 147573952589676412928 295147905179352825856 590295810358705651712 1180591620717411303424 2361183241434822606848 4722366482869645213696 9444732965739290427392 18889465931478580854784 37778931862957161709568 75557863725914323419136 151115727451828646838272 302231454903657293676544 604462909807314587353088 1208925819614629174706176 2417851639229258349412352 4835703278458516698824704 9671406556917033397649408 19342813113834066795298816 38685626227668133590597632 77371252455336267181195264 154742504910672534362390528 309485009821345068724781056 618970019642690137449562112 1237940039285380274899124224 2475880078570760549798248448 4951760157141521099596496896 9903520314283042199192993792 19807040628566084398385987584 39614081257132168796771975168 79228162514264337593543950336 158456325028528675187087900672 316912650057057350374175801344 633825300114114700748351602688 1267650600228229401496703205376 2535301200456458802993406410752 5070602400912917605986812821504 10141204801825835211973625643008 20282409603651670423947251286016 40564819207303340847894502572032 81129638414606681695789005144064 162259276829213363391578010288128 324518553658426726783156020576256 649037107316853453566312041152512 1298074214633706907132624082305024 2596148429267413814265248164610048 5192296858534827628530496329220096 10384593717069655257060992658440192 20769187434139310514121985316880384 41538374868278621028243970633760768 83076749736557242056487941267521536 166153499473114484112975882535043072 332306998946228968225951765070086144 664613997892457936451903530140172288 1329227995784915872903807060280344704 2658455991569831745807614120560689408 5316911983139663491615228241121378816 10633823966279326983230456482242757632 21267647932558653966460912964485515264 42535295865117307932921825928971030528 85070591730234615865843651857942061056 170141183460469231731687303715884122112 340282366920938463463374607431768244224 680564733841876926926749214863536488448 1361129467683753853853498429727072976896 2722258935367507707706996859454145953792 5444517870735015415413993718908291907584 10889035741470030830827987437816583815168 21778071482940061661655974875633167630336 43556142965880123323311949751266335260672 87112285931760246646623899502532670521344 174224571863520493293247799005065341042688 348449143727040986586495598010130682085376 696898287454081973172991196020261364170752 1393796574908163946345982392040522728341504 2787593149816327892691964784081045456683008 5575186299632655785383929568162090913366016 11150372599265311570767859136324181826732032 22300745198530623141535718272648363653464064 44601490397061246283071436545296727306928128 89202980794122492566142873090593454613856256 178405961588244985132285746181186909227712512 356811923176489970264571492362373818455425024 713623846352979940529142984724747636910850048 142724769270595988105828596944949527382170016 285449538541191976211657193889899054764340032 570899077082383952423314387779798109528680064 1141798154164767904846628775559596219057360128 2283596308329535809693257551119192438114720256 4567192616659071619386515102238384876229440512 9134385233318143238773030204476769752458881024 18268770466636286477546060408953539504917632024 36537540933272572955092120817907079009835264048 73075081866545145910184241635814158019670528096 146150163733090291820368483271628316039341056192 292300327466180583640736966543256632078682112384 584600654932361167281473933086513264157364224768 1169201309864722334562947866173026528314728449536 2338402619729444669125895732346053056629456899072 4676805239458889338251791464692106113258913798144 9353610478917778676503582929384212226517827596288 18707220957835557353007165858768424453035655192576 37414441915671114706014331717536848906071310385152 74828883831342229412028663435073697812142620770304 149657767662684458824057326870147395624285241540608 299315535325368917648114653740294791248570483081216 598631070650737835296229307480589582497140966162432 1197262141301475670592458614961179164994281932324864 2394524282602951341184917229922358329988563864649728 4789048565205902682369834459844716659977127729299456 9578097130411805364739668919689433319954255458598912 19156194260823610729479337839378866639908510917197824 38312388521647221458958675678757733279817021834395648 76624777043294442917917351357515466559634043668791296 153249554086588885835834702715030933119268087337582592 306499108173177771671669405430061866238536174675165184 612998216346355543343338810860123732477072349350330304 1225996432692711086686677621720247464954144698700660608 2451992865385422173373355243440494929908289397401321216 4903985730770844346746710486880989859816578794802642432 9807971461541688693493420973761979719633157589605284864 19615942923083377386986841947523959439266315179210569728 39231885846166754773973683895047918878532630358421139456 78463771692333509547947367790095837757065260716842278912 156927543384667019095894735580191675514130521433684557824 313855086769334038191789471160383351028261042867369115648 627710173538668076383578942320766702056522085734738231296 1255420347077336152767157884641533404113044171469476462592 2510840694154672305534315769283066808226088342938952925184 5021681388309344611068631538566133616452176685877905850368 10043362776618689222137263077132267232904353371755811700736 20086725553237378444274526154264534465808706743511623401472 40173451106474756888549052308529068931617413487023246802944 80346902212949513777098104617058137863234826974046493605888 160693804425899027554196209234116275726469653948092987371776 321387608851798055108392418468232551452939307896185974743552 642775217703596110216784836936465102905878615792371949487104 1285550435407192220433569673872930205811757231584743898204208 257110087081438444086713934774586041162351446316948779640416 514220174162876888173427869549172082324702892633897550880832 1028440348325753776346855739098344164649405785267795101761664 2056880696651507552693711478196688329298811570535590203523328 4113761393303015105387422956393376658597623141071180407046656 8227522786606030210774845912786753317195246282142360814093312 16455045573212060421549691825573506634390492564284721628186624 32910091146424120843099383651147013268780985128569443256373248 65820182292848241686198767302294026537561970257138886512746496 13164036458569648337239753460458805307512394051427773102549296 26328072917139296674479506920917610615024788102855546205098592 52656145834278593348959013841835221230049576205711092410197184 10531229166855718669791802768367044246009912411422214420394368 21062458333711437339583605536734088492019824822844428840788736 42124916667422874679167211073468176984039649645688857681577472 84249833334845749358334422146936353968079299291377715363154944 168499666669691498716668844293872707936158595982755430723089888 336999333339382997433337688587745415872371911965508861546175776 673998666678765994866675377175490831744742359311017732912351552 1347997333357531989733350754350981663489484718622035465824703104 269599466671506397946670150870196332697896943724407093164840208 539198933343012795893340301740392665395793887448814186328880416 1078397866686025591786680603480785330791587774897628372657760832 2156795733372051183573361206961570661583175549795256745315521664 4313591466744102367146722413923141323166351099590513490631043296 8627182933488204734293444827846282646332702199181026981262086592 17254365866976409468586889655692565292665404398362053962524173184 34508731733952818937173779311385130585330808796724107925048346368 69017463467905637874347558622770261170661617593448215850096692736 138034926935811275748695117245540522341323235186964311700193385472 276069853871622551497390234491081044822646470373928623400386710944 552139707743245102994780468982162089645292940747857246800773421888 1104279415486490205989560937964324179290585881495714493601546843776 2208558830972980411979121875928648358581171762991428987203093687552 4417117661945960823958243751857296717162343525982857874406187375104 8834235323891921647916487503714593434324687051965715748812374750208 17668470647783843295832975007429186868649374103931431497624749500416 35336941295567686591665950014858373737298748207862862995249499000832 70673882591135373183331900029716747474597496415725725990498998001664 141347765182270746366663800059433494949194992831451451980997996003328 282695530364541492733327600118866989898389985662902903961995992006656 565391060729082985466655200237733979796779971325805807923991984013312 1130782121458165970933310400475467959593559942651611615847983968026624 2261564242916331941866620800950935919187119885303223231695879360053248 4523128485832663883733241601901871838374239770606446463391758400106496 9046256971665327767466483203803743676748479541212892926783516800212992 18092513943330655534932966407607487353496959082425785853567033600425984 36185027886661311069865932815214974706993918164851571707134067200851968 72370055773322622139731865630429949413987836329703143414268134401703936 144740111546645244279463731260859898827975672659406286828536268803407872 289480223093290488558927462521719797655951345318812573657072537606815744 578960446186580977117854925043439595311902690637625147314145075213631488 1157920892373161954235709850086879190623805381275250294628290150427262976 2315841784746323908471419700173758381247610762550500589565580300854525952 4631683569492647816942839400347516762495221525101001179131160601709051904 9263367138985295633885678800695033524990443050202002358262321203418103808 18526734277970591267771357601390067049980886100404004716524642406836207616 37053468555941182535542715202780134099961772200808009433049284813672415232 74106937111882365071085430405560268199923544401616018866098569627344830464 148213874223764730142170860811120536399847088803232037732197139254689660928 296427748447529460284341721622241072799694177606464075464394278509379321856 592855496895058920568683443244482145599388355212928150928788557018758643712 1185710993790117841137366886488964291998776710425856301875771114037517287424 2371421987580235682274733772977928583997553420851712603751422280075034564848 4742843975160471364549467545955857167995106841703425207502844560150069129696 94856879503209427290989350919117143359902136834068504150056911203001383936 189713759006418854581978701838234286719804273668137008300113822406002767872 379427518012837709163957403676468573439608547336274016600227644812005535744 758855036025675418327914807352937146879217094672548033200455289624011071488 1517710072051350836655829614705874293758434189345096066400910579248022142976 3035420144102701673311659229411748587516868378690192132801821158496044285952 6070840288205403346623318458823497175033736757380384265603642316992088571904 12141680576410806693246636917646994350067473514760768531207284633984177143808 24283361152821613386493273835293988700134947029521537062414569267968354287616 48566722305643226772986547670587977400269894059043074124829138535936708575232 97133444611286453545973095341175954800539788118086148249582270071873417150464 194266889222572907091946190682351909601079576236172296499164540143746834300928 388533778445145814183892381364703819202159152472344592998329080287493668601856 77

(2) Change the register start number of a FZ slave

Registers D1052 to D1061 (10 registers) are now empty, and thus to fill in the empty registers, the register start number of FZ slave must be changed.

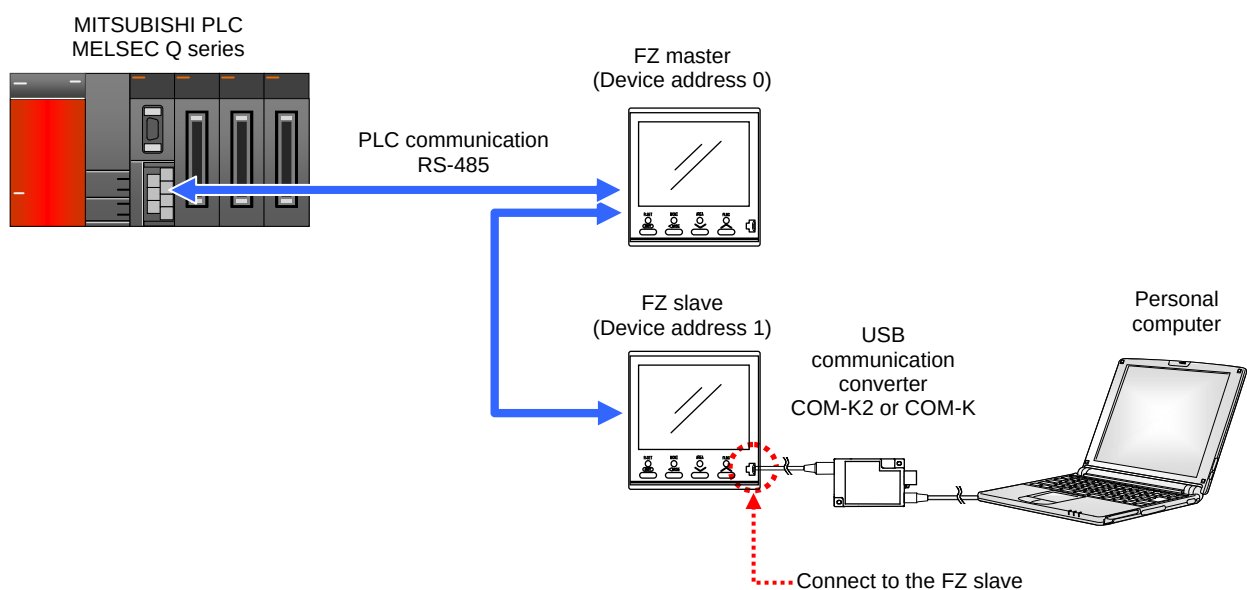
Leave no empty register areas D1066 to D1079 (14 registers) that were not used at the time of shipment.

Registers D1056 to D1079 are now empty. (24 registers)

Start register of FZ slave (D1080)

Device	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
D1000	1	0	-28672	9000	0	3	0	0	0	0
D1010	0	0	335	0	50	0	-50	-1	-50	-1
D1020	0	0	0	0	0	0	1	0	0	0
D1030	1	0	0	0	50	0	200	0	200	0
D1040	200	0	200	0	300	0	240	0	60	0
D1050	2	0	50	0	250	0	0	0	0	0
D1060	0	0	0	0	0	0	0	0	0	0
D1070	0	0	0	0	0	0	0	0	0	0
D1080	1	0	-28671	9001	0	2	0	0	0	0
D1090	0	0	301	0	0	0	-50	-1	1050	0
D1100	0	0	0	0	15	0	0	0	0	0
D1110	0	0	0	0	0	0	0	0	0	0
D1120	0	0	0	0	0	0	0	0	0	0
D1130	0	0	0	0	0	0	0	0	0	0
D1140	0	0	0	0	0	0	0	0	0	0
D1150	0	0	0	0	0	0	0	0	0	0
D1160	0	0	0	0	0	0	0	0	0	0
D1170	0	0	0	0	0	0	0	0	0	0
D1180	0	0	0	0	0	0	0	0	0	0
D1190	0	0	0	0	0	0	0	0	0	0
D1200	0	0	0	0	0	0	0	0	0	0
D1210	0	0	0	0	0	0	0	0	0	0
D1220	0	0	0	0	0	0	0	0	0	0
D1230	0	0	0	0	0	0	0	0	0	0
D1240	0	0	0	0	0	0	0	0	0	0
D1250	0	0	0	0	0	0	0	0	0	0

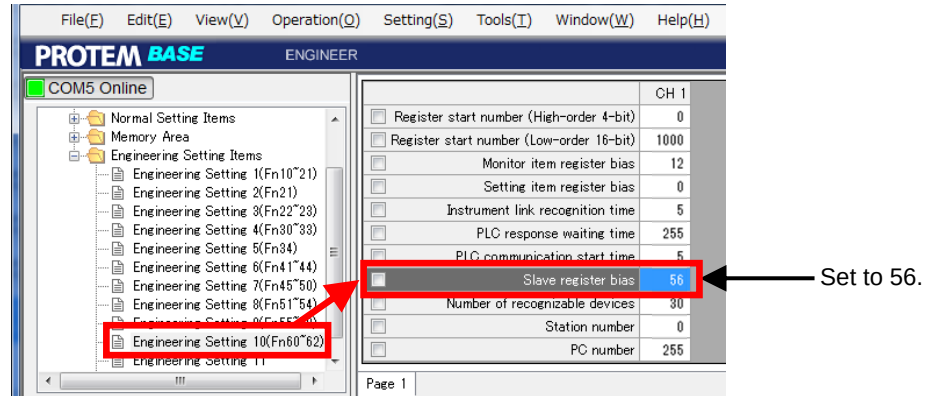
1. Connect a loader communication cable to FZ slave.



- Set the slave register bias of the FZ slave in the PLC communication environment setting item.

Slave register bias value = Slave register start number – Master register start number

To change the register start number for the communication data of FZ slave to D1056, set the slave register bias value to “56” (D1056 – D1000 = 56).

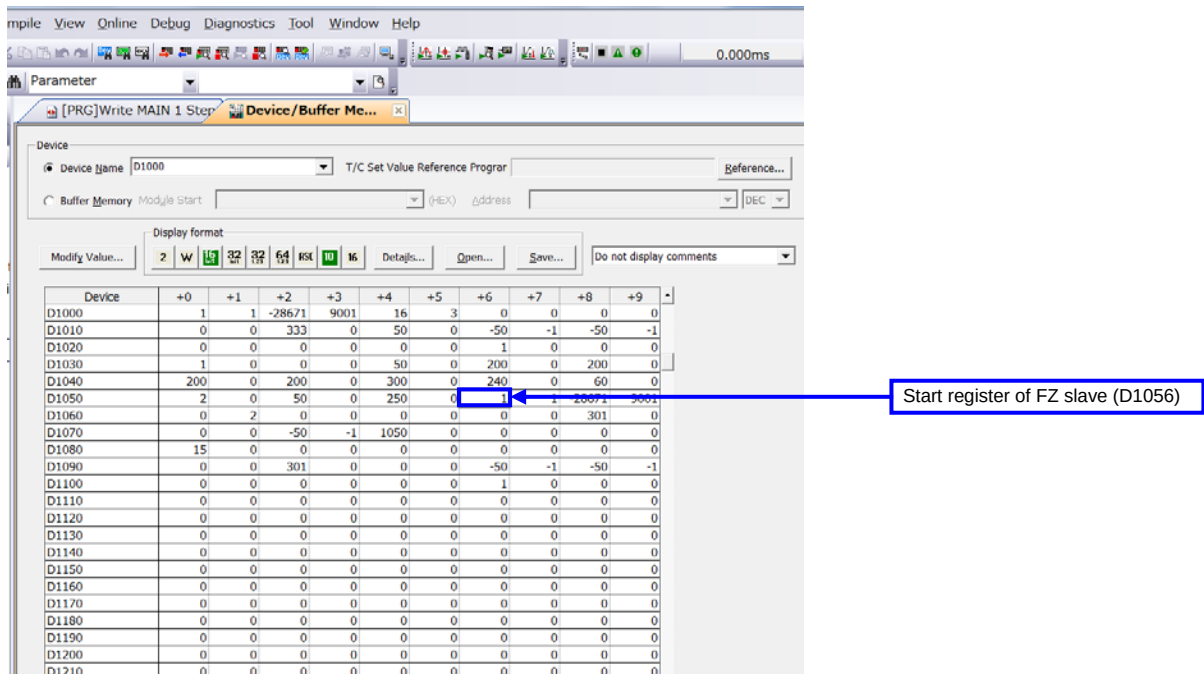


PLC communication environment setting screen of PROTEM2

- Turn off the power of the FZ slaver and then turn it back on. When the power is turned on, the new values will take effect.

- Check the edited PLC communication data map with “GX Works2.”

The first register for the communication data of FZ slave has been changed from D1080 to D1056.





USAGE EXAMPLE

7

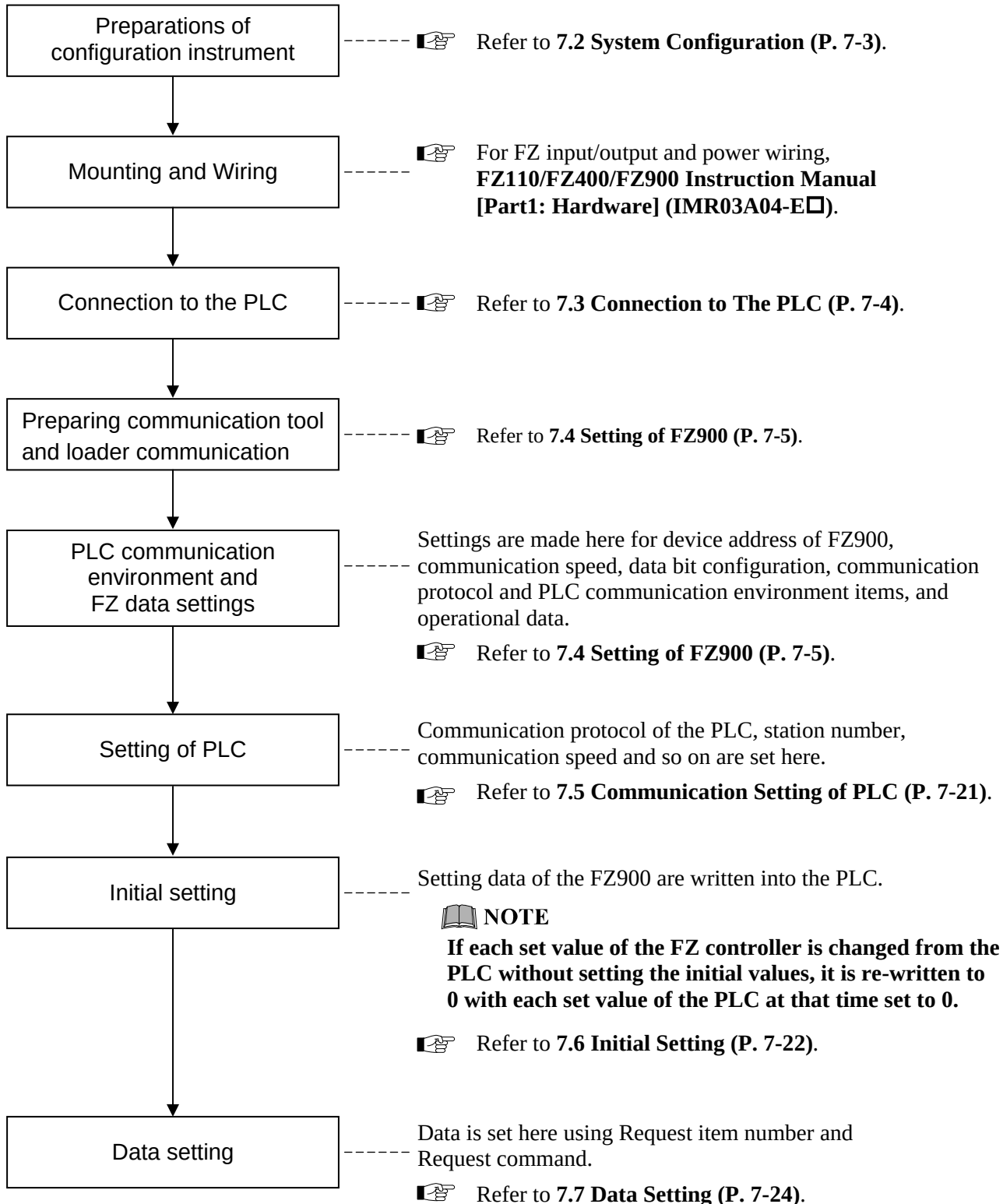
7.1 Handling Procedures	7-2
7.2 System Configuration	7-3
7.3 Connection to The PLC	7-4
7.4 Setting of FZ900	7-5
7.5 Communication Setting of PLC.....	7-21
7.6 Initial Setting	7-22
7.7 Data Setting	7-24

7.1 Handling Procedures

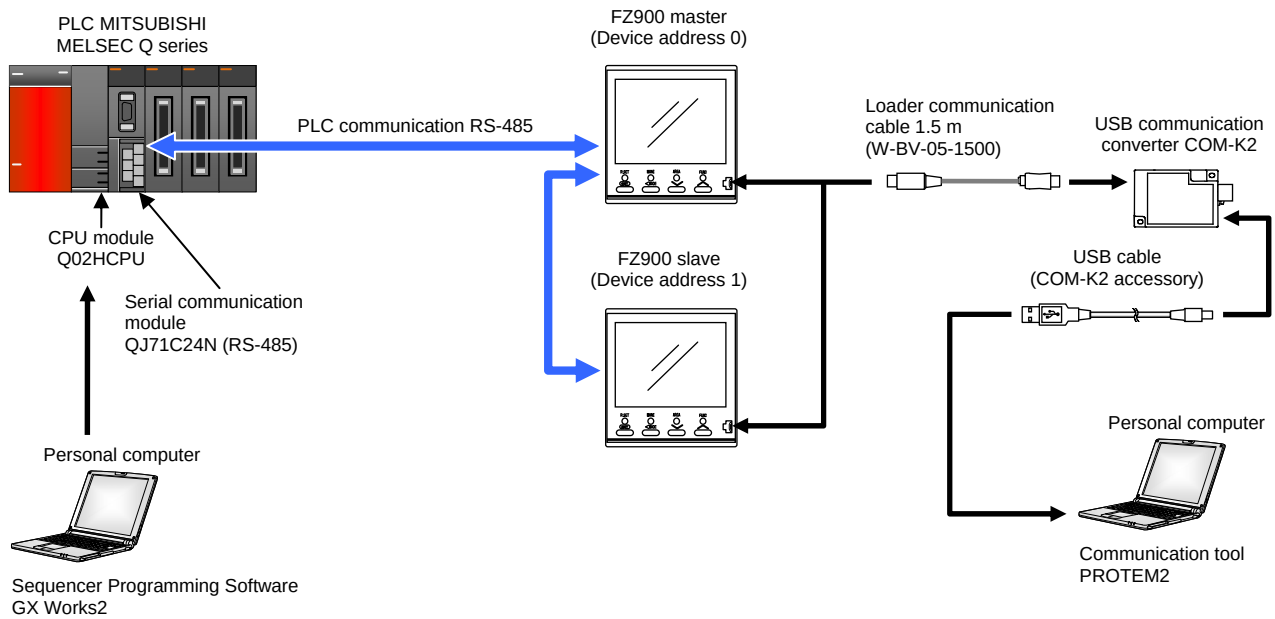
This section explains the data setting procedure when two FZ900 are connected to a MELSEC Q series PLC (Mitsubishi Electric).



Numeric values used in the example are just examples. They are different from the values users may use in their actual application.



7.2 System Configuration



■ Use instruments

● PLC MITSUBISHI MELSEC Q series

CPU unit Q02HCPU:	1
Serial communication unit QJ71C24N (RS-485):	1
Power supply, I/O module, etc.	

● FZ900

FZ900 (Master instrument: Device address 0):	1
FZ900 (Slave instrument: Device address 1):	1

● Communication converter

USB communication converter COM-K2 (RKC product):	1
Loader communication cable W-BV-05 [sold separately]:	1

● Personal computer: 1

One of the following operation systems is required.

Windows Vista, Windows 7 (32-bit/64-bit version), Windows 8 (32-bit/640bit version), or Windows 8.1 (32-bit/64-bit version).

● Communication programs

Communication tool PROTEM 2 (Available for download at our website.)

Sequencer Programming Software GX Works2 [Manufactured by MITSUBISHI ELECTRIC CO., LTD.,] *

* Consult the instruction manuals of the PLC for how to use GX Works 2 and how to wire to the PLC.

■ Other condition (FZ900)

Input data type: Double word

7.3 Connection to The PLC

Connect a FZ to PLC (serial communication unit QJ71C24N).



NOTE

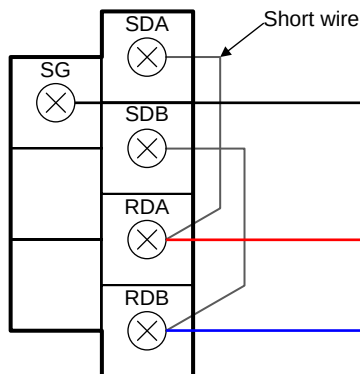
Note that the signal polarity symbols (A and B) are opposite to each other between the PLC (MELSEC series) and the FZ series controller. Normally A is connected to A and B to B. However, in this case, A must be connected to B, and B must be connected to A

• FZ900 communication terminal (RS-485)

Terminal No.	Symbol	Signal name
34	SG	Signal ground
35	T/R (A)	Send data/Receive data
36	T/R (B)	Send data/Receive data

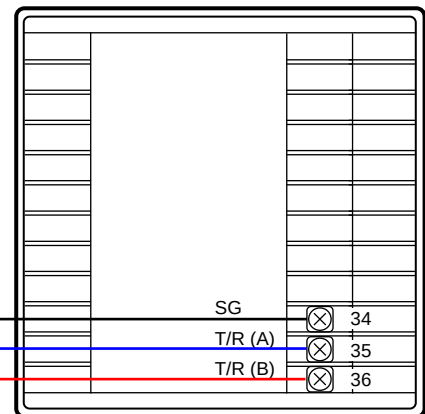
■ Wiring example

PLC MITSUBISHI
MELSEC Q series
Serial communication module
QJ71C24N

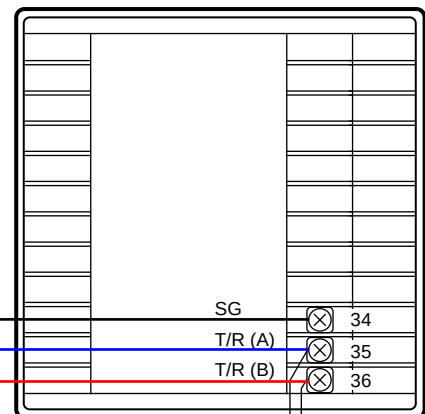


For the details of the termination resistor of the PLC, refer to the instruction manual for the PLC.

FZ900 master
(Device address 0)



FZ900 slave
(Device address 1)



If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors. Install the termination resistor across the communication terminals of FZ900 which is farthest among the connected FZ900.

7.4 Setting of FZ900

First, PLC-communication environment data necessary for communication with a PLC and engineering data and operational data of the FZ900 must be set up. This setting is required on each FZ900.

(1) Installing PROTEM2

Download PROTEM2 from our website and install it on your personal computer.



URL: http://www.rkcinst.co.jp/down_load.htm

(2) Installing COM-K2 driver

If a COM-K2 driver is not yet installed on your personal computer, install the driver now. The driver can be downloaded from the official RKC website.

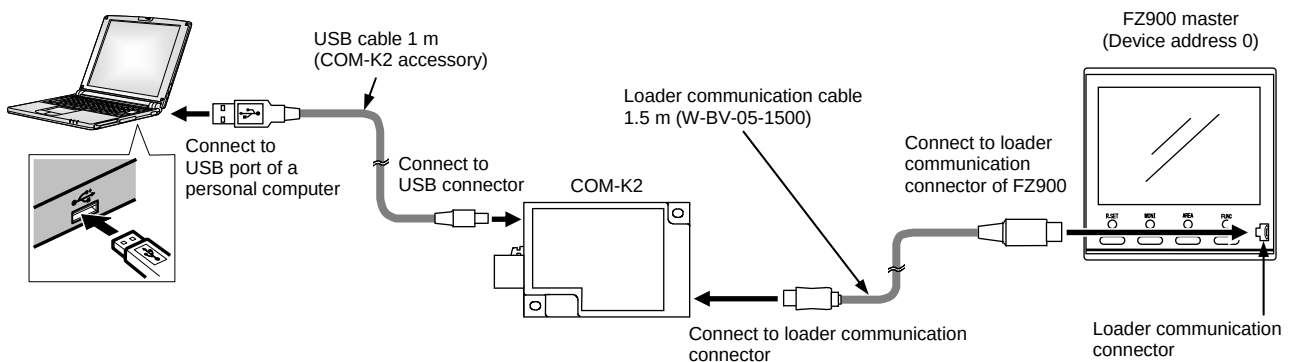
For installation, refer to the **USB Communication Converter COM-K2 USB Driver Installation Manual (IMT01D12-E□)**.



URL: http://www.rkcinst.co.jp/down_load.htm

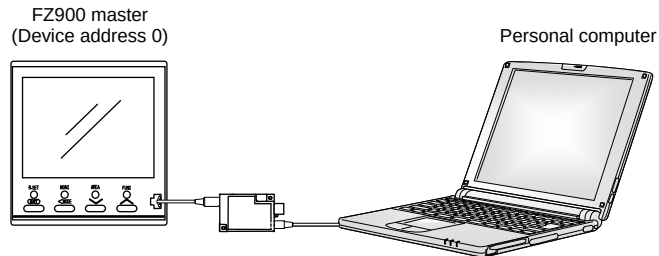
(3) Connection of loader communication

Connect a FZ900 master (device address 0) to converter COM-K2 and personal computer by connection cable.



(4) Configuring the PLC communication environment item and FZ setting data of FZ900 master

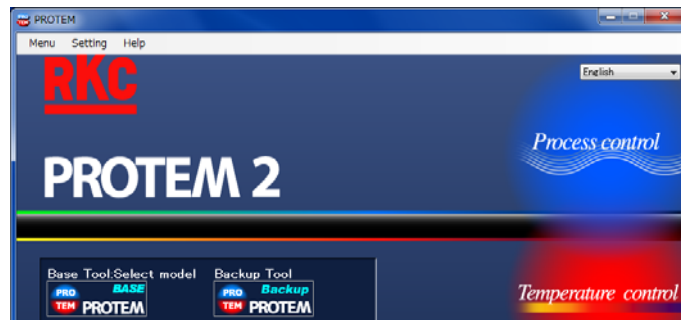
Configure the PLC communication environment and other data of the FZ900 master (device address 0) on your personal computer.



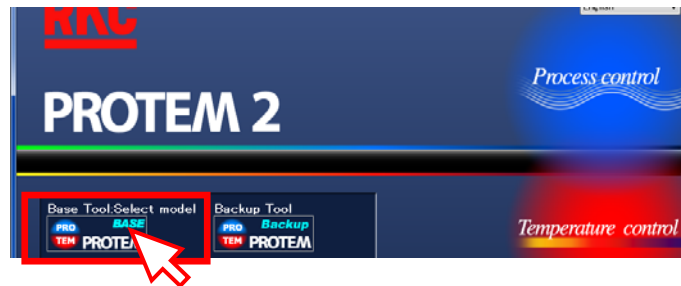
1. Turn on the power of the personal computer

2. Start PROTEM2

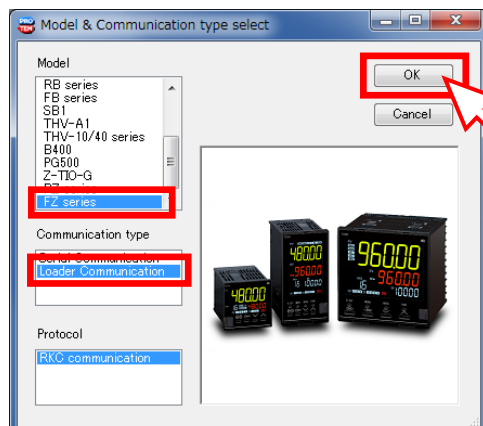
If you use the PROTEM 2 for the first time, you have to create a new project and set a communication port.



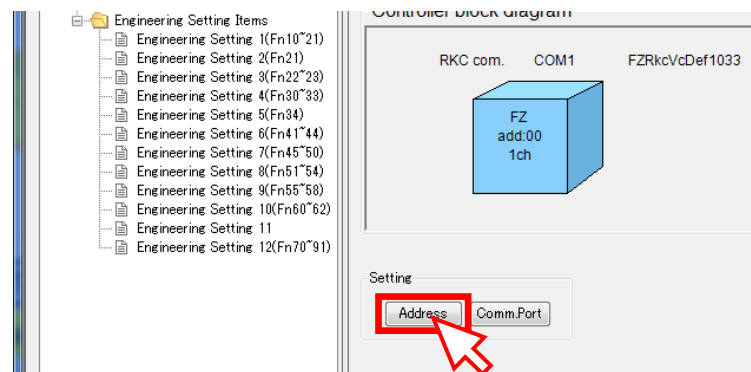
3. Click “Base Tool: Select model”



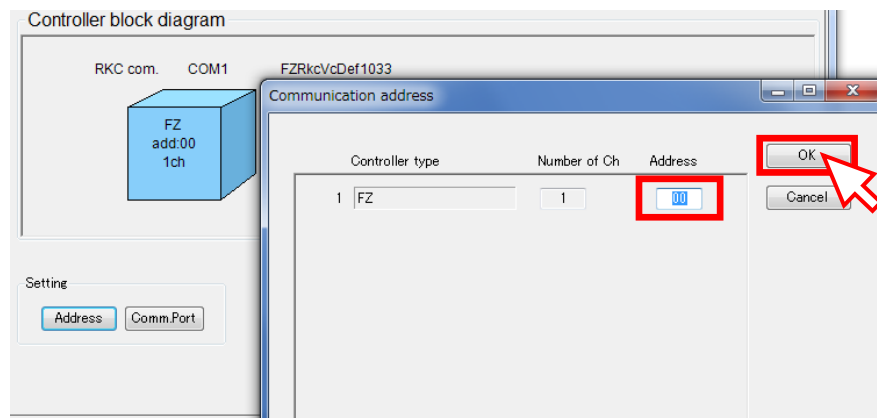
4. Select the “FZ series” and “Loader Communication,” and click “OK”



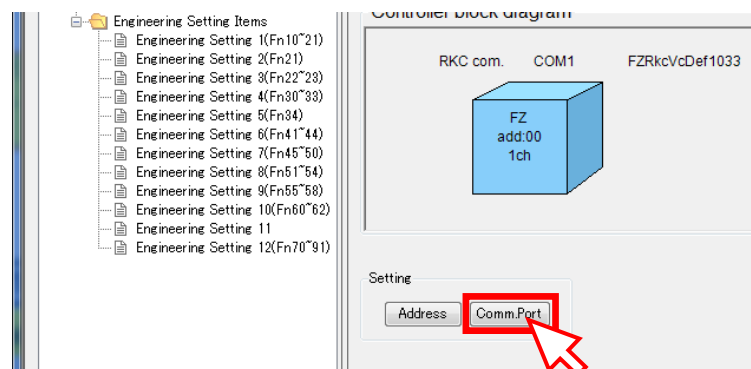
5. Click “Address”



6. Check to see if the device address is set to “0”. If set so, click OK. Device address is fixed for the loader communication.



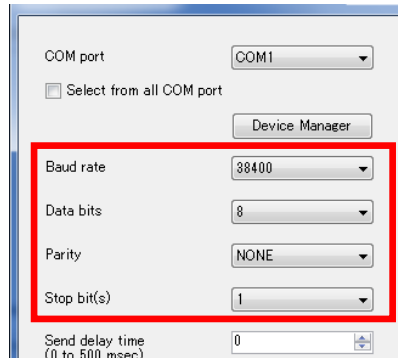
7. Click “Comm.Port”



8. Make sure that the loader communication is configured to the following values.

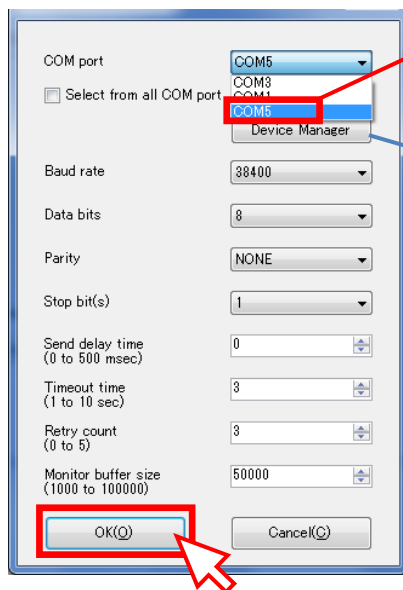
Communication speed and data bit configuration are fixed for the loader communication.

- Communication speed: 38400 bps
- Data bit: 8
- Parity bit: NONE
- Stop bit: 1



9. Select the port number

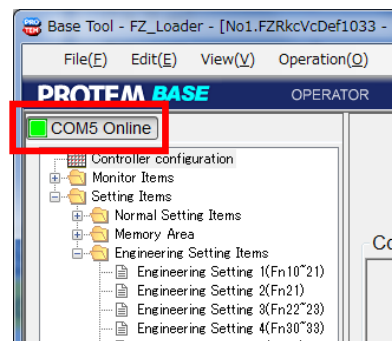
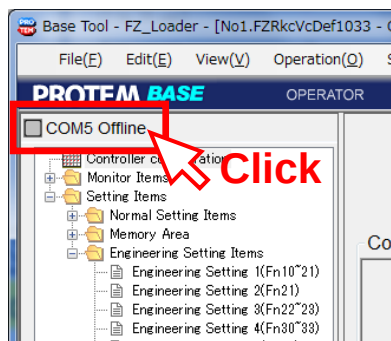
Select the port number on the personal computer to which the USB cable of the COM-K2 is connected, and click OK.



The port number depends on the personal computer.

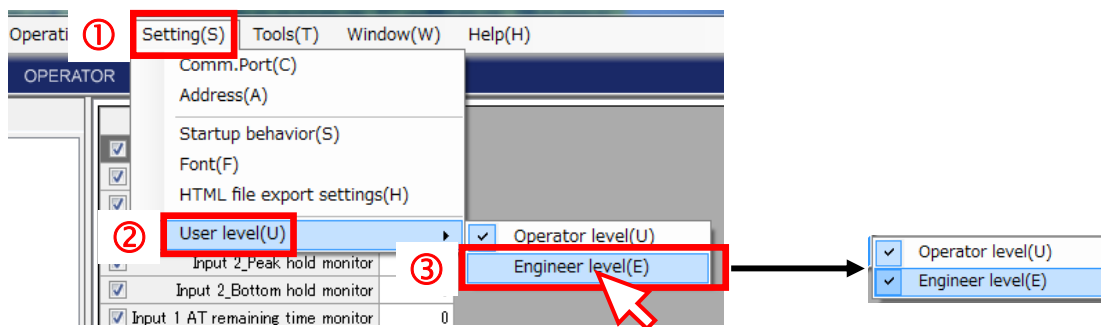
If you are unaware of the port number, click "Device Manager" and check the port number. Set the port number "RKC USB-to-Serial Bridge (COM□)" shown under "Ports (COM & LPT)."

10. Click the button left above and go online.

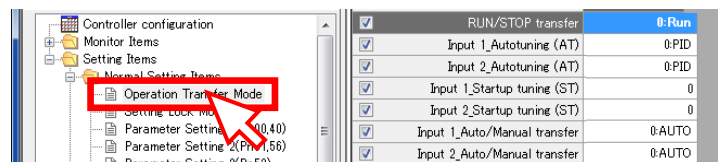


11. Authorize a user to set the Engineering Setting Items.

To allow the user to change the set values, the user level must be switched. Open the menu in the order of “Setting (S)” and “User level (U),” and click “Engineering level (E).”

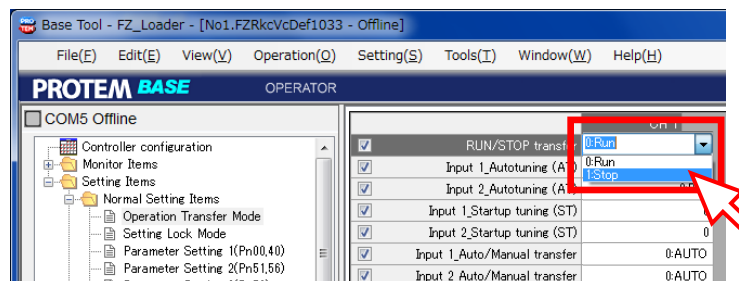


12. Select the “Operation Transfer Mode” in a TreeView

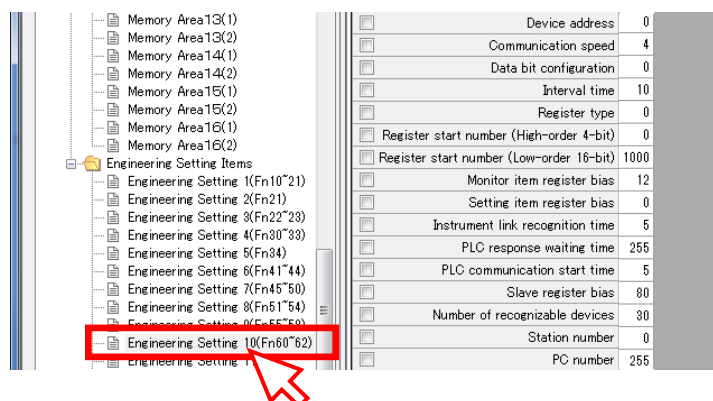


13. Control is stopped

Switch over to “1: STOP” in the RUN/STOP transfer.



14. Select the “Engineer setting 10” in a TreeView



15. Set the communication related items and PLC communication environment items

Set communication related parameters (such as communication speed) and PLC communication environment items at “Engineer setting 10.”

Set as follows for the data in “Engineer setting 10.” (Refer to **Table 1.**)

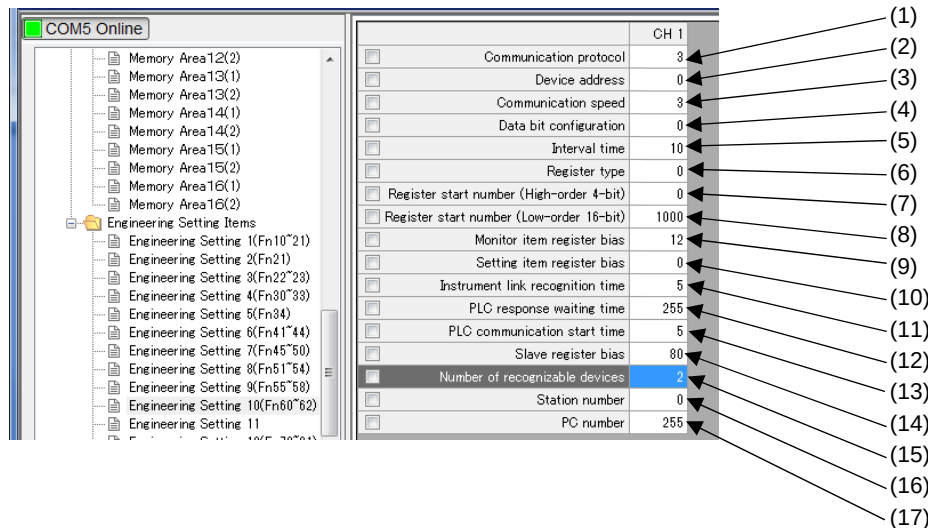


Table 1

Setting items	Set value
(1) Communication protocol	3
(2) Device address	0 (Factory set value)
(3) Communication speed	3 (19200 bps) (Factory set value)
(4) Data bit configuration	0 (Factory set value)
(5) Interval time	10 (Factory set value)
(6) Register type (D, R, W, ZR) ¹	0 (D register) (Factory set value)
(7) Register start number (High-order 4-bit) ¹	0 (Factory set value)
(8) Register start number (Low-order 16-bit) ¹	1000 (Factory set value)
(9) Monitor item register bias ¹	12 (Factory set value)
(10) Setting item register bias ¹	0 (Factory set value)
(11) Instrument link recognition time	5 seconds (Factory set value)
(12) PLC response waiting time	255 ms (Factory set value)
(13) PLC communication start time ²	5 seconds (Factory set value)
(14) Slave register bias ¹	80 (Factory set value)
(15) Number of recognizable devices ³	2
(16) Station number	0 (Factory set value)
(17) PC number	255 (Factory set value)

These values can be changed to change the starting number of the PCL communication data register.

¹ Usable register ranges and types vary depending on used CPU types. For register ranges and types that can actually be used, refer to the PLC instruction manual.

² The PLC communication start time is the time that writing of the system data starts. Actual communication with the PLC by request command can only take place after the system communication state (D01000) changes to “1.”

³ Only the FZ master device (device address 0) can be set up.



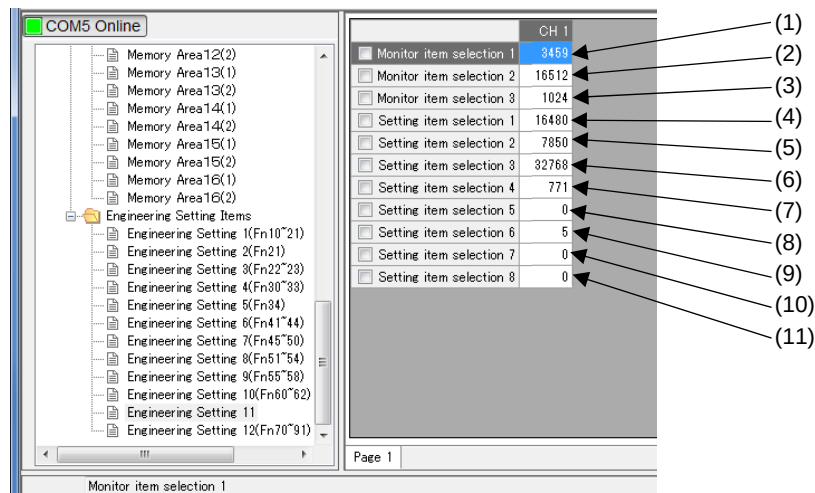
For the Register start number, Monitor item register bias and Setting item register bias, refer to **P. 5-18.**

16. Select the communication data to use.

Select the communication data that are sent/received between the PLC and the FZ master (device address 0). Selection of the communication data can be done at “Engineer Setting 11.”

In the following example, the data in the Engineering Setting 11 are used as they are configured at the factory. (Refer to **Table 2**)

- ☞ To select communication data, refer to **6.3 Example of PLC Communication Data Map Editing (P. 6-61)**.
- ☞ For the communication data type and data range, refer to the following sections:
 - **P.5-8 to P.5-13 of 5.2.1 Setting items list**
 - **6.2 PLC Communication Data Map (P. 6-23)**



Communication data of monitor group is assigned as a bit image in binary numbers.

Bit image: 0000000000000000
 Bit 15 ----- Bit 0
 0: Unused
 1: Used

Table 2

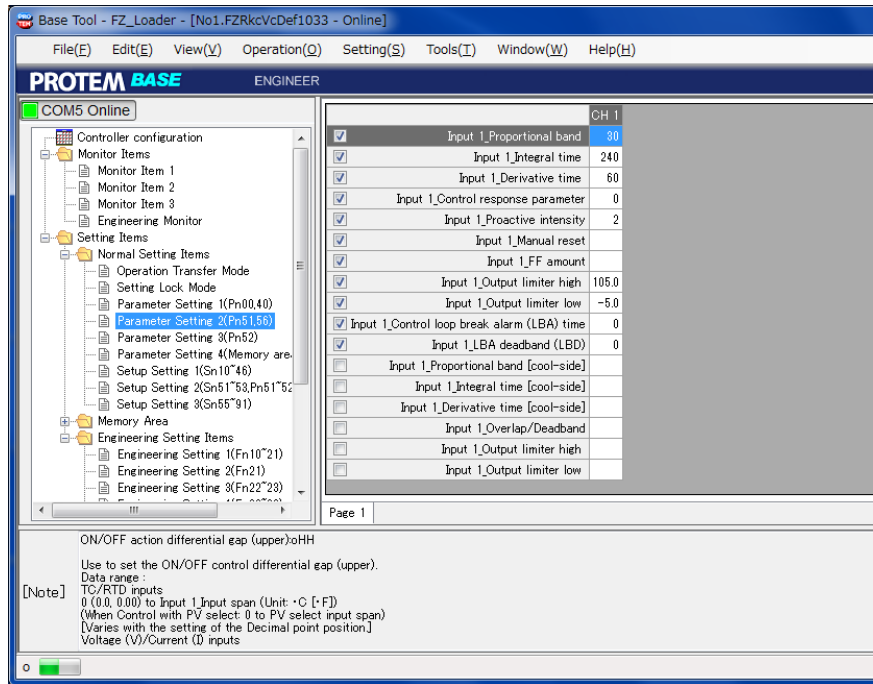
Setting item	Set value (factory set value)	
	Bit	Decimal
(1) Monitor item selection 1	0000110110000011	3459
(2) Monitor item selection 2	0100000010000000	16512
(3) Monitor item selection 3	0000010000000000	1024
(4) Setting item selection 1	0100000001100000	16480
(5) Setting item selection 2	0001111010101010	7850
(6) Setting item selection 3	1000000000000000	32768
(7) Setting item selection 4	0000001100000011	771
(8) Setting item selection 5	0000000000000000	0
(9) Setting item selection 6	0000000000000101	5
(10) Setting item selection 7	0000000000000000	0
(11) Setting item selection 8	0000000000000000	0

17. Make other initial setting

Following the setting of the PLC environment items, set up necessary functions and a set value (SV) to operate the FZ900 master (device address 0). This setting can be done using PROTEM2.



Refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)** for non-PLC communication related functions and parameters.



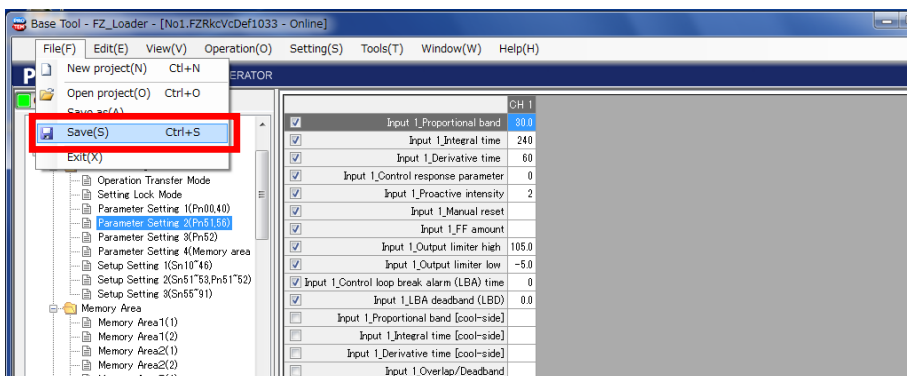
18. Activate the settings

To activate the settings done so far, shut down the FZ900 master (device address 0) once, and reapply power to the instrument. After power up, the modified values become effective.

If the FZ is running on the power from the COM-K2 without turning on the mains supply, remove the loader communication cable once and reconnect it to the FZ. The same effect can be obtained as powering up the FZ.

19. Save the project

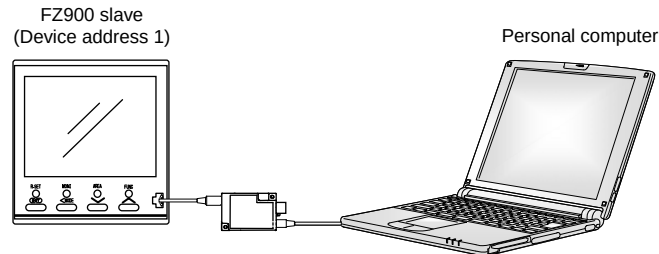
Overwrite to save the project of PROTEM2 (used to set up the FZ900 master with a device address "0").



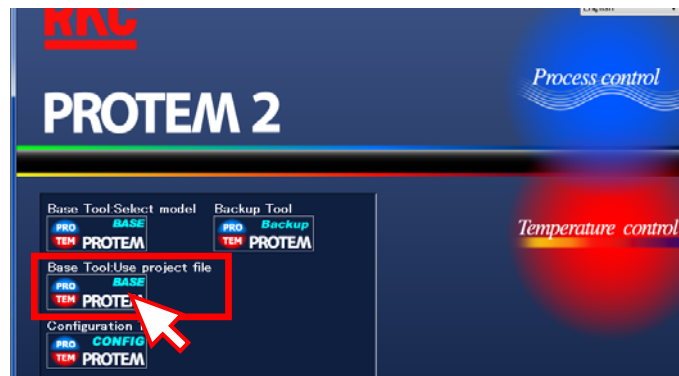
(5) Configuring the PLC communication environment item and FZ setting data of FZ900 slave

Following the setting of the FZ900 master (device address 0), the FZ900 slave (device address 1), set up the personal computer for the PLC communication environment setting and the initial setting.

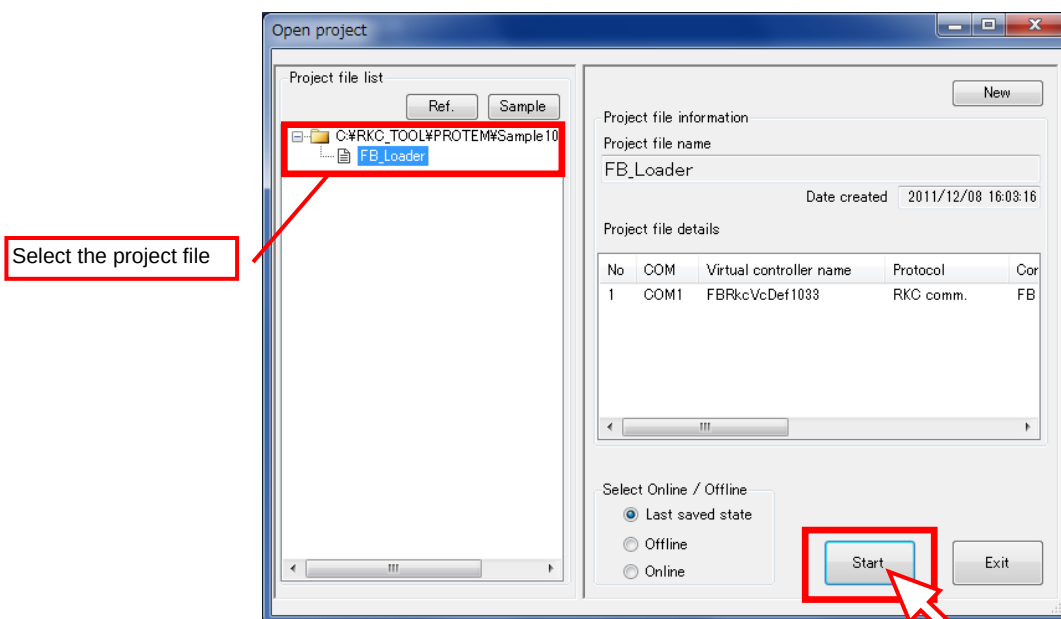
1. Connect the loader communication cable to FZ900 slave (device address 1)



2. Click “Base Tool: Use project file”



3. Open the project file used for the FZ900 master.
Select a project file to use and click “START.”



4. Similar to setting the FZ900 master, follow the procedures 10 through 14 to select the Engineering setting 10 screen.
5. Set the communication related items and PLC communication environment items of FZ900 slave (device address 1)
Set as follows for the data in “Engineer setting 10.” (Refer to **Table 3.**)

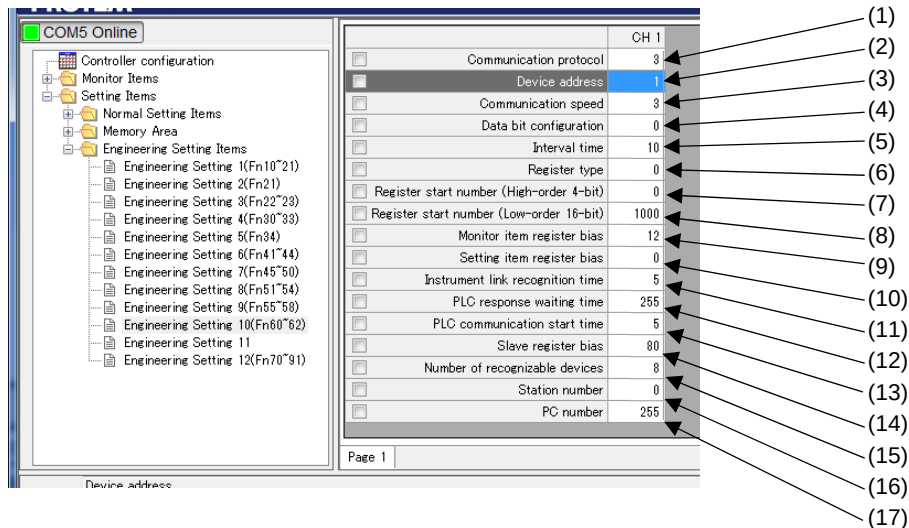


Table 3

Setting items	Set value
(1) Communication protocol	3
(2) Device address	1
(3) Communication speed	3 (19200 bps) (Factory set value)
(4) Data bit configuration	0 (Factory set value)
(5) Interval time	10 (Factory set value)
(6) Register type (D, R, W, ZR) ¹	0 (D register) (Factory set value)
(7) Register start number (High-order 4-bit) ¹	0 (Factory set value)
(8) Register start number (Low-order 16-bit) ¹	1000 (Factory set value)
(9) Monitor item register bias ¹	12 (Factory set value)
(10) Setting item register bias ¹	0 (Factory set value)
(11) Instrument link recognition time	5 seconds (Factory set value)
(12) PLC response waiting time	255 ms (Factory set value)
(13) PLC communication start time ²	5 seconds (Factory set value)
(14) Slave register bias ¹	80 (Factory set value)
(15) Number of recognizable devices ³	8 (Factory set value)
(16) Station number	0 (Factory set value)
(17) PC number	255 (Factory set value)

These values can be changed to change the starting number of the PCL communication data register.

¹ Usable register ranges and types vary depending on used CPU types. For register ranges and types that can actually be used, refer to the PLC instruction manual.

² The PLC communication start time is the time that writing of the system data starts.
Actual communication with the PLC by request command can only take place after the system communication state (D01080) changes to “1.”

³ Only the FZ master device (device address 0) can be set up.



For the Register start number, Monitor item register bias and Setting item register bias, refer to **P. 5-18.**

6. Select the communication data to use.

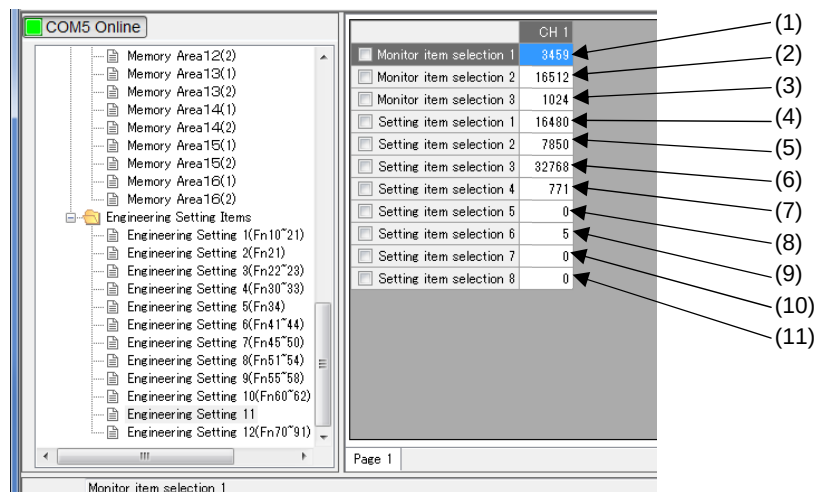
Select the communication data that are sent/received between the PLC and the FZ900 slave (device address 1). Selection of the communication data can be done at “Engineer Setting 11.”

In the following example, the data in the Engineering Setting 11 are used as they are configured at the factory. (Refer to **Table 4**)

To select communication data, refer to **6.3 Example of PLC Communication Data Map Editing (P. 6-61)**.

For the communication data type and data range, refer to the following sections:

- **P.5-8 to P.5-13 of 5.2.1 Setting items list**
- **6.2 PLC Communication Data Map (P. 6-23)**



Communication data of monitor group is assigned as a bit image in binary numbers.

Bit image: 0000000000000000
 Bit 15 ----- Bit 0
 0: Unused
 1: Used

Table 4

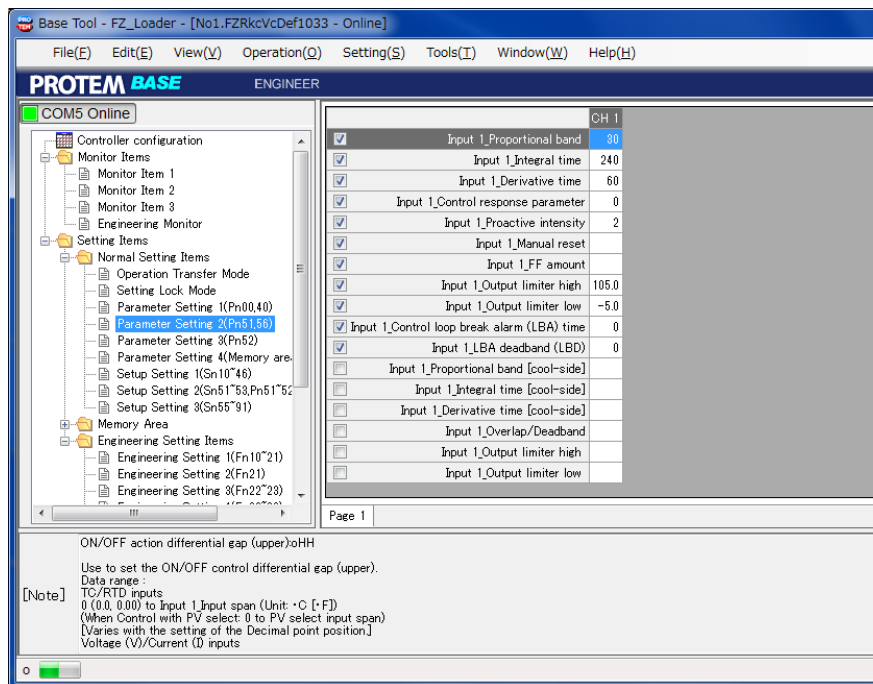
Setting item	Set value (factory set value)	
	Bit	Decimal
(1) Monitor item selection 1	0000110110000011	3459
(2) Monitor item selection 2	0100000010000000	16512
(3) Monitor item selection 3	0000010000000000	1024
(4) Setting item selection 1	0100000001100000	16480
(5) Setting item selection 2	0001111010101010	7850
(6) Setting item selection 3	1000000000000000	32768
(7) Setting item selection 4	0000001100000011	771
(8) Setting item selection 5	0000000000000000	0
(9) Setting item selection 6	0000000000000101	5
(10) Setting item selection 7	0000000000000000	0
(11) Setting item selection 8	0000000000000000	0

7. Make other initial setting

Following the setting of the PLC environment items, set up necessary functions and a set value (SV) to operate the FZ900 slave (device address 1). This setting can be done using PROTEM2.



Refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)** for non-PLC communication related functions and parameters.



8. Activate the settings

To activate the settings done so far, shut down the FZ900 slave (device address 1) once, and reapply power to the instrument. After power up, the modified values become effective.

If the FZ is running on the power from the COM-K2 without turning on the mains supply, remove the loader communication cable once and reconnect it to the FZ. The same effect can be obtained as powering up the FZ.

(6) PLC communication register address

In the PLC communication environment, by setting the values shown below for the Register type, Register start number, Monitor item register bias, Setting item register bias, Monitor item selection, Setting item selection, and Slave register bias, the register address of each data item in PLC communication will be as indicated below.

PLC communication environment item	Set value	
	FZ900 master (device address 0)	FZ900 slave (device address 1)
Register type	0 (D register)	0 (D register)
Register start number (Low-order 16-bit)	1000	1000
Monitor item register bias	12	12
Setting item register bias	0	0
Monitor item selection 1	3459	3459
Monitor item selection 2	16512	16512
Monitor item selection 3	1024	1024
Setting item selection 1	16480	16480
Setting item selection 2	7850	7850
Setting item selection 3	32768	32768
Setting item selection 4	771	771
Setting item selection 5	0	0
Setting item selection 6	5	5
Setting item selection 7	0	0
Setting item selection 8	0	0
Slave register bias	80	80



Occupied registers per data of FZ900

- System data (single word): One register per data
- Monitor group data (double word): Two registers per data
- Setting group data (double word): Two registers per data



The communication data selected at Monitor item selection and Setting item selection are assigned to the PLC register shifted to the left to remove blank.

Data map

Register address		Communication data	Data type
D1000	—	System communication state	FZ900 master (device address 0) System data (Single word)
D1001	—	Communication flag	
D1002	—	Internal processing	
D1003	—	Internal processing	
D1004	—	PLC communication error code	
D1005	—	PLC communication instrument recognition flag 1	
D1006	—	PLC communication instrument recognition flag 2	
D1007	—	Request item number	
D1008	—	Request command	
D1009	—	Setting group communication state	
D1010	—	Instrument recognition request command	
D1011	—	Internal processing	

Continued on the next page.



Continued from the previous page.

Data map

Register address		Communication data	Data type
D1012	D1013	Input 1_Measured value (PV)	FZ900 master (device address 0) Monitor item selection 1 data (Double word)
D1014	D1015	Input 1_Set value (SV) monitor	
D1016	D1017	Input 1_Manipulated output value monitor [heat-side]	
D1018	D1019	Input 1_Manipulated output value monitor [cool-side]	
D1020	D1021	Current transformer 1 (CT1) input value monitor	
D1022	D1023	Current transformer 2 (CT2) input value monitor	FZ900 master (device address 0) Monitor item selection 2 data (Double word)
D1024	D1025	Comprehensive event state	
D1026	D1027	Overall operation status	FZ900 master (device address 0) Monitor item selection 3 data (Double word)
D1028	D1029	Error code	
D1030	D1031	RUN/STOP transfer	FZ900 master (device address 0) Setting item selection 1 data (Double word)
D1032	D1033	Input 1_Autotuning (AT)	
D1034	D1035	Input 1_Set value (SV)	
D1036	D1037	Event 1 set value (EV1) Event 1 set value (EV1) [high]	FZ900 master (device address 0) Setting item selection 2 data (Double word)
D1038	D1039	Event 2 set value (EV2) Event 2 set value (EV2) [high]	
D1040	D1041	Event 3 set value (EV3) Event 3 set value (EV3) [high]	
D1042	D1043	Event 4 set value (EV4) Event 4 set value (EV4) [high]	
D1044	D1045	Input 1_Proportional band [heat-side]	
D1046	D1047	Input 1_Integral time [heat-side]	
D1048	D1049	Input 1_Derivative time [heat-side]	
D1050	D1051	Input 1_Control response parameter	
D1052	D1053	Input 1_Proportional band [cool-side]	FZ900 master (device address 0) Setting item selection 3 data (Double word)
D1054	D1055	Input 1_Integral time [cool-side]	
D1056	D1057	Input 1_Derivative time [cool-side]	FZ900 master (device address 0) Setting item selection 4 data (double word)
D1058	D1059	Input 1_Setting change rate limiter (up)	
D1060	D1061	Input 1_Setting change rate limiter (down)	FZ900 master (device address 0) Setting item selection 6 data (Double word)
D1062	D1063	Heater break alarm 1 (HBA1) set value	
D1064	D1065	Heater break alarm 2 (HBA2) set value	—
D1066	D1067	Blank registers	
⋮	⋮		
D1078	D1079		

Continued on the next page.

Continued from the previous page.

Data map

Register address		Communication data	Data type
D1080	—	System communication state	FZ900 slave (device address 1) System data (Single word)
D1081	—	Communication flag	
D1082	—	Internal processing	
D1083	—	Internal processing	
D1084	—	PLC communication error code	
D1085	—	PLC communication instrument recognition flag 1	
D1086	—	PLC communication instrument recognition flag 2	
D1087	—	Request item number	
D1088	—	Request command	
D1089	—	Setting group communication state	
D1090	—	Instrument recognition request command	
D1091	—	Internal processing	
D1092	D1093	Input 1_Measured value (PV)	FZ900 slave (device address 1) Monitor item selection 1 data (Double word)
D1094	D1095	Input 1_Set value (SV) monitor	
D1096	D1097	Input 1_Manipulated output value monitor [heat-side]	
D1098	D1099	Input 1_Manipulated output value monitor [cool-side]	
D1100	D1101	Current transformer 1 (CT1) input value monitor	
D1102	D1103	Current transformer 2 (CT2) input value monitor	
D1104	D1105	Comprehensive event state	FZ900 slave (device address 1) Monitor item selection 2 data (Double word)
D1106	D1107	Overall operation status	
D1108	D1109	Error code	FZ900 slave (device address 1) Monitor item selection 3 data (Double word)
D1110	D1111	RUN/STOP transfer	FZ900 slave (device address 1) Setting item selection 1 data (Double word)
D1112	D1113	Input 1_Autotuning (AT)	
D1114	D1115	Input 1_Set value (SV)	
D1116	D1117	Event 1 set value (EV1) Event 1 set value (EV1) [high]	FZ900 slave (device address 1) Setting item selection 2 data (Double word)
D1118	D1119	Event 2 set value (EV2) Event 2 set value (EV2) [high]	
D1120	D1121	Event 3 set value (EV3) Event 3 set value (EV3) [high]	
D1122	D1123	Event 4 set value (EV4) Event 4 set value (EV4) [high]	
D1124	D1125	Input 1_Proportional band [heat-side]	
D1126	D1127	Input 1_Integral time [heat-side]	
D1128	D1129	Input 1_Derivative time [heat-side]	
D1130	D1131	Input 1_Control response parameter	
D1132	D1133	Input 1_Proportional band [cool-side]	FZ900 slave (device address 1) Setting item selection 3 data (Double word)

Continued on the next page.



Continued from the previous page.

Data map

Register address		Communication data	Data type
1134	1135	Input 1_Integral time [cool-side]	FZ900 slave (device address 1) Setting item selection 4 data (Double word)
1136	1137	Input 1_Derivative time [cool-side]	
1138	1139	Input 1_Setting change rate limiter (up)	
1140	1141	Input 1_Setting change rate limiter (down)	
1142	1143	Heater break alarm 1 (HBA1) set value	FZ900 slave (device address 1) Setting item selection 6 data (Double word)
1144	1145	Heater break alarm 2 (HBA2) set value	

7.5 Communication Setting of PLC

Set the Serial communication module of MITSUBISHI MELSEC Q series as follows.

Setting item	Description
Operation setting	Independent
Data bit	8
Parity bit	None
Even/odd parity	Odd
Stop bit	1
Sum check code	Exist

Setting item	Description
Online Change	Enable
Setting modifications	Enable
Communication rate setting	19200 bps
Communication protocol setting	MC protocol (Format 4)
Station number setting	0



Setting in the serial communication module (QJ71C24N) belonging to the MITSUBISHI MELSEC Q series do with the GX Works2 of the MITSUBISHI MELSEC PLC programming software.
Setting set the following set value with switch setting for intelligent functional module.

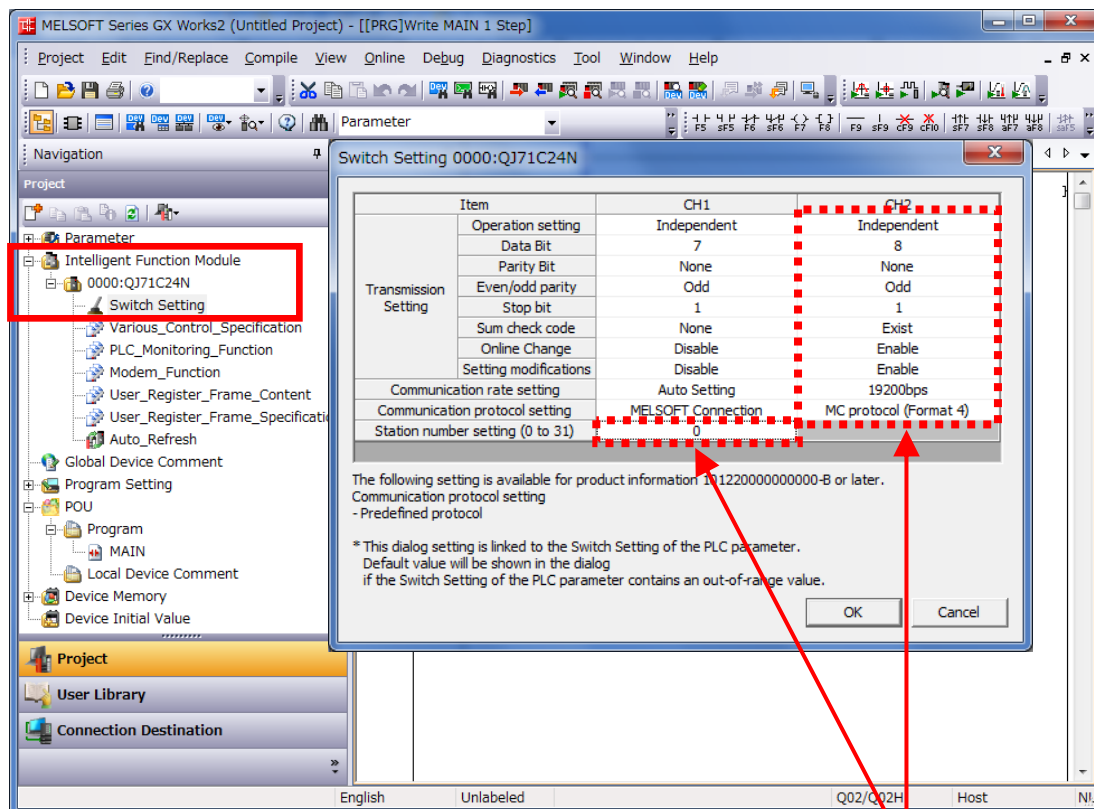
[Setting procedure]

[Intelligent functional module] $\rightarrow$ [0010: QJ71C24N] $\rightarrow$ [Switch setting]

[Setting screen]

The screen is a Japanese edition.

<Switch setting of the intelligent function module>



To be set.



The details of the switch setting for the PLC, refer to the instruction manual for the PLC being used.

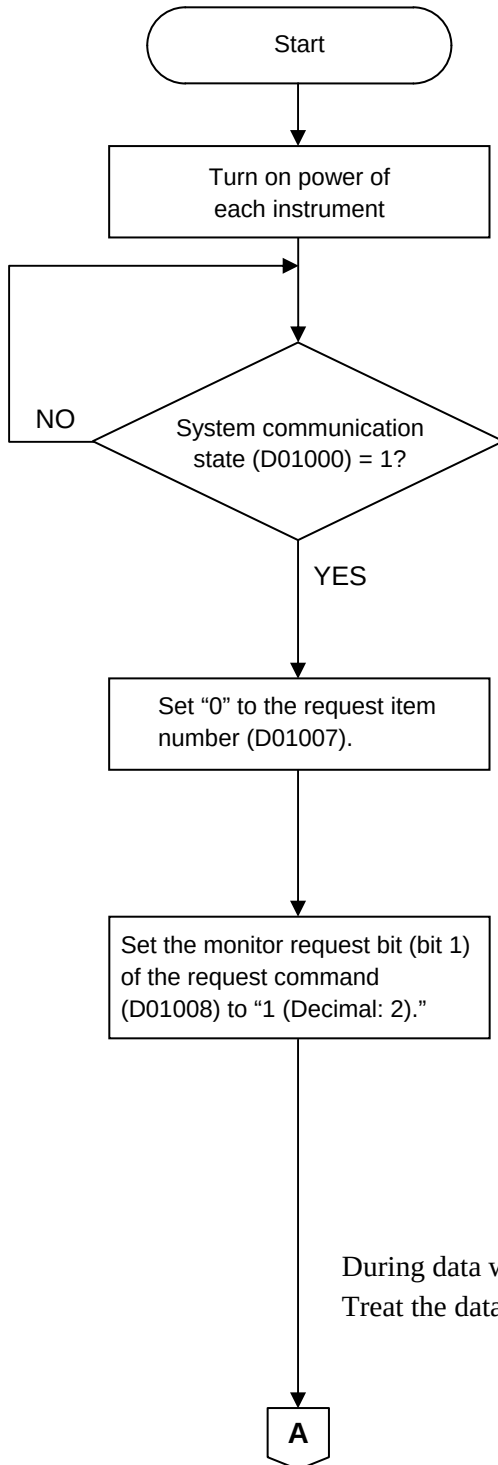
7.6 Initial Setting



NOTE

Change each set value of FZ controller from the PLC after the initial settings are made.
Configure initial settings for all of the FZ controllers.

■ Initial setting of the FZ900

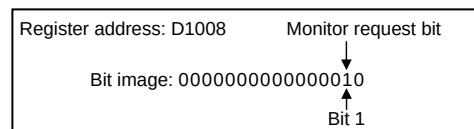


Turn on the power of the FZ controllers, and the PLC.
When the PLC communication start time (factory setting: 5 seconds) elapses, writing of the system data begins.

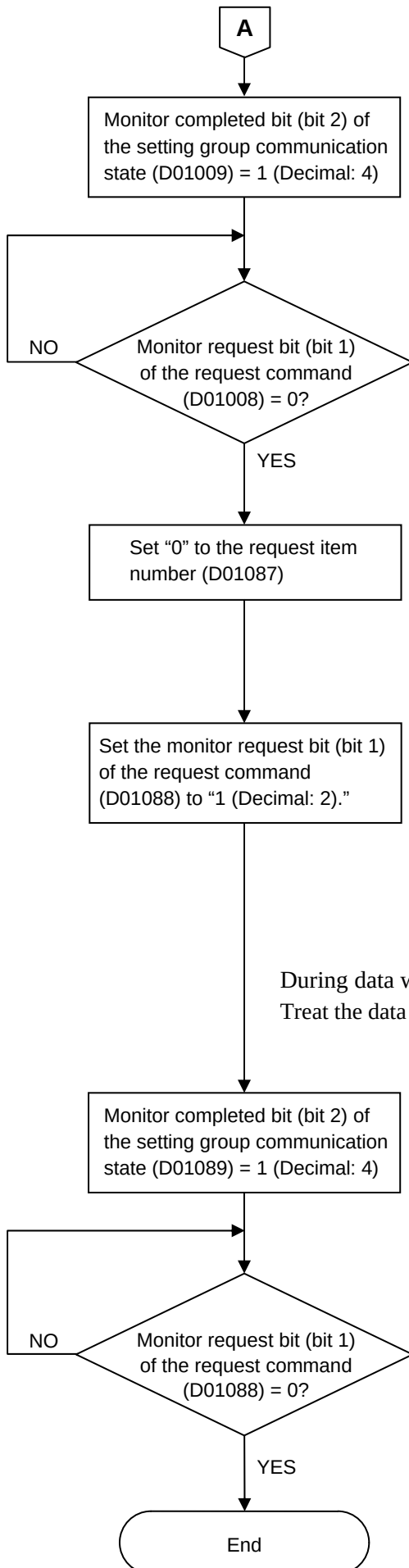
After the system data is written, the FZ controller begins writing the communication data of the monitor group to the PLC. When monitor group writing starts, “system communication state” changes to “1.”
When the system communication condition becomes “1,” PLC communication can be performed.

Data of the FZ900 master (device address 0) is transferred.
Because all communication data of the setting group is written to the PLC, the request item number (D01007) of the PLC register is set to “0.”

When the monitor request bit (bit 1) of request command (D01008) of the PLC register is set to “1 (Decimal: 2),” the FZ master begins writing the communication data of setting group to the PLC.

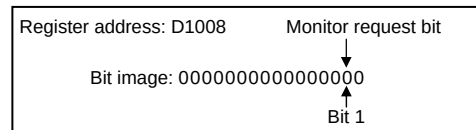


During data write:
Treat the data of all items as inconsistent during the data write.



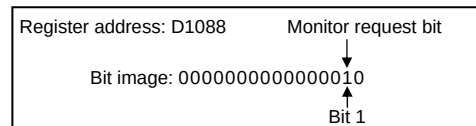
When writing is finished, the FZ master writes the communication state of the setting group to the monitor completed bit (bit 2) of the setting group communication state (D01009) of the PLC.

If the monitor request bit (bit 1) of the request command (D01008) of the PLC register is "0," this indicates that writing of data to the PLC is finished.



Data of the FZ900 slave (device address 1) is transferred. Because all communication data of the setting group is written to the PLC, the request item number (D01087) of the PLC register is set to "0."

When the monitor request bit (bit 1) of request command (D01088) of the PLC register is set to "1 (Decimal: 2)," the FZ slave begins writing the communication data of setting group to the PLC.



During data write:
Treat the data of all items as inconsistent during the data write.

When writing is finished, the FZ slave writes the communication state of the setting group to the monitor completed bit (bit 2) of the setting group communication state (D01089) of the PLC.

If the monitor request bit (bit 1) of the request command (D01088) of the PLC register is "0," this indicates that writing of data to the PLC is finished.

7.7 Data Setting

It is assumed that initial setting is finished.

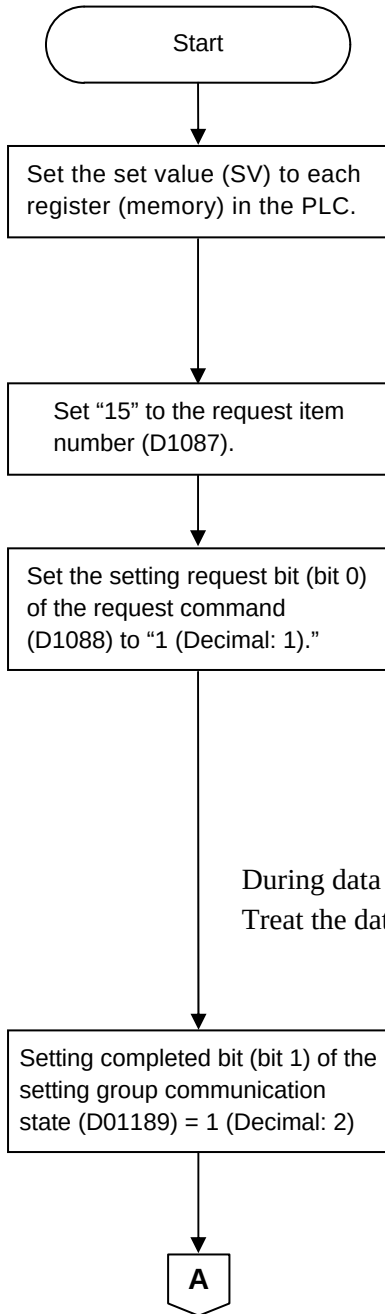


NOTE

If each set value of the FZ controller is changed from the PLC without setting the initial values, it is re-written to 0 with each set value of the PLC at that time set to 0.

■ Setting example

When the Input 1_set value (SV) of FZ900 slave (device address 1) is set to 200 °C

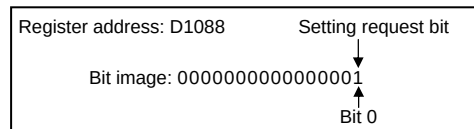


Set "200" as temperature set value to the PLC register D1114*.

* D1114 is the register address to which a set value (SV) of Input 1 is assigned. (Refer to P. 7-19)

Enter "15" which is the item number of set value (SV) of Input 1 into request item number D1087 of the PLC register.

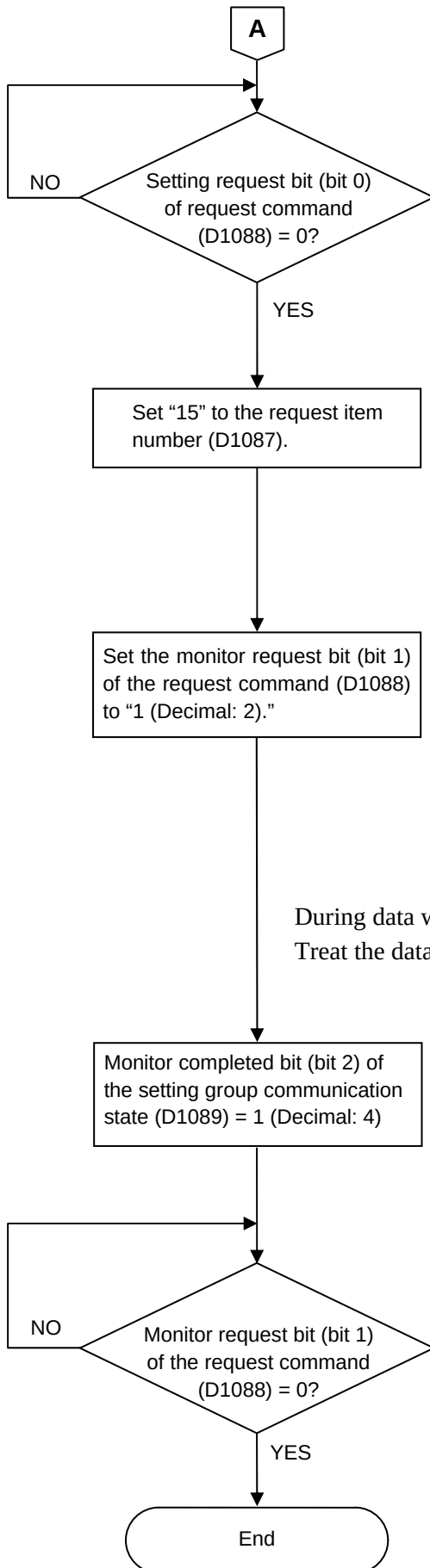
When setting "1 (1 in decimal)" to the setting request bit (Bit 0) of D1088, request command of the PLC register, FZ900 slave will start reading the data of set value (SV) of input 1 set to the PLC register (memory).



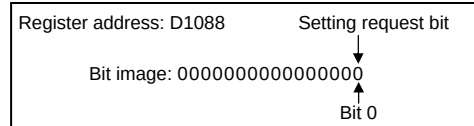
During data read:

Treat the data of all items as inconsistent during the data read.

When readout is completed, FZ900 slave will write the communication state of set value (SV) of Input 1 to the Setting completed bit (Bit 1) of the PLC Setting group communication state D1089.



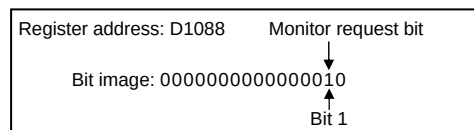
If the setting request bit (bit 0) of the request command (D1088) of the PLC register is “0,” this indicates that reading of data from the PLC is finished.



[Confirmation of setting data]

Set “15” (item number of the Set value (SV) of Input 1) to D1087 (the Request item number of the PLC register) in order to verify the data that the FZ900 slave has read from the PLC.

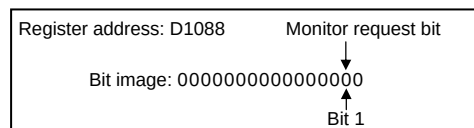
When the monitor request bit (bit 1) of request command (D1088) of the PLC register is set to “1 (Decimal 2),” the FZ slave begins writing the data of Input 1_Set value (SV) to the PLC.



During data write:
Treat the data of all items as inconsistent during the data write.

When writing is finished, the FZ slave writes the communication state of the Input 1_Set value (SV) to the monitor completed bit (bit 2) of the setting group communication state (D1089) of the PLC.

If the monitor request bit (bit 1) of the request command (D1088) of the PLC register is “0,” this indicates that writing of data to the PLC is finished.

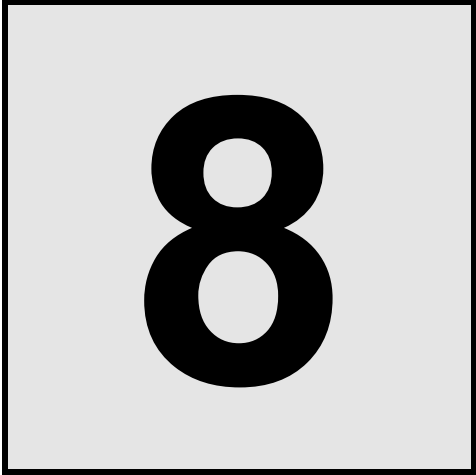




MEMO



TROUBLE SHOOTING



8



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

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

WARNING

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



NOTE

**When replacing the FZ with a new one, always use the module with the same model code.
If the FZ is replaced, it is necessary to re-set each data item.**

Solutions for Problems

Problem	Possible cause	Solution
Unable to communicate		
At "Communication response monitor" (<i>LCMRM</i>) (P. 8-5) at Fn60 in the Engineering mode of the FZ: Transmission status monitor does not display 0 and 1 alternately.	Communication protocol of the FZ is not set to "PLC communication"	Select "3: PLC communication" at "Communication protocol" at Fn60.
At "Communication response monitor" (<i>LCMRM</i>) (P. 8-5) at Fn60 in the Engineering mode of the FZ. • Transmission status monitor displays 0 and 1 alternately. • Reception status monitor does not display 0 and 1 alternately. RD/SD lamps on the PLC side RD lamp: Unlit SD lamp: Unlit	A communication message from the FZ has not reached the PLC. ↓ • Communication cable is wrongly connected. • Communication cable is not connected to the terminal. • Communication cable may be broken.	• Check terminal number and signal function, and properly connect the cable. • Check connection of communication cable. • Replace communication cable. Caution: Polarity of lines A and B of Mitsubishi PLC is just reversed from ours.
At "Communication response monitor" (<i>LCMRM</i>) (P. 8-5) at Fn60 in the Engineering mode of the FZ. • Transmission status monitor displays 0 and 1 alternately. • Reception status monitor does not display 0 and 1 alternately. RD/SD lamps on the PLC side RD lamp: Flashing SD lamp: Unlit	A communication message from the FZ has reached the PLC, but the PLC will not reply. ↓ • Wrong communication wiring • Wrong communication setting No sum check in communication setting of the PLC	• Check terminal number and signal function, and properly connect the cable. Caution: Polarity of lines A and B of Mitsubishi PLC is just reversed from ours. • Use sum check in communication setting of the PLC.
At "Communication response monitor" (<i>LCMRM</i>) (P. 8-5) at Fn60 in the Engineering mode of the FZ. • Transmission status monitor displays 0 and 1 alternately. • Reception status monitor displays 0 and 1 alternately. RD/SD lamps on the PLC side RD lamp: Flashing SD lamp: Slow flashing	The PLC sends a response to the communication message from the FZ, but the message is not received by the FZ. ↓ • Wrong communication wiring • Wrong communication setting No sum check in communication setting of the PLC	• Check terminal number and signal function, and properly connect the cable. For RS-422A, make sure RA and RB on the FZ side are properly wired. • Use sum check in communication setting of the PLC.
• Data transmission will not end even if "1" is set to the Setting request bit or Monitor request bit of the request command. The Setting request bit or Monitor request bit will not return to "0." • Communication seems to be working properly, but monitor values are not sent to the PLC. • No response	• Communication cable is wrongly connected. • Communication cable is not connected to the terminal. • Communication cable may be broken.	• Check terminal number and signal function, and properly connect the cable. • Check connection of communication cable. • Replace communication cable.
	Communication speed and data bit configuration are different from the PLC.	Check the communication speed and the data bit configuration of the FZ, and set the communication speed and the data bit configuration to be equal to those of the PLC.
	Communication protocol of the FZ is not set to "PLC communication"	Change the communication protocol of the FZ to the PLC communication.
	Wrong setting of PLC communication data	Confirm the PLC communication settings and set them correctly Setting of termination resistor in accordance with PLC or the insertion is done
	Setting of PLC becomes write inhibit	Setting of PLC is turned into write enable (Write enable in RUN, shift to monitor mode, etc.)
	Accesses outside the range of memory address of PLC (wrong setting of address)	Confirm the PLC communication environment setting and set them correctly

Continued on the next page.

Continued from the previous page.

Problem	Possible cause	Solution
An error occurs in the PLC communication error code. Bit 0 may be on.	Writing to the PLC from the FZ fails. ↓ • PLC response waiting time is short. • Register range is out of available range.	• Extend the PLC response waiting time. • Check the setting of the PLC communication environment and set the values correctly.
A request command was executed, but set values are updated only halfway through.		
To detect communication errors, a normal communication flag is used and a watchdog timer is programmed, yet timeout sometimes occurs.	When all of the set values are written into, the update of the normal communication flag may become slower. ↓ • Timeout time is too short. • PLC response waiting time is short.	• Extend the timeout time. • Extend the PLC response waiting time.
When two or more FZ are connected, some of these may not be recognized.	Instrument link recognition time is short	Lengthen Instrument link recognition time * * Set the Instrument link recognition time only for a FZ master (device address 0).
	The “Number of recognizable devices” may be incorrectly set up.	Check the total quantity of the connected instruments and set a correct value.
	• Turned on power to the FZ now connected. • FZ master, FZ slave, and PLC are powered on at different timing.	Conduct the recognition processing using Instrument recognition request command. When two or more FZ are connected and those that had been switched off are turned on again, the recognition processing of the controller must be performed.
When the setting request command of request command is set in “1,” setting error is become (Bit 0 of setting group communication state: ON)	Data range error	Read the data once, and try to re-write the data into the controller. Confirm the setting range of set value and set them correctly



For the communication speed, data bit configuration and communication protocol, refer to the following sections:

3.1 Communication Setting of FZ (P. 3-2)

5.2 PLC Communication Environment Items List (P. 5-3)



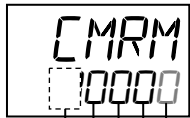
For the PLC communication environment setting, Instrument link recognition time or Number of recognizable devices, refer to **5.2 PLC Communication Environment Items List (P. 5-3)**.



For more details of the instrument recognition request command, refer to **Instrument recognition request command (system data) (P. 6-11)**.

Communication response monitor [Engineering mode: Function block No. 60]

Communication
response monitor



SV display unit

Communication response monitor

0: Normal response

1: Overrun error

2: Parity error

4: Framing error

8: Receive buffer overflow

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

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

0 (fixed)

Reception status monitor

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

Transmission status monitor

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

Lights off



For the display method of Communication response monitor, refer to the **3.1.2 Setting via front keys (P. 3-12)**.



MEMO





RKC INSTRUMENT INC.

HEADQUARTERS: 16-6, KUGAHARA 5-CHOME, OHTA-KU TOKYO 146-8515 JAPAN

PHONE: 03-3751-9799 (+81 3 3751 9799)

FAX: 03-3751-8585 (+81 3 3751 8585)

E-mail: info@rkcinst.co.jp

Website: <http://www.rkcinst.com/>

